“Hybrids of Birds and Bats with a Decidedly Reptilian Flavor”

Book review

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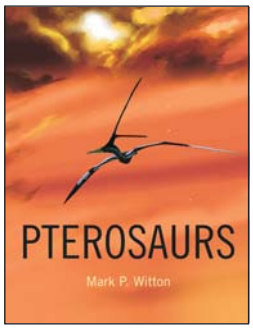
"Hybrids of Birds and Bats with a Decidedly Reptilian Flavor"

Mark P. Witton 2013. *Pterosaurs: Natural History, Evolution, Anatomy*. 304 pp. Princeton University Press, Princeton, NJ. Hardback. ISBN: 978-0-691-15061-1. Price: £24.95, $35.



"Unlike their dinosaur cousins, pterosaurs have never really made a sensational popular or academic splash"; Witton provides "an overview of the diversity and sheer awesomeness" of his subject (Preface), and some 200 illustrations. He begins with a "popular view of primordial Earth", "But That's All Hokum", and pterosaurs "have suffered more than most" in being misunderstood. Apart from powered flight, "they were also skilled walkers, runners, and swimmers". The overview "is split into three parts": their general palaeobiology is assessed, "looking at their anatomy, locomotion, and other generalities of their lifestyle". Chapters 9 to 24 are per pterosaur group, often per family. Chapter 25 "ponder[s] their evolutionary story" and demise. Why extinction? "Late Cretaceous pterosaur stock was almost entirely invested in one, slowly adapting lineage and was therefore very vulnerable" (p. 263), although "diversity curves […] reflect sampling biases" (p. 259).

Witton has "made a case for pterosaurs as diverse, successful animals that are as far away from their stereotype of Mesozoic gargoyles as could be imagined" (p. 259). He is rightly cautious about some taxonomical revisions (e.g., p. 174) or the state of nomenclature (e.g., p. 152). His own (re)positioning of taxa is well-argued (e.g., p. 188). So are his reinterpretations; e.g., he finds that only *Pterodaustro,* among pterosaurs, is a true filter feeder, *pace* such authors who consider other derived ctenochasmatids to also have been ones (p. 199): "their jaws lack the specializations required for straining food from the water column. Rather, their elongate, broad jaw tips and meshing teeth seem much better suited for tactile-feeding strategies" (p. 199). Witton discusses the evidence in detail.

Also consider, e.g., his reasoning (p. 209) about why dsungaripteroids developed shock-absorbing characteristics: the mass of their compact, hardy skeleton is a likely cause, not necessarily Fastnacht's hypothesis that frequent landing on hard ground caused this. Witton is clever at explaining complexity. He conveys the state of the art, not infrequently with original insights. He also explains well controversies, e.g., the criticism of the skim-feeding hypothesis even in *Thalassodromeus* (pp. 242–243).

Witton argues against a sail-like membrane extending between the antlers of *Nyctosaurus* (p. 178). *Contra* Wang et al. (2008: Proceedings of the National Academy of Sciences USA 105: 1983–1987), Witton finds it "likely that *Nemicolopterus* is a very young, perhaps an even recently hatched, tapejarid" (p. 219). Also note Witton's reasoning about the thermoregulatory crest hypothesis (p. 242); he denies that they were primarily developed for that role, his analogue being heat-loosing bird beaks (p. 242).

Rather than proposing a complete taxonomy or a phylogenetic tree (cf. p. 261) right away, Witton explains his approach as the exposition proceeds. Wisely, he does not bother to give intermediate taxa between Pterosauria and the family level, a named rank: relative position suffices. Superordinate taxa appear under chapter titles, e.g., pterosauria > monofenestrata > pterodactyloidea > lophocratia > azhdarchoidea > tapejaridae.

Witton only quite seldom resorts to cladograms, but his diagrams, and especially his biomechanical depictions, are sophisticated, eloquent, and pleasing. He is a really gifted illustrator, with in addition a talent for interspersing dense technical text with apt humour. A full-page life restoration facing the opening of Chapter 25 has this caption: "Realizing that the next chapter is about pterosaur extinction, a flock of the Maastrichtian Romanian pterosaur *Hatzegoteryx thambema* tries to fly back to an earlier part of the book to avoid the chop."

The presentation is often light-hearted, but always rigorously sound. Sporadic informal expressions include: anurognathids are "Muppet-faced" (p. 105); "a heck of a lot" (p. 109); "Oops." (p. 128); "The eyes of tapejarid aficionados were turned east in 2003, when" (p. 219); "Recycling, Mesozoic style" (p. 144); "No one messes with the 6 m wingspan *Ornithocheirus*" (p. 158); "With perhaps one exception, diddly-squat has been said in print about the biomechanics and functional biology of boreopterids" (p. 167); "While the smaller individuals with more sensible headcrests" (p. 171); "goofy teeth", "silly hat", "This is not a joke" (all three on p. 184); "better candidates for appearing on the front cover of rock music albums" (p. 202); "*Tupandactylus imperator* doing his best Clint Eastwood impression" (p. 217); "There's nothing quite like an azhdarchid." (p. 255); "The end. Any pterosaur alive in the last weekend of the Mesozoic would have seen the Earth plunged into a short-lived nuclear winter" (p. 260); "Pterosaurs were already on their last dance by this stage" (p. 260); "left carrying their torch" (p. 260).

I highly recommend this timely and also aesthetically rewarding, never dull book.

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