

ISSUES IN EVOLUTION

by

Bert Thompson, Ph.D.

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INTRODUCTION: EVOLUTION DEFINED

There are two fundamentally different, diametrically opposed explanations for the origin of the Universe and all living things in that Universe. Each of these explanations is a cosmogony—an entire world view, or philosophy, of origins and destinies, of life and of meaning. One of these worldviews is the concept of creation. According to the theory of creation, or as it may be called more properly, the **creation model**, the Universe is **not self-contained**. Everything in the Universe, and in fact, the Universe itself, came into being through the design, purpose, and deliberate acts of a supernatural Creator Who, using processes that are not continuing as natural processes in the present, created the Universe, the Earth, and all life on that Earth, including all basic types of plants and animals as well as humans.

The second alternative and opposing view is the concept of evolution. According to the theory of evolution, or as it may be called more properly, the **evolution model**, the Universe **is self-contained**. Everything in the Universe has come into being through mechanistic processes without any kind of supernatural intervention. This view asserts that the origin and development of the Universe, and all of its complex systems (the Universe itself, living non-human organisms, man, etc.), can be explained solely on the basis of time, chance, and continuing natural processes innate in the very structure of matter and energy.

According to this theory, all living things have arisen from a single, one-celled organism that in turn had arisen from a dead, inorganic world. This theory may be called the “General Theory of Evolution,” a name ascribed to it by G.A. Kerkut, the famous British physiologist/evolutionist who said: “On the other hand, there is the theory that all living forms in the world have arisen from a single source which itself came from an inorganic form. This theory can be called the ‘General Theory of Evolution’...” (1960, p. 157). The late George Gaylord Simpson, formerly of Harvard, defined evolution by stating that it “is a fully natural process, inherent in the physical properties of the universe, by which life arose in the first

place and by which all living things, past or present, have since developed, divergently and progressively”

(1960, 131:969). Theodosius Dobzhansky, the late evolutionist of the Rockefeller University, wrote:

The theory of evolution asserts that (1) the beings now living have descended from different beings which lived in the past; (2) the evolutionary changes were more or less gradual, so that if we could assemble all the individuals which have ever inhabited the earth, a fairly continuous array of forms would emerge; (3) the changes were predominantly divergent, so that the ancestors of the now living forms were on the whole less different from each other than these forms themselves are; (4) all these changes have arisen from causes which now continue to be in operation, and which therefore can be studied experimentally (1951, p. 11).

It is important to distinguish between the General Theory of Evolution, as defined by such men as Kerkut, Simpson, and Dobzhansky, and the Special Theory of Evolution, which states that while limited change within groups can be observed, such change always remains within phylogenetic boundaries. Dr. Kerkut, who first coined the phrase, “Special Theory of Evolution,” defined it in these words: “There is a theory which states that many living animals can be observed over the course of time to undergo changes so that new species are formed. This can be called the Special Theory of Evolution and can be demonstrated in certain cases by experiments” (1960, p. 157). In other words, this is limited variation within groups. In all cases, the process starts with life, the seed produces after its basic kind, and there are limits to the variations. None among us denies the fact that the Special Theory of Evolution is true. Change does occur. Thus, in this sense everyone believes in evolution. The real question that must be asked, however, is this: Do the changes that occur cross phylogenetic boundaries? Or, to put it another way, is organic evolution true?

ISSUES IN EVOLUTION

The creation/evolution question is hardly a trivial issue that concerns only a few scientists on the one hand and a few religionists on the other. In one way or another, the issue permeates practically every field of academic study and every aspect of national life. It deals with two opposing world views. Consequently, it is of special interest to people in all walks of life. And in recent years the controversy definitely has heightened. In 1981, for example, the states of Arkansas and Louisiana passed laws mandating the teaching of the scientific evidences for both creation and evolution, only to see those laws ultimately revoked by the United States Supreme Court on June 19, 1987 in a landmark 7-2 decision. Books are be-

ing written by evolutionists that attack the creationist stance; books are being written by creationists that attack the evolutionist stance. The news media have become involved. National science associations, teachers' associations, and political associations have become involved. Far from diminishing, the controversy seems to be increasing. And both sides acknowledge that it is not likely to "go away." As evolutionist John A. Moore said when he commented on the current upswing in creationism in America: "The climate of the times suggests that the problem will be with us for a very long time..." (1981, p. 1). Dr. Moore is correct in his assessment, the problem will be with us for "a very long time."

There was a time, not too long ago, when creationists and their arguments largely were ignored by many within the scientific community. That certainly is not the case currently, however. And there is good reason why evolutionary scientists now have become alarmed enough to consider creationists a significant threat. For example, a Gallup poll in 1980 showed that over half of the United States population believed in a literal, specially created Adam and Eve as the parents of the whole human race. In 1981, an Associated Press/NBC News poll found that no less than 36% of the people wanted creation to be taught alongside evolution in the public schools. Then, in August 1982, another Gallup poll found that 44% (almost half) of the population believed not only in creation, but in a **recent** creation occurring somewhat less than 10,000 years ago (Morris, 1982, pp. 12,130,164; see also: *San Diego Union*, 1982).

Such poll results were quite a shock for evolutionists, who had expected instead a general agreement with evolutionary theory—in light of the many decades of indoctrination in the schools, textbooks, and news media to the effect that evolution is a "fact" and that the Earth is multiplied billions of years old. Little wonder, then, that many evolutionists are becoming alarmed regarding the impact of creationism.

THE CURRENT STATUS OF EVOLUTIONARY THOUGHT

The fact that so many people today believe in creationism is devastating news to evolutionary scientists. But now, as if to add salt to an open and bleeding wound, some in the evolutionary camp are becoming disgruntled with evolutionary theory as well. Gary Parker, in the section in *What Is Creation Science?* that he authored, stated:

The case for **creation**, however, is not based on imagination. Creation is based instead on **logical infer-**

ence from our **scientific observations**, and on simple acknowledgement that everyone, scientists and laymen alike, recognize that certain kinds of design imply creation.... According to creation, living things **operate** in understandable ways, that can be described in terms of scientific laws—but these observations include properties of organization that logically imply a created origin for life.

The creationist, then, recognizes the orderliness that the vitalist doesn't see. But he doesn't limit himself only to those kinds of order that result from time, chance, and the properties of matter as the evolutionist does. Creation introduces levels of order and organization that greatly enrich the range of explorable hypotheses and turn the study of life into a scientist's dream.

If the evidence for the creation of life is as clear I say it is, then other scientists, even those who are evolutionists, ought to see it—and they do (1982, p. 16, emp. in orig.).

They do? Even evolutionists? Apparently so. Consider, for example, the following. On November 5, 1981 Colin Patterson, senior paleontologist for the British Museum of Natural History in London and one of the world's foremost experts on evolution, delivered an address to his evolutionist colleagues at the American Museum of Natural History in New York. In that speech, Dr. Patterson astonished his colleagues by stating that he had been "kicking around" non-evolutionary or anti-evolutionary ideas for about eighteen months. As he explained: "One morning I woke up and something had happened in the night, and it struck me that I had been working on this for twenty years and there was not one thing I knew about it. That's quite a shock to learn that one can be misled so long. Either there was something wrong with me, or there was something wrong with evolution theory." Dr. Patterson said he knew there was nothing wrong with him, so he started asking various people a simple question: "Can you tell me anything you know about evolution, any one thing that is true? I tried that question on the geology staff at the Field Museum of Natural History, and the only answer I got was silence." He tried it on the Evolutionary Morphology Seminar at the University of Chicago, a very prestigious body of evolutionists, and all he got there "was silence for a long time and eventually one person said, 'I do know one thing—it ought not to be taught in high school.'" Dr. Patterson then remarked: "It does seem that the level of knowledge about evolution is remarkably shallow. We know it ought not to be taught in high school, and that's all we know about it." He went on to say: "Then I woke up and realized that all my life I had been duped into taking evolution as revealed truth in some way." But more importantly, he termed evolution an "anti-theory" that produced "anti-knowledge." He said that "the explanatory value of the hypothesis is nil," and that evolution theory is "a void that has the function of knowledge but conveys none." Or, to use

Patterson's wording: "I feel that the effects of hypotheses of common ancestry in systematics has not been merely boring, not just a lack of knowledge, I think it has been positively anti-knowledge." [NOTE: These quotations are from a transcript of the taped lecture; cf. Bethell, 1985, p. 50.]

Dr. Patterson made it clear, and I certainly want to make it clear here, that he has no great love for the creationist position. He does, however, now consider himself an anti-evolutionist. That is quite a change for a man who has authored several books in the field he now calls "anti-knowledge."

That hardly is the end of the matter, however. In recent years, the distinguished British astronomer, Sir Fred Hoyle, has been stressing the tremendous problems (especially from the fields of thermodynamics) associated with any theory about the naturalistic origin of life on the Earth. In 1981, Dr. Hoyle went on record as saying:

I don't know how long it is going to be before astronomers generally recognize that the combinatorial arrangement of not even one among the many thousands of biopolymers on which life depends could have been arrived at by natural processes here on the earth. Astronomers will have a little difficulty in understanding this because they will be assured by biologists that it is not so, the biologists having been assured in their turn by others that it is not so. The "others" are a group of persons who believe, quite openly, in mathematical miracles. They advocate the belief that tucked away in nature, outside of normal physics, there is a law which performs miracles (provided the miracles are in the aid of biology). This curious situation sits oddly on a profession that for long been dedicated to coming up with logical explanations of biblical miracles... It is quite otherwise, however, with the modern miracle workers, who are always to be found living in the twilight fringes of thermodynamics (1981a, 92:526).

In fact, Dr. Hoyle described the evolutionary concept that disorder gives rise to order in a rather picturesque manner when he said: "The chance that higher forms have emerged in this way is comparable with the chance that a tornado sweeping through a junk-yard might assemble a Boeing 747 from the materials therein" (1981b, 294:105). He then provided his readers with an analogy that is difficult to misunderstand.

At all events, anyone with even a nodding acquaintance with the Rubik cube will concede the near-impossibility of a solution being obtained by a blind person moving the cubic faces at random. Now imagine 10^{50} blind persons each with a scrambled Rubik cube, and try to conceive of the chance of them all **simultaneously** arriving by random shuffling at just one of the many biopolymers on which life depends. The notion that not only biopolymers but the operating programme of a living cell could be arrived at by chance in a primordial organic soup here on the Earth is evidently nonsense of a high order (1981b, 294:527, emp. in orig.).

Hoyle, and his colleague Chandra Wickramasinghe (professor of astronomy and applied mathematics at University College, Cardiff, Wales), have gone even further. Using probability figures applied to cosmic time (not just geological time here on the Earth), their conclusion was this:

Once we see, however, that the probability of life originating at random is so utterly miniscule as to make the random concept absurd, it becomes sensible to think that the favourable properties of physics on which life depends, are in every respect deliberate.... It is therefore almost inevitable that our own measure of intelligence must reflect in a valid way the higher intelligences...even to the extreme idealized limit of **God** (1981, p. 139, emp. in orig.).

In fairness, however, Hoyle and Wickramasinghe pointed out that this “higher intelligence” does not necessarily have to be, so far as they are concerned, the God of the Bible, but rather a being with the intelligence even to the “limit” of God. Currently, they are opting for a “directed panspermia,” which suggests that life was planted on the Earth via genetic material sent by a “higher intelligence” somewhere else in the Universe.

The point I am trying to make is that even scientists who are not creationists are able to recognize that creation is a scientific concept whose merits deserve to be compared with those of evolution. And some make statements that at least lean more toward the scientific respectability of creation than toward that of evolution. Consider, to cite just one example, a thought-provoking article in the May 1980 issue of *Physics Bulletin* by British physicist, H.S. Lipson. The article was titled, “A Physicist Looks at Evolution,” and sparked quite a controversy when it was published. Dr. Lipson commented on his interest in life’s origin, and then on his non-association with any type of creation theory, but noted: “In fact, evolution became in a sense a scientific religion; almost all scientists have accepted it and many are prepared to ‘bend’ their observations to fit with it.” He then asked how well evolution has withstood years of scientific testing, and suggested that “to my mind, the theory does not stand up at all.” After reviewing many of the problems (especially the thermodynamic problems) of getting that which is living from that which is nonliving, Dr. Lipson asked: “If living matter is not, then, caused by the interplay of atoms, natural forces, and radiation, how has it come into being?” After dismissing any sort of “directed evolution,” Lipson concluded: “I think, however, that we must go further than this and admit that the only acceptable explanation is **creation**” (1980, p. 157, emp. in orig.). Like Hoyle, Wickramasinghe, and Patterson, Lipson is unhappy about his own conclusion. He made that clear when he wrote: “I know that this is anathema to physicists, as indeed it is to me, but I must not reject a theory that we do not like if the experimental evidence supports it.”

The men I have quoted here are not creationists. They are (or at least in the case of some, have been) esteemed evolutionists who are well known for their support of evolution theory. However, something has caused them to see that creation may well be a plausible explanation—which is my reason for quoting them here in the first place. I do not mention them to claim that they are strict creationists, but instead to show that there are some scientists who are beginning to acknowledge that the scientific evidence for creation may well have considerable merit after all.

After more than 140 years of Darwinism, there are many scientists (and their number is growing rapidly) who have become convinced that the natural laws and processes that we now understand absolutely exclude the possibility that the Universe could have created itself, and who have become convinced that the best available evidence from science demonstrates that living things could not, and in fact, did not arise from lower forms. These scientists likewise have become convinced that the concept of creation is a much more credible explanation of the evidence related to origins. This is not to say, of course, that all scientists now believe in creation as opposed to evolution. Nor do I mean to imply that even a majority of scientists so believe. One thing is clear, however. There are many issues in evolution that have come to light which do not bode well for evolutionary theory. Unfortunately, many in the scientific community are totally unaware of the complete disarray to be found in modern evolutionary thought. Even the most current theories are on the verge of collapsing, or already have collapsed. One such example can be seen in the concept known as “punctuated equilibrium”—an “issue in evolution” that is worthy of examination.

PUNCTUATED EQUILIBRIUM

One of the most popular, yet seemingly one of the most controversial, issues in evolution today is the process known as “punctuated equilibrium” (also known as punctuated equilibria). This idea threatens to debunk once and for all the concept known as Neo-Darwinism (or, as it often is called, the modern “synthetic” theory of Darwinism) and to replace it with a dogma that is radically different from start to finish. In order to understand the current controversy, and the idea of punctuated equilibrium itself, a brief historical detour is in order.

If the theory of evolution is a true account of the origin and development of life on the Earth, it is obvious that the record of gradual development of plant and animal forms to higher forms should be imbedded in the crust of the Earth in successive layers. This record should correspond directly to the evolutionary development of the various species up to the present time. LeGros Clark, the famed evolutionist, stated exactly that when he wrote:

That evolution actually did occur can only be scientifically established by the discovery of the fossilized remains of representative samples of those intermediate types which have been postulated on the basis of the indirect evidence. In other words, the really crucial evidence for evolution must be provided by the paleontologist whose business it is to study the evidence of the fossil record (1955, p. 7).

From the publication of *The Origin of Species* in 1859 to the present day, evolutionists have searched in vain for those ever-elusive “missing links” demanded by Darwin’s theory. Darwin himself wrote in the *Origin* that “the number of intermediate and transitional links between all living and extinct species must have been inconceivably great” (1976, p. 293). Students have been taught for years that evolution proceeds as the result of the slow, gradual accumulation of small changes and that the evidence for such change eventually would come to light in “nature’s museum”—the record of the rocks. But the search has been fruitless. Where there should have been transitional forms in “inconceivably great” numbers, none appeared. As one science writer stated the issue:

In the fossil record, missing links are the rule: the story of life is as disjointed as a silent newsreel, in which species succeed one another as abruptly as Balkan prime ministers. The more scientists have searched for the transitional forms between species, the more they have been frustrated.... Evidence from fossils now points overwhelmingly away from the classical Darwinism which most Americans learned in high school: that new species evolve out of existing ones by the gradual accumulation of small changes, each of which helps the organism survive and compete in the environment (Adler, 1980, p. 95).

Quotations from evolutionists could be given literally by the hundreds to document both the truthfulness of this assessment and the complete absence of the necessary transitional forms in the fossil record.

George Gaylord Simpson recognized this fact as early as 1944 when he wrote that:

...continuous transitional sequences are not merely rare, but are virtually absent...their absence is so nearly universal that it cannot, offhand, be imputed entirely to chance, and does require some attempt at **special explanation**, as has long been felt by most paleontologists (1944, p. 105, emp. added).

Stephen J. Gould of Harvard commented on this very point when he observed:

The extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology. We fancy ourselves as the only true students of life’s history, yet to preserve our favored account of evo-

lution by natural selection we view our data as so bad that we never see the very process we profess to study (1977, p. 14).

Dr. Gould went on to suggest that “all paleontologists know that the fossil record contains precious little in the way of intermediate forms; transitions between major groups are characteristically abrupt” (1977, p. 24). David G. Kitts of the University of Oklahoma was even more blunt in his assessment of the fossil record when he observed:

Despite the bright promise that paleontology provides a means of “seeing” evolution, it has presented some nasty difficulties for evolutionists, the most notorious of which is the presence of “gaps” in the fossil record. Evolution requires intermediate forms between species and paleontology does not provide them... (1974, p. 467).

Such statements as these (all from the pens of famous evolutionists) could be multiplied many times over and are typical of the comments in the scientific literature concerning the fossil record. The transitional forms that Darwin said should be present in “inconceivably great numbers” simply are not there. Darwin, of course, tried to explain the lack of transitional forms by blaming their absence on what he called the “imperfection of the fossil record.” Gertrude Himmelfarb, in her book, *Darwin and the Darwinian Revolution*, observed that this was a favorite mechanism of Darwin—claiming “imperfection of the record” or “ignorance of the way nature works.”

As possibilities were promoted into probabilities, and probabilities into certainties, so ignorance itself was raised to a position only once removed from certain knowledge. When imagination exhausted itself and Darwin could devise no hypothesis to explain away a difficulty, he resorted to the blanket assurance that we were too ignorant of the ways of nature to know why one event occurred rather than another, and hence ignorant of the the explanation that would reconcile the facts to his theory (1959, p. 319).

But, as Simpson (1944, p. 105) and others have noted and time again, it no longer is possible to blame the absence of the transitional forms on the imperfection or poverty of the fossil record. The renowned geologist of England, T.N. George, even stated that “there is no need to apologise any longer for the poverty of the fossil record. In some ways it has become almost unmanageably rich and discovery is outpacing integration” (1960, p. 1). The transitional forms simply are not there, as the evidence clearly indicates. As early as 1944, Simpson noted that a “special explanation” was needed in this area. He was not the only one to recognize this need, however. Even earlier (in the 1930s) Europe’s top paleontologist, O.H. Schindewolf, had proposed just such an explanation. In 1940, he was joined in his defense of this

new idea by no less an eminent geneticist than Richard Goldschmidt of the University of California at Berkeley. In America, it was Dr. Goldschmidt whose name became synonymous with “systemic mutations” that were supposed to have produced “hopeful monsters.”

The idea, as set forth by both Schindewolf and Goldschmidt, was based on the fact that everything we know about genetics and paleontology shows that gradual evolution had not occurred, and could not occur. As one writer observed:

Goldschmidt also observed, after forty years working with micromutations, that they seemed to lead nowhere. However many mutations are combined in such an organism as the fruit fly (a favourite sacrifice upon the altar of genetics), it remains itself. Goldschmidt was puzzled: if mutations lead nowhere, what are the origins of hair in mammals, feathers in birds and segmentation in arthropods? Where did teeth, blood circulation, compound eyes and the poison apparatus of the snake come from? Logically enough, he broke with Darwinian graduation, suggesting that “mega” or “macro” mutations must provide the answers. These amounted to such a shake-up in the genetic works as would normally be intolerable—fatal. Goldschmidt argued, however, that once in a while a “hopeful monster” must appear, burdened with mutation complexes that could, in the course of time, turn into something useful.... Goldschmidt analogized a quantum jump or “saltation” in genetic material which might, for example, lead to a prototype bird hatching from a reptilian egg (Pitman, 1984, p. 72).

It was in 1940 that Dr. Goldschmidt published his now-famous work, *The Material Basis for Evolution*, in which he explained his “hopeful monster” concept. He said, in essence, that it was far past time for his colleagues to admit what was becoming common knowledge—i.e., that the fossil record consisted mainly of gaps and that there were no intermediate forms. He noted that evolutionary paleontologists had dug for almost a hundred years since Darwin, and still had no trace of the transitional forms needed to document evolution as having occurred. His idea, he felt, would provide an explanation as to why the gaps in the fossil record **ought** to be present. And so were born the concepts of “systemic mutations” and “hopeful monsters.”

Goldschmidt believed that the Neo-Darwinian mechanism then in vogue (the accumulation of mutations plus the influence of natural selection) basically was restricted to small changes **within** species, and had little or nothing to do with changes **between** species. He postulated that the larger, more important changes that ultimately caused evolution to occur were the result of what he called “systemic mutations.” Here, in abbreviated form, is how he suggested that these systemic mutations worked.

Goldschmidt suggested that it was not just one or two mutations but instead many mutations that affected the entire “system” of the growing embryo, perhaps even at the zygote stage in its development. Somehow, he said, what he termed a “rate gene” was affected. This rate gene in turn affected (increased) rates of growth, rates of differentiation, rates of production of materials that eventually would benefit certain physical or chemical development, etc. If the systemic mutations occurred early in the growth process, said Goldschmidt, a small change of genetic instruction would result in large-scale change in what ultimately would become the adult form. Yes, noted Goldschmidt, every now and then a sheep was born with only two legs. It was a monster, and died. And yes, a calf could be born with two heads. It, too, was a monster, and died. Such monstrosities could not survive. But hopefully, said Goldschmidt, if you found enough of them you might get a good one. This he chose to call the “hopeful monster.” He then called upon this concept to bridge each of the gaps between all the major kinds of organisms.

Goldschmidt’s evolutionary colleagues were incredulous. Theodosius Dobzhansky, the renowned evolutionary geneticist of the Rockefeller University (and a contemporary of Goldschmidt’s), expressed his displeasure at such a suggestion as “hopeful monsters” when he wrote:

Another theorist proposes that the marvelous gifts of evolution to the living world came to birth through sudden and drastic “systemic mutations,” which created “hopeful monsters” that were later polished down to the final product by evolutionary selection. But these theories amount only to giving more or less fancy names to imaginary phenomena; no one has ever observed the occurrence of a “systemic mutation” for instance (1957, p. 131).

For more than forty years, Goldschmidt and Schindewolf were held in utter contempt—their theories considered absolute heresy. As Henry Morris noted: “...neo-Darwinism prevailed at the time and the hopeful monster idea was mostly ridiculed, despite the high reputations of its advocates” (1982, p. 86). Goldschmidt’s idea that “systemic mutations” existed and supposedly were able to affect rate genes, thereby causing evolution to occur, was “...subtle, invisible, and plausible but no evidence exists that it is true,” as Pitman has observed (1984, p. 128). One scientist stated the matter in these words: “But we have not seen...systemic mutations.... It seems to me that a theory that must be supported with more unsubstantiated theories is from the standpoint of science not well established” (Sears, 1969, p. 57). Stebbins and Ayala fairly well summed up the matter when they wrote: “The specific solution postulated by Gold-

schmidt, that is, the occurrence of systemic mutations, yielding hopeful monsters, can be excluded in view of current genetic knowledge” (1981, 213:969).

One might think that would be the end of that matter. But not so. In 1944, Simpson attempted to resurrect the “hopeful monster” hypothesis, dress it in a new suit of clothes, and give it a new name. He called his idea “quantum evolution,” and presented it to a waiting world as his “special explanation” as to why there were no transitional forms to be found in the fossil record. Dr. Simpson described the concept as follows:

For the sake of brevity, the term “quantum evolution” is here applied to the relatively rapid shift of a biotic population in disequilibrium to an equilibrium distinctly unlike an ancestral condition. Such a sequence can occur on a relatively small scale in any sort of population and in any part of the complex evolutionary process (1944, p. 206).

Five years later, in 1949, Dr. Simpson still was trying to get his point across with regard to the need for a “special mechanism” and the aptness of quantum evolution to fill that need. He argued:

It is thus possible to claim that such transitions are not recorded because they did not exist, that the changes were not by transition but by **sudden leaps** in evolution. There is much diversity of opinion as to just how such leaps are supposed to happen (1949, p. 231, emp. added).

Thus, according to Goldschmidt and Simpson, Neo-Darwinian evolution with its transitional forms and slow, gradual pace no longer was defensible. Replacing it were the concepts of either “hopeful monsters” or “quantum evolution,” with their conspicuous absence of transitional forms and rapid pace. But as valiant as their attempts were to elicit change among their colleagues, the efforts put forth by Goldschmidt and Simpson were doomed. No one was ready to opt for hopeful monsters or quantum evolution. Thus, for over three decades their ideas were banished to the relic heaps of the historical past.

But no longer! As surprising as it may seem, Goldschmidt’s scheme now has been salvaged from the historical relic heaps. In 1972, Stephen J. Gould and Niles Eldredge proposed the concept of “punctuated equilibrium” to do the salvage job (1972, pp. 82-115). The essence of this theory is that during evolutionary periods, individual species change very little. Speciation occurs only when long periods of little change (“equilibrium”) are “punctuated” by abrupt events, at which time a descendant species arises from the ancestral stock. However, even this scenario may have involved several intermediate steps, say its

proponents. Yet each stage involved only organisms so unfit to survive that they ultimately left no fossil remains, and therefore we should find no transitional forms in the record of the rocks.

Lester and Bohlin, in their work, *The Natural Limits to Biological Change*, assessed the workings of the Gould/Eldredge theory as follows:

Their thesis was based on two primary paleontological observations. The first is the presence of gaps in the fossil record between species and higher taxonomic categories.... Second, and more important, is the observation that once a species appears in the fossil record, its morphology changes to only a trifling degree. From these two observations, Eldredge and Gould postulated that on a geological time scale, new species arose with sufficient suddenness as to appear instantaneously in the fossil record. **This would account for the gaps.** Once in existence, the species would stabilize, adjusting only to minor environmental fluctuations until it experienced the ultimate fate of all species, extinction, virtually unchanged. Evolution would be episodic rather than gradual in the Neo-Darwinian sense. The term **punctuated equilibrium**, then is easily explained. For 99 percent of a species' existence, it survives at an equilibrium, with minor fluctuations. This equilibrium, or period of stasis, is punctuated by a rapid speciation event. The new species eventually settles down to a new and different period of stasis (1984, p. 112, emp. in orig.).

Shortly after the Gould/Eldredge punctuated equilibrium theory was published in 1972, it began to attract its fair share of supporters, many of whom certainly would be considered “heavyweights” in the evolutionary camp. For example, only one year after its publication, the punctuated equilibrium viewpoint drew strong support from Derek Ager, past-president of the British Geological Association. He wrote in 1973: “I am now coming more and more to the opinion that most evolution proceeds by sudden short steps or **quanta** and I was pleased to see the same views recently expressed by S.J. Gould in America” (1973, p. 20, emp. in orig.). In that same book, Dr. Ager even gave his own description of how he viewed the geological history of the Earth when he said: “In other words, the history of any one part of the earth, like the life of a soldier, consists of long periods of boredom and short periods of terror” (1973, p. 100).

Steven Stanley, paleontologist of Johns Hopkins University, joined Dr. Ager on the punctuated equilibrium bandwagon in 1979 by writing that “the known fossil record fails to document a single example of phyletic evolution accomplishing a major morphologic transition and hence offers no evidence that the gradualistic model can be valid” (1979, p. 39). Two years later, Dr. Stanley would pen the book that would become a sort of “layman’s guide to punctuated equilibrium,” *The New Evolutionary Timetable: Fossils, Genes, and the Origin of Species*. In the preface to that work, he spoke of what the fossil record actually does document.

The record now reveals that species typically survive for a hundred thousand generations, or even a million or more, without evolving very much. We seem forced to conclude that most evolution takes place rapidly, when species come into being by the evolutionary divergence of small populations from parent species. After their origins, most species undergo little evolution before becoming extinct (1981).

But probably the two most important events affecting the ultimate acceptance of the punctuated equilibrium scenario centered on the publication of an article in 1977 by Dr. Gould, and a major conference on macroevolution that occurred in Chicago three years later. The effect of neither of these events can be overestimated. In the June/July 1977 issue of *Natural History* magazine, Dr. Gould penned an article titled, "The Return of Hopeful Monsters." Apparently he felt safe enough, seeing that it was five years after his first announcement of the punctuated equilibrium proposal, to broach the subject in such a way as to link it with the Goldschmidt postulate of almost four decades earlier. Gould was clear, both in what he was saying and in what he was trying to accomplish. He reminded his readers that "the fossil record with its abrupt transitions offers no support for gradual change....," and then went on to propose that "macroevolution proceeds by the rare success of these hopeful monsters, not by continuous small changes within populations." His additional comments left nothing to the imagination.

Indeed, if we do not invoke discontinuous change by small alteration in rates of development, I do not see how most major evolutionary transitions can be accomplished at all. Few systems are more resistant to basic change than the strongly differentiated adults of "higher" animal groups. How could we ever convert a rhinoceros or a mosquito into something fundamentally different? Yet transitions between major groups must have occurred in the history of life (1977, p. 30).

"Discontinuous change by small alteration in rates of development" is exactly what Dr. Gould was advocating. He continued:

As a Darwinian, I wish to defend Goldschmidt's postulate that macroevolution is not simply microevolution extrapolated and that major structural transitions can occur rapidly without a smooth series of intermediate stages.... I do, however, predict that during the next decade Goldschmidt will be largely vindicated in the world of evolutionary biology (1977, pp. 24,22).

Little did anyone understand at the time that Goldschmidt's "vindication" was being prophesied by the very man who would attempt to vindicate him! That vindication, in fact, already was underway, and would be accelerated by a major evolutionary conference to be held three years later. During the dates of October 16-19, 1980 over 160 of the world's foremost evolutionary scientists (geneticists, paleontologists, anatomists, molecular biologists, etc.) gathered at the Field Museum of Natural History in Chicago,

Illinois to grapple with the knotty problems associated with of macroevolution. In fact, that was the title of the conference—“macroevolution.” When Dr. Gould published his article on hopeful monsters in 1977, the scientific community shuddered in horror, for not only was it an open admission that there was no evidence connecting the major groups of organisms, but it amounted to “throwing in the towel” and confessing that it was impossible to even make up a story that would be met with anything but ridicule and derision. Not only was Gould proposing that entirely new species arose by huge jumps so that they left no transitional forms in the fossil record, but he also was challenging the “sacred cow” of evolution—natural selection.

Three years after his 1977 article on “The Return of Hopeful Monsters,” Dr. Gould would take his public stand to vindicate Goldschmidt. The Chicago conference would be his opportunity to put his best foot forward. And he did just that. As Jerry Adler said, reporting on the conference for *Newsweek* magazine:

Seventy years after quantum theory revolutionized physics, an oddly analogous change has occurred in the theory of evolution—and it is just beginning to filter down to public understanding.... Increasingly, scientists now believe that species change little for millions of years and then evolve quickly, in a kind of quantum leap—not necessarily in a direction that represents an obvious improvement in fitness. The theory is still being worked out. Among other points of contention, it is uncertain whether the leap takes place in a few generations or over tens of thousands of years. But at a conference in mid-October at Chicago’s Field Museum of Natural History, the majority of 160 of the world’s top paleontologists, anatomists, evolutionary geneticists and developmental biologists supported some form of this theory of “punctuated equilibria” (1980, p. 95).

Roger Lewin prepared a report of the conference for *Science* magazine in which he commented on the fact that the idea of punctuated equilibrium (as opposed to Neo-Darwinian gradualism) did not come easy to those in attendance. He noted that “the proceedings were at times unruly and even acrimonious.” But he also noted that “many people suggested that the meeting was a turning point in the history of evolutionary thought.” Francisco Ayala, who made it clear that he had no love for the idea of punctuated equilibrium, went on record as stating that Neo-Darwinists “would not have predicted stasis from population genetics, but I am now convinced from what the paleontologists say that **small changes do not accumulate**” (1980, emp. added). Gabriel Dover of Cambridge University may well have summarized the Chicago conference succinctly and correctly by calling “species stasis ‘the single most important feature of

macroevolution.’”

Dr. Gould himself has spoken eloquently to the point that there are two important factors from the fossil record that brought about the hypothesis of punctuated equilibrium. He is on record as stating that:

The history of most fossil species includes two features particularly inconsistent with gradualism:

1. Stasis. Most species exhibit no directional change during their tenure on earth. They appear in the fossil record looking much the same as when they disappear; morphological change is usually limited and directionless.
2. Sudden appearance. In any local area, a species does not arise gradually by the steady transformation of its ancestors; it appears all at once and “fully formed” (1980, p. 182).

In a later article, Gould carefully emphasized that of these two factors, stasis is by far the most important.

In fact, he even went so far as to say that “the potential validation of punctuated equilibrium will rely primarily upon the documentation of stasis” (1982, p. 86).

What response(s) should be made to the concept of punctuated equilibrium? There is little doubt that it is destined to be the newest and most widespread attempt to describe at face value the evidence of the fossil record. While it has met with some resistance from “old-guard” evolutionists who still cling doggedly to Neo-Darwinism, it is growing stronger every day as the mainstream explanation for how evolution works. The following observations therefore are in order.

(1) Evolutionists have so strongly promoted gradualism by saturating their course outlines, textbooks, and audio-visually with it that to admit to an abandonment of it is nothing less than a candid admission of error. Students no doubt will question why a theory that has been around since the late 1930s was kept wrapped in secrecy until the majority of the “experts” finally accepted it. If it was right, why has it been kept hidden so long?

(2) If evolution-related materials are changed to include the punctuated equilibrium concept, it amounts to nothing less than a tacit admission that creationists have been correct all along in stating that there is no fossil evidence supporting the theory that all life is connected to a common ancestor. Michael Denton, himself an evolutionist, commented on that very point in his classic work, *Evolution: A Theory in Crisis*. He first noted that it would require nothing short of “miracles” to bridge the discontinuities in the

fossil record, and then added that “the punctuational model of Eldredge and Gould has been widely publicized but, ironically, while the theory was developed specifically to account for the absence of transitional varieties between species, its major effect seems to have been to draw widespread attention to the gaps in the fossil record” (1986, p. 194). Evidence for punctuated equilibrium is identical to the evidence for creation, namely, the abrupt appearance of all major categories of organisms, with nothing connecting them directly to any other groups. Gary Parker has spoken to this point.

Now at least we have the **chief advantage** of the hopeful-monster or punctuational approach: **it explains why the links are still missing**. Either they were so unfit to survive that they never multiplied in numbers sufficient to leave fossil remains, or else evolution simply jumped from one basic structural plan to another with no intermediate steps. Here again we find the creationist and the modern evolutionist (the post-neo-Darwinian punctuationalist) at least **agreeing that the missing links are missing**. But what is the scientific difference between saying that the missing links can never be found (the “new” evolution) and saying that they never existed at all (creation)?... The “rear guard” neo-Darwinian evolutionists like to point out the apparent absurdity of hopeful-monster evolution and claim that **evolution could not happen fast**. The punctuational evolutionists point to genetic limits and the fossil evidence to show that **evolution did not happen slowly**. The creationist simply agrees with both sides: evolution couldn’t happen fast and it didn’t happen slowly—because evolution can’t and didn’t happen at all! In terms of the kind of variation that **can** and **did** occur, the creation concept seems to be the more logical inference from our observations (1982, p. 115, emp. in orig.).

Alan Hayward also addressed these important points and suggested that:

The controversy is likely to go on for a long time, since both sides have at least one short suit. Orthodox Darwinism offers a plausible biological explanation for what might have happened, but is in conflict with the evidence of geology. And the alternative theory accepts the geological record, but cannot explain how species could arise so suddenly. To the outside observer it seems that both these versions of Darwinism are on shaky ground (1985, p. 19).

(3) When Dr. Hayward mentioned, concerning punctuated equilibrium, that it “cannot explain how species could arise so suddenly,” he provided a kernel of truth that should be explored further. If the main thrust of punctuated equilibrium is to explain how species “arise suddenly,” why, then, does he state that it cannot do exactly that? The answer, of course, lies in an examination of the genetic basis of the punctuated equilibrium concept. Hayward himself reminded his readers of the fact that

...mutations do not appear to bring progressive changes. Genes seem to be built so as to allow changes to occur **within certain narrow limits**, and to prevent those limits from being crossed. To oversimplify a little: mutations very easily produce new varieties within a species, and might occasionally produce a new (though similar) species, but—despite enormous efforts by experimenters and breeders—mutations seem unable to produce entirely new forms of life (1985, p. 55, emp. and parenthetical comment in orig.).

Punctuated equilibrium ultimately is dependent upon genetic changes—changes that are derived via mutations. The exact mechanism that accomplishes the genetic changes required in punctuated equilibrium still

is unknown. Lester and Bohlin wrote that "...the genetic aspects of this new development are open to a wide number of alternatives. With Neo-Darwinism, the gradual accumulation of point mutations over long periods of time was easily identified as the mechanism. No such clear-cut mechanism is available for scrutiny with punctuated equilibrium" (1984, p. 112). Even advocates of punctuated equilibrium do not profess to know the exact genetic mechanism. All they know is that genetic mutations of some kind are responsible. But of what good are these specific genetic mutations, even in the case of punctuated equilibrium? Lester and Bohlin also commented on this important point:

The overall factor that has come up again and again is that mutation remains the ultimate source of all genetic variation in any evolutionary model. Being unsatisfied with the prospects of accumulating small point mutations, many are turning to macromutations to explain the origins of evolutionary novelties. Goldschmidt's hopeful monsters have indeed returned. However, though macromutations of many varieties produce drastic changes, the vast majority will be incapable of survival, let alone show the marks of increasing complexity.... The overriding consensus of geneticists and population biologists, by far, is that the feasibility of macromutations being significant in evolution is practically nil....

A mutation of small effect is not very likely to disrupt an organism's balance with its environment, whereas a mutation producing a drastic phenotypic change stands the possibility of greatly altering the organisms chances of survival. Of concern is not whether such mutations occur. They do. What matters is, first, whether they are capable of surviving and, second, whether the mutation can be assimilated by the whole population, even a small founder population. Apparently there is little if any evidence to indicate that either of these situations is possible (1984, pp. 141,138).

These two scientists are not the only ones offering such an assessment. Dr. Gould himself has provided weighty testimony on this subject. In a public speech at Hobart College on February 14, 1980 Dr. Gould went on record as stating: "A mutation doesn't produce major new raw material. You don't make a new species by mutating the species.... That's a common idea people have; that evolution is due to random mutations. A mutation is not the cause of evolutionary change" (as quoted in Sunderland, 1984, p. 106). Evolutionist Richard Lewontin admitted: "We know virtually nothing about the genetic changes that occur in species formation" (1974, p. 159). And Guy Bush echoed that sentiment by acknowledging that "although the importance of speciation is clear and convincing, the processes involved are, for the most part, unknown" (1982, p. 119).

We are being asked to believe that evolution did occur, and that it occurred rapidly. We are being asked to believe that it occurred as the result of drastic genetic changes that produced rapid species formation along with immediate morphologic divergence. Yet we are told that the mechanisms for these

changes are “for the most part, unknown.” What we **do** know is that a mutation “is not the cause of evolutionary change” (to quote Dr. Gould). Gary Parker certainly was well within the mark when he concluded:

...this new concept of evolution is based on the fossils we **don't** find and on genetic mechanisms that have **never** been observed. The case for creation is based on thousands of tons of fossils that we **have** found and on genetic mechanisms (variation within type) that we **do** observe and put into practice every day. As a scientist, I'm inclined to prefer a model that's based on what we **do** see and **can** explain (creation), rather than one that's based on what we don't see and cannot explain (evolution) [Morris and Parker, 1982, p. 116, emp. in orig.].

(4) Surely one of the points that comes to bear on this issue is Gould's insistence that “species stasis is the single most important feature of macroevolution.” Doesn't this sound a bit odd? If stasis means anything, it means staying the same. If evolution means anything, it means change. We are discussing **macroevolution** (i.e., large and sudden changes). Yet we are being asked to believe that the “most important feature of macroevolution” is **no change** (stasis)! Does it not seem, then, that we are being asked to accept that the most fundamental fact of the evolutionists' theory of change is that everything stays the same? As Henry Morris correctly observed:

Thus, paradoxically, the main characteristic of evolution has become stability. Evolution, which implies “change,” is mostly characterized by stasis, which means “no change.” The mechanism of evolution is long periods of equilibrium punctuated by brief but dynamic episodes of chance upheavals, which somehow heave things up instead of down.... This is an amazing excursus into the logic of wonderland. Since species survive indefinitely without significant change (except extinction), therefore they evolve rapidly! (Morris and Parker, 1982, pp. 83-84).

Do not think that the evolutionists missed have this point. In fact, they now have begun to write so as to convince us that evolution really does not mean “change” at all. Instead, we are told:

Expectation colored perception to such an extent that **the most obvious single fact about biological evolution—nonchange**—has seldom, if ever, been incorporated into anyone's scientific notions of how life actually evolves. If ever there was a myth, it is that evolution is a process of constant change (Eldredge and Tattersall, 1982, p. 8, emp. in orig.).

Compare that statement by one of the co-authors of the new punctuated equilibrium theory to this now-famous (and practically universal) definition of evolution from the pen of renowned evolutionist Sir Julian Huxley:

Evolution in the extended sense can be defined as a directional and essentially irreversible process occurring in time, which in its course gives rise to an increase of variety and an increasingly high level of organization in its products. Our present knowledge indeed forces us to the view that the whole of reality is evolution—a single process of self-transformation (1955, p. 278).

Now which are we to believe? Do we accept that evolution is, in fact, “an increasingly high level of or-

ganization” and a “process of self-transformation”? [Increasing the level of organization and engaging in self-transformation most assuredly can be called “change.”] Or, do we accept Eldredge’s new definition that evolution really means “nonchange?” Interesting, isn’t it, how the rules are being rewritten in the middle of the game?

(5) There are other major problems with the concept of punctuated equilibrium as well. Dr. Goldschmidt asked us to believe that such monsters eventually would be born, given enough time. One of the most serious problems—which becomes evident the moment any kind of “hopeful monster” scheme is taken seriously—is this: with what would the “monster” mate. After all, the probabilities of getting even one viable “monster” are so ridiculous as to be almost laughable. But now we are asked to believe that the system produced **two** such monsters in the same geographic region, during approximately the same time span, with one being a male, one being a female, and both being fertile. Then, of course, we are expected to believe that these two somehow found each other, mated, and produced fertile offspring—which would breed with what? Stanley addressed this problem, and even attempted to find a way around it, when he wrote:

...there has recently been renewed expression of support for the importance in macroevolution of what Goldschmidt (1940) termed the hopeful monster.... At least in principle, Goldschmidt accepted Schindewolf’s extreme example of the first bird hatching from a reptile egg. The problem with Goldschmidt’s radical concept is the low probability that a totally monstrous form will find a mate and produce fertile offspring (1979, p. 159).

So, how does Stanley solve this problem? Why, he allows in his scenario for several monsters to evolve within a single population, of course. He avers that “evidence is also mounting that quantum speciation events themselves may span rather few generations.... It is generally agreed that quantum speciation takes place within very small populations—some would say populations involving fewer than 10 individuals” (1979, p. 145).

There you have it. In a very small population (fewer than 10 individuals) you will have macromutations present that can produce not one, but two “monsters” while at the same time giving you one male, and one female, both of which “just happen” to undergo the same transformation so that, when all is said and done, both are fertile and able to interbreed, thus producing offspring (which then will breed with

what?). As one writer commented upon hearing this suggested scenario: "It would seem that one could as easily believe in a fairy godmother with a magic wand!" (Morris, 1982, p. 88).

(6) As bad as all this may seem, things get progressively worse. One of the most revered of the Neo-Darwinians, population geneticist Sewall Wright, has discussed an additional problem inherent in the concept of punctuated equilibrium.

The reorganization required for the origin of the highest categories may seem so great that only "hopeful monsters" will do. Here, however, we must consider the size and complexity of the organisms. Such changes would probably have been impossible except in an organism of very small size and simple anatomy. I have recorded more than 100,000 newborn guinea pigs and have seen many hundreds of monsters of diverse sorts, but none were remotely "hopeful," all having died shortly after birth if not earlier (1982, 36[3]:440).

We are not dealing merely with "simple" organisms like a bacterium, amoeba, or paramecium (as if these were in any way "simple"). Dr. Wright's point (and it is well made) is that this system must work at all levels of evolution. Yet his own experimental evidence and practical experience have shown him that "monsters" rarely occur, and when they do, they turn out not to be "hopeful." The kind of genetic changes that would be required to cause plants or animals to cross phylogenetic boundaries would be so detrimental as to destroy the very thing the evolutionist needs so desperately to create in the first place.

(7) One last point bears mentioning. Evolutionists sometimes insist that the punctuated equilibrium concept applies only to sudden changes at the species level, and therefore should not be equated with the concept of "hopeful monsters," which presumably would apply only to higher categories. In fact, in an "enthusiastic" exchange between creationist Duane Gish and evolutionist Stephen J. Gould in the pages of *Discover* magazine (May and July, 1981), Dr. Gould was incensed that Dr. Gish would equate the ideas of punctuated equilibrium (as defended by Gould) and "hopeful monsters" (as proposed by Goldschmidt). Gould apparently does not want to be saddled with the same ridicule that Goldschmidt endured (and one certainly can understand why!). During the *Discover* exchange, Gould suggested that anyone who would believe that a bird hatched from a reptile egg would be laughed off the intellectual stage, and then accused Dr. Gish of misrepresenting evolutionists by mentioning such a concept. Appropriately, however, Gish pointed out in his response that the "reptile-bird jump" had been used as a specific example that was

quoted approvingly by Goldschmidt. Further, Gish reminded Dr. Gould that it was Gould himself who wrote on “the return of hopeful monsters” (1977), claiming that Goldschmidt would be vindicated. Also, it is of interest to note that Stanley, in his work, *Macroevolution: Pattern and Process* (1979), referred at least twice in an approving way to the possibility of “hopeful monsters.”

Remember also that it is Dr. Gould (and other punctuationalists) who frequently have referred to the sharp gaps between phyla, classes, orders, and families as evidence of punctuated equilibrium. Interesting, is it not, how they want to restrict the criticism of punctuated equilibrium by creationists “only to species” while their “proof” is allowed to come from phyla, classes, orders, families, etc. Once again, the rules have been changed in the middle of the game.

Furthermore, a survey of the tenets of Goldschmidt’s “hopeful monster” concept and Gould’s “punctuated equilibrium” concept shows not a nickel’s worth of difference between the two. Notice the following comparison.

Tenet	“Hopeful Monsters”	“Punctuated Equilibrium”
1	Natural selection has nothing to do with the origin of new species.	“Natural selection works to tune things up a bit, but doesn’t originate new species.”
2	There are no transitions connecting families and above.	The fossil record offers no support for gradual change. Species appear suddenly with no intermediate links.
3	New species arise in big steps.	“We can well imagine a Neo-Darwinian theory of discontinuous change—a profound and abrupt genetic lucky alteration making a new species all at once.”
4	Small changes have nothing to do with the origin of species.	“Macroevolution is not simply microevolution extrapolated.”

Naturally, Dr. Gould does not want too strict a comparison made between his “new” system of punctuated equilibrium and Goldschmidt’s “old” system of hopeful monsters. The reason is obvious. The two are practically identical. Even if an animal does not go from a reptile to a bird in one fell sweep via “systemic

mutations,” can it go from a leg to a wing in one jump? Or can it go from scales to feathers in one jump? And if the jump is not at least that big, then what is the difference between Gould’s punctuated equilibrium and plain old Neo-Darwinism based on the (apparently) discredited idea of the gradual accumulation of minor mutations?

When the dust settles, evolutionists find themselves right back where they started—leaning on a broken reed as a crutch while they struggle to defend an indefensible system. Surely the concept of punctuated equilibrium hits an all-time low when it suggests that evidence which we do **not** see in the fossil record establishes that the evidence which we **do** see from genetics simply is mistaken. Jerry Adler, writing for *Newsweek* after the 1980 Chicago conference on macroevolution, suggested: “It is no wonder that scientists part reluctantly with Darwin. His theory of natural selection was beautiful in its simplicity, and it has served well for over a century. To tamper with it is to raise a host of questions for which there are no answers” (1980, p. 96).

No answers indeed! Perhaps the words of the renowned evolutionary zoologist of France, Pierre-Paul Grassé, are apropos here. Although he was speaking of the concept of Neo-Darwinism, his assessment fits the concept of punctuated equilibrium equally well. “To insist that life appeared quite by chance and evolved in this fashion is an unfounded supposition which I believe to be wrong and not in accordance with the facts” (1977, p. 107). I agree wholeheartedly. It is interesting to note that the famous evolutionary anthropologist, Ernest Hooton, commented in 1937 on the same topics we are discussing here. His words are worthy of mention.

Saltatory evolution by way of mutation is a very convenient way of bridging over gaps between animal forms.... Now I am afraid that many anthropologists (including myself) have sinned against genetic science and are leaning upon a broken reed when we depend upon mutations (1937, p. 118).

One cannot help but wonder why, after more than fifty years of additional study, evolutionists of today cannot see how correct Dr. Hooton was. Perhaps Dr. Grassé stated the matter best when he observed:

Today our duty is to destroy the myth of evolution, considered as a simple, understood, and explained phenomenon which keeps rapidly unfolding before us. Biologists must be encouraged to think about the weaknesses and extrapolations that theoreticians put forward or lay down as established truths. The deceit is sometimes unconscious, but not always, since some people, owing to their sectarianism, purposely overlook reality and refuse to acknowledge the inadequacies and falsity of their beliefs (1977, p. 8).

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