

Student Poster Session (Thursday)

**ALLOSAURUS HUMERUS MORPHOLOGY: FUNCTION OR PHYLOGENY?**  
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Theropod limb function has been the focus of numerous studies in the past two decades. This research has concentrated on maniraptoran theropods and specifically on the origin and evolution of flight. Non-maniraptoran theropod functional morphology studies have focused on the hindlimb and its role in locomotion, whereas non-maniraptoran theropod forelimb function remains poorly understood. The common Late Jurassic theropod, *Allosaurus*, provides an opportunity to investigate forelimb function in a non-maniraptoran theropod. Forelimb use can be inferred using the humerus as an indicator. The proximal end of the humerus is the insertion site for shoulder and pectoral musculature, whereas the distal condyles are the origination site for the lower forelimb flexor and extensors. *Allosaurus* (n=35), *Columba livia* (Pigeon) (n=44), and *Alligator mississippiensis* (n=51) humeral data were collected from institutions across North America. Using reduced major axis (RMA) linear regression and principal components analysis (PCA), allometric changes in humeral landmarks (proximal and distal breadth, lateral and medial condyle breadth and height, delto-pectoral crest length, and medio-lateral and anterior-posterior midshaft least diameter) were measured in relation to the maximum length. RMA revealed an overall positive allometric signal for all taxa. Assuming a class-two lever system, over the ontogenetic spectrum of the *Allosaurus* specimens the musculature associated with humeral landmarks increased their mechanical advantage while overall forelimb mobility may have decreased. *Allosaurus* PCA results revealed size as the major component, but humeral landmarks (medio-lateral and anterior-posterior midshaft least diameter, medial condyle breadth and height) also contributed significantly to variation. These results support previous interpretations of a possible predatory function for *Allosaurus* forelimbs. Ultimately, the exact forelimb use of *Allosaurus* remains a mystery, but these results provide a base from which further research into non-maniraptoran theropod and archosaurian forelimb function can be conducted.

Technical Session IX, Friday 8:00

**NOTES AND REVIEW OF THE ORNITHISCHIAN DINOSAURS OF PORTUGAL**

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The record of ornithischian dinosaurs from Portugal is substantial but incomplete in terms of our understanding of taxonomic composition and details of the anatomy of many forms. New data and reinterpretation of these forms are provided. The basal thyreophoran from the Lower Jurassic (the nomen dubium "*Lusitanosaurus lissicus*") is the most primitive dinosaur from Iberia. Concerning the Late Jurassic, new material from the Lourinhã Formation (Kimmeridgian/Tithonian) referable to the stegosaur *Dacentrurus* provides additional information on the systematic position and osteology. The new material shows two rows of paired triangular plates, with a notch in the anterior rim. A maxillary of an ankylosaur from the Vale Frades (Lourinhã Fm.) is here reported, but cannot be referable to *Dracopelta*, the only ankylosaur genus currently known from Portugal. The ornithopod *Alocodon kuehnei* reported as Middle Jurassic (Callovian) is probably Oxfordian in age. A right dentary (ML768 from Zimbral) from the Lourinhã Formation, Kimmeridgian/Tithonian, and shares affinities with *Dryosaurus* but possesses more denticulation and no secondary ridges, suggesting the occurrence of a new or unreported species for the Late Jurassic of Portugal, which is here tentatively ascribed to aff. *Dryosaurus* sp. In summary, the Late Jurassic ornithischians species/genera from Portugal include *Dacentrurus armatus*, *Stegosaurus cf. unguilatus*, *Dracopelta zbyzwevskii*, *Phyllodon henkeli*, *Hypsiphodon* sp., *Alocodon kuehnei*, *Triunacodon cuneatus*, aff. *Dryosaurus* and *Draconyx loureiroi*. The Lower Cretaceous (Hauterivian / Barremian) of Praia das Aguncheiras, in Cabo Espichel, provided a partial left maxillary (CPGP1.997) of a basal iguanodontian that shows affinities with *Camptosaurus*, and is tentatively assigned to this genus. The maxillary teeth denticles differ from Iguanodon or other *Iguanodontoides* because not show mammillations. More material is necessary to validate but, to be true, that would confirm the presence of this genus in the lower Cretaceous. The *Iguanodon* has been well reported in the Lower Cretaceous of Cabo Espichel.

Poster Session III (Friday)

**TAPHONOMY AND SEDIMENTOLOGY OF THE FIRST KNOWN TRICERATOPS BONEBED, CARTER COUNTY MONTANA**

MATHEWS, Joshua, Northern Illinois University, Milton, WI, USA; HENDERSON, Michael, Burpee Museum of Natural History, Rockford, IL, USA; WILLIAMS, Scott, Burpee Museum of Natural History, Rockford, IL, USA

Bone bed accumulations of ceratopsian dinosaurs are not uncommon in Cretaceous age strata. There are several localities that provide strong evidence that these animals congregated in herds. Bonebeds have been found for *Centrosaurus*, *Styracosaurus*, *Torosaurus*, and *Chasmosaurus*. Many of the bonebeds discovered contain the remains of hundreds to possibly thousands of individuals that died during a cataclysmic event, such as a flood. While bonebeds for these animals are common, perhaps the most famous of the horned dinosaurs, *Triceratops*, has only been found as individual speci-

mens. *Triceratops* is one of the most common dinosaurs found in the Hell Creek Formation, second only to *Edmontosaurus*. Until now, there has never been a documented case involving a *Triceratops* bonebed. The Homer Site, excavated by the Burpee Museum of Natural History in the summer 2006, has yielded the remains of two sub-adult *Triceratops* within the same quarry. Over 110 bones and bone fragments have been recovered from the site, a majority of which is skull material, pectoral and pelvic girdles, and ribs. Excavation of the site resulted in 3 postorbital horncores, 4 squamosals, 2 parietals, 3 scapulae, and numerous ribs. Limb elements were represented by only one femur. The enclosing rock type at the Homer Site is an organic rich mudstone, interpreted as an overbank flood deposit along a paleo-river or stream. Although at first glance, there appears to be a preferred direction within the quarry that would show current direction, there is no statistical evidence to support it. The bones are well preserved and show minimum signs of abrasion. Most of the breakage present can be attributed to the excavation and collection process as well as compaction of the bone bearing layer over time. The lack of cervical and caudal vertebrae, along with the lack of phalanges and metapodials, suggest that the current was strong enough to carry away the smaller skeletal elements, however unable to carry away the larger, heavier skeletal elements. Most of the bones in the quarry were assigned to Voorhies Transport Groups 2 and 3, which are representative of a lag deposit.

Technical Session XII, Friday 2:45

**STABLE ISOTOPIC RECORD OF MESSINIAN MAMMALS FROM THE CIRCUM-MEDITERRANEAN REGION**

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During the Late Miocene Messinian Salinity Crisis (MSC), severance of the Mediterranean-Atlantic corridor coupled with a negative hydrological budget for the Mediterranean region, resulted in widespread desiccation of the Mediterranean Sea. We measured stable carbon and oxygen isotopes preserved in latest Miocene and early Pleistocene ungulate fossils from southeastern Spain and northern Libya to explore the potential environmental and ecological effects of a large, desiccated marine basin on nearby terrestrial environments. Tooth enamel  $\delta^{13}C$  values from Librilla (MN-13, Spain) range from -11.5‰ to -9.4‰ VPDB and those from Sahabi (MN-13/14, Libya) range from -10.4‰ to -8.6‰ VPDB, suggesting ungulates at both localities consumed  $C_3$  vegetation in a relatively arid climate. These latest Miocene enamel  $\delta^{13}C$  values are within the range (-8.0‰ to -12.1‰ VPDB) of Lower Pleistocene ungulates from the Baza Basin in southeast Spain, suggesting that large herbivore diets were not significantly different during the MSC. Relatively positive tooth enamel  $\delta^{18}O$  values further support the interpretation of an arid circum-Mediterranean climate during both the latest Miocene and the early Pleistocene. Mean  $\delta^{18}O$  of tooth enamel from Sahabi (31.5‰ VSMOW) is more positive than that of Librilla (29.9‰ VSMOW) or the Baza Basin (26.8‰ VSMOW), consistent with either a more arid climate or more  $^{18}O$ -enriched precipitation in northern Libya during the MSC. Hippopotamuses from Sahabi and the Baza Basin are depleted in both  $^{13}C$  and  $^{18}O$  relative to other taxa in the fauna, which is consistent with their semiaquatic habitat and diet. This observation also suggests that primary  $\delta^{18}O$  values are preserved in enamel carbonate. However, a lack of covariation between intra-individual enamel and dentine carbonate  $\delta^{18}O$  values suggests diagenetic alteration has taken place in one or both skeletal materials. Analysis of enamel and dentine phosphate  $\delta^{18}O$  will provide further insight into interpretations drawn from carbonate  $\delta^{18}O$ .

Student Poster Session (Thursday)

**THE EARLY CRETACEOUS CHORISTODERAN REPTILE, MONJUROSUCHUS, IN CHINA AND JAPAN**

MATSUMOTO, Ryoko, University College London, London, United Kingdom

New material of the Lower Cretaceous choristoderan reptile, *Monjurosuchus*, has been recovered from the Tetori Group, Japan. This genus was first described from the Lower Cretaceous Jehol Biota of China, but has only recently been recognised as a choristoderan. The new material provides the first record of the genus in Japan, but the same deposits produced the first long-necked choristoderan, *Shokawa*. The Japanese *Monjurosuchus* material is broadly similar to specimens of the type species, *M. splendens*, but differs in details of the parietal and temporal region. Cladistic analysis supports the monophyly of Neochoristodera, and also the sister group relationship of *Shokawa* and *Hyphalosaurus*, forming a Sino-Japanese clade of long-necked choristoderans. The placement of the European Tertiary *Lazarussuchus* remains problematic but the analysis supports its placement within Choristodera rather than on the stem, as in some other recent studies. Although the Jurassic *Ctenioeryx* and all neochoristoderans possess large, fully open, lower temporal fenestrae, these fenestrae are closed in *Monjurosuchus*, *Hyphalosaurus*, *Philydrosaurus*, and *Lazarussuchus*. The identification of *Monjurosuchus* from the Tetori Group provides an important link between the fossil assemblages of Japan and those of the roughly contemporaneous, and better known, Jehol Biota of China.