MEETING PROGRAM & ABSTRACTS

SVP
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have been conducted for public and private schools in the Midwest and on the East Coast, with highly positive feedback from those participating. These Virtual Field Trips can use existing field trip frameworks, or be customized to the group′s specific needs. Most importantly, each Virtual Field Trip is led by a museum educator or museum professional. This allows the students to engage directly with an expert as part of their experience.

Poster Session I (Wednesday, November 5, 2014, 4:15 - 6:15 PM)

FOSSIL LONGBONE CARTILAGE PRESERVED IN STEGOSAURS?

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Soft tissues normally do not fossilize, and if they do they are typically preserved as thin, carbon-rich films. The cartilage caps that cover archosaur limb bone ends are only rarely preserved, such as in the sole case of 3D cartilage preservation on a sauropod femur.

The stegosaurian dinosaur *Kentrosaurus aethiopicus* from the Jurassic Tendaguru localities of Tanzania is known from a plethora of bone elements. Several individuals preserve what appears to be fossilzed articular cartilage. In some specimens the tissue is up to 10 mm thick. The surface of the putative cartilage shows fibers up to ~1 mm thick and several millimeters long, similar to fibrous cartilage in extant archosaurs. The preserved tissue covers not only the articular surfaces of the elements, but also portions of the metaphyseal surfaces, further suggesting portions of the tissue were likely fibrocartilage.

The putative cartilaginous tissue is found in histologically mature individuals, but not in juveniles. Although the available data are insufficient to clearly determine if taphonomic conditions in the main *Kentrosaurus* quarry in Tendaguru caused the preservation, the bones investigated do not suggest a local taphonomic aberration, as specimens from other quarries also appear to show small amounts of fossil cartilage.

We hypothesize that the unusual preservation of large amounts of cartilage is caused by an *in vivo* ossification of fibrous cartilage. It is unclear whether this ossification was caused by a regular growth-related process, as the distribution only across (sub-) adult individuals seems to suggest, or by a pathological condition. Planned destructive study (coring and thin sectioning) of specimens will clarify this issue. Further studies on thyreophorans in general are needed to determine if similar fossil tissues exist outside Stegosauria, what their biomechanical relevance may have been, and how their preservation can be explained.

Poster Session I (Wednesday, November 5, 2014, 4:15 - 6:15 PM)

NEW SPECIMENS OF THE RARE CHASMOSAURINE *ARRHINOCERATOPS* (DINOSAURIA: CERATOPSIDAE) FROM THE UPPER CAMPANIAN-LOWER MAASTRICHTIAN HORSESHOE CANYON FORMATION OF ALBERTA

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Historically, the ceratopsid *Arrhinoceratops* was known from only a single skull. Although it is well preserved, extensive coossification, preservational artifacts, and other idiosyncrasies of the specimen have resulted in conflicting interpretations of its morphology and phylogenetic relationships. Two previously undescribed specimens of *Arrhinoceratops*, from the Royal Ontario Museum (ROM 1439) and Canadian Museum of Nature (CMN 8882), provide new information. ROM 1439 includes a nearly complete skull. Distinctive features not preserved on the holotype include a steeply inclined triturating surface of the predentary (otherwise seen only in centrosaurines) and a hypertrophied lateral dentary ridge (otherwise seen to a lesser degree in *Anchiceratops* and basal ceratopsians). Suturally distinct epiossifications show that *Arrhinoceratops* has an epinasal (contrary to past interpretations) and lacks a midline P0 epiparietal. CMN 8882 is a partial skull of a juvenile, assigned to *Arrhinoceratops* based on a hypertrophied lateral dentary ridge, steeply inclined triturating surface of the predentary, and simple frill ornamentation. The skull, approximately 75% maximum size, has an abbreviated face, short, recurved postorbital horncores, delta-shaped frill epiossifications, a bumpy dorsal margin of the posterior postorbital, and other features shared with immature *Triceratops*. Thus, a recently proposed *Triceratops* growth model is probably representative of other long-horned chasmosaurines. The well-developed lateral dentary ridge of CMN 8882 indicates that this feature was also present in young *Arrhinoceratops*, and was probably not sexually significant. It may, instead, be related to the jaw mechanism. Although revised character codings for *Arrhinoceratops* fail to resolve its relationship to other chasmosaurines within a parsimony analysis, the analysis provides tentative support for a deep split within Chasmosaurinae, with one lineage leading to *Chasmosaurus* and another to *Triceratops*.

Poster Session II (Thursday, November 6, 2014, 4:15 - 6:15 PM)

DAGGERS, SWORDS, SCYTHES AND SICKLES: PACHYCORMID FINS AS ECOLOGICAL PREDICTORS

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Pachycormids occupy a key position within Actinopterygii, as part of the Holostei-Teleostei Transition, although their precise position in this hierarchy has been fought over for some years. New discoveries in the Toarcian of Scotland, as well as the Kimmeridgian and Turonian of North America, have expanded our global knowledge of the diversity, distribution and success of pachycormids, continuing the recent 'Pachycormid Renaissance'. However, clarity over the definitions of pachycormid taxa (as with many fossils) has been undermined by the number of type specimens destroyed during World War II. This has introduced a need for neotype material to be identified (e.g. for *Asthenocormus titanius* and *Hypsocormus macrodon*). Furthermore, new comparative work has revealed how poorly constrained a number of historical genera are, particularly those of the Toarcian (Early Jurassic) Holzmaden shale fauna, taxa that were the foundation of Arthur Smith Woodward's family Pachycormidae in 1895. This series of historical problems with descriptions and material has undermined confidence in recent phylogenetic analyses. In lieu of the necessary large-scale systematic overhaul of this group to stabilize and clarify its internal relationships, a more limited cross-family review of core characters historically associated with the group was conducted. A detailed sampling of over 90 specimens from 16 recognised pachycormid genera was assessed, clearly demonstrating that the ubiquitously stated 'scythe'-like pectoral fin is not in fact a pachycormid synapomorphy. Three clear and distinct pectoral fin structural morphotypes emerged, reflecting a diversity of pachycormid lifestyles that changed throughout the Mesozoic. Use of a variety of pectoral fin characteristics including aspect ratio, proportional fin length and body position further support recent analyses that show two distinct ('toothed' and 'tusked') diverging tribes of pachycormids. The unusually long pectoral fins appear to have developed in conjunction with otherwise reduced skeletal ossification to counteract buoyancy problems in a group apparently lacking a gas bladder. Closer analysis also reveals adaptations of a primitive morphology to suit a suite of lifestyles from agile pursuit predator to slow-cruising suspension feeder. Unsurprisingly, some of the pectoral fin morphotypes mirror some of the most modern fuel saving wingtip designs from today's aerodynamicists, converging on similar solutions to these enigmatic and fascinating fish some 160 million years later.

Poster Session III (Friday, November 7, 2014, 4:15 - 6:15 PM)

NEW RECORDS OF EARLY EOCENE ELASMOBRANCHS FROM THE KYZYLKUM DESERT, UZBEKISTAN

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As part of an international expedition to Uzbekistan to study the stratigraphy and the fossil vertebrate faunas in the central Kyzylkum desert, the locality of Sarbatyr was visited. The lower Eocene deposits at the locality comprise the Alai and underlying Suzak formations. Phosphorite horizons at the base of the both formations were bulk sampled and dry screened yielding shark and ray teeth. Most were well-preserved, whole or slightly broken and not noticeably reworked. The assemblage from the Alai Formation included *Hexanchus* cf. *agassizi*, *Echinorhinus* sp., *Palaeorhincodon dartevellei*, *Xiphodolamia ensis*, *Isurolamna inflata*, *Otodus obliquus*, *O. aksuaticus, Abdounia beaugei* , *A.* sp., *Premontreia* cf. *subuidens*, *Triakis* sp., *Danogaleus* cf. *gueriri*, *Physogaleus* sp., *Pachygaleus* sp., *Burnhamia* sp., *Archaeomanta* sp.

Previous researchers determined the age of the Alai Formation as late Ypresian-Lutetian. The combined presence of *O. obliquus* and *O. aksuaticus* in the base of Alai Formation indicates a mid Ypresian age within the second half of nannoplanktonic zone NP12. The taxonomic diversity and number of benthic species indicates a shallow continental shelf environment.

The sharks from the phosphorite at the base of the Suzak Formation are less abundant and less taxonomically diverse. They include *Carcharias* sp., *Striatolamia striata*, *Otodus obliquus*, *Premontreia* sp. and palatal teeth of pycnodonts. The assemblage is probably late Paleocene or early Ypresian in age.

Poster Session I (Wednesday, November 5, 2014, 4:15 - 6:15 PM)

TRACE-METAL JACKET: THE ROLE OF MELANIN PIGMENT IN THE PRESERVATION OF *ARCHAEOPTERYX* FEATHERS

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Synchrotron-based elemental mapping and spectroscopy of *Archaeopteryx* have made it possible to identify the presence and distribution of melanin pigment. Pigment patterns are controlled by melanocytes during feather growth. There are two main melanin pigments in animal tissues, eumelanins and pheomelanins. The former are more prevalent (>75%) and furnish dark black or brown hues in both invertebrates and vertebrates. A diagnostic and functional component of the molecular structure of melanin is their carboxyl and porphyrin substituents. These negatively charged end-groups function as cation chelators, selectively binding positively charged particles such as free radicals and transition metals. Consequently, melanin granules in extant bird feather melanosomes display high concentrations of zinc, copper, calcium and iron. Results from synchrotron-based imaging show clear evidence for the presence of Cu-O/Cu-N complexation, indicative of endogenous melanin pigments being preserved within the exceptionally preserved feathers of *Archaeopteryx*. The distribution of metal chelates in such soft tissue provides a useful biomarker for eumelanin patterning in this extinct bird. The presence of trace metals in melanin may play a key role in feather function and also their preservation. When the black and white feathers of domestic chickens are exposed to feather-degrading bacteria (*Bacillus licheniformes*), white feather breakdown is significantly faster than in black melanised feathers. Such studies suggest plumage colour might be an evolutionary response to the presence of feather-degrading bacteria, with high melanic content being more resistant to decay. The biocidal properties and associated non-biodegradability of eumelanin allows for a useful proxy to reconstruct pigment patterns through mapping the trace-metal chemistry associated with feathers. However, the trace-metal coordinated biochemistry of melanin-type pigments that played a key role in life might also have impacted upon the taphonomic history of