

LITERATURE REVIEWS

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A GOD OF THE GAPS?

PUNCTUATED EQUILIBRIA: THE TEMPO AND MODE OF EVOLUTION RECONSIDERED. Stephen Jay Gould and Niles Eldredge. 1977. *Paleobiology* 3(2)115-151.

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Creationists have long argued that the fossil record offered scant support for the theory of evolution because it was characterized by many “missing links” and large gaps between major “kinds” of plants and animals.

Although dutifully deployed by virtually every creationist author, the “gap critique” has failed to dent the momentum of evolutionary theory. With the confidence befitting a juggernaut, Darwinian evolution has rolled on, content in its belief that the gaps in the fossil record were not real.

Yet, in one of those surprising shifts in perspective that occasionally turn a discipline inside out, leading paleontologists are now accepting the validity of some of creationists’ most trenchant criticisms, including the gap critique.

Paleontology combines the disciplines of biology and geology, both of which have long looked at the natural world through uniformitarian glasses inherited from Charles Lyell. It was Lyell who sold the nascent science of geology on the importance of an uncompromising uniformitarian view of earth history.¹ According to Lyell, present “tempos” as well as “modes” were the key to the earth’s past — and geology’s future as a science. Darwin’s view of life was similar to Lyell’s view of the rocks — uncompromising in its uniformitarianism. For Darwin the key to the history of life also lay in present tempos and modes. Central to Darwin was the conviction that microevolutionary changes observable in the present could be expanded infinitely to account for the origin of all species.²

Now there are signs that geologists and biologists are becoming uncomfortable with their Lyellian glasses. Some are daring to give expression to their malaise, pointing to blind spots and distortions in the overly restrictive view of nature they have inherited from Lyell. In the field of sedimentary geology, for example, the concept of catastrophism has been resurrected,

the dust of 100 years of neglect brushed off, and catastrophic explanations offered for many (but not all) features of the earth's crust. The most notable advocate of "neocatastrophism" in geology is Derek Ager. He vividly captures the new catastrophic point of view in geology in these 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."³

So it should not be surprising that a similar view of reality is now emerging in paleontology. The paleontological challenge to Darwinian uniformitarianism is also a return to a more catastrophic view of reality. Any revival of catastrophic views of nature is naturally of keen interest to creationists, whose reaction to the recent developments could justifiably be — "At last!"

One of the best articles for understanding the new developments in paleontology is found in a lively and stimulating professional journal called *Paleobiology*. The article is entitled "Punctuated Equilibria: The Tempo and Mode of Evolution Reconsidered," and is written by Stephen Jay Gould of Harvard University and Niles Eldredge of the American Museum of Natural History. Here, Gould and Eldredge vigorously restate their theory, defend it against its critics, and summarize the status of the debate it has inspired.

Have Gould and Eldredge really accepted the creationist critique? Probably not consciously, but listen to the assertions they make about the fossil record and evolution:

1. *Paleontologists have dealt with the fossil record in a seriously biased manner.* ("Paleontologists have worn blinders that permit them to accumulate cases in one category only: they have sought evidence of slow, steady and gradual change.... other classes of information were explained away or simply ignored....") (p 116).
2. *Stability is more fundamental than change.* ("...most species ...either do not change in any appreciable way, or else they fluctuate mildly in morphology, with no apparent direction.") (p 115).
3. *The gaps in the fossil record are real and will not go away with more collecting.* ("The punctuations that mark the fossil record do not smooth out as stratigraphic resolution improves.") (p 118).
4. *The processes that produce small-scale changes in living organisms are inadequate to explain the origin of the tremendous variety of living forms.* ("Genetic substitution within populations cannot be simply extrapolated to encompass all events in the history of life.") (p 139).
5. *Rates of change are far too slow to account for macroevolution.* ("The characteristic rates of supposed gradualistic events... are

too slow to account...for adaptive radiations and the origin of new morphological designs.”) (p 133).

All of these points have been raised by creationists, though, sad to say, rarely as cogently or with comparable sophistication.

Although these new developments will be (and should be) viewed by creationists as a sort of vindication, it is quite unlikely that creationist views will now achieve greater acceptance in paleontology. After all, the title of Gould and Eldredge’s article is *not*: “Punctuated Equilibria: Evolution Reconsidered!”

Most scientists who come to accept the Punctuated Equilibria model will follow Gould and Eldredge’s lead in assuming that macroevolution must be true (primarily because no other alternative exists within the framework of natural law) and direct their energies towards the task of explaining why intermediate forms should nevertheless not be expected in the fossil record.

To nonevolutionists this procedure may seem to smack of making the best of a bad situation — an ad hoc attempt to explain contradictory data. And the argument does come full circle: “Why don’t we find missing links?” Gould and Eldredge’s answer to the question is still the traditional one: “Because the fossil record is biased.” New is only the degree of emphasis placed on viewing the record as *hopelessly* biased. It is not that samples are currently inadequate, but that the nature of speciation and macroevolution makes the fossil record forever inadequate for the purpose of documenting the historical continuity that *must* have linked all forms of life.

Vindicated or not, creationists should steel themselves for the possibility that the new models in paleontology will make the creationist position less influential in the world of paleontological science. One of the most successful techniques a society can employ in meeting its radical critics is simply to co-opt much of the critique. In a sense the Punctuated Equilibria model co-opts the creationist critique. Therefore a real danger exists that paleontologists may be even more disposed to conclude that the creationist critique is irrelevant (partially true, but unimportant), and will swallow with relief any previous uneasiness over the absence of evidence for intermediate forms.

Ironically, creationists may find themselves holding a rooting interest in the success of the critics of Punctuated Equilibria! The strongest pressure for taking creationist models of the fossil record seriously may flow from a combination of compelling evidence for gradual evolution at lower taxonomic levels coupled with persuasive evidence against it at higher taxonomic levels.

A sometimes unnoticed aspect of the current discussion is that the Punctuated Equilibria model carries the emphasis on discontinuity beyond the range of the traditional creationist critique, extending it even to the species level. This has to be viewed as a mixed blessing by creationists,

because few wish to argue that the origin of many species necessarily involves direct special creation. Thus, if the Punctuated Equilibria model applies even to species, then species can and do evolve into new species without leaving connecting links in the fossil record. This tends to minimize the significance of gaps in the record — the lynchpin of the creationist critique.

Nevertheless, creationists can continue to insist upon the differences between the gaps that exist between lower taxa-like species and those that separate *different basic morphological designs*. If discontinuity is fundamental in the record all the way down to the level of species and “species selection” is the essence of evolution above the subspecies level (as Gould and Eldredge claim), why is not the degree of discontinuity characteristic of the species level characteristic of the entire fossil record?

In short, even if Gould and Eldredge’s view of speciation is correct and their explanation of the mechanisms of evolutionary change above the subspecies level is true, the problem of the “macro-gaps” between major morphological designs remains just that — an unsolved problem. Gould and Eldredge still do not have a tested mechanism to explain these gaps. The best they can presently offer is “changes in regulatory genes” — the genes that presumably control the growth and development of an animal from its conception until maturity.

Gould and Eldredge admit the gaps between basic morphological designs are enormous:

Smooth intermediates between Baupläne [basic morphological designs] are almost impossible to construct, even in thought experiments; there is certainly no evidence for them in the fossil record (curious mosaics like Archaeopteryx do not count) (p 147, emphasis supplied).

We might liken the Punctuated Equilibria view of speciation to one of these ubiquitous institutional electric wall clocks. The kind whose minute hand jerks in a noisy, almost spastic, spasm from one minute marker to the next, instead of flowing smoothly like the accompanying second hand. If Gould and Eldredge are correct, speciation proceeds by “jerks” because it occurs with geologic suddenness in small geographically isolated portions of a species that are under intense selective pressure. In these “peripheral isolates” one stable genetic system rapidly collapses and is replaced by another. Perhaps all this, although still far from adequately tested, is a more accurate description of the usual process of speciation and accounts for low level evolutionary change, whereas the observable processes of microevolution account predominantly for changes *within* species. But what mechanism is there to explain the prodigious leaps to new basic morphological designs (new “kinds” of animals)? Can a few random changes in regulatory genes produce workable new basic designs?

Or are we still stuck with “hopeful monsters,”⁴ “quantum evolution,”⁵ “inadaptive phases”⁶ and the other empty terminological ghosts of past confrontations with the stubborn fact of the systematic discontinuities in

the fossil record? Do Gould and Eldredge, like others before them, offer us only another set of terms (“species selection,” for example) but no real explanation of how new designs could arise with such apparent abruptness?

Their solution may not be satisfactory, but in their diagnosis of paleontology’s problems Gould and Eldredge are surely right on target. The extreme uniformitarian visions of reality characteristic of the historical natural sciences have never been based on an objective assessment of the actual nature of the record. They have been imposed on reality as western science has looked at the past wearing some very special cultural blinders (p 145-147).

The factors in our culture that have led to this view of reality are changing. The intellectual by-products of these changes are spilling over into many scholarly disciplines, including paleontology. But paleontologists still shrink from the possibility that the gaps in the fossil record can be the final word about the origin and history of life. Understandably they turn back, perhaps in fear of giving up too soon the attempt to develop natural explanations. But is it good science to exclude any possibility? Even the intellectually uncomfortable (for natural scientists) possibility that in a paleontological sense there is a God of the gaps?

ENDNOTES

1. Lyell C. 1892. Principles of geology. Vols. I and II. 11th ed. NY: D. Appleton and Company.
2. Darwin C. 1960. The origin of the species: by means of natural selection or the preservation of favoured races in the struggle for life. Introduction by Sir Julian Huxley. NY: Mentor Books, New American Library.
3. Ager DV. 1973. The nature of the stratigraphical record. NY: Macmillan Press, p 100.
4. Goldschmidt R. 1960. The material basis of evolution. NJ: Pageant Books.
5. Simpson GG. 1944. Tempo and mode in evolution. NY: Columbia University Press.
6. Simpson GG. 1953. The major features of evolution. NY: Columbia University Press.