

Creation Research Society Quarterly

Haec credimus:

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

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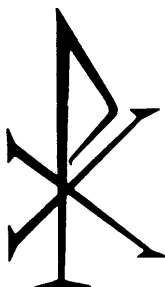
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TABLE OF CONTENTS

Membership Application.....	43
Order Blank for Past Publications.....	44
History and Statement of Belief.....	44
Editorial Comments	45
Educational Column— How Would You Teach About Scientific Laws?	45
John N. Moore	
D-World Evidence.....	47
Robert A. Herrmann	
Global Heat Balance with a Liquid Water and Ice Canopy	54
Gary L. Johnson	
Panorama of Science	62
Quantum Physics: Historical Review and Current Directions	66
S. G. Smith and C. E. Geist, Jr.	
Keyword Index to Volumes 21 and 22.....	72
G. W. Wolfrom	
Book Reviews (5).....	74
Article Review	78
Letters to the Editor (4).....	79

COVER PHOTOGRAPH

Exclusive photograph of a cliff at Joggins, Nova
Scotia, taken by George White. Polystrate tree trunks
in the cliff indicate violent catastrophism.

-George Mulfinger

ERRATA

Teaching about origin questions: origins of human
beings by John N. Moore (*CRSQ* 22:183-8) was re-
ceived 28 March 1985.

CRSQ 23:6 Next to the last paragraph, the last sen-
tence should read: The rain is . . . to arms.

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CREATION RESEARCH SOCIETY

History The Creation Research Society was first organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (with graduate degrees in science) and over 1500 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and now is recognized as probably the outstanding publication in the field.

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

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$15.00 (\$17.00 U.S. for overseas) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 14016, Terre Haute, IN 47803. Sustaining membership or those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at \$15.00 (\$17.00 U.S. for overseas) per year and includes a subscription to the *Quarterlies*. All others interested in receiving copies of all these publications may do so at the rate of the subscription price for all issues for one year: \$18.00 (\$20.00 U.S. for overseas).

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

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

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

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

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

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

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EDITORIAL COMMENTS

Dr. John N. Moore discusses how to teach scientific laws within a creationist framework. Several good "teaching" articles have been featured in past Quarterlies.

Another topic that has occupied many pages of the Quarterly is the discussion of classical and quantum physics in relation to the creation model of science. Smith and Geist add a contribution to the continuing debate. Dr. Robert A. Herrmann finishes his series on the deductive-world model and its relation to Scripture.

As an added help to Quarterly readers, Glen Wolfrom will provide a keyword index to the Quarterly that will appear in each September issue. Dr. Gary L. Johnson presents a model for a pre-Flood water and ice canopy. Several shorter items deal with geology, philosophy, insects, flood damage, thermodynamics and teleology. I hope that our readers will find much useful material in this Quarterly. I encourage you to send your comments to me. The exchanges in the Letters to the Editor are always very interesting.

Emmett L. Williams, Editor

EDUCATIONAL COLUMN

HOW WOULD YOU TEACH ABOUT SCIENTIFIC LAWS?

JOHN N. MOORE*

Received 2 August 1985; Revised 5 September 1985

Abstract

This article contains a short response to the title question as an appropriate point of view to guide teachers, parents, and others according to methodology of proper and orderly scientific procedure. Avoidance of common semantic confusion is illustrated briefly.

The scientist who describes regularities [processes or "patterned behavior of matter"] of naturally occurring objects and/or events in expressions of various scientific laws, natural laws (or laws of nature) may very well be describing the way God acts as He sustains and maintains His creation. (CRSQ 22:25)

Introduction

What is a scientific law? A scientific law is a repeatedly tested and well supported or substantiated *generalization* of seemingly universal application regarding a limited set of facts. Excellent examples are the gas laws, laws of motion, thermodynamic laws, and Mendelian laws.

Scientific laws are specific descriptive statements by scientists about relationships of aspects of their *natural* environment based upon repeated observations. Therefore scientific laws are "inventions" or "discoveries" or broadly worded "cognitions" that result from proper and orderly scientific work. In a word scientific laws are "made" by human beings.

Necessarily, common relationships of natural objects and/or events are *not* set up by scientists. Scientists only *detect* specific relationships of aspects of their natural environment. Again, scientific laws are human approximations of the contingencies of the natural environment which have been identified by scientists over the centuries.

Therefore scientific laws do not control the universe or any part of the environment. Scientific laws are *descriptive* statements; hence laws of nature (or natural laws) are *not prescriptive*, and are distinct from civil or judicial laws. Young minds need to comprehend clearly that there is a distinction between descriptive natural laws and prescriptive laws of society (or societal laws).¹

Impact of Determinism

Because of the highly influential thinking of proponents of Determinism during the time of post-Newtonian physics, a too easy pattern of thinking has been adopted for many decades. In those decades scientists have enjoyed many, many successes in formulating and applying scientific laws to varying aspects of the natural environment. Too freely, however, non-scientists (and even a number of leading scientists) have applied a deterministic attitude of mind to *all* physical and biological phenomena.

Even some proponents of scientific creationism (and devoted Christians in general) have practiced a type of deterministic thinking and utilized such words as, "Physical objects move according to the laws of motion," "Chemical reactions and processes are controlled by scientific laws," or "The universe is governed by natural laws."

In talking about scientific laws, science teachers, parents and others should consider seriously and discuss at length the accompanying analysis of items associated with an explicit analogy between "Laws of Nature" and "Laws of Society" (See Table I), as follows:

1. A *scientific law* is a limited statement containing description of regularities found in the natural environment. A *societal law* is a prohibition regarding interpersonal relationships of naturally gregarious human beings.

2. A *scientific law* is identified or discovered (detected) with regard to already existing objects and/or events (with no information beyond mere relational existence). A *societal law* is passed by legislative proc-

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Table I. Scientific Laws: An Analogy Analyzed

Laws of nature (natural laws) are not just like laws of human society. Laws of nature are not enforced in the same way as laws of society.

Laws of Nature	Laws of Society
1. Descriptions	1. Prohibitions
2. Identified, discovered	2. Passed or decreed by human beings
3. Mainly a choice among average readings	3. Stated with precision as basis for punishment for infraction
4. Apply to things incapable of any volition	4. Govern responsible beings with free will
5. No moral connotation	5. Lead to implications of criminality for those who break laws

THERE ARE CRUCIAL DIFFERENCES BETWEEN USE OF THE TERM LAW WITH RESPECT TO (1) THE GENERALIZATION OF A SCIENTIST, AND (2) THE COMMAND OF AN AUTHORITY OF SOCIETY.

esses or decreed by human authority to be prescriptive of appropriate human behavior.

3. A *scientific law* is mainly an average of observations or meter readings (measurements by some means), often of limited application within parameters such as speed (velocity) or temperature. A *societal law* is stated with precision to avoid ambiguity of application and is the basis of just punishment (penalty) for some infraction.

4. A *scientific law* is applied to things incapable of any volition (and disregard of this point is the basis, regrettably, of improper and undesirable anthropomorphic thinking, writing and speaking that is inconsistent with professional scientific work). A *societal law* is a means to *govern* responsible, volitional human beings.

5. A *scientific law* has no moral connotation as such. A *societal law* commonly leads to the implication that criminal action has been taken by those who “break the law.”

Natural objects *do not obey* natural laws or laws of nature. Scientific laws *only describe the behavior* of naturally existing objects. In contrast, the laws of human government *are prescriptive* as indications of how human beings should behave. Civil laws *are* types of *controls* over human behavior. But civil laws are not necessarily descriptive of how human beings behave. These basic distinctions stated here and afforded in the analogy analysis should be made very clear to students.

Laws Are Explained by Theory

Furthermore a precise analysis of the “position” of scientific laws with respect to scientific theories results in placement of scientific laws “under” scientific theory. Essentially scientific laws are *not* “elevated” to theory level or status. Let me explain.

Excellent examples of scientific theories are kinetic-molecular theory, modern atomic theory, nuclear theory, and gene theory. These scientific theories are used as particular frames of reference to explain particular facts relevant to natural objects and/or events in the natural environment.

Isolated facts are nearly useless. They have meaning or value primarily when related to other facts and placed into some coherent ideational framework: *an explanation*. Either such an explanation is accomplished when relationships and relational aspects of individual facts are comprehended in an overall “picture”; or when particular facts are fitted into some universal formulation by which widely diverse and

apparently isolated facts are organized into meaningful relationship: *a scientific theory*.

In contrast a scientific law is a limited generalization of specific scope as relating to a state of matter: a gas described by a gas law. As depicted in Table II scientific laws are “under” scientific theories. The scientific law is a specific generalization which in turn is “explained” by the scientific theory.

With respect to the quotation at the beginning of this article, the science teacher or parent of theistic viewpoint would be fully proper to point out in academic freedom to students that a “scientific law” may very well be an expression of the manner in which God acts “as He sustains and maintains His creation.”

Table II.
Scientific Laws Are “Under” Scientific Theory

Postulates of Gas Kinetic Theory:

1. All matter is composed of small particles.
2. Gas molecules are small compared with distance between them.
3. Particles are in motion.
4. When molecules collide with each other or walls of a container there is no loss of energy.
5. The average kinetic energy of all different gas molecules is the same at the same temperature.
6. The energy of molecular motion is heat energy, that is, the temperature of a gas is a measure of the average kinetic energy of the molecules.

Gas Laws:

1. The volume of a confined gas is inversely proportional to the pressure of the confined gas, when temperature is held constant.
2. The pressure of a confined gas is directly proportional to the temperature of the gas, when volume is held constant.
3. The volume of a confined gas is directly proportional to the temperature of the gas, when pressure is held constant.

(Note: Electrostatic Laws, Magnetic Polar Laws, Laws of Chemistry, Thermodynamic Laws, and Mendelian Laws are explained by specific scientific theories, such as modern atomic theory, nuclear theory, and gene theory.)

Laws Represent Divine Governance

Physicist Howard J. Van Till has reasoned, “All material behavior may be perceived far more consistently

as evidence for the reality of divine action.”² Within Van Till’s context of emphasis that God is the Creator and that the cosmos is His creation, he states further:

Perhaps we all must be reminded that the Creator revealed in the Bible is not only the Originator of the cosmos, but also its Preserver, Governor, and Provider. Let us learn to see all phenomena as the product of divine activity: not just the extraordinary or unusual, but the ordinary and usual as well; not just the discontinuous or singular events, but the continuous and universal phenomena as well; not just the special events of the past, but the common events of the present as well.³

I am indebted to Professor Van Till for providing this insight because I agree with him so specifically when he makes explicit that detected processes in the natural environment, that is, “patterned behavior of matter,” are manifestations of divine governance. Thus, in the 1980s, he affords an excellent re-statement of the thinking of many of the founders of modern science.

Van Till points out that scientists label their *descriptions* of patterned behavior of material systems by the term “natural laws.” Then he states that he would “strongly prefer to call them the patterns of divine governance” (p.38). I agree because then the Biblical oriented scientist and parent indicates acceptance of the contingency of the entire cosmos. The entire cosmos is dependent upon God; the entire cosmos is *not*

independent of God as proponents of Materialism, Naturalism, and Determinism would maintain.

Conclusions

In conclusion I recommend teaching about scientific laws as limited, man-made, descriptive generalizations. Scientific laws are descriptions by human beings of already existing, contingent relationships “found” by scientists. Thus scientific laws are not prescriptive as are societal laws.

Scientific laws are not deterministic. Therefore scientific laws do not control existing patterns of behavior or processes involving natural objects and/or events. Hence, one would *not* state, “The universe is governed by natural laws.”

Rather, for the theistic oriented person, scientific laws may well be representations or manifestations of divine guidance and sustenance and maintenance. All the cosmos is fully contingent upon God the Creator of all things. The evidence is all around.

References

1. Moore, John N. 1983. How to teach origins without ACLU interference. Milford, MI: Mott Media, pp. 80 and 138. Condensed or abridged treatment of related methods of teaching about origin questions are developed by the author in *Creation Research Society Quarterly* 21:115-19, 21:189-94, 22:20-25, and 22:183-88.
2. Van Till, Howard J. 1984. The cosmos: nature or Creation?, *Occasional Papers from Calvin College*, 3(1):41.
3. *Ibid.* p. 26. Note taken from context of author’s emphasis on the difference between “cosmos” and “nature.”

D-WORLD EVIDENCE

ROBERT A. HERRMANN*

Received 26 August 1984; Revised 4 April 1986

Abstract

This is the final article in the series Nature: The Supreme Logician. This article discusses indirect evidence for the acceptance of the deductive-world model. This evidence includes the unification of certain incompatible logics internal to quantum mechanics, other physical theories and computer science; subparticle models for quantum transitions, the formation of elementary particles and fields, the local Special Theory and how such subparticle models explain the experimental results associated with the Bell inequality. It is shown how a special interpretation correlates the deductive-world model to Scripture.

1. Introduction

It may not be obvious to a reader of the previous articles in this series but I am actually expounding a very restricted philosophy of science. Historically, human or machine observations and measurements preceded attempts to correlate such observations to mathematical structures. When a compatible structure is accepted, then many of its predictions are open to verification. If these predictions did not correspond to a preponderance of experimental evidence, then the mathematical structure was often altered or a new structure sought. Unfortunately, in modern times, this process has been reversed. For example, in quantum mechanics the indirect evidence for β -decay does not verify certain conservation laws within the theory. Pauli, in an attempt to save the physical integrity of the theory, suggested the use of a physical term the “neutrino” that would be endowed with physical “life” by assigning to it the missing theory predicted analytical

components. Many scientists accept this term as objectively real rather than simply admitting that this invention may be a pure theory catalyst having no objective reality (i.e. the term neutrino need not correspond to anything in reality) or that for this particular scenario the theory or the mathematical structure may be incorrect. What physical terms for assumed indirectly detectable objects are in reality catalytic and what are not is unknown, but the more that are inserted in order to extend a restricted theory to other scenarios seems to me to imply that the original theory has an intrinsic weakness. This unfortunate philosophy of science is what this author has attempted to avoid with the construction of the deductive-world model (i.e. D-world model.)

All known scientific theories with one exception¹ are restricted by the use of standard discipline languages and mathematical structures to specific “states of affairs” where it is hoped that their descriptive content mingles rationally into a general theory. Recall that quantum mechanics has recently been shown to be

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incomplete in the sense that within the discipline language there is a description for an experimental preparation that cannot be analyzed by the theory's mathematical structure.²

The deductive-world model is concerned with the possible existence of a more fundamental unifying reality than that expressed by the standard language theories. It is a substratum model that partially describes this background world, and in so doing yields and preserves the descriptive content of other standard theories. Please note that certain theories for the behavior of natural systems, such as quantum theory and the various "relativity" notions, have been criticized due to additional philosophical implications—philosophical constructs that need not be valid. Mostly these implications tend to deny that the predicted effects can be rationally described by means of some more fundamental cause and yet retain the content of these and other such theories. As shown by the previous treatises in this series the deductive-world model eliminates this philosophic predilection and restriction.

Since journal resources require that this final series article be briefly presented, a prolonged discussion of these philosophic matters will not be undertaken. However, the conservative philosophy of science purposely incorporated into the D-world methodology will be discussed. Further, various definitions that appear in the previous articles³⁻⁵ will not be repeated and no formal derivations will appear. All derivations are being made available upon request, while supplies last, free of charge.⁶

Patton and Wheeler claim that many known "laws of nature" (i.e. descriptions for assumed invariant relations) are mutable under certain circumstances.⁷ It can be strongly argued that standard *descriptive* theories (theories that predict behavior and do not explain why objects behave in the predicted manner from a more fundamental point of view⁸) apply only to certain experimental preparations or scenarios. Not only is the behavior of a natural system only partially describable by a coalescing of distinct standard theories, but such concepts as energy and momentum conservation need not be absolutely inviolate. For these reasons when experimental evidence and methods are modeled, only the most common features of many theories and those methods that have survived the tests of time and experience will be considered. The modeling will remain extremely conservative in the *a priori* selection of pre-sumptions. It utilizes only the most simplistic logical processes and finitary procedures.

One basic restriction is predicted by results determined by Gödel's incompleteness criteria. When individuals restrict themselves to finite human choice it can be shown⁹ that there is no known method for establishing a *fixed* nonvarying, nonintuitive rule within the standard world of communication that will allow them to determine automatically whether or not a description *F* for natural system behavior is a member of a certain theory Γ . Much to the surprise of theoreticians this "Gödel effect" is nullified within the natural world (i.e. N-world) by the deductive-world model. Within the D-world there is a *pure* D-world process that does determine whether or not *F* is a member of Γ . However, even though the D-world bypasses all such N-world Gödel effects, it does force one to be very conservative in the selection of additional D-

world hypotheses. This basic and absolute restriction is called the (D-world) *hypothesis law*. It has been established that within the D-world there are pure D-world procedures (laws?) that yield automatically pure D-world developmental paradigms. These developmental paradigms may be assumed to represent *refined* D-world behavior as presented in a D-world language that has no counterpart in the natural world—including our new D-world metalanguage.¹⁰ Also recall that human languages describe natural system behavior if and only if developmental paradigms exist, paradigms which contain descriptive elements that cannot be expressed explicitly in any human language. This rationally implies that there is refined D-world behavior that cannot be described in any N-world language. For this reason the *hypothesis law* states that unless some significant information can be transferred from the N-world into the D-world by allowable mathematical procedures then unreasonable speculation should not be used. The results stated above imply immediately that our descriptive knowledge of the D-world must remain very incomplete, disjointed and piecemeal in character.

On the more positive side, the concept of a developmental paradigm may be applied to sequences of statements that describe "natural laws" themselves, both standard and nonstandard laws. Thus within the D-world the hyperfinite choice process—a prior non-random choice process—may be assumed to yield rationally the very "laws" that produce N-world *and* D-world behavior.

In the following sections, I will adhere to the above conservative philosophy. It is essential that commonly accepted or actually observed N-world behavior patterns be our major guide to the hidden aspects of the deductive-world.

2. Local Evidence

The D-world model is not simply attached to various standard world models in some haphazard fashion. The D-world model is being constructed from the class of all D-world structures, where a structure is a logically generated collection of sentences within a mathematical theory. The D-world structures exist if and only if the standard mathematical structures used to generate applied mathematical models exist. You cannot have one without the other. Moreover, the standard structures are "embedded" into the D-world structure in a nonarbitrary manner. A D-world structure completely "invades" the standard structure and, indeed, a standard structure is usually considered to be a substructure of a D-world structure. Consequently, as the D-world model is constructed it will become a *unifying* or *universal* model for all of the known applied mathematical models that claim to describe humanly comprehensible or observable system development.

When applied mathematical models generate physical language descriptions then certain special descriptions occur that are termed *states of affairs*. These states of affairs concentrate upon particular portions of one or more physical paradigms and often utilize a language that is exterior to the physical language generated by the applied mathematical model. The *discreteness paradox* is produced by an apparent clash between equally predictive theories that bridge what

is called the boundary line between quantum mechanics, its probabilistic outcomes and discrete alterations, and the classical concepts of a "continuous" change. Relative to the quantum physical situation Gerald Feinberg assures us that: "The changes in the actual physical situation . . . occur suddenly."¹¹ Patton and Wheeler seem to contradict Feinberg when they write: "But in quantum physics no change is sudden."¹² Employing the infinitesimal portion of the D-world structure, the discreteness paradox has been solved. From the viewpoint of the D-world there is no paradox. The apparent contradiction is a simple indirect manifestation produced by the D-world model. The complete solution can be found in the references,¹³ and it tends to yield indirect evidence not available from any other source for the acceptance of the D-world model.

With respect to the solution of the discreteness paradox and applications of infinitesimal modeling to developmental paradigms be advised that two distinct procedures are utilized. First, consider the descriptive *general* technique termed "hyperfinite composition" which is modeled after the human process of combining finitely many objects together to produce a single entity. This process may be assumed to yield standard N-world and nonstandard D-world entities that may correspond to objects in objective reality. The second process is a special technique used to model *refined* behavior and termed "hyperfinite summation." This process is combined with such concepts as the standard part operator as well as other internal and external procedures to yield mathematical objects such as real or complex numbers, or vectors that *characterize* possible N-world or D-world objects. In the D-world theory the concepts of hyperfinite combinations, supermind processes, hyperfinite choice, supercontinuity and the like are *general* processes that are not eliminable since they are gleaned from the most common aspects of human experience or are common to most scientific theories. However, the refined techniques are obtained by modeling the common aspects of some *specific* standard theory. If a portion of the standard theory that was used to establish some portion of refined D-world behavior is found to be in error, then this would invalidate the refined D-world description. On the other hand, this would *not* invalidate the established general techniques.

With respect to an N-world sudden alteration demanded philosophically by quantum mechanics (the Feinberg statement) and a classical continuous change recall that the method developed for the solution of the discreteness paradox obtains a supercontinuous alternation within the D-world that manifests itself in an apparent N-world "sudden" alteration. There is an additional interesting aspect of the D-world itself. The general notion of hyperfinite combinations is reflected within the D-world by (A) discrete "sudden" D-world hyperfinite summations that yield *all* of the physical quantities that characterize elementary particles and processes from one fixed number ($\aleph_0$). On the other hand, there are (B) supercontinuous D-world functions that also take this single number and obtain the appropriate N-world physical quantities. Analyzing the (B) case it is discovered that there exists another type (A) process (C) generated by the (B) functions that also produces these characterizing quantities. Thus even though (A) is totally discrete and not

itself supercontinuous in character it does mirror the D-world (B) type processes. It is significant to note that there cannot exist any N-world method that can differentiate between cases (A), (B) or (C) and that the dominate feature within the D-world may be assumed to be supercontinuity. This should yield strong evidence in favor of the D-world model for those individuals who adhere to the belief that the ultimate organization of our universe is classical in character.

The metalogic used to argue for many quantum concepts is classical logic. The mathematical theories used throughout the sciences are usually obtained by either classical or intuitionistic logic. Of course, there are also computer logics and the distinctly different inner logic for certain sequences of quantum mechanical descriptions—quantum logic.¹⁴ Indeed, the usual quantum logics are incompatible with all of these other deductive systems. It is self-evident that scientists are faced with a perplexing situation involving competing and even contradictory logical schemes.

The inner logic for the developmental paradigm eliminates this confusing situation. It has been discovered¹⁵ that the basic logical operators S and $*S$ that appear in all of the previous articles in this series may be replaced within every statement in which they appear by the operator S_0 and $*S_0$, respectively. The significance of this substitution is that the deductive system that generates S_0 and $*S_0$ is weaker than quantum-logic with the Mittlestaedt's conditional,¹⁶ classical logic, intuitionistic logic, computer logic and, indeed, all known inner logics for any of the known scientific theories. This means that S_0 is compatible with respect to all of these logics and any of our previous statements in which the symbols S_0 or $*S_0$ appear is consistent with each of the known inner logics associated with scientific theories.¹⁷ This yields more indirect evidence for the acceptance of the D-world model.

As discussed in section 1, the Gödel effect and the developmental paradigm notion imply that *all* word-pictures including diagrams and computer generated imagery of any type must be incomplete in that these "symbol" models do, not represent a fixed rule that forces automatically an experimentally determined description into a specific theory. It is for this reason and the hypothesis law that I am forced to reject any describable configuration for the entities called "subparticles." The multifaceted subparticles are not to be construed as particles nor waves nor quanta nor anything that can be represented by some *fixed* imagery. Subparticles are viewed only *operationally*, and observe that this will tend to eliminate many of inter-theory biases and actual contradictions that occur if theories are not restricted to specific states of affairs.

After examining the numerous infinitesimal methods utilized since Archimedes, many of the operationally described mental processes of the human being and the general paradigms generated by statements common to scientific theories, it appears likely that each subparticle may be characterized or represented by a sequence $\{a_n\}$ of hyperreal numbers.¹⁸ For convenience we let each $\{a_n\}$ be represented by an "n-tuple"

$$(a_1, a_2, \dots, a_n, \dots) \quad (1)$$

where the sequential values will be termed "coordinates." The first coordinate a_1 is a positive hyperreal number and is a "naming" coordinate. The other co-

ordinates correspond, in a manner to be explicated, to the various real number, complex number or vector quantities that are measured in order to characterize certain physical qualities defined within various theories. The use of such sequences to represent subparticles is an indication of our lack of knowledge of D-world mechanisms.

For example, $a_2 = 1$ is the counting coordinate—the hyperreal a_i ; $i = 3, 4, 5, 6$ may represent the D-world space-time coordinate location of the subparticle named by a_1 — the a_i ; $i = 7, 8$, represent the concept of the positive or negative charge associated with every subparticle — the a_i ; $i = 9, 10, 11$ are hyperreal numbers that represent inertial, gravitational and intrinsic (rest) mass respectively. For vector qualities such as the electromagnetic field vector E , I assume that they are representable in the Euclidian D-world by four vector components a_i ; $i = 12, 13, 14, 15$. So as not to be biased also include, as if they are independent qualities, the various defined energies, apparent momenta and other physical quantities required within the theories that must combine in order to produce a reasonable description for N-world behavior. Application of the law of simplicity yields the postulate that in general many of the coordinate values are independent from one another and that the subparticle represented by such a sequence may be the “substance” of which our universe is made.¹⁹

All of this may seem very ad hoc in character if it were not for a substantial piece of mathematical evidence that lends credence to these assumptions. Using the concept of fixed and private units of measure within the D-world it has been established that there exists a special hyperreal number $\mathbb{0}^{(\omega)}$ where ω is an infinite natural number (an element of ${}^*N - N$), and each subparticle sequence value, with the exception of the first and second, may be assigned the fixed values of either $+\mathbb{0}^{(\omega)}$ or $-\mathbb{0}^{(\omega)}$. The human ability of constructing material entities by combining together finitely many material objects is modeled within the D-world by hyperfinite composition, which is, in turn, numerically characterized by (independent coordinate) hyperfinite summation. This latter summation process when applied to subparticle sequences with these fixed coordinate values yields, within the N-world, all of the numerical characterizing quantities for all accepted elementary particles and zeros for those coordinates that do not have any characterizing content.

For example, let m_e , q , $|\mu_z|$ represent, with respect to the common N-world units of measure, the intrinsic mass, charge and magnetic moment, respectively, for the electron. Then there exist three hyperreal natural numbers M , Q , Mg such that

$$\left. \begin{aligned} \text{st}\left(\sum_1^M (1/(10^\omega))\right) &= m_e; \\ \text{st}\left(\sum_1^Q (-1/(10^\omega))\right) &= q; \\ \text{st}\left(\sum_1^{Mg} (1/(10^\omega))\right) &= |\mu_z| \end{aligned} \right\} \quad (2)$$

In (2) the symbol “st” represents the well known standard part operator that inserts this subparticle combination into the standard world. However, within the

D-world a great deal of additional information exists relative to this composition. Intuitively, the second coordinate states that the number of subparticles that have been combined together in order to produce this *one* electron is $(M)(Q)$ (Mg) and a new first coordinate *name* may be assigned to this particular electron. The coordinates that within the N-world appear to be assigned the value zero do not have zero values within the D-world. This is a significant fact for subparticle theory since it yields an explanation for all quantum transitions, if such processes exist in objective reality, and the effects of electromagnetic and gravitational fields. Intuitively, even though the electron can now be identified within the standard world by its common numerical characteristics, the combination still retains, within the D-world, other coordinate representations that include all of the possible interactions the object can have with respect to N-world material objects and fields.

Notice that the electron is not required to have any particular geometric configuration after it is inserted since it is the N-world theory that may require the use of such geometric language. Further, cardinality studies indicate that there are “more than enough” subparticles to produce all of the material universe where the elementary particles have any definable “shape” or common density feature.

As to the perceived N-world behavior of such objects, it is the broadly deterministic nonrandom D-world supermind processes and hyperfinitely selected “laws” that govern the inter and intra coordinate relationships between these characterizing numerical quantities. Due to the hypothesis law there can be no human language that will describe all of the appropriate relationships.

Even after all of the material universe is formed from subparticle combinations general paradigms indicate, and it is consistent with the mathematical theory, that there exist numerous subparticles that are not specifically required for corporeal reality. It is a portion of these remaining subparticles that can be used to model the concept of a completely dense substratum that exhibits all of the various field properties.

One might conclude that there are but two levels of activity for subparticle D-world behavior, but once again general paradigms and the methods of infinitesimal modeling indicate that this is not the case. From the intuitive point of view this third D-world substratum has some unusual behavior characteristics that are generated *directly* by the mathematical methods. For example, the influences that this third level has upon the N-world are classical in character and this third level appears to be an absolute uniform substratum from which the D-world “laws” are applied. It also provides a background source of distinctly different collections of subparticles that may be utilized to measure all of the N-world alterations. Do not assume that these three D-world subparticle levels exhaust the D-world structure. Once again cardinality studies clearly indicate that these three levels need only represent a minuscule portion of the D-world model.

Is there additional historical and scientific evidence for the acceptance of the D-world model with this added subparticle feature? Consider that for 2200 years the concepts and intuitive procedures of infinitesimal modeling have been successfully applied to obtain

thousands of statements that correctly predict natural system behavior and these techniques have now been made rigorous. The evidence for the acceptance of these procedures is more conclusive than for any other known device for such predictions. Further, it appears to be difficult for the human mind to disassociate itself from what is perceived to be a local Euclidean world. Infinitesimal reasoning takes advantage of this quality by forcing upon this "unperceived" infinitesimal world the simplest of Euclidean behavior. It is an overwhelming empirically accepted fact gathered over these many years that this "unperceived" infinitesimal world has directly yielded those most cherished of our scientific predictor expressions. A secondary disjoint fragment—the G-model—actually suggests that it is the D-world itself that has implanted the concepts of infinitesimal reasoning upon our conscious mind and not conversely.

Subparticle theory, simplicity and infinitesimal reasoning may lead to a better understanding of some of the effects predicted by the Special Theory of Relativity. The major natural system in which we locally exist is a space-time system. This seemingly empty space-time has only a few characteristics when viewed from a Euclidean perspective. From the D-world, electromagnetic propagation is investigated relative to a very small Euclidean neighborhood of space-time.

Recall that one of the basic precepts of infinitesimal modeling is the experimentally verified *simplicity* of such a local system. For very small actual time intervals certain physical processes take on simple behavioral descriptions.²⁰ Experiments show that for such small standard time intervals and even much larger ones the linear Galilean theory for average velocities (speeds) suffices to give accurate information relative to the composition of such velocities. If you assume, as required by the methods of infinitesimal reasoning, that such Euclidean behavior occurs within an infinitesimal space-time neighborhood of a standard N-world location and also that light acquires the velocity of the emitting material, then a special type of equation is obtained that represents how transverse (linear) displacement is measured. This result is based upon how electromagnetic radiation is employed within the N-world to measure physical quantities. One solution to this equation leads directly to the mass-energy and velocity transformations of the *local* Special Theory of Relativity. However, the apparent restrictions that these transformations place upon natural system behavior do not apply with the D-world.

As an example, consider an electron with rest mass m_e having measured linear (scalar) velocity v with respect to an N-world observer. An observer stationed within the D-world employing third level objects, that are termed hyperfast subparticles, and various D-world laws measures the electron's linear velocity as w with respect to D-world units. The N-world observer would determine that the inertial mass of the electron has apparently increased by the value $m_e(1 - v^2/c^2)^{-1/2}$ while the D-world observer states that for the local N-world neighborhood under consideration the inertial mass would be $m_e(\cosh(w/c))$. Thus even though the N-world observer would not be able to measure the inertial mass if $v = c$, the D-world observer has no difficulty in measuring the apparent mass as being $m_e(\cosh(1))$. Subparticle theory gives a "physical" basis for such unusual results. The mass and velocity trans-

formation laws merely indicate possible D-world propagation properties of electromagnetic radiation as they have been perceived from our N-world experiences with measuring procedures. Since all corporeal N-world objects carry D-world field coordinates then these results indicate how these field coordinates interact with the everywhere present local fields of the second level. All of the apparent measured Special Theory variations in mass and energy may be manifestations of the existence of subparticle substratums—manifestations that yield an ultimate resistance to increased N-world linear propagation of a material object. Such a restriction does not exist within the third D-world level since it is exterior to first and second substratums. The methods of infinitesimal modeling suggest that the D-world laws allow both material objects and fields to be partially propagated as a fixed system in a simple classical manner. However, it can be shown that these transformations yield extremely incomplete information relative to such D-world propagation. Indeed, there are infinitely many different propagation schemata within the D-world that produce the same N-world mass-energy and velocity effects. (The coordinate, length and time transformations, if they are absolute and not material in character, require the introduction of an additional global hypothesis.) Once again this yields indirect evidence for the acceptance of the deductive world model.

In May 1984, this author became aware of the Bell inequality and dEspagnat's discussion of local realism.²¹ dEspagnat writes:

Perhaps in such a world [D-world?] the concept of an independent existing reality can retain some meaning, but it will be altered and one remote from everyday experience.²²

The concept of the general paradigm leads to a possible mechanism that can send "instantaneous" informational signals between all standard particles or aggregates within the D-world and not contradict standard world Einstein separability (i.e. no influence of any kind can propagate faster than the speed of light).²³ This would reconcile the apparent contradiction between the Bell inequality and the experimental results predicted by the quantum mechanics formalism.

As previously stated there is a "large" quantity of subparticles that are not utilized for standard particle or field construction. In our derivation for the mass-energy and velocity transformations for the local Special Theory of Relativity, the standard substratum points correspond to standard world positions for particles, fields and the like. There is no *a priori* justification in assuming that this local Special Theory applies to other D-world objects. It is a basic tenet of infinitesimal reasoning that without further justification the only properties that are to be associated with such unutilized objects are the simplest classical ones. The logic of particle physics and general paradigms allow us to accept the existence of such unutilized particles without any additional justification. A somewhat lengthy derivation yields the following results as viewed from the D-world. Hyperfast subparticles may propagate with velocity $\lambda \in *N - N$ and subsequently input all types of state changing information into various coordinate positions-information that from the N-world would appear to be "instantaneously re-

ceived." In doing so these hyperfast subparticles would not contradict the various conservation laws even if they have transmitted such information for an infinity of events. This D-world state of affairs lends credence to dEspagnat's explanation of why the Bell inequality is violated and gives further evidence for the acceptance of the D-world model.

The basic law that signals cannot travel faster than light is demoted from a property of external reality to a feature of mere communicatable human experience. Although this represents a step toward philosophical positivism, the concept of an independent or external reality can still be retained as a possible explanation of *observed* regularities in experiments. It is necessary, however, that the violation of Einstein separability be included as a property, albeit a well-hidden and counterintuitive property . . .²⁴

What is being described throughout this section has been previously alluded to by one of the world's foremost scientists. There is no question that a "pregeometry" as first discussed by Wheeler²⁵ is being outlined and verbally presented. Even though this research is preliminary it is, for the present, a reasonable speculative model and it has enabled this author to eliminate the more glaring inconsistencies of all of the modern day predictive theories while retaining some of the old states of affairs and all of their numerical predictions.

Thus far it would appear that I am simply describing a higher form of nature. As part of the next section it is shown how another distinct portion of the D-world—the Grundlegend model—explicates certain patterns of human behavior. It is the G-model portion that places the D-world model into a unique position and it is this portion that continues to supply the controlling mechanisms for all of the events thus far discussed.

3. A Special Interpretation

In August 1978, the Grundlegend structure²⁶ (i.e. G-structure) was constructed for the sole purpose of modeling certain areas of psychology—areas that are not presently susceptible to numerical modeling. The G-structure is the specific supermind substructure for the D-world model and it was employed originally to model the concepts of the conscious mind, the possible subconscious mind, subliminal perception, the possible (exterior) vertical parasubconscious, the vertical parasubconscious and various relations between these states of awareness. Immediately after the original constructive attempts were completed, it was discovered that this crude structure also models an idea of de Broglie,²⁷ among others, and C. S. Lewis' concept of the Divine mind.²⁸

. . . that events in the remotest parts of space appear to obey the laws of rational thought . . . There is in our minds something that bears a faint resemblance to it.²⁹ According to it what is behind the universe is more like a mind than it is anything else we know.³⁰ What appears to be my thinking is only God's thinking through me.³¹ He lends us a little of His reasoning power.³²

An entire book was written delineating various relationships between Lewis' concepts and the very general descriptive content of the G-model.³³ It was only after this endeavor that the refining D-world proce-

dures were developed and the combined theories yield the deductive-world model. It is an obvious and interesting fact that by simply substituting throughout the deductive-world theory for the word "deductive—" or the symbol "D—" the words "Divine" or "Supernatural" then a rational theological description emerges. Further, this new model or interpretation predicts a vast array of Jewish and Christian behavior when one assumes that such behavior is supernaturally associated with the Divine mind.

There exist some special G-model and, hence, D-world logical processes such as "strong reasoning from the perfect" that can be rationally assumed to directly influence human mental processes. This influence is externally generated from the D-world in a supercontinuous manner and from a human point of view may take place instantaneously. Such G-model processes are, of course, D-world subprocesses that may at first be considered to produce weak parasubconscious influences that guide the conscious mind through a process modeled after subliminal perception. Different processes yield different mental influences. Even though these procedures may be applied by the supermind portion of the D-world to humanly unknowable word forms, the consequences of many of these G-model processes are humanly comprehensible. One can assume that the D-world supermind procedures aid or influence the human brain in producing some verbal expressions. In contradistinction to certain psychological assumptions, it is rational to assume that human thinking is not the only cause that can yield a human verbal expression.

It would not be difficult to obtain statistically meaningful evidence by means of standard psychological testing or by the gathering of experiential evidence—evidence that could verify empirically the existence of these G-model subprocesses. Hence, many of the G-model conclusions are at least *capable* of indirect verification. We have discussed subparticle mechanisms that could actually mediate these mental influences. However, recall that the D-world model explicitly states that there are infinitely many possible D-world properties that are neither humanly knowable nor comprehensible. Many of these properties and mechanisms may be described in a pure D-world language that could not be humanly comprehended even with application of our extended metalanguage descriptions. Further, the supermind portion performs supermental processes that are much stronger than any logical process that can ever be produced by a purely human or machine brain.³⁴ Thus it is rational to assume that if some of the D-world mechanisms and processes are being described correctly, then there are numerous other D-world mechanisms and processes that are humanly unknowable.

There is present within much of the world's literature actual extraordinary (indirect) evidence that a supermind of some sort may indeed have influenced the minds of certain individuals. For thousands of years many descriptions for the behavior and characteristics of named natural systems as well as the behavior and characteristics of named constituents contained within these natural systems have been written down. Some of these descriptions include statements that imply that the human being can appreciate the beauty of such uniformly developing systems, can discover for

himself some of the uniform processes that allow for natural system development and even apply these processes to the material available within his environment in order to create objects that apparently did not exist within his environment previously.

On the other hand, there are other descriptions that appear in these literary works, say F_i and F_{i+1} , such that they include a perceived internal design or beauty to the human mind, but they also imply that a human observer could not comprehend a mechanism that is capable of producing the described system development or logically changing one system (description) F_i into an adjacent system (description) F_{i+1} . Moreover, the descriptions were all written at about the same general cosmic time and they refer to system development that could not have been predicted by an unaided writer. If viewed from the D-world, one would conclude that these descriptions were obtained from outside-external to-the development itself. This is exactly what happens relative to the developmental paradigm approach and its production by supermind processes. The supermind operation is outside of the development itself.

The type of descriptions I am referring to are, of course, those that are traditionally called revelations or prophecies as well as other illuminations for how certain developing systems such as our universe or earth have come into being. It is important to note that these descriptions were obtained by what can be rationally described as a vertical paraconscious process—a process that forms an acceptable subsystem of the D-world. Since many of these remarkable descriptions were obtained prior to the development of the canons of modern science and the mathematical methods utilized in order to show that such descriptions are completely rational and “scientific” in character, then acceptance of such descriptions, if they can be (indirectly) verified, yields additional evidence for the acceptance of the D-world model. It is a remarkable fact that many of these descriptions, these illuminations or revelations if you wish to call them that, have indeed been verified.

With respect to exact Scriptural quotations, I am confident that the reader could easily supply references. However, I provide a few examples. As previously stated the D-world theory exists if we have standard languages that describe natural system behavior. This is also indicated by Romans 1:20, II Corinthians 4:18. Moreover, throughout Scripture the processes of creating both corporeal and incorporeal objects are modeled after language and thought processes. Genesis 1:1-26, Job 34:14, Psalms 19:1,33:6 & 9, 98:6, 147:15 Proverbs 2:6,3:19, Hebrews 1:3, Hebrews 11:3.

As shown during this investigation all of the supermind logical processes being partially described by the Grundlegend portion of the D-world model are more powerful in scope and infinitely beyond any “natural process.” Furthermore, the entire set of all natural “laws” may be beyond human comprehension. The Scriptures indicate these possibilities in II Chronicles 2:14, Job 9:10, 11:7, 28:12-13, 33:12, 37:23, 38:33, Psalms 93:2, 139:6, 145:3, 147:5, Ecclesiastes 3:11, 8:17, 11:5, Isaiah 55:8-9.

The relations previously established between the workings of the human mind and the supermind are modeled every time the Scriptures state that God “speaks” to a prophet, or any Jew or Christian. These

relations also model Job 32:8, 38:36, Psalms 44:21, 94:11, 119:34, 139:2, 4, 17-18, Proverbs 2:6, Isaiah 22:14, Jeremiah 17:10, 31:33, Daniel 2:20, 28, 29, 46 and Amos 3:7. The G-model predicts a supernatural relation between the spiritually indwelt Christian and Jesus Christ as it is implied by John 16:13, Romans 8:14, I Corinthians 2:10, 2:16, Ephesians 4:20, Philippians 2:5, 1 John 2:27. Not only are the conscious mind aspects of the gifts of the Spirit as outlined in I Corinthians 12:8-10 modeled, but the D-world model yields a possible mechanism for the corporeal and miraculous processes that never cease but continue throughout all of God’s creation—including those exemplified by the fully indwelt Christian believer.

As indicated by Job 25:1 and Ecclesiastes 3:11, the D-world model also predicts a God’s harmonious ordering of His Creation—but an ordering that can only be slightly understood while human beings remain in their present restricted state. Also notice that the fact that there are single entities such as the operator $*S_0$, the number 0 (a single subparticle representation, among others, intuitively reveals the unity and oneness of the Godhead.

Obviously, the above examples correlate only a small portion of Scripture and the D-world theory and certainly the reader could add many features to this new interpretation. However, I must include a disclaimer. This special interpretation need not be accepted. As pointed out in the second article in this series³⁵ this special interpretation is not required to establish the validity of the D-world model. This interpretation is useful intuitively, but it indicates only that the D-world model may be consistently embedded into a theological description.

I do not apologize for the fact that the D-world model has this theological interpretation. Note that the theological expressions carry many *additional* connotations that are *not* established by the D-world model directly even though they are rational extensions of the D-world theory. These additional concepts and expressions also have an emotional impact that tends to cloud the pure analytical results obtained. Whether or not an individual accepts this special interpretation is a personal preference that should not be dictated by a theoretical scientific investigation. Such acceptance should be based upon deep personal reflection, experience and many of the imponderables of human existence. An individual’s elimination of this special interpretation in no manner invalidates the D-world’s explanatory power and usefulness as a predictor of natural system behavior—as a pregeometry. It is the responsibility of every thoughtful scientifically minded individual to determine the value of the D-world model based upon its analytical contributions and not upon a pure personal philosophy exterior to its actual content.

References

1. Herrmann, R. A. 1986. A solution to the grand unification problem, *Abstracts of the American Mathematical Society* 7:238.
2. Aerts, D. 1984. The missing elements of reality in the description of quantum mechanics of the E.P.R. paradox situation, *Helvetica Physica* 57:421-28.
3. Herrmann, R. A. 1985. Subparticles and realism in quantum theories, *Creation Research Society Quarterly* 22:84-89.
4. Herrmann, R. A. 1985. Language and, science, *Creation Research Society Quarterly* 22:128-37.

5. Herrmann, R. A. 1986. Developmental paradigms, *Creation Research Society Quarterly* 22:189-98.
6. Herrmann, R. A. 1986. Derivations for D-world evidence, preprint. Simply request a copy.
7. Patton, C. M. and J. A. Wheeler. 1974. Is physics legislated by cosmogony? in *Quantum gravity*. Oxford University Press, Oxford, pp. 538-605.
8. Dyson, F. J. 1980. Fields and particles. Headings from Scientific American. W. H. Freeman & Co., San Francisco, p. 18.
9. When such expressions as "it can be shown" or "it has been established" are used they refer to the derivations that appear in reference 6 or elsewhere.
10. One basic reason for this is that a nonfinite alphabet would be required. Such alphabets are assumed and studied in abstract general logic.
11. Feinberg, G. 1977. What is the world made of? Atoms, leptons, quarks and other tantalizing particles. Doubleday, New York, p. 85
12. Patton and Wheeler *Op. Cit.* p. 569.
13. Herrmann, R. A. 1983. Mathematical philosophy and developmental processes, *Nature and System* 5(1-2):17-36.
14. Beltrametti, E. G. and G. Gassinelli. 1981. The logic of quantum mechanics. Addison-Wesley, Reading, MA
15. Herrmann 1986 (Reference 1), p. 20-1.
16. Beltrametti and Cassinelli 1981 *Op. Cit.* p. 223.
17. This means that if you let $\vdash$ denote the deductive process for any of the mentioned deductive systems, except for S_0 , and let Γ be a set of propositions and F a proposition, then $F \in S_0(\Gamma)$ implies that $\Gamma \vdash F$. Further, for a developmental paradigm d with inner logic determined by $\vdash$ — there exists a superword w such that $d \subset *S_0(\{w\})$ and $w * \vdash d$.
18. Robinson, A. 1966. Non-standard analysis. North-Holland, Amsterdam. p. 55. The hyperreal numbers is the term that is now generally used to identify Robinson's $*R$.
19. Patton and Wheeler *Op. Cit.* p. 543.
20. The intuitive concepts need for infinitesimal modeling were once taught under the title of the "Theory of Indivisibles." Very little on the subject appears in modern texts with the exception of some slight mention in such works as Planck, M. 1932. The mechanics of deformable bodies, Vol. 111. Introduction to theoretical physics. Macmillan, New York, p. 18.
21. dEspagnat, H. 1979. The quantum theory and reality, *Scientific American* 241(5):158-181.
22. *Ibid.* p. 181.
23. *Ibid.* p. 158.
24. *Ibid.* p. 180.
25. Patton and Wheeler *Op. Cit.*
26. Herrmann, K. A. 1981. Mathematical philosophy, *Abstracts of the American Mathematical Society* 2(6):527.
27. March, A and I. M. Freeman. 1963. The new world of physics. Vintage Books, New York, p. 143.
28. Herrmann, R. A. 1982. The reasonableness of metaphysical evidence, *Journal of the American Scientific Affiliation* 34(1): 17-23.
29. Lewis, C. S. 1978. Miracles. Macmillan Paperbacks, New York, p. 32.
30. Lewis, C. S. 1960. Mere Christianity. Macmillan Paperbacks. New York, p. 32.
31. Lewis 1978 *Op. Cit.* p. 29.
32. Lewis 1960 *Op. Cit.* p. 60.
33. Herrmann, R. A. 1982. The G-model (Applied to C. S. Lewis). Institute for Mathematical Philosophy Press, Annapolis. This book is out-of-print. However, a revised printing is planned for the near future.
34. Herrmann, R. A. 1986. Nonstandard consequence operators, *Kobe Journal of Mathematics*, (to appear)
35. Herrmann. 1985. (Reference 3).

GLOBAL HEAT BALANCE WITH A LIQUID WATER AND ICE CANOPY

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Abstract

A new model of the pre-Flood canopy is proposed, consisting of large water globules at about 2 km altitude over equatorial regions and large ice fragment clouds at about 2200 km altitude over the polar regions. This canopy would have maintained both temperature and solar radiation at proper levels for good plant growth from pole to pole. The water globules would have collapsed at the time of Noah and the ice clouds would have collapsed several hundred years later to start the ice age.

Introduction

The first few chapters of Genesis indicate that the climate of the earth was once much different from what we now experience. There was no rain, but rather a mist rising from the earth to water the ground (Genesis 2:4-6). Adam and Eve apparently did not need clothes (Genesis 2:25) for comfort, indicating a rather narrow temperature range. The first mention of rain occurs in Genesis 7 at the time of the Flood. Then in chapter 9, God uses the rainbow as a sign of a covenant. If rain had occurred before the Flood, the rainbow would have occurred also and would not have been useful as a sign.

The temperatures on the early earth would have needed to be nearly uniform from pole to pole, or otherwise the temperature gradients would have caused weather systems similar to what we experience today, with the associated rain. The earth would have been like a greenhouse, with lush plant growth from pole to pole. The earth's temperature must have been

moderated by some mechanism in order for this greenhouse effect to exist. The only possibility suggested is that of the water above the firmament (Genesis 1:6-8).

It can be argued that this water canopy would have to meet several requirements, such as:

1. It should contain enough water for 40 days and nights of heavy rain.
2. The water should be liquid, at least where Noah could see it.
3. The water should be at a height where the potential energy stored in the gravitational field would not be large enough to cause undue atmospheric heating when the water fell as rain.
4. There must be enough solar radiation incident upon the earth's surface to allow vigorous plant growth, from pole to pole.
5. The temperature at the earth's surface must be in the proper range for both human comfort and plant growth.
6. There should be a source or mechanism for very cold ice over the polar regions, to account for the

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ice age, including quickly frozen mammoths (Dillow, 1982 pp. 311-420).

7. There should be adequate light in the polar regions for plant growth or at least plant maintenance in the winter months, when the sun is normally below the horizon for up to six months.
8. The canopy should allow the sun, moon, and stars to be seen.
9. The canopy support system should be readily explained in terms of presently-understood physics.

A number of models have been proposed for the canopy, but all have some problem with one or more of these requirements. Similarly, this model meets all the requirements except the last one. Either a miracle or unknown physical laws must have been operating for the proposed canopy to have existed. This is not a reason for immediate rejection because God has used miracles in other situations, such as the pillar of fire by night and pillar of cloud by day seen by the Israelites for 40 years in the wilderness.

Other Canopy Models

Dillow has suggested a model whereby 40 feet of liquid water was placed above the firmament and immediately turned into steam (Dillow, pp 221-310). This extra mass above the earth would have caused the atmospheric pressure to be 2.18 of today's atmospheres. There would have been a strong temperature inversion above the earth, with the temperature rising from about 20°C at the earth's surface to 38°C at only 120 m above the surface to 111°C at 9.8 km above the surface.

One of the difficulties of Dillow's model, as with most of the other canopy models, is the heat load or heat energy content of the canopy. The canopy must somehow be cooled from approximately 100°C to the condensation point, the latent heat of condensation must then be removed at the same temperature, and then the liquid must be cooled to the present atmospheric temperature of about 25°C. The potential energy (mgh) of the canopy must also be removed. Dillow (pp. 269-72) shows that if all this energy were released to the atmosphere in a short period of time, the temperature of the atmosphere would rise to 2100°C, an obviously impossible value. Dillow's model also does not deal with the winter darkness near the poles. The combination of high temperatures and darkness would actually be detrimental to plant life. The dominant species might be mushrooms in such an environment. This model therefore has several difficulties.

Other models also have difficulties. Probably the most obvious model would be for the water to be maintained in a permanent heavy cloud cover. This is not a satisfactory model for several reasons. One is that such a cloud cover will contain only a few inches of water equivalent, not enough for the rain at the time of the Flood. Another problem is that a cloud cover will reflect a greater amount of the sun's energy away from the earth, lowering the temperature of the earth's surface below freezing. The present albedo of the earth is about 0.34 (Houghton, 1954). A heavy cloud cover over the earth would increase the albedo to as high as 0.8, which would yield a mean surface temperature of -60°C. If the albedo were increased to only 0.5 from the present 0.34, the mean surface temperature would

drop to +5°C (Dillow, p. 217). Yet another objection to the cloud canopy is that it would block all starlight, while Genesis 1:14-18 seems to imply that the stars were visible before the Flood.

Another model suggested by many writers is that of an ice canopy (Dillow, pp. 195-215). They propose a cylindrical or spherical shell, perhaps 350 miles above the earth's surface and a few hundred feet thick, held in place by centrifugal force. The idea of centrifugal force would seem to eliminate the need for a miracle, but actually just changes the character and timing of the miracle (elimination of the heating effect of the potential and kinetic energy stored in the ice).

The kinetic energy for an ice shell at 350 miles above the earth would be 6,855 cal/gm and the potential energy would be 1,114 cal/gm for a total of 7,969 cal/gm. The latent heat of fusion of water is 80 cal/gm, the latent heat of vaporization is 540 cal/gm, and the heat needed to raise the temperature of water from 0 °C to 100°C is 100 cal/gm. The kinetic and potential energy in the rotating ice shell is 10 times the amount needed to turn ice at 0°C into steam at 100°C. The collapse of such a canopy would immediately destroy all life on earth unless a miracle was performed to remove the heat.

It appears that a miracle is necessary for any canopy model, either to hold the water up, or to get it down without destroying the earth. I will not deal with this issue, but will work backwards from the other requirements listed earlier to determine as many of the canopy characteristics as possible.

Liquid Water and Ice Canopy

If the water is in a continuous layer above the earth, there is a conflict between the requirement for a large quantity of water on one hand and adequate solar energy at the earth's surface on the other. A layer of water 25 m thick, for example, will absorb or reflect about 96 percent of the incident solar radiation when the sun is directly overhead, with a larger percentage for the sun closer to the horizon. The four percent of solar radiation reaching the earth would be enough to meet the needs of a few shade loving plants, but would not be nearly enough to produce the lush vegetation which became our coal, oil, and gas deposits. A continuous water layer would also obscure the stars, which were apparently created to be seen by people before Noah. It is suggested therefore that the water was not in a continuous layer but rather in large globules separated by air. The appearance from the earth would be similar to a sky filled with scattered clouds.

Having open spaces between globules means that each globule must be thicker in order to hold the same amount of water. If the globules occupied 25 percent of the sky in a single layer, then each globule must be 100 m thick to contain an average of 25 m of water over the earth. The horizontal dimension of a globule is probably greater than the vertical dimension by a factor of three to five to maximize the direct solar radiation on the earth for solar positions away from the vertical.

The globules would need to be high enough above ground level that the area under the globule would be illuminated by the sun at mid-morning and mid-afternoon. The globules cannot be too high, however, or they would freeze in the cold temperatures of the

upper atmosphere. The dry adiabatic lapse rate of today's atmosphere is about 1°C per 100 m. This is probably an upper limit on the temperature gradient existing in the pre-Flood atmosphere. The minimum surface temperature in the lower latitudes would probably be in the vicinity of 20°C (68°F). If the dry adiabatic lapse rate applied, a temperature of 1°C would be reached at 2000 m above the earth's surface. The earth before the Flood was probably much flatter than it is today, so this could have been above the highest mountain. Therefore I assume that the water globules were not much above 2000 m or much below 1000 m above the earth.

The proposed layer of water globules close to the earth does not deal with the question of plant growth in polar regions with up to six months of darkness. As mentioned earlier, if the canopy were able to maintain temperature (and humidity) during the dark period, many plants would not be able to survive. For normal plant growth and survival, either the temperature and humidity need to drop during the winter so the plants can go dormant, or significant amounts of light need to be provided during the winter so growth can continue. The geological record seems to indicate polar regions that were warm and supported plant growth during the entire year, so evidently the polar regions were not entirely dark during part of each year before the Flood as they are now.

One suggestion that has been made is that the earth has somehow changed its axis of rotation. Before the Flood there was no tilt, and after the Flood something had happened to give the earth its 23.45° tilt from its plane of rotation around the sun. Such a change of angular momentum would require another miracle or perhaps a visiting planet from space (Patten, 1966).

Another suggestion would be solar reflectors in space. If some of the water above the firmament were placed at heights of several hundred km above the polar regions, it would freeze and become highly reflective of solar radiation, much like the rings of Saturn. A reasonable size would be for the ice to extend from each pole for 23.45°, or to 66.55°N or S. The ice could be in either one continuous piece or in fragments. The surface probably would be rough so most

of the reflection is diffuse rather than specular. The layer would probably be relatively thin, a few hundred meters if solid, and a few kilometers if in fragments. My proposed canopy model therefore consists of liquid water globules in the equatorial regions and a hemispherical cap or cloud of ice fragments over each pole, as shown in Figure 1.

An ice cloud of this size and a height of 2200 km would admit direct solar radiation to the pole during the summer for the same 24 hour period it now enjoys. During the winter it would reflect diffuse light to the polar area. There would be continuous daylight at the poles on a year around basis. Areas away from the poles but still inside the Arctic and Antarctic circles which had a short night in the summer would not have night in the winter.

Heat Balance

Solar radiation incident on the atmosphere may be reflected back into space or it may be absorbed by the earth or atmosphere. The absorbed energy may be radiated back into space as infrared radiation, it may be stored on a seasonal basis by raising the temperature of soil or water, or in the present climate it may be physically transported to a different latitude by atmospheric movements and ocean currents. In the canopy model presented here, it is assumed that there were no atmospheric movements or ocean currents before the Flood. Incoming solar radiation and outgoing infrared radiation must therefore have been balanced at each latitude when integrated over a yearly cycle. In the present climate, equatorial regions are cooled and polar regions are heated by a poleward energy flux. Water globules provide the equatorial cooling in this canopy model by shading the earth, while the poles are heated by reflection from an ice cloud.

The approach taken here is basically that of working backward from the presumed pre-Flood climate to determine the characteristics of the canopy. Accepted equations for solar radiation reflection and absorption and infrared radiation to space have been used in a computer program to determine the temperature of the earth and of the liquid water canopy. Parameters such as the fraction of sky covered by globules, the reflectivity of the ice cloud, and the albedo of the earth were varied until the temperatures were in a plausible range.

According to this computer model, no shading of the earth is necessary, and the water globules cannot be maintained in liquid form at higher latitudes than about 45°N or S. This computer model shows that it is necessary for the fraction of sky covered by the globules to decrease with distance from the equator, from a maximum of about 50 percent to about 10 percent at 40°N or S. From about 45° to about 66.5° there would not be a canopy of any type in this model.

Available Radiation

The average value of radiation from the sun on the top of the earth's atmosphere is the solar constant, $SC = 1353 \text{ W/m}^2$ [$= 1.940 \text{ cal/(cm}^2 \text{ min)} = 1.94 \text{ ly/min} = 428 \text{ BTU/(ft}^2 \text{ hr)} = 4.871 \text{ MJ/(m}^2 \text{ hr)}$].

The angle of incidence of beam radiation on a horizontal surface is found from (Duffie and Beckman, p. 16)

$$\cos \theta = \sin \delta \sin \phi + \cos \delta \cos \phi \cos \omega \quad (1)$$

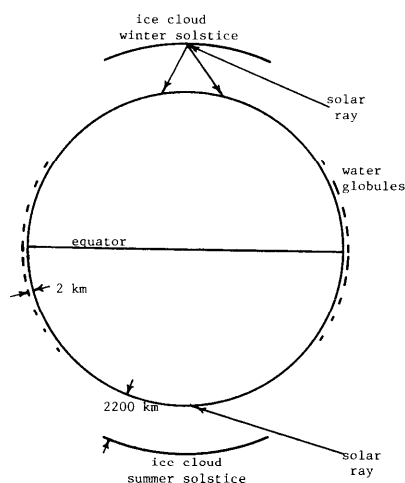


Figure 1. A pre-Flood canopy model of liquid water globules and ice clouds above the earth.

where ϕ = latitude (north positive), δ = declination (i.e., the angular position of the sun at solar noon with respect to the plane of the equator) (north positive), θ = the angle of incidence of beam radiation, the angle being measured between the beam and the normal to the plane, ω = hour angle, solar noon being zero, and each hour equaling 15° of longitude with mornings positive and afternoons negative (e.g., $\omega = +15$ for 11:00, and $\omega = -37.5$ for 14:30).

The declination can be found from the approximate equation (Duffie and Beckman, p. 15)

$$\delta = 23.45 \sin(360(284 + N)/365) \quad (2)$$

where N is the day of the year.

The radiation (P_{top}) incident on a horizontal surface at the top of the atmosphere is then given by

$$P_{\text{top}} = (\text{SC}) \cos \delta \quad \text{W/m}^2 \quad (3)$$

Absorption and Scattering in the Atmosphere

The amount of radiation available on a horizontal surface at the top of the atmosphere is relatively easy to determine from these formulas. Not all of this radiation will reach the ground, due to absorption and scattering in the atmosphere.

Both absorption and scattering are functions of the distance traveled in the atmosphere. There will be less absorption, for example, when the sun is directly overhead than when it is close to the horizon. This distance is referred to as the air mass or the optical distance. The distance is normalized so the unit air mass is a vertical path through the atmosphere from sea level. The air mass for a beam arriving at some angle θ from the vertical is approximately $1/(\cos \theta) = \sec \theta$ for angles near the vertical. A good approximation for this normalized air mass (m) for any angle θ is (Carroll, 1985 p. 106)

$$m = \frac{35}{(1224 \cos^2 \theta + 1)^{1/2}} \quad (4)$$

The direct beam radiation incident on the earth is assumed to be (Carroll, p. 105)

$$P_{\text{er}} = P_{\text{top}} T_{\text{ra}} T_{\text{rw}} T_{\text{rl}} T_{\text{rp}} \quad (5)$$

where T_{ra} is the transmissivity of the atmosphere after absorption by the fixed gases, T_{rw} is the transmissivity after absorption by water vapor, T_{rl} is the transmissivity after Rayleigh scattering* by fixed and variable gases, and T_{rp} is the transmissivity after Mie scattering** by particles.

The diffuse radiation incident on the earth is

$$P_{\text{ef}} = f_1(P_{\text{w1}} - P_{\text{er}}) + f_2(P_{\text{w2}} - P_{\text{er}}) + f_3 \quad (6)$$

where f_1 is the forward scatter fraction from Rayleigh scattering, f_2 is the forward scatter fraction for Mie scattering, and f_3 is a correction to account for surface albedoes other than 0.25. P_{w1} and P_{w2} are the direct radiative components in the absence of Rayleigh scattering and Mie scattering, respectively (Carroll, p. 105).

*Rayleigh scattering applies where the wavelength of the radiation is very short compared with the size of the particle causing the scattering (in the visible and infrared region).

**Mie scattering applies where the wavelength of the radiation is approximately the size of the particle causing the scattering (in the infrared region).

The power absorbed by the earth is

$$P_e = (1 - \text{AL}) (1 - \text{FW}) (P_{\text{er}} + P_{\text{ef}}) \quad \text{W/m}^2 \quad (7)$$

where AL is the effective albedo of the earth's surface and FW is the fraction of the sky covered with liquid water.

The transmissivities are assumed to be (Carroll, p. 105)

$$T_{\text{ra}} = 10^{-0.02m} \quad (8)$$

$$T_{\text{rw}} = 10^{-(0.04y^{0.1} + 0.01y)m} \quad (9)$$

$$T_{\text{rl}} = 10^{-\gamma m} \quad (10)$$

$$T_{\text{rp}} = 10^{-0.666\beta m} \quad (11)$$

where

$$\gamma = 0.054 - 0.0088m + 0.00108m^2 - 0.000051m^3 \quad (12)$$

is the Rayleigh extinction coefficient. The parameter β is Angstrom's turbidity coefficient which falls in the range 0.01-0.3 in the present climate, but probably in the low end of this range for the pristine conditions before the Flood. The parameter y is the centimeters of precipitable water vapor in the atmosphere.

Carroll (p. 105) rewrites the first two terms of Equation 6 as

$$P'_{\text{ef}} = (0.5 + 0.3\beta)(P_{\text{w}} - P_{\text{er}}) \cos^{1/3} \theta \quad \text{W/m}^2 \quad (13)$$

The third term is written as

$$f_3 = (0.98 + 0.1\text{AL} + 0.36\beta(\text{AL} - 0.25))(P_{\text{er}} - P'_{\text{ef}}) - (P_{\text{er}} - P'_{\text{ef}}) \quad (14)$$

The total diffuse radiation incident on the earth is then

$$P_{\text{ef}} = P'_{\text{ef}} + f_3 \quad \text{W/m}^2 \quad (15)$$

In these equations, P_{w} is the direct component if no scattering has occurred. The Rayleigh forward scattering fraction (0.5) and the Mie forward scattering fraction (β) have been combined as one factor.

The radiation absorbed by the atmosphere on the way into the surface is

$$P_{\text{ain}} = P_{\text{top}}(1 - \text{FW})(1 - T_{\text{ra}} T_{\text{rw}}) \quad \text{W/m}^2 \quad (16)$$

I assume that the liquid water in the globules has a shortwave albedo of 0.08, so 0.92 of the radiant energy incident on the atmosphere above the globules is absorbed by the globules (Sellers, 1965 p. 21). The total radiation absorbed by the atmosphere/canopy is then

$$P_a = P_{\text{ain}} + 0.92(\text{FW}) (P_{\text{out}}) \quad \text{W/m}^2 \quad (17)$$

The total daily radiation energy absorbed by the earth or atmosphere is then found by a summation of the radiation over all hours of the day. If the solar constant is expressed as 1353 W/m^2 , the hourly energy outside the atmosphere is $1353(60)(60) = 4,870,800 \text{ J/(m}^2\text{hr)} = 4.8708 \text{ MJ/(m}^2\text{hr)}$. Adding all the hourly energies yields the daily energy in $\text{MJ/(m}^2\text{day)}$.

The daily energy absorbed by the earth would then be

$$Q_e = 4.8708 \sum P_e \quad \text{MJ/(m}^2\text{day)} \quad (18)$$

Computationally, I start at solar noon with $\omega = 0$. At the next step, $\omega = 15^\circ$, and the hourly energy value is multi-

plied by two to get the symmetrical contribution from plus and minus ω or from 11:00 AM to 1:00 PM solar-time. The summation continues until $\cos \theta$ becomes negative (that is, the sun has gone below the horizon). A similar expression holds for Q_a , the energy absorbed by the atmosphere (including the liquid water).

Long-Wave Radiation to Space

The heat transfer by infrared radiation from the earth to the atmosphere/water layer is given by (Duffie and Beckman, p. 127):

$$Q_{ca} = \frac{\sigma(T_c^4 - T_a^4)}{1/\epsilon_c + 1/\epsilon_a - 1} \quad \text{MJ}/(\text{m}^2 \text{ day}) \quad (19)$$

where T_e is the temperature (K) of the earth, T_a is the temperature of the atmosphere, ϵ_e is the emissivity of the earth, ϵ_a is the emissivity of the atmosphere, and σ is the Stefan-Boltzmann constant, $5.6697 \times 10^{-8} \text{ W}/(\text{m}^2 \text{ K}^4)$. The infrared emissivity of water is between 0.92 and 0.96, and is between 0.9 and 0.98 for the vegetation covered earth (Sellers, p. 41).

The radiation from the atmosphere/water layer to the sky would be given by

$$Q_{as} = \epsilon_a \sigma(T_a^4 - T_{sky}^4) \quad \text{MJ}/\text{m}^2 \text{ day} \quad (20)$$

For a flat plate solar collector radiating to the open sky above, the temperature T_{sky} is really an equivalent atmosphere temperature and is only a few degrees lower than the air temperature at the solar collector. For our model, with the earth radiating to the atmosphere and the atmosphere radiating to space, it would seem that the equivalent sky or space temperature should be the temperature of deep space, close to absolute zero. We will assume T_{sky} to be absolute zero, except under the ice cloud where it will be closer to the temperature of the ice, perhaps 200 K.

Reflection From Ice Layers

During the winter, the underside of the ice cloud is illuminated by the sun, reflecting light to the earth. Using trigonometry, the radius of the largest ice cloud which will not shade the earth at the summer solstice can be shown to be about 3400 km.

The albedo of the ice cloud could be rather high, in the range of 0.6 to 0.8 or even higher. Part of the reflected radiation will be specular or beam radiation and the remainder will be diffuse radiation. A ray from the sun which strikes a horizontal specularly reflecting surface in the ice cloud will have the same angle of reflection as incidence (from Snell's Law or Fermat's Principle) and will not strike the earth. This does not help illuminate the polar region, so we need a good fraction of diffuse radiation which is radiated in all directions. Even if the diffuse radiation is isotropic (the same in all directions), only a fraction will be intercepted by the earth. The remainder will be radiated through the gap between the earth and the ice cloud and lost in space. The fraction of diffuse radiation from the ice cloud that is actually intercepted by the earth will probably not be larger than about 0.5.

The radiation reflected toward earth is given by

$$P_{ice} = (SC)(R_{ice}) \sin \delta \quad \text{W}/\text{m}^2 \quad (21)$$

where R_{ice} is an equivalent reflectance factor, including the albedo of the ice cloud, the ratio of diffuse to

total radiation, the fraction of diffuse radiation intercepted by the earth, and any difference between the area of the ice cloud and the illuminated area on the earth. An albedo of 0.6, no specular reflection, 0.5 of the diffuse radiation intercepted by earth, and no differences in sizes would yield a value of $R_{ice} = 0.3$, which would probably be the maximum that could be anticipated.

The sun maintains the same angle δ with respect to the ice cloud during a 24 hour period, so the total daily radiation energy to the area under the ice cloud would be

$$Q_{ice} = -24(SC)(R_{ice}) \sin \delta \quad \text{MJ}/(\text{m}^2 \text{ day}) \quad (22)$$

The minus sign is present to make Q_{ice} positive during the winter when the declination δ is a negative value.

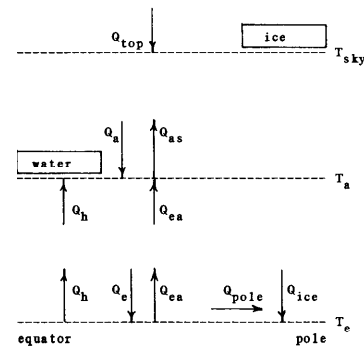


Figure 2. Energy flux diagram of canopy model. Temperatures are of the earth, the atmosphere/water layer, and the sky.

Heat Flows

The heat flows within this model of the earth/atmosphere system are as shown in Figure 2. All quantities are expressed in $\text{MJ}/(\text{m}^2 \text{ day})$ or the energy per square meter of horizontal surface per day. The incoming heat flow from the sun is Q_{top} . Q_a is absorbed by the atmosphere and Q_e or Q_{ice} is absorbed by the earth.

The energy absorbed by the earth can be radiated back out as infrared radiation, can go into storage by raising the temperature of either the soil or water, can be transferred to the atmosphere as sensible heat Q_h , or it can be physically transported to a different latitude. The latter heat flux is shown by a horizontal arrow and is designated by Q_{pole} . Considerable quantities of energy are transported toward the poles by atmospheric movements and ocean currents in today's environment. This is an important component in today's climate in that equatorial temperatures are lowered and polar temperatures are raised from the values they would otherwise have.

Sensible heat is transferred by convection and conduction rather than infrared radiation. In today's climate, the average sensible heat transfer is $24,000 \text{ ly/yr} = 66 \text{ ly/day} = 2.7 \text{ MJ}/(\text{m}^2 \text{ day})$ over land surfaces (Sellers, p. 105). The pre-Flood climate would have had very little wind, which reduces the convection term, so Q_h would probably have been in the range of 1 to 2 $\text{MJ}/(\text{m}^2 \text{ day})$.

Because of energy storage, there will not be an exact energy balance for either the earth or the atmosphere

on any one day. The difference or the net energy input to the earth would be

$$Q_{c,net} = Q_c - Q_{ea} - Q_{polc} - Q_h \quad (23)$$

Likewise, the net energy input to the atmosphere would be

$$Q_{a,net} = Q_a + Q_{ea} - Q_{as} + Q_h \quad (24)$$

There will be a change in temperature based on the thickness of the earth or atmospheric layer which is available for storage, and on the heat capacity of this storage. For simplicity, I will model the storage capability of both the earth and atmosphere as that of equivalent layers of water of thickness d_e and d_a , respectively. The mass of the present atmosphere would be the same as that of a layer of water about 9 m thick, but the atmosphere does not hold as much heat due to the lower heat capacity of the atmospheric gases as compared with water. Air has a specific heat of 0.241 at one atmosphere and 25°C, so the atmosphere without any water globules would be equivalent to a water layer somewhere between 2.0 and 2.5 m in thickness. The water globules would then add to this thickness depending on their area and thickness.

The thickness of the equivalent water layer representing the energy storage of the earth is more difficult to estimate. Only about the top two meters of soil actually participate in the annual cycle of heat storage, so soil might be represented by a water layer perhaps one meter thick. However, part of the earth's surface is covered by water so we could have 100 m or more of water thickness participating in the annual cycle. Since we have very little information on the fraction of the earth's surface which was dry land before the Flood, or on the depth of the water, we will consider the entire earth, both land and water, to be modeled for heat storage purposes by a layer of water of thickness d_e . This thickness is varied in the computer model to determine the effects of different depths of water.

For this model, it is quite accurate to assume that the temperature of one cm^3 of water is increased one °C by one calorie or 4.184 J. One m^3 of water would have its temperature raised one degree by 4.184 MJ. Energy flows are expressed in $\text{MJ}/(\text{m}^2 \text{ day})$ so that 4.184 $\text{MJ}/(\text{m}^2 \text{ day})$ will raise the temperature of a 1 m thick water layer by one degree or a 2 m thick layer by 0.5 degrees, etc. In equation form,

$$\Delta T_c = Q_{c,net}/4.184d_e \quad (25)$$

Likewise, the change in temperature in the atmospheric layer will be

$$\Delta T_a = Q_{a,net}/(4.184(d_a + (FW)d_w)) \quad (26)$$

where d_w is the thickness of the water globules. I arbitrarily assumed $d_w = 100$ m, which even with the spacing increasing in a poleward direction would still contain ample water for a 40-day rain.

An iterative technique is used to determine the temperature variations of both the earth and the atmosphere. Starting temperatures for January 1 are assumed for both the earth and the atmosphere, e.g. 20°C for the earth and 0°C for the atmosphere. The daily energy absorbed by the earth would be computed from Equation 18, and likewise for the daily energy absorbed by the atmosphere. The daily heat transfer

from the earth to the atmosphere is computed by Equation 19 and the daily heat transfer from the atmosphere to space is computed by Equation 20 for the current temperature, which will be changing throughout the year. The net daily input to storage is computed from Equations 23 and 24 and the change in temperature is found from Equations 25 and 26. The temperature at the end of the day is found by adding ΔT to the temperature at the beginning of the day.

By repeating this process for each day of the year, a final temperature can be found for both the earth and the atmosphere. If the final temperature is not the same as the initial temperature, the temperature profile is not correct to radiate the same amount back into space as was incident from the sun. The difference between incident and radiated energy has been accommodated by the storage in earth and atmosphere. The final temperature can be used as the initial temperature for the following year, and the process repeated until the final temperature is within some small amount, e.g. 0.1°C, of the initial temperature. This indicates a convergence to a solution for the annual temperature profile of both the earth and the atmosphere.

Temperature and Energy Curves

The variation of the average annual temperature with latitude as predicted by this model is shown in Figure 3. $T_e(\text{ice})$ refers to the surface temperature with only the ice portion of the canopy present, $T_e(\text{water/ice})$ is the surface temperature with the entire pre-Flood canopy in place, and $T_e(\text{present})$ is the temperature predicted by the model under present conditions. $T_a(\text{water/ice})$ is the temperature of the atmosphere at the level of the water globules. The variation of the summer and winter temperatures with latitude for the same set of parameters is shown in Figure 4.

These curves are the result of varying parameters until the temperatures seemed reasonable, or, in the case of the present climate, until the temperatures agreed with presently measured values. The parameters for the curves shown are listed in Table I.

The fraction of sky covered with water globules, FW, needed to vary from 0.5 at the equator to 0.1 at 40°N or S. to prevent overheating of the equatorial region. The amount of precipitable water vapor in the atmosphere is proportional to temperature, and was arbitrarily assumed to vary linearly from 1.0 of its

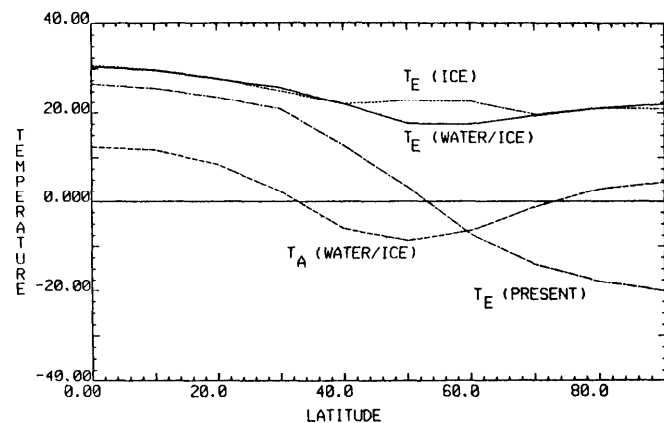


Figure 3. Annual average temperature (°C) for the earth (T_E) and the atmosphere (T_A) as a function of latitude.

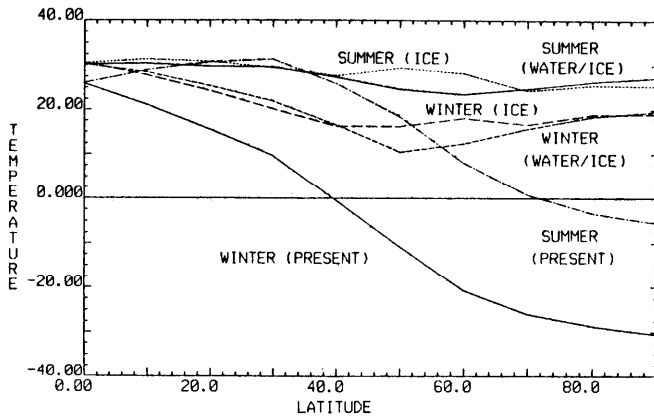


Figure 4. Average summer and winter temperatures (°C) for the earth as a function of latitude.

Table I. Model Parameters

	Water/ ice	Ice	Present
Value of FW at equator	0.5	0	0
Ice reflectance factor R_{ice}	0.3	0.3	0
Equivalent surface water thickness, d_e (m)	8	8	4
Equivalent atmosphere thickness, d_a (m)	2.5	2.5	2.5
Emissivity of atmosphere	0.96	0.96	0.96
Emissivity of earth	1	1	1
Albedo of earth/atmosphere	0.15	0.25	0.30
Centimeters of precipitable water, y_o	4	4	4
Turbidity coefficient	0.01	0.01	0.01
Maximum sky temperature, K	220	220	0
Sensible heat transfer, Q_h	1	1	1

Quantities that varied with latitude are shown in Table II.

equatorial value to 0.55 of that value at the poles. An equatorial value of 4 cm of water vapor was assumed in all cases. The equivalent thickness of the mass of the atmosphere was maintained at 2.5 m of water in all cases. The emissivity of the atmosphere was assumed to be 0.96 and the emissivity of the earth was taken as 1.0. An emissivity of 0.96 for the earth might be better but would raise the earth's temperature about 3°C and would require adjustment of other parameters to get a more acceptable temperature profile.

The turbidity coefficient was maintained at 0.01 throughout. The sensible heat transfer from earth to atmosphere Q_h was maintained at 1 MJ/(m²day). These are not very good assumptions for the present climate,

but it seemed good to maintain as many parameters at about the same value as possible.

The poleward energy flux Q_{pole} was assumed to be zero before the Flood. With only the ice clouds above the earth, Q_{pole} must be positive near the equator and negative poleward of 40° latitude to prevent overheating near the equator and frigid conditions poleward. The energy flux under the ice cloud would not need to be large. With the ice cloud gone, the poleward energy flux near the poles must increase to prevent the poles from being even colder than they are at present.

The albedo of the earth before the Flood would be the albedo of green plants, about 0.15. After the Flood, there would be clouds, which would raise the effective albedo to perhaps 0.25. After the ice clouds collapsed, the earth would be colder and drier, and the snow, ice, and desert regions would raise the effective albedo to perhaps 0.3.

The other parameter that was varied between the example cases was the equivalent thickness of water involved in heat storage on the earth's surface. It was assumed to be 8m before the ice clouds collapsed, when all the water on earth was in the liquid form, and 4 m after the collapse, when much of the water was in the form of ice, which is not as good for heat storage purposes.

The model yielded the present day temperature profiles very well, both for the annual average and the profiles at the summer and winter solstices. Since any parameter modifications were minor, and in a reasonable direction, the temperature profiles before the Flood and after the Flood with only the ice clouds present may be close in value to the actual values. The temperatures near the equator appear to be about 3°C warmer than today's mean temperature, which would have encouraged the growth of dinosaurs. There would have been little temperature variation in summer but a significant variation in winter, with minimum temperatures occurring at latitudes of 50 and 60°. Regions with less than the assumed 8 m of equivalent surface water for heat storage or on low mountains of 1000 to 2000 m in elevation would experience winter frost, which is necessary for the survival of some plant species.

The average radiation energy absorbed by the earth is shown in Figure 5. It is seen that the water globules lower the incident radiation substantially near the equator while the ice clouds raise the radiation near the poles. The average radiation before the Flood would be that currently experienced between 35 and 45° N or S. If temperature, moisture, soil, and nutrient levels are correct, this is quite adequate to produce heavy plant growth.

The difference between $Q_e(\text{ice})$ and $Q_e(\text{present})$ at low latitudes, and between $Q_e(\text{water/ice})$ and $Q_e(\text{ice})$ at high latitudes is due to the assumed differences in albedo. Albedo varies substantially with latitude in

Table II. Latitude Variation of Model Parameters

Latitude	0	10	20	30	40	50	60	70	80	90
Sky temperature	0	0	0	0	0	154	176	202	216	220
FW	0.5	0.5	0.45	0.3	0.1	0	0	0	0	0
Precipitable water y/y_o	1.0	0.95	0.9	0.85	0.8	0.75	0.7	0.65	0.6	0.55
$Q_{pole}(\text{ice})$	2.0	2.0	1.5	0.5	-1.0	-2.5	-2.2	-0.8	-0.6	-0.3
$Q_{pole}(\text{present})$	2.0	2.0	1.5	0.5	0.2	-0.4	-1.0	-2.0	-2.5	-2.5

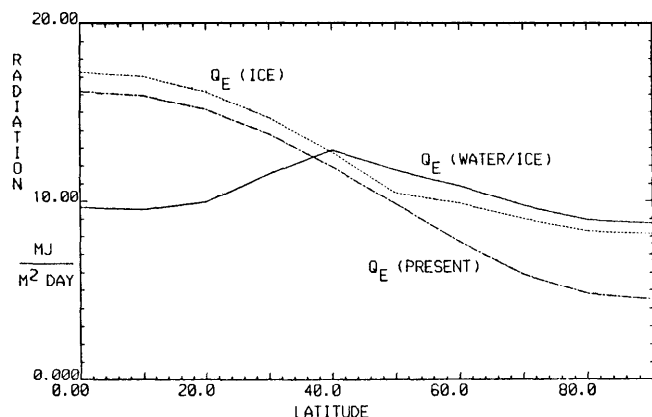


Figure 5. Average daily radiation energy incident on the earth as a function of latitude for the original water/ice canopy, the ice canopy, and the present.

today's climate and may have had some variation under the ice cloud, so these minor differences should not be considered significant.

Canopy Collapse

This simple model shows that a two level canopy over the earth between the times of Adam and Noah is quite plausible. The lower level would have consisted of liquid water and would not have extended under the upper level of ice. The earth would have been somewhat warmer under the water canopy, favoring the development of large numbers of dinosaurs. The liquid water canopy would have collapsed at the time of Noah, contributing to the Flood. The ice canopy would have remained, however. The earth would still have good growing conditions from pole to pole.

The animals on the ark would have multiplied rapidly over several hundred years after Noah. For a variety of climatic and forage reasons, the mammoths could have been concentrated in the northern latitudes. When the ice layer finally collapsed, it would have buried the mammoths and permanently changed the climate of the polar regions. The heat input would have decreased, lowering the temperature, but perhaps more importantly, there would not be adequate light for plant growth for six months of the year.

The collapse of the ice would not have been directly visible to Noah's descendants living in the middle east, which may explain why it is not mentioned in the Bible. It would have the effect of lowering the earth's

temperatures even more for a period of time, which would certainly have destroyed any remaining dinosaurs. There are several references in the book of Job (6:16, 9:30, 24:19, 37:6, 10, 38:22, 29, 30) to ice and snow which are not commonly observed today throughout much of the middle east, so perhaps it was written during this period of depressed temperatures. The human population tended to live in one region until the tower of Babel incident, so it is possible that there was little or no loss of human life with the collapse of the ice layer because people had not yet migrated into the polar regions. Without direct impact on God's people, there would have been little reason to mention the event.

Conclusions

A computer simulation with a simple global heat balance model has shown that a combination of a liquid water canopy and an ice canopy meets the requirements of both temperature and radiant energy for the pre-Flood era. Collapse of the water layer at the time of the Flood and collapse of the ice layer perhaps several hundred years later would explain the ice age and the burial of the mammoths as a totally separate catastrophe from the Flood.

A miracle would have been required to maintain the canopies above the earth, or some as yet undiscovered physical phenomenon. This is similar to each of the other canopy theories which require a miracle either in maintaining the canopy above the earth or in dissipating the heat when it descends to the earth.

This model is consistent with Scripture in that Noah would have seen liquid water above him, but would also have seen the sun, moon, and stars between the water globules. It therefore eliminates several major problems experienced with the other canopy theories.

References

- Carroll, J. J. 1985. Global transmissivity and diffuse fraction of solar radiation for clear and cloudy skies as measured and as predicted by bulk transmissivity models. *Solar Energy* 35(2):105-6.
- Dillow, J. C. 1982. The waters above: Earth's pre-Flood vapor canopy. Moody Press, Chicago.
- Duffie, J. A. and W. A. Beckman. 1974. Solar energy thermal processes. Wiley, New York.
- Houghton, H. G. 1954. On the annual heat balance of the northern hemisphere. *Journal of Meteorology* 11(1):1-9.
- Patton, D. 1966. The Biblical Flood and the ice epoch. Pacific Meridian, Seattle.
- Sellers, William D. 1965. Physical climatology. University of Chicago Press, Chicago.

QUOTE

We can begin, then, by noting several relevant aspects of the biblical world-view:

(1) Certainly the biblical world-view implies that since God is the creator of all that exists, He ultimately is the rightful owner of all that exists. Whatever possessions a human being may acquire, he holds them temporarily as a steward of God and is ultimately accountable to God for how he uses them. However omnipresent greed and avarice may be in the human race, they are clearly incompatible with the moral demands of the biblical world-view.

(2) The biblical world-view also contains important claims about human rights and liberties. All human beings have certain natural rights inherent in their created nature and have certain moral obligations to respect the rights of others. The possibility of human freedom is not a gift of government but a gift from God.

Nash, Ronald H. 1985. Socialism, capitalism, and the Bible *Imprimis* Hillsdale College 14(7):1-2.

PANORAMA OF SCIENCE

Local Flood Damage

Introduction

When hurricane Camille moved over Virginia in August of 1969, the U.S. Weather Bureau confirmed that 25-31.5 inches of rain was dumped on various areas of Nelson County in a six-hour period (Simpson and Simpson, pp. 1, 31). From 9:30 PM August 19 to 3:30 AM August 20 the rainfall may have been as much as 46 inches in a 12-mile strip in this county of many narrow valleys surrounded by steep ridges (pp. 1, 31, 314).^{*} The death and destruction wrought by this natural disaster is reviewed as a limited analogous situation to the Noachian Deluge.

Landslides

Observers noted that as the rain began to lessen around 3:30-4:30 AM August 20, many ominous rumblings could be heard and the earth would quiver (pp. 8, 9, 343) as land and mud slides occurred. Much damage was caused by loosened mud, rocks, and trees moving rapidly down mountainsides (p. 341). A man caught in the deluge relates his experience with moving rocks, trees and earth:

And it was the awfulest racket you ever heard. I was getting scared. I been up in the mountains all my life and I aint never been so scared before, or seen it so scary. The ground didnt feel right. It was like walking on a big pile of moss.

I was resting, holding on to a sapling, and all of a sudden the rocks were coming down around me and the whole . . . thing was going down the mountain even where I was standing. The sapling fell over, and I was half on my hands and knees, trying to get away, and the rocks were tumbling down like cannonballs. (p. 343)

Force of Flood Waters

Water rose rapidly at many locations:

We stood there watching Tye River gradually rising for about 20 minutes. Then all at once, while we looked across the river, not paying any attention to the ground, my feet commenced getting cold, and I looked down, and water had come up right to the top of my shoes, and was gradually climbing. I went back and jumped into the truck and backed up about a hundred yards, and stopped, and left the light on and the motor running.

I got out of the truck and made about four or five steps down the road. And that is where I met the water coming up. That's how fast it came up. (p. 10)

One man looking at a creek near his house related that the stream had overflowed its banks and that waves six to eight feet high with white caps were generated by the moving water (p. 148).

Unbelievably rapid erosion occurred during the storm:

The river was up and passing over the roadway. As it cascaded down the east (downriver) side of

the fill, it began to erode this and we watched it as it kept digging back, with the road collapsing bit by bit. The water ate its way back, from the down-river side, all the way through the fill. Once it got back thin enough, the whole thing broke and the water just charged through. The gap between the bridge and the edge of the road started getting wider and wider . . .

Long after it began to subside I saw a telephone pole or power pole come downstream and strike the bridge railing as it was bobbing along on the waves. The pole struck the railing with such speed and force that it flew up into the air, and flipped over, and knifed into the water on the lower side of the bridge. (p. 150)

Houses, trucks, cars, tractors, cattle and people were rapidly swept along by the violently moving water (p. 10). An entire tractor trailer was observed going off into a torrent never to be seen again (p. 352).

Human Deaths

Of the dead persons that were examined by the medical authorities very few showed evidence of drowning. Dr. James H. Gamble, a well-known and respected physician in the County at that time, who examined most of the bodies noted:

We have a stock Bureau of Vital Statistics category for the death certificates: "multiple injuries and/or drowning." But this is interesting: in very, very few of these people that we opened up did their lungs show evidence of death from drowning. The vast majority were just multiple fractures—rib fractures, spine fractures, long bone fractures, skull fractures— from rocks and trees and so forth. This was rather surprising to me. However, on my death certificates and my CME reports— and I think the other doctors did the same— we used just one blanket category: multiple injuries and/or drowning. But most died from just massive, what we call "blunt force" injuries. It's just unbelievable when you open these bodies up and really take a good look at the fractures, and the damage to the body, how many fractures these people had. It's just fantastic. (pp. 270-1)

Lack of Human Fossils

Creationist writers have discussed reasons for the lack of human remains in the so-called fossil record from a Deluge context (Morris 1966 p. 9, Clark 1971 pp. 22-3, Woodmorappe 1983 p. 170). Generally the suggestion offered is the mobility of humans enabling them to remain afloat until exhausted. Finally they die in the raging waters and their bodies eventually decay in the Flood waters or after the waters abated.

In Nelson County, on the night of the catastrophe, people were seen floating on debris in the torrents [pieces of buildings, large trees, hay bales, etc. (pp. 10, 11)]. Many of the people that died probably were struck by moving objects or thrown against stationary material with such force causing multiple bone fractures. Finally being weakened, they died and were washed into debris piles. Once the water subsided, the

^{*}All page numbers listed without a specific author are from Simpson and Simpson.

bodies rapidly decayed when exposed (pp. 268-71). Similar circumstances could have existed in the Flood as "great fountains of the deep" released vast streams of water rapidly hurling countless humans to a battered death.

Rapid Burial Necessary for Preservation

Creationist writers also have mentioned that rapid burial is necessary to preserve dead organisms (Morris 1967 p. 95, Hedtke 1971 p. 214). Such was found to be true in Nelson County. If any of the bodies found were buried and not exposed to organisms that attack dead tissue, they were in a preserved condition. One body was described as being "in almost perfect condition" when found beneath 12 feet of sand 80 days after the storm (pp. 199, 311). After four weeks the body of a young girl found buried in moist sand was not deteriorated (pp. 253-4). In May 1970 while dredging in the Woods Mill area of the County a pocketbook was recovered with identification cards and money in it. It was mentioned that the ID cards did not appear to have been wet as the ink was not smeared (p. 199).

Conclusions

From the observations made in a recent tragic natural catastrophe, it is seen that creationist postulations about the universal Flood are supported, i.e., reasons for the lack of human fossils, and the necessity of rapid burial to preserve organisms for fossilization.

References

- Clark, H. W. 1971. Paleocology and the Flood. *Creation Research Society Quarterly* 8:19-23.
- Hedtke, R. 1971. A geo-ecological explanation of the fossil record based upon divine Creation. *Creation Research Society Quarterly* 7:214-21.
- Morris, H. M. 1966. World population and Bible chronology. *Creation Research Society Quarterly* 3(3):7-10.
- Morris, H. M. 1967. Sedimentation and the fossil record: a study in hydraulic engineering. *Creation Research Society Quarterly* 4:89-99.
- Simpson P. S. and J. H. Simpson, Jr. 1970. Torn land. J. P. Hell and Co. Lynchburg, VA.
- Woodmorappe, J. 1983. A diluviological treatise on the stratigraphic separation of fossils. *Creation Research Society Quarterly* 20: 133-85.

Contributed by Emmett L. Williams

The Jumping Spider's Wondrous Eyes

Spiders, comprising the order Araneida, are members of the class Arachnida in the phylum Arthropoda. They are world wide in distribution, being found even on the upper slopes of Mount Everest and in Arctic regions. The estimated number of species varies widely from 30,000 to over 40,000 (Wallace, p. 613). With few known exceptions, and from a behavioral perspective, spiders generally may be categorized as web-builders and wanderers, the latter stalking their prey on the ground, on walls, tree trunks, etc. Only relatively few of the 2,500-3,000 estimated species of the wanderers have been investigated and described. (Forster, p. 165). The web-builders, which depend primarily on vibratory stimuli to locate and capture their prey, have indifferent vision, whereas, as would be expected, the jumping spider has a very sophisticated and efficient visual apparatus which is eminently suited to its way of

life. All spiders spin silk but the vast majority of the jumpers do not construct prey-catching webs. (Jackson, p. 102). Instead some of them use this ability for other purposes such as nesting. These little animals average about one cm. in length and can make an accurate leap of about 1.5 cm.

In both types the visual system consists predominantly of six or more, usually eight, simple eyes (ocelli) arranged in two or more transverse rows, situated on the anterior aspect of the cephalothorax. In the web-spinners the eyes individually resemble one another, but in the jumping spiders there are two larger and closely associated eyes placed centrally and anteriorly, with a row of three smaller ones more or less in line along each side of the cephalothorax, behind and lateral to the two larger frontal ones. Each of the frontal ones is moved by six muscles but the laterals, having none, are fixed. These two types of eyes differ markedly in structure as they serve different purposes.

For the jumping spider a wide field of vision would be an obvious and necessary requirement in efficiently searching for food. The eight eyes are wonderfully adapted and designed for this purpose, both in their different positions and functions. The six lateral eyes, three on each side, survey the environment for movement, and because they are facing in somewhat different directions, with some overlapping of the visual fields, any movement is detectable through almost 360°. When the image of a moving object crosses the retina of one or more of these lateral eyes the spider reflexly aligns itself to face the object, thus bringing it into the narrow field of vision of the two forward looking anterior eyes, whose complexity and visual acuity greatly exceed that of the lateral eyes.

The two frontal eyes are tubular with a focal distance at least double that of the side eyes, the latter being shallower and saucer-like which results in much wider visual fields.

The retinas in the two types of eyes differ markedly also. The retina in each of the two anterior eyes has four layers of light-sensitive cells, the complicated structure of which has been revealed by electron microscopy (Eakin and Brandenburger, p. 618). The physiology and function of this complicated structure have not been explained but it has been suggested that they may possibly have something to do with color vision or form analysis. Nerve fibres from the light-sensitive cells in the two eyes partially cross in the chiasma and proceed to the ganglion of the first cephalic segment of the nervous system (Duke-Elder, p. 214). The arrangement of the retinal cells and conducting nerve fibres follows the typical verted plan which is almost universal in invertebrates. There is a fovea at the base of a "v" shaped pit in the retina, the slanting sides of which, along with the relatively long focal length, produce a considerable degree of enlargement of the retinal image, thus enhancing the efficiency of these two frontal eyes, which can, apparently, identify movement as prey at a distance of 20-30 cm. (Forster, p. 167 and Jackson, p. 111).

In contrast, each retina of the lateral eyes consists of a single layer of light-sensitive cells arranged in the uncharacteristic (for invertebrates) inverted plan of the vertebrates. The afferent fibres from all the lateral eyes go to the second ganglion of the first cephalic segment.

Reflex action does not exhaust the capabilities of the jumping spider, as its predatory movements in stalking, jumping and injecting its poison, or in mating activities, involve recognizing the object of its attention as suitable prey, other spiders, male or female, or enemies. Input from various combinations of the different eyes determines the various types of overt activity, as has been worked out after covering certain of them and observing subsequent behaviour.

Jackson (p. 113) has postulated that the jumping spiders' ancestor was a web-builder with poor vision, which subsequently and gradually developed the habit of invading adjacent webs in its search for food, either prey caught in the web or the tenant itself. In some unexplained manner some individuals developed an improved visual sense, and, exhausting this source of prey, began to seek out other webs further afield, necessitating traveling over the ground and thus developing improved capabilities of locomotion. With the improved vision and better mobility, insect capture was possible and thus, as web building was no longer required, it was abandoned. Thus supposedly the various types of jumping spider evolved. Since natural selection can only select from what is available and the need for something cannot operate as the cause for it, the above scenario seems a bit optimistic.

In this very brief overview of the visual faculties of the jumping spider it is evident that it has been endowed with an apt and masterful facility completely adequate and adapted for its particular niche. Here we find a most unusual situation where an invertebrate animal possesses image-producing eyes with retinas of widely differing structures both verted and inverted, (Hamilton, p. 59) with the former being amazingly complex and intricate. It would appear far beyond the non-teleological hit and miss chance operation of natural selection acting on regressive mutations by stages over a prolonged period of time, or in short spurts at intervals via punctuated equilibria, to produce such a coordinated visual unit as we find in the jumping spider. Such exquisite and intricate structures as the frontal eyes would be totally useless unless fully developed and integrated in all their parts.

Eakin and Brandenburger (p. 663) close their article with this impression:

We conclude this paper with a non-scientific statement. Of all the eyes which we have explored from the eyes of a protist to the third eye of a lizard, none has been so exciting or beautiful as the eyes of a jumping spider.

References

- Duke-Elder, S. 1958. System of Ophthalmology, Volume 1, The eye in evolution. Henry Kimpton, London.
- Eakin, R. M. and J. L. Brandenburger, 1971. Fine structure of the eyes of jumping spiders. *Journal of Ultrastructure Research* 37:618-63.
- Forster, L. 1982. Vision and prey-catching strategies in jumping spiders. *American Scientist*. 70:165-75.
- Hamilton, H. S. 1985. The retina of the eye: an evolutionary road block. *Creation Research Society Quarterly* 22:59-64.
- Jackson, R. R. 1985. A web-building jumping spider *Scientific American* 253:102-15.
- Wallace, H. K. 1978. Spiders. World book encyclopedia Volume 18, World Book Inc. Chicago.

Contributed by H. S. Hamilton

As a Watch Needs a Watchmaker (circa 1868)

In the novel *Marooner's Island* by F. R. Goulding, (author and inventor), originally copyrighted in 1868, a typical argument for the existence of a Creator is given by a Dr. Gordon to his son and a nephew. The conversation involves attempts to convince a hypothetical person of God's existence if the person is open minded and *willing* to consider evidence from the natural world. An interesting argument using probability is employed.

Dr. Gordon paused, looked around for an illustration, then seeing a book in Harold's hand—a copy of the New Testament, which he had been reading— he went on to say,—

"How came you, Harold, with that book?"

"It is my own, sir; I brought it from home," he replied.

"But how came it into your possession?"

"My mother bought it for me in Montgomery."

"But how came the merchant there with it?"

"I suppose he bought it from somebody else."

"But how came that somebody else with it?"

"He bought it, probably, from the person that made it."

"But why do you suppose any one made it?"

"Because it is a book, and it could not make itself."

"But why not suppose that it came by chance?"

"I cannot suppose that," replied Harold, "because chance could not possibly put together so many things as are necessary to make a book—the paper, the printing, the binding; and more than that, there are many other books exactly like this, and if chance by any possibility make one, it could not be expected to make more. It *must* have had a maker. Indeed, every book must have had a maker; and as I come to think of it, every page in every book must have had a maker,— yes, and every word, every letter, every part of the paper, printing, and putting together."

"Very well," said his uncle. "Now look at the oak-tree. It has upon it more leaves than there are pages in your book. Every leaf is composed of a mid-rib and side-ribs, and fibres crossing from one side to the other, like beautiful lacework and the spaces between are filled with green matter, glossy on one side to shed rain, and on the other side occupied with numberless pores to admit air and moisture. These pores are most ingeniously contrived, being in shape somewhat like a long letter O, sharp at both ends, and made of such material, in such way that in dry weather they open wide to catch all the moisture possible, and in wet weather they contract so that no moisture can enter. These ingenious little pores are more numerous in each leaf than the letters are on each page of your book. Besides these wonderfully constructed leaves, there are flowers and fruits to be reckoned in our account, each as wonderful in its way as the leaf. Then there are the roots, by tens of thousands, little hair-like things, each with its tiny mouth wide open at the end for sucking up water from the earth. And there is the wood itself, a wonderful structure, made up of tubes bundled together, each

with its apparatus of valves and pumps for forcing the water twenty, thirty, fifty feet high, to the topmost branch. Superadded to all these, and more wonderful still is its power of elaborating seeds, in each of which wrapped up, in small compass, a young tree of its own kind, and then of dropping that seed at the time of the year suited for its growing up and becoming a tree like itself.

"Now compare the tree with the book. Which has the greater number of parts put together?"

"The tree," answered Harold, "for the book is made up of paper, print, and binding, while the tree is made up of leaf, stem, fruit, wood, bark, roots, and each of these made up of many parts in itself. The tree has, beyond comparison, the greater number of parts."

"What is the probability that chance put their various parts together to make a tree?"

"It is not probable at all," he replied. "It is *just nakedly impossible*."

"Well," said his uncle, "you have in this illustration one of the arguments from nature for believing that there is a God. For to say it is impossible for the tree to have come by chance, is equivalent to saying that it must have had a Maker. And what is thus true of this tree must be, in like manner, true of every tree, and shrub, and vine, and blade of grass, and, much more, of every bird and beast, reptile and fish, worm and insect. *This Maker of all things we call God.*"

At this point, Robert put in an inquiry,—

"How would you reply to one who should contend that the trees we see now are only so many parts of a series, without beginning or end; that they have *always* been growing and propagating their kind?"

"I would reply to him," said his father, "that his theory only removed the difficulty a few steps further back, for every numerical series must have a beginning, and, moreover, it is not only of *first* tree of each series that our argument holds good, but of every tree in itself. Each bears its own testimony. More than this, if the science of geology teaches anything with certainty, it teaches that the time was when trees did not grow upon the earth,— the soil and temperature of our planet's surface did not admit of their growth. They came after certain other changes; therefore *they had a beginning*, and therefore they must have a Creator."

"I am satisfied," said Robert, "for, so far as I can see, one of three things must be true: that this tree came into existence by chance; or that it always existed in kind; or that it had a Creator. But it *did not* always exist; it *could not* have come by chance; therefore it must have been created."

A new form of the thought here occurred to Dr. Gordon, and he said,—

"To calculate the probability or improbability of so simple a thing as a book being produced by chance, let us suppose that all the paper, and type, ink, and other materials necessary for printing and binding are provided; and, if you will, all the frames and cases and levers and rollers used in printing, besides. Let us suppose, too, that in producing a book, there is necessary a certain degree of blind power, say a one-horse power, and that this is provided in the shape of a neat little waterfall. Let us see now how many parts will be necessary to make our book. In an ordinary New Testament, there are,— counting the headings of chapters, numbering of verses, punctuation marks, etc.,— at least half a million of letters, figures, and other marks, each requiring a type. We will put all these types, with the necessary paper, ink, leather, thread, pasteboard, rollers, printing frames, etc., into a bag, jumbled together, and carry them to that neat little waterfall of one-horse power, and there empty them all in. How long will we probably have to wait before we may reasonably expect to see an elegant little copy of the New Testament, like that Harold has, come out of the water?" Goulding (pp. 360-5)

Reference

Goulding, F. R. 1923. Marooner's Island. Dodd, Mead, and Co., New York.

Contributed by Emmett L. Williams

Addendum To As A Watch Needs A Watchmaker

Since the time the above book was written macro-evolutionists have asserted that life arose by chemical reactions in an ancient reducing environment on the earth. Thus they might claim that Dr. Gordon's argument of spontaneous generation by chance under the influence of a one-horsepower machine does not apply to the chemical genesis of primordial cells! Evolutionists may assert that the whole analogy breaks down—but does it? The chemical problems facing the origin of early proteins are legion. (See the bibliography given in the Editorial Comments CRSQ 22:6)

The chance that useful DNA molecules would develop without a Designer are approximately zero. Then let me conclude by asking which came first—the DNA (which is essential for the synthesis of proteins) or the protein enzyme (DNA-polymerase) without which DNA synthesis is nil? I say that Gordon's observations do apply and that there is virtually no chance that chemical "letters" would spontaneously produce coherent DNA and protein "words."

Contributed by George F. Howe

QUOTE

One word about "puffing up." There is always an element of pride and conceit in every kind of knowledge. The knower congratulates himself— *he knows!* If one has not seen how much the scientist or scholar takes pride in his knowledge, one has not seen enough of human nature. One can be only humbled when acknowledging sin, and one can acknowledge sin only when Jesus Christ convicts one of it. Without this conviction, one thrives on pride and dies in pride. (How many scientists and scholars I have seen dying in pride!)

Malik, Charles H. 1984. Faith and reason in the university. *Modern Age* 28:319

QUANTUM PHYSICS: HISTORICAL REVIEW AND CURRENT DIRECTIONS

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Abstract

For several decades in the 20th century quantum physics has produced lively discussion and serious debates. The authors summarize early foundational work establishing quantum physics prior to 1930 and briefly consider the need for an epistemological shift in our classical philosophy of science. A further evaluation is made regarding egregious interpretations surrounding recent applications in quantum mechanics and their bearing on science and theology. Finally, a creationist framework is entertained to provide scientific insights and constrain ideas deduced from modern physics.

Introduction

In a recent article in *Christianity Today*, Allen Emerson reports the qualms of his theological friend regarding apparent conclusions derived from quantum mechanics.¹ Others, such as author Dave Hunt, are beginning to express their concern also.² Is a common sense view of the universe slipping away? Is the "new physics" paving the way toward pantheism? Will we be able to know or have certainty about anything? Let us first take a brief look at the foundations leading to what is called Quantum Physics.

The following list in Table I will begin helping us to understand some of the details in the development and interpretations involved in Quantum Physics. This list could be embellished with additional contributions, but it serves to represent some of the people and events from which modern physical concepts have been derived.

Max Planck derived a new mathematical relationship, $E = h \nu$, from his radiation formula fitted to black-body radiation curves. Albert Einstein was later credited with demonstrating the discrete or particle-like nature of light, photons, from the photoelectric effect. Following the chain of this development, Compton's experimental results were interpreted as illustrating the particle nature of light when interacting with electrons. This is a brief outline which is generally used to convince us of the particle nature of electromagnetic radiation.

A parallel development began with N. Bohr's model for the hydrogen atom which tended to explain hydrogen's emission spectra in terms of a planetary electron, about a proton, within select or quantized orbits. These orbits were determined through the "quantization" of the electron's angular momentum.

After Bohr, the next critical step came with L. de Broglie's prediction that matter possesses wave properties, $\lambda = h/p$. This concept was regarded as the corresponding principle to Einstein's photon theory, as well as a better rationale for Bohr's atomic orbits of radius, r in terms of the number (n) of electron wave lengths, $n \lambda = 2\pi r$. After this, the work of Heisenberg, Born, Jordan, Bohr, Pauli, Schrodinger and others provided the mathematical formalism which has been commonly used in quantum mechanics. Beginning with such classical forms as matrix theory, wave propagation, Fourier analysis, etc., new relationships were developed which included the concepts $E = h \nu$ and $\lambda = h/p$ in the mathematical scheme.

A short time later, the wave nature of the electron was apparently confirmed by the electron diffraction experiment of Davisson and Germer. The "new physics" appeared theoretically and experimentally complete around 1930. From this point on, quantum physics would find much use in specific applications to various problems. The debate, however, continues regarding

Table I. Summary of Historical Developments in Quantum Physics

Planck and Blackbody Radiation (1900)

Development of mathematical formula satisfying experimental data for blackbody radiation; purported to indicate that light is radiated in "quanta" of energy, $E = h \nu$ (E = quantum of energy; h = Planck's constant; ν = linear frequency).

Einstein and the Photoelectric Effect (1905)

Theoretical explanation of photoelectric effect in terms of quantum energy; used to support particle nature of light (photons).

The Bohr Atom (1913)

Modification of Rutherford's atomic model proposing that electron orbits are selected due to quantized angular momentum, $L = nh/2\pi$ where $n = 1, 2, 3, \dots$. Also included idea that electromagnetic radiation from the atom results from jumps between electron orbits, $E_2 - E_1 = h \nu$ where E_1 and E_2 are orbital energies of the electrons.

The Compton Effect (1922)

Experiment involving scattering effects of photons interacting with electrons; used to confirm particle-like nature of light (billiard ball behavior).

DeBroglie and Matter Waves (1923-4)

Theoretical proposal that matter has wave-like behavior, $\lambda = h/p$. λ = wavelength of electron or other particle; p = particle momentum).

Heisenberg, et al. and Matrix Mechanics (1925-7)

Development of matrix mechanics in quantum physics, uncertainty principle, probability interpretation, etc.; also foundation of what has been called the Copenhagen interpretation of quantum theory.

Schrodinger's Equation (1926)

Development of wave mechanics in quantum physics following de Broglie relationship; mathematically equivalent to matrix mechanics.

Davisson and Germer Experiment (1927)

Electron interaction with nickel crystal producing apparent diffraction patterns; purported to confirm de Broglie relationship.

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the proper physical and philosophical interpretation quantum physics is to be awarded.

At present among creationists, Dr. Thomas Barnes has been a significant opponent of some of the standard quantum mechanical interpretations. In his book *Physics of the Future*, Dr. Barnes discusses the photoelectric and Compton effects, and the Bohr atomic model. His quotations of such men as Lorentz, Poincare, and Ives generate serious reconsideration of the particle nature of light.³ Barnes further develops an electronic model of the atom in contrast to the Bohr model.⁴ Atoms are thought of as high Q oscillators whose wave properties are characterized in terms of electronic resonance.⁵

In deference to Dr. Barnes, we confess our partiality to mechanical models. However, the profound concept which underlies some of his work is the maintenance of *real particles with resonant characteristics* (whether electrical or mechanical). Resonance is a classical concept which, in this case, can be used to simultaneously relate mass or charge to frequency and therefore wavelength. Although we do not wish to prematurely depreciate or exalt Dr. Barnes's atomic model, we believe that maintaining a view of the atom as a *real* resonant oscillator is sound. A proper interpretation of such oscillators could possibly contribute to sweeping away wave-particle dualism or abstract probability approaches in atomic modeling. Even Planck and Schrodinger expressed such an emphasis somewhat in their respective work speaking of oscillators and resonance. Indeed, Schrodinger himself had discussed the Compton effect completely in terms of wave phenomena.⁶ However, our main emphasis is that quantum physics proper should be first seen as an extension of classical physics and not as something wholly different mathematically or philosophically.

Basic Mathematical Relations

The following includes a few common mathematical presentations, found in many physics texts, regarding Bohr's atomic model,^{7,8} De Broglie's⁹ relationship, and Schrodinger's time independent equation.^{10,11}

(A) Bohr, using Rutherford's basic atomic model, equated the appropriate electrical and mechanical forces in the planetary model of hydrogen:

$$\frac{mv^2}{r} = \frac{e}{4\pi\epsilon_0 r^2} \quad (1)$$

where m = mass of electron, v = velocity of electron, r = orbital radius of electron, and ϵ_0 is a constant (permissivity of free space). Equation (1) is employed to arrive at expressions for both v and r . Combining the kinetic and potential terms for electron energy (E_t) we obtain

$$E_t = \frac{-e^2}{8\pi\epsilon_0 r} \quad (2)$$

Using Bohr's proposition $L = mvr = nh/2\pi$ and the idea that changes between electron orbits were accompanied by a specific quantum of energy $E_2 - E_1 = h\nu$ we obtain the general relationships:

$$r \sim n^2 h^2 \quad v \sim 1/nh \quad E(h\nu) \sim 1/n^2$$

The integer n , which was Bohr's principal quantum number, was equivalent to individual values in the set of series numbers for the Ryberg formula:

$$\nu = R(1/n_j^2 - 1/n_k^2) \quad (3)$$

Bohr's formula for frequency took on the same form with a physical meaning for the Ryberg constant:

$$R = \frac{me^4}{8\epsilon_0 h^3} \quad (4)$$

The integer n becomes the selection number for a specific orbit, and the constant, R , has been physically derived.

(B) After de Broglie introduced his proposition it was shown to be mathematically equivalent to Bohr's selection rule. De Broglie's relation is:

$$\lambda = h/p = h/mv \quad (5)$$

If, as de Broglie indicated, the radius of the electron encircling the nucleus is determined by a unit wavelength then,

$$\begin{aligned} 2\pi r &= n\lambda \\ 2\pi r &= nh/mv \\ mvr &= nh/2\pi \end{aligned} \quad (6)$$

Equation (6) is known as the Bohr selection rule. De Broglie's idea about the electron was of course much different than Bohr's, but the former tended to give an explanation for the selection of orbits. It also tended to explain a mechanism for electron stability in terms of standing waves instead of moving charges, which would continually radiate energy and fall toward the nucleus.

(C) The following derivation shows how the time-independent form of Schrodinger's equation can be obtained from the classical wave equation using de Broglie's relationship.

$$\frac{\delta^2 \psi}{\delta x^2} = \frac{1}{v^2} \frac{\delta^2 \psi}{\delta t^2}, \quad \psi = \psi(x, t) \quad (7)$$

Equation (7) is the classical wave equation and ψ is generally referred to as the wave function. Classically it is represented as a wave with magnitude dependent upon location and time, $\psi(x, t)$. The quantum approach will result in a localized waveform, which is to imply particle-like behavior. The standard solution for this equation may be expressed by separating the time (t) and space element (x) by using $\psi(x, t) = \psi(x)\psi(t)$. If we take $\psi(t) = e^{-i\omega t}$ where ω is the angular frequency, the function (or particle) moves as a wave in time, then:

$$\frac{\delta^2 \psi(x)}{\delta x^2} = -\frac{\omega^2}{v^2} \psi(x) \quad (8)$$

Understanding that $\omega = 2\pi\nu$, $v = \lambda\nu$, and using $\lambda = h/p$ and, $p^2 = 2m(E_t - V)$ derived from the total energy [kinetic and potential (V)] of a hypothetical atomic system $E_t = p^2/2m - V(x)$, then:

$$\frac{\delta^2 \psi(x)}{\delta x^2} = -\frac{4\pi^2 p^2}{h^2} \psi(x)$$

$$\frac{\delta^2 \psi(x)}{\delta x^2} = -\frac{4\pi^2}{h^2} \cdot 2m(E_t - V) \psi(x)$$

$$\text{or} \quad \frac{h^2}{4\pi^2} \frac{\delta^2 \psi(x)}{\delta x^2} + 2m(E_t - V) \psi(x) = 0 \quad (9)$$

Equation (9), which is called the time-independent Schrodinger equation, is a) for one dimension only and b) developed considering the potential as a function of position alone. Of course much more is involved in the derivation of the complete time dependent form of Schrodinger's equation as well as the rest of quantum mechanics. However, what is important to note is that the previous equations, being developed prior to 1930, can be consistently derived from the formalism of classical physics with appropriate modifications.

In conclusion to these simple exercises, it was our intention to demonstrate the dependence of quantum mechanics upon the foundation of classical physics. Even in more recent times, for example, John Wheeler in a discussion on quantum gravity stated:

No one today knows how to get quantum theory as quantum theory without having at the start the mathematical guidance of what we call classical' theory.¹²

It is a respectable opinion that when distilled down to the fundamental ingredients quantum physics (1930) = classical physics + $(E = h \nu) + (\lambda = h / p)$. By saying this we do not mean to minimize the profound mathematical work of others involved. We also recognize that spin, perturbation theories, approximations, and further developments have contributed to the intricacy of quantum mechanical approaches. However, we believe that the historic mathematical progression has been consistent with classical scientific epistemology as opposed to some of the philosophical interpretations attending quantum physics.

New Directions of Quantum Mechanical Interpretations

The previous sections dealt briefly with quantum physics in the past. We shall now deal with some philosophical concepts concerning the interpretation of science and reality which have been attributed to quantum mechanics. It is here we think that many make offensive "quantum leaps."

An excellent article in *Scientific American* by Bernard dEspagnat discusses a number of experiments which bear on quantum mechanical predictions.¹³ Before discussing dEspagnat's conclusions refer to Table II for some definitions of concepts involved.

After several conferences in the early 30's, the debate concerning reality and quantum mechanical interpretations had focused primarily on two men and their views: Bohr and Einstein. Later in 1935, Einstein, with Podolsky and Rosen, laid down a final challenge to quantum mechanical interpretations in what is known as the EPR paradox. Einstein and his colleagues stressed that unknown factors or hidden variables existed so that quantum mechanics must be an incomplete system. If we could discover the hidden variables we could once again return to a deterministic explanation of atomic phenomena.

The EPR paradox can be illustrated using the following example: Let two particles interact in such a way that some of their properties are correlated i.e. spin. Once the particles are separated and the spin, etc. analyzed for one of them, we could perhaps automatically conclude something specific about the same property of the other particle (again representing a deterministic view of reality).

Table II. Definitions of Terms

Determinism

Belief that all activity is fixed or determined by a continuous sequence of cause-effect relationships.

Einstein Separability

Specifically: The idea that matter or information cannot be transmitted faster than the speed of light; generally: the observer is separate, distinct and does not influence that which is observed.

Inductive Reasoning or (Induction)

Interpretation of limited information, i.e. experimental data, to form general conclusions about reality.

Positivism

Belief that only empirical observations have real meaning and that conclusions beyond observables should be disregarded; extended in the present sense to infer that only what is experienced is real.

Realism

Belief that all things have separate or objective existence apart from human observations or experience.

In 1964 John Bell developed a mathematical relationship which assisted in bringing the EPR experiment into the laboratory. This relation, called Bell's inequality, could be used to calculate the results of correlated properties which differed from quantum mechanical predictions.

dEspagnat lists the experiments which were carried out in the 70's regarding the EPR paradox. Five of seven experiments have been reported as confirming the predictions of quantum physics. Most of these experiments dealt with the polarization of photons, but one experiment employed pairs of protons. Not only did dEspagnat evaluate the results of these experiments, he anticipated the philosophic conclusions related to the potential results of the Alain Aspect experiment (1982) while still in progress. The results of the Aspect experiment are apparently "making waves" both in the scientific and theological communities.

This experiment has been reported to show that correlated photons, after separation over some distance, affect one another almost instantaneously (transferring information about the property or situation of one to the other faster than the speed of light). The Aspect experiment was uniquely designed so that no correlation could exist unless an action-reaction response traveled faster than the speed of light. If the experimental instrumentation is sound, and the measurements sufficiently correct, then certain principles of relativity may be called into question.

We believe that dEspagnat has done an excellent job in assessing the Aspect experiment, particularly before the results were recorded. In his evaluation of the assumptions concerning the experimental method, he examines 1) realism, 2) inductive reasoning, and 3) Einstein separability. He suggests that Einstein separability is the faulty assumption within the experimental framework (a conclusion not at all displeasing to many creationists).

On the other hand, many popularized science books such as *The Tao of Physics*,¹⁴ *The Dancing Wu Li Masters*,¹⁵ and *Taking the Quantum Leap*¹⁶ use a number of these experimental results to emphasize a positivist (related to solipsism) or pantheistic view of re-

ality. For example, Fred Wolf states:

A quantum solipsist says: I am the only reality. Everything out there is in my mind. To change reality, that is, to change objects into different objects, I need to change my mind. To the extent that I am able to do this, so appears the world as I see it.'

Zukav states:

Photons do not exist by themselves. All that exists by itself is an unbroken wholeness that presents itself to us as webs (more patterns) of relations. Individual entities are idealizations which are correlations made by us. . . . The new physics sounds very much like old eastern mysticism.¹⁸

dEspagnat mentions this sort of thinking and explains that positivism in physics has been replacing the notion of realism in our day:

A number of philosophers, who can collectively be called positivists, have rejected the realistic viewpoint. The positivists do not assert that the world external to the mind does not exist; they merely dismiss as meaningless any statement about an external reality that does not refer directly to sensory impressions. In the 20th century some radical positivists have had an appreciable, if indirect, influence on the thinking of theoretical physics.¹⁹

Although dEspagnat concedes that the rejection of Einstein separability may "represent a step toward philosophical positivism," a realistic view of a cause-effect universe could remain intact. The tragedy of an encroaching positivist view in science, however, is well represented in his statement as follows:

If the refusal to seek underlying causes of observed regularities is applied consistently, it trivializes the entire scientific enterprise. Science is reduced to a set of recipes for predicting future observations from a knowledge of past ones. Any notion of science as the study of nature is impossible; nature is a phantom. One can imagine a physics grounded on positivist principles that would predict all possible correlations of events, and still leave the world totally incomprehensible.²⁰

The previous quote confirms why creationists realize that our philosophy of science must begin with and follow divine revelation. A rejection of realistic views hardly seems warranted and actually appears to be a case of attempting to use science to prove nonscience, or possibly nonsense.

How might this affect theology? Again Wolf states:

The first case of quantum consciousness may have been Moses. When he asked, who are you?' of the presence felt at the burning bush, the answer: I am that I am.' Moses then recognized that within him, the god voice spoke as Moses. And from that moment onward, humans began to control their destiny.²¹

No space is necessary to elaborate on this absurdity to serious students of Scripture.

When theology is the topic discussion, there should be no doubt as to the authority of God's Word in the matter. However, our philosophy of science must also be consistent with epistemological foundations set forth in the Scriptures. We do not affirm this position, of course, merely to set forth some unique personal

view of Christian dogma. We do so because this is what is true.

Whatever quantum physics brings to light regarding the physical universe, we have every confidence that its correct understanding will be constrained by theology proper. Positivism being humanistic is inherently uncertain. Only revelation provides a real basis for understanding. In the following evaluation of the Genesis account, we consider the creation of matter and light. Quantum physics provides a mathematical framework for the phenomena. However, are matter and energy mutually exclusive in form, two shades of the same thing, or do they fit "hand in glove," so to speak? This exercise may yield a fruitful reflection upon our scientific models for particles and waves, as well as interpretations affecting both physics and cosmogeny.

Biblical Considerations in Cosmogeny

As creationists we approach the creation account of Genesis 1 and 2 as truthful and factual history and interpret it as such. Further, we accept the Bible's claim to divine authorship and look to the Scripture as the only revelation of God's will for man, and it is the only adequate source for the explanation of origins. We also believe that any accurate implications from sound approaches in quantum physics may have already been anticipated within in the canon of Scripture. The question of origins is answered with a true cosmogeny which shines forth:

. . . We are taken back to that point which the human mind will naturally revert and in reference to which it asks: What was the beginning of things?' This solemn and pithy statement gives man the information: the beginning was made by God in His creation of heaven and earth. As far as this world is concerned, it simply had no existence before this time.²²

The Early Earth

The origin of the earth is expressed in Genesis 1:1. Moses, the author of this account, used the Hebrew word *bara* which in this particular verb form means, without exception, creation ex nihilo.²³ In itself *bara* does not necessarily preclude the use of pre-existing material because of the use in Isaiah 65:18. However, as Leupold notes: ". . . When no existing material is mentioned as to be worked over, no such material is implied."²⁴ Thus, man sees the staggering exercise of divine omnipotence through the creative word of God. In this context, *bara* means to create out of nothing, but not in a final state. The Genesis account reveals God like a potter who begins with raw clay on a wheel and shapes and forms that clay into his creation; the raw unfinished universe is molded into the finished brilliant universe and verdant earth.

One important aspect of the creation week was the work of the Holy Spirit of God as expressed in Genesis 1:2: "and the Spirit of God was *hovering* over the waters" (NIV). The Hebrew root is *rkph* and in this verse can be translated "hovering, flying, fluttering."²⁵ This word is used in Deuteronomy 32:11 of the mother eagle who hovers over the nest of young eaglets "to warm them, and develop their vital powers . . ."²⁶ Similarly, the Holy Spirit ". . . moved upon the deep, which had received at its creation the germs of all life, to fill them with vital energy by His creative breath of

life.²⁷ The author of Genesis is apparently saying that God started with a raw, unfinished creation and will now begin to shape and form that creation into a finished, organized creation. The work of the Spirit in verse two as expressed in the term “hovering” is “a vibrant moving, a protective hovering.”²⁸ Leupold expresses this particular activity of the Holy Spirit as follows:

From all other activities that are elsewhere ascribed to the Holy Spirit we conclude that His work in this case must have been *anticipatory* (our emphasis) of the creative work that followed, a kind of impregnation with divine potentialities. The germs of all that is created were placed into dead matter by Him. His was the *preparatory* work for leading over from the inorganic to the organic.²⁹

Another commentator from the previous century expresses a similar interpretation:

It was not the self-development of powers inherent in matter. The creative movement was made by the will of God; . . . Through the whole of the Old Testament, “The Spirit of God” is represented as the great agent in imparting vital energy and action (cf. Ps. civ. 3) both to animals and plants; and thus, as he is represented to have brought His immediate influences to bear upon “the void and formless” world, by working on the dead or discordant elements, the action must be considered as having consisted in combining, arranging, and ripening them into a state adapted as being the scene of a new creation. . . .³⁰

Henry Morris has the same understanding of the “hovering” work of the Spirit and says this: “. . . In modern scientific terminology, the translation would probably be vibrated.”³¹ Morris goes on to add: “If the universe is to be energized, there must be an Energizer. If it is to be set in motion, there must be a Prime Mover.”³²

Morris and the above commentators are saying that the matter created by God “in the beginning” was then given properties by the “hovering” of the Spirit which prepared it for the further molding and shaping of God’s creation that would occur as revealed in Genesis 1 and 2. Although the exact nature of the work of the Spirit cannot be known, we believe that the interpretations of the above writers are true to the Scripture and fit the context of the passage.

The State of Early Earth

The earth is described in Genesis 1:2 “Now the earth was formless and empty.” The word “formless” is in the original language *tohu* and “empty” is the word *bohu*. The word *tohu* refers to the original state of creation as it was after God brought it into existence by His spoken Word. It was “formless” or “unformed”³³ in the sense that God had yet to put it into His desired final shape and form.³⁴ Weston Fields says the following concerning the meaning of *tohu*:

. . . When God was done with his creation work in relation to the earth, it was not *tohu*. It was *tohu* in the purest sense only for a short period on the first day of creation. All during the creation week it became less and less *tohu*, as the light appeared, the firmament was made, the land was divided from the sea, the plants and animals were created,

and the sun, moon and stars were made. Finally, by the time Adam was created on the sixth day, the earth was in the state God had planned it should be. It was *completed*; it was now *formed* and *filled*!³⁵

The word “empty” *bohu* is listed under the “emptiness” entry in the lexicon³⁶ and means merely that the earth was without dwellers.³⁷ The earth therefore “. . . must be peopled with all kinds of inhabitants or beings . . .”³⁸ God then had created the earth in its original state and in the remainder of the creation week he would shape and mold earth until it was formed, and filled with inhabitants.

Light

The text of the Genesis is clear in placing the creation of light from the earth as preceding the creation of the sun and stars. The original language of the translation “Let there be light” is quite forceful using the imperative and could be translated “become light” with the resulting effect “and there was light,” which more literally could be translated “became light.”³⁹ The point of the passage seems to be that light was first created on the earth and later appeared in the rest of the universe. Lange brings this out in the following:

. . . In the fact of the first illumination of the earth the author presents the fact of the birth of light generally in the world, without declaring thereby that the date of the genesis of the earth’s light is also the date of the genesis of light universally. But we may well take the birth of light in the earth (or the earth becoming light) as *the analogue whereon is presented the birth of light in heaven*. (Our emphasis.)⁴⁰

Light originated in conjunction with the development of earth or matter and then at God’s command light appeared in, or emanated within, the rest of the universe in response to His word.

This brief examination of Genesis 1:1-2 shows that the universe was created in an unfinished state and through the working of the Holy Spirit, God began to complete His work. Genesis reveals that light originated on the earth and later appeared in the rest of the universe.

Consideration of Creationist Position

As creationists, we are confident that we can make some general assertions regarding both quantum mechanical discoveries and interpretations before a maze of metaphysics clouds the issues.

- I. *Matter was constructed with resonant characteristics*
Matter, in its construction phase was apparently infused with vibrational energy by the action of the Spirit (Genesis 1:2). Resonant characteristics were a part of this construction of matter before the embellishment of the heavens and the earth. The incorporation of vibrational characteristics within matter was most likely both integral and preparatory to the production of light (Genesis 1:3).
- II. *The Universe exists apart from human existence*
Contrary to conclusions which could be derived from an extreme positivist view, the *existence* (with a tangible purposeful cause-effect nature) of the universe is not a function of human observa-

tion. God was clearly creating a real and *good* universal order before human occupation.

III. Human activity influences the universe

God constructed man in such a way that his behavior influenced the destiny of things associated with the earth (Genesis 1:26-28) and apparently all of creation-including the universe (Romans 8:20-22). It is in this sense that we are interconnected with the universe, both physically and spiritually (which includes moral responsibility).

Although some of these ideas may seem simple or obvious to the Christian mind, they may need to be stressed to the scientific world.

Conclusion

In our effort to outline the fundamental development of quantum mechanics we have stressed a need for careful reflection of representations supporting this area of physics. We believe that this development was (and is) consistent with our classical epistemology of science.

We also conclude that positivist and pantheistic views regarding modern physics are not only antichristian by nature, but they corrupt and destroy the discipline of science. In reality, this new shift in philosophy might appropriately be termed "mystical positivism."

Finally, we are confident that a creationist interpretation may fully incorporate current scientific findings related to quantum mechanics. We further suggest the possibility that 19th century theology has qualitatively proposed a unified relationship between matter and energy prior to the development of modern physics. The basis of such a proposal was the reasonable conclusion from a literal Genesis.

Other concepts could conceivably be added or derived from our previous discussion. For instance, instead of "the big bang" the primordial universe might actually have experienced "the big flash" with all light emanating from a formless earth of unknown initial dimension.

Finally, to answer the concerns of Emerson's friend, I only need borrow words from the philosophic trilogy of Dr. Francis Schaeffer. We have no need to fear anything because God is there; nor do we need to escape from reason as some have done—because He is there and He is not silent!

Acknowledgements

The late Francis Schaeffer discussed positivism in a sense slightly different than was presented in this paper. We chose to use a definition which was more strictly consistent with the scientific sources used. However, we wish to acknowledge Dr. Schaeffer's clear insight and predictions, prior to the 70s, regarding the death of science (in the cultural sense) following moral decline in the West.

References

1. Emerson, A. 1985. A disorienting view of God's Creation *Christianity Today* 29(2):18-23.

2. Hunt, Dave 1983. Peace, prosperity and the coming holocaust. Harvest House Publishers, Eugene, OR, pp 183-4.
3. Barnes, T. G. 1983. Physics of the future. Institute of Creation Research, El Cajon, CA pp. 62-70.
4. *Ibid.*, p. 70-4.
5. *Ibid.*, p. 129-83.
6. Scott, W. T. 1967. Erwin Schrodinger. University of Massachusetts Press, Amherst, MA, pp 69-72.
7. Gasiorowicz, S. 1974. Quantum physics. John Wiley and Sons, Inc., New York, pp. 14-20.
8. Haliday, D. and R. Resnick. 1974. Fundamentals of physics. John Wiley and Sons, Inc., New York, pp. 771-4.
9. *Ibid.*, p. 784.
10. Weidner, R. T., and R. L. Sells. 1980. Elementary modern physics, third edition. Allyn and Bacon, Inc., Boston, pp. 151-2.
11. Squire, C. F. 1971. Waves in physical systems. Prentice-Hall, Inc., Englewood Cliffs, NJ. pp. 24-5.
12. Duncan, R. and M. Weston-Smith (editors). 1978. The encyclopedia of ignorance. Pocket Books. Simon and Schuster. New York, p. 23.
13. DEspagnat, B. 1979. The quantum theory and reality, *Scientific American* 241(5):158-81.
14. Capra, F. 1975. The tao of physics. Shambala Publications, Boulder, CO.
15. Zukav, G. 1979. The dancing Wu Li masters: An overview of the new physics. William Morrow and Co., New York.
16. Wolf, F. A. 1981. Taking the quantum leap. Harper and Row Publishers, San Francisco.
17. *Ibid.*, p. 206.
18. Zukav, *Op. cit.*, p. 95.
19. DEspagnat, *Op. cit.*, p. 177
20. *Ibid.*, p. 177.
21. Wolf, *Op. cit.*, p. 245.
22. Leupold, H. C., 1942. Exposition of Genesis. Baker Book House, Grand Rapids, MI 1:39-40.
23. Keil, C. F. and F. Deilitzch. 1976. Commentary on the Old Testament. William B. Eerdmans Publishing Company, Grand Rapids, MI 1:47.
24. Leupold, *Op. cit.*, p. 49.
25. Alcalay, R. 1975. The complete Hebrew-English dictionary. Massada Publishing Co., Jerusalem. p. 1.
26. Keil and Deilitzch, *Op.cit.*, p. 49.
27. *Ibid.*
28. Leupold, *Op. cit.*, p. 48.
29. *Ibid.*, p. 50.
30. Jamieson, R., A. R. Fausett, and D. Brown. 1961. A Commentary on the Old and New Testaments. William B. Eerdmans Publishing Company, Grand Rapids, MI. 1:4.
31. Morris, H. M. 1976. The Genesis record. Baker Book House, Grand Rapids. p. 52.
32. *Ibid.*
33. Alcalay, *Op. cit.*, p. 2754.
34. Fields, W. 1976. Unformed and unfilled. Presbyterian and Reformed Publishing Company, Nutley, NJ, pp. 113-36.
35. *Ibid.*, p. 123.
36. Brown, F., S. R. Driver, and C. A. Briggs. 1974. A Hebrew and English Lexicon of the Old Testament. Clarendon Press, Oxford, p. 96.
37. Leupold, *Op. cit.*, p. 46.
38. *Ibid.*, p. 47.
39. *Ibid.*, p. 52.
40. Lange, J. P. 1960. Commentary on the Holy Scriptures. Zondervan Publishing Company, Grand Rapids, MI, 1:165.

QUOTE

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.

Planck, Max. 1968. Scientific autobiography and other papers, Greenwood. New York pp. 33-4.

KEYWORD INDEX TO VOLUMES 21 AND 22

by GLEN W. WOLFROM

Note: The first of each pair of numbers separated by a hyphen represents the volume while the second indicates the page.

ABIOGENESIS see life, origin of
 ACLU 21-92
 ACTUALISM 22-94
 AGE OF EARTH 21-109, 21-114
 ALLOPATRY 22-124
 ANIMISM 22-91
 ANTHROPIC PRINCIPLE 22-107
 APOLOGETICS 21-47, 21-157
 ARCHAEOLOGY 22-33, 22-64
 ARCHAEOPTERYX 21-155
 ARMSTRONG, HAROLD L. 22-57
 ARTIFICIAL INSEMINATION 21-47
 ASTEROIDS 21-82, 22-171
 ASTRONOMY 21-48, 21-95, 21-125, 21-154, 22-180
 ATMOSPHERE, EARLY 21-22, 22-25
 AUSTRALOPITHECUS 22-144
 AUTOGENOUS THEORY 22-78

 BEHAVIOR 21-124.
 BIBLICAL CREATIONISM 22-141
 BIG BANG 21-119, 21-154, see also universe, origin of
 BIOGENETIC LAW see recapitulation, embryonic
 BIOLOGY 21-18, 22-105
 BIRDS 21-124, 21-155

 CANOPY 21-182
 CARBON-14 21-125, 22-64 see also dating, radiometric
 CHANCE 22-128, 22-204
 CHICKEN EGG 21-195
 CHRONOLOGY, BIBLICAL 22-33, 22-64
 CIVILIZATION, ANCIENT 22-33, 22-64
 CONGLOMERATES 22-158
 CONTINENTAL DRIFT 22-171 see also plate tectonics
 COSMOGONY 21-189
 COSMOLOGY 21-189
 CREATION ORGANIZATIONS 22-94
 CREATION RESEARCH SOCIETY 21-9, 21-62, 21-96, 21-151, 21-199, 21-208, 22-94, 22-166, 22-181
 CREATION SCIENCE 22-93, 22-128, 22-141
 CREATIONISM 21-115, 21-155, 21-182, 21-189, 21-203, 21-208, 22-93, 22-94, 22-141, 22-183, 22-201

 DALRYMPLE, G. BRENT 21-109, 21-114, 21-184
 DARWIN, CHARLES 21-37, 21-40, 21-89, 21-165, 22-89, 22-114, 22-146
 DATING 21-109, 21-114, 21-125
 DATING, RADIOMETRIC 21-109, 21-114, 21-184, 21-209, 22-64, 22-179, 22-200
 DE VRIES, HUGO 21-40
 DE WIT, J. J. DUYVENE 21-79, 21-137, 21-182
 DESIGN 21-124, 21-154, 21-195, 21-196, 21-197, 21-198, 22-59, 22-107, 22-124, 22-149, 22-166
 DIAGENESIS 22-158
 DYNAMO 21-140

EARTH 21-82, 22-149, 22-171
 EARTH, AGE OF 22-198 see also geochronology
 EARTH, ANTEDILUVIAN 21-206, 22-171
 EARTH, YOUNG 21-109, 22-10
 ECLIPSE, SOLAR 22-7
 EDUCATION 21-92, 21-115, 21-189, 21-202, 21-203, 22-20, 22-183
 EINSTEIN, ALBERT 21-56
 ENDOSYMBIONT THEORY 22-78
 ENTOMOLOGY 22-166
 ENVIRONMENT 21-6
 EPISTEMOLOGY 22-114
 ETYMOLOGY 21-202
 EVOLUTION see macroevolution, megaevolution
 EVOLUTION, EVIDENCES 21-137
 EVOLUTIONISM 21-115, 21-155, 21-182, 21-189, 21-203, 22-93, 22-114, 22-183, 22-201
 EXTINCTION 21-104
 EXTRAPOLATION 22-25
 EYE 22-59

 FLOOD 21-82, 21-206, 22-47, 22-158, 22-171
 FLOOD MODEL 21-33, 21-156
 FLOOD JUDGMENT 22-171
 FOSSILS 21-23, 21-95, 21-198, 21-202, 22-94, 22-146, 22-166
 FOSSILS, INDEX 21-125
 FOSSILS, MAN 22-183

 GARLIC 22-124
 GENEALOGY, POST-FLOOD 22-39
 GENESIS 22-47, 22-199
 GENETIC ENGINEERING 21-47
 GEOCHRONOLOGY 21-109, 21-114, 22-25 see also earth, age of
 GEOGRAPHICAL ISOLATION 22-68
 GEOLOGY 21-23, 21-76, 21-88, 21-95, 21-150, 21-200, 22-127, 22-158, 22-188
 GLACIERS 22-147
 GRAND CANYON 22-68, 22-182
 GRAND CANYON EXPERIMENT STATION 21-9, 21-96, 22-166
 GRASSLANDS EXPERIMENT STATION 21-62
 GREBE, JOHN J. 21-199

 HARDY-WEINBERG EQUILIBRIUM 22-68
 HEAVEN (S) 22-47
 HUMANISM 22-91
 HUMANISM, SECULAR 22-89
 HUTTON, JAMES 21-76
 HYDROLOGIC CYCLE 22-107

 ICE AGE(S) 21-66, 21-125, 21-170, 22-147
 IDIONOMY 22-91
 IN VITRO FERTILIZATION 21-47
 INSECTS 22-166
 IRIIDIUM 21-82

 KIND(S) 22-105, 22-201
 KORTHALS, RICHARD G. 22-5

 LADY HOPE 21-37
 LAMARCK, JEAN 21-40
 LANGUAGE 21-202
 LEGALITY 21-92

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LIFE, ORIGIN OF 21-22, 22-20, 22-25, 22-91, 22-124, 22-143, 22-157, 22-200
 LIGHT 21-18, 21-210
 LINNAEUS 22-93
 LITIGATION 21-115, 21-203
 LOGIC, MATHEMATICAL 22-84
 LUCY 22-144 see also man, origin of

MACROEVOLUTION 21-203, 22-90 see also mega-evolution, evolution
 MAGNETIC FIELD 21-109, 21-140
 MAN, ORIGIN OF 22-93, 22-94, 22-142, 22-144, 22-183
 MATERIALISM 22-91
 MECHANISM 21-78, 22-48, 22-49, 22-143
 MEGAEVOLUTION 21-40, 21-49 see also macroevolution, evolution
 METAPHYSICS 22-203
 METEORITES 21-82
 MICROEVOLUTION 21-49, 21-104, 21-203 see also variation, genetic
 MITOCHONDRIA 22-78
 MODEL(S) 21-49, 22-128
 MOLECULAR ANTHROPOLOGY 22-142
 MOON 21-82
 MUTATION 21-40, 21-195, 22-126

NATIONS 22-146
 NATURAL SELECTION 21-40, 21-93, 21-104, 21-195, 22-16, 22-126
 NEO-DARWINISM 22-201
 NEODYMIUM 22-10
 NEUTRINOS 22-123
 NEWTON, SIR ISAAC 21-195, 22-114
 NOAH 22-146
 NUCLEOSYNTHESIS 21-154

OLBERS' PARADOX 22-123
 ONION 22-124
 ONTOLOGY 22-114
 OPARIN 22-128 see also life, origin of
 ORDER 22-157
 OVERTHRUSTS 21-88, 21-150, 21-200, 22-127, 22-188
 OXYGEN ISOTOPES 21-125, 21-170

PALEOBIOLOGY 21-76
 PALEOMAGNETISM 21-170
 PARASITES 21-124
 PHILOSOPHY 22-114
 PHILOSOPHY, CHRISTIAN 21-79, 21-182, 22-91
 PHILOSOPHY EVOLUTION 21-137, 21-182
 PHILOSOPHY, REDUCTIONIST 22-91
 PHYSICS 21-56, 21-186, 21-201, 21-206, 21-207
 PHYSICS, CLASSICAL 21-206, 21-207
 PHYSICS, QUANTUM 21-206, 21-207, 22-84
 PLANARIA 22-16
 PLANETS 22-180
 PLANT EVOLUTION 22-181
 PLANTS 22-126
 PLATE TECTONICS 22-171 see also continental drift
 PLEOCHROIC HALOS 21-119, 22-179
 PLESIOSAUR-LIKE 22-89
 POLLEN 22-181
 POLONIUM RADIOHALOS see pleochroic halos
 POPULATION 22-47
 POPULATION ECOLOGY 22-16

POTASSIUM / ARGON 21-170, 21-209 see also dating, radiometric
 PRE-CAMBRIAN 21-95
 PROBABILITY 22-97
 PUNCTUATED EQUILIBRIUM 21-40, 21-195, 22-201

QUANTUM THEORY 21-56, 22-84
 QUARKS 22-128
 QUARTZ 22-158

RACE 22-146
 RADIOCARBON see carbon-14
 RADIOHALOS see pleochroic halos
 RADIOMETRIC DATING see dating, radiometric
 RANDOM 22-128
 RECAPITULATION 22-105
 RECAPITULATION, EMBRYONIC 22-93, 22-105
 REDSHIFT 21-48, 21-119, 21-154, 21-189, 21-210
 REDUCTIONISM 22-91
 RELATIVITY 21-18, 21-56, 21-207
 RELIGION 22-201
 RESEARCH 21-9, 21-62, 21-96, 21-208
 RETINA 22-59
 RUBIDIUM / STRONTIUM 21-184 see also dating, radiometric

SAGAN, CARL 21-94
 SAND 22-47, 22-158
 SCIENCE 21-49, 21-89, 21-115, 21-137, 21-155, 21-203, 22-93, 22-96, 22-97, 22-105, 22-128, 22-189, 22-201, 22-204
 SCIENTIFIC METHOD 21-115, 22-25, 22-114, 22-124, 22-128
 SCIURUS ABERTI see squirrel, kaibab
 SCRIPTURE 22-96, 22-199
 SEDIMENTATION 21-23
 SOLAR SYSTEM 21-82, 21-154
 SQUIRREL, KAIBAB 22-68, 22-182
 STARS 21-18
 STATISTICAL MODELS 22-39
 STEWARDSHIP 21-6
 SUBPARTICLES 22-84
 SUCCESSION 21-104
 SUN 22-123
 SUPRANATURAL 21-40

TAXONOMY 22-105
 TEACHING see education
 TEKTITES 21-82
 TELEOLOGY 21-154, 22-91 see also design
 TELEONOMY 22-91
 THERMODYNAMICS 21-154, 22-124, 22-157, 22-200
 THERMOLUMINESCENCE 22-194

UNIFORMITARIAN 21-66
 UNIFORMITARIANISM 21-23, 22-128, 22-158, 22-189
 UNIVERSE, ORIGIN OF 21-119, 21-125, 21-189, 21-210
 URANIUM 21-125, 21-184, 22-10

VARIATION, GENETIC 22-25, 22-201 see also micro-evolution
 VESTIGIAL ORGANS 21-198, 22-105
 VITALISM 21-78, 22-48, 22-49, 22-95, 22-143

WATER 22-107
 WATER, FRESH- 21-33
 WATER, SALT- 21-33

BOOK REVIEWS

Science and Scepticism, by John Watkins, 1984. Princeton University Press, Princeton, 387 pages, \$44.00 hb. \$14.95 pb.

Reviewed by Robert A. Herrmann*

John Watkins, Professor of Philosophy at The London School of Economics and Political Science, has written two books for the price of one. If the publisher is any indication, then one might assume that this should be considered an "important" contribution to the Philosophy of Science. However, the title is somewhat misleading since it is more relative to Part 1, than Part 2. Within this review I will also describe Watkins' program and its relation to scientific creationism.

In Part 1, the author gives his almost complete answer to the scepticism of David Hume, where Hume in 1739-40 stated approximately that (p.3)

(I) there are no synthetic a priori truths about the external world., (II) any genuine knowledge we have of the external world must ultimately be derived from perceptual experience; (III) only deductive derivations are valid.

The author lists and investigates nine titled strategies that are often utilized to affirm or deny these Hume statements. The author accepts (I) (p.117) with no real discussion except for a passing reference to Kant, supplies arguments from himself and many others, especially Popper, that allow him to accept an altered form (II*) of (II) that "requires that experience should *negatively* control scientific hypotheses" (p. 118) and that hypotheses are obtained by conjecture. Along with this the author argues for the rational acceptance of level-I reports as part of the empirical basis for a theory and states that they are indispensable for testing, where a level-I report is a singular statement about "observable things or events" (p. 79).

The author's definition of "observational predicates" is significant for his investigation. He assumes that certain individuals have been categorized into groups called "scientists working in a certain field" (p. 193) and that these groups, as a whole, have decided which interpreted predicates are "observational" and which are "theoretical." For this treatise this appears to yield a vast array of possibilities except that in his very brief section on "perception" (p. 254), that is essential for Watkins' empirical basis, the perceptions of some Christians who are also scientists would be excluded.

At this point, I respectfully criticize Watkins' position. The Scriptures specifically yield numerous synthetic a priori statements about the external world and a Spirit-indwelt Christian is informed personally and supernaturally that these statements are absolutely true. This enhances the intuitive comprehension of any scientist who is so indwelt. For the same reasons I reject the Hume statement (II) and, due to his concept of perception, Watkins' modified (II*). Spirit-indwelt scientists have certain perceptions that are additional to the "ordinary." Some have demonstrated that they are aware of the sustaining influences that the incorporeal (supernatural) world has upon the natural world and such perceptions tend to lead to different

testable conjectures. However, the author does not stress his concept of perception. A major portion of part 1 and a section of 2 are extensive arguments for the acceptance of statement (III). The reader must, however, carefully distinguish between the terms induction, probabilism, deduction, statistical and their relation to explanations.

It is clear the the author considers the second part of his book, that begins with "The Optimum Aim for Science," a significant contribution. The author analyses the concept of a simple interpreted scientific theory and prescribes conditions that such theories need to meet in order to progress towards a so-called "optimum" goal. I point out that the author liberally uses formal first-order expressions and a weak set-theory in his discussions.

As a basic aim the author gives the following very personal and now absolutist statement (A*):

Science aspires after truth. The system of scientific hypotheses adopted by a person X at any one time should be possibly true for him, in the sense that, despite his best endeavours, he has not found any inconsistencies in it or between it and the evidence available to him. (p. 155).

The basic ingredient for his rules for theory building and scientific progress is the "testable content" CT(T) for the logical consequences of the theory axioms T (p. 182). I note that CT(T), which is often denoted with a typographical error, is defined in terms of what a group of scientists considers to be the interpreted "observational predicates." Please note that testable content is not equivalent to the reviewer's concept of the verifiable content. In this short review I cannot delineate the actual rules themselves that the author claims will show that a science is progressing. I simply note that Watkins' uses the CT(T) and the selected theoretical and combined predicates from the theory axioms in order to postulate all of his simplistic criteria for theory formation, theory improvement, scientific progress, corroboration and the like.

The relation of the Watkins' program to scientific creationism is significant since I am confident that well-founded scientific creationism and its theories can be shown to follow the author's basic criterion (A*) and (B*) (p. 136) for scientific progress and an optimum aim. If one is allowed to compare such "creation science" theories with secular theories I conjecture that they could also be shown to be "better" in the technical Watkins' sense. Unfortunately, I am just as confident that the secular scientific community would still reject the scientific creationism and its theories due to what this reviewer calls the "embedding principle" that states that when such a creationist theory T is directly or indirectly embedded into certain theological systems S then it does not entail a contradiction and may enhance the fundamental precepts expressed within S. On the other hand, due to the required predicate interpretation, many secular scientific theories when embedded into S entail a contradiction and this may seem to force a rational rejection of S, especially when S is a conservative Biblical theology. This secular predicate selection is one of the technical reasons some secular scientific theories will not rationally combine with

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theories for scientific creationism. Of course, even when the predicate selection is consistent with secular science, scientific creationism will continue to be rejected as some how or other "unscientific" in character.

I do not think that the active creation scientist should be overly concerned with the Watkins' program. However, in their leisure moments, they might obtain this book and determine that their science is progressing and is, indeed, "better" than its secular counterparts, at least from Watkins' technical point of view.

The Meaning Of Creation, Genesis and Modern Science. 1984. By Conrad Hyers. Atlanta, Georgia John Knox Press. 203 pages, \$11.95.

Reviewed by Paul A. Zimmerman*

Conrad Hyers is Professor and Chairperson of Religion at Gustavus Adolphus College. His book represents an attempt to relieve the tensions between the evolutionary account of the origin of living things and the Biblical creation story by interpreting the Genesis account as being exclusively religious in purpose. Its stories are said to be largely symbolical without any necessary relationship to actual creation events. The purpose of Genesis is said to be to combat the polytheism of the people that lived around ancient Israel. It is to show the absolute power and dominion of God. But it is not intended to correspond to or be identified with any cosmogony or account of how life and mankind came into existence. Hyers asserts that Genesis 1-2 have a purely religious purpose. They are not intended to teach anything concerning science and natural history. Rather they speak against the worship of the sun, moon, and stars as divinities. Therefore he concludes they can teach us nothing concerning a sudden creation, a progressive creation, or any evolutionary process.

Hyers condemns alike scientific creationism, creation science, creation research, and Bible science. However, he does not deal with the fact that reputable scientists who are creationists by virtue of faith in the Genesis account have also been able to make an impressive case for creation that stands on its own scientific evidence. Many a scientist would have trouble accepting evolution based on chance even if he were not one who also accepts the Genesis account of creation for religious reasons. Rather he seems to think that creation science is blinded by its bias and thus without scientific merit. He characterizes creationism as a religious theory of Biblical interpretation claiming to be Biblical fact. Unfortunately Hyers merely states his opinion without a scientific evaluation of creation science.

The book is in reality primarily a theological presentation, since the weaknesses of evolutionary theory are not examined. Nor is any attention paid to the recent criticisms of the theory. The author deals with the creation account in Genesis by basing his interpretation on the theory of Historical Criticism that Genesis chapters 1 and 2 are essentially two separate independent accounts coming from widely separated times in Israelite history. Hyers identifies Genesis 1 as the so-called Priestly account; while Genesis 2 is said to be the Yahwist account, distinguished by the use of the name

"Yahwe" for God. The Yahwist is supposed to have been written around the time of Solomon in the tenth century before Christ. The Priestly account is said to have been produced in the period following the Babylonian captivity, about 538-450 B.C. He does not discuss the source that others find in Genesis 1, namely the Elohist, a hypothetical author using the name "Elohim" for the Creator and presumably coming one or two centuries after the Yahwist. Hyers is not at all critical of this multiple source account. He operates with the assumption that it is correct. No attention is given to the critics of this theory, including such notable Jewish scholars as Cassuto. However, despite the differences the author believes there are in the "two" accounts, Hyers asserts that the two are not really contradictory, but rather complementary.

Hyers leans heavily on the concept that the "intention" of authors of a Biblical account governs the interpretation. Unfortunately this approach, while not without merit, can lead to some very subjective exegesis. Hence he concludes the account is to be regarded as largely symbolical. However, this reader does not feel that Hyers demonstrated the intention of Genesis to be as limited as he asserts. After all, many commentators on Genesis have drawn the same lessons concerning the absolute power of the Creator, monotheism, etc. and at the same time not found it necessary to deny that these lessons were indeed being taught by a factual presentation of Creation as it took place in response to the fiat of the Creator.

It is indeed interesting that Hyers concedes that in earlier days the Israelites may have understood the Biblical stories in a "simplistic" way, i.e. corresponding to a factual account. This would appear to be concession on his part that perhaps the early Israelites regarded the stories of Genesis 1 and 2 in a way not essentially different from that of creationists today. Hyers also states that there may indeed be some historical value of basis in the Genesis stories. But he then makes it clear that any such kernel of reality is small indeed. For example he suggests that the story of Eden may be a reflection simply of a food-gathering stage in the history of man that preceded sheepherding.

Hyers also attempts to deal with the problems that evidence for design in nature presents to the evolutionist, while at the same time fitting chance into the picture as the evolutionist demands. He comes up with a "controlled accident" scenario of Creation in which God controlled certain events and left others to chance development. He thus attempts to find value in the language both of design and of chance or randomness. God is presented as giving direction while allowing for chance happenings in the "game" of life. It is likely that Hyers' approach will appeal little to either the creationist or the evolutionist.

From a theological point of view the conservative theologian will be distressed by the author's seeming neglect of any reference to the inspiration of the Scriptures. Also when he speaks eloquently of the blessing given to Abraham and the line of David he misses a golden opportunity to refer to the Messianic promise which was there and which the New Testament identifies. Surely the intent of the Scriptures was not limited to combating polytheism. There is also no reference to the Messiah in Genesis 3:15, which Christian scholars have long regarded as the "proto" Gospel.

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The author writes well. He is clear and has an interesting style. He enjoys a wide grasp of symbolism and comparative ancient religions. But he joins the group of authors who would resolve the problem of the conflict of evolution with Genesis by taking the position that the two are largely unrelated and the conflict thus imagined and irrelevant. He does say that there is some mutual stimulation and checks, but the connection is slight indeed. One would have hoped that the author would have come to a better understanding of creation science before he condemned it as being utterly without merit.

The Biblical Basis for Modern Science by Henry M. Morris 1984. Baker Book House. Grand Rapids, MI 49506. 516 pages. \$24.95

Reviewed by Emmett L. Williams*

The world's foremost authority on the Bible and science has written an encyclopedic volume that can be employed as a reference on the subject. The point is well-made that modern science has a Biblical basis and the discipline was pioneered by creationists such as Newton, Kepler, Boyle, Kelvin, Pasteur, Maury, Faraday, Maxwell, Ray and Linnaeus. The implications of cause and effect in modern science are discussed and used as evidence for a Creator as well as design in nature. One aspect of man's responsibility to the Creator is handled in the dominion mandate.

It is noted that the creation reflects the triune Creator-God. The important subject of miracles compared with the present uniformity in nature is presented. Conservation processes operating in nature are covered. One must understand these processes to understand the uniformity of nature. This discussion naturally leads into a presentation of the first and second laws of thermodynamics. Degeneration processes are discussed pointing out that they prohibit the ordering and complexity supposedly arising in macroevolution. The interplay of conservation and degeneration processes is the key to understanding the operation of the natural world.

The various splinter deviations of the creation model of science such as theistic evolution, progressive creation and the gap theory are presented and refuted. The author, one of the main proponents of the young earth, defends the concept and points out the short-comings of an ancient earth view.

Dr. Morris then specifically covers several areas of science relying heavily on Scripture. First physics and chemistry are outlined with a major emphasis on the energy concept. The evolutionary scenarios on the origin of life are discussed and debunked. Creation is shown to be the only viable possibility for the origin of life.

The geological sciences, one of Dr. Morris's specialties, are explored from the creationist viewpoint. Also a chapter on the Flood and its importance in historical geology is given. At each juncture the author takes pains to refute the evolutionary viewpoint and show that the creation viewpoint is the superior model.

The life sciences are covered in the final section. The topics elucidated center on man, i.e., anthropology, population growth, the origin of languages and

the origin of nations with emphasis on a recent creation. There is an extensive bibliography and six appendices that can be utilized for further study. This book will make a fine reference volume for the novice as well as the expert in the subject of origins.

The Criterion by Jerry Bergman. 1984. Onesimus Publishing, 62455, Newton Ave. So., Richfield, MN 55423. 80 pages. \$6.95.

Reviewed by Robert L. Goette*

In the Foreword to *The Criterion*, John Eidsmoe, a law professor, writes:

In this fascinating and disturbing book, Dr. Jerry Bergman—himself a victim—chronicles evidences of religious persecution in America today. A highly respected, credentialed, and published professor, he was denied tenure—and subsequently fired—admittedly because of his creationism beliefs and writings. His case is pending in the courts. Dr. Bergman describes numerous other cases, often concealing names to protect those who do not wish to risk losing their current positions, in which creationists have experienced persecution.

Dr. Bergman deals with cases of religious discrimination based on his interviews with over 100 creationists ranging from those very actively involved with creationism to those with little involvement. All of those interviewed had at least a master's degree and the majority held a PhD and several had more than one earned doctorate. He states that discrimination usually falls into the following categories:

1. Derogatory and clearly inappropriate comments.
2. Refusal of admittance to graduate programs.
3. Refusal to award degree.
4. Denial of promotion.
5. Firings, terminations and denial of tenure.

As case after case was presented, the reader was shocked to hear of such biased and grossly unfair treatment of those holding differing (creationist) views within the "scientific" community which seems to pride itself on being "open-minded."

This is a book which ought to be read by the Christian community and then after soul-searching and prayer, they should make sure that similar situations do not exist in their own community. The book is sobering, depressing, challenging, demanding some action on the part of the reader. If the reader takes his eyes off the Lord, this presentation could be most discouraging!

The author's concluding postscript speaks volumes to those who might want to let this problem pass them by:

When this author presented some of these concerns relative to the above (documented cases of discrimination) to a Christian tenured professor, he felt that I was overreacting. There were, at best, a few cases of religious discrimination, he was quite sure. How was one to know for sure that religious intolerance was the main reason for termination? I assured him that in most of the cases I had examined I was quite certain that religion was the major reason for termination, denial of pro-

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motion, or withholding of the awarding of a degree. Even if one were to eliminate the questionable cases, there would still be hundreds of cases of termination each year due to religious intolerance. The professor responded, Well, that may be so, but I have excellent student ratings, a number of publications, and am in the upper quarter of our department in merit ratings for performance and productivity so I am not worried.'

Last week I received a phone call from my professor friend. He told me that he had just been fired.

For those interested in Dr. Bergman's case there is an appendix containing an article by Luther D. Sunderland dealing with details on Dr. Bergman's own experience of being fired from Bowling Green State University in Ohio because of his creationist beliefs and for his authorship of the booklet, *Teaching About the Creation/Evolution Controversy*.

Comet by Carl Sagan and Ann Druyan. 1985. Random House, New York. \$27.50

Reviewed by Clifford L. Lillo*

According to the book jacket, "*Comet* is an indispensable book for anyone who has ever looked up at the heavens and wondered *why?*" For most creationists, it is not indispensable. However, it is entertaining reading.

The authors, Ann Druyan, a novelist, television writer, and producer, and Carl Sagan, Professor of Astronomy and Space Sciences at Cornell University, have endeavored to provide information on comets "for clarity and accessibility by the general reader." (p. xi) They say:

We have tried to give some sense of the evolution of scientific discovery, and present the evidence for and against those cometary theories that have been rejected, those that are currently fashionable, and some that are neither fashionable nor rejected (p. xi).

However, the most important theory in the book involves the origin of comets. Creationists believe comets were part of the original creation by God, and their very existence at this time is evidence for a young earth. On the other hand, evolutionists, while acknowledging that short-term comets from the original big bang no longer exist, insist that there is a source of new comets. The "Oort Cloud" theory is presented by the authors as such a source.

Readers will not learn how Edmond Halley discovered the comet which was named for him, because he did not discover it. "In fact, discovering a comet was one of the few scientific activities in which he [Halley] did not engage." (p. 65)

Halley then compared the orbital characteristics . . . of the comets of 1531, 1607, and 1682, and found many striking similarities: in the tilt . . . ; in the distance of the comet from the Sun at perihelion; in the region of the sky in which perihelion occurs; and in the place where the comet's orbit crosses the zodiacal plane. (p. 55)

Halley published the results of his work in 1705. It is because of his recognition that the three comets were really one comet and his many other contributions to the science of astronomy that he has a comet named after him.

In describing Halley's investigations into the age of the earth using the salinity of sea water as a clock, the authors say:

He thought that regular measurement of ocean water would reveal increasing salinity as time went on. Rivers carry salt into the oceans at a rate that Halley crudely calculated. Extrapolating back to a time when sea water was fresh, Halley found that the world is much older than the Bible implies—not six thousand years, but at least a hundred million years old. Halley's method cannot be used to determine the exact age of the Earth, because seawater has long been saturated with salt. But it is a perfectly suitable way of arriving at a lower limit for that age. (p. 54)

Here the authors have made an obviously false statement, probably in an attempt to make their book slightly less technical. Several bodies of water have a greater density than the oceans. We know that there are extremes of salinity in the coastal regions and in some partially enclosed seas. The range of salinity in the open ocean is somewhere between 33 and 37 percent. What Druyan and Sagan probably were referring to was,

. . . the hypothesis that so far as the major dissolved constituents are concerned, seawater has constant relative composition. This hypothesis, based on the determinations of Dittmar on seawater samples collected on the famous Challenger Expedition (1873-1876), has not been substantially altered to the present time. (Fairbridge, p.758)

While Halley was right in his calculations (if it is assumed that the oceans were initially fresh water), Druyan and Sagan are wrong in their conclusions. Although some Bible scholars have stated that six thousand years is the age of the earth based upon the genealogies in the Bible, nowhere in the Bible is such a statement made. On the other hand, evolutionists have frequently stated that evolution requires billions of years and Halley's calculations do not give them that.

Henry Morris points out:

The significant thing to note, however, is that in every case [of calculating the age of the ocean based upon its dissolved chemicals] the calculated apparent age of the ocean is vastly less than the supposed 5 billion year age of the earth. (Morris 1985, p. 153)

What was Halley's viewpoint?

He never doubted that the Earth had been formed, or even created, and his efforts assumed the truth of the Biblical time scales, or at least of the duration of the Flood. (p. 54)

Morris includes comets in a list of 68 reasons for believing in a relatively young earth. According to him, calculations of decay periods indicate a maximum age of the earth as,

Decay of short-period comets	10,000 years
Decay of long-period comets	1,000,000 years
(Morris and Parker 1984 p. 255)	

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He further states:

Most creationist scientists, including myself, are strongly convinced after examining all these data that the young age calculations are on much stronger scientific footing than those few which yield old ages. (Morris and Parker p. 252)

Where do the comets come from? Druryan and Sagan say:

There are only two possibilities: Either comets are being made today somewhere in the solar system, or there is a vast repository of hidden comets that supplies a steady trickle of samples. All suggestions about how comets might be manufactured lately . . . have failed. That leaves only the possibility that the comets are sequestered . . . It follows that they must be stored at great distance from the Earth (and the Sun). (p. 194)

The authors give a detailed description of the theory of J. H. Oort, that a cloud of cometary matter exists in space like a giant sphere around the sun in an effort to explain why the supply of comets never seems to end. They say further:

Recent evidence supports the idea that the Oort Cloud stretches from its periphery near 100,000 A.U. [astronomical units] from the Sun continuously inward, reaching almost to the orbit of Pluto. (p. 196)

Harold Slusher, in his book *Age of the Cosmos*, lists the Oort Cloud hypothesis as one of five beliefs of evolutionists for the replenishment of comets. Others include: capture hypothesis, asteroids origination hypothesis, volcanic eruptions, and accretion hypothesis. (Slusher, pp. 46-53)

Are there strong reasons for believing in the Oort Cloud theory? The authors claim:

The scope of Oort's idea is remarkable . . . The idea explains what we know about comets in an elegant way that no other theory even approaches . . . Many scientific papers are written each year about the Oort Cloud, its properties, its origin, its evolution. Yet there is not yet a shred of direct observational evidence for its existence. (p. 201)

According to Slusher, there are numerous objections to Oort's hypothesis, and he then lists six objections which have been advanced by R. A. Lyttleton. He also tells of Lyttleton's calculation of ten thousand years as the maximum period for the extinction of all short-period comets since the beginning of time and says,

This seems then to put an upper limit on the age of the solar system, if the comets came into existence at the same time as the solar system. Thus, the solar system is quite young. (Slusher, p. 45)

This view is also expressed in the book *Science and Creation*, by Boardman, Koontz and Morris, who tell us that R. A. Lyttleton is an evolutionist who frankly affirms his distaste for creationism. They add that Lyttleton's calculations further show,

All the comets [long period and short period] . . . would be totally destroyed after 50 million years. Not one . . . should remain. . . . Since many comets are still intact, these facts would point to an age for the solar system of less than 10,000 years. (Boardman, Koontz, and Morris p. 149)

The book contains many photographs and drawings, some in color, and is pleasant reading. What a pleasure it would be to see such a book with a balanced treatment of the creation and evolution models.

References

- Boardman, William W., Robert F. Koontz, and Henry M. Morris, 1973. *Science and Creation*, Creation-Science Research Center, San Diego.
- Fairbridge, Rhodes W. 1966. *The encyclopedia of oceanography; Encyclopedia of earth sciences series*, Vol. I. Reinhold Publishing Corporation, New York.
- Morris, Henry M. 1985. *Scientific creationism*. Master Books, El Cajon, CA.
- Morris, Henry M. and Gary E. Parker, 1984. *What is creation science?* (public school edition). Master Books, El Cajon, CA.
- Slusher, Harold S. 1980. *Age of the cosmos*. Institute for Creation Research, San Diego.

ARTICLE REVIEW

Molecular Approaches to the Identification of Species
by J. M. Lowenstein, 1985. *American Scientist* 73: 541-7.

Reviewed by Walter E. Lammerts*

Introduction

In this article Lowenstein notes that family trees of living organisms which were originally constructed on the basis of morphological similarities have increasingly been derived from comparisons of DNA, RNA, or proteins. After discussion of the limitations of an analysis based on morphology due to convergent evolution and the difficulty of estimating the time involved in the divergence from a common ancestral type due to the fact that anatomical features such as bones and teeth may evolve rapidly in one lineage and slowly in another, Lowenstein is all for the molecular or DNA comparisons. Thus he states:

By contrast comparisons based on DNA or on proteins start from the *premise* that these molecules do not "converge" in evolutionary terms, to any significant extent but rather change at a fairly steady rate, acting as a crude "molecular clock."

Now we should realize that a premise is merely a proposition upon which an argument is based or from which a conclusion is drawn. It is thus similar to a theory. Creationists might, with equally good logic, propose that since the DNA, RNA, and resulting proteins are the Creator's way of making possible an almost infinite variety of organisms, there would of necessity be a close relationship between the *appearance* of an organism and its DNA content. Therefore the comparative study of the DNA of various creatures would give a far better picture of just how closely two organisms were related by virtue of their creation from a common source of molecules, than the mere description of their morphology.

Molecular Comparisons

As Lowenstein says molecular comparisons of organisms ranging from bacteria to plants and animals have generally proved concordant with classic systematics. There are a number of surprises, however. Thus be-

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cause the teeth of the extinct mammoth are more similar to those of the Asian elephant it has been generally assumed that these two were more closely related than either one of them to the African elephant. However, albumin of the mammoth is bound in equal amounts with the antibody of the Asian elephant and that of the African one. These results do not confirm the implications of dental affinity between the mammoth and the Asian Elephant (*Elephas*) nor do they contradict it. Another surprise was that the sea cows are the closest living relatives of the elephant.

Most interesting is the reduction in time values which Lowenstein's analysis of the remaining protein in fossil animals reveals. Thus these tests reveal a divergence between the dugong and Stellar's sea cow of 4-8 million years ago as compared to the approximately 25 million years estimate by paleontologists. Also a divergence between dugongids and manateids at about 17-20 million years ago in contrast with the estimate by paleontologists of 40 million years is indicated. The Tasmanian wolf exterminated as a pest in the early 1900s has been classified with a diverse group of marsupial carnivores that includes the tiger cat, the kowari, and the Tasmanian devil. However, a number of systematists have concluded that because of its remarkable resemblance to the extinct South American marsupial *Borhyaena* it should be classified as a relict borhyaenid and not a dasyurid such as the tiger cat and the Tasmanian devil (*Sarcophilus*). Tests revealed that the albumin of the Tasmanian wolf was very similar to that of the two dasyurids, the small immunological distance implying a divergence time of only 6-10 millions years. For reasons given in many of the papers published in *CRSQ* we do not accept these estimates of millions of years of time. Thus it is most interesting that Lowenstein greatly reduces the time estimates by his methods of protein analysis. Thus he concludes that modern forms diverged from common ancestors much more recently than prevalent readings of the fossil records indicate.

Piltown Man

For years creationists have maintained that the Piltown man was a fraud or at best a most uncertain

fossil because the fragments were not all found together being scattered over an area of several yards. It is most interesting then that an evolutionist such as Lowenstein has come to this same conclusion. (Price 1923 p. 698). Three anthropologists decided to have a fresh look at this specimen, using the biochemical techniques available in 1950. The principal technique was the measurement of fluoride, a substance absorbed into buried bones from the surrounding soil. The longer a bone is buried the more fluoride it absorbs. In the Piltown skull and jaw, concentrations of fluoride were low, showing that they were of recent and not ancient origin. Moreover, the fluoride concentration of the jaw was different from that of the skull, indicating that the two did not belong together. Further analysis showed that the bones had been soaked in bichromate, a laboratory reagent, to make them appear old. The canine tooth found later than the jaw had been painted with brown pigment and the other teeth had been shortened with a file. Weiner Oakley and Clark (1953) concluded that the Piltown man was a deliberate hoax, in which fragments of a modern human skull had been paired with the doctored jaw and canine tooth of an immature ape, probably a chimpanzee or an orangutan. Thirty years later the Piltown man was subjected to further scrutiny when tiny specimens of the jaw and canine tooth were provided by the British Museum of Natural History for analysis by radioimmunoassay, a technique for measuring very low concentrations of proteins, hormones or drugs. Extracts of the specimens were tested with antisera to the collagen of humans, chimpanzees, orangutans, and rhesus monkeys. The reaction showed that both the jaw and the tooth had come from an orangutan.

One of the most interesting features of Lowenstein's work is that enough collagen would remain in a fossil about two million years old to permit a radioimmunoassay. This would seem to indicate that these fossils are not nearly as old as paleontologists claim they are.

References

- Price, G. M. 1923. The new geology, second edition. Pacific Press Publishing, Mountain View, CA.
Weiner, J. S., K. P. Oakley, and W. E. LeGros Clark 1953. The solution of the Piltown problem *Bulletin of the British Museum of Natural History* A2(3):141.

LETTERS TO THE EDITOR

Some Additional Comments on Concerning Several Matters (Part II)

(This is the second part of a previously-published¹ reply to Morton)

On the Extreme Improbability of Long-Distant Transport of Fragile Plant Material

In my section,² I had stated that paleoclimatic evidences should be taken as basically valid, and that—contrary to Morton's views—most biotic material should not be transported all around the globe. Morton responded³ by pointing out that organisms *can* be transported long distances. I know that very well: in fact add another example of long-distance transport—reports in Meyerhoff and Meyerhoff⁴ about tropical turtles from the Equatorial Atlantic ending up off the British Isles.

But that is not what I had denied at all! Let us review again *exactly* what I said: "Such a view is untenable because many organisms could not be transported long distances." Clearly, I was *not* denying that some examples of some organisms could be transported long distances; what I was saying was that the *type* and *quantity* of biotic materials are not suitable for long distance transport—the type that would make paleoclimatic judgement useless. I specifically discussed the fragile but well-preserved Permian plants of Antarctica. In describing their conventional use in paleoclimatology, Glass⁵ wrote: "In addition, Antarctica was found to contain coal deposits, indicating a past warm climate with lush vegetation." But Morton objects that such paleoclimatic judgements are useless because the Permian vegetation could have been transported—in during the Flood from some subtropical source. I will now

reiterate— and this time substantiate with documentation— that the Permian plants of Antarctica are too fragile to have survived anything like such a long-distance transportation. In discussing excellent preservation of fossil leaves (as is the case over immense areas in the Permian of Antarctica), Spicer⁶ wrote:

The violent weather that frequently causes flooding commonly damages the vegetation. Whole branches bearing leaves and reproductive organisms may be torn from a tree and, if they become preserved, may provide the paleobotanist with excellent material for morphologic and taxonomic studies (Figure 6, 10). Leaf fall is also accelerated under such conditions, with the result that much fresh and relatively undamaged material enters the fossil record. Although violent, *the transport to the final site of burial is also rapid and the remains become entombed before any biodegradation can take place.* (Italics added)

I doubt very much that the Permian plants would have been well preserved if they had been transported from afar. The *prompt* and *proximate* burial required is even more evident in these statements by McFall⁷ concerning well-preserved fossil leaves: “This was probably a lake deposit since a leaf will not drift very far in a stream before decaying or disintegrating.” It is far more probable (if not virtually certain) that the well-preserved Permian leaves of Antarctica grew in Antarctica and hence that paleoclimatic interpretations *are* valid and that antediluvian earth *was* warm.

Most Sediment Eroded Off the Continents During the Flood Would Not End Up in Deep Ocean Basins

Morton originally expounded the view that, had the Flood occurred on a non-expanding earth, most of the sediment should have ended up on the ocean bottom and not predominantly on land as is the case. I had pointed out⁸ that most sediment eroded off continents does not have sufficient flow energy (in terms of the water carrying it) to be deposited much beyond a few hundred miles from the continent. I further discussed the fact that tectonics places a major constraint upon sedimentation (such as basins, geosynclines, etc.) preventing most sediment from even being available to reach the oceans.

Morton⁹ responded by pointing to significant accumulations of sediment on the ocean bottom. But, right from the start, most of his examples do not even superficially rebut my views, because they are only a few hundred miles from shore. The fact is that Morton and I are talking about two different things. Morton is talking about sediment on the ocean bottom; and I am talking about the fact that fluvial discharges into oceans do not cause most of the sediment to end up in deep-ocean basins. Nowhere do I deny that there is significant sediment on the ocean bottom (I have had enough Marine Geology courses— incidentally, from one of the nation's leading experts in this field— to know about it). My point was and is that most sediment coming off the continent does not go into deep ocean basins but gets deposited within a few hundred miles from shore. Thus there is no reason to say that there should be more sediment from the Flood on the ocean floor than on continents. My point has recently been confirmed by a study on global fluvial discharges as described by Milliman and Meade:¹⁰

Although most summaries of world-wide sediment discharges, including this one, claim to be reporting the discharge to the oceans, *relatively little river sediment appears to escape the present-day continental shelf.* As mentioned previously, much of the sediment probably accumulates on the sub-aerial parts of subsiding deltas, never really reaching salt water. . . . Everywhere rivers debouch onto continental shelves, much of the sediment accumulates on large deltas (Yellow, Mississippi, Niger) or along the adjacent coastline (Yangtze and Amazon). *Only a small portion of the modern river sediment brought to the coastlines of the world accumulates on the floor of the deep sea.* (Italics added.)

Even the Amazon Cone, which Morton says extends two-thirds of the way to the mid-Atlantic Ridge, can now be seen (in the light of Milliman and Meade) to contain only a small portion of the Amazon River discharge.

Thus, one should *not* expect more sediment to be in deep ocean basins than on land; and so there is no need for an expanding earth or some other exotic explanation to account for what is actually found. (I should reiterate my previous point that distance of discharge is at least a second-power function, so even if the Flood-recessional currents were much faster than current river discharges, this still would not enable *most* sediment eroded off the continents to be deposited much more than a few hundred miles from the nearest shore— let alone in great thicknesses at the deepest ocean basins.)

Concerning Morton's Reproductive-Repopulation Model and Alleged Difficulties of Ecological Zonation and Differential Escape

Morton¹¹ claimed that I misunderstood his article when I pointed out that he suggests that Flood sediment is Precambrian. But, that seems to be what was said. At the bottom-right of page 109 [CRSQ 19(2)] he writes;

Thus it is suggested that the most reasonable explanation of this puzzle is that the humans, the houses and other cultural artifacts were totally obliterated by the tremendous erosive forces at the onset of the Flood.

In another paper [CRSQ 18(4):230], Morton said: “Noah would have been off the ark before the entire Cambrian was deposited; Peleg would have lived in Devonian times . . .” If even the Cambrian is already a post-Flood snapshot and most of Precambrian is indeed pre-Flood, it follows that the Flood proper must be at or about the Precambrian-Cambrian boundary.

I thus had showed,¹² with (I believe) valid understanding of Morton's views, that it is highly unreasonable to suppose that the Precambrian-Cambrian boundary could have arisen because nearly all pre-Flood organisms (remember that, according to Morton, the entire Phanerozoic is post-Flood reproductive-repopulational “snapshots”) had been “totally obliterated by the tremendous erosive forces at the onset of the Flood.” I had noted also that there are very many areas where Precambrian grades into Cambrian without an unconformity; this situation of gentle deposition should have

just about guaranteed the preservation of some antediluvian remains. Yet they do not exist, and as I had previously pointed out, this definitely falsifies Morton's model. As for the suggestion that the Precambrian-Cambrian boundary may still be worldwide but that it has not been properly dated due to lack of Cambrian fossils, there are many places where the Precambrian-Cambrian contact is spanned by definite Precambrian and Cambrian fossils, and without an unconformity. Siberia is one such example, as described by Missarzhevskiy:¹³ "Here there are. . . sections, *without breaks*, ranging from Vendian to Botoman in age . . ." (Italics added). Vendian is late Precambrian and contains the Ediacara fauna; Botoman is lower Cambrian and is fossiliferous.

Morton finds it difficult to explain the succession in the Triassic Newark Basin. I see no problem. He points out many alternating layers of clamshrimp, burrows, dinosaur prints, plants, etc. One must remember that, during the Flood, relatively minor tectonic changes could cause changes of submergence, emergence, and biotic contributions to sediment in incipient deposition. For example, suppose that the clamshrimp zone has just been washed out by Floodwater. A clamshrimp horizon is deposited. Just then, a tectonic movement causes shift of net Floodwater transport. Accordingly, something else is deposited atop the clamshrimp stratigraphic horizon. The former prevailing currents reestablish themselves and once more clamshrimp is deposited: hence a second clamshrimp horizon is deposited. That is just one way that repeating clamshrimp (and, of course, other) horizons can be generated via Flood burial. It is not at all surprising that Floodwater transport could have varied, to generate a stratigraphic mosaic, in view of the tectonic upheavals involved. (It should be pointed out that sedimentary rocks in general show some type of cyclicity (i.e. repeating stratigraphic horizons). For instance, in my very first published creationist research, that on ancient cyclic sedimentation,¹⁴ I showed how cyclic coal-bearing strata could be readily accounted for by Diluvial tectonosedimentary action.)

Footprint horizons can be explained by areas of emergence and submergence. Suppose that, as an example, the dinosaurs were in an area which we may divide into quadrants I, II, III, and IV. Suppose further that we denote emergence by (+), submergence by (-), and allow the notation (I, II, III, IV) to denote which of the quadrants are submerged and which are emerged. Thus note that complete emergence is denoted by: (++++)). As the Floodwaters encroach, they are shifted about by underlying tectonic action and cause regions to be repeatedly emerged and submerged. This can be shown schematically by the aforementioned notation as follows: (++++) → (--++) → (-++-) → (+---) → (+--+ → (--+-) → (----). Each time a quadrant of the unit area is in the process of being submerged, dinosaurs escape to a quadrant or quadrants that are not submerged. As an area is submerged, the footprints are covered by sediment. When that area emerges again, the dinosaurs flee to that area, again away from any other submerged quadrants. Since areas repeatedly emerge and then submerge (and thus covered with a fresh layer of sediment), repeated horizons of footprints are generated. The process does not stop until all four quadrants are simultaneously

submerged, leaving no place for the dinosaurs to flee and thus ending with their drownings. From the example given above, the resultant will be quadrant I having three footprint horizons, II having two, III with four, and IV with three. Lest this scenario appear contrived, let it be said that the noteworthy thing about footprints is not their presence but their *rarity*. Dodd and Stanton¹⁵ wrote:

Vertebrate footprints are uncommon in the fossil record because they are preserved only if buried soon after being formed in damp sediment.

Thus, if anything, the footprint argument can be turned around with the overall paucity of fossil footprints favoring a Diluvial explanation.

Morton has also presented an objection based on differential escape when he claimed that animals would not have advance knowledge about where to escape. I responded¹⁶ by pointing out that animals need not know where to go but need only go away from where Floodwaters are encroaching, for of course the Floodwaters submerge lower areas first. Morton now has claimed¹⁷ that small differences in topography would not make a great difference. This, I believe, stems from a misconception about differential escape. Escape is not primarily vertical (as up a 50-foot hill, which indeed would be trivial) but horizontal (such as a 50-foot change in elevation every 100 miles). Note that the primary motion of fleeing animals would be lateral. As the Floodwaters rise the 50 feet, the 100-mile swath of land will be incrementally submerged. The 100-mile horizontal distance, not the trivial 50-foot change in elevation, produces the net differentiation of animals' escape capabilities. Thus one will be, in example, left with a band of *wide area* (cross-section of the first few miles of the 100-mile swath of submergence) where the weakest animals failed. Another band of cross-section several miles in length will have been covered by stronger animals who faltered there— and so on until the full 100 miles are covered.

Desiccation Mudcracks Versus Synaeresis Cracks: Not at All a Clear-Cut Distinction Between the Two

Morton proposed that mudcrack horizons must require spans of time, and I responded¹⁸ by showing that cracks can form by synaeresis. Morton¹⁹ then claimed that the two can be easily distinguished, a point which I now take issue with. Morton cited Plummer and Gostin; and Morton's partial quote is shown in italics below. Plummer and Gostin²⁰ wrote:

CONCLUSIONS

In this review of shrinkage cracks an attempt has been made to outline the wide variety of morphologies displayed by cracks of both desiccation and synaeresis origin (Table 1), and also to emphasize that other structures exist having strongly comparable morphologies but very different and unrelated origins. *Desiccation mudcracks are generally continuous, polygonal, and often of several generations with V- or U-shaped cross-sections that are infilled from above. Synaeresis cracks, on the other hand, are generally discontinuous, spindle, or sinuous in shape and of one generation only, with V- or U-shaped cross-sections that are infilled from either above or below.* However, because of the many possible combinations of interplay be-

tween the factors influencing crack morphology under conditions of both desiccation and synaeresis, an overlap in crack morphology occurs between the two groups. Desiccation mudcracks, in particular, can be induced under a variety of conditions, consequently no precise relationship can be drawn between the morphology of any one fossilized mudcrack and the conditions of its formation.

It is therefore important when attempting environmental analyses of sedimentary sequence and using mudcracks as a structure diagnostic of subaerial exposure to do so in association with other structures typical of subaerial exposure (e.g. Figs. 10 and 11), so as to increase the "level of confidence" of the interpretation. Other such structures typical of subaerial exposure may include raindrop and hailstone imprints, salt and gypsum casts, foam impressions, bubble tracks, flat-topped ripple marks, vertebrate tracks, etc.

In the prior section on radiometric dating,²¹ I have shown, I trust, that I had not quoted Mauger²¹ out of context. Now in considering Plummer and Gostin, it seems that it is Morton who has quoted out of context. The part of Plummer and Gostin's article that Morton has quoted is shown in italics. The quote makes it seem to say that synaeresis cracks and desiccation cracks are very readily distinguished. But the next statement of Plummer and Gostin shows the opposite; the two types of cracks overlap in morphology and so are not easily distinguished. In *practice*, the two are not unambiguously distinguishable. Glaessner²² wrote: "The morphological distinction between subaerial and intraformational mud cracking is not yet completely clear." Recently, Collinson and Thompson²³ wrote: "Synaeresis cracks may be confused with desiccation cracks and with sandstone dykes, and they have commonly been mistaken for trace fossils, particularly in rocks of late Precambrian age." Even Plummer and Gostin cited above only say that impressions increase the "level of confidence" of *interpretations*.

I am not denying that there are legitimate desiccation-mudcrack horizons in the Phanerozoic record: these can be accounted for by the same type of emergence that was previously discussed with respect to repeating footprint horizons. What I *am* saying is that the vast majority of mudcracks in the Phanerozoic are either ambiguous or not-compellingly desiccational in origin, and therefore do not require subaerial exposure as their cause.

Unfossiliferous Pure Sandstones: Not Proof of Slow Deposition

Morton has repeatedly insisted that creationists have a problem with pure sandstones, but I see no problem at all. First of all, let it be noted that there often (if not usually) is independent evidence at least compatible with rapid deposition of pure nonfossiliferous sandstone. For instance, Singh,²⁴ *et al.*, described an example as follows:

The sedimentological characteristics of Green Sandstone, like clean quality of sand, large-scale cross-bedding, absence of mud drapes, rare biogenic structures like burrows, indicate deposition under high-energy conditions.

Clearly, then, lack of fossils in pure sandstone is not proof of slow deposition.

Morton bases his claim that pure sandstones are nearly always devoid of fossils on a very old quote by Pirsson and Schubert (1920). I question very much the reliability of such an old text, especially in view of the fact that there have been major advances in sedimentology just since WWII. In any case, I would have to see a rigorous study of very many pure sandstones from around the world before I would agree that pure sandstone is almost invariably nonfossiliferous.

Since pure sandstones were formed in nearshore and beach environments (which are, of course, poor in biota), the Flood would have moved around that sediment and, with the low input of biota, the sandstones would indeed not be fossiliferous. Pure sandstones may also be from antediluvian aquifers which would not have much life associated with them—hence the pure sands would have been deposited with a minimal contribution of organisms. It is probable that pure sandstones tend to be unfossiliferous because of several different diagenetic causes. Pure sandstones are commonly friable, which indicates that there was not much cementing agent to lithify them. Accordingly, there may also not have been the proper chemical conditions for fossilization to occur. Fenton and Fenton²⁵ point out that sandstones tend to be poorly fossiliferous because water can percolate through them and destroy incipient fossils. Dodd and Stanton²⁶ write:

Ground water undersaturated with respect to the mineral of which the fossil is composed will in time dissolve the fossil. Solution is especially likely to occur in a permeable rock and when the fossil is in a matrix that differs in mineralogy from the fossil. Thus a carbonate fossil buried in a quartz sand has a high probability for solution.

Since the hard parts of most organisms are not siliceous, it is not surprising that sandstones tend to be poorly fossiliferous.

There is no problem at all in the differentiation of sediment into sandstone, shale, etc. From elementary sedimentology, it is well known that sedimentation is not primarily vertical, but from *horizontal* migration of facies. Accordingly, when there is a horizon of sandstone and shale, it does not mean that the two must have been sorted out at that spot. This was amply discussed and illustrated in my work on cyclic sedimentation,²⁷ to which I refer any interested reader.

On Some Miscellaneous Factors

Erosional surfaces can be generated in soft sediment. For example, both turbidites and tempestites usually have sharp erosional bottoms. Although such erosional surfaces are not on the same scale as regional unconformities, they strongly suggest that erosional unconformities do not require considerable time to form (that is, the underlying sediment does not have to be lithified).

As for the suggestion that God's promise to Noah that He would never again flood the earth could have been made up to 300 years after the Flood, I think that it takes a lot of imagination to read in a large time gap somewhere between Genesis 8:15 and 9:15. In any event, the burden of proof should be on those who do believe that there is such a time gap, not on those who do. Just as in the Gap Theory, it is fallacious arbitrarily to inject large spans of time in between Bible verses.

I had pointed out²⁸ that, according to Morton's model, all individuals between Noah and Isaac would have had to live in a state of levitation in midair. This is because the Middle East is underlain by Mesozoic and Cenozoic rock. Since, according to Morton, Mesozoic and Cenozoic are deposited long after the Flood, then the Middle East would have been unsuitable for any type of human habitation until Tertiary had been deposited.

My point about migrational barriers is that they would prevent a synchronous repopulation all over the world (assuming, of course, that Morton's repopulation sequence really worked). Barriers do not have to be impervious to prevent synchronized repopulations. An even slightly-effective barrier will prevent the fauna crossing it from being the same as that which was stopped by the barrier. One can see, then, the extreme improbability that migration could cause a sequence (i.e. amphibians, reptiles, dinosaurs, mammals) going from place to place all over the earth's land surface. One would rather see a morass of variable fossil faunas, reflecting the migrational barriers having caused endless detours, stoppages, and comminglings of migrating vertebrates.

Yet all this discussion presupposes, to begin with, that the organisms in the Phanerozoic actually reproduced at rates according to Morton's model. Since we do not know the reproductive rates of many fossil organisms, this is a liability—not an asset—to Morton's model. However, Morton makes a complete parody when he suggests that fossils would have to be tested for reproductive rates. The Devonian plants have an extant relative—the *Equisetum*²⁹—which can be used to estimate Devonian reproductive rates. Another extant relative is the *Lycopodium*.³⁰ There is evidence,³¹ based on gregariousness, that Devonian plants were rhizomatous. If so, then this is further evidence for low reproductive rates in Devonian plants and thus further evidence against Morton's model. Concerning spores vs. seeds, one should realize that the greater number of spores is not the main factor in reproductive rates. The more important factor is the much greater survival potential of seeds (especially angiosperm seeds—which do not arrive until towards late in the geologic column). It is believed that the first trees appeared (after the Devonian plants, incidentally) because they were an improvement in survival and reproduction. Trees, after all, can generate large volumes of spores or seeds, and are more resistant (than other plants) to drought, high winds, fire, etc.

The marine invertebrates of the Phanerozoic record are so diverse in terms of size, reproductive strategies (based on analogy with extant relatives), ecological niches, etc., I doubt very much that they reproduced at differential rates compatible with Morton's model. For example, Cambrian Trilobites and Devonian Trilobites each are extremely diverse; and I doubt very much that Cambrian Trilobites as a whole out-reproduced Devonian Trilobites. The same goes for every other major group of ancient organisms.

Morton acknowledges³² that the rapidly-reproducing Tertiary forams are contrary to his model, yet insists that they are also contrary to other models. But I had explicitly said³³ that, according to Clark's model of ecological zonation, there were several marine ecological zones. Hence the Tertiary forams need not

occur in Cambrian since they were not part of that ecological zone.

References

1. Woodmorappe, J. 1985. Some additional comments on concerning several matters (Part I). *Creation Research Society Quarterly*, 21:209-10.
2. Woodmorappe, J. 1983. Concerning several matters. *Creation Research Society Quarterly*, 20:53-56.
3. Morton, G. R. 1983. Reply to Woodmorappe. *Creation Research Society Quarterly*, 20:56-58.
4. Meyerhoff, A. A. and H. A. Meyerhoff. 1974. Tests of plate tectonics (in Kahle, C. R. 1974. *Plate tectonics—assessments and reassessments*. American Association of Petroleum Geologists Memoir 23), p. 63.
5. Glass, B. P. 1982. *Introduction to planetary geology*. Cambridge Univ. Press, p. 52.
6. Spicer, R. H. 1980. The importance of depositional sorting to the biostratigraphy of plant megafossils (in Dilcher and Taylor. 1980. *Biostratigraphy of fossil plants*), p. 178-79.
7. McFall, R. P. 1983. Fossils for amateurs. Van Nostrand Reinhold, New York, p. 103.
8. Woodmorappe. 1983. *Op. cit.*
9. Morton. *Op. cit.*
10. Milliman, J. D. and R. A. Meade. 1983. World-wide delivery of river sediment to the oceans. *Journal of Geology* 91:19.
11. Morton. *Op. cit.*
12. Woodmorappe. 1983. *Op. cit.*
13. Missarzhevskiy V. V. 1983. Subdivisions of the Precambrian boundary sequences based on certain ancient groups of skeletal organisms. *International Geology Review* 25(7):750.
14. Woodmorappe, J. 1978. A diluvian interpretation of ancient cyclic sedimentation. *Creation Research Society Quarterly* 14: 189-208.
15. Dodd, J. R. and R. J. Stanton, Jr. 1981. *Paleoecology*. John Wiley & Sons. New York, p. 285.
16. Woodmorappe. 1983. *Op. cit.*
17. Morton. *Op. cit.*
18. Woodmorappe. 1983. *Op. cit.*
19. Morton. *Op. cit.*
20. Plummer, P. S. and V. A. Gostin. 1981. Shrinkage cracks: desiccation or synaeresis? *Journal of Sedimentary Petrology* 51:1153.
21. Mauger, R. L. 1977. K-Ar ages of biotites from tuffs in Eocene rocks of the Green River, Washakie, and Uinta Basins, Utah, Wyoming, and Colorado. *Contributions to Geology (University of Wyoming)*, 15:37.
22. Glaessner, M. F. 1969. Trace fossils from the Precambrian and basal Cambrian. *Lethaia* 2(4):373.
23. Collinson, J. D. and D. B. Thompson. 1982. *Sedimentary structures*. George Allen and Unwin, London, p. 140.
24. Singh, et al. 1983. Palaeoenvironment and stratigraphic position of green sandstone (Lameta: Late Cretaceous) Jabalpur Area. *Journal of the Geological Society of India* 24:419.
25. Fenton, C. L. and M. A. Fenton. 1958. *Fossil book*. Doubleday & Co., New York, p. 20.
26. Dodd and Stanton. *Op. cit.*, p. 128.
27. Woodmorappe. 1978. *Op. cit.*
28. Woodmorappe. 1983. *Op. cit.*
29. Prance, G. T. 1985. *Leaves*. Crown Publishers, New York, p. 210.
30. Gensel, P. G. and H. N. Andrews. 1984. *Plant life in the Devonian*. Praeger Publishers, New York, Philadelphia, p. 159.
31. *Ibid.*, p. 113.
32. Morton. *Op. cit.*
33. Woodmorappe. 1983. *Op. cit.*

John Woodmorappe

QUOTE

Avicenna was not alone among Muslim thinkers to hold pantheistic emanationism. He is in fact a chief figure in the camp of those great Muslim scholars who put Aristotle's pantheistic philosophy above the Koran.

Jaki, Stanley L. 1985. The physics of impetus and the impetus of the Koran. *Modern Age*. 29:157.

Substance Or No Substance— The Plot Thickens

This is a follow-up to two recent letters. In my last (*CRSQ* 22:143-4) I expressed the hope that Creationists and Dooyeweerdians would “relax, sit down, talk things over, give and take.” This sentiment was no sooner published than an issue arose to test it.

In that second letter I had brought out that denial of the substance-concept was involved at the very zenith of Dooyeweerd’s philosophy. But then I also find that in that same issue of *CRSQ* Mr. Ralph Ancil writes that denial of the substance concept in science is the hand-maid of evolutionism and atheism, and that Charles Darwin lost faith simultaneously in God and in the substance-concept. Here indeed is a monumental test-case! Could Mr. Ancil and myself “relax, sit down, talk things over.”

Actually Mr. Ancil and myself have already had a reasonably friendly correspondence. This was around the time of my first letter (*CRSQ* 22:48-9). Ironically, I had taken from a previous article by Mr. Ancil an insight on Godel’s theorem which I took to show that the information code leading to a higher sphere in an object obviated the need for any underlying substance. This confirms Dooyeweerd’s proposition that the most ultimate reference point of an object is not in some hypothetical hypostasis but involved in its interrelation with other objects. Now our differences seem deeper but possibly not after matters have been analyzed.

The existence of such universals was mandated by Thomas Aquinas in the cathedral era as one of the proofs of the existence of God. But then nominalism was one aspect of the revolt against the cultural centrality of Catholicism. It established a spirit of pragmatism which succeeding philosophers tailored to the spirit of their times.

Mr. Ancil notes with approval that Isaac Newton opposed the rising tide of nominalism by a stalwart faith in the reality of hypostasis. “Newton’s impenetrable atom was an example par excellence of a permanent structure (essence) that participated in a world of change without being altered thereby.” (p. 117). Nor was Newton alone in this. Until around 1800 cultural conditions in Europe were such that the rank and file of philosophers were at least nominally Christian. Also, especially among those scientifically inclined, there were yet many of whom the universals were still “real”—a reality directly related to their faith in the unchanging character of a personal Creator.

Ancil designates Charles Darwin as making the decisive break with this tradition simultaneously through his abandonment of (1) a belief in essences, and (2) of the Christian faith. Thus we are given a black-and-white picture of (1) God and science joined through universalism in the middle ages; (2) God and science gradually separated through nominalism culminating with Darwin, and—presumably—(3) God and science rejoined through creationism.

Let me say I have great respect for this world-view. It is very majestic. When the average man-on-the-street hears the term Judaeo-Christian culture he probably thinks instinctively of Thomist-Aristotelian ontology and Newtonian physics. At the same time I must say I think it falls short of the Biblical realism that should be expected. And reasons for this are fairly obvious. There

has always been a certain discontent about Thomas Aquinas’s marriage ceremony between the Bible and Greek philosophy. The two speak different languages. The medieval concept of universals was theistic but it did not adequately express the mind of the God of the Bible. Hence the nominalistic revolution bore the seed of the Reformation as well as of the Renaissance. Of this part of the full picture Mr. Ancil says nothing.

Mr. Ancil claims that Newton’s hard, impenetrable particles give to the physical world the sense of coherence and permanence without which intelligence and learning would have been impossible. This is an amazing statement to me. If that false picture of the substantiality of particles had not been denied the electrical revolution would have never taken place and we would be living today in the cultural conditions of over a century ago.

The success of the electrical revolution sprang directly from the experiments of Faraday culminating in the invention of the dynamo. Pearce Williams in his penetrating biography of Faraday clearly brings out that it was essential for him to break away from the Newtonian orbit in order to achieve his results. Faraday, however, while the prince of experimenters was poor at mathematics. It remained for Clerk-Maxwell to lay the theoretical basis of electrical science in his monumental complex of equations. This was an instance of inspired teamwork. But then Ancil characteristically includes Clerk-Maxwell in his condemnation of nominalism in a footnote:

Wightman claims it was Maxwell who made the ‘critical transition’ from Newton’s method of explaining phenomena based on known things (hard, massy particles) to one in which the form of the relationship only is sought in analogy, the model being discarded as soon as its usefulness has been exhausted. . . . This involves the rejection of the doctrine of essences in favor of pragmatism and functionalism based on the modern mind’s epistemological dilemma: one can never really know things; one can at best only know what works. (p. 122)

This is a formidable accusation but I must really question that the creationist model requires that Isaac Newton be looked on as the Rock of Ages of Science. Apropos of this is a quotation from Leon Sutcliff in the *Bible-Science Newsletter* 24(7):5 “Newton can reasonably be called a Unitarian. God was supreme. Christ was not one member of an equal and eternal Godhead.” Yet Mr. Ancil would have us believe that Newton stood for God and Maxwell stood for atheism..

Newton was a Unitarian. Clerk-Maxwell was not only an explicit trinitarian but could well be called the blue-ribbon evangelical layman of the 19th century. An article of mine [*CRSQ* 10:176-8] develops this theme. Faraday also was a strong Bible believer in the tradition of the Plymouth Brethren. Something is lacking in Ancil’s picture. The pragmatic nominalistic tradition is neither as black as he paints it nor for that matter is the Aristotelian substance-concept of the cathedral era as white as he paints it. To repeat, there has always been a grumbling that the medieval universalism does not adequately reflect the mind of God nor is it the *sine qua non* of Western culture. The only trouble is that nobody as yet has come up with anything

better. At least the Cosmologic philosophy developed first in Holland by men like Kuyper and Dooyeweerd offers the most viable possible alternative yet for the Lord's people.

Actually if one conceives of "substance" as applying equally to God and created entities the danger looms of getting into pantheism—that God is all and all is God. To deny ultimacy in created things is not to deny the existence of God. Dooyeweerd's denial of the substance-concept in created entities is the last thing from a fickle, cynical atheism. Contrarily his concept of Jesus Christ as the true substantiality in reference to an intermodal coherence of created entities has a massive theistic grandeur seldom equalled.

If the creationist movement is starting to take philosophy into its camp they would do well to consider this. At issue now is not so much dealing with particulars as a basic heart-willingness to afford a fair hearing. If this were done I am sure great good would come.

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Reply to Wolfe

I thank Mr. Wolfe for his comments on my recent article. I quite agree that these issues should be discussed and views exchanged by creationists. Let me address myself then to what I understand to be Mr. Wolfe's main points.

First, it is true that nominalism contributed to the events culminating in the Renaissance and the Reformation. But I would emphasize that acceptance of metaphysical realism is not a uniquely Catholic position. In addition to the three scholars of Protestant background cited in my paper, one could also cite Norman Geisler, a Protestant scholar known to many creationists for his favourable testimony at the Arkansas trial. Dr. Geisler also embraces a Thomistic view of essences as indicated in his book *Philosophy of Religion*. Again, he edited a book, *Biblical Errancy*, in which some of the contributors of a Calvinist tradition also recommend a realist view. The Apostle Paul clearly used Greek and Roman learning as Schaeffer points out and his example was followed by later scholars (Ambrose, Jerome, Augustine) who rejected Tertullian's strictly negative view of classical thought.

Secondly, I am surprised that Mr. Wolfe would place such emphasis on Newton. I devote only one paragraph to him in a rather lengthy article and certainly do not advocate him as the "Rock of Ages of Science." I point out that for Newton the creative genius, essences were indispensable. Newton's Unitarianism is entirely another matter. One certainly cannot infer that the one is a consequence of the other given the long-standing tradition of trinitarianism and essentialism. These could possibly be opposing elements, the unitarianism being the sign of a rising secularism which may have contributed to undermining belief in essences, at least for later scientists. Contradictory elements could exist in Newton as they do today for Christians who accept evolution.

Thirdly, Mr. Wolfe believes that the concept of substance as "applying equally to God and created entities" runs the danger of "getting into pantheism—that

God is all and all is God." There are innumerable ways of erroneous thinking and there is no way of telling how some might misconceive the case for substance. Yet in the article I tried to show that it is precisely the rejection of the traditional view of a moderate realism which leads to pantheism, not the concept of substance *per se*. Traditional scholars were careful to distinguish between God and His Creation. Metaphysical realists always observe basic distinctions which involve accepting our status as limited creatures with an intelligible structure, i.e., an essence or nature. On the other hand, pantheism blurs the differences for the sake of a false unity, either absorbing God into the world (atheism) or the world into God (acosmism). (Recall that Eckhart's view of man as an essenceless void led to the confusion of God and Creation, of identifying man's soul with God.) In any case, acceptance of the reality of essences no more leads to pantheism than does belief in the soul's immortality.

Actually Molnar argues it was during the Renaissance and Reformation that pantheism entered one of its most fertile periods. The advocates of pantheism were not oriented toward Athens but to Egypt, Syria and North Africa. Giordano Bruno exemplified this view which unites pantheist and Ockhamist lines of thought. And unfortunately these scholars were received at the universities of the new Protestant England and Germany.

Finally, believing in substance/essence does not constitute a deification or absolutization which rivals God. As I quoted Dr. Jaki, the traditional view is one of "contingent essences." Their contingency points to a non-contingent existence while their being essences points to an unlimited coherence and consistency in the Being whose essence is existence itself. (Note the important distinction here between God and created beings. Geisler following Aquinas accepts this reasoning.) Such contingency signifies incompleteness in the Goedel sense and so suggests the need of a higher reference, ultimately God the Creator. According to my understanding this is fully in accord with Scripture which makes numerous references to "kinds," "natures," etc.

We live in a world of both continuity and change but the continuity which lies beneath the superficial appearances, the epiphenomena of change, is of prime importance especially in the origins debate where evolutionists see nothing but flux. If God is unchangeable and if the world reflects His invisible qualities including this changelessness, then one would expect to find "substance," that which *stands under* the world of change, an inner structure or nature bespeaking continuity and coherence.

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Man, craving to become more than God, becomes less. That is Augustine's analysis which sees circumstances as symptoms of, rather than as causes for, human insecurity and discontent.

Niemeyer, Gerhart. 1984. Augustine's political philosophy in Morris, Lynne, editor. *The Christian vision: man in society*. The Hillsdale College Press, Hillsdale, MI, p. 72.

Thermodynamics, Snowflakes, and Zygotes

Frederick Edwords in his letter to the editor (CRSQ 22:95) mentioned a paradox that is often wielded in the evolution/creation debate: water drop>snowflake or zygote>adult. I have had this sort of thing offered as proof by both sides! As a thermodynamicist I have some interest in this topic.

To the eye, a snowflake has an aesthetic quality that a drop of water does not. This tempts one to infer a greater thermodynamic availability (or lower entropy) beyond the obvious freezing and increase in surface area. The eye, however, is not a device for accurately measuring thermodynamic quantities. There is a similar phenomenon familiar to everyone: salad dressing mix. If you shake the salad dressing, it appears to be homogeneous (except for the spices). After sitting for a few hours it separates into distinct layers. This appears to the eye to be evidence of self-organization and a violation of the second law of thermodynamics; but it is not. The separated state is actually lower thermodynamically than the shaken state. The missing quantity that is not apparent to the eye is the tremendous increase in energy and availability. If you neglect the surface phenomenon in this example you will come to the wrong conclusion.

Likewise if you neglect the interaction of microscopic fields in multi-particle, multi-species systems you will come to wrong conclusions in analyzing mixtures, snowflakes, or chemical reactions. Such complex interactions have never been successfully analyzed (with the possible exception of some limited success at tremendous expense with plasmas). In those systems that can be analyzed (e.g. salad dressing) the second law is upheld. It is no more than idle speculation that the second law fails in systems that are beyond our present capability to rigorously analyze (e.g. snowflakes).

The zygote>adult process might be compared to the following: Suppose a programmer created a code to alphabetize. This program is then copied many times and used by many people to alphabetize numerous lists. Making copies of the code definitely results in an increase in usefulness of the media on which it is stored. However, copying is not of the same level of usefulness as the development of the original code. Even if the copies are indistinguishable from the original, there is a uniqueness (undetectable by eye or machine) associated with the original by virtue of its location in time. No matter how much information is alphabetized this will never possess a quality that the code possesses.

While every analogy fails at some point, it is illustrative to compare the first of the species (creation of the code), reproduction (making copies), and growth (alphabetizing raw material from the environment). The alphabetizer makes sense and does not violate any principles. While even the simplest living creature is vastly more complex than the most sophisticated computer program, to postulate that these somehow violate the second law is conjecture. The idea that zygote>adult is a paradox arises from a confusion of quantity and quality. The first law of thermodynamics relates to energy which is brute quantity and is no indication of quality. The second law relates to availability (or entropy) which indicates quality.

The difference between a zygote and an adult is quantity, not quality. Hence, this is not violation of the second law, nor the first for that matter, as the first law says nothing about the direction of processes. The second law was violated at the origin of the species. This is the whole point: the second law does not allow it, so natural processes could not have done it.

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Editor's Note: The reader can refer to Williams, E. L. 1981. *Thermodynamics and the development of order*, Creation Research Society Books, Norcross, GA 30092, pp. 91-110, for further discussion of the zygote to adult growth from a creationist viewpoint.

QUOTE

Dewey provided the social philosophy of the movement, Thorndike the teaching theories and techniques, and Cattell the organizing energy. There was among all of them, disciples and colleagues, a missionary zeal to rebuild American education on a foundation of science, evolution, humanism, and behaviorism. But it was Dewey who identified high literacy as the culprit in traditional education, the sustaining force behind individualism. He wrote 1898:

My proposition is, that conditions— social, industrial, and intellectual— have undergone such a radical change, that the time has come for a thoroughgoing examination of the emphasis put upon linguistic work in elementary instruction. . . .

The plea for the predominance of learning to read in early school-life because of the great importance attaching to literature seems to me a perversion.

But in order to reform the system, the mind had to be seen in a different way. Dewey wrote:

The idea of heredity has made familiar the notion that the equipment of the individual, mental as well as physical, is an inheritance from the race: a capital inherited by the individual from the past and held in trust by him for the future. The idea of evolution has made familiar the notion that mind cannot be regarded as an individual, monopolistic possession, but represents the outworkings of the endeavor and thought of humanity.

Blumenfeld, S. L. 1985. Who Killed Excellence? *Imprimis* 14(9):3. Hillsdale College, Hillsdale MI 49242.

QUOTE

For it is not inevitable that we submit ourselves to a social life-in-death of boring uniformity and equality. It is not inevitable that we reduce our schooling to the lowest common denominator. It is not inevitable that the computer should supplant the poet. It is not inevitable that obsession with creature-comforts should sweep away belief in a transcendent order.

Kirk, Russell. 1985. The wise men know what wicked things are written on the sky. *Modern Age*. 29:116-117.

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