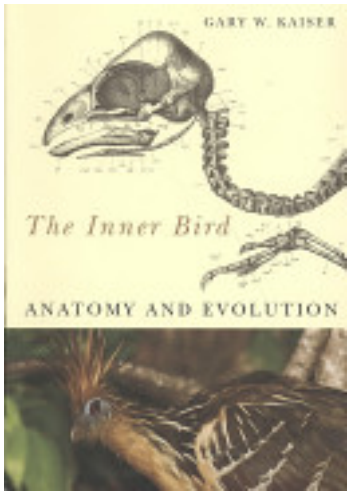

The Inner Bird: Anatomy and Evolution, Gary W. Kaiser, University of Brit Columbia Press, 2008, 077481344X, 9780774813440, 386 pages. Birds are among the most successful vertebrates on Earth. Animportant part of our natural environment and deeply embedded in ourculture, birds are studied by more professional ornithologists andenjoyed by more amateur enthusiasts than ever before. However, bothamateurs and professionals typically focus on birdsÐ²Ð‚â„¢ behaviourand appearance and only superficially understand the characteristicsthat make birds so unique.The Inner Bird introduces readers to the avian skeleton,then moves beyond anatomy to discuss the relationships between birdsand dinosaurs and other early ancestors. Gary Kaiser examines thechallenges scientists face in understanding avian evolution - evenrecent advances in biomolecular genetics have failed to provide a clearevolutionary story. Using examples from recently discovered fossils ofbirds and near-birds, Kaiser describes an avian history based on thegradual abandonment of dinosaur-like characteristics, and the relatedacquisition of avian characteristics such as sophisticated flighttechniques and the production of large eggs. Such developments haveenabled modern birds to invade the oceans and to exploit habitats thatexcluded dinosaurs for millions of years.While ornithology is a complex discipline that draws on many fields,it is nevertheless burdened with obsolete assumptions and archaicterminology. The Inner Bird offers modern interpretations forsome of those ideas and links them to more current research. It shouldhelp anyone interested in birds to bridge the gap between long-deadfossils and the challenges faced by living species..

Birds A Visual Guide, Joanna Burger, Jul 25, 2006, Nature, 304 pages. Presents a survey of major bird groups and families, describing their distribution, habitats, adaptations for survival, and their relationship with humans throughout history..

Anatomy of birds , Frank Evers Beddard, 1884, Nature, . .

Avian myology , John Caleekal George, Andrew John Berger, 1966, Nature, 500 pages. .

Ornithology , Frank B. Gill, 2007, Science, 758 pages. Ornithology is the classic text for the undergraduate ornithology course, long admired for its biological/evolutionary approach to bird science. The new edition--the first ....

The bird building book a manual for preparing bird skeletons with a bone identification guide, Lee Post, 2005, Nature, 89 pages. This is volume 5 of the 10 Bone Building Books that will be in print. This is a two part manual. The first part is a step by step guide to preparing and articulating a bird ....

Bird , David Burnie, 1988, , 63 pages. A photo essay on the world of birds examining such topics as body construction, feathers and flight, the adaptation of beaks and feet, feeding habits, courtship, nests and eggs ....

The great dinosaur discoveries , Darren Naish, Oct 21, 2009, Nature, 192 pages. This elegantly

illustrated volume is a journey through more than two centuries of remarkable discovery. Books on dinosaurs are usually arranged by classification or epoch, but ....

The Origin and Evolution of Birds , Alan Feduccia, 1999, Nature, 466 pages. This monumental book is a comprehensive & profusely illustrated exploration of all that is known about the origin of birds & of avian flight. Alan Feduccia, a leading ....

Feathers The Evolution of a Natural Miracle, Thor Hanson, 2012, Nature, 336 pages. A biologist presents the natural history of feathers, applying the findings of paleontologists, ornithologists, biologists, engineers, and art historians to answer questions ....

The age of birds , Alan Feduccia, 1980, Nature, 196 pages. An authoritative examination of the evolution of birds analyzes avian anatomy from an aerodynamic perspective, recounts successful and unsuccessful evolutionary adaptations ....

The Inner Bird introduces readers to the avian skeleton, then moves beyond anatomy to discuss the relationships between birds and dinosaurs and other early ancestors. Gary Kaiser examines the challenges scientists face in understanding avian evolution - even recent advances in biomolecular genetics have failed to provide a clear evolutionary story. Using examples from recently discovered fossils of birds and near-birds, Kaiser describes an avian history based on the gradual abandonment of dinosaur-like characteristics, and the related acquisition of avian characteristics such as sophisticated flight techniques and the production of large eggs. Such developments have enabled modern birds to invade the oceans and to exploit habitats that excluded dinosaurs for millions of years.

While ornithology is a complex discipline that draws on many fields, it is nevertheless burdened with obsolete assumptions and archaic terminology. The Inner Bird offers modern interpretations of some of those ideas and links them to more current research. It should help anyone interested in birds to bridge the gap between long-dead fossils and the challenges faced by living species.

This volume stands out from the plethora of books on birds by concentrating on structural makeup and how structural modifications make one group of birds different from others. …It is an altogether welcome offering by an eminently qualified writer. …Summing up: Highly recommended. (H.N. Cunningham, Jr. CHOICE, Vol. 45, No. 01 20070901)

Kaiser's book is called 'The Inner Bird' because he concentrates on the skeleton and internal features of this large and varied group of animals rather than the superficial plumage and behaviour which have been the subject of a great number of books in the past. It is an exceptional and possibly unique presentation of the highly specialized field of modern ornithology and the origin and development of the bird written in language readily accessible to the reader by an acknowledged expert. Kaiser describes the basic structure of birds, the most recent discoveries of feathered dinosaurs, early evolution and the way birds have adapted in their anatomy to different environments. The book is full of interesting insights and asides. Few people are aware for example that the bird was fully evolved long before the extinction of the dinosaurs or why penguins are so successful underwater (their anatomy allows them to generate pressure on the upstroke)or that the little swift may achieve speeds of more than 160 Km/hour. This book is not cheap but very good value for anyone who is interested in these extraordinary animals.

The Inner Bird is not a typical bird book, and therein lies a great deal of its value. It is the first recent popular science treatment of the anatomy of birds, and how that anatomy ties into the features more commonly written about aspects of avian biology; evolution, behaviour and taxonomy. Even experts of bird ecology or taxonomy will find something of value here, it brings back the almost Victorian emphasis on anatomy, on the skeleton, on how the shape drives the function (and visa versa). The treatment of evolution takes the recent revolution in our understanding of birds as dinosaurs from a skeletal point of view, and the recent breakthroughs in avian systematics and cladistics as derived from DNA and molecular analysis are explained for the layman and contrasted with previous

attempts to assemble a tree of life for the class Aves.

The scholarship isn't always flawless, there are a few statements that will leave you scratching your head ("[bee-eaters] are one of only a few small non-passerine birds that undertake lengthy migrations"?). The price is also rather hefty, and the index could have been more helpful, but these are minor distractions in what is otherwise an excellent book that fills a gap in the market.

I can think of no other book that brings the evolution of avian insides (physiology and anatomy) to life like this one. Gill's or Petingill's textbooks (or even the newer Cornell textbook) are pretty dull in comparison. Although I work on birds for a living, I learned an awful lot about how avian physiology was shaped by the requirement of flight. At times, Kaiser digresses a little too much and probably speculates beyond where the science can take him. Also, the overemphasis on seabirds and murrelets at times distracts from the broader picture. Nonetheless, the book brought together the fossil record and modern anatomy/physiology in a way that made a lot of sense out of all the rapidly changing world of bird evolution (at a large scale). With all the fossils coming out of China and the rapidly changing higher order phylogeney (due to genomics and the Tree of Life) it is nice to see how the different pieces fit together. Excellent read.

aerial albatrosses ancestors animals anseriform appear Archaeopteryx aspect ratio auks avian ball-shouldered birds beak biomolecular phylogeny birdâ€™s birdlike body bones characteristics Charadriiformes clades cladistic classification Confucius bird coracoids cormorants Coronaves Cretaceous cuckoos developed digit diving diving-petrels eggs Enantiornithes evolution evolutionary extinct feathers femur Figure ï¬,apping ï¬,at ï¬,eshy ï¬,exible ï¬,ight ï¬,ight muscles ï¬,ight style ï¬,ightless ï¬,y forest birds fossil frigatebird function furcula fused galliform gene grebes Hesperornis hipbones Hoatzin humerus hummingbirds Ichthyornis joint legs limb lineages living birds loons mammals Metaves modern birds Murrelet neck neognaths Neornithes nest ornithologists owls paleognaths paleontologists pectoral Pelecaniformes penguins petrels plumage predators prey primitive Procellariiformes pygostyle reï¬,ect relationship relatively reptilian ribs seabirds shape Sibley and Ahlquist similar skeleton skull songbirds specialized species speed spinal sternum structure suggest surface synapomorphies tail tarsometatarsus taxonomy tendons terrestrial theropods thoracic tinamous tissue toes underwater vertebrae weight wing wing-propelled World vultures

Birds are among the most successful vertebrates on Earth. An important part of our natural environment and deeply embedded in our culture, birds are studied by more professional ornithologists and enjoyed by more amateur enthusiasts than ever before. However, both amateurs and professionals typically focus on birds’ behaviour and appearance and only superficially understand the characteristics that make birds so unique.

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. […] 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. […] I can recommend his book to ornithologists as an entrance into this fascinating area of avian biology.

Good, non-technical books on anatomy are rare; good, non-technical books on avian anatomy are just about non-existent. Gary Kaiser’s The Inner Bird: Anatomy and Evolution stands out as one of a kind – it is not brand-new (having been published in 2007), but still has yet to be widely recognised as the valuable piece of scholarship that it is. I will state here at the outset that I cannot recommend it highly enough.

Containing a wealth of information that ranges from the Mesozoic ancestry of birds to neornithine phylogeny, flight dynamics, functional morphology and ecology, it should be sought out and consulted avidly by anyone seriously interested in avian anatomy and evolution. Kaiser’s volume not only serves as both a wide-ranging introduction and review, but also includes new data and several interesting new hypotheses. The author also challenges widely-held ideas where

appropriate and brings attention to the fact that erroneous, highly dated views on avian anatomy and function are still being promoted. The Inner Bird is also eminently readable: it is not a text-book.

The book begins with an introduction to avian anatomy (covering both bone structure in general, and the many skeletal and soft-tissue peculiarities of the different bird groups) and then compares and contrasts modern (neornithine) birds with their dinosaurian ancestors. There is a huge amount of information here that has not been distilled before. Kaiser’s discussions of such areas as sesamoid distribution and function, neck mobility, the form of the lumbar-synsacrum junction, chewing behaviour and bill morphology in cuckoos and turacos, the possible role of the glycogen body, and the massive variation seen in furcular anatomy among neornithines are extremely welcome [motmot skull shown below: from Kaiser's collection of skull photos archived at http://innerbird.com].

A second section begins with a review of the history of avian classification and is then devoted to a discussion of avian phylogeny. Kaiser spends a lot of time on convergent evolution and focuses on ambiguity and disagreement more than their opposites. He also uses this as an opportunity to examine the wonderful but always annoying Hoatzin Opithocomus hoazin. The amazing anatomy and controversial phylogenetic position of this South American bird evidently fascinate the author and he returns to it many times over, also featuring it and its skeleton on the cover.

The anatomy and function of feathers, their evolutionary origins, and their distribution in dinosaurs form the subject of the third and final section. Kaiser uses his knowledge of modern bird aerodynamics and flight behaviour to look anew at Archaeopteryx, confuciusornithids, enantiornithines (‘ball-shouldered birds’ of his usage) and other fossil birds, and the final chapter in this section – that on the structure and function of marine birds – is one of the best in the book. A glossary and numerous graphs, tables and diagrams are included, and the text is fully referenced.

The volume takes its title from one of Kaiser’s most profound intellectual proposals: the notion that neornithine birds are “puppeteers that hide behind a screen of feathers”; creatures that have evolved a highly novel body plan for vertebrates. Neornithines are, generally speaking, small, fragile, thin-limbed animals, protected and covered by an extensive ‘environmental suit’ formed from their integument, and with only a few of their extremities truly exposed to the elements. This is the ‘inner bird’ body plan, and it has enabled some birds to make a living from freezing cold oceans, to live for months on end on the wing, and to become one of the most successful vertebrate clades in a multitude of terrestrial and aquatic habitats. As Kaiser puts it, neornithines have come a long way from their ancestors.

Kaiser is convinced by the evidence for the dinosaurian origin of birds, and long sections of the book are devoted to discussing the similarities and differences seen between birds and their non-avian relatives*. The notion that birds cannot be dinosaurs is heavily promoted in the ornithological literature – most notably in Alan Feduccia’s The Origin and Evolution of Birds (Feduccia 1996). Because Feduccia’s book is one of the most visible of volumes on bird evolution, audiences can be forgiven for thinking that ornithologists as a whole reject the hypothesis of a dinosaurian ancestry for birds. This is absolutely not true, and those interested should take every opportunity to note that all of Feduccia (et al.’s) criticisms are invalid or erroneous (e.g., that non-avian theropods are too big to be ancestral to birds, that they occur too late in the fossil record, that their anatomy bars them from avian ancestry, and that other Mesozoic reptiles make better potential bird ancestors). It is also worth noting that many of Feduccia’s proposals about the phylogeny of neornithines are idiosyncratic and that his volume does not accurately represent current thinking on avian evolutionary history. The Inner Bird helps provide part of the antidote, bringing home the point that the dinosaurian origin of birds is well supported and robust, and adopted by many ornithologists interested in palaeontology.

Indeed, if anything is clear from the explosion of recently described feathered maniraptoran theropods (virtually all of which are from Liaoning Province in China), it is that the early members of several of the key groups (oviraptorosaurs, epidendrosaurs, troodontids and dromaeosaurids) were

all extremely similar to the earliest birds. All were small, feathered, leggy omnivores or predators with long arm and tail feathers and delicate, toothed skulls. In fact these little maniraptorans are so similar that the members of the different lineages are sometimes wrongly allocated. The early troodontids Anchiornis and Jinfengopteryx, for example, were originally described as birds, and it has proven increasingly difficult to find reliable characters that distinguish Archaeopteryx from non-avian maniraptorans. Analyses that incorporate good taxonomic and character sampling still find Archaeopteryx to be part of the bird branch within Maniraptora (e.g., Norell et al. 2001), but it is far from inconceivable that Archaeopteryx could prove to be on the deinonychosaur branch, or that deinonychosaurs could be on the bird branch. This makes a mockery of the idea that deinonychosaurs are somehow fundamentally different from birds*. Accordingly, a reasonable interpretation of the fossil record is that birds were, originally, only one maniraptoran lineage among many: nothing special, and not obviously destined for phenomenal success.

* This is what Feduccia and colleagues argued until recently. They have since rescinded this and, like Greg Paul, now argue that bird-like maniraptorans are flightless birds. I don’t think that’s right, but I don’t find it offensive. They continue to argue, however, that this ‘expanded Avialae/Aves’ is nothing to do with dinosaurs. For discussion of this area see the article (and comments) here [Berlin Archaeopteryx shown below; from wikipedia].

Worth noting is that Kaiser is a bit out of date in saying that Archaeopteryx is older than all of its closest non-avian relatives. Even prior to 2007, numerous (admittedly scrappy) remains demonstrated the presence of non-avian maniraptorans older than Archaeopteryx. Pedopenna – a Middle Jurassic bird-like maniraptoran with long hindlimb feathers – was described in 2005 (Xu & Zhang 2005). Several additional, recently described feathered maniraptorans can now be said to pre-date Archaeopteryx, including Anchiornis, Epidendrosaurus and Epidexipteryx.

While I am extremely happy that Kaiser tackled Mesozoic birds and other dinosaurs so extensively (and while his insights and hypotheses are excellent, insightful and though-provoking), his work would definitely have benefited from a check by a worker who specialises on these animals. In one section, the four-winged dromaeosaur Microraptor is repeatedly referred to as Eoraptor: the latter is an early predatory dinosaur from the Triassic of Argentina; it is not closely associated with avian ancestry. Protoavis (a highly controversial fossil from the Triassic of Texas, thought by its describer to be a bird more closely related to neornithines than is Archaeopteryx) is wrongly and consistently called ‘Protavis‘ and quite a few other names are spelt incorrectly too. The reference to Rahonavis from Madagascar as a close relative of Archaeopteryx ignores recent evidence showing that it is more likely one of the unenlagiine dromaeosaurs. Kaiser is incorrect in suggesting that Archaeovolans (see below) might be synonymous with Arctosaurus: the former is a Chinese bird from the Cretaceous while the latter is an indeterminate archosauromorph named for a single neck vertebra from the Triassic of Canada; they have never been linked to my knowledge.

Greg Paul’s proposal that deinonychosaurs and other non-avian maniraptorans may have been secondarily flightless is not, as Kaiser implies, the same as the ‘birds come first’ hypothesis. The latter notion, developed by writer-researcher George Olshevsky, proposes that small size and a scansorial lifestyle evolved early on in archosaurs, that all dinosaurs are the direct descendants of such ancestors, and that one dinosaur lineage – Aves – is unique in retaining these ancestral features (Olshevsky’s ‘Birds Come First’ hypothesis was covered at length here and here).
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