

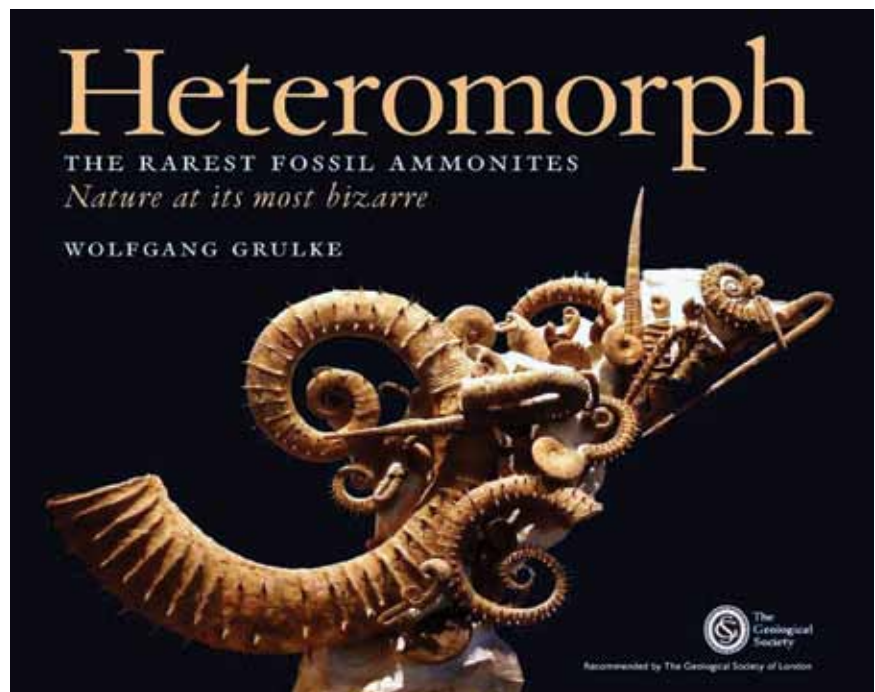
**Review of: *Heteromorph: The Rarest Fossil Ammonites, Nature at its Most Bizarre*, by Wolfgang Grulke, At One Communications, 2014, 224 pp., hardcover, ISBN-10: 0992974003, ISBN-13: 978-0992974008 (about \$50.00)**

I balked when first invited to review the stunning, lavishly illustrated tome on heteromorph ammonites by Wolfgang Grulke; after all, despite a lifetime dedicated to mollusks, I am neither a paleontologist nor “cephalopodologist.” After a brief perusal of the volume, however, I decided I really wanted to know more about the subject and write about the book. One of the concepts that makes this book so attractive in the first place is that author Grulke, through the judicious choice of interrelated topics to construct the book’s different sections, renders his choice of a rather specialized topic into a delightful and well-structured volume.

Then, there is the author himself: Wolfgang Grulke is a well-known visionary, former IBM executive, and Chairman Emeritus of FutureWorld International, a global think-tank. Grulke is a futurologist whose main hobby is to study and collect heteromorph ammonite shells, some of the most remarkable and attractive objects left from the deep past. Grulke has established what is now regarded as the world’s foremost collection of these rare heteromorphs. (The trend-setter in Grulke comes through on the copyright page of the book, which is licensed under the relatively new Creative Commons Attributions Share-Alike license, which lets others “remix, tweak, and build upon this work, even for commercial reasons, as long as they credit the source and license their new creation under the identical terms.”)

Heteromorph ammonites were cephalopods that reached their highest diversity in the Cretaceous Period, between 145 and 65 million years before present. They had coiled shells that changed direction of coiling at least once during growth (hence the colloquial name, from the Greek *hetero*, different + *morphos*, shape), giving the impression that the animal “changed its mind” as far as the direction of shell growth is concerned. The resulting shells look unlike regularly coiled mollusks, with coiling in adult life taking place around two or more axes.

Although the astute reader will need to research elsewhere if he or she wants to learn the finest details on the latest developments in systematics and paleoecology of het-



eromorph ammonites, Grulke did a terrific job of chronicling the group and the extensive range of interest it elicits in researchers, citizen scientists, artists, and dealers specializing in fossil cephalopods.

While relatively little is known about their phylogeny, it is now accepted that the different families of heteromorph ammonites may have evolved a few times, independently, from ancestors with planispiral shells. With the largest number of species and degree of morphological variation occurring in the Cretaceous, Grulke naturally focuses his approach on the diversity of that period, presenting, among other perks, an excellently illustrated “Gallery of Cretaceous Heteromorphs.”

There are sections that will certainly stimulate the interest of readers of all persuasions (and not only a paleocollector or student). “Lifestyle” is where Grulke describes in broad strokes what is known and what is speculation about the biology, habitats, reproduction, and feeding of heteromorph ammonites. “Curiouser & Curiouser,” is a smorgasbord of super-rare, unusual, strange, and questionable heteromorphs. In this section, Grulke describes *Pravitoceras sigmoidale*, which he considers to be the weirdest of all ammonites, a “perfect blend of a planispiral and heteromorph ammonite.” Also in this section, Grulke reminds us that heteromorphic shells are not the exclusive domain of fossil ammonites: for example, he presents and illustrates the exquisite terrestrial microsnail *Opisthostoma vermiculum*, a limestone-loving pulmonate whose shell may change coiling direction as many as four times in the snail’s lifetime!

Those interested in the history of the study of heteromorphs will enjoy “From Old to New,” where Grulke introduces selected heteromorph enthusiasts, past and present, discusses existing controversy between professional pa-



**Wolfgang Grulke and a museum collection of ammonites.**

leontologists and commercial dealers, and emphasizes the importance of citizen scientists and private collectors in the development of academic paleontology (“Changing Attitudes”, page 190.)

A little hiccup is found on page 94, with the inclusion of the names of two purported new species of the genus *Hyphantoceras*, prior to their formal description elsewhere, qualifying them as “nude names” (*nomina nuda*) from the standpoint of formal zoological nomenclature. (Had Grulke added more information differentiating the two taxa and naming a depository collection for the specimens illustrated, those could then be considered formal, albeit most likely unintentional, descriptions of the two species.) Although it is always preferable that scientific names never be publicized or written prior to the formal description of the taxa they represent, the names in this case can be made available if they are formally described following the appropriate criteria.

On the whole, “Heteromorph” is a book worth belonging in a shell collector’s library. The exquisite nature of heteromorph ammonites, Grulke’s comprehensive approach, and the quality of the illustrations in the volume are in my opinion excellent reasons for that. I strongly recommend it!

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The Recent terrestrial microshell mentioned in the book and Jose Leal's review is *Opisthostoma vermiculum* Clements & Vermeulen, 2008. It is only slightly more than 1mm in length and is only known from the type locality: Gunung Rapat, Perak, Malaysia. Apparently no living snail has yet been observed. The image here is from Lifedesk: <http://opisthostoma.lifedesks.org/pages/759>, and clearly shows the four different coiling axes.