Technical Session X (Friday, October 16, 2015, 8:00 AM)

A NEW THERIZINOSAUR WITH FUNCTIONALLY DIDACTYL HANDS FROM THE BAYANSHIREE FORMATION (CENOMANIAN-TURONIAN), OMNOGOVI PROVINCE, SOUTHEASTERN MONGOLIA

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Mongolia is rich in therizinosaur dinosaurs, known from two Upper Cretaceous formations (*Enigmosaurus*, *Erlikosaurus,* and *Segnosaurus* from the Cenomanian-Turonian Bayanshiree Formation and *Therizinosaurus* from the Maastrichtian Nemegt Formation). The Bayanshiree therizinosaurs are important taxa to understand the evolution of this group because these are positioned as successive taxa between the Early Cretaceous to late Late Cretaceous forms; however, these taxa are represented by incomplete specimens.

In 2012, the Institute of Paleontology and Geology, Mongolian Academy of Sciences, discovered a new therizinosaur specimen from the Bayanshiree Formation at Urlibe Khudak in Omnogovi Province, southeastern Mongolia. The Urlibe Khudak locality has produced ornithopod (hadrosauroid), sauropod, and theropod (dromaeosaurid, ornithomimosaur, and therizinosaur) dinosaurs. The Urlibe Khudak therizinosaur includes an articulated ulna, radius, carpals and manus from both sides. This is the first record of a complete articulated manus from the Bayanshiree Formation and sheds light on the manual morphology of early Late Cretaceous therizinosaurs.

The manus of the Urlibe Khudak therizinosaur is, in general, similar to other therizinosaurs (e.g., *Alxasaurus*, *Erliansaurus*, and *Nothronychus*) except in the third digit. Metacarpal III, missing its distal end, shows bizarre features for therizinosaurs. Metacarpal III does not participate proximally in the articulation of the metacarpal complex and is positioned more distally overall. Strikingly, it is reduced in size (one-fourth the width of metacarpal II at the proximal end) almost to a splint, suggesting an absence or a great reduction of digit III. No element of digit III was preserved or discovered from the locality despite its excellent preservation. Although the absence of digit III cannot be confirmed at this point, the morphology of metacarpal III indicates the Urlibe Khudak therizinosaur had functionally didactyl hands, as seen in tyrannosaurs. Left phalanx I-2 preserves a keratinous sheath. The keratinous sheath of digit I is strongly curved and is longer by 54% than the supporting ungual along the dorsal margin. The Urlibe Khudak therizinosaur may have used the claws as grasping hooks during foraging because the morphology of unguals is similar to other therizinosaurs such as *Nothronychus*.

Symposium 2 (Friday, October 16, 2015, 1:45 PM)

ASSESSING THE VULNERABILITY OF ANTARCTIC SEALS TO ENVIRONMENTAL CHANGE: INSIGHTS FROM STUDIES OF SEAL MUMMIES

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Polar systems are shifting rapidly in response to human-induced environmental change. Records of response to past environmental shifts may reveal the vulnerability of species or ecosystems by demonstrating their sensitivity and adaptability to such changes. Our prior work has shown that for much of the Holocene (7000 to 500 years ago), and unlike the situation today, land-fast ice shelves were absent along the southwestern coast of the Ross Sea, Antarctica, allowing the region to be inhabited by a large population of southern elephant seals (*Mirounga leonina*). We are using data from mummified remains to explore the response of three currently common Antarctic seals (crabeater seals, *Lobodon carcinophagus*; Weddell seals, *Leptonychotes weddellii*; leopard seals, *Hydrurga leptonyx*) to changes in iciness and the abundance of a large potential competitor.

During field seasons in 2012–13 and 2013–14, we collected samples (bone, skin, fur, etc.) from mummified seals that occur in the Dry Valleys region of Antarctica (~76.75 °S to ~78.25 °S and up to 60 km from the coast). While species identification is still underway, we found >300 crabeater seals, nearly 100 Weddell seals, and ~20 leopard seals. We calibrated carcass weathering stage against approximately 130 ^{14}C dates. Carcass weathering varies with age to ~1000 years old, then plateaus, and most carcasses are under 1500 years of age. Stable carbon and nitrogen isotope ratio variations in seal bone, which reflect trophic level, foraging zone, and marine biogeochemistry, match expectations among these species. In addition, there are no strong temporal patterns in any species (though data from leopard seals are sparse). Our isotopic data suggest that the ecology of these land-fast ice or pack-ice dependent seals was not affected by the change in iciness or elephant seal abundance that began ~1000 years ago. This contrasts with isotopic data from fossil penguins and elephant seals, which point to drops in ^{15}N-concentration over the last 1000 to 100 years, perhaps due to changes in the productivity of the Ross Sea. The constancy of ecological patterns among crabeater, Weddell and leopard seals and the failure of these seals to respond to shifts in Ross Sea productivity suggest a low adaptability in foraging patterns, which may affect their vulnerability to environmental change. Beyond its ongoing use in species identification, we will use ancient DNA data to explore historical population dynamics and signals for selection in the context of the ecological constancy we observed in the face of environmental shifts.

Grant Information
The work was supported by NSF grants ANT-1142108 and -1141849.

Poster Session II (Thursday, October 15, 2015, 4:15 - 6:15)

DESMOSTYLIAN REMAINS FROM UNALASKA (USA)

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Derived members of the enigmatic extinct mammalian order Desmostylia have molars comprised of appressed columns whose morphology does not render their function in feeding simple to discern. Here we describe specimens of a new desmostylid desmostylian from the Arriaga Quarry, Dutch Harbor Member of the Unalaska Formation, Unalaska Island, Aleutian Chain. The quarry was originally used to obtain road metal but a school has since been built over it. The age is limited between 24.1 and 13 Ma, but most likely falls near the Oligocene-Miocene boundary (23.03 Ma). The descriptions are augmented by three dimensional scans. Specimens from Unalaska vary in ontogenetic stages but all appear to belong to a single species because they share unique morphological features. We conducted phylogenetic analysis based on 37 characters from the previous study with two newly added characters (number of major cusps on M_2 and M_3). The strict consensus tree derived from 12 most parsimonious trees (tree length = 61, consistency index = 0.70, retention index = 0.76, rescaled consistency index = 0.53) shows the Unalaska taxon is more derived than *Cornwallius* and the sister taxon to the clade that includes *Desmostylus and Vanderhoofius*. The Unalaska taxon has more cusps and higher crown on M_2 and M_3 than *Cornwallius* but lower crown than *Desmostylus*. The morphology of the teeth and the vaulted palate seen in derived desmostylids, including the new Unalaska taxon, indicate that derived desmostylids may have clenched their teeth strongly while employing suction during feeding, most likely on marine and coastal plants as previously suggested.

Technical Session XIV (Friday, October 16, 2015, 1:45 PM)

A MOSASAUR (SQUAMATA: MOSASAURIDAE) SNEEZE: A HYPOTHESIS CONCERNING SALT EXCRETION IN THE TOP PREDATORS OF THE CRETACEOUS SEAS

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Due to the inability of reptilian kidneys to handle a large salt influx, marine reptiles have evolved salt glands through modification of a wide variety of cephalic organs. This physiological modification was so critical that in the earliest-known sea turtle, *Santanochelys*, the foramen interorbitale was already enlarged to house large lachrymal glands, which would have served as salt glands as in extant taxa, while the paddles were still largely underdeveloped. Following this sequence of events in adaptation to life in marine environs, hydropedal mosasaurs are expected to have had well-developed salt glands, yet no osteological structures have so far been postulated to have been associated with such a structure. Using a new high-fidelity 3D skull reconstruction of a halisaurine mosasaur, I here propose that paired palatines, which in mosasaurs extend well anterior to the antorbital wall, may have supported enlarged nasal glands that functioned as salt glands in these marine reptiles. First, it is the posterior end of the palatine body where the antorbital wall of the prefrontal articulates from above, as opposed to the anterior margin of the palatine body near the choanal emargination as in extant squamates. From the level of the antorbital wall of the prefrontal, the main palatine body extends anteriorly, approximately to the level of the posterior terminus of the external naris above. The posterior terminus of the choana thus becomes vertically aligned with that of the external naris. The dorsal surface of this palatine body forms a shallow, well vascularized basin, and when articulated with the prefrontal, forms the floor of what is here referred to as the preorbital dermal enclosure, longitudinally occupying the space between the choana and the orbit, and is wide open medially and anteriorly, and connected to the orbit posteriorly via a notch that is open medially at the dorsomedial corner of the antorbital wall. It is unlikely that this enclosure was occupied by the nasal chamber, which does not extend posteriorly beyond the level of the choana. Salt glands are highly vascularized organs and can occupy a significant cranial space in reptiles. The large enclosure, along with a well vascularized inner wall and its close proximity to the nasal chamber, may have housed such a gland and allowed mosasaurs to excrete excessive salt when breathing.

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

FIRST RECORD OF POSTCRANIAL BONES IN THE EXTINCT SUBFAMILY DEVINOPHOCINAE (CARNIVORA, PHOCIDAE)

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Despite a long history of phocid studies, no fossil postcranial bones have ever been described for the extinct subfamily Devinophocinae. The recent description of new cranial material (skull, mandibles and teeth) classified a new species, *Devinophoca emryi*, as the sister taxon of the previously described *D. claytoni*. The cranial and postcranial bones were discovered at the same locality during several excavations at the base of the Malé Karpaty Mountains (Slovakia), specifically at the Bonanza site near the junction of the Morava and Danube rivers. The new *Devinophoca* postcranial material from the early Badenian, early Middle Miocene (16.26–14.89 Ma) presents mixed characters with the three extant phocid subfamilies (Cystophorinae, Monachinae and Phocinae) as well as unique postcranial characters not seen in any representatives of the other three subfamilies. These distinguishing characters (i.e., well-outlined, large oval facet on greater tubercle of humerus; broader width between the head and lesser tubercle of humerus; femoral proximal epiphysis larger than distal; thin innominate ilium that is excavated on ventral surface) demonstrate that this material belongs to a new species not previously known. During ecomorphotype analyses, fossil humerus and femur bones were directly associated with their corresponding mandible to reveal associations based on Recent morphological analogues. Also, strong correlation between ecomorphotypes

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