beavers show two primary locomotor specializations, fossoriality in the Paleocastorinae and Migmacastorinae and semi-aquatic habits in the Castorinae and Castoroidinae. The craniodental structure of the burrowing beavers reveals adaptations for chisel-tooth and head-lift digging behaviors, an ecology more similar to living gophers and blind mole-rats than living beavers. Craniodental structure of both burrowing and semi-aquatic beavers suggests that most species had highly specialized herbivorous diets. The inferred ecologies of extinct beavers were then mapped onto their phylogeny to examine morphological evolution through time. Burrowing beavers display increased specialization for fossoriality and herbivory over time, corresponding with the expansion of more open habitats and a radiation of grasses in the early Miocene. They also diverge into specialized chisel-tooth and head-lift digging forms, which may have allowed sympatric taxa to partition resources. The semi-aquatic beaver lineages both show increased specialization for semi-aquatic life and herbivory over time, as well as a progressive increase in castoroidine beaver size after the immigration of *Castor* to North America in the late Miocene.

New Directions in the Study of Fossil Endocasts: a Symposium in Honor of Harry J. Jerison, Thursday 8:15

THE ENDOCRANIAL ANATOMY OF THE DOMED-SKULL CHALICOTHERE TYLOCEPHALONYX UCMP 115867 WITH EMPHASIS ON THE PARANASAL SINUSES AND TURBINATES

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The domed-skull nature of the Split Rock Miocene chalicothere, *Tylocephalonyx* UCMP 115867, from Fremont County, Wyoming was speculated on by Munthe and Combs. Aided only by examination of the skull's external morphology and glimpses of the internal structures afforded by fractures in the specimen, they developed an extensive list of possible functions of the calvarial dome that typified domed skulled chalicotheres. We revisit this subject with the aid of computed tomography to describe the internal anatomy of the skull with particular attention to the paranasal sinuses and nasal turbinates. Based on our analysis of the skull's internal anatomy, we further refine the speculated possible functions of the dome. With CT, any well-preserved skull can be potentially evaluated with respect to the endocranial anatomy as well as the paranasal sinus anatomy. With the domed skull chalicothere *Tylocephalonyx*, the paranasal sinus anatomy is particularly relevant to the nature of the domed calvarial architecture of the skull in that, as we now know through our investigation, the dome is an extension of the frontal sinus into the parietal plates. Furthermore, the entire volume of the dome above the dural covering of the brain is in fact pneumatized. The endocranium is well preserved including gyral empressions and calcified dural remnants. As the internal matyx is undisturbed, there are also traces of differential infilling of the endocast possibly reflecting a taphonomic sequence of brain material mummification and later replacement. Distinct crystalline replacement of preserved turbinate molds reveals the surprizingly complex sinonasal turbinate anatomy.

Preparators' Session, Thursday 10:30

RESTORATION AND THREE-DIMENSIONAL ASSEMBLY OF A NEARLY COMPLETE, ARTICULATED EOCENE PROTOCETID WHALE SKELETON FROM PAKISTAN

SANDERS, William, University of Michigan Museum of Paleontology, Ann Arbor, MI, USA; GRAF, John, University of Michigan Museum of Paleontology, Ann Arbor, MI, USA; ZALMOUT, Iyad, University of Michigan Museum of Paleontology, Ann Arbor, MI, USA; UL-HAQ, Munir, Geological Survey of Pakistan, Quetta, Pakistan; GINGERICH, Philip, University of Michigan Museum of Paleontology, Ann Arbor, MI, USA

A Geological Survey of Pakistan-University of Michigan team working on the western side of the Sulaiman Range in Balochistan, Pakistan has recovered a diverse marine mammal assemblage, including an articulated protocetid whale skeleton (GSP-UM 3551), from middle Eocene (mid-Lutetian) sediments. GSP-UM 3551 is valuable for understanding the transformation of terrestrial to aquatic lifeways in cetaceans because it is the most complete protocetid skeleton known, with all elements of the head and body represented, including the tail and fore- and hind-legs and feet. We detail the technical procedures of field recovery, preparation, and replication used to comprehensively reconstruct the skeleton of this individual. During excavation, bone was consolidated with PVAc, and the specimen was removed in blocks in plaster jackets. Elements were initially prepared within these blocks using airscribes, and molded in articulation. Molds were made of layered silicone rubber, to capture maximum detail, and done in multiple pieces to protect the integrity of original bone. Casts of the blocks were assembled and elements numbered to ensure correct association of bones throughout the process. Elements were then manually prepared out of blocks, and remolded. Next, casts of individual bones were used to restore broken segments and cut apart and reset to correct for plastic distortion and step fracturing. An internal latticework was constructed to rebuild the anterior dentaries, in close alignment with the cranium, permitting precise occlusion of the teeth. Paste epoxy was used for reconstruction, because it is easy to sculpt and retains its shape over time. Reconstructed elements were then remolded and hollow cast in laminar polyester mixed with talc and lined with fiberglass, for dimensional accuracy, stability, and strength. Heating cast copies and bending them into serial alignment with unaffected ribs, directly on the mount, removed rib deformation. The finished mount of GSP-UM 3551 is morphologically accurate, lightweight and internally supported, facilitating placement in dynamic exhibit postures and visual assessment of its amphibious locomotor abilities.

Technical Session XVI, Saturday 8:45

OSTEOLOGY OF *YUNGUISAURUS* (SAUROPTERYGIA, PISTOSAUROIDEA)

SATO, Tamaki, Tokyo Gakugei University, Tokyo, Japan; CHENG, Yen-nien, National Museum of Natural Sciences, Taichung, Taiwan, ROC; WU, Xiao-chun, Canadian Museum of Nature, Ottawa, ON, Canada; LI, Chun, Institute of Vertebrate Paleontology and Paleoanthropology, Beijing, China

A large number of species and specimens of basal sauropterygians are known exclusively from the Triassic, whereas the Plesiosauria are the only but very successful sauropterygians in the Jurassic and Cretaceous. Triassic pistosauroids are important to understand this transition, but the paucity of well-preserved specimens has been a major obstacle for research. *Yunguisaurus liae* from the Late Triassic of China, described in 2006, was the first pistosauroid represented by a nearly complete skeleton. Further preparation of the holotype and a detailed comparison with other sauropterygians including two recently reported pistosauroids (Late Triassic *Bobosaurus* from Italy, and *Yunguisaurus* sp from the Middle Triassic of China) revealed additional characteristics of this taxon, filling the stratigraphic and morphological gaps at the transition. The long neck of *Yunguisaurus* consists of more than 40 vertebrae, and this is within the range of Early Jurassic plesiosaurs but well over those of basal sauropterygians, which typically have 20 to 30 cervical vertebrae. Cervical neural arch is wider than the centrum because of the large zygapophyses, and presence of zygosphene-zygantrum articulation is suggested. Neural spines in dorsal region are not so tall as in *Bobosaurus*. The scapula is comparable to *Corosaurus* in having a long dorsal blade with moderately expanded tip and in lacking the ventral flat surface. Unlike the short and hourglass-shaped ilia of basal sauropterygians and *Bobosaurus*, those in Chinese pistosauroids have a small acetabular portion and wide dorsal (sacral) end, and thus approach the plesiosaurian condition in which the ilium is essentially a rod. There is no trace of an obturator foramen in the pubis. Mosaic of primitive and derived characters in *Yunguisaurus* indicates some of the plesiosaurian characteristics appeared before the latest Triassic from which the earliest known plesiosaurs occur.

Poster Session III (Friday)

THREE DIMENTIONAL TRAUMA ANALYSIS USING X-RAY MICROTOMOGRAPHY IN *TENONTOSAURUS TILLETTI*, CLOVERLY FORMATION (MONTANA, USA)

SCHACHNER, Emma, University of Pennsylvania, Philadelphia, PA, USA; MANNING, Phillip, University of Manchester, Manchester, United Kingdom

The study of disease and injury in the fossil record dates back to Moodie's early 19th century descriptions of abnormalities preserved in the fossilized remains of extinct animals. The identification and classification of pathological bone allows for a more complete understanding of the biology and physiology of extinct taxa. Extrapolating inferences of dinosaurian behavior is more difficult, however pathological bones give insight into predator-prey relationships, intraspecific interactions, and disease or trauma experienced by an animal. While pathological bones are being increasingly documented for the Dinosauria, the identification of the underlying cause of many pathological conditions remains equivocal until the basic physiological responses of archosaur bone to disease are better understood. Accurate descriptions of pathological bones in both extinct and relevant extant taxa are essential in order to better understand the complex nature of osteological responses to injury and disease in archosaurs. This study provides a detailed anatomical description of both external and internal pathological bone in a new specimen of *Tenontosaurus tilletti* (UMM LL.12275), housed at The Manchester Museum (University of Manchester). The macroscopic mechanical properties of trabecular bone are related to both the 3D architecture and properties of individual trabeculae. In this study, X-ray microtomography has been used to determine the internal 3D architecture of a number of trabecular structures and develop meshes for finite-element analysis. A distinct osteophyte projecting from the lateral surface of the terminal phalanx of digit II (left manus) is consistent with exostosis as a function of a tendon avulsion, resulting in the observable trauma. The x-ray microtomography supports this interpretation and provides an additional internal, 3D microstructural marker in the trabecular bone that is directly related to the external avulsion pathology (osteophyte). The response of the bone to the trauma can be quantitatively assessed for the first time in three dimensions and compared with similar trauma observed within extant species.

Poster Session I (Wednesday)

TRANSGRESSIVE LAG OR CONDENSED SECTION?: TAPHONOMIC EVIDENCE FROM THE LATEST CRETACEOUS-EARLIEST TERTIARY BASAL HORNERSTOWN FORMATION (NEW JERSEY, U.S.A.)

SCHEIN, Jason, New Jersey State Museum, Trenton, NJ, USA; LACOVARA, Kenneth, Drexel University, Philadelphia, PA, USA; GALLAGHER, William, New Jersey State Museum, Trenton, NJ, USA; POOLE, Jason, Academy of Natural Sciences of Philadelphia, Philadelphia, PA, USA

Despite a lengthy history of investigation, the sedimentological nature of the fossil-rich latest Cretaceous – earliest Tertiary basal Hornerstown Formation remains contentious. Several investigators interpret the Main Fossiliferous Layer (MFL) as representing a transgressive lag, with all of the fossils essentially reworked out of the underlying latest Maastrichtian Navesink Formation. However, this interpretation ignores abundant and overwhelming taphonomic evidence: it does not explain the numerous articulated and associated partial