

fied tectonic activity and global warming. Subsequent global cooling resulted in dramatic species-richness decline in the montane region and increased richness on the Great Plains. These results suggest that an interaction between tectonic activity and climate change was mediating mammal diversification.

Poster Session II, (Monday)

BLOCK 124: A LOOK INTO THE HISTORY OF A 100-YEAR-OLD FIELD JACKET FROM THE CARNEGIE QUARRY, DINOSAUR NATIONAL MONUMENT, UT
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The Utah Field House of Natural History State Park Museum has had in storage for 30 years, a field jacket (Block 124) from the original Carnegie Museum excavation at Dinosaur National Monument, UT. Upon the 100th anniversary of Earl Douglass' 1909 discovery of the monument, staff at the Utah Field House decided it would be appropriate to open Block 124, to see what lay within. After preparation, a *Stegosaurus* caudal vertebra was revealed. The fossil was wrapped in layers of plaster and burlap bandages, however, no separator between the bandages and bone was used. This jacketing technique is still used today with little variation. It has proven over time to be a tried and true method for protecting fossils as indicated by the condition of Block 124 after 100 years. Working on this fossil prompted several questions: Who was the first paleontologist to use plaster jacketing as a way to package fossils and who was the first person to use toilet paper or other paper products as a separator? These and many other questions prompted the bigger question: How have fossil excavation techniques evolved throughout the history of paleontology and what techniques were used during the excavation of the Carnegie Quarry? Using mainly hammers, chisels, shovels and picks, the removal of over 350 tons of fossils and rock from the quarry occurred from 1909 to 1924. All of the bones, including Block 124, were shipped in wooden crates via horse-drawn wagons and trains back to the Carnegie museum. Because technology lagged behind out west, the low-tech but dependable method of jacketing allowed these valuable resources to be transported safely back east where the proper resources existed to prepare and display these fossils. Today, in addition to using the same tools and techniques as the paleontologists of the past, we now use tools like hammer drills and jackhammers powered by gas and smaller pneumatic tools run on compressed air to facilitate excavation and fossil preparation. Furthermore, new methods and techniques are constantly being developed and tested to further improve the safe recovery of fossils.

Poster Session I, (Sunday)

A NEW DINOSAUR ICHNOFAUNA FROM THE LATE CRETACEOUS OF WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE, ALASKA
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An unnamed nonmarine sedimentary package of rocks in southeastern Alaska in Wrangell-St. Elias National Park and Preserve, the largest national park in the United States, has provided the first evidence of dinosaurs for this vast region. The rock unit is contained within the Wrangellia Terrane and exposures are of limited geographic extent. Sections are overwhelmingly dominated by intraformational conglomerates. Fine to medium grained light colored sandstones are common and medium gray shales occur as minor components to the sections. Field parties found evidence of a small theropod and ornithopods. The theropod impression is approximately 12 cm long and 10 cm wide. Attribution to the Theropoda was based on the sinusoidal shape of the impression of the middle digit. Ornithopod impressions, identified by clearly blunt and rounded digit impressions, are approximately 21-28 cm long and 23-30 cm wide. All impressions were undertracks. Pollen samples failed to produce diagnostic pollen but kerosene and charcoal were abundant. The abundance of charcoal suggests that fire was prevalent in this ancient ecosystem. The abundance of conglomerate and sandstone in the sections, combined with the abundance of charcoal suggest that this area during deposition was tectonically dynamic and prone to ecological disturbance. Megafloral specimens indicate an abundance of horsetails, ferns and gymnosperm wood. The rock unit is mapped as Late Cretaceous in age, which ranges from approximately 99 Ma to 65 Ma. The lack of angiosperm pollen and megafloral remains suggest that fossil flora composition is most consistent with the floral composition of the Campanian/Maastrichtian Prince Creek Formation of northern Alaska rather than the underlying, older Nanushuk Formation. The megafloral record suggests that this unnamed rock unit may be of youngest Cretaceous age.

Poster Session I, (Sunday)

THE TRIASSIC MADYGEN LAKE ENVIRONMENT - A SHARK NURSERY GROUND?

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Some recent marine shark species show a separation of their nursery grounds from the usual distribution area of the population. Gravid females deposit their eggs in specific areas with abundant food suitable for the offspring and with low predation risk. The shark pups remain

in these nursery areas after hatching until they reach a size that allows them to join the adult stock. Separation of nurseries from adult areas is also documented in Carboniferous xenacanth and hybodont sharks, which demonstrates pronounced nursery behavior since the Late Paleozoic in nonmarine environments. The co-occurrence of hybodont teeth referable to *Lonchidion* sp. and hybodont egg capsules of the form type *Palaeoxyris* in the Middle-Late Triassic (Ladinian-Carnian) lake deposits of Madygen (SW Kyrgyzstan, Central Asia) may be interpreted in terms of a reproductive strategy analogous to recent sharks. Whereas shark teeth of small size occur as probable autochthonous elements in sediments of the pelecypod-rich littoral, the *Palaeoxyris* capsules appear as allochthonous elements within massive greyish mudstones that represent prodeltaic fluvial input into the nearby lake. *Palaeoxyris* itself proves hybodont spawning, which probably occurred in the highly energetic vegetated shallow water zones along shorelines of the Madygen lake and/or discharging streams. The empty capsules then subsequently drifted and were allochthonously buried. As we find egg capsules in sediments of the Madygen lake close to where teeth of the juveniles were deposited, the Madygen freshwater environment may have formed a nursery area similar to that of recent sharks. Another similarity is the availability of hard-shelled benthos on which the young may have fed until they left the nursery. The continuous occurrence of eggs in the Madygen profile suggests a persistent use of the nursery through time. Furthermore, as indicated by the xenacanth egg capsule form type *Fayolia* in Madygen strata, a second shark species shared the Madygen area. There was probably some degree of temporal partitioning, as is seen in several recent species of the same geographic area.

Physical Drivers and Marine Tetrapod Evolution, Monday 8:45

RECONSIDERING THE EXTINCTION OF ICHTHYOSAURS

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Despite their extreme adaptation to life in the open sea, ichthyosaurs were one of the first major groups of post-Triassic marine reptiles to disappear, at the end of Cenomanian, whereas plesiosaurs, mosasaurs and numerous families of marine crocodiles and sea turtles disappeared during the Cretaceous/Paleocene Extinction Event. It has been proposed that unique biological factors drove ichthyosaurs to extinction, namely a break in the food chain at the level of belemnites or a progressive ecological replacement by teleost fishes since the Middle Jurassic. However, new discoveries in France and Russia turn both these hypotheses unsatisfactory because ichthyosaur diversity remained high during the Early Cretaceous both from taxonomic and ecological points of view, with the persistence of several Late Jurassic genera into the Early Cretaceous and the colonization of various feeding guilds. The extinction of ichthyosaurs during the Cenomanian was therefore more sudden than previously described. The present study aims at replacing the extinction of ichthyosaurs within the global context of changes in marine ecosystems during the 'middle' Cretaceous. The 'middle' Cretaceous (Aptian-Turonian) is indeed punctuated by numerous and profound global climatic and oceanic changes, as well as intense underwater volcanism. These factors led to recurrent anoxic events, sometimes of worldwide extension. Interestingly, the peak of changes in the geosphere, taking place during the Cenomanian, coincides with major biological changes within the marine realm: the rise of polycotylid plesiosaurs, marine squamates, teleost fishes and chondrichthyans, the onset of the 'Chalk sea', and an extinction within marine invertebrates communities. Ichthyosaurs disappeared during this profound reorganization of the marine ecosystems. However, the precise mechanisms that lead to the sudden extinction of these successful marine reptiles cannot be understood in the current state of our knowledge given the multitude of possible causes occurring at the same time.

Technical Session IX, Tuesday 11:45

IMPACT FRACTURING OF MAMMOTH LIMB BONE DIAPHYSES (LATE PLEISTOCENE, MICHIGAN, USA)

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A recently reported site near Saranac, Michigan has yielded mammoth (*Mammuthus* sp.) remains, including a variety of dental, cranial, and postcranial material. Bones occur within sediments deposited near the margin of a late Pleistocene lake basin. No date is yet available, but the context is consistent with other late Pleistocene occurrences for which age estimates range from 12,000-10,400 RYBP. In situ material is well-preserved, but much of it is extensively fractured. Most interesting are limb bone diaphysis fragments showing green-bone fracture, producing bone flakes with sharp edges. Among these fragments, a partial femoral diaphysis shows a series of three, stacked, concentric, conical fractures diagnostic of heavy percussion. Such fractures form as the energy of a blow radiates through the anisotropic, but still relatively homogeneous medium of dense cortical bone. Experiments with bone breakage have demonstrated that this pattern can be produced with a boulder wielded with sufficient force, but observation of trampled bone or bone modified by freezing or other agency of ice has shown no comparable features. Impact features such as those observed at this site are thus indicative of human association, probably related to production of sharp flakes for use as cutting implements (and other activities related to carcass processing). At the surface where a county drain intersects site stratigraphy (leading to discovery of the site) a large (ca. 7.5 kg; 22 cm major axis), bifacially flaked quartzite boulder was found. This boulder was juxtaposed with in situ bone, but its surface exposure and consequent possibility of displacement preclude describing it as in situ. It is nonetheless suggestive of human activity and is a plausible impactor that could account for bone breakage at this site. This site helps document human association with extinct fauna of the Great Lakes region, but it also replicates, and thus supports, interpretations of similar mammoth occurrences in older (pre-Clovis) loess contexts on the Great Plains, previ-