Poster Session I (Wednesday, October 26, 2016, 4:15–6:15 PM)

FIRST DESCRIPTION OF AN ARTICULATED MANUS OF A HEGETOTHERIINE NOTOUNGULATE, BASED ON A SPECIMEN FROM THE MIDDLE MIOCENE OF QUEBRADA HONDA, BOLIVIA

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Hegetotheriids were small to medium-sized South American endemic ungulates of the suborder Typotheria, and their fossil record extends from the early Oligocene to the early Pleistocene. The family is traditionally divided into two subfamilies, Pachyrhukhinae and Hegetotheriinae, though the monophyly of the latter is still uncertain. Most of the skeleton has been described for some species of both groups, but the manus has only been documented in pachyrukhines. In this study, we provide the first description of the manus of an hegetotheriine based on UTAF-V-001591, a well-preserved partial skeleton of *Hemihegetotherium trilobus* from the middle Miocene (Laventan South American Land Mammal Age) Quebrada Honda Fauna of southern Bolivia. The manus of this specimen preserves two carpals, metacarpals (Mc) II–V, all phalanges of digits II–III, and a partial proximal phalanx of digit IV. It also includes a partial mandible (confirming its identification as *H. trilobus*), an articulated pes (with the cuboid, metatarsals (Mt) II–V, and phalanges of digits III–V), and several partial limb bones. The manus of *H. trilobus*, like that of the pachyrukhines *Pachyrukhos*, *Propachyrucos*,and *Paedotherium*, is tetradactyl with three relatively robust digits (II, III, IV), a reduced digit V, and apparently no pollex. Manual digit reduction could have occurred either early in the evolution of hegetotheriids (prior to the divergence of these two groups) or in parallel in hegetotheriines and pachyrukhines. A mesaxonic pes with robust Mt II–IV, reduced Mt V, and no digit I has been documented in the hegetotheriines *Prohegetotherium*, *Hegetotherium*,and *Hemihegetotherium achataleptum* and the pachyrukhine *Pachyrukhos*. (*Propachyrucos* and *Paedotherium* are also tetradactyl but have digit proportions that are less strictly mesaxonic.) The overall form of the pes of *H. trilobus* resembles that of *H. achataleptum.* Although Mt V has not previously been reported in *H. achataleptum*, facets on Mt IV of this species have been interpreted as suggesting a small Mt V was present. This interpretation is supported by the articulated pes of this specimen of *H. trilobus*, which preserves a small Mt V. In addition to clarifying the anatomy of *H. trilobus*, the specimen described here will provide new data for studies of the functional morphology of hegetotheriines and may yield characters useful for clarifying phylogenetic relationships among hegetotheriids.

Grant Information
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Technical Session XX (Saturday, October 29, 2016, 2:30 PM)

JUST HOW DIFFERENT? QUANTIFYING VERTEBRAL DIVERSITY IN TEMNOSPONDYLS

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The size and shape of vertebrae within the vertebral column are influenced by ecology and phylogeny, in addition to body size. Parameters such as total vertebral number, degree of regionalization, dimensions and angles of vertebral processes have been correlated with locomotor type, performance, and axial mobility. Despite studies across a wide range of extant taxa, and a history of vertebral morphology changing to suit new forms of locomotion, these data have not been expanded towards understanding basal tetrapod biomechanics. Yet, this ancestral assemblage underwent major biomechanical innovations which enabled the evolutionary water–land transition, critical to the explosive diversification of land vertebrates. Temnospondyls were a diverse set of stem-amphibians that arose in the Middle Mississippian (346 Ma) and went extinct in the Early Cretaceous (120 Ma). Early works on temnospondyls described and categorized their diversity of ecologies, habitats, and gross morphologies, including complex vertebral morphologies. However, no study has quantified temnospondyl vertebral diversity in, or addressed their effects on, biomechanical metrics such as overall spinal stiffness, or lever arms of epaxial musculature. We conducted a 2D geometric morphometric study of shape differences and investigated the biomechanical consequences of pre-sacral vertebral morphology in the temnospondyls by calculating, plotting, and analyzing principal components to determine disparity patterns. We document the diversity of the intercentra and neural spines. Principal components separate the temnospondyls into clusters consistent with their phylogeny and, biomechanically relevant, habitat. The clade Rhachitomi had terrestrial and aquatic members that clustered with other temnospondyls of similar habitats but in different clades. This project lays the groundwork for a series of quantitative studies to understand differences within this diverse group and to better understand key innovations in the axial column for terrestrial locomotion.

Poster Session I (Wednesday, October 26, 2016, 4:15–6:15 PM)

THE VERTEBRATE ASSEMBLAGE OF THE MADSEN BONE BED, LOWER JUDITH RIVER FORMATION (MCCLELLAND FERRY MEMBER, CAMPANIAN), NORTH-CENTRAL MONTANA

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The Judith River Formation is a relatively poorly sampled geologic unit in comparison to other formations deposited in the Campanian of North America. The formation is chronostratigraphically and lithostratigraphically equivalent to the uppermost Foremost and Oldman Formation in Alberta. The lower half of the Judith River Formation, the McClelland Ferry Member, was deposited during the regressive phase of the western interior sea, and as such records the transition from marine to non-marine environments. The fauna of this unit is particularly poorly sampled. Here we report on the vertebrate assemblage of a recently excavated bonebed in the upper, sandy interval of the McClelland Ferry Member located near Malta, Montana. Approximately 70 vertebrate fossils were collected from the multi-taxic bonebed. The site is mixed and includes both macrovertebrate and microfossil components, but majority of the fossils collected are larger than 5 cm. The bones were identified to the lowest taxonomic level and an illustrated faunal list has been compiled. The fossils originated from a diverse set of terrestrial and freshwater species. Of the bones excavated, 42% belong to hadrosaurid dinosaurs, 23% belong to saurischian dinosaurs, 23% belong to Testudines, and 10% belong to crocodilians. Stratigraphically, the site occurs in strata that are equivalent to the Comrey Sandstone zone of the Oldman Formation, allowing comparison of this fauna with sites in Alberta, which are located over 100 km further west. The single sampled microsite from the Comrey zone in the Manyberries region of Alberta has a greater relative abundance of fish and salamanders, with hadrosaurs being the most abundant reptile. However, the difference in fossil size distribution of these two sites may account for some of the differences in faunal composition. The microvertebrate fauna of the lower McClelland Ferry Member of the Judith River Formation is reasonably well documented, but there are few, if any, microsites known from the upper portion this member, which records the maximum regression of the western interior sea. The analysis of the Madsen Bonebed contributes new data on the faunal composition and paleoecology of the Judith River Formation.

Technical Session VIII (Thursday, October 27, 2016, 3:45 PM)

FIRST COMPLETE SKULL OF A FOSSIL FLYING SQUIRREL FROM THE MIOCENE OF CATALONIA

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Flying squirrels (Sciuridae: Pteromyini) are relatively common and diverse in the European Miocene, although they are mostly known from isolated cheek teeth, mandibles and maxillary fragments. Due to the lack of postcranial material, their inclusion into the Pteromyini has been questioned, because truly diagnostic characters only occur in the carpus. Here we report two skulls that, on the basis of dental morphology, are assigned to *Miopetaurista neogrivensis*, a large-sized 'flying' squirrel known from the middle to early late Miocene of Eurasia. The recovered material comes from sites ACM/C5-D1 and ACM/C8-Af of Abocador de Can Mata, located in the Vallès-Penedès Basin (Catalonia, Spain) and with an age of 11.6 Ma. Although the skulls are almost complete, both are crushed, either dorsoventraly or laterally in a slightly oblique angle. The main fragments are only slightly displaced and not plastically distorted. To reconstruct the original skull shape, these specimens were micro-CT scanned and the different bone fragments were digitally individualized. The virtual models of each fragment were then matched with one another by fitting the fractures so as to reconstruct uncrushed bones, mirroring them when required. Finally, a complete 3D model of the undistorted skull was generated as a composite of the models of the two specimens. In addition, CT-scanning enabled the observation of the internal morphology of key anatomical structures, such as the tympanic cavity. The robust appearance of the skull is very similar to that in extant large-sized squirrels, particularly the flying squirrels *Aeromys* and *Petaurista*. Furthermore, it shares with those taxa a short and wide rostrum, and short and robust postorbital process. Other details are strikingly similar, such as the inflation of the bulla, the presence of a marked jugal process in the zygomatic arch and the number of septa (2 to 3) in the tympanic cavity. Most of the smaller flying squirrels show more elongated muzzles, longer postorbital processes and a higher number of septa. Pending the study of postcranial material, the remarkable number of similarities indicates that *Miopetaurista* is indeed a flying squirrel.

Grant Information
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Colbert Prize (Wednesday–Saturday, October 26–29, 20164:15–6:15 PM)

USING ICHNOFOSSILS AND PALEOSOLS TO RECONSTRUCT THE MIDDLE MIOCENE PALEOENVIRONMENT OF QUEBRADA HONDA, BOLIVIA

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The Neotropics are home to exceptional levels of mammalian diversity, but few fossil-producing localities document the history of this unique fauna. La Venta, Colombia, and Quebrada Honda, Bolivia are well-sampled, roughly contemporaneous (13–12 Ma) sites that preserve the remains of many extinct nonvolant Neotropical mammals (59 and 30 genera, respectively). Almost no mammalian genera are shared between the two sites, and this could reflect climate and/or habitat differences. In this study, we use paleopedology and ichnology as independent lines of evidence to elucidate the habitat of Quebrada Honda and test this hypothesis. The paleosols of Quebrada Honda are weakly to moderately developed and composed primarily of brown-to-red silts, silty sands, and mudstones. They are interpreted as Entisols and Inceptisols that formed in floodplains. The suite of ichnofossils present within the paleosols include cm- to dcm-scale, horizontal-to-vertically oriented mottled, passively filled burrows, and cm-scale subvertically-oriented meniscate and pelleted back-filled burrows. Horizons of *Celliforma* and *Coprinisphaera* are present in the paleosols, as are dcm-scale calcified burrows with cylindrical chambers. These ichnofossils are interpreted as dwelling, feeding, and breeding structures of solitary social insects, and dwelling structures of small mammals, respectively. Rhizoliths include mm-scale rhizotubules, cm-scale rhizohaloes, and dcm-scale rhizocretions. The rhizotubules and rhizohaloes are interpreted as roots of grasses and other small herbaceous plants while the rhizocretions