

New Perspectives on the Origin and Early Evolution of Birds. Proceedings of the International Symposium in Honor of John H. Ostrom.—Jacques Gauthier and Lawrence F. Gall, Eds. 2001. Peabody Museum of Natural History, Yale University, New Haven, Connecticut. xiv + 613 pages. Paper, \$49.00.—One of the rituals of the Birds-Are-Dinosaurs-Movement (BADM) is to hold periodic symposia to reaffirm the belief that birds really are dinosaurs, much as Southern Baptists hold revival meetings. The volume reviewed here is the metastasis of one of these symposia, which honors Yale paleontologist John Ostrom, celebrated for his resurrection of the hypothesis of a dinosaurian origin of birds. Just as a revival tent is not the haunt of free-thinkers, there are few authors in this book who depart from the true path and numerous papers consist of the cladogram-thumping dogma we have come to expect from the more insistent proponents of the BADM. Kevin Padian, the Elmer Gantry of the theropod crusade, is an author on no fewer than four contributions, which does nothing to diminish the impression of the whole volume as a dreary, sectarian tract from the Kingdom Hall of Hennig's Witnesses.

From the outset (p. 4), Gauthier asserts that "one question, at least, can finally be put to rest—there can no longer be any serious doubt that birds are living dinosaurs." By now, of course, this is nothing novel, having been stridently trumpeted for quite a few years as one of the basic tenets of cladistic fundamentalism. I could discover no "new perspectives" on avian origins in this collection that are not fully in line with what was always a predetermined conclusion.

No opportunity is lost to drub the reader with the BADM agenda, however, so one must suffer through headers for different sections of the book such as "Phylogeny of Flying Dinosaurs," "Phylogeny of Living Dinosaurs," and "Evolution of Feathered Dinosaurs." Having to suppress one's gag reflex as early as page 3, where we read about "the considerably more lively varieties [of dinosaurs] flitting about our

backyards," only generates queasiness for tackling what follows.

The book gets off to a dreadful start with an essay by Gauthier and de Queiroz on the name "Aves" and its constituents. Elsewhere (p. 541), Larry Witmer supports a succinct definition of "the name Aves as pertaining to the group comprising the most recent common ancestor of *Archaeopteryx* and modern birds, and all its descendants," which is both workable and comprehensible. But that will not do for Gauthier and de Queiroz who indulge in 34 pages of abstruse, convoluted, pseudointellectual, and jargon-riddled bloviation invoking their "PhyloCode," which is supposed to have as its goal "effective communication" (p. 8). Here is just one example: "We agree that all organisms in the final unitary lineage segment ancestral to *Archaeopteryx* are parts of the same species" (p. 10). Where's the communication here?

To touch on some of the contributions more likely to be of direct interest to ornithologists, Cracraft and Clarke use morphological and molecular data to derive a phylogeny in which all modern birds except paleognaths are the sister-group to the Galliformes and Anseriformes. In the following paper, Ericson et al. also use morphological and molecular data to show that the Galloanseres are not monophyletic, but then they backpedal in an addendum citing more recent molecular work supporting monophyly of the Galloanseres. As all postcranial morphological data and an excellent fossil record are in direct conflict with such a conclusion, a satisfactory resolution is still to be sought.

I do not think that future students of the origins of feathers will find the conjectural generalities in Brush's essay (p. 171) on the subject to be very useful. However, in a most welcome interjection of lucidity and logic, Nick Arnold explores how we should go about making inferences about the behavior of fossil organisms. He applies this to the origins of avian flight, concluding (p. 195) that climbing and gliding would be expected precursors of flight but that "stretching the forelimbs laterally to improve bal-

ance during rapid ground locomotion is not usual and may not have been a preliminary stage in the origin of flight." Although an arboreal origin of flight "is not very strongly supported . . . there is little positive evidence for a cursorial" origin either.

Hopson provides an extensive analysis of phalangeal proportions in birds and theropods, finding that the birds *Archaeopteryx* and *Confuciusornis* each cluster with modern birds such as pigeons and Galliformes that forage both on the ground and in trees. Some other genera of Cretaceous birds clearly align with arboreal birds whereas others are clearly terrestrial. In hindlimb proportions, *Archaeopteryx* again clusters with pigeons as being "equally at home on the ground or in trees" (p. 211). Zhou and Farlow further analyze *Confuciusornis* and conclude that it was arboreal and a powered flier.

Through elaborate experimental procedures, Sokoloff et al. (p. 319) found that "the specialized supracoracoideus morphology of modern birds is not a *sine qua non* for ground-level takeoff," but I would caution that this has only been shown for their subject, the European Starling (*Sturnus vulgaris*), and may not be the case for turkeys or eagles, for example. Witmer does yeoman's service, though long overdue, in debunking the notorious Triassic fossil *Protoavis* as an improperly restored, disingenuously depicted, poorly preserved composite (my wording) that merits "little or no role in the debate on avian origins" (p. 537).

Most of the rest of this book deals with dinosaurs or corollaries of the purported dinosaurian origin of birds, such as derivation of flight from the ground up. The hypothesis of a dinosaurian origin of birds, as everyone knows by now, is an old one that was long rejected but perhaps for insufficient reasons. Thus, when John Ostrom discovered a well-preserved new theropod that showed what seemed to be some distinctly avian characters, it was perfectly logical and legitimate to exhume and re-examine the dinosaurian hypothesis. At the time, I thought it seemed quite reasonable myself, but from my perspective 25 years later it is a hypothesis that has been rigorously scrutinized and has come up deficient.

In the meantime, however, the birds-are-dinosaurs equation has achieved cult status and has become a sociological phenomenon embodying vigorous religious and political components and strongly influenced by economics. Ornithologists reading Prum's (2002) "Perspectives in Ornithology" should be aware that there is much more going on here than a conflict of scientific hypotheses and methods.

The whole underpinning of the BADM is cladism, a systematic formulation elevated to a religion years ago and with adherents as fervent as any biblical zealot. Because the BADM is the most visible public manifestation of cladism, it automatically receives support from cladists outside of paleontology. On the other hand, opponents who are not members of the faith

can be handily stigmatized as heretics whose views should be ignored simply because they refuse to accept the "only" methodology. For numerous reasons, I was never attracted to cladism, above all because my own research leads me to conclude that its fundamental assumption—that speciation proceeds by dichotomous branching—is probably wrong. Be that as it may, cladism involves only a formulaic procedure and is not infallible. It is just as easy, perhaps easier, to derive a wrong answer, maybe even purposefully, using cladistics as by any other means. Two outstanding examples are directly pertinent to the BADM: (1) the dinosaur *Mononykus* was described and classified as a bird; (2) the bird *Caudipteryx* was described and classified as a dinosaur.

The saga of *Mononykus*, much abbreviated here, is in my estimation one of the most damning developments in the whole BADM. In 1993, I was invited by an enthusiastic Luis Chiappe to come view the specimens of this new organism in New York before they were returned to Mongolia. By coincidence, Evgeny Kurochkin, Zhonghe Zhou, and Per Ericson were there at the same time. What we saw was most of the skeleton of a truly extraordinary bipedal animal with a very shortened forelimb, a mole-like humerus, and the hand reduced to a single huge claw obviously adapted for digging. Extraordinary yes—a bird, no. Kurochkin related that he himself had found a specimen like this in Mongolia and had at first been very excited by the discovery until he realized it was a dinosaur, when he lost all interest in it.

But Chiappe and Mark Norell insisted that they could construct a cladogram in which this latest Cretaceous vertebrate was placed within Aves. And so it was published in *Nature* (Perle et al. 1993) under the preoccupied name *Mononychus* (later changed to *Mononykus*). Then the hype began. Reconstructions of *Mononykus*, covered with imaginary feathers, of course, appeared all through the print media and even made the cover of *Time* magazine. Eventually, Zhou (1995), among others, tried to reason that *Mononykus* was not a bird. That provoked a predictable response (Chiappe et al. 1997)—no challenge to the BADM ever goes unanswered—consisting almost entirely of a tedious, sanctimonious deposition on the inadequacies of Zhou's methodology. Now, however, Sereno (p. 69) has redone all the cladistics and concluded that *Mononykus* and its relatives in the Alvarezsauridae belong among dinosaurs of the Ornithomimosauria and are not birds. And Chiappe is forced to concur (p. 125). But there are no banners or whistles now, no press releases, no *Time* covers, no apologies to Zhou, and not a word in *Nature*. The propaganda machine is in reverse and if the BADM had its way the public would never find out that all the hoopla over *Mononykus* was just a lot of buncombe about a weird dinosaur.

Caudipteryx, from the renowned early Cretaceous lake deposits in Liaoning, northern China, presents

the opposite case. The first specimen was preserved with unquestionable feathers positioned such as to be undeniably associated with the skeleton. It was, expectedly, described as a dinosaur (Ji et al. 1998). When I and a number of my skeptical colleagues saw the original specimen we found it of even greater interest than *Mononykus*, because to us *Caudipteryx* was clearly a flightless bird, meaning that flightlessness must have evolved very early in avian history and in a completely different lineage from any other known flightless birds.

Dissenters from the BADM line on *Caudipteryx* are lambasted by Padian (p. 486), who never says who the dissenters are or where they made their assertions. He makes the accusation that dissenting views were advanced without the unnamed dissenters having seen the specimens, which is certainly untrue in some or all cases, and then assails those nameless heretics as unscientific noncladists motivated only by politics "to keep the issue alive in the press." Subsequently, however, Maryanska et al. (2002) subjected the Oviraptorosauria, in which they include *Caudipteryx*, to an exhaustive cladistic analysis including definitions following the PhyloCode, a three-page list of characters, and four pages of character matrices (but no illustrations). The result is the bleakest sort of scientific writing, one step removed from binary code, but the authors conclude that *Caudipteryx* and the Oviraptorosauria are not dinosaurs at all, but flightless birds. The study is seemingly unsailable from the standpoint of strict cladistic orthodoxy, but is still likely to elicit criticism from someone in the BADM because it eliminates the only example of a "dinosaur" with real feathers. Also, if *Oviraptor* and its relatives are chalked up on the bird side of the slate, many widely heralded bird-like traits of dinosaurs, including egg-brooding, go with them. Not good for the BADM.

The *Mononykus* and *Caudipteryx* stories are revealing. Unscientific noncladists could look at those taxa and see that the first was a dinosaur and the second was a bird. Their original describers, promulgating the BADM and using "scientific" cladism, came to the exact opposite conclusion, which was then shown by the same technique to be wrong. Granted, these are all only "phylogenetic hypotheses" that are subject to falsification, but the same applies to the theropod origin of birds. If some of the arch-promoters of the BADM cannot be relied upon to tell a bird from a dinosaur and vice versa when they apply cladistics, why should ornithologists unquestioningly accept the theropod origin of birds from the same people?

If *Caudipteryx* is not a feathered dinosaur, what about all those other supposed feathered dinosaurs from China that the public has recently been bombarded with? To be succinct, there are none. The whole story is essentially a hoax. Numerous specimens of various theropod dinosaurs from the Liaoning Lake deposits are preserved with associated car-

bonized filaments often positioned so as to appear to be integumentary structures. None of this "dino-fuzz" exhibits the structure of a pennaceous feather. Furthermore, there reportedly are in the same deposits various other organisms, unrelated to birds or theropods, that sport those same filaments. If so, the information has been suppressed.

The BADM has been putting imaginary feathers on dinosaurs for more than 20 years (Battaglia 1979), but real fossils with feathers were crucial to making the bird-dinosaur connection. So when the filament-adorned dinosaur fossils turned up in China there was little hesitation about hyping them as feathered dinosaurs. Not surprisingly, an entirely conjectural origin of feathers from filaments was hastily supplied (Prum 1999). Feathers are preserved in the fossil record in a unique manner that is easily recognizable with scanning electron microscopy (Davis and Briggs 1995), but that was not done for the Chinese fossils before they were so enthusiastically presented as feathered dinosaurs.

Meanwhile, theropods are being depicted and modelled everywhere clad in feathers. Even in what is supposed to be a serious scientific discussion of the anatomy of the hand of *Deinonychus*, the phalanges are shown (Gishlick p. 314) bearing asymmetrical remiges! Young *Tyrannosaurus* have been depicted covered with down (Sloan 1999). There is not one shred of evidence for any of this ridiculous make-believe about feathered dinosaurs that will withstand scrutiny.

But that does not keep Gauthier and de Queiroz (pp. 12-13, fig. 1) from constructing an unfathomable fairytale concerning the presence and structure of feathers superimposed upon a cladogram of "select theropod dinosaurs," and deliberately clouding and confusing matters by suggesting that there are various definitions of a feather. Thus, if feathers are defined as "hollow-based filaments derived from follicles," basal Aves, according to Gauthier and de Queiroz, would include *Carnotaurus*, *Spinosaurus*, and *Allosaurus*. To begin with, "dino-fuzz" has never been shown to be hollow or follicular. Furthermore, the only integument preserved with any of the preceding dinosaurs is the skin of *Carnotaurus* (Bonaparte et al. 1990), which consists of "non-imbricating scales similar to those which are known from herbivorous dinosaurs" (Czerkas and Czerkas 1997: 155). If feathers are defined as "remiges + rectrices" then Gauthier and de Queiroz would have basal birds include *Sinosauropteryx*, *Tyrannosaurus*, *Pelecaninimus*, *Ornitholestes*, and *Caudipteryx*. Except for *Caudipteryx*, which, as we have seen, is a bird, there is no evidence for feathers of any sort, say nothing of remiges and rectrices, in any of those taxa. Then, if feathers are defined as "flight feathers," Aves would be composed of *Sinornithosaurus* and *Archaeopteryx* onward. Disregarding the fact that *Sinornithosaurus* has not been proven to have any feathers, let alone

flight feathers, what is supposed to be the difference between "flight feathers" and "remiges + rectrices"? They are absolutely synonymous throughout ornithological literature. Furthermore, no one has ever previously defined feathers as being only remiges and rectrices or flight feathers. Thus, Gauthier and de Queiroz's discussion of feather-based definitions of Aves is nothing more than a Humpty-Dumptyesque tissue of twaddle.

Ornithologists should exercise caution in accepting anything written about avian evolution by theropodists for the simple reason that few of them really know very much about birds, ornithology, or avian anatomy. That ignorance manifests itself in diverse fashion. Gauthier and de Queiroz (p. 17) tell us that tinamous were unknown to Merrem in 1813, whereas the genus *Tinamus* and the species *T. soui* was described in 1783 and three additional species of tinamous were named by Gmelin in 1789. Arnold (p. 201) says that "some birds, such as gulls, lose the external hallux entirely," yet all gulls have an external hallux, although it is very reduced in the two species of kittiwakes. Hopson's list (pp. 230–235) of birds sampled in his study places *Pluvialis* in the Glareolidae and contains no fewer than 15 misspelled names of taxa that were not caught by author or editors.

And what are we to make of Prum's observation (2002:4) that "some dromaeosaurs and birds even show a prominently bowed ulna . . . a feature that zooarcheologists still use to identify avian ulnae in human middens"? Does this mean that a bowed ulna is a synapomorphy of birds and dromaeosaurs? If not, why bring it up? How would these zooarcheologists or Prum identify the ulnae of shearwaters, gulls, or even an ostrich, to name but a few, using the "prominently bowed" criterion?

It is clear that raising any question whatever about the theropod origin of birds is unacceptable to those in the BADM. Prum (2002:5) ironically refers to the "unrelenting criticism" of the theory, when in reality the voices of criticism have for the most part been drowned out by the incessant *petarade* of propaganda from the BADM. Prum's own essay is little more than naked proselytizing, designed to cajole the heathen onto the path of enlightenment. Like a harassed politician, Padian (p. 485) blames the media for helping to keep controversy alive and bemoans the fact that the BADM agenda is diminished by what he regards as an inappropriate attempt on the part of reporters to achieve balance and fairness.

It is often emphasized in publications of the BADM that its opponents are unscientific. Padian has maintained that the truth has been revealed and that contrary views should be suppressed. Prum (2002:13) exhorts ornithologists to "abandon debate on the theropod origin of birds." In my view, that is the most unscientific posture of all. What are these people afraid of? If the evidence for a theropod origin of

birds is so overwhelming, why can it not stand on its own merits without active suppression of contrary views, without proselytizing the noncombatants, and without a vigorous propaganda campaign in the popular press? I do not regard it as a valid criticism that opponents of BADM have not identified a better ancestor for birds than theropods. If conflicting evidence suggests that birds did not come from theropods, then we should accept the possibility that we do not have all the answers and continue to look for the true origins. When an alternative ancestor is found, we can be certain that the proponents of the BADM will not be involved because they have already removed themselves from the search. Healthy skepticism is the most powerful tool of science and should be cherished as a welcome anodyne to the complacency of certitude.—STORRS L. OLSON, *Division of Birds, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. E-mail: olson.storrs@nsmnh.si.edu*

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Proceedings of the international symposium in honor of John H. Ostrom. Jacques Gauthier and Lawrence F. Gall, Editors. 613 pages, 156 figures, 13 tables, 13 appendices, index. Sponsored by Yale's Department of Geology and Geophysics and the Yale Peabody Museum, this historic international symposium was designed to place these discoveries in the larger context of current paleontological and evolutionary thought. These papers provide diverse perspectives along with an overview of the central issues and current controversies in vertebrate paleontology that address the transition from feathered to flying to crown dinosaurs. Pages 49-67 in *New Perspectives on the Origin and early evolution of Birds*. M A Norell, J Clark, P J Makovicky. Proceedings of the international Symposium in honor of John h. Ostrom (J. gauthier and l. f. gall. 2001. VIEW 24 EXCERPTS. The origin and early evolution of birds: discoveries, disputes, and perspectives from fossil evidence. Z Zhou. *Naturwissenschaften*.