



Evolving Form and Function: Fossils and Development. Proceedings of a Symposium Honoring Adolf Seilacher for his Contributions to Paleontology, in Celebration of his 80th Birthday (April 1–2, 2005, New Haven, Connecticut), edited by D.E.G. Briggs, 2005, Peabody Museum of Natural History, Yale University, Special Publication, 288 p., ISBN-10: 0-912532-72-6, USD 59.00

One of the lessons I remember most clearly from my Invertebrate Paleontology course in 1989 was the disconnect between paleontological and neontological studies. William Miller III spent time on this topic as a challenge to us to bridge that gap—not by merely applying ecological and biological terms, but by understanding the fundamental framework of the science. In the nearly two decades since, there has been much enrichment of paleontology by the integration of ideas from evolutionary biology and ecology. This proceedings volume broadly covers the utility of fossils in understanding form and development and is a testament to how much the science itself has evolved. It is, of course, fitting that the symposium was convened in honor of Adolf Seilacher, who continues to be a leading voice on the frontiers of paleontology. Dolf's legacy also is apparent by the wide breadth of papers presented in this volume.

The papers collectively are not light reading and would not be appropriate for a typical undergraduate seminar. Rather, the articles depart from a typical survey compilation by providing much rigorous discourse and new interpretations. The papers are broadly divided into those that deal with form and function from the fossil record and case studies of particular groups.

While each of the articles is unique and worthwhile, several stand out as quite bold and likely to stir healthy controversy—like Dolf himself. Gehling and colleagues, in “Ediacara Organisms: Relating Form To Function,” present an updated view of Seilacher's vendobionts, in which they evaluate a large amount of new data on the taphonomy of the Ediacaran fauna and present arguments for ecological responses based on penecontemporaneous trace-fossil evidence and inferred tectonic switch to behavioral responses. The result provides the reader with a sense of understanding of the current state of affairs with these most enigmatic fossils. Coupled with the paper by Droser and colleagues on the trace fossils (and nontraces) of the type section, the two studies shed interesting light on the Neoproterozoic.

Several review articles demonstrate the closing of the gap between paleontological and neontological studies. The paper by Donogue and Dong, “Embryos and Ancestors,” persuades the reader that new embryonic evidence from the Doushantuo Formation and other deposits can offer real fossil insight

that will be useful in reconstructing developmental biology in early metazoans and testing hypotheses about ontogeny of early animals. Similarly, Stefan Bengtson's contribution, “Mineralized Skeletons and Early Animal Evolution,” provides an insightful overview of the early record of mineralized skeletons and summarizes some of the current views of the role that late Proterozoic–Cambrian ocean chemistry played in mineralogic pathways. Many of the papers—most notably the contributions by Erwin, “The Origin of Animal Body Plans,” and Seilacher (see below)—continue the arguments of Niles Eldredge and others, i.e., that changes in the environment, or ecological landscape, drive major global events in polyphyletic developmental changes.

Nearly half of the papers are specific to a particular group and reading these papers emphasizes again how much the gap between paleontology and biology is narrowing. The papers by Hughes (“Trilobite Construction: Building a Bridge”) and by Giorgianni and colleagues (“Conquering Land, Air and Water: The Evolution and Development of Arthropod Appendages”) on arthropods interweave nicely together and show that extinct trilobites offer new insights toward understanding the ontogeny of arthropods. In fact, halfway through the readings I checked to see if Sean Carroll was a coauthor! Unlike other papers I have read that merely draw on the current biological vocabulary to add an air of sophistication, the articles in this volume demonstrate a maturity and integration of key concepts in both ecology and developmental biology.

By far, the most valuable and interesting paper to a general paleontologist is the keynote paper by Briggs on Seilacher himself, “Seilacher on the Science of Form and Function.” It was interesting to read how the classic trigonal plot of development, the *Konstruktions-Morphologie* triangle, was conceived and how it evolved. Briggs weaves the story of the development of the fossil contribution to form (e.g., morphodynamics) through the many papers of Seilacher and his contemporaries. Whereas other papers and reviews on the subject leave the reader bogged down in statistics and mathematical models, Briggs creates a readable story that, in the end, is all the more insightful and convincing.

Finally, the contribution by Adolf Seilacher (“Secondary Soft-bottom Dwellers”) stands out as a readable review of one

of his many interests, the recurrence of soft-bottom dwellers as an evolutionary leap from sessile benthic filter feeders. In this paper, he is able to show the reader how several of the key concepts he developed, such as the constructional morphology triangle, can be used in a case study. He also shows how much the science has changed, as even common concepts such as convergence and phylogeny need to be readdressed in light of changes in the field over the last few decades.

In summary, this volume of disparate papers is a valuable asset as a collection of papers emphasizing the current state of paleontology as a tool for understanding key concepts of form and developmental biology. Because of the nature of the topic and the emphasis on new, and potentially controversial, insights,

this book is probably not accessible to undergraduate students of paleontology. I see the book serving more as a catalyst for further innovative research like that done by Adolf Seilacher himself. Noticeably, the only thing missing from this otherwise well-edited volume is a multipage color spread of Dolf's paleoart, but the interested reader can find that view of form and function elsewhere.

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