Technical Session 18: Carnivora & Co (Saturday, November 2, 2024, 8:00 AM)

Getting to the point of sabre teeth: functional optimality underpins the repeated evolution of extreme 'sabre-tooth' morphology

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"Sabre teeth" – elongate blade-like canines – are a classic example of convergence, having evolved repeatedly throughout mammalian history. Within canine teeth there is a trade-off between the aspects of shape that improve food fracture and those that increase tooth strength. Optimal morphologies will strike a balance between these antagonistic functional criteria. The extreme sabre-tooth morphology is thought to confer functional advantage for more specialised predatory adaptations and optimisation; however, the adaptive bases underpinning their evolution remain unclear. To determine whether sabre-tooth shape reflects selection for functionally optimal morphologies we generated a morphospace of the 3D shape of 70 non-sabre and 25 sabre-toothed species, a subset of which were used to quantify functional metrics of puncture performance and breakage resistance. These data were combined using a Pareto rank-ratio algorithm to evaluate optimality. We demonstrate that extreme sabre-tooth morphologies are functionally optimal, sitting atop a local peak in our optimality landscape. Unlike other optimal canine morphologies, extreme sabre teeth optimise puncture performance at the expense of breakage resistance. This identifies functional optimality as a key driver underpinning the repeated evolution of this iconic tooth.

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Regular Poster Session 4 (Saturday, November 2, 2024, 4:30 - 6:30 PM)

Domain expansion: New occurrences of phorusrhacids, cariamids, and rheiformes (Aves) in the late Middle Miocene of Bolivia

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Avian fossils have been widely documented throughout the Cenozoic of South America. This includes relatives of modern lineages, such as the rheas and seriemas, as well as ones from fully extinct clades. Among these, one of the most charismatic is the family known as Phorusrhacidae, more colloquially known as the "terror birds." These terrestrial predators are some of the most iconic of South America's paleofauna, however, most described material comes from Argentina, (particularly southern Argentina), obscuring their geographic distribution. This lack of described material from much of the rest of the continent limits our understanding of

their biology and ecology. The new material corresponds to nine specimens from the Quebrada Honda, Rio Rosario, and Casa del Ministro local areas that include bones of the mandible, an articulated atlas and axis, a distal femur, and pedal phalanges and unguals, among other elements. They are referred to Cariamiformes (Cariamidae and two size classes of Phorusrhacidae) as well as Rheiformes (stem Rheidae). These specimens bridge the circa 5 million-year gap in the phorusrhacid fossil record between the early Middle Miocene Collón Curá Formation and the Late Miocene site of Arroyo Chasicó. The remains from Quebrada Honda are only the second pre-Pleistocene avian fossils described from Bolivia, contributing important new spatial and temporal distribution data for each of these families.

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Regular Poster Session 4 (Saturday, November 2, 2024, 4:30 - 6:30 PM)

Morphological correlates for herbivory in extant lizard skeletons

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Herbivory has independently evolved multiple times within Diapsida, a group that includes living reptiles and birds. Although the presence of proportionally larger digestive tracts in herbivores compared to omnivores and carnivores has been established in diapsids, a skeletal reflection of this soft-tissue pattern has yet to be quantitatively demonstrated. Limited understanding of the skeletal adaptations associated with herbivory in diapsids hinders the accurate identification of diet in fossil taxa in which tooth/skull data may be equivocal. In this study, we tested the hypothesis that herbivorous lizards would exhibit larger body cavities relative to head size and trunk length, reflecting the need for proportionally increased gut volume to accommodate plant-based diets. We took linear and curve measurements from 3D models and museum specimens of 94 extant lizard taxa spanning 20 families, encompassing both cranial and postcranial skeletal features. We found statistically significant differences in the ratio of simplified body volume (based on skeletal proxies from the precaudal postcranium) to simplified head size (based on cranial and mandibular dimensions) and trunk length between herbivorous and non-herbivorous lizards, with herbivores displaying proportionally larger body cavities. These findings establish the viability of multivariate analysis of skeletal morphology to discriminate herbivory within diapsids, supporting the accommodation space hypothesis and providing a methodology for distinguishing the diets of extinct taxa using fossilizable material. The findings have implications for understanding the morphological correlates for diet in diapsids and will inform future investigations on the macroevolutionary patterns of diet transitions in this clade.

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Regular Poster Session 2 (Thursday, October 31, 2024, 4:30 - 6:30 PM)

The phylogenetic relationships of *Stratodus*, *Prionolepis* (*Aspidopleurus*), and *Cimolichthys* among Late Cretaceous genera of the order Aulopiformes (Teleostei: Neoteleostei)