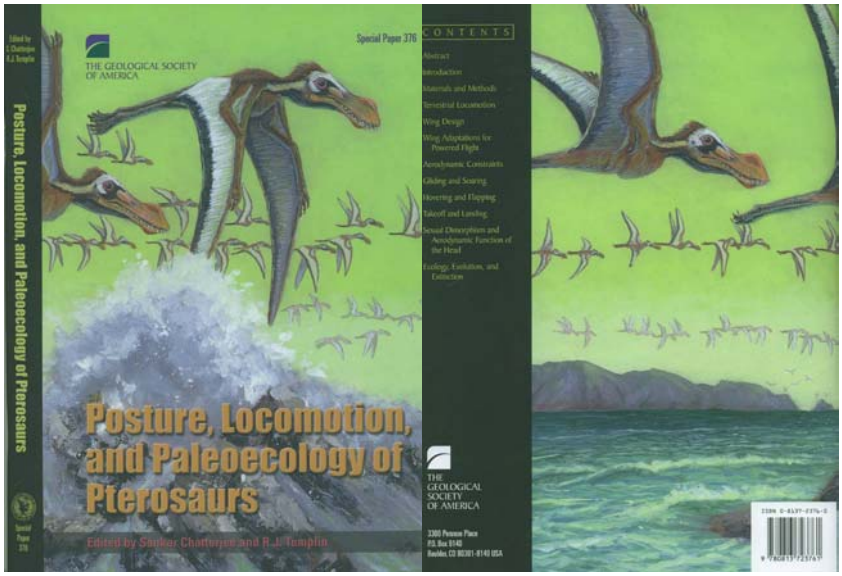
Chatterjee, S. & R.J. Templin. 2004. Posture, locomotion, and paleoecology of pterosaurs. – Boulder, Geological Society of America (Special Paper 376)

Book review by M. Signore



In this GSA Special Paper, Chatterjee & Templin offer their perspective on assorted problems related to the palaeobiology of pterosaurs. Although including only 64 pages, this interesting paper is packed with information. It is divided into three parts. The first part provides a short introduction to pterosaur origin and evolution. The substantially larger second part, accompanied by mathematical formulae, pictures and graphs, tackles the biomechanics of pterosaur flight. The small, final part details pterosaur palaeobiology and extinction.

The authors discuss several species of pterosaurs, although their taxonomic coverage appears a little puzzling in the context of the functional and palaeobiological treatment of these vertebrates. For instance, *Anhanguera*, a highly specialised pterosaur and a derived member within its own clade, is used to illustrate the morphofunctional characteristics of the whole group. Another questionable choice is represented by *Quetzalcoatlus*, known only from fragmentary skeletal remains. Although they claim to have taken into account taxa from United States, Germany, China and Brazil, their tables 1 and 2 (p. 5) include *Eudimorphodon ranzii*, which comes from Italy. Finally, the cladogram on p. 4 (figure 1) is presented without a discussion of alternative topologies and a clarification of clade support.

The largest part of the monograph, on aerodynamics and theory of flight, includes details of the mathematical aspects of inferring pterosaur flight, landing and taking off, and offers a useful set of equations employed by flight engineers. However, Chatterjee & Templin often provide incorrect reconstructions of the pterosaur wing, the shape of which appears to have been often 'averaged' on the basis of certain biomechanical assumptions (see for instance figure 14, p. 21) that appear to fit their hypotheses

Their model of pterosaur taking off and landing appears to have little ecological basis and is based mainly on the hypothesis that pterosaurs were some sort of 'biomechanical' gliders. Personally, I find it hard to figure out how a pterosaur could dive into water or spend a considerable amount of time floating like a seagull. Pterosaur wings could not be completely folded and, in my opinion, were functionally more similar to a windsurf sail than to a bird wing when the animal was in the water; they consist of a single and uninterrupted fold of skin, as opposed to birds, in which feathers allow water to flow easily through their wings. If water covered the whole wing surface of a pterosaur, then it would force the animal to face the same problem that every windsurfer has when they need to lift up the sail from the water. And I can hardly see how the animal could raise both wings and take off when water quite literally trapped the wings.

Other biomechanical explanations put forward in the paper, however, appear sound. Thus, the authors refuse the hypothesis of 'skimming large pterosaurs' on the basis that they would not have been stable during the skimming and that no extant skimmer has a pointed beak. Also, they refuse the hypothesis that *Quetzalcoatlus* was a carrion feeder, and adopt the much more ecologically plausible idea that this gigantic pterosaur fed on fish both at sea and along the banks of rivers and lakes.

The final section of this paper deals with pterosaur head crests and the evolution and extinction of pterosaurs. As regards head crests, Chatterjee & Templin suggest that they had several purposes (thermoregulation, aerial turns, sexual dimorphism).

Finally, even though their phylogenetical view of the Pterosauria may be questionable, and they do not take into account any published cladogram, they provide compelling arguments about pterosaur extinction. Evidence of a competitive displacement of pterosaurs by birds is tenuous at best. However, the asteroid impact theory appears to have met with the authors' approval

All in all this monograph is a good example of palaeobiological research, with the balance heavily tilted towards the 'quantitative' and analytical approaches, but perhaps without much emphasis on the palaeontological evidence – and some errors. Almost all illustrations, many of which are computer-generated, are of good quality. The graphs are clear and informative, and accompanied by exhaustive captions. While I would have expected more, I still think that this paper may be useful to those who are interested in biomechanical and palaeobiological researches.

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