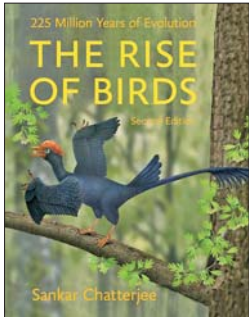




The saga of birds



Sankar Chatterjee 2015. *The Rise of Birds. 225 Million Years of Evolution. Second Edition. 370 pp.* Johns Hopkins University Press. ISBN 978-1-4214-1590-1 (hardcover). Price \$59.95; e-book \$59.95.

How do you sum up two hundred million years of birds' natural history? Not an easy task. The second edition of "The Rise of Birds", a considerable contribution concerning origins and evolution of birds, takes us on such a journey throughout 16 richly illustrated chapters.

Professor Chatterjee gives a thorough and original account of the evolution of birds from their very inception in the Mesozoic to their achievement of aerial supremacy beginning in the Cretaceous and continuing today. The book covers all the major steps of bird evolution and diversification, with emphasis on the Mesozoic (chapters 3–10). Two full-length chapters concern the earliest flying forms, *Archaeopteryx* and the Triassic *Protoavis*, the latter a highly controversial creature regarded by some as a chimera but interpreted by Chatterjee as a bird *avant la lettre*.

In chapters 12–16 Chatterjee skillfully reviews all most pertinent aspects of "what it takes to be a bird". The longest chapter is obviously devoted to the origin of flight in birds and provides an excellent summary of the topic, not avoiding the basics of aeronautic engineering. Further chapters cover the structure and evolution of feathers, possible avian trace fossils, the fossil record of eggs and embryos, as well as explore two more anatomy-related topics, i.e., the feeding mechanism and cranial kinesis. The final chapter deals with bird-human interactions; sadly, humans have been responsible for multiple extinctions, in particular of island avifauna.

Although Chatterjee presents some crucial events in the origination and evolution of birds from multiple perspectives, it cannot be missed that this book is a highly personal narrative or vision of the natural history of this group, and thus it certainly provokes some questions.

The first bone of contention strongly affecting all phylogenetic and evolutionary content is the status of *Protoavis* which, Chatterjee continues to posit, represents the earliest bird. Putting aside the validity of this taxon, Late Triassic *Protoavis* displays features not present in Aves until the Early Cretaceous (e.g., a keeled sternum, kinetic skull) paired with extremely primitive morphologies (e.g., the structure of the hand, long bony tail). Another problem throughout the book, there are almost no photographs of actual fossils so that the reader has no opportunity

to verify the presence of anatomical features such as the keeled sternum in *Protoavis*. While Chatterjee does discuss the controversy and provides additional support for his identification, if valid, it is unclear why the mentioned histological results have not been formerly published.

While there is a good deal of information provided for an old controversial taxon, more recent data is often lacking. Take for example the chapter on the basal avialan *Jeholornis*: The introduction is well written and the morphological description is detailed. However, this chapter depicts *Jeholornis* as a primitive gliding taxon when in fact evidence indicates this bird had evolved a unique form of flight unlike that in living birds but well developed nonetheless. Although only slightly more derived than *Archaeopteryx*, jeholornithiforms possessed advanced flight related features such as a procoracoid process on the coracoid that evolved in parallel to the neornithine lineage. Despite appearing on the cover, there is no mention of the "two-tail" caudal plumage that characterizes this clade, consisting of a proximal fan-shaped array of rectrices capable of generating lift and a distal tail frond of feathers that together with the elongated bony tail would have functioned as stabilizer, in addition to any potential ornamental function. The tail in all probability could not have functioned as a prop while climbing trees, as proposed by Chatterjee.

Furthermore, discussion of pygostyle evolution, a key anatomical feature of modern birds, hinges on *Zhongornis haoae*. However, a recent alternative interpretation (O'Connor and Sullivan 2014) suggests this taxon is not a bird, citing similarities with scansoriopterygids. This has obvious bearing on phylogenetic considerations throughout the book, although the Author is not to blame here; in our time of multiple venues for rapid publications, a traditional book with its long editorial process cannot compete with electronic media for data currency. Instead, it should serve rather as a referral source, a starting point for further studies, which is in fact what we expect from a good book: to be a source of established knowledge and inspiration for further research, which may or may not lead to quite different conclusions than those reached by an author. In this respect, "The Rise of Birds" stands out brilliantly, not least due to the artful prose of the book.

To sum up, Chatterjee's may not be a vision shared by all or even the majority of bird researchers, but it is undoubtedly worth reading and serious consideration.

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