

Science Update

Rebirth of Philosophical Paleontology

BY CONNIE BARLOW

Eight or nine years ago when I was ruminating through the popular writings that biologists had produced earlier this century, I was overtaken with nostalgia. In the 30s, 40s, and 50s paleontology was one of the richest fields for extension of science into the realm of meaning. Such greats as George Gaylord Simpson, Julian Huxley, and Pierre Teilhard de Chardin engaged in profound and eloquent debates as to whether there was evidence of progress in evolution, whether self-aware intelligence was inevitable, and whether one should rejoice in or recoil from the scientific view of life. Moreover, all this was conducted in earshot of the broadly reading public.

Stephen Jay Gould has, of course, done an immense service in the latter decades of this century in teasing out some worldview implications of ongoing paleontological discoveries, and he has cultivated a vast readership. But where is the debate? My generation has heard only one voice, one interpretation. And because there is only one interpretation, I fear that too many of us mistake Gould's personal inflection for scientific fact.

In 1998, however, two respected paleontologists independently stepped up to the podium to boldly offer interpretations at odds with that of Gould's. Mark McMenamin expresses his contrarian view in his newest book, *The Garden of Ediacara* (Columbia University Press). Simon Conway Morris challenges Gould throughout his *The Crucible of Creation: The Burgess Shale and the Rise of Animals* (Oxford University Press). I have read the first, but have not yet got around to the second. Too many books; so little time! Fortunately, two magazines that bring science to the public have done a fine job of presenting both the science and the stunning

interpretations of McMenamin and Conway Morris.

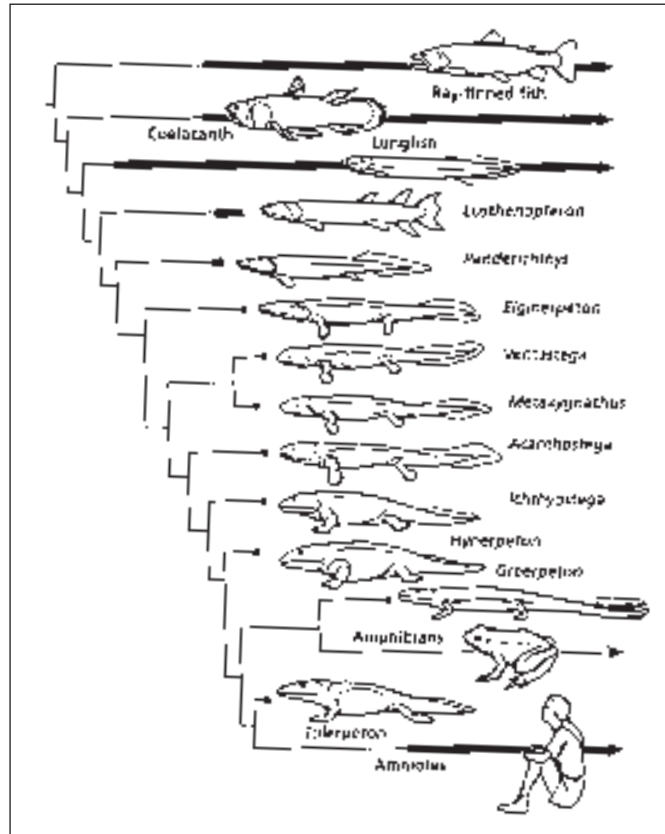
The current December-January issue of *Natural History* magazine features a debate between Simon Conway Morris and Stephen Jay Gould: "Showdown on the Burgess Shale." Conway Morris calls Gould to task on both the science and the philosophical "lessons" presented in Gould's 1989

written, shown a catastrophic decline. But now we come to the most egregious misinterpretation of the Burgess Shale in Gould's book, a conclusion drawn not from the evidence of paleontology but from Gould's personal credo about the nature of the evolutionary process. Gould sees contingency—evolutionary history based on the luck of the draw—as the major lesson of the Burgess Shale... Such a view, with its emphasis on chance and accident, obscures the reality of evolutionary convergence."

Conway Morris then gives various examples of convergent evolution (as did Julian Huxley sixty years earlier), concluding with the example of intelligence evolving independently and in parallel in chordates and in mollusks (octopus). "Contingency or no," he argues, "I believe that a creature with intelligence and self-awareness on a level with our own would surely have evolved—although perhaps not from a tailless, upright ape."

Natural History magazine, in which Gould has a monthly column, gave Gould the opportunity to respond to the challenge (though the respondent took a page more space than did the challenger). Unfortunately, the reader must first get past what seems to be a nasty personal tussle between the two great scientists, but then Gould does offer some very good points. I find that on some points I am persuaded by Gould, and on others by his challenger. But the most important facet of the debate, in my view, is what the

very existence of this exchange demonstrates: not only scientific interpretation is unsettled but philosophical interpretation is too. More, for the first time, it should be clear to readers that the choice between contingency or convergence, chance or necessity, is to some extent a matter of taste.



From *At The Water's Edge: Macroevolution and the Transformation of Life* by Carl Zimmer, copyright 1998 by Carl Zimmer. Reprinted with permission of the author and The Free Press, a division of Simon & Schuster, Inc.

best-selling book, *Wonderful Life*. Conway Morris concludes:

"The new evidence suggests that not only did the sheer number of species increase since the Cambrian (as nearly everyone agrees), but, more significantly, the total number of phyla has been maintained and has not, contrary to what Gould has

Mark McMenamin echoes Conway Morris's philosophical conclusion in both his book and in an article/interview on his own Garden of Ediacara hypothesis. The article is a good place for interested readers to start. It was written by reporter Bennett Daviss and published in the 16 May 1998 issue of *New Scientist* magazine. Whereas Conway Morris concerns himself with soft-bodied fossils of a great diversity of animal body forms thought to be 520 million years old and thus close to the beginning of the "Cambrian Explosion," McMenamin interprets the soft-bodied fossils preserved in the immediately prior chapter of life (dating from 600 to 545 million years ago).

McMenamin proposes that these "Ediacaran" life forms were not animals at all. Nor were they plants or fungi or protists. These multicellular (actually, metacellular) creatures were a kingdom unto themselves, he claims. (Drawings of Ediacaran fossils or reconstructions of the living creatures are strewn throughout this issue of the *Epic*, all copied from McMenamin's current book or from his 1990 *The Emergence of Animals*.)

Not all paleontologists agree with McMenamin's interpretation, of course. But if he is right—and right in two other interpretations drawn from these fossils—then the philosophical outwash is profound. Remember that Conway Morris argues that some other animal would almost surely evolve humanlike intelligence had primates failed to do so. (I have long placed my bets with raccoons.) McMenamin argues that Earth would likely have produced such intelligence in a creature that was not even animal. He thinks the Ediacarans were already elaborating a central nervous system, a brain, when they vanished from the ocean waters that had nurtured them for tens of millions of years.

Why they vanished is another hypothesis of McMenamin's that lends the title to his book. The Garden of Ediacara was a kind of peaceable kingdom, before the fall into the Cambrian. Ediacarans appear to have had no mouths; they likely drew energy from the environment, thanks to either photosynthetic algae or chemosynthetic bacteria embedded in their tissues. This was the grand age of symbiosis. There was competition for space, of course, but there seems to have been no predators. In fact, the invention of predation by a large-bodied animal may have driven the bold experimentation in shells and plates and armor that makes the hard-bodied creatures of the Cambrian Explosion—

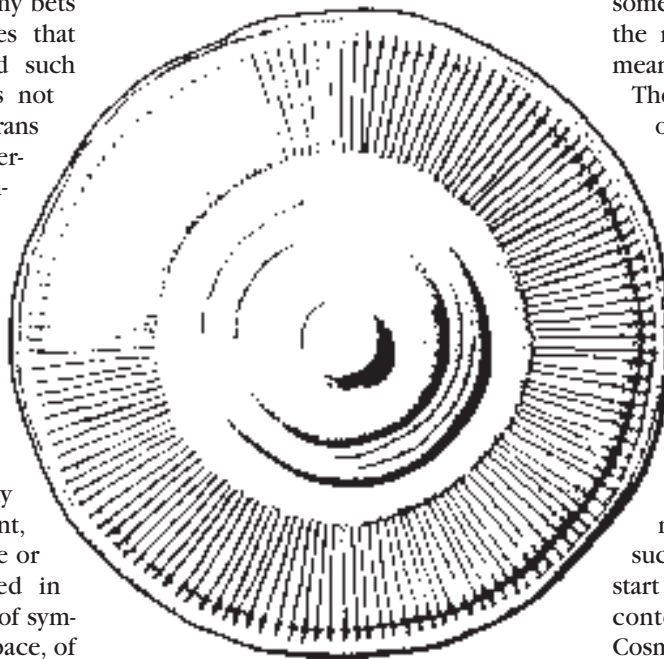
notably, brachiopods—so easy to add to amateur fossil collections.

If McMenamin is right, therefore, we will have a stunning and a metaphorically rich addition to build into our various tellings of the Epic of Evolution. The final two chapters of McMenamin's book are particularly helpful in this way. "There must be something about the structure of the material world that causes matter to organize in this particular and very interesting way," he muses. "In other words, it would appear that life evokes mind. There is indeed some kind of evolutionary directionality and vital potency. This is a fully scientific statement, rich with possibilities for analysis, investigation, and generation of new knowledge about our world." (p. 270)



I shall conclude this Science Update with a brief notice of a significant discovery useful for those who wish to put more detail into one particular part of the timeline of life. That will be followed by mention of a remarkable new book, which provided me with a hero figure you may recall my having mentioned elsewhere in this issue of the *Epic*.

First, the discovery: For some time there has been dispute as to which taxonomic



group the earliest land plants belonged to. The earliest evidence of land plants is not in the form of fossils of the plants themselves but of their spores found in rocks of mid-

Ordovician age (476 million years old). Did these spores come from liverworts, hornworts, or mosses? A new and wide-ranging study (published in the 13 August 1998 issue of *Nature*) concludes that, based on a comparison of DNA in living representatives of these groups, liverworts represent the most ancient lineage. I salute thee, liverworts!

And I salute thee Ichthyostega! Ichthyostega is one of a growing number of fossil intermediates discovered in just the last twenty-some years that document our own lineage's venturing from sea to land. The story of these paleontological discoveries and their interpretations is beautifully told by *Discover* magazine's senior writer on evolution, Carl Zimmer. His 1998 book, *At the Water's Edge: Macroevolution and the Transformation of Life* (Free Press) is sure to become an essential resource for science teachers at all levels who have had to contend with creationist claims that there are no fossil intermediates. That may have been somewhat true during the Scopes trial, but it ain't so today. His book not only documents the vertebrate adaptation to a land way of life but also the return of land vertebrates to the ocean (whales). He thus chronicles the move in both directions "at the water's edge."

You will see my hero depicted on the chart reprinted here from Zimmer's book. Why did I choose Ichthyostega rather than, say, Ventastega? I'm not sure. I think it has something to do with the way it feels to say the name: I like the sound. Also, "ichthy" means fish. (Ichthyology is the study of fish.)

The chart reveals that there are many other characters equally deserving of reverence in this particular stage of the Epic, so in my mind Ichthyostega symbolizes them all.

Epicists (as in "lyricists"; those who would tell the story artistically) can also look to Zimmer's book to find an equally long list of candidates for hero from the whale's perspective. Shall it be Pakicetus? or Ambulocetus? or Rodhocetus? or Gaviocetus? Maybe ask your kids or grandkids to choose. Young folk have no trouble remembering the names of such larger-than-life characters. And if we start exposing kids to these names in the context of an Epic ritual, perhaps the Cosmic Walk, then we will no longer need to worry whether scientific terms can be made to sound sacred. For children so imprinted, Ichthyostega, proton, what have you, will be part of their religion and should remain so, even when they subsequently encounter these terms in science class. ☺