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energy input through use of the front limbs, as they offer a long lever arm. This has implications for predator/prey interactions, as the main predatory threat for hadrosaurs stems from agile bipeds, e.g. tyrannosaurids.

Poster Session I (Wednesday)
FIRST 3-D FESS (FINITE-ELEMENT STRUCTURE SYNTHESIS) OF THE SHOULDER GIRDLE OF A RECENT ARCHOSAUR UNDER CONSIDERATION OF ARCHOSAUR MUSCULATURE AND LOCOMOTION.

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3-D FESS has formerly been applied for vertebrate skulls, especially of primates and sauropod dinosaurs. Now we present a virtual structure synthesis of a tetrapod shoulder-girdle skeleton. Unlike the most inductive studies using Finite-Elements our deductive approach is focusing on the relationship between form and function according to Wolff's law. The 3-D model is constructed with *Ansys 10.0,* choosing 10-nodes tetrahedral finite-elements, with a Young`s modulus of cortical bone. Initial conditions consist of four homogeneous solids (the "Bauraum") roughly shaped as trunk, including neck and head, scapulo-coracoid and the forearm bones. These parts are completely independent from each other, held together and kept in balance by forces simulating the necessary muscles. Their values and positions were calculated from muscle dimensions obtained by dissecting an *Alligator mississipiensis.* These assumptions, however, are tested by the mechanical stability and balance of the model. The stress flows of each investigated load step were summarized by "physiological superposition". Stress free areas in the model were eliminated to reduce "the Bauraum" to the most exact shape regarding to the archosaur anatomy in iterative steps. Since bony material is only deposited where compression stresses occur, the stress-bearing regions indicate the elements forming the shoulder girdle. So our method allows the simulation of developing processes and shows the muscles and tendons responsible for the bony structures and their influence on skeletal shape. FESS is an appropriate technique to point out the direct relationship between function and form. Since we are able to construct a 3-D model of the postcranial parts of a skeleton it will be possible to investigate any fossil skeletal structure by using FESS.

Student Poster Session (Thursday)
RHINOCEROTOID AFFINITIES OF DEPERETELLIDAE (MAMMALIA, PERISSODACTYLA) BASED ON ENAMEL MICROSTRUCTURE

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Deperetellids are a family of perissodactyls endemic to the Eocene of Asia. Like the contemporary lophialetids, deperetellids have generally been classified as tapiroids or else as a ceratomorph family of uncertain relationships. Although some authors have alluded to a possible relationship between endemic Asian "tapiroids" and rhinocerotoids, no previous study has explicitly allied deperetellids and rhinocerotoids. Rhinocerotoids share an unusual feature of their enamel microstructure, namely vertical decussation of the enamel prisms. Vertical enamel decussation is a rare feature in mammals, and rhinocerotoids are unique among perissodactyls in possessing it. Thus, vertical enamel decussation is likely a synapomorphy of rhinocerotoids. Although it is a feature of the enamel microstructure, vertical decussation can be detected under low magnification from the characteristic ridges visible on the occlusal edge of the enamel of cheek teeth. Specimens of deperetellids from the Lagrelius Collection of the Museum of Paleontology at the University of Uppsala and from the Central Asiatic Expeditions of the American Museum of Natural History possess these ridges indicative of vertical enamel decussation. The presence of vertical enamel decussation in deperetellids supports a close relationship between deperetellids and rhinocerotoids. A preliminary phylogenetic analysis places Deperetellidae as the sister-taxon of Rhinocerotoidea, and Tapiroidea and Lophialetidae are successive sister-groups to this clade.

Technical Session VIII, Thursday 2:00
THE EPIPTERYGOID OF CROCODYLIFORMS AND ITS SIGNIFICANCE IN THE EVOLUTION OF THE ORBITOTEMPORAL REGION OF EUSUCHIANS

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The orbitotemporal region of crocodyliforms is highly apomorphic and poorly understood and may represent a reservoir of informative features. A broad survey of fossil and extant crocodyliform archosaurs was conducted to explore the evolutionary and morphological patterns of the region. Observational and radiological data were gathered on the topological similarity and evolutionary congruence of features of the epipterygoid, laterosphenoid, and temporal region as a whole including relevant osteological correlates and inferred soft tissues such as the trigeminal nerves and jaw musculature. Despite the complete suturing of the palatocranial junction, the epipterygoid remained a consistent cranial element throughout crocodyliform evolution, only to be replaced by the topologically analogous, but developmentally neomorphic laterosphenoid lateral bridge during the early evolution of neo- and eusuchians. These changes led to a unique morphology of the exit of the trigeminal nerve and surrounding region in the crown clade. Mesoeucrocodylian taxa exhibit a diversity of epipterygoid morphologies including waisted (e.g., *Araripesuchus*), overlapping, (e.g., *Sarcosuchus*) and isolated (e.g., *Goniopholis* and *Leidyosuchus*) forms. The isolated form represents a key transition to the extant condition in which the epipterygoid uncoupled from the pterygoid and failed to cover the cavum epiptericum laterally. The distribution of these characters in current phylogenies indicates the epipterygoid was convergently eliminated several times within Neosuchia and also Crocodylia suggesting it and related features may bear systematic importance. These changes in braincase and palatal construction are potentially linked to the apomorphic migration of M. pseudotemporalis superficialis to a position rostroventral to the dorsotemporal fossa and topological change in the intermuscular path of the maxillary nerve-both are apomorphies of extant taxa. These data suggest a diverse spectrum of orbitotemporal morphologies among mesoeucrocodylians and eusuchians were present and warrant further developmental and functional investigations as well as their inclusion in phylogenetic analyses.

Carnivora: Phylogeny, Form and Function Symposium, Saturday 9:00
EVOLUTION OF HYPERCARNIVORY: CONVERGENCE AND CHARACTER STATE BIAS IN CARNIVORA

HOLLIDAY, Jill, Spring Hill College, Mobile, AL, USA

Carnivorans are well known for their tendency to independently evolve similar phenotypes in similar environments (ecomorphs). Once such phenotype is the hypercarnivore, or meat-specialist, which is recognized morphologically on the basis of a specific suite of features that includes elongation of the carnassial blade, reduction or loss of the post-carnassial molars, and shortening of the rostrum. A previous study of the evolution and effects of specialization to the hypercarnivore morphotype compared levels of morphological diversity between hypercarnivores and their sister groups, and showed that hypercarnivores not only occupy relatively less morphospace than their sister groups, but also exhibit fewer character state changes overall. Here, I use detailed character mapping in conjunction with sister and outgroup comparisons in order to evaluate the underlying processes that might lead to a reduction in morphological state changes. Outgroup comparisons provide a "baseline," or expected rate of morphological change, while sister group comparisons allow comparison of rates since a shared ancestor. Use of multiple sister group comparisons (= replicated sister-group comparisons) facilitates consideration of patterns that are applicable to hypercarnivory in a broad sense. Topological and branch length information from recent phylogenetic analyses also allows me to perform more sophisticated tests of bias than have been previously feasible, significantly improving confidence in the results.

Technical Session VI, Thursday 1:45
NEW DATA ON ANTHRACOTHERIIDAE (ARTIODACTYLA) FROM THE PALEOGENE OF EGYPT

HOLROYD, Patricia, University of California, Berkeley, CA, USA; GUNNELL, Gregg, University of Michigan, Ann Arbor, MI, USA

Anthracotheriid artiodactyls are fairly abundant in the successive late Eocene to early Oligocene terrestrial faunal assemblages of the Qasr el Sagha and Jebel Qatrani Formations, Fayum Province, Egypt. They have received little attention until recently, partly because previous systematic work has been conducted on specimens of unclear provenance. Here we use the stratigraphically constrained collections resulting from expeditions by the AMNH, UCMP, and YPM to establish the stratigraphic ranges of Fayum anthracotheriids. Compilation of historical data and maps help us to establish the provenance of most specimens and place these in a chronostratigraphic framework. Anthracotheres are only represented by postcrania from the uppermost part of late Eocene Qasr el Sagha Formation, dated to approx. 35 Ma. Based on size, two taxa appear to be present, and these represent the oldest occurrences of the family in Africa. In the overlying Jebel Qatrani Formation, dental and gnathic specimens are common in the three successive faunal horizons assessed. Four distinct species of *Bothriogenys*, a single species of the rare genus *Qatraniodon*, and a small form of unclear taxonomic status are recognized. Of these *B. gorringei* and *Q. parvus* are the only taxa recognized in the early Oligocene lower sequence of the Jebel Qatrani Formation, occurring in two distinctive horizons dated to approx. 33.6 and 33 Ma. *B. fraasi* and *B. rugulosus* co-occur in the upper sequence of the Jebel Qatrani Formation from quarries approx. 30.2-29.5 Ma in age. No additional specimens clearly assignable to *B. andrewsi* were found in our survey of collections. Based on analysis of metric and morphologic data, the two most common species *Bothriogenys gorringei* and *B. fraasi* are sister taxa and may form a single time-successive lineage. Relationships among the remainder of the *Bothriogenys* species are less clear, in large part due to the rarity and incompleteness of specimens. *Qatraniodon* is the sister taxon to all *Bothriogenys* species, and together these two genera appear to form a distinctive Paleogene African anthracotheriid clade.