composite cast of a giant ground sloth Megatherium americanum (NHMUK 26540) on public display in the Natural History Museum, London.

Our ‘alpha-shapes’ predictive equation is characterised by a high correlation coefficient (r² of 0.973, p < 1.0e−3, 13.4°C). The species M. primagenius and M. americanu were estimated to be 3635 kg and the 3706 kg respectively, which match well with previous volumetric estimates of body mass. The application of alpha-shapes matches the predictive capacity of the convex hulling method but reduces the potential bias that segmentation of the skeletons may introduce. Future work should be used to combine aspects of both approaches and alpha-shapes methods to provide a reliable mass estimation technique for complete fossil skeletons.

Poster Session III (Friday, October 16, 2015, 4:15 - 6:15)

BIOMECHANICAL ADAPTATIONS TO INCREASED BODY SIZE IN THE NEURAL柱

GARDNER, Jacob D., Montana State University, Bozeman, MT, United States of America, 59717; WOODDUFF, D. Cary, Museum of the Rockies and Montana State University, Bozeman, MT, United States of America; WILSON, John P., Montana State University, Bozeman, MT, United States of America; FLORA, Holley M., Montana State University, Bozeman, MT, United States of America; HORNER, John R., Museum of the Rockies and Montana State University, Bozeman, MT, United States of America;

The fossil theropod dinosaurs exhibit diversity in diet, lifestyle, cranial and body ornamentation, and body size, among other traits. However, the majority of theropods are characterized by a bipedal posture and locomotion. Unlike quadrupedal posture, which distributes weight across both fore- and hind limbs, bipedal posture distributes weight only on the hind limbs. This posture therefore generates bending moments in the vertebral column about the hips. Rugosities on the anterior and posterior aspects of neural spines are common in theropods. Histologic analysis of these spinal projections indicates that they evolved as a result of the development of a stiff spinal column, increasing passive support for body weight. A stiff spinal column would also decrease the risk of collapse and sealed shut behind each penetrating digit, leaving a V-shaped sulcus. Such slit-like tracks can be easily misinterpreted, particularly if only one surface is available for analysis. Colbert Prize (Wednesday - Saturday, October 14-17, 2015, 4:15 - 6:15)

EARLY MIOCENE PALEOEVOLVEMENTS OF RUSINGA ISLAND, KENYA: NEW DATA FROM FOSSIL MAMMALIAN TOOTH ISOMALS STABLE ISOTOPE COMPOSITIONS

GARRETT, Nicole D., University of Minnesota, Minneapolis, MN, United States of America, 54554; FALKINGHAM, Peter, Liverpool John Moores University, Liverpool, United Kingdom. An animal's foot can indirectly deform layers beneath the substrate's surface, leading to the development of ‘undertracks’ that are frequently discovered in the fossil record. Despite the benefits of the undertrack model, its application to footprints formed by different taxa is not justified. For example, Mesoziocic dinosaurs moving through soft, well substrates sank to significant depths without transmitting deformation far below the foot. In taxa with a relatively long toe, such as theropods and some ornithopods, much of the apparent depth of a shallow track made by a wide-toed foot. 3) Sampling of incompletely exposed sulci at multiple levels yields a sequence (one of Hitchcock's "stormy volumes") that appears to show a shallow track transmitting undertracks over long distances. 4) Forward, diverse and nearly divergent footprints are found across the collapsed sulci, contrary to the popular conception that detail decreases with depth. Given that deep track surfaces are more likely to be encountered than very shallow track surfaces, we believe that these errors and similar mistakes may be quite common in studies of dinosaurs and other taxa. A more complete understanding of track formation dynamics is critical for correct interpretation of morphologies encountered in the field and collections.

Poster Session IV (Saturday, October 17, 2015, 4:15 - 6:15)

PALEOGENE XERANThRA AND THE EVolución OF SOUTH AMERICAN MAMMALS

GAUDIN, Timothy J., Univ of Tennessee at Chattanooga, Chattanooga, TN, United States of America, 37403-2598; CROFT, Darin, Case Western Reserve University, Cleveland, OH, United States of America.

Recent studies show Xeranthera to be even more isolated systematics from other placental mammals than traditionally thought. The group not only represents one of the primary placental clades, but also represents the first fissional mammal taxa (e.g., Pholidota, Phalanomorpha) have been contradicted. No unambiguous Paleocene fossil xenarthran remains are known, and Eocene remains consist almost exclusively of isolated cingulate osteoderms and isolated postcrania of uncertain systematic provenance. Unlike extant xenarthran taxa, the group’s progenitors were myrmecophagous with digging and perhaps some climbing adaptations. The earliest cingulates were terrestrial diggers and likely myrmecophagous but soon diverged into numerous omnivorous lineages. Early sloths were more gregarious with a preference for forested habitats, exhibiting both digging and climbing adaptations. We attribute the rarity of early xenarthran remains to low population densities associated with myrmecophagy, likely to have durability, enameled covered teeth, and general scarcity of fossil localities from tropical latitudes of South America. The derivation of numerous omnivorous and herbivorous lineages from a myrmecophagous ancestor is a curious and unique feature of xenarthran history and may be due to the peculiar ecology of the native South American mammal fauna. Further

Technical Session VII (Thursday, October 15, 2015, 1:45 PM)

MACROEVOLUTIONARY TRENDS IN THE PREORBITAL SKULL REGION OF ORNITHOPTOD (ORNISCHIA) DINOSAURS

GATES, Terry A., North Carolina Museum of Natural Sciences, Raleigh, NC, United States of America, 27601.

Hadrosaurid dinosaurs are some of the most derived megaherbivorous tetrapods ever to evolve, typified by elongated preorbital skulls and large external naris that began as the opposite condition in more primitive ancestors such as Lesothosaurus, dating from the earliest Cretaceous. Though the evolution of the large external naris in these dinosaurs appears to be directional based on observation of primitive versus derived Late Cretaceous species, Late Jurassic and mid-Cretaceous ornithopods allow rigorous testing of this hypothesis by providing pivotal anatomical data throughout the ornithopod tree. This data set includes three of the four dinosaur species that have records of skull length in the preorbital skull length, area of the antorbital fenestra, and area of the narial fenestra were tested using a variety of phylogenetic comparative methods on 37 ornithopod taxa and 750 time-scaled trees to account for stratigraphic uncertainty in species occurrences. An enigmatic mode of trait evolution revealed no correlation between random walk model and directional model in preorbital skull length evolution, either considering the tracks of a single clade or the entire range of modern C. americana. The entire range of modern C. americana was used to test the hypothesis that ornithopod cranial evolution was on a directional path towards the hadrosaurid ontogenetic mode. The hypothesis was not supported by these analyses as the opposite condition in more primitive ancestors such as Lesothosaurus is both the rarest and supports the hypothesis that ornithopod cranial evolution was on a directional path towards the hadrosaurid ontogenetic mode. The hypothesis was not supported by these analyses.
progress in understanding early xenarthran evolution may depend on locating new Paleogene fossil sites in northern South America.

**Grant Information**

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**Poster Session III (Friday, October 16, 2015, 4:15 - 6:15)****

**DID THE HUNT FOR EARLY MAMMALS IN ARIZONA CREATE A SIGNIFICANT SAMPLING BIAS?**

GAY, Robert J., Mission Heights Preparatory High School, Casa Grande, AZ, United States of America, 85122

The completeness of the fossil record and biases in our collections of this record have been the subject of numerous previous studies. Most of these have focused on two main areas: the relative completeness of organisms or the overall body mass of the recovered organisms. This has resulted in a fairly good understanding of the completeness of the fossil record in what could be termed “normal” conditions; prospectors collecting specimens with no particular focus on clade collected or size of the organism. However, large-bodied organisms are difficult to be discovered and described sooner while smaller-bodied organisms are generally discovered later and tend to be less complete.

To test if this trend is robust, the Lower Jurassic (Sinemurian-Pliensbachian) Kayenta Formation of Northern Arizona was investigated. In the 1970s and early 1980s, intensive fieldwork was undertaken by crews from the Museum of Northern Arizona and Harvard’s Museum of Comparative Zoology attempting to locate early mammals and stem-mammal synapsids. Based on this focus we hypothesized that a “rebound” would exist, with a gut the morphol-ogy of the sceloporus and ring and orbit structures may prove two bodied ones, reversing the “normal” trend. A review of the published literature suggested this hypothesis was supported. A specimen-level analysis of the Kayenta Formation collections of the Museum of Northern Arizona was conducted to test these results from the literature review. Data collected included date of collection, least-inclusive clad, estimated body length, and a completeness index score. Analyses of these data did not support the rebound hypothesis. Declining trends for size over time have an R-squared value between 0.95 and 0.97, indicating that most organisms are in “standard big first” model. This suggests a publishing bias may exist and literature-based studies of collection biases may be missing underlying signals in collections themselves.

**Poster Session I (Wednesday, October 14, 2015, 4:15 - 6:15)**

**THE IMPORTANCE OF SENSITIVITY ANALYSES FOR THE INFERENCE OF STRUCTURE FROM FUNCTION**

GEE, Bryan, Pomona College, Claremont, CA, United States of America, 91711; AUGUSTINE, Elizabeth, W.M. Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges, Claremont, CA, United States of America; SCHMITZ, Lars, W.M. Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges, Claremont, CA, United States of America

The presence of function from structure is a challenging aspect of vertebrate paleontology, yet provides fascinating paleobiological insights. For example, understanding the variability in temporal activity patterns is crucial for gaining insight into ecological interactions and resource partitioning in paleoecosystems. Recent studies have shown that the morphology of the skeleton and orbit structures may prove two-bodied ones, reversing the “normal” trend. A review of the published literature suggested this hypothesis was supported.

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**Poster Session III (Friday, October 16, 2015, 4:15 - 6:15)**

**A NEW DIVERSE SQUAMATE FAUNA FROM THE LATE MICOCENE OF NORTHERN GREECE**

GEORGALIS, Georgios L., University of Fribourg, Fribourg, Switzerland; DELFINO, Massimo, University of Fribourg, Fribourg, Switzerland; DUG, J.R., Montana State University, Bozeman, MT, United States of America; CHIAPPE, Luis, University of Fribourg, Fribourg, Switzerland; VARRICHIO, David J., Montana State University, Bozeman, MT, United States of America; SCHMITZ, Lars, W.M. Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges, Claremont, CA, United States of America

Late Miocene microvertebrate faunas from Southeastern Europe are crucial for our understanding of the evolution, extinction events and biogeographic scenarios of Neogene squamates. However, the relative scarcity of such localities from this region and the low number of microfossil specimens make the identification of squamates, especially, difficult. This new locality is already well known for its rich micromammal fauna as also important large mammal finds, which all have pointed with certainty a late Turolian age (MN 13). Squamates have only received minor attention, with only a few sporadic referrals of the existing finds. However, new undescribed taxa from a recently recovered sample represent a highly diverse squamate fauna. Lizards are represented by numerous agamids, lacertids, scincids and anguids, as also some indeterminate forms. Much of the material consists of dentaries, maxillae, vertebrae, osteoderms and limb elements, permitting the identification of a multivariate fauna. Moreover, the number of isolated vertebrae, but also from cranial elements as well as fangs, allowing the identification of scolecophilodinids, natricine and non-natricine colubrids, and several indeterminate forms. The presence of a scolecophilodinid is rather important as it constitutes one of the few occurrences in the Neogene fossil record of this group at a global level. Comparison with the adjacent and slightly coeval locality of Laramene, also from the Serres Basin, reveals the notable absence of varanids, vipers and elapids from the Ano Metochi fauna. This absence should be attributed to preservation or collection biases, as Metochi has been more intensively investigated for microvertebrates, although a genuine absence of these groups due to ecological factors should not be ruled out. Deciphering the alpha taxonomy of the Ano Metochi lizards and snakes adds significantly to the known diversity of squamates from the Neogene of Southeastern Europe, contributing also to the knowledge of their ecology, evolution and biogeography.

**Poster Session IV (Saturday, October 17, 2015, 4:15 - 6:15)**

**TAPHONOMIC DESCRIPTION OF THREE RECENTLY DISCOVERED TROODON CLUTCHES FROM EGG MOUNTAIN**

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Troodon eggs are known from the Upper Cretaceous (Campanian) Two Medicine and Judith River Formations. Egg clutches document the reproductive behavior of this dinosaur and provide insight into the evolutionary transitions from non-avian dinosaurs to birds. Here we describe the taphonomy of three recently discovered Troodon clutches excavated during 2012, 2013, and 2014 at the Two Medicine Egg Mountain locality. These clutches consist of 12 clutches varying in size and shape, and from three different locations with associated eggshell debris. The 2012 clutch is the most heavily disturbed since the eggs lack the vertical postural typical of better-preserved clutches. In contrast, the less disturbed 2013 and 2014 clutches retain upper eggshells leaning toward the clutch center. Because the eggs were partially buried in sediment after being laid, these clutches indicate autochthonous nesting. Sediment samples from the clutches indicate grey siltstones that are very poorly to moderately sorted. Orientation of associated eggshell debris from the 2012 and 2013 clutches favor concave down (n = 80) and concave up (n = 50), respectively, whereas those from the 2014 clutch favor concave down (n = 73). Eggshell orientation from modern avian nesting sites and transport experiments may provide insight into the interpretation of these clutches. Eggshell orientations from all three clutches are inconsistent with transported assemblages. Eggshell orientations near the 2012 clutches is not due to trampling by chicks after hatching. Orientations near the 2014 clutch more closely compare to fragmentation due to either hatching or predation. The 2012 (n = 11) and 2013 (n = 17) clutches preserve high numbers of shed Troodon teeth and may record feeding on a cluck or the large breaching period. Orodromeus and small skeletal remains near these two clutches could be consistent with the former.