



Echinoderm Paleobiology, edited by William I. Ausich and Gary D. Webster, 2008, Indiana University Press, Bloomington, Indiana, 456 p., USD59.95 cloth, ISBN: 9780253351289.

When I was a teen, I was lucky enough to go on short forays into that great, deep-time machine of the Paleozoic that exists in many of the quarries in southern Ontario, Canada. In the layers of predominantly shales and limestones, we would dig to find trilobites, cephalopods, bryozoans, and even graptolites, but the most prized of all were the echinoderms, at least to me. There was a rich and bewildering array of crinoids and other taxa possessing such stunning geometric beauty in both overall form and minute detail that I wondered why I could not find very much information about them, or about the people who actually studied these fossils. Of course, now I know my way around the literature a little bit and am happy to add books such as this one to that set of resources, next to the collections of specimens like those that inspired my interests in the first place.

I feel it is my duty to report, however, that *Echinoderm Paleobiology* suffers from an affliction that many such edited volumes share. When editors invite contributors to such a book, authors tend to focus on their specialties. As these can sometimes be a little on the arcane side, each chapter will reflect, at best, what is going on in a narrow part of the field and develop themes only around selected research.

The editors had to work hard to organize disparate contributions into a knitted whole that addressed the topic suggested in the title. There is likely no way that this book ever could be considered to be about echinoderm paleobiology in the same way that a single-authored volume such as Andrew Smith's *Echinoid Palaeobiology* (1984) was a survey of echinoid paleobiology. Even urchin paleobiology is a pretty broad topic, but not nearly as difficult to cover as all of echinoderm paleobiology. At best, *Echinoderm Paleobiology* could only be a compendium of hints concerning the diversity in the field and not a true statement of the breadth of echinoderm paleobiology.

Some important contributors to the field have been omitted and some of the chapters are fairly short, suggesting space constraints. Of the 17 chapters, 10 of them deal with crinoids and 2 more deal explicitly with sea lilies, even though the title of the chapter does not reflect this. Given the interests of the editors, this might be understandable, but should other major taxa be left almost completely unrepresented? The Asterozoa and Ophiurozoa are pretty much excluded, brachiopod-bearing forms are covered in only two or three chapters, and even edrioasteroids are only mentioned in a few places, in spite of the fact

that major advances dealing with the fossil record of all these taxa have been made in recent years. The editors attempt to tie together what remains with well-written bridges between the major sections and in a somewhat engaging overall introduction, but in the end the book really could have been more accurately entitled, *Selected Topics in Echinoderm Paleobiology with a Focus on Crinoids*.

The book is divided into five sections. The first part contains six chapters dealing with Functional Morphology, Paleoecology, and Taphonomy, and it is not surprising that this is the biggest part of the book. Three chapters deal explicitly with taphonomy but also address morphology to a certain extent, some of that in a functional sense. There are good data here that can make a statement concerning what we can and cannot learn from echinoid Lagerstätten. Other chapters in this part include investigations of interesting and poorly understood microcrinoids (Sevastopoulo) and the treatment of the taphonomy of a single species of aberrant crinoid, *Uintacrinus* (Webber et al.). The latter provides a fairly convincing argument that *Uintacrinus* was not a pelagic form, but most likely a benthic animal living in relatively dense populations. A chapter dealing with the intersection between knowledge of extant forms and how that sheds light on fossil crinoids (Baumiller et al.) is, along with the Schneider chapter on echinoids of the late Paleozoic, perhaps among the best representations of what one might hope to find in such a book. These treatments are especially fine insofar as they discuss what can be learned from specific localities, preservational modes, and a diversity of approaches on a variety of taxa. The Nebelsick chapter on echinoid taphonomy focuses on a single genus, *Clypeaster*. This work is partly a restatement of some even more general papers (in the sense of dealing with more species) in the primary literature, but it provides an interesting look at taphonomic processes in both modern and Cenozoic environments using a taxon that occurs in both. A chapter by Brett et al. could have found its way into the part of the book dealing with faunistics, as it focuses on crinoids in the Ordovician of Kentucky; however, it does emphasize certain factors that determined the paleoecology and distributions of crinoids from other late Ordovician associations. The illustrations show gorgeously preserved Lagerstätten and bring the ecological relationships of these organisms to life.

Part 2, Evolutionary Paleoecology, is the smallest with only two chapters. One (Dornbos) deals with the phenomenon of tiering in benthic, suspension-feeding echinoderm communities since the Cambrian, and the other (Ausich and Kammer) with origination and extinction patterns among members of a single clade of Paleozoic crinoids, the periechocrinoids. Both provide valuable information concerning ways to approach studies of ecological shifts across time, which is perhaps why they were singled out for a more narrowly defined section of their own.

The third part of the book, Morphology for Refined Phylogenetic Studies, includes three chapters that are uniformly excellent treatments of specific character suites among selected taxa. The chapter by Sumrall is important because it focuses on the oral plate homologies of a group of cystoids and does much to help straighten out terminological problems. It was refreshing to read (p. 230) a clear statement from the author on why unirayed taxa of echinoderms should be considered diversions on the path to understanding the origins of major echinoderm features. Sumrall has argued, like many others, that one should dismiss studies placing unirayed forms at the base of the echinoderm tree. As he says, these assignments rest on the basis of what are increasingly unsupportable concepts of homology and inverted character polarity. The concept of Lovén's Rule (which is an empirically derived rule observable in many echinoderms) is regrettably not covered thoroughly enough for the nonspecialist to comprehend why it is of great importance to echinoderm studies. There is reference to other works by the author, but the chapter is by itself very dense with terminology and likely to be unapproachable by anyone other than an expert. This observation holds to a certain extent for all three chapters in this section, but crinoid specialists will find the chapters on arm terminology (Webster and Maples) and pedomorphosis in crinoids (Kammer) stimulating portals into a complex world of fossils exhibiting myriad systematic characters. I use the term systematic because it is far from clear exactly how these characters have phylogenetic significance (despite the title of Part 3) in the absence of phylogenetic analyses, as not a single tree appears in this section. In fact, there is only one chapter in the entire volume that contains a phylogenetic analysis or depicts a tree of relationships (Ausich and Kammer, Part 2, which deals with patterns among periechocrinoids). It is surprising to see that a book about evolution has so few phylogenetic analyses, as a few trees would have gone a long way toward helping readers put some of these obscure taxa into context, especially those readers learning about echinoderm evolution. That context will have to come from more accessible treatments.

Part 4, Mississippian Impacts and Biomarkers, is a somewhat forced pairing of two chapters. The first, by Miller et al., deals with what a mixed-age assemblage of echinoderm and other fossils from Missouri can tell us about the effects of a Mississippian meteorite impact. This is a relatively long, interesting, and in the end, convincing account of how echinoderm fossils can help date the occurrence of a bolide impact. The second (O'Malley et al.) is a similarly fascinating description of how the molecular derivatives (fringelites) of original pigments can be preserved and detected within the calcite elements of fossil echinoderms, even those as old as the Mississippian. It would have been informative to see Figure 13.1 in color, as it shows an outstanding bed of Kinderhookian crinoids, evidently iden-

tifiable by color. I find the phenomenon of fringelites far more interesting and spectacular than the recently hyped accounts of dinosaur color for which evidence is considerably less direct and much younger geologically. Although heterogeneous, Part 4 is perhaps of the most general interest to people who are not necessarily echinoderm paleontologists.

The final part of the book is a series of Echinoderm Faunal Studies that describe fossil assemblages from various places and of various ages. Faunistic studies have long been the bread and butter of paleontological research, although many incorrectly feel they are more like stamp collecting than science. Faunal accounts continue to provide the raw data for all paleontological work, including the paleoecology that is the subject of this book. Whether treating the early diversification of crinoids (Sprinkle et al.), the vicissitudes of Silurian crinoid taxonomy in Great Britain (Donovan et al.), important new finds of crinoids from China (Waters et al.), or fossil echinoderms from the Mesozoic and Cenozoic of Puerto Rico (Vélez-Juarbe et al.), the importance of basic descriptive taxonomy and the correcting of the record remains. The importance of scholarship at the level of meta-analysis is no more important than at the alpha level. An example of this is in the chapter on Puerto Rican fossils, in which the occurrence of *Echinarachnius sebastiani* is discussed in the context of its implications for paleoclimatology. These implications rest on the assumption that *E. sebastiani* was correctly identified as a member of *Echinarachnius*. Jackson (1922) described *E. sebastiani* before more modern concepts of clypeasteroid classification, and it is a mistake to use his outdated assertion that the species is representative of a group now living in high latitudes. It is almost certain that this fossil is not placed in the correct genus; it is much more like certain other Cenozoic forms that may or may not typify colder climates during the Oligocene of Puerto Rico. Other specialists will find similar examples in this book and in other literature that illustrate how important and relevant carefully performed systematics and phylogenetics continue to be in almost every aspect of paleobiology.

The book concludes with appendices containing data in support of several chapters in the volume and an excellent index. Overall, *Echinoderm Paleobiology* cannot be considered to be the last word on the subject, and it would not be my recommendation to a student or newcomer as the first word either. The book provides several fairly unrelated yet focused snapshots of the field, and these glimpses of recent advances illustrate the careful and detailed work that continues to make important contributions to our understanding of echinoderm evolution. As such, this book finds a useful place in my library as an accompaniment to more general works.

#### REFERENCES

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