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HINDLIMB MUSCLE MORPHOLOGY AND MECHANICAL ADAPTATION IN GALAGOS: AN ANALYSIS OF SCALE, FUNCTION, AND PHYLOGENY. Sharon K. Babcock, Duke University, Durham, NC.

Differences in mammalian muscle morphology due to size have not previously been separated from patterns due to phylogeny, behavior, or mechanics. Data on whole muscle mass, belly length, superficial tendon length, and fascicle length data were collected for mm. plantaris, soleus, and gastrocnemius, in three galago species (Galago demidovii, G. senegalensis, G. crassicaudatus), one loris (Nycticebus coucang) and a cheirogaleid (Microcebus murinus). The galagos are closely related, similarly shaped leapers that range in body size from 60 to 1800g. Lorises, sister-group to the galagos, are slow quadrupedal climbers. Cheirogaleids are small scurriers that possibly represent the primitive locomotor condition for these groups. Within galagos, whole muscle mass scaled isometrically for plantaris and soleus. Whole muscle mass for gastrocnemius did not scale isometrically but appears to be related to performance differences among galagos. Fascicle lengths in plantaris scaled isometrically while those in soleus, a postural muscle, did not. Architectural patterns in M. murinus resemble G. demidovii whereas N. coucang is distinct. These results indicate that scale, function, and phylogeny are reflected in locomotor muscle morphology at several levels.

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FEEDING BEHAVIORS OF SMILODON. A.R. Biknevicius* and B. Van Valkenburgh. State Univ. of New York, Stony Brook and Univ. of California, Los Angeles.

Section moduli were used to estimate bending strengths in mandibular corpora of Smilodon fatalis, a Pleistocene sabre-toothed cat, and of living felids and hyaenids. Corpus bending strengths in Smilodon exceed values found for extant felids having similar lever arm lengths and are more comparable to hyaenid values. Lacking any evidence for habitual ingestion of large bone, the need for developing great bending strength in Smilodon was likely a result of powerful biting with the anterior dentition. Evidence for use of the incisor battery in prey capture and meat ingestion includes relative fracture frequencies and incisor dimensions. The oft-cited inability of Smilodon to maintain canine bites has probably been exaggerated; at full closure, when prey was held firmly by the incisor battery, distal portions of the canines would have been external to the prey and therefore minimally stressed by prey movements.

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HETEROCHRONIES IN CRANIOFACIAL DEVELOPMENT IN EUTHERIAN AND METATHERIAN MAMMALS. K.K. Smith. Duke Univ., Durham, NC.

Although it has long been recognized that the timing of developmental events varies in eutherian and metatherian mammals, few studies precisely document relative patterns. In this study the relative sequence and rate of development of major craniofacial bones, muscles and nervous tissues are compared in a representative eutherian, *Mus musculus* and representative metatherian, *Monodelphis domestica*. As shown previously by Clark and Clark and Smith, *Monodelphis* is characterized by an extended period of osteogenesis with a distinct rostral to caudal gradient. In the present study it is shown that the differentiation and growth of the nervous system likewise follows an extended time course. In contrast, craniofacial muscles in *Monodelphis* develop rapidly over a period of several days, at a similar rate, and in the same relative sequence as seen in *Mus*. No functional or spatial gradient is apparent; all craniofacial muscles develop approximately simultaneously. In both species tongue musculature is the first to differentiate. The patterns observed in these taxa are compared to additional taxa, and the significance of these patterns for a variety of functional and structural hypotheses is discussed.

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STRUCTURE AND MECHANICAL DESIGN OF WHITE RHINOCEROS DERMAL ARMOR. R.E. Shadwick, A.P. Russell* and R.F. Lauff. Scripps Inst. Oceanography, CA and Univ. of Calgary, Alberta, Canada.

The collagenous dermis of the white rhinoceros forms a thick, protective armor that is highly specialized in its structure and material properties when compared to other mammalian skin. Rhinoceros skin is three times thicker than predicted allometrically, and it contains a dense and highly ordered 3-D array of relatively straight collagen fibres. This structure has a steep stress-strain curve with very little "toe", high elastic modulus (240MPa), high tensile strength (30MPa), low breaking strain (0.24) and high breaking energy ($3MJm^{-3}$) and work of fracture ($78kJm^{-2}$). In compression rhinoceros skin withstands average stresses and strains of 170MPa and 0.7, respectively, before yielding. These data show that the dermal armor of the rhinoceros is very resistant to penetration and tearing by horns of conspecifics, as might occur during aggressive behavior. Material properties of the integument rather than just its disproportionate thickness endow it with its peculiar mechanical attributes.

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