

Preface

Imagine you belong to any religion and your chief deity asks you: “Could you imagine editing the new sacred book?” This is the feeling you have as an ammonoid worker, when you are offered to take care of the new edition of ‘Ammonoid Paleobiology’. Not only for us, who had the honor and burden of this gigantic task, ‘Ammonoid Paleobiology’ represented a comparably important book since we consulted it so often in order to better understand these organisms, which went extinct 65 million years ago.

Although many of the early ammonoid researchers of the nineteenth century have spent thoughts on the ammonoid organism and its mode of life, most of the major contributions to modern ammonoid paleobiology appeared roughly in the past half century. Looking at the scientific output of these decades, it appears like the first edition of “Ammonoid paleobiology” was a product of something like a golden age of ammonoid research. The two decades preceding its publication saw the first five international symposiums “Cephalopods—Present and Past” and many important articles by colleagues such as John Callomon, Antonio Checa, John A. Chamberlain, Larissa Doguzhaeva, Jean-Louis Dommergues, Jean Guex, Roger H. Hewitt, Michael House, David K. Jacobs, Jim Kennedy, Cyprian Kulicki, Neil Landman, Ulrich Lehmann, Harry Mutvei, Takashi Okamoto, Bruce Saunders, Yasunari Shigeta, Kazushige Tanabe, Henri Tintant, Jost Wiedmann, Peter D. Ward. Gerd Westermann, Yuri Zakharov (incomplete list!) contributed essential data and interpretations, but they also stimulated further research in this field. Unfortunately, many important cephalopod workers and good colleagues have died in the last two decades. In 2014 alone, for example, Fabrizio Cecca, Adolf Seilacher, Helmut Hölder, Gerd Westermann, and Hiromichi Hirano passed away.

Due to fundamental changes in the structure of scientific communities including the dubious judgment of the value of scientific work by impact factors and citation rates, cephalopod research has changed as well. Additionally, the community of ammonoid researchers appears to have started shrinking. Nevertheless, the past decades still saw thousands of interesting contributions on representatives of this

fantastic clade. And still, we have a lot of work ahead of us prior to becoming able to respond to all questions regarding ammonoid paleobiology.

So what is new? In terms of content, we have restructured the former into a two-volume work with the main parts shell, ontogeny, anatomy, habit and habitats, macroevolution, paleobiogeography, ammonoids through time, fluctuations in ammonoid diversity, and taphonomy. Most of these parts are subdivided into chapters. The great amount of 41 chapters reflects the panel of ammonoid workers present nowadays in academia, junior and senior scientists from many countries and a higher percentage of female authors compared to the previous edition. We aimed at being as up-to-date as possible, which had the consequence that some chapters also present unpublished specimens, data and results. We also included two chapters on the geochemistry of ammonoid shells, a field that still offers vast possibilities for new research. This is also reflected in the slightly different views presented therein.

Furthermore, we added an introductory chapter for the definition of terms and with a recommendation for the description of new ammonoid taxa. We emphasized the next challenges in ammonoid research such as reconstructing ammonoid phylogeny, understanding their intraspecific variability or reconstructing the soft parts. Studying intraspecific variability has been widely neglected, but it offers a wealth of possible implications for life histories, ontogeny, reproduction and, most importantly, for evolution. In this context, another challenge is establishing a phylogeny for ammonoids, and thus, one part comprising five chapters is dedicated to ammonoid macroevolution. In our eyes, paleontological data yield the essential information for research on evolution. As pointed out already by Seilacher and Eldredge, ammonoids are of particular interest due to their accretionary shell, which has a good fossilization potential and hold a record of their life history, their high evolutionary rates, their wide geographic distribution, high taxonomic diversity and morphological disparity as well as their well-constrained stratigraphic (i.e., temporal) framework. In the case of ammonoids, however, countless homoplasies occurred throughout their evolution, thus hampering attempts to reconstruct ammonoid phylogeny. Nevertheless, a sound phylogenetic model for the ammonoid clade should be one of the central tasks in ammonoid research because the knowledge of ammonoid phylogeny is still patchy. Furthermore, although some quantitative approaches have been pioneered with ammonoids (e.g., Raup's morphospace, Okamoto's growing tube model), such methods are still too little used in many studies on ammonoid paleobiology and evolution; many studies restrict themselves to narrative discussions or qualitative assessments. For this reason, the application of several quantitative and statistical methods to study many aspects of ammonoid like biostratigraphy, biogeography, intraspecific variability, evolutionary trends, etc. are explained and demonstrated in several of the chapters of these two volumes, in the hope these methods will be used more widely in the ammonoid community.

Finally, we added new information obtained from tomographic data obtained both from computer tomography and grinding tomography. The field of virtual paleontology has just started to deliver ammonoid data, which are of special interest in the studies of shell morphology, ontogeny, buoyancy, mode of life, and ultimately evolution.

These two volumes would have been impossible without our wonderful authors, and especially the help of Neil Landman as well as Kazushige Tanabe. Additionally, we greatly appreciate the support of the army of reviewers, who are listed and thanked in the corresponding chapters. Naturally, our partners and families have been affected more or less from the additional time consumed by the preparation of the volumes, we apologize for that and thank them for all their patience, inspiration, and support.

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