ON THE ROLE OF TECTONICS AND CLIMATE IN STIMULATING THE CRETACEOUS DIVERSIFICATION OF MAMMALS

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Mammals rose to prominence in terrestrial ecosystems after the Cretaceous-Paleogene mass extinction, but the mammalian lineages characteristic of Paleogene faunas began their evolutionary and ecological diversification in the Late Cretaceous, coincident with the rise of angiosperms. This burst in biodiversity on land has been termed the Cretaceous (or Angiosperm) Terrestrial Revolution, but the mechanisms underlying its initiation remain opaque. Here, we compile data from the fossil and rock records of western North America to explore the role that tectonism and climate might have played in catalyzing the rise of modern-aspect terrestrial biodiversity, especially that of mammals and angiosperms. We find that the acceleration of mammal and angiosperms species richness in the Late Cretaceous mirrors the acceleration of tectonic processes that formed the Rocky Mountains. Increases in both mammal and angiosperm diversity also occurred during the 'middle-Cretaceous hothouse' climate and the zenith of Western-Interior-Seaway transgression, the latter being a period when the availability of lowland habitats was at its minimum, and oscillatory transgression-regression cycles would have frequently forced upland range shifts among lowland populations. Mammals' increase in species richness during this interval does not appear to be a taphonomic artifact—some of the largest spikes in diversity occur when the available mammal-bearing fossil localities are sparse. Mountainous regions are biodiversity hotspots today and have been identified as engines for evolutionary radiations in the geologic past; thus, we propose that the Cretaceous/Angiosperm Terrestrial Revolution was ultimately catalyzed by accelerated tectonism and enhanced via consequent changes to landscapes and climate. At the basin scale we predict that (1) increases in mammalian diversity through the Late Cretaceous should be positively correlated with rates of tectonic uplift, (2) mountain-proximal mammalian assemblages should exceed the diversity of coeval mountain-distal assemblages, especially in the latest Cretaceous, and (3) endemism should increase from the latest Cretaceous to early Paleogene as Laramide mountain belts fragmented the Western Interior. Empirical tests of these predictions will require increased fossil collecting in under-sampled regions and time intervals, description and systematic study of existing collections, and basin-scale integration of geological and paleontological data.

Regular Poster Session 4 (Saturday, October 21, 2023, 4:30 - 6:30 PM)

XENARTHRAN MORPHOLOGICAL DISPARITY AND IMPLICATIONS FOR CINGULATE TAXONOMY

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Xenarthra is one of four superorders of placental mammals and is composed of two orders*:* Cingulata (armadillos, pampatheres, and glyptodonts) and Pilosa (sloths and anteaters). The extant diversity of xenarthrans (14 genera and 30 species) is far surpassed by the diversity of extinct representatives. Recent molecular phylogenetic analyses have called into question traditional taxonomic arrangements of cingulates and have proposed dividing the group into two major clades: Dasypodidae, consisting solely of *Dasypus* spp., and Chlamyphoridae, including all other extant armadillos plus extinct glyptodonts (traditionally recognized as a separate family). This proposal has been criticized for lumping most cingulate morphological diversity into a single family (Chlamyphoridae), in stark contrast to its sister-group, Pilosa, which includes seven family-level groups. An alternative taxonomic scheme for cingulates would recognize four families of extant armadillos plus Glyptodontidae (and several other extinct families). In order to test the idea that the morphological diversity (= disparity) of these two groups is similar, we quantified the disparity of cingulates and pilosans.

Morphology was quantified using 15 multistate craniodental, postcranial, and dermal armor characters, focusing on features likely to reflect ecological/functional adaptations. We coded eight extant and fourteen extinct xenarthrans at the genus level, including 10 cingulates and 12 pilosans, and analyzed the matrix via correspondence analysis in PAST. Disparity was measured as the area occupied by each clade in a plot of the first two axes from this analysis, which together accounted for 61.4% of the total variation. Disparity of cingulates (6.30) was less than that of pilosans (7.22) but greater than that of sloths (5.83). Sloths (folivorans) are currently divided among five highly disparate families, implying that a similar number of families should be recognized among cingulates. That would not be the case if the recent Dasypodidae-Chlamyphoridae classification were followed. Recognizing greater familial diversity among cingulates would also result in family-level divergence dates comparable to those of other mammal groups. To our knowledge, this is the first study to quantify morphology of xenarthrans in order to compare disparities of different clades.

Technical Session 2: Early Mammals & Carnivora (Wednesday, October 18, 2023, 8:00 AM)

ETHMOTURBINALS OF LATE CRETACEOUS *MENISCOESSUS ROBUSTUS* (MULTITUBERCULATA: CIMOLODONTA) AND PALEOECOLOGICAL INFERENCE

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A high-resolution CT scan of NSM 20436 (National Museum of Nature and Science, Japan), a cranium of the Lancian multituberculate mammal *Meniscoessus robustus* recovered from The Sandy Site in the Hell Creek Formation of South Dakota, reveals that although the respiratory turbinals of this specimen were lost, more posterior olfactory turbinals are present and roughly in place, although the specimen is slightly deformed.

Turbinal bone appears distinct from bones enclosing the nasal cavity in having a finely trabeculated structure. In addition to a nasoturbinal, there are preserved portions of at least three ethmoturbinals that extend anteriorly. These are associated with ethmoturbinal ridges. There are seven additional ridges occurring in a fan arrangement visible on the ethmoid and orbitosphenoid, which are also associated with turbinal bone in the posterior and inferior portion of the olfactory recess.

Turbinals have not previously been described in Allotheria. Bony specks were observed in cross-sections of the cimolodontan *Kryptobaatar*, as were a tectal lamella of the nasoturbinal and basal lamellae of ethmoturbinals in the gondwanathere *Vintana*. Allotherian mammals had proportionally large olfactory bulbs, so the discovery of extensive olfactory turbinals confirms inferences by other authors.

Meniscoessus robustus fossils are most commonly recovered from stream channel deposits, and its molar morphology and enamel microwear are consistent with herbivory and even folivory, as is its relatively large size. The large extent of the olfactory turbinals suggests that *Meniscoessus* was not aquatic but had a longer taphonomic pathway into the deposits in which it is found. The turbinal morphology observed is most similar to that of insectivores among those living mammals from which turbinals have been published. This may reflect body size and relatively unspecialized rostral shape, rather than a shared diet. On the other hand, the ossified cribriform plate, some of which is preserved, may have been relatively large, which can correlate with a large olfactory genome.

Funding Sources Oklahoma State University Center for Health Sciences

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Regular Poster Session 3 (Friday, October 20, 2023, 4:30 - 6:30 PM)

CONVOLUTED HISTORY OF A COLLECTION: FOSSIL CARNIVORA FROM QUERCY, FRANCE IN THE SWEDISH MUSEUM OF NATURAL HISTORY

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The Department of Palaeobiology, Swedish Museum of Natural History houses a substantial collection of fossil mammals from the Quercy region of southern France. This collection was accumulated between c.1870 and 1920 and includes about 600 cataloged specimens of Perissodactyla, Artiodactyla, Primates, Carnivora and Hyaenodonta. We here focus on carnivores, which comprise approximately 150 specimens assigned to Carnivora (18 genera) or Hyaenodonta (3 genera). The history of this collection is complex and only recently has rediscovered documentation allowed us to reconstruct its path from France to the Natural History Museum and to affirm its historical significance. The oldest specimens come from the collection of Russian paleontologist Vladimir Kovalevsky (1842-1883), an