MEETING PROGRAM AND ABSTRACTS

OCTOBER 17–20, 2018

SVP
SOCIETY OF VERTEBRATE PALEONTOLOGY

78TH ANNUAL MEETING 2018

ALBUQUERQUE CONVENTION CENTER • ALBUQUERQUE, NM

SOCIETY OF VERTEBRATE PALEONTOLOGY
OCTOBER 2018
ABSTRACTS OF PAPERS
78th ANNUAL MEETING

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EDITORS
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Vertebrates are important components of global ecosystems past and present. Yet, apart from conodonts, vertebrate material is scarce in the 100 million years following their first appearance in the Chengjiang Lagerstätte during the Cambrian Explosion. Their comparatively minor contribution to Cambro-Ordovician communities suggests a divergent history and potentially different triggering factors for diversification of "fishes" than invertebrate phyla, and brings the fossil record into conflict with phylogenetic inferences of origins from ghost ranges and molecular studies. We assembled new occurrence, phylogenetic, and morphological databases to determine the timing, triggers, and tempo of the first diversification of vertebrates. We fit phylogenetic models to habitat data for early vertebrate occurrences, much of it based on environmental inferences and depositional details for invertebrate faunas in existing compendia (e.g., Paleobiology Database, Boucot and Lawson's 'Paleocommunities'). This revealed that vertebrate groups, jawed and jawless, were initially limited to shallow waters at the margins of ancient seas. Time-series of vertebrate occurrences showed that armored vertebrates, the relatives of living jawed forms, massively increased in abundance and diversity in the aftermath of the end-Ordovician extinction, following global losses of conodonts. We created multi-clade morphospaces by coding of functional aspects of body form in extinct and living fishes (via FishBase and descriptions in Google Scholar) and compared distribution of traits with occurrence in environmental zones along the marine depth gradient. This showed that modern relationships between form and habitat use were already established in the Silurian among jawless stem-gnathostomes. Following their initial appearance in nearshore environments, jawed fishes were limited to pelagic ecomorphologies resident in offshore zones rarely used by agnathans, and remained so into the Devonian "Age of Fishes." This result undermines assertions of a "Devonian Nektonic Revolution" and competition-induced extinction of jawless fishes, and might support a sea-level based control on agnathan diversity. Our results illustrate how new databasing efforts and quantitative approaches are completely rewriting the first half of vertebrate history.

Technical Session XVIII (Saturday, October 20, 2018, 2:45 PM)

THE STRUCTURE OF RODENT AND LAGOMORPH COMMUNITIES ACROSS THE CENOZOIC OF NORTH AMERICA: THE IMPORTANCE OF REGIONAL TOPOGRAPHY AND CLIMATIC DIFFERENCES

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Recent studies have demonstrated dramatic changes in North American rodent and lagomorph communities through the Cenozoic, with open-habitat specialists becoming common as open and arid habitats spread. Increased crown heights and burrowing, jumping, and cursorial adaptations appeared in rodents and lagomorphs millions of years before ungulates responded. Prior studies have primarily focused on continental scale analyses, but summation of geographically widespread faunas obscures individual community changes. Comparison of regional and local changes are key to understanding how communities have changed, which is expected to be strongly influenced by topography and local climate. Here, we use a database of fossil rodents and lagomorphs in North America to compare small mammal communities through time from eight distinct regions, and examine whether changes were synchronous across the continent or differed due to topography and vegetational history. The earliest mammals with hypselodont (ever-growing) cheek teeth appeared in the late Eocene of the Northern and Central Great Plains. Hypselodont taxa appeared later in other regions, in the early Oligocene of the Pacific Northwest, early Miocene of the Great Basin and California Coast, and late Miocene of the Gulf Coast. Shifts to communities dominated by taxa with high-crowned teeth were also regionally variable, starting in the early Oligocene in the Northern Great Plains and Pacific Northwest, early Miocene of the Central Great Plains and California Coast, middle Miocene of the Great Basin, and late Miocene of the Gulf Coast. Multiple regions showed increases in low-crowned taxa and declines in hypselodont taxa during the Middle Miocene Climatic Optimum. In the Pliocene, the Pacific Northwest and Northern Great Basin shifted to faunas dominated by hypselodont taxa. Burrowing and cursorial species became common in the late Oligocene of the Pacific Northwest and Great Plains, but not until the middle Miocene in the Great Basin and late Miocene on the Gulf Coast. These results help reveal important regional differences in the nature and timing of shifts within rodent and lagomorph communities through the Cenozoic.

Poster Session III (Friday, October 19, 2018, 4:15–6:15 PM)

GEOMETRIC MORPHOMETRICS ON TREESHREW CRANIAL ENDOCASTS: A COMPARATIVE ANALYSIS OF SCANDENTIAN AND PLESIADAPIFORM BRAIN SHAPES

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In order to better understand what is primitive in terms of brain shapes for the order Primates, it is essential to understand the brain morphology of their closest extant relatives: Dermoptera and Scandentia (treeshrews). Dermopterans are larger animals and, therefore, have gyrencephalic brains, making them problematic proxies for the form of the brain in smaller ancestral primates. Treeshrews have often been used as modern analogues for plesiadapiforms because they are small-bodied and have smaller, lissencephalic brains. Despite this, one of the biggest limitations in previous studies is that they were restricted in terms of their taxonomic range for scandentians, particularly excluding *Ptilocercus lowii*, which is the most primitive living treeshrew.

This study uses geometric morphometrics on the endocasts of a diversity of living treeshrews in order to better characterize the variation in their morphology, and to create a context to compare them to early primate endocasts. A new set of 21 endocranial landmarks were placed on endocasts derived from microCT data for three treeshrew genera: *Ptilocercus* (n = 5), *Tupaia* (n = 20), and *Dendrogale* (n = 2). Additionally, two plesiadapiforms were also landmarked: *Ignacius graybullianus* (n = 1) and *Microsyops annectens* (n = 1). The coordinate data were used in a Principal Component Analysis. The treeshrew-only plot shows that there is a lot of variation among the treeshrews, with two distinct groups: one largely composed of tupaiine treeshrews and the other including all the specimens of *Ptilocercus*. In the plot including the fossil endocasts with the scandentian specimens, it can be seen that in spite of sharing superficial similarities, the treeshrews did not group with the plesiadapiforms. These results would suggest that members of Scandentia share features that have evolved since their common ancestor with Primates.

Grant Information
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Poster Session IV (Saturday, October 20, 2018, 4:15 – 6:15 PM)

THE GIANT "MYSTERY BONES" FROM EUROPEAN RHAETIC BONE BEDS—A HISTOLOGICAL TEST OF COMPETING HYPOTHESES OF AFFINITY

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During the latest Triassic (Rhaetian), a rich and unique ecosystem is recorded. The historically important Rhaetic bone beds of Aust Cliff in England and the newly discovered bonebeds of Bonenburg in Germany contain one of the most peculiar finds from this ecosystem: giant bone shafts and broken parts of the outer cortex of such shafts. The most striking characteristic of these bones is their size, the minimal shaft diameter of the largest of the bones from Aust Cliff being 14 cm. Estimates of the original size of these bones and fragments suggested that dinosaur-like gigantism had already evolved in the Late Triassic. Based on the geological age and on bone size, these bones have been considered to belong to either sauropodomorphs or to giant pseudosuchian archosaurs in the past.

Since cortical bone histology carries a phylogenetic signal and is a mature technique, the controversial affinities of the "mystery bones" appear amenable to testing by histological comparison. The giant bone shafts exhibit a peculiar cortical histology of longitudinal primary osteons with secondary osteons inside. The primary osteoans are set in a coarsely fibrous matrix, indicating that this bone tissue type pertains to the fibrolamellar complex. Growth marks are common as either LAGs or annuli, indicating cyclical growth. Finally, there is an abundance of structural fibers. Thus, bone histology appears inconsistent with both previously suggested clades. All sauropodomorphs have fibrolamellar bone with a laminar vascular architecture. Pseudosuchians have well developed growth marks and longitudinal vascular canals but lack fibrolamellar bone. Neither does the bone histology of the Rhaetian "mystery bones" fit to the histology of any other dinosaur group.

A recently advanced hypotheses based on morphology is that the bone shafts and fragments from the Rhaetic bone beds belong to gigantic ichthyosaurs (>25 m long), representing the surangular of the lower jaw. Thin sections of the surangular and splenial of the giant Norian ichthyosaur *Shastasaurus sikanniensis* show longitudinally arranged vascular canals but they differ from the Rhaetian "mystery bones" in that the bone tissue is spongy. Finally, the abundance of structural fibers in cortical bone is not seen in any amniote but in temnospondyl amphibians. Among these, brachyopoids can be extremely large. To conclude, archosaurian affinities of the "mystery bones" are inconsistent with the histological evidence, but either ichthyosaurian or temnospondyl affinities remain a possibility.

Poster Session I (Wednesday, October 17, 2018, 4:15 – 6:15 PM)

REVALIDATION OF THE GENUS *DROMOCERATHERIUM* (PERISSODACTYLA, RHINOCEROTIDAE) AND ITS KEY ROLE WITHIN RHINOCEROTINAE

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Dromoceratherium mirallesi is a fossil rhinoceros species originally described in the 1950s on the basis of scarce distal limb elements and lower cheek teeth from the early Miocene (early Aragonian, biozone MN4) locality of Can Julià (Vallès-Penedès Basin, Catalonia, NE Spain). We report recently recovered fossil remains of *D. mirallesi* from the contemporaneous Vallès-Penedès locality of Les Cases de la Valenciana including upper cheek teeth and elements of the skull, a complete femur, a partial humerus, phalanges and vertebrae amongst other elements. The new material allows for an adequate differential diagnosis of the species and reveals unknown details of its anatomy. Overall consensus regarded *Dromoceratherium* as a junior subjective synonym of *Plesiaceratherium* when *D. mirallesi*, the type and only known species within the genus, was transferred to *Plesiaceratherium*. The updated diagnosis of *D. mirallesi*, based on the re-description of the type material from Can Julià and the new recovered material, together with the meta-analysis of previously published cladistic hypotheses supports the distinction of the genus *Dromoceratherium* and confirms its pivotal placement in the diversification of the main clades of Rhinocerotinae.

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Poster Session (Wednesday–Saturday, October 17–20, 2018, 4:15–6:15 PM)

UTILIZING MUSEUM COLLECTIONS IN COLLABORATION FOR EXPERIENTIAL LEARNING AND CITIZEN SCIENCE IN HIGHER EDUCATION

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Recent studies have shown that experiential learning may aid students in higher education better retain information outside the classroom setting. In higher education, there has been an increase in the development of programs and learning spaces in which students become active participants in the scientific method. The Raymond M. Alf Museum of Paleontology and the W. M. Keck Science Department of the Claremont Colleges have begun a collaborative citizen project that provides undergraduate students in comparative anatomy

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