Mesozoic Birds: Above the Heads of Dinosaurs

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While working with Errington, Leopold, and Van Tyne, Hammy published major scientific papers each year, but thereafter his production was limited mainly to annual reports for the Wisconsin Department of Natural Resources (DNR). His superb writing skills, however, were used to help posthumously complete Aldo Leopold's *Sand County Almanac* and to critique and improve the papers of many younger biologists. Fran found her niche in writing technical and popular articles, many in collaboration with Hammy, and most telling of her raptor studies. Between 1970 and 1994 she added 10 books, including *An Eagle to the Sky, Walk When the Moon is Full, Wild Food Cookbook,* and *Harrier: Hawk of the Marshes*.

Corneli has used the Hamerstrom archives to good purpose and has caught the generous spirit of this dedicated couple, their remarkable hospitality, their teaching and mentorship and their good example to all they met. The photographs are excellent, but a map of the mentioned areas in Wisconsin and Michigan is lacking. I detected five typographical errors in names of people and places. I was surprised that Corneli did not give the exact date of death for either Hammy or Fran, an absolute necessity in any biography, and regret that she did not share the full story of the reason for the Hamerstrom's early retirement. The DNR spot-checkers were not looking for evidence that they were shirking as might be inferred from page 244; instead, the Hamerstroms were officially chastised for working *more* than the forty-hour week covered by DNR insurance policies.

The "ripple effect" of Hammy and Fran, through their students, and their influence on a third generation in turn, will live on for years to come. This informative two-person biography deserves a wide readership.—C. Stuart Houston, *863 University Drive, Saskatoon, Saskatchewan, S7N 0J8, Canada. E-mail: houstons@duke.usask.ca.*

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Mesozoic Birds: Above the Heads of Dinosaurs.—Luis M. Chiappe and Lawrence M. Witmer, Eds. 2002. University of California Press, Berkeley, California. xii + 520 pp., 230 text figures. ISBN 0-520-20094-2. Cloth, $95.00.—For the past 150 years, the earliest known bird has been the late Jurassic *Archaeopteryx*. In spite of multiple, beautifully preserved specimens of this bird, which still retains some undeniably reptilian features, perhaps the most polarized issue in ornithology and vertebrate paleontology is the origin of birds. To generalize, one group of researchers believes that birds evolved from theropod dinosaurs, most likely from within a family such as the Dromaeosauridae or Troodontidae. There is much to recommend the theropod-to-bird (TB) hypothesis, as well as considerable unresolved problems (see Feduccia 2002, Olson 2002). Either way, claims that that the TB hypothesis is "the only game in town" (Lawrence Witmer, p. 19) or that the debate is waning (Livezey 2003) are not accurate and therefore do little to further the TB cause. A second set of researchers, constituting a minority, favors the origin of birds from an undetermined archosaur other than theropods, with thecodonts and crocodylomorphs most often mentioned as possible candidates. This "non-theropod-archosaur-to-bird" (NTAB) hypothesis also has good evidence to support it, although suffers from poor taxonomic resolution that logically can be attributed to incompleteness of the fossil record. Negative evidence, of course, haunts all of paleontology; the TB group has not identified with certainty even the family of theropods that they believe is closest to birds. (Recent assignment of the Early Cretaceous four-winged bird called "*Microraptor*" to the Dromaeosauridae [Xu et al. 2003] is not substantiated osteologically.)

For perspective, I should note that, in spite of NTAB leanings, I am not an active member of either the TB or NTAB group. Happily swamped studying much younger fossils, I am content to sit in the stands and observe the game, which sometimes seems to lack umpires. There have been lots of Cretaceous bunt singles, some Triassic and Cretaceous errors, but no Jurassic home runs. Each of the competing hypotheses has both strong and weak points. As someone who studies only fossils that certainly are birds and even can be placed in modern orders and families if not genera or species, I must also say that I appreciate the difficulty of studying Mesozoic fossils that have no surviving close relatives.

Mesozoic Birds is a large book divided into four parts: I. The Archosaurian Heritage of Birds (chapters 1–2), II. Taxa of Controversial Status (chapters 3–5), III. The Mesozoic Aviary: Anatomy and Systematics (chapters 6–17), and IV. Functional Morphology and Evolution (chapters 18–20). Both editors, and most of the 31 authors, are from the TB group. The authors are from 10 countries and six continents, an impressive gauge of the strong international interest in Mesozoic birds. There is considerable overlap in authorship and subject matter with another large collection of papers published in 2001, *New Perspectives on the Origin and Early Evolution of Birds* (Gauthier and Gall 2001).

Lawrence Witmer begins *Mesozoic Birds* with a chapter called "The Debate on Avian Ancestry" in which he promotes the TB hypothesis and the cladistic methodology that makes it possible. He also attempts to refute some of the snags in the TB hypothesis that

have been raised by NTAB researchers. I am not sure, however, that his arguments will convince doubters, in part because of a lack of photographs or illustrations, which would have helped a skeptical reader to evaluate, for example, his assessment of what may or may not be feathers in Cretaceous nonavian theropods. (Of course, to the NTAB group, the phrase "non-avian theropod" is redundant.) Whether or not you agree with all of their strictly cladistic interpretations, the osteological characters of Mesozoic reptiles and birds in chapter 2 (James Clark, Mark Norell, and Peter Makovicky) provide a very important data set that others can use to evaluate existing and yet-to-be-discovered specimens, and in the process evaluate the characters themselves.

The first chapter in Part II is a short study by Patricia Vickers-Rich, Luis Chiappe, and Sergei Kurzanov that illustrates the enigmatic *Avimimus* (late Cretaceous, Mongolia) but reaches no conclusion. (*Avimimus* is placed outside of birds as an oviraptosaur by Clark et al. in chapter 2.) In the next two chapters, Luis Chiappe, Mark Norell, and James Clark ("The Cretaceous, Short-armed Alvarezsauride") and Fernando Novas and Diego Pol ("Alvarezsaurid Relationships Reconsidered") admit that alvarezsaurids (*Mononykus*, *Shuvuuia*, *Patagonykus*, *Alvarezsaurus*, etc.), previously regarded by TB researchers as birds, are reptiles. That determination had been made already by Zhonghe (1995) and other authors.

Part III is the longest section in the book, featuring nearly 300 pages of well-illustrated, important chapters on diverse taxa such as *Archaeopteryx* s.l. (Andrzej Elzanowski), *Sinornis* (Paul Sereno, Rao Chenggang, and Li Jianjun), Enantiornithes (Luis Chiappe and Cyril Walker), and *Enaliornis* (Peter Galton and Larry Martin), or geographically based studies of Mesozoic birds such as those of Zhou Zhonghe and Hou Lianhai (China) and José Sanz et al. (Spain), or Mesozoic fossil feathers (Alexander Kellner) and tracks (Martin Lockley and Emma Rainforth). These descriptive chapters are where, in my opinion, this book makes its best scientific contribution, because an essential first step in paleontology is to describe fossils as thoroughly and accurately as possible. Two comments will qualify my praise. First, glancing at Chiappe and Walker's 20 "unambiguous synapomorphies" of the extinct "Euenantiornithes" (p. 244), I noticed at least six characters that can be found as well in some living species of birds. Second, I found the chapter by Sylvia Hope ("Mesozoic radiation of Neornithes") to be fraught with the highly suspect practice of trying to assign isolated, fragmentary Cretaceous fossils to modern orders of birds. That is not safely done even in most early Cenozoic specimens, much less those of the Mesozoic. Molecular systematists who believe that modern orders of birds arose in the Cretaceous should seek a second paleontological opinion before believing in genuine Mesozoic loons, pelecaniforms, galliforms, or parrots.

Part IV features a careful study by Anusuya Chinsamy, who documents a fundamental difference in bone histology between ornithurine birds (rapid, sustained rate of bone deposition) and nonornithurine birds (cycles of rapid and then slow bone growth). This information suggests that ornithurines, which includes all living birds, as well as certain advanced Cretaceous taxa such as *Ambiortus*, *Hesperornis*, and *Ichthyornis*, were endothermic but that nonornithurines were not.

In the final chapter, Luis Chiappe presents a phylogeny of "basal birds" with a strict consensus tree based on "unambiguously optimized synapomorphies." Following the data in Chapters 4 and 5 as well as earlier authors, this tree (figure 20.1) places the Alvarezsauridae outside of Aves, which should please both NTAB and TB researchers, who still will debate how closely related those short-armed bipeds are to birds (NTAB would say far, TB would say close). Placing the late Cretaceous flightless South American *Patagopteryx* several nodes within Aves might be controversial. Lacking a reversed hallux (see figure 13.25 C, E), *Patagopteryx* (covered by Chiappe in detail in Chapter 13) looks like a nonavian theropod to my Cenozoically biased eye. Another possibly controversial placement might be the late Cretaceous Malagasy *Varona*, which has enantiornithine features recognized by both NTAB and TB researchers (see chapter 12 by Catherine Forster et al.), although Chiappe puts it next to *Patagopteryx* as part of an unresolved trichotomy with the Ornithurae.

For each chapter in *Mesozoic Birds* to have had an abstract (none does) would have been useful. Many chapters also lack a conclusions section so that important results or interpretations are buried somewhere in the text. A larger problem is the mandatory abbreviation of generic names in nearly all figure captions and many tables. In some chapters, many sentences and even paragraphs in the text also begin with abbreviated generic names that do not appear spelled out anywhere on the page. This criticism might seem trite, so please let me explain. Most genera of Mesozoic reptiles and birds are monotypic, so using an abbreviated generic name with a species name, rather than just spelling out the genus, not only saves no space (on average) but also conveys no more information. The abbreviation zeal is presumably the fault of the editors or publishers, not the authors. Several examples should show how acute and confusing this problem is. In Zhou Zhonghe and Hou Lainhai's chapter on Mesozoic birds in China (pp. 160–183), *C. sanctus* = *Confuciusornis*, *C. yandica* = *Cathayornis*, and *C. beishanensis* = *Chaoyangia*. All three genera are monotypic and only distantly related. On pp. 165–173, generic names always are spelled out in the text (without species names) but abbreviated in the figures. Ironically in the next chapter (Paul Sereno, Rao Chenggang, and Li Jianjun), *Cathayornis yandica* is stated to be a junior synonym of *Sinornis santensis*, perhaps eliminating

the future need for one of the Chinese Mesozoic genera beginning with *C*.

The abbreviation epidemic extends even to systematic accounts (pp. 211, 231, etc.) where spelled-out generic names not present anywhere on the page. Tables 11.1, 15.1, and 15.2, and appendix 11.1 are almost nonfunctional to the average reader without penciling in the generic names yourself, a substantial task that requires close inspection of many pages and is sure to upset librarians. Looking at appendix 20.1, which presents Luis Chiappe's discussion of outgroup and in-group taxa used to score characters, the abbreviation problem once again gets out of hand. On p. 461, for example, he lists *A. calvoi*, *A. platyrhynchos*, *A. dementjevi*, and *A. lithographica* successively, while never spelling out the first three generic names, which are *Alvarezsaurus* (a late Cretaceous nonavian theropod from Argentina), *Anas* (modern dabbling ducks), and *Ambiortus* (an early Cretaceous ornithurine from Mongolia). The last one is *Archaeopteryx*.

Whether your sympathies lie with the TB or NTAB hypothesis, there is much to be learned in *Mesozoic Birds*. Whether this book wins any new converts to the TB theory remains to be seen, although most people already seem to be on board. Open-mindedly, I still lean toward NTAB. Given the blood already spilled in the debate on avian origins, any sort of cease-fire agreement between NTAB and TB may not be imminent. Nevertheless, I would like to end by pointing out an area of common ground, which is a shared enthusiasm for the many fantastic new fossils that have been unearthed in the past two decades. The study of Mesozoic birds has moved forever beyond the time when, as in my own graduate training, the only ones mentioned were *Archaeopteryx*, *Hesperornis*, and *Ichthyornis*. The trouble is that most of these new fossils are Cretaceous, whereas *Archaeopteryx* is constantly reminding us that birds arose earlier. Intense, well-organized exploration of early and middle Jurassic rocks is needed to resolve this important debate, perhaps followed by joint analyses of specimens by NTAB and TB researchers sitting at the same table. Whether a pitchers' duel or a slugfest, I hope to be watching the game.—David W. Steadman, *Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA. E-mail: steadman@flmnh.ufl.edu*

Literature Cited

Feduccia, A. 2002. Birds are dinosaurs: Simple answer to a complex problem. Auk 119: 1187–1201.

Gauthier, J., and Gall, L. F., Eds. 2001. New Perspectives on the Origin and Early Evolution of Birds. Proceedings of the International Symposium in Honor of John H. Ostrom, Peabody Museum of Natural History, Yale University, New Haven, Connecticut.

Livezey, B. C. 2003. Vertebrate paleontology: Millennial status report as debate wanes. Science 299:1664–1665.

Olson, S. L. 2002. Review of: *New Perspectives on the Origin and Early Evolution of Birds. Proceedings of the International Symposium in Honor of John H. Ostrom by Jacques Gauthier and Lawrence F. Gall*. Auk 119:1202–1205.

Xu, X., Z. Zhou, X. Wang, X. Kuang, F. Zhang, and X. Du. 2003. Four-winged dinosaurs from China. Nature 421:335–340.

Zhonghe, Z. 1995. Is *Mononykus* a bird? Auk 112: 958–963.