Title: Testing hypotheses of deep time functional convergence between phytosaurs and crocodilians

Supervisors: Dr Richard Butler (Birmingham), Dr Ivan Sansom (Birmingham), Dr Stephen Brusatte (Edinburgh), Dr Emily Rayfield (Bristol)

Project description: Phytosaurs are a diverse group of large, quadrupedal, carnivorous reptiles known from at least 30 species found in Upper Triassic sediments worldwide. Although phytosaurs are only distantly related to modern crocodilians, the two groups appear highly similar in cranial and postcranial morphology. These similarities have been used to suggest functional and ecological convergences, with phytosaurs typically reconstructed as crocodilian-like aquatic predators. However, convergence between these two groups has received little explicit testing, and functional morphological research on phytosaurs remains in its infancy. This project will focus on increasing understanding of the evolutionary history, anatomy and palaeoecology of phytosaurs, and use a range of approaches to test phytosaur/crocodilian convergence.

The student will first develop a comprehensive phylogenetic tree for phytosaurs by expanding existing cladistic datasets to include all currently recognized phytosaur species, including European, Asian and North African species that have been underrepresented in recent phylogenetic analyses of the group. The student will be expected to travel extensively to collect anatomical data from museum collections in Europe, the USA and India. The resultant morphological dataset will be used to generate phylogenetic trees that will provide the evolutionary framework for functional work. A broad range of approaches, potentially including novel muscle reconstructions, geometric morphometrics, CT-scanning, and finite element analysis, will then be used to explore the functional morphology of phytosaur skulls and reassess hypotheses of phytosaur/crocodilian convergence and the implications for phytosaur palaeoecology.

The student will receive a broad training in modern palaeontological approaches, including comparative anatomy, systematics, geometric morphometrics, analysis of CT data, functional morphology, and the presentation and publication of scientific research results. This training will be designed to prepare the student for a career in palaeobiological research at a university or museum.

The successful candidate will have a strong background in palaeobiology, zoology, biology or Earth sciences. Experience with vertebrate anatomy, phylogenetic methods and/or use of CT data would be highly advantageous.

Above: Skull of the phytosaur *Nicrosaurus* from the Late Triassic of Germany.

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Applicants should apply via http://www.birmingham.ac.uk/postgraduate/courses/research/gees/earth-sciences.aspx where they should click on ‘Apply now’ and choose the option ‘PhD in Department of Earth Sciences’ and give the PhD title in the ‘Funding details’ section of the online application.