

despite the inclusion of other taxa with presumably similar dietary adaptations, indicating that there is a phylogenetic signal in eutherian dental morphology apart from the overriding dietary signal. However, the impact of homoplasy is substantial, particularly in the case of genera and families such as Arctostylopidae that are strongly distinct at the time of their first appearances. Such taxa are unstable and are often resolved at unexpected positions near taxa that fall into a broadly similar dental category (e.g. lophodont) but differ substantially in detail, suggesting that the phylogenetic signal in dental morphology is rapidly masked by convergence if sampling is not denser, in some cases denser than is currently possible.

Poster Session II

BLANCAN WOODRATS (RODENTIA: CRICETIDAE) FROM THE MEADE BASIN SOUTHWESTERN KANSAS

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Three species of woodrat are known from Blancan deposits in the Meade Basin of southwestern Kansas. *Neotoma quadruplicata* was described from the Rexroad 3 local fauna (l.f.) and subsequently identified at six other sites in the basin. *N. sawrockensis* was described from the Saw Rock Canyon l.f. and *N. taylori* from the Borchers l.f. R.A. Martin and colleagues have recovered woodrats from 16 additional sites.

The study sample included 30 specimens of each molar from Rexroad 3 and all molars from the other sites. Two of the variables measured were greatest length and width of the molars. Those sites (7) at which $N = > 8$ were analyzed using Student's *t*-test, with $P < 0.05$ as the level of significance. *N. leucopetrica* from the White Rock l.f. of north-central Kansas served as an outgroup.

Significant results indicate that molars from XIT 1B are shorter than from the other sites, except for the M1 at Borchers. The M3 and m3 are narrower, except for the m3 from Borchers. The M2 from Rexroad 3 and Wendell Fox and m1 from White Rock are wider than the sample from XIT 1B. At Wendell Fox the M3 is wider than from Borchers and the m1 is also wider than from Borchers and Rexroad 3. The M1, M2, m1, and m2 from Wendell Fox are longer than from Borchers and Rexroad 3. The length of m1 and m2 and the width of m1 from Wendell Fox are smaller than from White Rock.

These data suggest the presence of two additional woodrats in the basin; a small taxon at XIT 1B that may be in a lineage with *N. sawrockensis* and *N. taylori* and a larger taxon at Wendell Fox that may be in a lineage with *N. leucopetrica*.

Poster Session A

REDUCTION OF THE EOCENE SIRENIAN PELVIC GIRDL: WHO WAS WALKING AND WHO WAS SWIMMING?

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Reduction and loss of hind limbs are progressive adaptations in several groups of marine mammals. Sirenians are a typical example of such adaptation for life in coastal and offshore environments.

Preserved pelvic girdles belonging to three Eocene sirenian families (Prorastomidae, Protosirenidae, and Dugongidae) from Caribbean and Tethyan deposits show that there was a gradual reduction in their size with loss of some features associated with hind limb functions. The Caribbean late early Lutetian *Pezosiren* has a terrestrially adapted pelvic girdle. Middle to late Eocene *Protosiren* from Egypt and Pakistan shows intermediate characteristics between semiaquatic and terrestrial forms in having a single sacral vertebra with elongated transverse processes, an innominate with a shallow acetabulum and reduced obturator foramen, and a femur with an oval femoral head and anteroposteriorly compressed femoral shaft. Late Eocene *Eosiren* and *Eotheroides* have the most reduced pelvic and femoral features, including: reduced length of the ischium and ilium, a diminutive obturator foramen, and unfused and distinctly separated left and right pubic bones that must have been connected to one another by ligaments or cartilage, presaging the complete loss of function in hind limbs.

Reduction in length of the innominate is associated with reduction in the diameter and depth of the acetabulum and obturator foramen, and there is also a notable reduction in the diameter of the femoral head associated with shortening of femoral length. This general reduction in size is progressive over time. By the latest Eocene, sirenians had their hind limbs inside their body wall and were fully aquatic. This dramatic transition to aquatic life in sirenians was phased differently from that of contemporaneous archaeocete whales.

Poster Session I

ECOLOGY AND PHYSIOLOGY OF WHITE RIVER MAMMALS BASED ON STABLE ISOTOPE RATIOS OF TEETH

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To characterize the ecology and physiology of common late Eocene to early Oligocene White River mammals, we analyzed $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ of tooth enamel carbonate for five of the most abundant taxa: the perissodactyls *Brontops* (brontothere), *Mesohippus* (equid), and *Subhyracodon* (rhino); and the artiodactyls *Merycoidodon* (oreodont) and *Leptomeryx* (leptomerycid). Excepting *Brontops*, which became extinct by the Orellan, teeth include Chadronian and Orellan specimens. $\delta^{13}\text{C}$ values of M2s, M3s, and premolars range from -13.1% to -7.7% (V-PDB), consistent with expected pure C3 diets. In the Chadronian, *Mesohippus*, *Merycoidodon*, and *Leptomeryx* show indistinguishable average $\delta^{13}\text{C}$ values ($\sim 10\%$). However, *Brontops* and *Subhyracodon* exhibit lower (-11.2%) vs. higher (-9%)

values, respectively, indicating a preference for denser forests/wetter conditions (*Brontops*) vs. more open habitats/drier conditions (*Subhyracodon*). Orellan compositions are similar, except that *Leptomeryx* shows higher average $\delta^{13}\text{C}$ values, perhaps indicating a different habitat preference for the new Orellan species *L. evansi*. Chadronian $\delta^{18}\text{O}$ values are indistinguishable for *Mesohippus*, *Merycoidodon*, *Leptomeryx*, and *Subhyracodon* ($\sim 25\%$, V-SMOW) whereas *Brontops* shows a statistically lower $\delta^{18}\text{O}$ (23%). Only *Leptomeryx* exhibits a different Orellan $\delta^{18}\text{O}$ value (24%). Because hind-gut fermentation in perissodactyls requires high water turnover, whereas foregut fermentation does not, the indistinguishable $\delta^{18}\text{O}$ values of perissodactyls (except *Brontops*) and artiodactyls suggest that foregut fermentation had not yet developed, at least in these taxa.

Friday 2:30

ONTOGENY AND LIFE HISTORY OF *FALCARIUS UTAHENSIS*, A PRIMITIVE THERIZINOSAURID FROM THE EARLY CRETACEOUS OF UTAH

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The type locality of the recently named basal therizinosaur *Falcarius utahensis* is known as the Crystal Geyser Quarry (CGQ)—a dense, paucispecific bonebed within the Cedar Mountain Formation that is notable for being the largest known maniraptoran mass death assemblage. To date over 2000 elements have been recovered from the CGQ, representing individuals of a minimum of five growth stages. Recent excavations at the site have generated novel elements from the smallest known size class (estimated to belong to a minimum of one individual of approximately 0.5 m in length) as well as previously unknown elements from individuals of intermediate growth stages (i. e. smaller than 4 m in length). Recovered juvenile specimens include dorsal, sacral, and caudal vertebrae, an ischium, pubis, femur, fibula, astragalus, proximal scapula, proximal humerus, metacarpals, and multiple phalanges. Thus far less than five percent of the CGQ has been excavated and only a small amount of the bones removed from this area have been prepared. The MNI based on femora is eight, therefore extrapolation of this value suggests an MNI for the quarry of approximately 300.

Falcarius bones from the CGQ are excellently preserved, displaying well-developed LAGS. From the femoral and fibular ontogenetic series thus far recovered, we are generating the first detailed histological analysis for this clade. This study aims to: 1) characterize the microstructure of major long bones for use in phylogenetic analyses; 2) construct a growth curve for comparison with other non-avian dinosaur taxa; and 3) identify possible physiological and/or metabolic changes correlated with modification of the therizinosaur diet. Initial results are promising, offering a nearly complete LHC from hatchling to adult.

Poster Session B

LOCOMOTORY BEHAVIOR IN THE LAMBEOSAURINE HYPACROSAURUS STEBINGERI

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In order to investigate the locomotory behaviour in lambeosaurines, we CT-scanned humeri and femora from an ontogenetic series (embryonic to adult individuals) of *Hypacrosaurus stebingeri*. These elements were scanned at approximately 65% down the length of the bone, below either the deltopectoral crest or the fourth trochanter. Cortical bone distribution and cross-sectional properties were quantified from the CT scan data. Cortical bone area (CA) and second moment of area (I) were determined from CT slices with ImageJ software, and each parameter was plotted against bone length in logarithmic space. Plots reveal that these biomechanical properties scale nearly identically between the humeri and femora (CA is positively allometric and I is isometric), which indicate that both forelimbs and hindlimbs are subject to the same loading regime throughout ontogeny. We interpret these results as evidence that *Hypacrosaurus* used its forelimbs during locomotion at all growth stages, although the extent to which they were quadrupedal cannot be determined. Our results differ from those obtained previously for *Maiasaura* for which the biomechanical properties of the forelimbs scaled differently from those of the hindlimbs, indicating a transition from bipedal to quadrupedal locomotion during ontogeny. If the conclusions reached for *Hypacrosaurus* and *Maiasaura* can be extrapolated to their respective subfamilies, such a difference in locomotory behaviour between hadrosaurines and lambeosaurines could help explain the larger hatchling size, the larger egg size, and the more robust humeri of lambeosaurines.

Poster Session B

A LATTICE-LIKE PATTERN OF OSSIFIED TENDONS IN PSITTACOSAURUS (DINOSAURIA: CERATOPSIA)

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Ossified tendons are important in studying the musculoskeletal system and behaviors of dinosaurs. Since Dollo's description of dinosaur ossified tendons in 1886, the pattern of ossified epaxial tendons is best known in iguanodonts and hadrosaurids. In this study, an ossified tendon lattice is described in *Psittacosaurus* from the Lower Cretaceous Yixian Formation in Liaoning Province, China, furnishing new information on epaxial musculature evolution in archosaurs.