

A Theory of Theistic Evolution as an Alternative to the Naturalistic Theory

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The author considers recent papers by Howard Van Till, Phillip Johnson, and Ian Thompson dealing with God's sovereignty and the origin and evolution of living organisms. He then presents a theory of theistic evolution as an alternative to the current naturalistic theory. He insists that the origin of new genetic information is the major unanswered question of a naturalistic theory and proposes an intelligent cause (God) as a continuing provider of new genetic information. He affirms the traditional statement of Christian theism that God is the author, sustainer, and finisher of all natural processes. His theory of theistic evolution is considered in regard to (a) a "God of the gaps" theology, (b) hypotheses of common ancestry and punctuated equilibrium, and (c) the direction of current research in molecular evolution.

In a recent exchange of views entitled "God and Evolution,"¹ Howard Van Till and Phillip Johnson have presented their views on that topic. Primary areas of disagreement between these two appear to be (1) whether Johnson's position approaches a "God of the gaps" theology, and (2) Van Till's conviction that the Creator has equipped his creation so that "molecules and organisms have in fact accomplished the changes envisioned in the macroevolutionary paradigm simply by employing their own resident capacities."² This is clearly a presupposition, but Van Till has chosen to refer to it as the "doctrine of Creation's functional integrity."³ Van Till draws support for his thesis of functional integrity from writings of Basil and Augustine, early Christian theologians. It should be noted, however, that these theologians were writing from the standpoint of a very different understanding of living organisms. They accepted the spontaneous generation of life, a concept that was not fully disproven until the work of Pasteur in the nineteenth century. As will be noted subsequently, Peacocke and Polkinghorne also propose this

same presupposition. Van Till does note that functional integrity of the creation does not entail reducing the Creator either to the remote God of deism or the unnecessary god of atheism.⁴ He further clarifies his position by saying:

...every one of these processes and every connective pathway in the possibility space of viable creatures is itself a mindfully designed provision from a Creator possessing unfathomable intelligence.⁵

Is there really any great distinction between Van Till's "...mindfully designed provision from a Creator..." and Johnson's: "If God exists at all, he could create by whatever means he chooses..."?⁶ There is certainly some difference, when we try to determine what is meant by a "God of the gaps theology" and Van Till's thesis of "Creation's functional integrity," points I shall subsequently consider in more detail. I view my own position as intermediate between that of Van Till and Johnson, and would hope that these individuals might be open to a proposal that clearly recognizes the necessity of a continuing role of a Creator.

I have previously considered some presuppositions of science as related to origins,⁷ and at that time I proposed that *an intelligent cause was involved in cosmological and biological origins*. I now wish to proceed from that presupposition and am proposing a theory of theistic evolution that I consider to be consistent with both Christian theism and modern scientific evidence. I hope to show that this view will in no way interfere or limit processes of scientific enquiry; nor will it limit those who want "to determine the causes of natural things from which effects regularly proceed as described by physical laws."⁸ In a recent paper, Ian Thompson⁹ has proposed that divine immanence and transcendence are involved as part of God's sovereignty over the physical laws of this world. He notes that traditional Christian theism has held that God is the author, sustainer, and finisher of all natural processes. In a book chapter entitled "The Character of Contemporary Natural Science," Van Till¹⁰ refers to God's *governance* as an expression of God's sovereignty and notes that this governance is not amenable to scientific study. Van Till distinguishes between *behavior* and *governance* and notes: "We shall find one concept—behavior—to lie within the scientific domain, and the other—governance—to lie outside its boundary."¹¹ He indicates that categories of *physical properties*, *physical behavior*, and *formative history* lie within the scientific domain as components of *behavior*. A key consideration in this paper will be whether or not there is a clear distinction between *behavior* and *governance* as Van Till suggests and particularly whether, and to what degree, the *formative history* of life forms comes under *behavior* or *governance*.

The initial presupposition of Van Till quoted earlier closely resembles the position of two British scientist-theologians, Arthur Peacocke and John Polkinghorne. Peacocke states this principle of a built-in creative capacity of molecules as follows:

This is the in-built creative potentiality of all-that-is, which we have now to see *as* God at work, continuously creating in and through the stuff of the world he had endowed with those very potentialities.¹²

Both Peacocke and Polkinghorne would regard themselves as theistic evolutionists, but consider the role of the Creator to lie more within the concept of *governance* as suggested by Van Till. I clearly differ from Van Till, Peacocke, and Polkinghorne in my evaluation

of the scientific evidence related to their presupposition of "built-in creative capacity," when this presupposition is applied to living organisms. At the biological level, I find no convincing evidence that atoms or molecules spontaneously form into all the necessary building blocks (amino acids, purines, pyrimidines, sugars, etc.) of living organisms, nor that those building blocks have innate properties that would cause them to form the informational macromolecules that are essential to life.¹³ Van Till¹⁴ argues that if the Creator did not provide initially for all of these innate capacities, this world would be developmentally incomplete; that there would be gaps and deficiencies in his creation. I must disagree. Is not Van Till limiting God's omnipotence by insisting that he should implant all of these "resident capacities" at the time of creation? Surely, a Creator could have chosen to provide capacities for organismal development on a continuing time basis if he so willed. Is it not possible (and I believe theologically sound) to believe that the Creator chose *not* to place capacities for organismal development in atoms and molecules, and that the properties that have been observed in the laboratory are really the true capacities that the Creator chose to give these atoms and molecules? I also wonder if it is not God's province rather than man's intuition to decide whether such a world would be developmentally incomplete.

The primary informational molecule in living organisms is deoxyribonucleic acid (DNA). The nucleotide sequences in DNA may be transcribed into informational sequences in ribonucleic acid (RNA), and one particular type of RNA, messenger RNA, may be translated into amino acid sequences in protein molecules. Therefore we may speak of genetic information at the level of DNA, RNA, or proteins. At the level of proteins, the genetic information is evident in three-dimensional structures as they carry out their specific functions.

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The major stumbling block for a naturalistic¹⁵ theory of evolution, one guided entirely by chance, is that it has failed completely to answer the most basic origin and developmental questions. These begin with the origin of life problem: Which came first—RNA, DNA, or protein—and could they be formed spontaneously from some prebiotic molecules? Today, most origin of life theorists seem to favor RNA as the initial molecule since some RNA molecules (ribozymes) have been shown to catalyze certain reactions. Nevertheless, these catalytic activities are very limited in scope and no one has shown that ribozymes could be formed spontaneously. The second question is even more fundamental: Where does new genetic information come from? Probabilities of forming new genetic information spontaneously are calculated most readily at the level of protein enzymes. The complexity of a simple protein molecule (cytochrome c) with a sequence of 101 amino acids is such that the probability of obtaining that information by chance has been

calculated by Yockey¹⁶ to be of the order of 2×10^{-65} . Yet many hundreds of different protein molecules are required for the simplest living organisms. In regard to the chance hypothesis for the origin of genetic information, Koppers notes:

The expectation probability for the nucleotide sequence in the bacterial genome is thus so slight that not even the entire space of the universe would be enough to make the random synthesis of a bacterial genome probable.¹⁷

Even Richard Dawkins in his blind watchmaker thesis is forced to postulate repeated events of "a ration of luck" with probabilities of 10^{-20} in his proposals of "cumulative natural selection."¹⁸ Although Dawkins insists such proposals are scientific, I would argue that his dependence on events of "luck" is not science, but is a matter of faith in chance, since the presumed success of these events is contrary to all of the laws of mathematical probability.

Although the above evidences against the validity of a fully naturalistic theory are cited, they apply equally to the presupposition of Van Till, Peacocke, and Polkinghorne. Any "in-built creative potentiality" would be dependent upon random collisions of atoms and molecules, acting fully in accordance with physical laws.

The genetic information for all living organisms could not have been supplied initially to the simplest one-celled organisms, since higher organisms have hundreds of times as much genetic information in their cells. Consequently, I propose the following as a theory of theistic evolution: *that in the history of the origin and development of living organisms, at various levels of organization, there has been a continuing provision of new genetic information by an intelligent cause.*

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For a theist, that intelligent cause is God. When I use the term genetic information, I include DNA coding sequences and DNA control regions for all types of proteins and the various types of RNA. One could speculate that this genetic information may have been provided to existing organisms (possibly in the form of a template?) utilizing the organismal machinery, or in other instances it could have been independent of those processes. The Creator might have chosen to carry this out by "royal edict" or "divine command," terms used by Van Till to describe the Creator's "mindfully designed provision."¹⁹ At this point I would not wish to make the manner of introduction of new genetic information a component of the theory, nor would I wish to speculate how the Creator might have supplied the genetic information, the structures, and metabolic

processes necessary for the first living cells. I would apply this view of theistic evolution to most of the evolutionary events that are often referred to as macroevolution and which appear to require new genetic information. These events would include the development of organ systems (sight, hearing, means of locomotion, sonar detection (e.g., in bats), etc.), as well as the development of new organisms at various taxonomic levels (phyla, classes, etc.).

I would apply this view of theistic evolution to most of the evolutionary events that are often referred to as macroevolution and which appear to require **new** genetic information.

In accordance with the suggestions of Lewis²⁰ regarding the structure of theories, I list three postulates to my theory of theistic evolution:

1. That coding sequences of DNA need not be expressed immediately when the information is provided. They could remain dormant (repressed) for hundreds, thousands or possibly millions of years, with subsequent expression possibly, but not necessarily, being triggered by chance events (mutations, gene crossovers, gene conversions, etc.).
2. That genetic information for events generally termed as macroevolution might be supplied over either a short period of time or over a somewhat longer period of time with the possibility of initial repression of that information.
3. That genetic information once expressed might become dormant (repressed), only to be expressed again hundreds, thousands or possibly millions of years later.

Postulate 1 is proposed to consider possibilities for rapid diversification of species, particularly following various mass extinctions. Postulate 2 is proposed to provide for macroevolutionary events that might require a number of new genes and control factors; in these cases the expression of some of these genes would be of no value until all were expressed. In postulating possible repression of genes for extended periods, I am aware that these genes would need protective mechanisms (copy editing, repair enzymes, etc.) to prevent deleterious mutations prior to the time they were fully expressed. I would also note: (1) that my concept of genetic information would include not only DNA coding sequences, but also those DNA sequences adjacent to coding sequences, as well as those found elsewhere in the cellular genome, that are involved in regulating the expression or repression of coding sequences; and (2) that natural selection could play a significant role in the establishment of new genetic information throughout organisms of animal and plant kingdoms. The role of natural selection in my theory of theistic evolution will be discussed more in subsequent sections.

It should be noted that the naturalistic theory of evolution rejects by definition the possibility of an intelligent cause. Kerkut has listed seven postulates for a naturalistic theory of evolution as follows:

1. Non-living things gave rise to living material, i.e., spontaneous generation occurred.
2. Spontaneous generation occurred only once.

3. Viruses, bacteria, plants and animals are all interrelated.
 4. The protozoa gave rise to the metazoa.
 5. The various invertebrate phyla are interrelated.
 6. The invertebrates gave rise to the vertebrates.
 7. Within the vertebrates the fish gave rise to the amphibia, the amphibia to the reptiles, and reptiles to the birds and mammals.²¹
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...my theory [of theistic evolution] would involve an intelligent cause in each of these macroevolutionary steps, if the evidence clearly supports the validity of proposed ancestral pathways.

Lewis²² lists the postulates in a different manner, but covers many of the same basic points. Although Kerkut listed those postulates nearly thirty-five years ago, adequate verifying evidence for most of them has still not been supplied. This does not mean that the above postulates have all been proven to be false; it does mean that they have not been proven to be true. For postulate 1, I believe the evidence, apart from an intelligent cause is clearly lacking. For postulate 2, most investigators may believe that life began only once but there are many who consider the evidence inconclusive. For postulate 3, involving interrelationships of organisms, most would agree that there is some kind of relationship, but there would be disagreement regarding the nature of that relationship. Postulates 4 through 7 deal with proposed ancestral relationships for all organisms. With the many discontinuities in the paleontological record, verifying evidence in support of these last four postulates is variable; in some cases, it is fair, in others it is clearly lacking. I have tried to bring my theory of theistic evolution as nearly as possible into agreement with current scientific evidence. At the same time, I would note that my theory would involve an intelligent cause in each of these macroevolutionary steps, if the evidence clearly supports the validity of proposed ancestral pathways.

[My view of theistic evolution] provides a role for natural selection in the establishment of genetic changes in organisms.

In proposing the above view of theistic evolution, I would not mean in any way to limit God's sovereignty or governance of all His creation. I concur with Thompson's view that God is sovereign over all of the physical laws which scientists utilize in their day to day operations and in their scientific explanations, but would note as Thompson²³ does that

there may be questions regarding the origin of certain biological structures that scientific investigation may never be able to answer. One notes the same type of reservation by Van Till when he says:

But, one might ask, how can such "mindless" material processes function to bring about what appears to be the product of intelligent design? The point is, they are not really mindless at all. Rather, every one of these processes and every connective pathway in the possibility space of viable creatures is itself a mindfully designed provision from a Creator possessing unfathomable intelligence.²⁴

It is clear from this quotation, that Van Till is rejecting the concept of "blind chance" as the directing force of naturalistic evolution, and imposing a requirement for *direction* by a Creator. My view of theistic evolution suggests a means by which that direction might be imposed by the Creator without "limiting those who want to determine the causes of natural things from which effects regularly proceed as described by physical laws."²⁵ Phillip Johnson is theologically correct when he notes:

If God exists at all, He could create by whatever means he chooses, whether or not the choice pleases me, Van Till, or the rulers of evolutionary biology. Determination of the method that God actually employed should be left to unbiased scientific research.²⁶

My view of theistic evolution is one which I believe God in his sovereignty *may* have chosen to express his will over nature and is a view that I believe agrees with the best results of modern research in molecular and evolutionary biology. It provides a role for natural selection in the establishment of genetic changes in organisms. Although some of these changes may be a consequence of chance events, my view rejects the possibility that *only* chance events are responsible for changes.

Theistic evolution and "new genetic information"

I have previously noted that genetic information included DNA coding sequences and the related control regions that provide the blueprints for sequences in the different types of RNA and in all types of proteins. The proteins include not only all of the protein enzymes and other structural proteins, but also receptor proteins, protein hormones, and especially proteins involved in the control of cell and organ development. The protein enzymes in turn, would be responsible for catalyzing all of the metabolic reactions of the cell including the synthesis of DNA, RNA, protein, and other cellular macromolecules. It would not be possible for me to define in precise terms what I mean by *new* genetic information, but I will try to define it in general terms and also to indicate some areas that I choose not to include. I have previously utilized the specific amino acid sequence in cytochrome c to illustrate that genetic information in structures of that size simply cannot be a consequence of chance events. Probabilities of 2×10^{-65} simply are beyond the realm of achieving by chance, especially when these events would have to be repeated in a very localized spatial volume. Cytochrome c is a relatively small protein (ca. 100 amino acids long) with essential three dimensional structural features that are fairly typical of proteins in general. Many proteins are much larger than cytochrome c. Although selecting a dividing line would be arbitrary, we might say that protein molecules with a complexity

comparable to or greater than that of cytochrome c clearly would require an intelligent cause for their first appearance in living organisms.

At the same time, many protein families are known. These groups of similar proteins, often with similar functions, share certain structural and sequence similarities, although some portions of the molecules may be quite different. In some cases, these protein families may share only a certain domain within a larger three dimensional structure. Doolittle²⁷ has provided a good summary of protein families and superfamilies and has also discussed the occurrence of repeating units of certain protein segments in different organisms. It is possible that some of these families may have originated with a single gene. Following gene duplication, there may have been modifications and transfer of gene segments from other DNA sources within the cell. At the present time, I would not choose to include the genetic information for each protein in these family groups as *new* genetic information, simply because we do not know the limits of possibilities for information transfer from external sources. Amabile-Cuevas and Chicurel²⁸ have reviewed various types of transfer of genetic information. They note particularly the transfers of plasmid DNA between bacteria by a process termed conjugation, and the transfer of genetic information between eukaryotic organisms (organisms with a cell nucleus), especially that type of transfer utilizing retroviruses as carriers of eukaryotic DNA.

Another area that I would be reluctant to include at present as new genetic information concerns some of the genes involved in the production of antibodies. When many higher organisms are exposed to a foreign substance (antigen) they are able to produce protein antibodies that recognize the three dimensional structure of the foreign material. Our understanding of this fascinating process is not sufficiently complete for me to suggest which genes, or portions of genes, might involve new genetic information.

There are also many peptides of varying lengths that have hormonal and other functions in various organisms. These are often produced in cells as longer protein molecules with the functional portion produced by specific proteolytic cleavage. Without examination of each of these on an individual basis, it would not be possible to say whether new genetic information was involved in their initial appearance in an organismal genome. I have recently reviewed the various means of both intraspecies and interspecies transfer of genetic information,²⁹ which explains why I wish to differentiate as clearly as possible between the *introduction of new genetic information* and the *transfer of genetic information*, whatever the source.

Theistic evolution and a "God of the gaps"

A major question that will clearly be raised regarding my view of theistic evolution is how it differs from a "God of the gaps" theology. Wright speaks of a "God of the gaps" theology as follows:

When we make God responsible for those things that we currently cannot explain, the gaps in our explanations, we open up a line of reasoning that leads to a denial of God as soon as a natural explanation is found.³⁰

This may indeed be true if one relegates the role of the Creator only to unexplained events, but as Wilcox notes:

Anyone who is a fully biblical theist must consider ordinary processes controlled by natural law to be as completely and deliberately the wonderful acts of God as any miracle, equally contingent upon his free and unhindered will.³¹

Consequently, when one speaks of a Creator as having a continuing involvement in creation, not only in providing infusions of genetic information, but also as author, sustainer, and finisher of all natural processes, then surely any charge of a "God of the gaps" theology is avoided. Thompson³² refers to a "God of the gaps" as a god who may have intervened from time to time and disrupted the natural order. I believe a key point in Thompson's expression of a "God of the gaps" theology is that this would interfere with the scientific study of natural events. If scientists could not depend on the reproducibility of natural law or natural science, then the process of scientific enquiry would certainly be disrupted.

I believe that the provision of genetic information would in no way interfere with the scientific study of natural events.

Although some may consider that providing new genetic information is a disruption of the natural order, I believe that the provision of genetic information would in no way interfere with the scientific study of natural events. My view differs only slightly from that of Van Till when he considers God's governance of natural events. His view of governance as providing direction would not cause a disruption of the natural order. In my proposal for the provision of new genetic information, I have suggested a means by which a Creator may have provided that direction. Hummel has outlined a number of scientific presuppositions that might be considered as nearly articles of faith by the scientific community. Two of these that I feel are pertinent to this discussion are listed as follows:

1. *Order in nature.* Nature has an underlying order, shown in patterns and regularities that can be discovered.
2. *Uniformity of nature.* The forces of nature are uniform throughout space and time.³³

The second of these presuppositions should probably be qualified to note that it refers to uniformity of kind, but not necessarily uniformity in expression or amplitude. The postulate of an evolutionary molecular clock sought to present rates of evolutionary change of protein sequences as *uniform* or *clocklike*. I have recently reviewed that evidence and have shown clearly that rates of these changes are quite variable and are definitely not clocklike.³⁴

Does my view of theistic evolution conflict with either of the two scientific presuppositions listed by Hummel? I believe that with the postulates that I have carefully considered and phrased, my expression of theistic evolution will not conflict with those two presuppositions. My view does conflict with the presupposition of naturalistic materialism "that everything, including origins, can be explained in terms of natural processes."³⁵ That statement, which has been phrased in different ways by different proponents of naturalistic materialism, remains at the heart of that philosophy. It is an element of belief that remains totally unproven. My view replaces that element of belief in *chance* alone with the element of belief in an *intelligent cause*. I see no limitation on the expression of an individual's scientific research for one who accepts the view of theistic evolution that I have proposed. I believe this to be true whether the field of research endeavor be evolutionary biology, taxonomy, paleontology or molecular biology. It is true that this view should cause these research scientists to carefully review and evaluate some of the hypotheses on which their experimentation is based, a point which I shall consider in more detail in a subsequent section.

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Phillip Johnson defines the "God of the gaps" problem as "when we point to a gap in current scientific knowledge, and attribute unexplained events to a divine cause."³⁶ He notes that a far better theological position "...is that God is responsible for all events, and not just those for which scientific explanations are currently lacking." I would agree and would insist that God's sovereignty extends to all of His creation, and not only to providing the *new genetic information* that I include in the theory of theistic evolution. Nevertheless, in order to propose an alternative theory of evolution that can be the subject of criticism and dialogue within the scientific community, I have chosen to select the provision of new genetic information as an arbitrary dividing line. All of the evidence that I have seen indicates that science will never provide a naturalistic answer to my question: What is the source of new genetic information?

Theistic evolution and common ancestry

I have previously discussed the meanings of the word "evolution,"³⁷ using the article by Keith Thomson³⁸ of Yale University as a primary guide. These meanings range from (a) *change over time* to (b) *relationships of organisms by descent through common ancestry* to (c) *a particular explanatory mechanism for the pattern and process of (a) and (b), such as natural selection*. Thomson notes that there is a factual basis for *change over time*, but that *descent through common ancestry is a hypothesis*. Nevertheless, descent through common ancestry of all organisms is a major component of the broad view of the general theory of evolution. It is such an important component because the theory presupposes the monophyletic origin of life (i.e., all life began with an original archetypal cell).

Therefore all present living organisms have descended from that original living cell and must be related by lines of descent. John Wiester³⁹ evidence is clearly lacking. In the California Academy of Sciences exhibit at Golden Gate Museum in San Francisco, he noted that: "...museum curators have transformed inference into evidence and falsified the placement of fossils..."⁴⁰ This deception was carried out in order to make the data fit the *descent through common ancestry hypothesis*.

A monophyletic origin of life is a possible component, but is clearly not mandatory to my view of theistic evolution. Likewise, the role of ancestral descent (sometimes referred to as genealogical continuity) is not nearly as essential to my view of theistic evolution. Whenever the evidence for common ancestry is sound and is established by experimental observations, there is no problem in accepting the data. Where the evidence is lacking, there is no compelling need to postulate that *all* organisms will one day be linked by ancestral relationships. Scientists, nevertheless, are free to postulate organismal relationships and to design and carry out investigations to confirm or disprove those hypotheses. It should be clear, however, that in my theory of theistic evolution, consideration of ancestral relationships would include the possibility of new genetic information provided by an intelligent cause.

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The greatest difference between my view of theistic evolution and that of a completely naturalistic view of evolution lies in the understanding of the third meaning of evolution as a *particular explanatory mechanism*. The difference does not lie in the understanding of natural selection, because some role for natural selection is involved in both views, although a greater role would surely be postulated in the naturalistic view. Note that natural selection deals only with the establishment of new organisms, or with the disappearance of existing organisms. It does not provide a mechanism for formation of those organisms. Both the naturalistic view and my theistic views of evolution accept evidence for change by mutations, trinucleotide repeats, gene duplications, gene conversions, gene crossovers, gene transfer, etc., but the naturalistic view *demand*s that these changes by *chance events* account for all of the evolutionary changes in the grand scheme of common ancestry. My theistic evolutionary view postulates that the mechanism for change for macroevolutionary events resides with an intelligent cause, and that the mechanism involves the introduction of new genetic information. In a subsequent section, I will consider the extent to which this new genetic information might be amenable to study.

Theistic evolution and punctuated equilibrium

The Darwinian view of evolution was one of tiny progressive changes, i.e., gradualism. Eldredge and ⁴¹ made a sharp digression from that view when they proposed their theory of punctuated equilibrium in 1972. In this latter view, which is much more in accord with the paleontological record than the Darwinian view, evolution (change over time) has proceeded by sudden jumps interspersed with periods of minimal or no change (stasis). Eldredge and Gould noted that new life forms often appeared very suddenly in the geological record, with little or no evidence of transitional groups. It should be added, however, that in terms of paleontology, "suddenly" could be interpreted as meaning periods of thousands of years, or even up to a million years.

In postulating this view, Eldredge and Gould provide no satisfactory mechanism for formation of new life forms at the macroevolutionary level. They consider natural selection as the means by which new life forms are established. My view of theistic evolution would not contradict their proposal of punctuated equilibrium, but would add one possible explanation for the sudden appearance of new life forms when these new forms required new genetic information. Many lesser changes in life forms (speciation, etc.) might be accounted for by some of the newer concepts of gene transfer as well as the more traditional explanations (gene conversions, gene crossovers, gene duplications, mutations, etc.). These sudden appearances of new life forms have been particularly evident during periods immediately following the various mass extinctions in the earth's geological history.⁴² I would consider natural selection to have played a significant role in establishing these new life forms only after they were produced.

Theistic evolution and the direction of current research in molecular evolution

There are several areas of research in the field of molecular evolution that I believe would be profitably redirected if one accepts my view of theistic evolution. A cardinal hypothesis of the naturalistic theory of evolution has been that the earliest living organisms must have been very simple. This simplicity requirement has been applied to structures of enzymes, morphological structures (membranes, intracellular organelles including ribosomes, etc.), and even to a simpler genetic code. An examination of data for living, simple organisms provides no indication for the validity of this hypothesis. The components required for translation of the genetic information from nucleic acids to protein are extremely complex in all organisms as I have noted previously.⁴³ The enzymes necessary for several other fundamental life processes are also very complex. This is equally true whether the process is photosynthesis which utilizes solar energy to drive the biosynthesis of organic compounds, or various types of chemosynthesis to utilize energy in various chemicals (H₂S, etc.) for the same purpose. The complexity extends not only to the structure of the enzyme proteins, but also to these processes as well. In each case, it is not a single enzyme that is involved, but a whole sequence of coupled enzymes. Often the different enzymes are bound together in defined macromolecular protein structures. In a great many instances, coenzymes or prosthetic groups are intimately involved in addition to protein in the catalytic function of these complex enzymes. I conclude that the evidence, when examined closely, provides no support for the hypothesis that all aspects of life must have been simple in the beginning.

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In contrast, if my view of theistic evolution is considered, there is no need to postulate initial simplicity. An intelligent cause could have provided genetic information for whatever degree of complexity that was required by the organism. It would still be important to study comparative sequences of genes and their expressed proteins and of protein structural features throughout all organisms in any phylogenetic grouping. This would provide information regarding the taxonomic levels involved in the appearance of new genetic information. Although it would provide no clue as to the source of that information, it might give an indication of the complexity when that information was first noted. Amino acid sequences and three dimensional structures of many proteins (for example, cytochrome c and hemoglobin) have been studied very extensively, but comparable studies on the majority of proteins have not been carried out. With procedures for isolating genes available and techniques for rapid DNA sequencing now automated, additional information of this type is rapidly becoming more available. It should be noted that gene sequencing should be carried out even though the gene might not be expressed as a functioning protein. In recent papers on cytochrome c genes^{44,45} and in a paper critiquing the molecular evolutionary clock hypothesis,⁴⁶ I have considered some of the potential problems of this type of study and the potential information to be derived.

If my view of theistic evolution is valid, then the entire research area of origin of life studies should be carefully reevaluated. One has only to read recent evaluations of origin of life research to see a need for new hypotheses and new types of studies in this field of endeavor.⁴⁷

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There are clearly other areas of research that might be affected by a view of theistic evolution. One of the most intriguing areas of investigation and also one with tremendous potential for future study involves research on developmental genes and their expressed proteins. Processes of embryogenesis and differentiation are tremendously complex. Brun has this to say regarding the process of embryogenesis:

The timing of embryogenesis is accomplished in at least two different ways. First there are specialized pace-maker genes that play an important role in making "decisions"—for example, deciding at what time in embryogenesis the limbs grow out. In addition, timing is also controlled by the hierarchical organization of

the genome. Primary genes are activated first, and the resulting gene products turn on secondary regulatory genes later. As these are turned on, tertiary genes will become active, activating regulatory genes that are located even further down stream...⁴⁸

One has only to read "The Making of a Fly" by Lawrence⁴⁹ to realize the marvelous complexity of the manner in which these genes, functioning as their expressed proteins, control the migration and positioning of cells in the developmental stages of an organism. At this point, it is clear that some of these genes are present and function in a broad variety of organisms; others are unique to much smaller groups. Many evolutionary changes noted in paleontology involve changes in morphology, and formation of morphologic structures are under the direction of developmental genes. It is possible that during these evolutionary changes, some developmental genes may be turned on (expressed), while others may be turned off (repressed). My theory would propose, however, that some new genetic information would be required as well to account for major morphologic evolutionary change. It is evident that additional studies of developmental genes should be a primary area for future research, and would contribute much to our understanding of evolutionary processes.

Conclusion

I wish to make clear that my understanding of theistic evolution, like the naturalistic view of evolution, should be freely open to criticism. If my proposal proves to be clearly wrong, it should be rejected. If it needs modification to bring it more completely in accord with the facts of science, it should be modified. I present it as *a* Christian theistic view, not *the* Christian theistic view. I am aware that in presenting this view I may be opposing those who, in recent years, have spoken of a theistic view in such general and often scientifically vague terms that their views could never be subjected to scientific criticism. Since it is more specific and detailed, my view can surely be subject to criticism. My proposal of theistic evolution can also be considered partially as an answer to those philosophers, such as William Hasker, who insist that: "...the normal scientific response is to retain a hypothesis until a superior replacement hypothesis emerges."⁵⁰

I also hope I have avoided the pitfalls that undermined the design argument of William Paley's Natural Theology in the nineteenth century. Brooke notes that Paley argued: "...that every part of every organism had been meticulously designed for its function..."⁵¹ Or as Paley's Natural Theology is described by Wright: "There was no search for mechanisms that could explain how adaptations might have come about... Design and original creation answered all of the questions about origins and adaptations..."⁵² My view of theistic evolution clearly encourages the search for mechanisms of change and avoids the claim "that every part of every organism is perfectly designed." I have carefully avoided the question of divine determinism by leaving many evolutionary changes, particularly those at the species level, to chance events. Some theistic philosophers of science (for example, Polkinghorne) have suggested that the Creator chose to self-limit his omnipotence by not interfering in random events (i.e., those due solely to chance). At the same time, God's sovereignty surely extends in some manner, to these events as well. I shall not comment on this further, except to note that my theory of theistic evolution leaves open the possibility in this regard of divine self-limitation.

My understanding of theistic evolution can be phrased in terms that should permit it to be included as an alternate view in chapters on the origin of life and on evolution in high school and college textbooks. The dominance of a completely naturalistic view of these topics in high school textbooks in the United States has recently been the subject of a critique by this author and others.⁵³

There are clearly aspects of God's *governance* of His creation that I have not touched upon. As noted by Van Till, there are areas of evolution at the molecular level where the guiding hand of a Creator may be involved. As one compares lower and higher levels in any phylogenetic tree, the marked similarities in sequence structure for particular protein molecules (for example, cytochrome c) are clearly evident. It is true that each step in these pathways could be a consequence of one or more point mutations. But is there not also a need for guidance in the selection of viable pathways? The possibility seems remote that all of the dead ends have necessarily been selected by random mutational events, and lost because they are not viable. Is it not likely that Van Till is correct when he says: "...every one of these processes and every connective pathway in the possibility space of viable creatures is itself a mindfully designed provision from a Creator possessing unfathomable intelligence."⁵⁴ This is an area that is not included in my theory of theistic evolution, but is certainly worth considering as an aspect of God's *governance* in an overall Christian theistic view. It could also be true that the continuing provision of new genetic information by an intelligent cause could be far more extensive than my arbitrary dividing line would suggest. My intention in proposing this theory is to open up such possibilities for serious consideration and possible experimentation.

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Notes

¹Van Till, H.J., and Johnson, P.E. (1993). "God and Evolution: An Exchange." *First Things*, June/July: 32-41. For additional dialogue on this topic, readers are referred to the *Christian Scholar's Review*, XXI, (Sept. 1991).

²Van Till, H.J. op. cit., p. 34.

³Van Till, H.J. (1993). "Is Special Creationism a Heresy," *Christian Scholar's Rev.* XXII: 380-395.

⁴Van Till, H.J. op. cit., p. 393.

⁵Van Till, H.J. see note 1, p. 38.

⁶Johnson, P.E. op. cit. p. 39.

⁷Origins." *Perspectives on Science and Christian Faith*, 42: 155-161.

⁸Thompson, I.J. (1993). "The Consistency of Physical Law with Divine Immanence." *Science & Christian Belief*, 5: 19-36; p. 19.

⁹Thompson, I.J. op. cit.

¹⁰Van Till, H.J. "The Character of Contemporary Natural Science." in *Portraits of Creation*, by Van Till, H.J., Snow, R.E., Stek, J.H., and Young, D.A. (1990). Eerdmans Publ., Grand Rapids, MI, pp. 126-165.

¹¹Van Till, H.J. op. cit., p. 133.

¹²Peacocke, A. (1991). "God's Action in the Real World." *Zygon*, 26: 455-476, p. 464.

¹³The following are cited as summarizing the present status of origin of life research; Thaxton, C.B., Bradley, W.L., and Olsen, R.L. (1992). *The Mystery of Life's Origin: Reassessing Current Theories*. Lewis & Stanley, Dallas, TX (second printing); Shapiro, R. (1986). *Origins: A Skeptic's Guide to the Creation of Life on Earth*. Summit Books, New York, NY; Dose, K. (1988). "The Origin of Life: More Questions than Answers." *Interdiscipl. Sci. Rev.*, 13: 348-356. I believe that the suggestion that material processes in themselves might have the resident capacity to carry out the events envisioned in the macroevolutionary paradigm is contrary to the scientific evidence. As I and others have indicated elsewhere (c.f., Rust, P. (1992). "How has Life and its Diversity Been Produced?" *Perspectives on Science and Christian Faith*, 44: 80-94), and Denton, M. (1985). *Evolution: A Theory in Crisis*. Adler & Adler, Bethesda, MD), origin of life and macroevolutionary events are beyond the capacity of material processes governed only by chance.

¹⁴Van Till, H.J., see note 3, p. 384.

¹⁵In this paper I use the term "naturalistic" in the broad sense indicated by Van Till (see note 1 above); i.e., a naturalistic view of evolution is one guided entirely by chance events. This view is sometimes referred to as metaphysical naturalism or naturalistic materialism.

- ¹⁶Yockey, H.P. (1977). "A Calculation of the Probability of Spontaneous Biogenesis by Information Theory." *J. Theor. Biol.*, 67:377-398.
- ¹⁷Kuppers, B.O. (1990). *Information and the Origin of Life*. MIT Press, Cambridge, MA, p. 60.
- ¹⁸Dawkins, R. (1986). *The Blind Watchmaker*. W.W. Norton Co., New York, NY.
- ¹⁹Van Till, H.J., see note 3.
- ²⁰Lewis, R.W. (1990). "Theories, Speculation, and the Structure of Knowledge." *Speculations Sci. Technol.*, 13: 13-17.
- ²¹Kerkut, G.A. *Implications of Evolution*. Pergamon Press, 1960, pp. 6, 7.
- ²²Lewis, R.W. (1986). "Teaching the Theories of Evolution." *Amer. Biol. Teacher*, 48: 344-347.
- ²³Thompson, I.J., see note 8.
- ²⁴Van Till, H.J., see note 1, p. 38.
- ²⁵Thompson, I.J., see note 8.
- ²⁶Johnson, P.E., see note 6.
- ²⁷Doolittle, R.F. (1989). "Redundancies in Protein Sequences." In *Prediction of Protein Structure and the Principles of Protein Conformation*, Plenum Press, New York, Fasman, G.D., editor, pp. 599-623.
- ²⁸Amabile-Cuevas, C.F. and Chicurel, M.E. (1993). "Horizontal Gene Transfer." *Amer. Scientist*, 81: 332-341.
- ²⁹Mills, G.C. (1994). "The Molecular Evolutionary Clock: A Critique." *Perspectives on Science and Christian Faith*, 46: 159-168.
- ³⁰Wright, R.T. (1989). *Biology Through the Eyes of Faith*. Harper & Row, New York, NY, p. 85.
- ³¹Wilcox, D., as quoted in Wright, R.T., op. cit., p. 110.
- ³²Thompson, I.J., see note 8.
- ³³Hummel, C. (1986). *The Galileo Connection*, Intervarsity Press, Downers Grove, IL, p. 158.

³⁴Mills, G.C., see note 29.

³⁵Mills, G.C., see note 7.

³⁶Johnson, P. (1993). "Creator or Blind Watchmaker?" *First Things*, January, 8-14, p.14.

³⁷Mills, G.C., Lancaster, M., and Bradley, W.L. (1993). "Origin of Life and Evolution in Biology Textbooks—A Critique." *Amer. Biol. Teacher*, 55: 78-83.

³⁸Thomson, K. (1982). "The Meanings of Evolution." *Amer. Scientist* 70: 529-531.

³⁹Wiester, J. (1992). "How Science Works: The Views of Gingerich and Johnson.," *Perspectives on Science and Christian Faith*, 44: 249-252.

⁴⁰Wiester, J., op. cit., p. 251.

⁴¹Eldredge, N. and Gould, S.J. (1972). "Punctuated Equilibrium, an Alternative to Phyletic Gradualism." *Models in Paleobiology*, Schopf, T.J.M. (ed.), Freeman Cooper & Co., San Francisco, CA, pp. 82-115.

⁴²Ward, P.W. (1992). *On Methuselah's Trail: Living Fossils and the Great Extinctions*. W.H. Freeman Co., New York.

⁴³Mills, G.C. (1991). "The Role of the Components of the Translation System in Information Transfer." Proceedings of the 1988 Tacoma Conference, *Sources of Information Content of DNA*, pp. 1-26.

⁴⁴Mills, G.C. (1991). "Cytochrome c: Gene Structure, Homology and Ancestral Relationships." *J. Theor. Biol.*, 152: 177-190.

⁴⁵Mills, G.C. (1992). "Structure of Cytochrome c and c-like Genes: Significance for the Modification and Origin of Genes." *Perspectives on Science and Christian Faith*, 44: 236-245.

⁴⁶Mills, G.C., see note 29.

⁴⁷Thaxton, C.B., et al, Shapiro, R. and Dose, K., see note 13.

⁴⁸Brun, R.B. (1993). "Principles of Morphogenesis in Embryonic Development, Music and Evolution." *Communio*, 20: 528-543, p. 530.

⁴⁹Lawrence, P.A. (1992). *The Making of a Fly: The Genetics of Animal Design*, Blackwell Scientific Publ., Cambridge, MA.

⁵⁰Hasker, W. (1992). "Evolution and Alvin Plantinga." *Perspectives on Science and Christian Faith*, 44: 150-162, p. 155. I believe this philosophic view of Hasker is clearly

in error, as my many years as an experimental scientist have exposed me to many scientific theories that have been rejected with no new theory to replace them.

⁵¹Brooke, J.H. (1991). *Science and Religion*. Cambridge Univ. Press, Cambridge, England, p. 192.

⁵²Wright, R.T. see note 30, p. 53.

⁵³Mills, G.C., et al., see note 37.

⁵⁴Van Till, H.J., see note 5.
