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**EVOLUTION (third edition), Monroe W. Strickberger, 2000, Jones and Bartlett, Sudbury, Massachusetts, Jones & Bartlett, 721 pp., hardcover \$83.95.**

Did paleontology ever sit at the high table? In the 1970s, paleontology began to shake its status of subservience to genetics and Neo-Darwinism, and proclaim that the fossil record taught us things that could not be observed in lab mice or Galapagos finches. At the 1980 Chicago evolution conference, paleontology's challenge to the hegemony of the fruit flies first made an impact. During the 1980s, the importance of stasis as an unexplained phenomenon began to have an effect on the Neo-Darwinian orthodoxy, and the hierarchical thinking that led to models of species sorting were developed and published. In 1984, one of the doyens of the Neo-Darwinists, John Maynard Smith, wrote, "Paleontologists have too long been missing from the high table. Welcome back" (*Nature*, v. 309, p. 402). It seemed as though paleontology was finally going to be a major player in the community of evolutionary biology, and take part in the societies and journals (such as *Evolution*, founded in part by paleontologists) that had long been the domain of geneticists.

The year 2002 marked the thirtieth anniversary of the Eldredge and Gould punctuated equilibrium paper, which profoundly changed the way paleontology works. So much so that debates about the relative importance of punctuation have ceased, and recent papers in journals like *Paleobiology* take stasis and punctuation for granted, and rarely mention gradualism. Among paleontologists, the punctuated equilibrium pattern is now assumed as given, and the controversies have now moved into areas regarding macroevolutionary patterns and processes, coordinated stasis, mechanisms for evolutionary explosions, and the random effects of mass extinction events on otherwise well-adapted organisms.

The year 2002 also marked the passing of our most eloquent spokesman, Stephen Jay Gould, even as his long-awaited magnum opus, *The Structure of Evolutionary Theory* (Harvard University Press) was finally published. Yet despite the glowing remarks in obituaries, there were rumblings by evolutionary biologists that Gould and the paleontological challenge were wrongheaded in their views of evolution, and will be soon regarded as a "minor footnote" (see remarks summarized by Shermer, 2002, *Social Studies of Science*, v. 32, p. 489-524).

So how effective was the paleontological revolution in changing the thinking of orthodox Neo-Darwinists? Combing the pages of recent issues of *Evolution* shows even fewer papers by paleontologists than before, and evolution meetings have had even fewer paleontologists participating than in the 1980s. Paleontology continues to be balkanized into GSA meetings, North American Paleontological Conferences and the like, with little or no cross-fertilization from neontologists, who seldom consider paleontological issues in their own meetings. If it seemed that paleontologists were going to have an impact on evolutionary theory in the 1980s, we have lost considerable ground since then.

Perhaps the most revealing barometers of the thinking of the evolutionary biology mainstream are textbooks adopted to teach future generations of biologists. Two of the most widely used are Strickberger's *Evolution* (now in its third edition) and Levinton's *Genetics*,

*Paleontology, and Macroevolution* (already in its second edition). Surely 30 years since the debates began, these books have had a chance to digest what paleontologists have been saying, and modify their strict Neo-Darwinian views to a "new and general theory of evolution" (as Gould suggested in 1980)?

However, a closer examination of both books is profoundly disappointing for paleontologists. Strickberger's book was first published in 1990, but it could have been written in the 1960s. It takes the student through all the basic topics in history of evolutionary thought, genetics and molecular evolution, and then a phylum-by-phylum tour of the animal kingdom that assumes the student has had no previous exposure to most groups of animals or plants in basic biology. Punctuated equilibrium rates only half a page (p. 599-600), and even this mention completely misses the point of all the arguments of the past 30 years, dismissing the debate as a minor quibble about rates of speciation. Even more disturbing is the antiquated level of presentation of the major topics of animal evolution, with diagram after diagram that have long been abandoned by paleontologists familiar with the cutting edge of research. For example, the "hypothetical ancestral mollusc" makes a surprise reappearance (p. 377); the idea that jaws are modified gill arches (long discredited in vertebrate paleontology) is still promulgated (p. 402); the ancient division of Reptilia into four subclasses based on temporal fenestra reappears (p. 420), with the even more outdated notion that Synapsida ("mammal-like reptiles") had anything to do with the Reptilia as now defined; archaic ideas of Mesozoic mammal evolution also are featured (p. 449); and scattered throughout are outdated wastebasket taxa (such as "Eupantotheria," "Agnatha," and "Thecodontia") and 30-year-old diagrams of the evolutionary relationships of groups that show no relationship at all—each taxon independently arises from some paraphyletic ancestral group as if the past 30 years of phylogenetic studies have learned nothing. Symptomatic of this outdated approach is the cutesy animation printed on the lower right corner of each odd-numbered page, which form a flip book showing a primitive tetrapod crawling out on land to catch insects. As explained on the title page, this reflects the old notions that tetrapods crawled out of the water to escape predators or catch new prey—but completely ignores all the new evidence from *Acanthostega* and other recent finds that suggest four-legged animals evolved their limbs while remaining fully aquatic, and not in response to a need to crawl up on land.

If Strickberger's book is clueless because it is intended for beginning-level undergrads without much background, Levinton's is clueless at the advanced level. It is clearly aimed at the graduate student and professional, but it still misunderstands the fundamental nature of the important discoveries made by paleontologists. Page after page, it takes on polemical tone to defense of Neo-Darwinism, completely unwilling to concede that important things have been learned. For example, Levinton's coverage of the punctuated equilibrium debate either selectively chooses examples that support his biases, or focuses on gradualistic studies that have long since been discredited—completely misrepresenting the general consensus among paleontologists that gradualism is rare, and that punctuation and stasis are real and important phenomena. And where paleontology has fundamentally changed the way we

see evolution, his "revisionist history" conveniently rewrites the past as if Neo-Darwinists saw it this way all along. For example, he states (p. 146) that stasis was the expectation of the orthodoxy for many years, but that comes as a complete surprise to most of us who are familiar with the normal way evolution is taught (or even how some of his contemporaries, such as Strickberger, present old-fashioned Neo-Darwinism as panselectionism and adaptationism). Even Mayr (1992, in *The Dynamics of Evolution*, A. Somit and S.A. Peterson, eds.) conceded that the prevalence of stasis was a surprise to the Neo-Darwinians, and could not be easily explained by neontologists. Yet the real paradox is not just that stasis is prevalent, but that it occurs even in the face of environmental change that Neo-Darwinists would argue demand morphological change (e.g., Prothero, 1999, *GSA Today*, v. 10, no. 7, p. 1-11). The tired old "escape clause" of stabilizing selection does not apply here—these environments are clearly changing rapidly, yet organisms fail to respond to these drastic environmental fluctuations. Reading Levinton's book generates almost the same sense of frustration that reading a creationist book does. Levinton's lack of firsthand experience with fossils and what they really show is readily apparent. If he had wrestled with the paradoxes posed by paleontology with a more open mind, it would be fair, but as he reveals from the opening pages, his biases are clear and he is out to discredit those who would challenge the Neo-Darwinian orthodoxy. Such positions may be defensible in court, but such close-mindedness and lack of firsthand familiarity with the facts are not conducive to breaking through the confusion and find a newer, better theory of evolution.

If these books are representative of what neontologists think of the paleontological record, then truly we have not had any real effect on their worldview, and have not taken a seat at the "high table." Now that Gould is gone and few of us have an impact on them, will there be any future hope that our discoveries and viewpoint will affect the evolutionary biology textbooks of the future?

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