

BOOK REVIEW

MORPHOLOGY AND EVOLUTION OF TURTLES: PROCEEDINGS OF THE GAFFNEY TURTLE SYMPOSIUM (2009) IN HONOR OF EUGENE S. GAFFNEY, by Donald B. Brinkman, Patricia A. Holroyd, and James D. Gardner (editors), 2013. Springer, New York, 577 pp. US\$139.00, ISBN: 978-94-007-4309-0.

All in all it's better to be honored while still alive, when one can enjoy the compliment, rather than posthumously, when one must, of necessity, miss the party. The timing of the 2009 Gaffney Turtle Symposium, from whence this comprehensive volume derived, was thus excellent: Eugene Gaffney, who has dominated chelonian studies for the past 50 or so years, was very much alive and well for the party in his honor, and remains so to this day. The Symposium and consequent Proceedings volume drew a wide variety of participants from across 'Turtalia,' and rightly celebrated the career and contributions of an extraordinarily important, productive, and generous colleague. The dawn of Gaffney's career in effect coincided with the dawn of the nexus of phylogenetic systematics and vertebrate paleontology. Working with what is by terrestrial vertebrate standards an abundant fossil group with lots of synapomorphic characters, Gaffney marshaled an uncommon appreciation for what he calls "the intricacies of morphology," and addressed a wide range of questions chelonian, providing perhaps his most important insights on turtle relationships and evolution.

The large-format volume is hardbound, and although most of the contributions in it are printed in black and white, there are some color figures as well. For all that, however, the list price is not completely off the scale. The book consists of six parts. The first is, unsurprisingly, a bibliography and appreciation of Gaffney (by Robert Carroll), followed by Gaffney's 'Autobiography,' a sparse but entertaining document in which we learn that although Ned Colbert, Gaffney's advisor, did not actually read his Ph.D. dissertation, Colbert bequeathed to Gaffney "the best possible legacy, his [Colbert's] job." The other parts are 'Part II: The Origin of Turtles' (five contributions); 'Part III: The Early Diversification of Turtles' (six papers); 'Part IV: Pleurodire Diversity and Biogeography' (five papers); 'Part V: Diversity, Biogeography, and Paleobiology of Late Cretaceous and Tertiary Turtles' (eight contributions); and 'Pathologies, Anomalies, and Variation in Turtle Skeletons' (two contributions). Virtually every important fossil turtle worker in the last 20+ years is represented in these peer-reviewed contributions.

Non-specialists (like me) will naturally be drawn to Part II. With once-heterodox proposals such as the diapsid nature of turtles, as well as tantalizing discoveries such as the primitive *Odonotochelys* and *Chinlechelys*, the beginning of the 21st century breathes promise of matching, for turtles, the richness of late 20th century insights on the origin of birds. Unfortunately, this volume arrived before we actually got there. There is a comprehensive review of turtle origins, a subject that is revealed to have been a veritable cottage industry among vertebrate paleontologists for the last 100 or so years. Interestingly, the author (veteran early amniote specialist Robert Carroll) concludes, with Watson (1914), that *Eumotosaurus*, or at least its synapomorphies, figure in turtle ancestry. Other highlights from that section include a discussion of the origin of the shell, attempts to integrate paleontological and neontological data into hypotheses of turtle origin, and a detailed treatment of the evolution of the internal carotid artery as a means of understanding the evolution of turtle skulls.

It has often been said that once the pleurodire-cryptodire split took place, turtles in each clade were fundamentally unchanged through their post-Triassic evolutionary history (e.g., Pough et al., 2009). What, then, is left for Part III? Perhaps because of that history of relative stasis, the contributions are a series of relatively short, non-comprehensive offerings. So, although Part III is supposed to be about the early evolution of turtles, it really is about a variety of discoveries: new material of *Notoemys*; new turtles from the Junggar Basin of China; the rediscovery of a historically significant specimen of *Chelone*; the establishment of some new genera (*Kappachelys*, *Spoochelys*, *Brachyopsemys*); and even a new, if enigmatic, eucryptodiran family (Sandownidae). These discoveries range from Jurassic–early Paleocene in age and, with the exception of the Junggar specimens, which allowed the authors to adduce information about early stages of the basicranium in eucryptodires—shed light less on the early evolution of turtles, than on more focused aspects of the evolution of various chelonian clades.

Part IV is a mini-Pleurodirefest. New genera are described (*Laganemys* from Niger; *Nostimoachelone* from Greece), and the relationships of older groups (bothremydids from Spain; pelomedusoids from Brazil) are revisited. The Oligocene Atlantic biogeography of the podocnemidid *Bairdemys* is also presented.

It is not fair to state that the meat of the book is in Part V, but this is certainly the largest and most diverse portion. This section is highly informed by geography (if not biogeography): there are treatments of Late Cretaceous turtles from eastern Europe; the San Juan Basin (New Mexico, U.S.A.); Asian trionychids; Oligocene and Miocene kinosternids from Florida (U.S.A.); new Paleogene turtles largely linked by time, locality (North America), and the author's (J. H. Hutchinson) research interests; and a history of European sea turtle discoveries. The genera *Neurankylus* and *Zangerlia* are revisited in particular phylogenetic detail. From an organizational standpoint, therefore, these offerings don't fall into well-defined categories, but in general it would seem that if mixed pleurodire-cryptodire assemblages, or purely cryptodires are being treated, they fall within the broad compass of this section.

The last section (Part VI) essentially deals with residuals: chelonian paleopathologies and modern intraspecific variation. The first article is a comprehensive review of this subject. Pathologies are organized by anatomical part and by diseases, and the article makes for fascinating, if at times grisly, reading. The second article treats morphological variation in the extant *Terrapene coahuila*, developing an important baseline for the meaning of morphological variation in these chelonians.

In summary, like many multi-authored, edited volumes, this is not the place to acquire a comprehensive, organized, integrated understanding of the fossil history of turtles. Although many aspects of paleontological and a rare few aspects of neontological research are represented, coverage is uneven and, with the exception of two or three review articles about selected topics (e.g., turtle origins; chelonian paleopathologies), the treatments do not aspire to comprehensive coverage. Instead, they tend to be focused on specific aspects of turtle morphology, relationships, and

evolution. Perhaps this may limit the breadth of the appeal of the book for non-specialists; on the other hand, aren't turtle morphology, relationships, and evolution what a tribute to the total corpus of Gene Gaffney's work ought to be about?

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