

The Inner Bird: Anatomy and Evolution

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The Inner Bird: Anatomy and Evolution. Gary W. Kaiser. 2007. University of British Columbia Press, Vancouver. 386 pages, numerous figures and 4 tables. ISBN 978-0-7748-1343-3. Cloth, \$85.00 (Canadian).—Under this intriguing title, Gary Kaiser emphasizes that, in many cases, one must consider the internal morphology of birds before other aspects in their life history can be well understood. This book comprehensively covers the internal structure of birds with respect to many aspects of their life history and evolution from reptiles, with an emphasis on the skeleton. It is divided into three sections—"What is a bird," "What kind of bird is it," and "How does a bird fly"—which allows a natural flow of ideas. All chapters have a small number of citations to further reading, and the extensive bibliography is selective (almost all citations are in English) and overlooks some important review papers. Emphasis is placed on the avian skeleton and avian flight. Kaiser accepts the hypothesis that birds evolved from dinosaurs and includes, in some detail, the early fossil history of birds and the evolution of feathers and of flight. Because of his extensive research on the Marbled Murrelet (*Brachyramphus marmoratus*), he includes an interesting chapter on oceanic birds that stresses the different ways in which they have become suited to life on the oceans. Kaiser does not mention that several other species of murrelets are perhaps the most extreme oceanic birds, in that the precocial chicks leave the nest for the ocean two days after hatching.

In his discussion of avian evolution and the relationships of fossil and Recent birds, Kaiser follows a cladistic approach and presents a quite thorough discussion of molecular studies of avian classification. The early fossil history of birds is well covered from *Archaeopteryx* to the known Cretaceous fossil birds. Mention is made of the earlier, puzzling Triassic *Protavis*, and of the *Enantiornithes* (here called the "ball-shouldered birds"), but the main coverage of the latter comes to less than two pages, which seems inadequate for this large group of Cretaceous birds. There are other discussions of the *Enantiornithes* throughout the text, though these do not do justice to an understanding of the "opposite birds" in early avian evolution. This large radiation of early birds apparently acquired several important avian features independently from the lineage that led to modern birds, spread worldwide to become the dominant avian group, and disappeared at the end of the Cretaceous. It is rather speculative (p. 253) to postulate that extinction of the *Enantiornithes* resulted from their lack of a "tail fan"; absence of a tail fan is speculative and based on negative evidence.

Care must be exercised in reading this book, as it contains some dubious or inaccurate statements. All tetrapods have hollow bones; birds differ from most in having thin-walled bones, which, in most cases, are filled with marrow, not air sacs. I simply do not understand the statement (pp. 30–31) that avian bones have a thin layer of "sclerotic tissue" (= keratin) that lines their inner and outer surfaces and is continuous with the outer layer of the skin. More serious is the lack of any discussion of the muscular system, which must be included in any consideration of the skeleton when assessing avian internal morphology and in understanding differences among the groups of birds.

In reviewing this book, I found numerous things to think about and have been directed to a good deal of literature in avian anatomy, systematics, and paleontology. Hence, I found this book to be an interesting read as it led to additional ideas. Most important is that Kaiser has emphasized, in the title *The Inner Bird*, a significant area of avian biology that has been little considered over the past decades, and one that must be given more attention if we are to fully appreciate all aspects in the life of birds. Simply put, we do not know everything about avian morphology, and there is much more to be discovered. But Kaiser has taken on a most difficult task and one in which he is not entirely successful. Part of the problem is that he attempted to cover too much in this volume. It would have been better if he had restricted himself to the “inner” Recent bird and the differences seen in the various groups in this remarkable radiation of tetrapods. In spite of the problems mentioned above, I can recommend his book to ornithologists as an entrance into this fascinating area of avian biology.—WALTER J. BOCK, *Department of Biological Sciences, 1212 Amsterdam Avenue, Mail Box 2428, Columbia University, New York, New York 10027, USA. E-mail: wb4@columbia.edu*