

campaign relied heavily on a few large cornerstone donations; ten donors contributed over 50% of the total funds raised.

In the Schein project, donors fall into seven categories: (1) past field workers, their family and friends (PP); (2) family and friends of campaign organizers (FF); (3) staff of the campaign host company (St); (4) avocational groups (AG); (5) professional paleontology and earth science colleagues (Co); (6) museum support groups (SG); and (7) other individuals with no known ties to the campaign (Ot). Of the \$6,800 raised from 64 donors, PP contributed the greatest percentage of funds (30%) from the greatest number of donors (22). Four AG donors accounted for 23.6% of the total, ten FF donors contributed 17%, and five SG donors contributed 15%. The smallest average donations came from Co and Ot; Co contributed the least amount of funds (2.4%). In an age of shrinking government support, crowdfunding presents a viable alternative to fund mission critical aspects of paleontological research, with the added benefit of raising public support and awareness.

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

HEAD POSTURE IN PLEISTOCENE RHINOCEROSSES

SCHELLHORN, Rico, Universität Bonn, Bonn, Germany

The Pleistocene was marked by interchanging cold glacial and warmer interglacial periods with distinct floral and faunal elements. Among the rhinoceroses distributed in Europe in this time, the woolly rhinoceros (*Coelodonta antiquitatis*) was adapted to the cold climatic conditions of the glacial periods. As indicated by stomach content, it was mainly feeding on low vegetation. During the warmer interglacial periods, members of the genus *Stephanorhinus* immigrated from warmer regions into the landscapes and replaced the woolly rhinoceros, which moved to refugial colder regions. It is known that some species of *Stephanorhinus* were browsers, while others were grazers living in open environments. The different feeding habits on low or higher vegetation are related to different head postures. In rhinoceros skulls these postures are reflected in different shapes of their occipital regions. Grazing species carry their heads downward oriented with the muzzle low above the ground and therefore the occipital crest is extended posteriorly. In comparison the skulls of browsers are carried in a horizontal position and the occipital crest is inclined forward.

In this study, skull remains of the Pleistocene woolly rhinoceros and *Stephanorhinus etruscus* from different German localities have been scanned using micro computed tomography with focus on the inner ear. For comparison, the extant white rhinoceros, a pure grazer in Africa, and the Javan rhinoceros, a pure browser in Asia, were investigated. The lateral semicircular canal of the inner ear is assumed to be held horizontal in the habitual head posture. For all investigated specimens these canals have been virtually reconstructed. The horizontal orientation of the lateral canal resulted in the head posture that correlates with their preferred type of feeding. This is distinctly visible in the two grazing species white rhinoceros and woolly rhinoceros, both showing a downgrade head posture. *Stephanorhinus etruscus* was assumed to be a browser, indicated by strong cingula on the teeth and an anterior inclined occiput. The inner ear supports this feeding habit showing a nearly horizontal habitual head posture for this fossil species like it does for the browsing extant Javan rhinoceros.

Grant Information

This research received support from the SYNTHESYS Project, which is financed by European Community Research Infrastructure Action under the FP7 "Capacities" Program.

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

TAPHONOMY OF MARINE VERTEBRATES IN THE UPPER CRETACEOUS TROPIC SHALE, SOUTHERN UTAH

SCHMEISSER MCKEAN, Rebecca L., St. Norbert College, De Pere, WI, United States of America, 54115; GILLETTE, David D., Museum of Northern Arizona, Flagstaff, AZ, United States of America

The Tropic Shale was deposited along the western side of the Western Interior Seaway during the late Cretaceous (Cenomanian–Turonian). The formation contains abundant invertebrates, as well as a diverse vertebrate fauna including fish, sharks, turtles, plesiosaurs, and mosasaurs. Stratigraphic position of vertebrate localities have been placed precisely using a combination of laterally extensive bentonite beds and ammonite biostratigraphy. From an examination of the taphonomic characteristics (as well as associated field notes, photographs, and locality information) of a total of 178 marine vertebrate specimens collected from the Tropic Shale, it is clear that physical factors were the dominant influence on preservation. Robust and durable skeletal elements (such as teeth and vertebrae) are far more prevalent in the formation than thinner and less robust skeletal elements (such as plesiosaur girdle bones and cartilaginous skeletal elements from sharks). Additionally, isolated teeth and bones are far more common in the formation than complete or nearly complete skeletons. Skeletal elements had slightly higher levels of abrasion and weathering to the west (in shallower water), although low signals of abrasion, weathering, and compression are common on elements across the region, mainly from post-burial alteration. High levels of fracturing on all bony skeletal elements (not including teeth) also indicate a strong post-burial alteration signal. A lack of evidence for epifaunal or infaunal activity on skeletal remains or bioturbation of seafloor sediments suggest that biological factors did not influence preservation as strongly as physical factors. However, scavenging/predation marks were found on most of the more complete specimens, suggesting that scavengers likely decreased the total number of carcasses that made it to the seafloor to be preserved. Based on the preservation of the marine vertebrate fauna, a detailed paleoenvironment for the Tropic Shale can be reconstructed. Vertebrate carcasses in the Tropic Shale were deposited on a muddy ocean floor with a substrate that ranged from soupy to firm. The environment was low energy, although some weak bottom currents were capable of scattering lighter skeletal elements of more complete skeletons nearby. Varying levels of benthic oxygen and moderate sedimentation rates both served to protect carcasses from destruction prior to a relatively rapid burial.

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

DIRE STRAITS IN THE ICE AGE-A MAMMOTH SCAVENGED BY A WOLF IN THE LATE PLEISTOCENE OF KANSAS

SCHMERGE, Joshua, University of Kansas, Lawrence, KS, United States of America, 66045; BURNHAM, David, University of Kansas, Lawrence, KS, United States of America; TIMM, Robert, University of Kansas, Lawrence, KS, United States of America

We report a *Mammuthus columbi* bearing tooth marks attributable to a large canid from the Late Pleistocene of Cowley County, Kansas. The markings were discovered during a renovation of the mammoth and mastodon exhibit at the University of Kansas Natural History Museum. Predation markings of any kind on mammoth bones are rare, and this is the first report for tooth marks on a mammoth from Kansas. The mammoth skeleton comprises the upper skull, a single vertebra, the pelvis, and limb elements from the left side. We interpret the carcass as laying on its right side as it was scavenged, based on the preserved material and the occurrence of the bite marks. We suggest that the pattern and distribution of a series of marks on the proximalateral portion of the ulna were made during a single bite. These markings consist of several elongate (1–5 cm) grooves that penetrate the surface of the bone. The deepest grooves are ~2 mm, and they shallow and taper to the opposite end. One series of markings appear in a nearly linear pattern and are attributable to a carnivore's upper canine tooth due to their V-shaped cross section. The remaining markings are asymmetrically V-shaped in cross section, indicating that they were formed by an upper carnassial (P4). The spacing and irregular placement of the carnassial markings suggest the flesh was tough at the time the bite was made, causing the carnivore's skull to skid across the surface of the bone during jaw closure. These bite marks were most likely made during an attempt to strip flesh and connective tissue from the bone during an act of scavenging rather than active predation. This style of scavenging indicates the feeding traces were probably made during a period of resource scarcity. Other tooth markings on the limb elements are additional evidence that the skeleton was scavenged. The mammoth must have been exposed for several months or longer prior to final burial. Contemporaneous large carnivores such as *Arctodus*, *Miracinonyx*, *Panthera*, coyotes, and Wolverines can be ruled out based on the pattern and size of the bite marks. The size and pattern of the described marks are consistent with the bite patterns of canids, either *Canis lupus* or a sub-adult *C. dirus*. *Canis lupus* is known to strip flesh down to the bone and crack bones in order to access marrow. A scavenging lifestyle has been proposed for *C. dirus* based on tooth wear, however, this is the first report of canid scavenging of proboscideans based on physical evidence. This suggests a greater role for wolves as scavengers in Ice Age food webs than previously described.

Technical Session XVII (Saturday, October 17, 2015, 1:45 PM)

PALEONEUROLOGY OF *EUROPASAURUS HOLGERI*, AN INSULAR DWARF SAUROPOD FROM NORTHERN GERMANY

SCHMITT, Armin, University of Bonn, Bonn, Germany, Cologne, Germany; KNOLL, Fabien, University of Manchester, UK, Manchester, United Kingdom; TSCHOPP, Emanuel, Università di Torino, Italy, Torino, Italy

Europasaurus holgeri represents the first unequivocal dwarf sauropod. It is known only from the Langenberg Quarry (Oker, Germany; Kimmeridgian, Jurassic). The hypodigm includes abundant and excellently preserved specimens of various ontogenetic stages, including a large number of cranial elements from at least 15 individuals. The best preserved braincase of *Europasaurus* was CT scanned and 3D renderings of the endocast and osseous labyrinth were generated.

Because of the incompleteness of the braincase anteriorly, the olfactory lobes could not be reconstructed and neither could most of the cerebrum. However, it was possible to create an accurate reconstruction of the most posterior part of the endocast, including most cranial nerves, the labyrinth, and various vascular structures. The trochlear nerve may have found its way out of the braincase through the metopic foramen together with the oculomotor or, alternatively, through the orbitocerebral foramen. As usual in sauropods and many other amniotes, the trigeminal nerve is large. The abducens nerves penetrate the dorsum sellae close to one another, but then diverge so that they contact the pituitary fossa very laterally. The facial nerve is relatively large. It extends posteroventrally as does the large metopic group formed by the glossopharyngeal and vagooaccessory nerves. The hypoglossal nerve has two rami, the posterior being larger as in the other sauropods in which two hypoglossal branches of different diameter are present. The internal carotid arteries penetrate the pituitary fossa relatively apart from one another. The dorsal-head/posterior-middle-cerebral vein system passes through the occipital plate. The radius of curvature of the anterior semicircular canal of the inner ear is significantly larger than that of the other semicircular canals as in some, but not all, sauropods. The lagena seems to have been short.

The neuroanatomy of *Europasaurus* is reminiscent of that of *Giraffatitan*, both in global morphology and a number of details (e.g., presence of a flocculus), as already suggested by the osteology of the braincase. The development of the vestibular apparatus of *Europasaurus* is also comparable with that seen in *Giraffatitan*. In any case, it is clearly different from the situation in both *Camarasaurus* and derived titanosauriforms, in which the semicircular canals are contracted. Generally, the brain of *Europasaurus* can be described as an isometrically scaled-down version of that of *Giraffatitan*.

Grant Information

Marie Curie Fellow (PIEF-GA-2013-624969) to F. Knoll, Marie Skłodowska-Curie grant agreement No 609402 to E. Tschopp

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

INVESTIGATING MOLECULAR PRESERVATION IN *DREADNOUGHTUS SCHRANI*, AN EXCEPTIONALLY COMPLETE TITANOSAUR FROM ARGENTINA

SCHROETER, Elena R., North Carolina State University, Raleigh, NC, United States of America, 27695; CLELAND, Timothy P., Rensselaer Polytechnic Institute, Troy, NY, United States of America; SCHWEITZER, Mary H., North Carolina State University, Raleigh, NC, United States of America; LACOVARA, Kenneth J., Drexel University, Philadelphia, PA, United States of America