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THE BIBLE AND BIOLOGY

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In an essay entitled The Bible and Science, an approach to the relation of science and faith was presented. That essay included a method for dealing with areas in which scientific conclusions and the Bible seem to be in conflict. When scientific interpretations do no agree with a list of "biblical anchor points" or statements of biblical conclusions about biological origins, this conflict can stimulate a more careful study of both the scientific data and the Bible. If we understand the method correctly, Scripture can be maintained as the authoritative standard for our religious beliefs, while science and the Bible shed light on each other. Since both nature and Scripture originated with God, they will ultimately be in harmony, but because of our limited understanding, we sometimes must live with unanswered questions as we search for truth.

Examples of using biblical premises to suggest useful research

The method for relating science and faith, suggested above, can be put to practical use in research. The list of biblical anchor points cannot be directly tested by science, but those biblical concepts can suggest hypotheses that are testable by the methods of science. This method applies equally to other science fields, and perhaps even more examples can be given in subjects like paleontology and geology, but in this essay I will only be discussing biology.

We will begin by dividing biology into two general areas - 1) the study of biological processes that can be observed today, and 2) the study of biological history. The first category, on-going processes, can be experimentally studied and most hypotheses can be rigorously tested. In this category our religious beliefs will contribute little to our scientific research. There could be exceptions in nutrition, since the original diet in Eden can suggest ideas about diet today, and the Bible also suggests that the peace resulting from trust in God can benefit our health (McMillen 1984). It is difficult to find much else in Scripture that directly interacts with fields like physiology, histology, much of biochemistry, or microbiology. One general implication resulting from acceptance of biblical creationism is that we will understand biology best if we interpret it based on study of modern processes, and not on unprovable speculations about deep evolutionary history.

The most prominent interaction between faith and science is likely to be in the second category,

the history of life. I enjoy studying how my car works - what are the processes which make the engine, transmission, brakes, etc. work. I can understand those processes without knowing anything about the origin of the car or knowing the processes used by engineers to design it so its parts work so well together. Only when I ask questions about the car's origin do I need to deal with the issue of design and designers, and in biology it is primarily when we ask questions about origins that we must decide what to do with the philosophy of naturalism, and with the relation between science and faith.

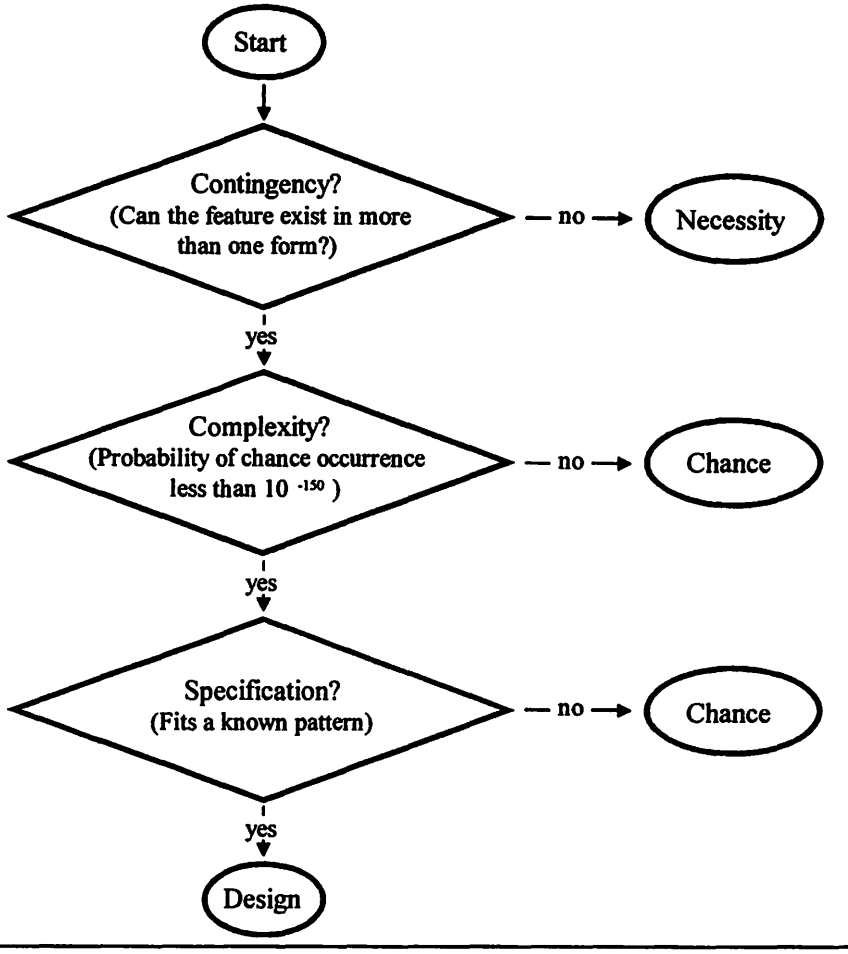
In genetics there are many implications that can be derived from a biblical position. Evolution theory has proposed mechanisms for evolution processes, but Genesis indicates that there are limits to how much change these processes have produced. Examination of the scientific literature indicates that there is abundant evidence supporting microevolution and speciation, but a lack of genetic evidence for a process that can result in significant macroevolution - the origin of new body plans or new structures or organs. Biological research contributes to our understanding of microevolutionary processes and events, and applying a biblical creationist philosophy can suggest testable questions about how much evolution has occurred and about changes that have resulted since the entrance of sin. A biblical viewpoint integrated with biological knowledge can help us understand how mutation and natural selection have replaced the harmonious original creation with the vicious, competitive side of nature, a natural result of the reign of natural selection (Brand 1997, ch. 12). There are many lines of research that can be done to explore the implications of these concepts. An integration of Scripture and biology can also help explain why truly altruistic behavior is rare in the animal world, and perhaps even help a little in understanding why it is not more common in human behavior, and why we are dependent on God's sanctifying power to change our hearts.

There is currently an active movement among creationists called the design movement. We all recognize the evidence for design in nature, and for centuries these have been argued as evidence for the existence of a Creator. Since Darwin's day science has claimed that nature is not the result of design at all, but mutation and natural selection result in adaptations that only look like design. However, in spite of the persistent claims of convinced believers in naturalism (Dawkins 1986, 1997, 1998), most people do not believe that nature, unaided by intelligent intervention, could produce life from non-living material or produce the fantastic complexity of design revealed by study of molecular biology or of physiological or anatomical adaptations of animals and plants. When we see design we

can usually recognize it, but the problem is how to make the design argument scientifically rigorous. This task has been tackled by Michael Dembski (1999) and his colleagues in the design movement.

Dembski has developed a scheme for objectively determining if an event or some structure in nature cannot be explained by natural law (even if the natural laws are God-created), but requires direct involvement of intelligent design. Dembski calls this the explanatory filter (Fig. 1).

Figure 1. The explanatory filter, for evaluating claims that features in nature require design.



To apply the filter in our study of some biological feature, the feature must pass three different criteria before it will qualify as the result of design. The first criterion is "contingency", which is to say that there must be the possibility that the feature could exist in some condition other than the one that it is in. For example, the amino acids in a protein could be arranged in any one of many different sequences - the laws of nature do not specify the order of amino acids in any protein, so if left to chance the 20 amino acids can link together in almost any random sequence. Thus a protein could have different sets of amino acids, and so it passes the test of contingency. However, if there is some molecule that can only exist in one state, then it would not pass the test of contingency, since the normally operating laws of nature control the structure of that molecule and the special action of a designer is not needed.

The next criterion is "complexity", or in other words is the feature complex enough to warrant invoking design. One concern about the explanatory filter is whether it will produce false positive decisions - deciding that design is required when it really isn't; the feature could be explained by chance. The test of complexity is designed to answer this concern, and make the method quantitatively rigorous. Comparison of two examples will illustrate how the explanatory filter deals with this problem. A few years ago a meteor crash landed into Jupiter. This happened 25 years to the day after Apollo 11 landed on the moon. Would their filter require this unique timing to be explained by design? This can be easily calculated. If we assume that the meteor could have landed on any day within the year, and if it landed on the correct day and even in the same second that Apollo 11 landed, the number of seconds in a year can be determined, and the probability of the meteor landing in the correct second is 1×10^{-8}. But to insure that the explanatory filter eliminates false positive decisions, they require that the feature in question have a probability of less than 1×10^{-150}. As you can see, the meteor landing doesn't even come close to requiring design (Dembski 1999). This is one of the strong approaches of this method - it puts real numbers on the design argument, and requires a high standard for accepting design as an explanation.

The timing of the meteor was curious, but not unreasonable to explain without design. Now contrast that to exploring some desolate place and finding a 20 page booklet on astronomy. The probability of the letters and words in the book becoming arranged without intelligent input can be calculated, and they would clearly fall into the category requiring design, as long as the next criterion is met.

The final criterion is "specification", which means that the characteristics of the feature in question fits some previously known pattern, rather than being random. For example the set of letters "God loves you" spell three words with known meaning and also fit together as a phrase with known meaning, and thus pass the test of specification, whereas the set "egigkaeac eieisxz ikmnh" fit no known pattern, and do not pass the test of specification - there is no reason to invoke design, because there does not seem to be any design or meaning involved - an untrained monkey could have typed those letters. If the feature in question meets all three of these criteria, then according to the explanatory filter the feature contains sufficient evidence to indicate that it was the result of design. (note that some things in nature that do not pass the test of the explanatory filter may still represent the action of natural laws which are so precisely tuned as to convince us that the laws themselves were designed. The explanatory filter does not address the question at that level, but asks if a feature requires the special action of a designer, beyond what natural law can explain)

A couple of specific examples will provide additional clarification of the "complexity" and "specification" criteria. Figure 2 shows pages from dictionaries in two languages. Below these are several sets of letters, which can be compared with the dictionaries to determine which ones fit a "specified" pattern and which do not. The figure also shows several sequences of amino acids from proteins. We do not yet have a dictionary of proteins, but if a protein in an organism works - does the biochemical task that it is supposed to do, then it can be considered "specified".

Figure 3 shows rocks on a hillside. If you look carefully at the pattern in A it is possible to recognize the word "rocks". In B the word "rocks" is unmistakable. The probabilities of each of these arrangements could be calculated, and the probability that B occurred by chance would be far smaller than it would be for A. If you saw the sentence in C, "these are rocks" on a hillside, would you have any question whether this occurred by chance or by design? The explanatory filter subjects this intuitive recognition of design to an objective, quantitative evaluation.

Figure 2. Selections from two dictionaries, A) several specified and unspecified sequences of letters, to be evaluated by comparison with the dictionaries, and B) two sequences of amino acids, analogous to sequences of letters.

Dip Ed ['dɪped] N (*Brit*) ABBR *of* **Diploma in** *magisterio.*
diphtheria [dɪf'θɪərɪə] N difteria *f.*
diphthong ['dɪfθɒŋ] N diptongo *m.*
diphthongize ['dɪfθɒŋaɪz] 1 VT diptongar. 2 VI diptongarse.
diploma [dɪ'pləʊmə] N diploma *m.*
diplomacy [dɪ'pləʊməsɪ] N diplomacia *f.*
diplomat ['dɪpləmæt] N diplomático *m*, -a *f.*
diplomatic [ˌdɪplə'mætɪk] 1 ADJ diplomático; valija *f* diplomática; ~ **corps, ~ service** cuerpo *munity* inmunidad *f* diplomática. 2 N: **the D~** el cuerpo diplomático.
diplomatically [ˌdɪplə'mætɪkəlɪ] ADV diplomáticamente
diplomatist [dɪ'pləʊmətɪst] N diplomático *m*, -a
dipole ['daɪˌpəʊl] N bipolo *m.*
dipped [dɪpt] ADJ: ~ **headlights** luces *fpl* cortas.

understand that; **no había ni** ~ there wasn't a
diosa NF goddess.
dióxido NM dioxide; ~ **de carbono** carbon dio nitrogen dioxide.
dioxina NF dioxin.
Dip. ABR *de* **Diputación** ≃ County Council, CC.
diploma NM diploma.
diplomacia NF diplomacy; ~ **de cañoneras** gun
diplomado 1 ADJ qualified, trained, having a d 2 NM, **diplomada** NF qualified person, holde
diplomarse [1a] VR (*esp LAm*) to graduate (from
diplomática[1] NF (a) (*Hist, Jur*) diplomatics. (b) (CORPS; (*carrera*) diplomatic career, (career in the
diplomáticamente ADV diplomatically.
diplomático 1 ADJ diplomatic. 2 NM, **diplomática**[2] NF diplomat; (*fig*) diplon
diplomatura NF diploma course. course leadi

A

dwoviopecl dipole dpokg
diplomat dapxocl ddllddcckk
dofltpseif diplomatico dvvmekpd
dioxina dmolvmatic diosa

B

Ala-Phe-Gly-His-Val-Gln-Asp-Lys-Pro-Lys-Met-Gly-Cys-Ser-Trp-Ala-Glu-His
Phe-Leu-His-Gln-Arg-Trp-Cys-Ser-Val-Met-His-Gln-Cys-Ala-Thr-Ser-Gly-Pro

However, there is another issue to consider when we are evaluating biological systems. We know how humans arrange rocks, and we don't know of any natural process that will arrange rocks into letters, so even the most hard-headed skeptic will accept the rock sentence as resulting from design. On the other hand, many scientists believe there is a mechanism to produce biological order without a designer - mutation and natural selection. The question is - do we really have evidence that this mechanism can produce life, or can produce new body plans, new organs, and new complexes of genes to specify the structure of these new features?

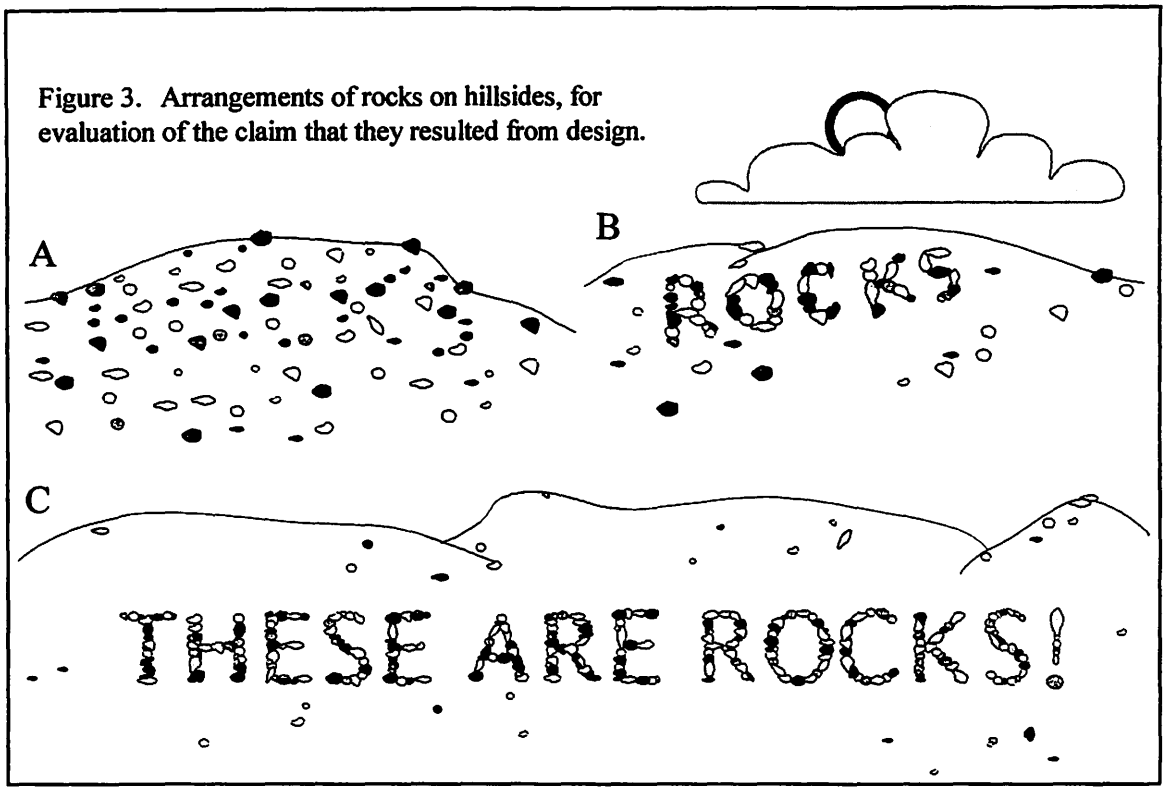


Figure 3. Arrangements of rocks on hillsides, for evaluation of the claim that they resulted from design.

One answer that is given to this question is that the fossil record shows a sequence of appearance of organisms that is predicted by evolution theory - there are only invertebrates at the bottom of the Cambrian, and then fish, amphibians, reptiles, mammals, and birds appear in that order, just as predicted and thus verifying the macroevolutionary origin of life forms. But this answer is not adequate to eliminate the alternate explanation - design. The fossil sequence correlates with other things besides the prediction of evolution - it also correlates with increasing terrestriality of animals, increasing intelligence, increasing adaptability, etc. These factors could determine the order in which the vertebrates were affected and overcome by, for example, a geological catastrophe. In addition, there is always the possibility that the Creator interacted with nature in some other way that produced this sequence. The point is that there could be another explanation for the fossil sequence, so the fossils in themselves cannot demonstrate whether mutation and natural selection can result in evolution of genuine biological novelties. Some other evidence is needed to answer this question - preferably genetic evidence.

Evaluation of two of the best evolution textbooks provides one line of evidence (Fig. 4). In both of these well-respected books, we see that there is abundant evidence supporting the reality of microevolution and speciation. However, when they get to questions of macroevolution - evolution of higher categories of organisms, which would involve new structures and new genes - they turn from genetics to analysis of the fossil record. The only real biological evidence that either text gives in support of evolution of biological novelties are variations in genes of the globin gene family and the chicken ovomucoid, protease family. These are actually just evidence for variation in existing types of proteins, and don't provide any evidence that mutation and natural selection could ever produce a completely new protein. It appears that there is no convincing evidence for a genetic process that can evolve new structures or gene complexes. This topic can benefit by vigorous research efforts designed to test the prediction that random mutations and natural selection in duplicate copies of genes will produce variations on a random pattern, but will not produce new gene complexes and new organ systems.

Michael Behe (1996) has developed a line of research that addresses the question of whether evolution can produce novel structures, above the level of individual proteins. His reasoning is somewhat similar to the explanatory filter. Charles Darwin stated in his book *Origin of Species* that if any biological structure was found that could not be built up step by step, his theory would break down. Behe uses a mousetrap to illustrate the concept. A mouse trap is composed of five parts, and if any one of these is missing or nonfunctional, the mousetrap will not work. All five parts must be fully formed and assembled properly or the local mice are very safe. If a part is missing it does not make the trap less efficient, the trap will not work. Behe refers to this phenomenon as irreducible complexity - a number of parts must be present all at once before a structure will function at all. He looked for biochemical systems in organisms that seem to exhibit irreducible complexity, and found several. This seems to indicate that mutation and natural selection are not able to construct some biological systems step by step, but a designer is required to put it all together at once. His critics have argued that Behe is just not creative enough to figure out a way to evolve those structures step by step. This criticism loses its force when we realize that those who believe in the unlimited power of evolution have also not devised any theories for the evolution of those irreducibly complex biological systems.

Figure 4. Topics covered in two prominent evolution textbooks

	Ridley, Mark, 1993. Evolution. Boston, Blackwell Scientific Publ.	**Futuyma, Douglas J. 1986.** Evolutionary Biology, 2nd ed. Sunderland, MS., Sinauer Associates.
Microevolution and speciation, and misc.	Ch. 1-16, except p. 243-260 (see below) Ch. 17-19 Ch. 20, p. 537-551 Ch. 21, p. 560-580	Ch. 1-10 Ch. 13-14 Ch. 15, p. 444-464, 478-480. See also below. Ch. 16 Ch. 17 (in part)
Genetic evidence for megaevolution processes (the evolution of new genes and structures)	Ch. 16, p. 243-260 - gene duplication and evolution; evidence for variation within a gene family (globin gene family, alpha, beta, myoglobin), and theory of how this occurs through gene duplication, etc.	Ch. 15, p. 464-478 - gene duplication and evolution, variation within a gene family (chicken ovomucoid, protease family)
Patterns in the fossil record	Ch. 18 Ch. 20, p. 533-537, 551-557 Ch. 21, p. 559-560, 581-589 Ch. 22	Ch. 11, 12 Ch. 14, p. 397-398, 401-402, 404-409 Ch. 17 (in part)

In reality, Behe and his irreducibly complex systems are just like other science research programs. They illustrate how a theory (the theory that life is the result of design) suggests a productive line of research (irreducible complexity), but the initial results of that research do not once and for all disprove evolution. Behe's results have presented a challenge to those who disagree with him, and now we will wait to see if they can answer his challenge with valid and convincing scientific data. Meanwhile Behe and others can pursue this productive line of biochemical research, rigorously

testing the concept of irreducible complexity. In doing so, however, they will avoid a lot of frustration if they are aware that there is often more than one way to interpret data (especially when dealing with questions about history), and it will probably be difficult to find a "silver bullet" that once and for all proves that creation did or didn't happen. A more realistic goal is to show that it is still possible for intelligent, reasonable people to believe in creation, and thus open up the realistic possibility of faith in the Creator to more people.

Answering our questions about origins and finding data to support Scripture is not the only reason for pursuing research in subjects such as those mentioned above, and in other areas of science. If we are active in doing quality research, attending scientific meetings and presenting papers, publishing in scientific journals, and become personally acquainted with the scientists in our field, this is probably the best way for them to see that our religion is consistent with good science. This breaks down prejudice against creationism and opens minds that might not be opened without this personal contact.

Conclusion

We understand the intelligent design implied by the words of a book, or by the intricate structure of a computer, so why is there such reluctance to see design in proteins or in larger biological systems like those studied by Behe? The reluctance results from the absolute dominance of the philosophy of naturalism in the thinking of many scientists. If the stranglehold of naturalism can be weakened enough for open discussion of the philosophical issues, the resulting open-minded discussion of design vs. chance will be very beneficial to science. There is a great need of this openness in science. If life was created, isn't it better for science to know this rather than to pretend it isn't so? Science should be an open-ended search for truth, rather than a closed system that will not consider certain ideas. This more open approach must, of course, take seriously the cautions and safeguards discussed in this essay and the earlier essay on the Bible and science.

There is not a "creationist" research method. Creationism does not propose a new research methodology, but it does the following: 1) rejects the unproven assumption of naturalism, and suggests a whole new set of research questions that can be asked, 2) opens our eyes to see things that others are less likely to notice, and 3) produces more effective scientific progress, because science that builds on a more correct theory will be more successful.

I predict that in the long run science that follows this approach will be more successful than naturalism. Examples of questions suggested by a creationist paradigm are:

1. How much biological change has occurred? What have been the limits of evolutionary change?
2. What were the original created groups? Is there molecular evidence that can indicate which groups have never been genetically linked?
3. What have been the phylogenetic pathways of adaptational change occurring within created groups?
4. To what extent does natural selection only slow down the destructiveness of random mutations, rather than create new adaptations?
5. What molecular systems meet the criteria for irreducible complexity? If we knock out the genes for one part of those systems at a time, can they still function?
6. What is the true explanation for features that have been interpreted as evolutionary vestiges? For example, creationism may predict that much of what has been interpreted as "junk DNA" actually has a function.
7. What are the correct explanations for biogeographical patterns - the distribution of animals and plants? What parts of these patterns resulted from animal movements after the global flood, and which biogeographical patterns resulted from animal adaptations to new environments, within created groups after they repopulated the earth?
8. Sociobiology theory (evolution theory applied to study of animal and human behavior) has stimulated much interesting research. However, there is need of reinterpretations of the data in view of the biblical insight that life began as a perfect creation and has declined, instead of the reverse (see Brand 1997, ch 11).

In large areas of research (embryology, hox genes etc., genetics of biological change, parts of animal behavior and ecology), the research might not be much different, but a design explanation may suggest very different explanations for the data, and can yield more meaningful insights into biological patterns and functions, especially in study of the history of life.

In other large areas of biological research on ongoing processes that can be observed today (physiology, biochemistry, molecular biology, anatomy, parts of animal behavior and ecology) the

researcher's philosophy will have little influence on their interpretations, unless they try to explain the origin of biological structures and functions. A creationist will be spared much wasted effort trying to explain how basic structures and functions evolved.

A creationist philosophy predicts that some areas of research will not be productive, and are a waste of time. A prime example is abiogenesis (molecular evolution of life from non-living material). Another example would be study of the evolution of major groups (classes and phyla, e.g.) of organisms.

When we study biology from a biblical world view, it opens before us the wonders of the complex biological world that God has created. The more I learn of the awesome wonders of molecular biology, while recognizing that the Inventor of all this has a personal interest in each one of us, I see Him in a new and more reverent light. Non-theistic scientists also experience awe and wonder as they contemplate the amazing facts of biology, but they credit the origin of all this to mindless natural processes, unaware of what they are missing by that interpretation. "The poet and the naturalist have many things to say about nature, but it is the Christian who enjoys the beauty of the earth with the highest appreciation, because he recognizes his Father's handiwork and perceives His love in flower and shrub and tree. No one can fully appreciate the significance of hill and vale, river and sea, who does not look upon them as an expression of God's love to man". SC 87

Study of biology can also answer specific questions about origins and support our faith in Scripture. Study of molecular biology in the last few decades has revealed intricate mechanisms within each cell of living things that would seem like science fiction if it weren't for the evidence showing the reality of these intracellular mechanisms. The more we learn of the complexity of life the more it points to a Designer - an Inventor of life. Surprising as it may seem, data from the field of evolution also helps in supporting our faith. The accumulating data indicate that biological change does happen within groups of organisms, and in recent years there is more evidence that helps us to understand how these changes could happen within a biblical time frame (Brand 1997), but genetic evidence does not support the concept of the evolution of new animal body plans.

We are entering a new era in molecular biology, with the sequencing of the genomes of many types of organisms. This gives access to fantastic new lines of evidence that offer possibilities for evaluating theories of evolutionary history. Perhaps these data will help clarify the nature and limits of biological change. They also may introduce new challenges for the creationist, especially since

most scientists will automatically interpret the data from within naturalistic assumptions. These will be opportunities to seek alternative interpretations for the data.

Since science textbooks are almost all written from within a naturalistic philosophy, Christian teachers and students have to learn how to recognize the difference between data and interpretation, because in science books they generally are intermixed together with no explanation of where data end and interpretations begin. For example, in a textbook that I teach from, the statement is made that the mammalian cerebral hemispheres "were ultimately derived from a part of the brain important in 'lower' vertebrates in receiving and relaying olfactory stimuli." . . . and the neopallium "first appeared as a small area in the front part of the cerebral hemispheres in reptiles, which in mammals has expanded over the surface of the deeper, 'primitive' vertebrate brain." This reads like established fact, when in reality the data indicate only that 1) a reptile brain has a very small cerebrum at the back of the brain, and 2) mammal cerebrum is a large structure that covers the top of the rest of the brain. The claim that the mammal cerebrum evolved from the reptile brain is strictly an assumption based on the belief that mammals evolved from reptiles.

It is common to see statements that a certain group of animals "developed" or "discovered" their unique structural adaptations, or that a system like e.g., birds' unique type of lungs or whales nostrils high on their foreheads "evolved" to adapt them to a particular life style or environment. In reality there is no data showing that these features evolved, but it is an interpretation unsupported by data. To a student who is not familiar with the evidence, or with the philosophical basis behind this type of statement it can sound like science has firmly established that these evolutionary changes have occurred. To a person who has accepted the assumption that all life arose by evolution it is logical to describe animal adaptations as the result of evolution, but those statements are typically statements of belief, not of scientific fact. It may be stated that when bats appear in the fossil record in the Eocene they had already evolved their adaptations for flight. What the data show is that the oldest bat fossils, in Eocene rocks, are virtually identical to living bats, with no indication of any process of evolution from some other kind of mammal.

Science has chosen to adopt a philosophy based on naturalism, and it works within the rules of this philosophy (no hypotheses implying any supernatural events in history are acceptable). It could be argued that whether we agree with that or not, it is better to work within the accepted rules of science and not try to "fight the system". Certainly that will be the easy way, and will allow us to fit

in with our scientific colleagues without conflict. However, the problem with that approach is that it forbids us, if we are going to be accepted as scientists, to consider the possibility that life was created by an intelligent Designer. Is our goal to take the easy road to scientific acceptability, or to seek truth? Should the goal of science be to just apply an arbitrary set of rules, even if they are false, or should it be an open-minded, open-ended search for truth? Even though science cannot directly test hypotheses about miracles, there are many testable hypotheses, like irreducible complexity, that can result from an open-minded attitude towards the existence of a Designer, and such research can improve our understanding of nature and bring glory to God. Almost every major new insight in science has required someone to challenge scientific orthodoxy, but think where science would be if Copernicus, Harvey, Galileo, Einstein, and many others had taken the easy way out?

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