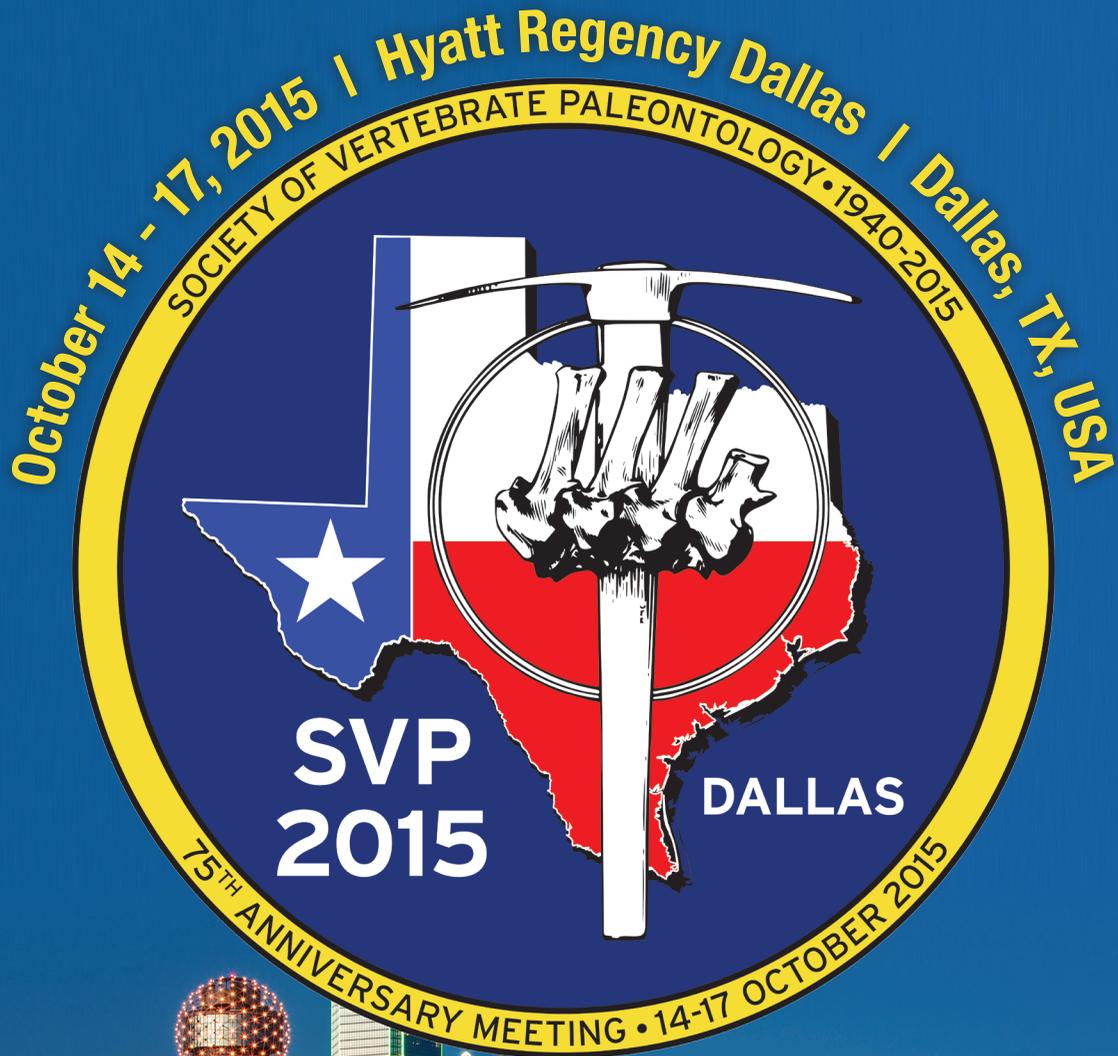


SVP 75th Annual Meeting



Meeting Program & Abstracts

Meade County, Kansas, 48 km north of Gate Ash Pit 2. Estimation of body mass from an equation derived from the regression of mass on m1 length in modern arvicolid indicates the Arlene's Ledge muskrats were 31% lighter than their pre-ashfall relatives. A return to the trend towards large size in late Cenozoic muskrat evolution is indicated by a large muskrat m1 recovered from a stratigraphically higher level in nearby Gate Ash Pit 1. These results suggest that, in addition to affecting rodent community turnover, widespread continental ashfalls may act as selective agents for at least size change in small mammals.

Rapid dwarfing in the Arlene's Ledge population also demonstrates the danger of using tooth size change in arvicolid lineages to infer age of deposition (so-called 'vole clocks'). Using the mean value of 5.12 mm for m1 length of the Arlene's Ledge sample and an available polynomial regression of m1 length and time in *O. zibethicus* history, the Arlene's Ledge muskrat sample would be assigned a date of approximately 2.1 Ma.

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

NOVEL MORPHOLOGICAL INSIGHTS FROM AN INCOMPLETE, ARTICULATE SKELETON OF A PRIMITIVE AETOSAUR (ARCHOSAURIA, PSEUDOSUCHIA) FROM THE UPPER TRIASSIC ISCHIGUALASTO FORMATION, SAN JUAN PROVINCE, ARGENTINA

MARTÍNEZ, Ricardo N., Instituto y Museo de Ciencias Naturales, San Juan, Argentina; HECKERT, Andrew B., Appalachian State University, North Carolina, NC, United States of America

An incomplete, articulated skeleton of a basal aetosaur from the Upper Triassic Ischigualasto Formation of San Juan Province, Argentina preserves several novel features not previously recorded in aetosaurs. We identify the specimen as a basal aetosaur because the few exposed dorsal and lateral osteoderms have a typical ornamentation of radially distributed pits, grooves, and ridges emanating from a 'center of ossification.' The specimen is exposed primarily in ventral view from the sacrum posteriorly and preserves many anatomical features not previously recorded from Ischigualasto Formation aetosaurs, and may be distinct from *Aetosauroides scagliai*, the only species recognized from the unit by most recent authors. Features that differ from the holotype of *Aetosauroides scagliai* include dorsal vertebrae that lack well-developed fossae and femora that are more strongly twisted, with the twisting occurring more distally than in *A. scagliai*. The femora also lack the pronounced sulchus on the anterodorsal face seen in the holotype of *A. scagliai*. The appendicular armor over the hind limbs is extensive and well preserved, showing numerous rhomboid osteoderms in close articulation. Several small osteoderms are in place over the ischia as well. Other noteworthy features of this specimen include extensive appendicular armor and a well-preserved caudal ventral carapace that consists of only two columns of ventral osteoderms, including a large cloacal vent proximally that is accommodated by modifications to the first six rows of osteoderms. Beginning in the 16th row, the ventral osteoderms fuse to form a single element, something that has not previously been demonstrated in aetosaurs. The caudal osteoderms differ from many other aetosaurs in that they decrease in length rapidly, indicating that the specimen had a relatively short tail. Some of these features may represent the plesiomorphic condition for Aetosauria.

Poster Symposia (Wednesday - Saturday, October 14-17, 2015, 4:15 - 6:15)

MODULAR EVOLUTION OF THE CARNIVORAN PELVIC GIRDLE: A THREE-DIMENSIONAL MORPHOMETRIC APPROACH

MARTÍN-SERRA, Alberto, Universidad de Málaga, Málaga, Spain; FIGUEIRIDO, Borja, Universidad de Málaga, Málaga, Spain; SERRANO, Francisco, Universidad de Málaga, Málaga, Spain; PALMQVIST, Paul, Universidad de Málaga, Málaga, Spain

The pelvic girdle is a key skeletal structure within the appendicular skeleton in quadrupedal mammals. The pelvis anchors many important muscles and connects the hind limb to the axial skeleton. However, unlike other appendicular bones, each hemipelvis is composed of three different girdle bones: ilium, ischium and pubis.

Here we investigate if the functional and developmental interactions among these bones accounts for the integration and modularity of the pelvis in mammalian carnivores. We use carnivorous mammals as a case study because our recent work has demonstrated that their appendicular skeleton is also integrated by functional reasons.

A series of landmarks in 3D on one half of the pelvic girdle were digitized in a wide sample of living carnivores. The landmarks were divided into four basic developmental units: ilium, ischium, pubis and acetabulum. The latter was considered as a different unit because it interacts with the femoral head during development. Later, we tested different modularity hypotheses that consider all possible modules formed by the combination of these four developmental units. For each hypothesis, we calculated the RV coefficient, a proxy for morphological covariation. We compared each specific hypothesis with a distribution of RV coefficients resulting from randomly-defined modules to assess for statistical significance.

One of the hypotheses with more statistical support separates the four original units as modules, which indicates a strong influence of development. Other supported hypotheses clearly point towards an association between the ischium and the pubis, with the ilium and acetabulum more or less independent. However, these hypotheses cannot be unequivocally ascribed to functional interactions, because the ischium and the pubis also share some developmental processes. These results clearly indicate that the carnivoran pelvic girdle preserves a developmental modular structure with little modification attributable to functional adaptations, which agrees with previous studies that showed that the pelvis is conservative within each carnivoran family.

Symposium 3 (Saturday, October 17, 2015, 8:15 AM)

GEOMETRIC MORPHOMETRICS AND THEORETICAL MORPHOLOGY

MARUGAN-LOBON, Jesus, Universidad Autonoma de Madrid, Madrid, Spain; PRIETO, Guillermo, Universidad Autonoma de Madrid, Madrid, Spain

Geometric morphometrics (GM), the statistical analysis of shape, has revolutionized the way in which phenotypic evolution is assessed, particularly increasing mathematical rigor in the analysis of morphological variation. Less exploited is the ability of GM to search for unity in diversity (constraint), the specific disciplinary landscape of macroevolution in paleobiology, historically inquired using theoretical morphology

(TM). TM addresses the possible range of morphologic variability that nature could produce, and in doing so, its unifying criteria comprise both the mathematical simulation of form and the construction of morphospaces, where the possible (theoretical) and the actual (real) can be represented and compared. Morphospace is indeed the major contribution of TM to the study of evolution and represents the common ground where these two disciplines meet. The Procrustes shape data of GM enables the customary statistical assessment of morphological disparity, trends and potential constraints over morphospace (e.g., allometry), as well as the simulation of theoretical (non-existing) geometries, plus the estimation of hypothetical ancestral configurations in combination with phylogeny. Further, any such outcomes can be rendered back into virtual reality, providing the opportunity to test, for instance, the involvement of function and efficiency in morphospace bias under the scope of biomechanics (i.e., structural analysis). Using 3D landmark data from a phylogenetically broad sample of extant bird skulls, we discuss the many conceptual and operational advantages that the merger between these two disciplines affords to paleobiological research. We show that the landbirds (encompassing passerines, parrots, and raptors, among others) cluster within a particular region of morphospace due to a characteristic combination of features such as short and wide facial skeleton, and a bulked cranium. This evolutionary key novelty is a response of craniofacial integration to factors such as allometry and encephalization, and we demonstrate that such constraint compromises aerodynamics by assessing the performance of empirical and theoretical morphs into wind tunnel simulations.

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

ONTOGENETIC SHIFTS IN *GORILLA* AND *PAN* WITH HETEROCHRONIC IMPLICATIONS

MASSEY, Jason S., University of Minnesota, Minneapolis, MN, United States of America, 55455; MCNULTY, Kieran, University of Minnesota, Minneapolis, MN, United States of America

African ape biology provides an important comparative framework for interpreting human evolution. When collecting data in museums, researchers group specimens from multiple localities, subspecies and even species. While this allows for larger sample sizes, it invariably averages genetically and morphologically distinct samples. In fact, it is known that morphological differences exist among populations of chimpanzee and gorilla adults. Likewise, adult differences among human populations have been attributed to differing ontogenetic trajectories. However, population-level (i.e., subspecific groupings) ontogenetic trajectories in extant African apes have yet to be studied. Thus, the current framework of ape ontogeny from which we interpret the human fossil record is based on unrealistic and statistically untested biological models. This preliminary study is one part in a broader project which seeks to address population-specific levels of ontogenetic variation in *Gorilla* and *Pan*.

Here, we used the crania of four populations of *Gorilla gorilla gorilla* and four populations of *Pan troglodytes troglodytes* from the Cleveland Museum of Natural History, Powell-Cotton Museum, and Royal College of Surgeons. African ape crania were three-dimensionally scanned with a Breuckmann smartscan3D white-light scanner. Geomagic Design X was used to align and merge the scans into one mesh. The meshes were then imported into Stratovan Checkpoint to collect derived, 3D landmark data.

Once specimens were landmarked, we ran a generalized Procrustes analysis and subjected the specimens to multivariate analyses in order to test whether African ape populations differ in their ontogeny. A multivariate analysis of variance was performed to determine if there were statistical differences between adult specimens of different populations. Ontogenetic trajectories were studied by regressing shape variables on log(Centroid size). Differences between populations were computed as the multivariate angle between trajectories and tested for significance using permutation tests.

Each specimen in this study retains latitude/longitude information allowing for fine-grained analysis on African ape population divisions. Here, we show that the observed morphological differences among populations of African apes are indeed due to differing ontogenetic trajectories. This research has broad implications for studies of human evolution by characterizing variation with increased biological validity in order to more accurately study heterochrony within our own lineage.

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

STRATIGRAPHIC ASSIGNMENT OF DINOSAUR-BEARING EOLIAN SEDIMENTS IN THE GOBI DESERT, MONGOLIA AND ITS APPLICATION FOR A PROGRAM OF DINOSAUR-FOSSIL PROTECTION FROM ILLEGAL ACTIVITIES

MASUDA, Risa, Department of Biosphere-Geosphere Science, Graduate School, Okayama University of Science, Okayama, Japan; SANEYOSHI, Mototaka, Okayama University of Science, Okayama, Japan; ISHIGAKI, Shinobu, Okayama University of Science, Okayama, Japan; NISHIDO, Hirotugu, Okayama University of Science, Okayama, Japan; TSOGTOBAATAR, Khisigiav, Mongol Paleontological Center, Ulaanbaatar, Mongolia

Upper Cretaceous strata in the Gobi desert, Mongolia are considered to be some of the most important accumulations of dinosaur fossils in the world. Many vertebrate fossils from the Djadkhta Formation have been discovered, however tephra and microfossils for geochronological examination have not been identified. Therefore a stratigraphic assignment of the eolian sediments in this region would be useful for paleontological investigations on the evolution of the dinosaurs as well as for a geological study. We focus on the variation in cathodoluminescence (CL) features of quartz grains occurring in the eolian sediments, which can characterize each unit of the sediments. In this study, we clarify the CL properties of quartz grains from the formations including three dinosaur localities (Tugrikin Shireh, Alag Teg and Bayan Dzak) in the Gobi desert, Mongolia.

CL spectroscopy of the quartz grains was made by a SEM-CL system, which is comprised of an SEM combined with a grating monochromator. All CL spectra were corrected for total instrumental response using a calibrated standard lamp. All samples exhibit two broad bands at 400 nm in a blue region and at 600-650 nm in a red region. The deconvoluted components by a Gaussian curve fitting can be assigned to the emission centers derived from structural defects related to trivalent Fe at 1.65 eV,