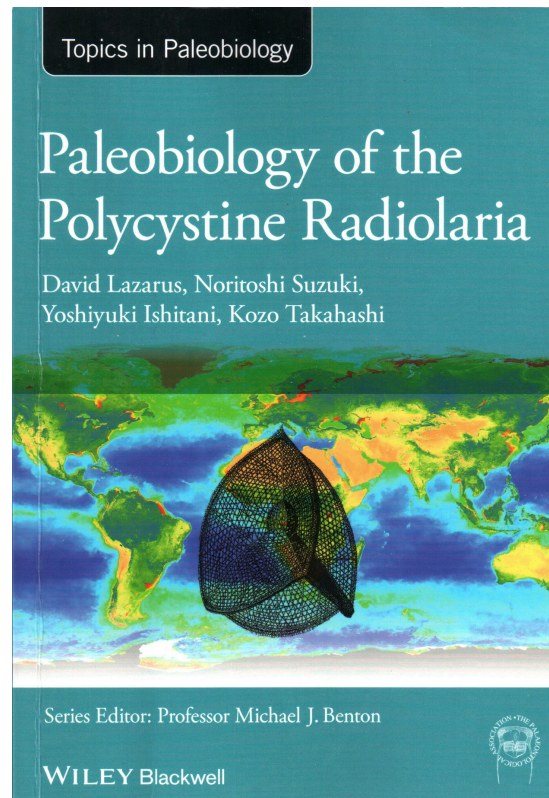


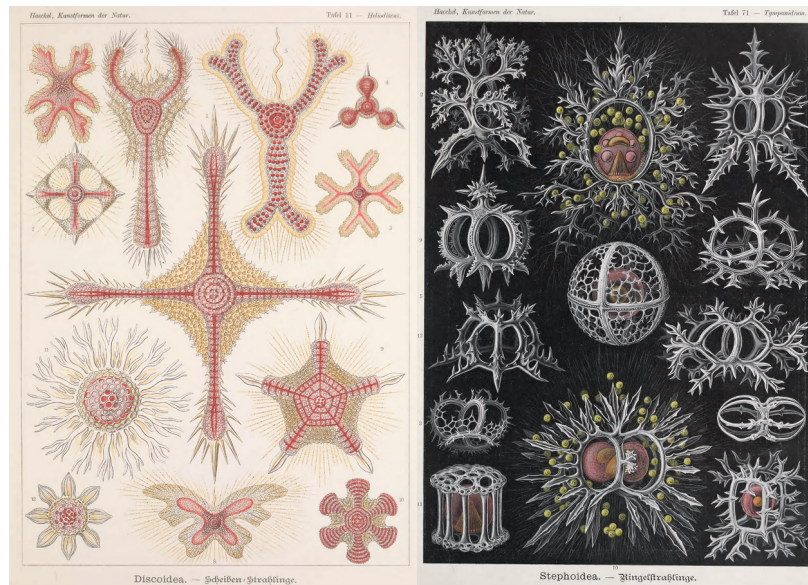
Dolan, J.R. 2021. Book Review: Lazarus, D., Suzuki, N., Ishitani, Y., Takahashi, K. 2021. *Paleobiology of the Polycystine Radiolaria*. Wiley Blackwell, Hoboken, NJ, ISBN 978047067 (paperback), 481 pp, \$95. *Journal of Eukaryotic Microbiology*, <https://doi.org/10.1111/jeu.12853>

## Book Review



Lazarus, D., Suzuki, N., Ishitani, Y., Takahashi, K. 2021. **Paleobiology of the Polycystine Radiolaria**. Wiley Blackwell, Hoboken, NJ, ISBN 978047067 (paperback), 481 pp, \$95

You may be asking yourself 'What is a polycystine radiolarian and do I care about paleobiology?' Well, first, you probably do know what polycystines are but don't realize it. They are the major constituents of the phylum Radiolaria in recent classifications. In ISOP's latest scheme (Adl et al. 2019), the class Polycystinea is composed of the orders Spumellaria and Nassellaria. They are remarkably species-rich groups of radiolarians in terms of both living and fossil forms distributed in literally hundreds of genera. Their siliceous skeletons, or shells, are iconic of the beauty of protists, made famous for example, by Haeckel in his *Kunstformen der Natur* (e.g., Fig 1). Second, despite the title, paleobiology is actually not the main focus of the book; it could have been more accurately titled '*The Biology, Ecology, Evolution of Radiolarians Living and Fossil*'. The only inaccuracy of such a title is that some might have expected the book to include Acantharians and Phaeodarians. Acantharia are not treated and Phaeodarians, alas, are no longer considered to belong within the Radiolaria. However, the polycystines alone are a large enough subject to easily fill this substantial volume.



**Figure 1.** Plates 11 and 71 showing spumullarian (left) and nassularian (right) radiolarians from Haeckel's *Kunstformen der Natur* (Haeckel 1899-1904). Haeckel's many illustrations of radiolarians were a major component of *Kunstformen der Natur* (10 of the 100 plates), a book that introduced the general public to the beauty of protists and had a major impact on the Art Nouveau movement (Dolan 2019).

*Paleobiology of the Polycystine Radiolaria* is aimed, in principle, at "advanced undergraduates to doctoral students and a broad range of professionals in biological and earth sciences". Such a wide audience requires an engaging text combined with presenting a fair amount of detail and the authors have done this quite well. The book is composed of 9 chapters. It begins with a chapter devoted to the history of radiolarian studies. It takes us on a tour from the days of Ehrenberg to the present with marvelous illustrations along the way. The second chapter, "Biology", introduces us to the physical world of planktonic protists and then covers basic biology, cell structure and skeleton formation and anatomy of radiolarians. The third chapter "Ecology" reviews our fairly considerable knowledge of the distribution of radiolarians relative to biogeographic zones, oceanographic features, depth, etc. The fourth chapter is titled "Genetics". One could say it is not really about radiolarian genetics about which we actually know little (we do not even know if sexual reproduction occurs in all groups). The chapter is a valuable review of genetic relationships among taxa based on recent work on the molecular phylogeny of radiolarians, including studies up to 2019. The fifth chapter is an odd beast as it tackles both taxonomy and the fossil record of radiolarians. First, we are introduced to general principles of taxonomy, then the many singular peculiarities and challenges of radiolarian taxonomy are presented, and finally we are given summaries of the characteristics of the amazingly diverse groups of polycystines.

The second part of Chapter 5, on the fossil record of radiolarians, begins the 'Paleo' part of the book. We are given a brief summary of the very long fossil record of the radiolaria. The following chapter on 'Preservation and Methods' tells us about how radiolarians are fossilized and the specialized methods used

to study micro-fossils. Chapter 7 introduces us to the field of Paleooceanography and its reliance in part on radiolarian data. We learn, for example, that the ratio of Spumellaria to Nassularia in the sediment has been used as an indicator of the depth of the water column in the past as Nassularians are more common than Spumellarians in deep water sediments. The Paleooceanography chapter also provides prerequisite knowledge needed to understand chapter 8, 'Radiolarian Biostratigraphy'. Of all the chapters, the biostratigraphy is the one that puts some demands on the reader (at least this reader) as it not difficult to get lost in the long geological record of radiolarians. The final chapter is "Evolution" and it tackles radiolarian evolution and evolution in general, beginning with presentations of mechanisms of evolutionary changes and ending with discussion of radiolarian evolution throughout geological epochs.

The only previous comprehensive treatment of radiolarians is O.R. Anderson's 1983 book 'Radiolaria'. It remains a valuable standard reference but it is nearly 40 years old and a considerable amount of work has been done in the intervening years since its appearance. There are fairly recent reviews of radiolaria, for example by Suzuki & Not (2015) and Boltovskoy et al. (2017), and they are also quite valuable but they are not comprehensive treatments.

Bottom line? Paleobiology of the Polycystine Radiolaria is well worth the purchase price and should be in the personal library of all protistologists working on marine forms. It is worth noting that the book is very well illustrated and overall, well produced. There is central section of color versions of some of the key illustrations. As a final note, the authors are to be commended for going to the trouble of finding and dealing with a professional publisher, not having succumbed to the temptation of using a print on demand outfit to produce their book.

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