Book review

P. A. JOHNSTON & J. W. HAGGART, eds., 1998. Bivalves: an eon of evolution; Paleobiological studies honoring Norman D. Newell. Foreword by Stephen Jay Gould. xiv + 461 pp., 270 illustrations. University of Calgary Press. ISBN 1-55238-005-X (hc) $ 59.95, ISBN 1-55238-004-1 (sc) $ 44.95.

This well-produced book with an attractive cover, showing Norman D. Newell in the badlands of southern Alberta and a *Girtypecten* (my favourite bivalve), includes papers presented at the International Symposium on the Paleobiology and Evolution of the Bivalvia, Royal Tyrrell Museum of Palaeontology, Drumheller, Alta., 1995.

It starts with a pleasantly written introduction by Gould, describing Norman Newell, to whom the volume is dedicated, in the light of his personal contacts and summarizing the contents of the volume. Newell is not only well known for his early work on Late Palaeozoic pectinids and mytilids, but also for his work on the modern carbonate environments of the Bahamas and his magnificent monograph on the Permian reefs in the Texas Glass Mountains. Later he returned to systematic and evolutionary studies, together with Boyd, of particular bivalve lineages, such as the early trigonioids and pseudomonotids, and did outstanding work for the Bivalvia volumes of the 'Treatise on Invertebrate Paleontology'. The introduction is followed by a short preface on the book and the symposium by the editors Johnston & Haggart.

The alphabetically (by author) arranged contributions, which form an interesting mixed bag with evolution as a 'Leitmotiv', are preceded by an in depth phylogenetic analysis of the mollusc classes by Waller, showing the bivalves to have derived from the rostroconchs, which in turn had derived from the Stenothecoidea, with the other shelled molluscs forming a sister group. Waller thoroughly discusses the relationships between all major molluscan classes and gives good arguments against long-held views, such as a supposed close relationship of scaphopods and rostroconchs He also discusses the relationships of the bivalve superfamilies, grouping them into two subclasses, the Protobranchia and the Autobranchia. In short, Waller's contribution is of importance for all malacologists.

It is interesting to compare his results, e.g. an ostreoid-pectinoid link, with those based on genetic sequencing (18S rDNA and 18S rRNA by Campbell, Hoekstar & Carter and Frischer, Williams & Kenchington, respectively), who suggest an ostreoid-pterioid link. The latter result need not necessarily be better, as some strange results (e.g. the linkage of the solemyids with the gastropods, based on long-branch attraction) show.

Comparative morphology plays an important rôle in the revision of classifications at the generic and family level, sometimes with far-reaching consequences for the evolution of a group. Damborenea gives good evidence for the placement of *Kolymonectes* in the family Propeamussiidae and discusses its bipolar distribution and its palaeoecology. Fang clarifies the position of *Beichuania* in the subfamily Modiomorphiinae by comparing it with *Modiomorpha* and discusses the placement of the Modiomorphidae in the Anomalodesmata rather than in the heterodont Carditoidea. The creation by Guo of the new subfamily Sinonaiinae (of the family Nippononaiidae) for Cretaceous non-marine bivalves from Asia on the basis of the shell ornamentation seemed poorly founded to me as a non-specialist. Harte uses cladistic analysis to shed light on the evolution of the venerid *Mercenaria* and its derivation from *Placamen*. Johnstom & Collom show conclusively that the Inoceramidae are Cryptodonta (not Pteriomorpha) in a thorough study of the group, comparing them with the Praecardioidea which also were adapted to low benthic oxygen and may have used chemosymbiosis. Johnston & Zhang reinterpret *Sinodora* as a trigonioid genus based on the study of well preserved material from the Lower Devonian of China, thus throwing light on the early history of the Trigonioidea. Malchus provides an in depth phylogenetic analysis of the significance of shell chambers and chomata in the Ostreoidea, concluding to the independent (convergent) evolution in the Spondylidae. Sánchez & Babin make it clear that the question whether the actinodont dentition arose from the taxodont dentition or vice-versa is not appropriate since their development might be adaptive rather than evolutionary. Seilacher gives a thought-provoking discussion of the rudist evolution based on the replacement of the ligament function and the related possibility of algal photosymbiosis. Of special interest to me is his comparison with the richthofeniid and oldhaminiid brachiopods, suggesting the possibility of

photosymbiosis for the latter. Silantiev analyses the hinge structure of *Paleomutela* and concludes that Late Permian non-marine bivalves from Russia formerly assigned to *Naiadites* and *Anthroconaia* should be reassigned to *Paleomutela*.

Evolution forms the basis for using bivalve faunas as a stratigraphic tool. Aberhan, Hrudka & Poulton discuss the biostratigraphy of Early Jurassic and Aalenian bivalves from Canada and their bipolar palaeogeographic distribution (e.g. Siberia and southern South America). Collom gives a detailed biostratigraphic overview of the Late Cretaceous inoceramid genus *Gremnoceramus* in North America, based on a taxonomic revision and phylogenetic analysis. Good describes freshwater unionoids from the Upper Triassic of the SW. USA, thus clarifying the early evolution of this group. Gou & Shi report on Cretaceous rudists from Tibet and their use for stratigraphic correlation. Gu relates the evolutionary trends of non-marine Cretaceous bivalves from NE. China. Guo gives a thorough phylogenetic analysis of the non-marine Cretaceous trigonioidoids and their origin from unionids in Jurassic lakes on the Asian continent. Their rare occurrence in North Africa and North America is intriguing. Hartman shows that the latest Cretaceous non-marine bivalves from Montana (USA) are completely different from the Paleocene ones. According to him the pattern of last appearances suggests that a bolide impact was not the reason for the demise of the fauna, but possibly changes in groundwater level due to a regressive pulse of the Cannonbal Sea.

Finally, a group of papers emphasizes the palaeoecological aspects of bivalves. Amler gives an overview of the Lower Carboniferous (Mississippian) Central European quietwater (Kulm) faunas, presenting an environmental zonation. Anelli, Simões & Rocha-Campos discuss the mode of life of some in situ preserved Late Palaeozoic anomalodesmatans. Carter & Seed describe the influence of thermal potentiation on the mineralogical evolution, based on extant *Mytilus* species. Eliuk presents an overview of the occurrence of megalodonts in Canada from the Silurian to the Cretaceous, emphasising on the Devonian and Jurassic occurrences and stressing the palaeoecological implications such as nutrient-poisoning of reefs. Since no systematic descriptions are given, one wonders, whether these megalodonts form a monophyletic group (genus, family?), or whether this is a case of convergence. Frey discusses the distinctive Ordovician *Pseudocolpomya* fauna, which occurs repeatedly in association with patchy bryozoan thickets; one wonders whether such a book is the right place to create a new genus, such as *Pseudocolpomya*. Trophonid gastropod predation on Recent bivalves from the Magellanic region (S. Argentina) is described by Gordillo. Based on the knowledge of modern populations of *Crassostrea virginica*, Haglund describes three ecophenotypes of the Cretaceous *Crassostrea subtrigonalis* from Central Alberta, thus cleaning the taxonomic mess that had arisen. Kondo gives a taphonomic analysis of living and extinct (Pleistocene) infaunal, suspension-feeding bivalves, showing that adaptation to reworking, rapid burial and other physical disturbances is a major control of their evolution. Savazzi describes the constructional morphology of the aberrant species *Pedum spondyloideum*, which lives trapped within living coral. Simões, Rocha-Campo & Anelli give an overview of the Permian marine bivalves that dominated the palaeoecologically restricted faunas that had evolved in the isolated Parana Basin.

The contributions treat a wide range of subjects, and all together provide a good picture of modern evolutionary-systematic research on bivalves. The application of modern shell data (e.g. genetics, behaviour, mineralogy) to fossils provides important new insights. For anyone interested in fossil bivalves this book is excellent value for money.

Cor F. WINKLER PRINS