

Preliminary taphonomic works allow us to characterize the bonebed. The latter shows a wide range of fossil size, a high diversity of vertebrate taxa and is dominated by the new species of ornithomimosaur. The various taphonomic signatures observed on bones (cracking, fracturing, erosion and marks) underlines the complexity of the depositional history, showing a mixture of bone concentrating influences: ecological, biological and physical.

Ornithomimosaurids are represented by at least 20 individuals, based on the minimum number of tibiae, unearthed from a surface of about 100 m². Close proximity of ornithomimosaurian remains, homogeneous age-profile, absence of hydraulic sorting of elements depending on Voorhies groups and uniform preservation of unweathered and unabraded ornithomimosaurian bones indicate a catastrophic mass-mortality occurrence rather than attritional accumulation of bones. In-situ breakage pattern, skeletal completeness analysis, rarity of tooth marks and abundance of scratch marks on bone surfaces suggest an intense trampling of the ornithomimosaurian remains, at the origin of skeletal disarticulation, as well as displacements, cracking and fracturing of bones. The chronology of these taphonomic signatures on ornithomimosaurian bones and results of a trample experiment in Angeac sediments, realized during summer 2013 field campaign, support this assumption.

The 20 ornithomimosaurids are arranged into six distinct age classes, from juveniles to sub-adults. This indicates that they probably belonged to a juvenile-dominated multi-year herd, as in modern ostriches. This kind of gregarious habit has been previously reported for other ornithomimosaurian species, as *Sinornithomimus dongi* from the Upper Cretaceous of China.

Technical Session XIII (Friday, November 7, 2014, 2:45 PM)

DENTAL EVOLUTION READ IN TOOTH AND JAW

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Theories on the evolution of teeth and tooth replacement in jawed vertebrates have been based largely on chondrichthyans, because they constitute the sister lineage to all other crown-gnathostomes, and because their comparatively simple structure fulfills expectations. However, living chondrichthyans are a mosaic of secondary specializations resulting in simplification of morphology that, without consideration of stem-chondrichthyans and, indeed, stem-gnathostomes, provide a poor guide to ancestral gnathostome conditions.

We employed digital, non-destructive methods including synchrotron X-ray tomographic microscopy (SRXTM), to determine sclerochronology in order to elucidate the pattern of tooth development and replacement in stem-gnathostomes, stem-chondrichthyans and both stem- and crown-osteichthyans.

Taking this broader approach, it is clear that teeth evolved long before the first crown-gnathostomes since they are present in placoderms, an array of sister lineages to crown-gnathostomes. Here, teeth are replaced but not shed, arranged in two or more rows. Evidently, the files of shed and replacement teeth are a specialization of chondrichthyans, not a primitive condition for jawed vertebrates. However, tooth whorls, comprised of teeth that are replaced but not shed, may be a component of the dentition that is primitive to crown-gnathostomes.

Poster Session IV (Saturday, November 8, 2014, 4:15 - 6:15 PM)

EGGS AND EGGSHELLS OF CROCODYLOMORPHA FROM THE LATE JURASSIC OF PORTUGAL

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The Lourinha Formation, cropping out on the western shore of Portugal, dated from the Late Kimmeridgian to latest Tithonian-earliest Berriasian, has produced an extensive record of fossil vertebrates, including nine localities with nests, eggs and embryos. In four of these localities, Paimogo N and S, Casal da Rola and Peralta, several thinner eggshell fragments were recovered associated with dinosaur egg material. Besides the fragments, 3 partial eggs were found. In a fifth locality, in Cambelas, a nest with 13 mostly well-preserved eggs was recovered. On average, these eggs are 42 mm long and 26 mm wide. Preliminary observations suggested a crocodylian affiliation based on eggshell features such as tabular ultrastructure, wedge-shaped shell units and triangular blocky extinction. We found that, excluding the small nest, all the samples exhibit a clear, outer diagenetic layer (DL) with recrystallized and secondary calcite. The typical crocodyloid ultrastructure and shell units are present, although faint and not always clearly defined; strong sub-horizontal fracturing precludes a more extensive description. No ultrastructure is observable in the nest sample. The presence of basal plate group knobs on the inner eggshell surface is also diagnostic. Three layers can be differentiated in three of the samples, with an inner or mammillary layer corresponding to the dark basal knobs, a middle layer characterized by the presence of the tabular ultrastructure, and an outer layer, below the DL, distinguishable from the middle layer by a darker thin band. Furthermore, all the samples show the distinct triangular blocky alternating extinction. The thicknesses range between 163 µm and 392 µm, which is consistent with values for fossil crocodyloid eggshells. The density of the mammillae is very similar to what is observable in extant eggshells, as are the pores, with long, straight canals. Moreover, the ellipsoid shape of the eggs is typically crocodylian, even though such shape is shared with some dinosaur eggs. Thus, this analysis allows us to ascribe it to the oofamily Krokolithidae, making them the oldest crocodylomorph eggs known so far, as well as the best record for eggs of non-crocodylian crocodylomorphs. Based on the morphological characters, we tentatively assign it to the oogenus *Krokolithes*. The structure of crocodylian eggshells is very conservative and has seemingly remained unchanged since at least the Late Jurassic.

THE DVINOSAUR *KOURERPETON*, AND A NEW ANALYSIS OF RELATIONSHIPS AND EVOLUTIONARY RATES IN PALAEOZOIC TEMNOSPONDYLS

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The anatomy of the temnospondyl *Kourerpeton bradyi* (probably originating from the San Angelo Formation, Texas) is reviewed in conjunction with a new cladistic analysis of (chiefly) Palaeozoic temnospondyls. Notable features of *Kourerpeton* include the small postfrontals (albeit these are comparatively larger and more elongate than those of tupilakosaurids), broad polygonal postorbitals, a shallow squamosal embayment, and absence of an incisure along the distal portion of the pterygoid quadrate ramus. *Kourerpeton* is nested within dvinosaurs, in an apical position relative to trimerorhachids, eobrachiopids, and dvinosaurids and as a sister taxon to tupilakosaurids. Reassessment of *Kourerpeton* prompted a re-analysis of the large-scale relationships of Palaeozoic temnospondyls. Dvinosaurs and a clade consisting of eryopods plus basal archegosauriforms compete for their placement as the second earliest diverging radiation at a post-edopoid level of temnospondyl organization. A study of rates of character change reveals significantly high rates in the most apical regions of most temnospondyl clades (an exception is represented by edopoids) as well as along the internal branches that connect such radiations. Rates tend to decrease significantly within certain branches in dissorhophoids (e.g. branch leading to amphibamids) and in dvinosaurs (e.g. post-eobrachiopid taxa).

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

MACROSCOPIC TOOTH WEAR AND DIETS OF EXTANT AND FOSSIL XENARTHANS (MAMMALIA, XENARTHRA)

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Xenarthra is one of the major superorders of placental mammals. It comprises a major group of the large terrestrial mammal fauna in South America during the Cenozoic and in North America during the Pleistocene. Understanding dietary paleoecology of Xenarthra would provide information not only about the dietary adaptations of the species but also about how their diets have varied according to changing resources and environmental conditions. The usually simple and reduced tooth morphology of the xenarthrans, lacking enamel, has rendered dietary analyses based on their fossil teeth challenging. In particular, the problem is analyzing paleodiets of xenarthrans using a consistent methodology which would give results comparable to mammals with other kinds of tooth morphologies. We introduce a new method based on macroscopic tooth wear morphology easily applicable for fossil and extant xenarthran teeth. Relief on the occlusal surface of xenarthran teeth forms during the tooth wear as a result of uneven wear of harder dental materials (durodentin) and softer dental materials (vasodentin). The wear-resistant durodentin edges of the teeth wear down more heavily as a result of abrasive food materials (for example grass), causing lower relief of the tooth surface. The new method is similar to mesowear analysis and it is based on measuring the relief of the worn molariform teeth of xenarthrans as antero-posterior angles by placing the tip of the angle at the bottom of worn vasodentin valleys and the sides of the angle as tangent to durodentin edges of the teeth. The wider the measured angles are, the lower the worn tooth relief is, which indicates an increasingly abrasive diet. This method gives consistent, comparable information about the relief of the worn tooth surface regardless of differences in the primary morphology of the teeth. We have previously successfully applied this method for dietary analysis of proboscideans. The results based on our angle-based method of recording tooth surface relief correlate with dietary analyses based on stable isotopes from xenarthran teeth. This work was funded by the Finnish Doctoral Program in Geology and the Waldemar von Frenckells Stiftelse.

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

THE LATE CENOZOIC PROBOSCIDEANS OF MYANMAR: A REAPPRAISAL

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Paleontological expeditions of the Irrawaddy sediments and the Freshwater Pegu Beds, as well as reappraisal of the collections of proboscidean fossils housed in museums and universities in Myanmar, sheds new light on the Neogene

The Freshwater Pegu Beds yields a small sized gomphothere, besides a small deinothere comparable with *Prodeinotherium pentapotaminae* from the lower Siwalik of India and Pakistan. This gomphothere, represented by isolated teeth showing amebelodont traits such as symmetric pretrite trefoil and presence of posttrite conules, appears to be endemic to Indochina.

Irrawaddy sediments yields *Sinomastodon*, *Anancus* and various stegodontids. The materials of *Sinomastodon* from both the Upper of Myanmar and those from Nakhon Ratchasima province, Northeast Thailand include both the derived and primitive morphotypes, suggesting that this genus has been present in Indochina since the late Miocene. A left gomphothere intermediate molar (NHM m15594) and a right m3 (NMMP-KU-IR 0441) housed in the Natural History Museum, London and the University of Yangon, respectively, represent an anancine that exhibits primitive cusp arrangement and can be compared with *A. perimensis* from India.

The Lower Irrawaddy and possibly the Freshwater Pegu Beds yield a primitive stegodontid of tetralophodont grade, *Stegolophod latidens*, and the upper Irrawaddy yields derived *Stegolophodon stegodontoides* and an unnamed species of primitive *Stegodon*. These materials appear to represent an evolutionary transition between the two genera of the family Stegodontidae. Numerous stegodont molars from the Upper Irrawaddy show the spectrum of dental evolution of the genus *Stegodon*, and the types of *S. elephantoides* and *S. insignis birmanicuscan* can be placed in this spectrum. A *Stegodon* skull from the Upper Irrawaddy exhibits a quite dissimilar morphology to previously known *Stegodon* crania from other regions of Asia and suggests that the stegodont molars from the Irrawaddy sediments represent a new species of the genus. A