Edwin H. and Margaret M. Colbert Poster Competition (Thursday)

MATHEMATICAL MODELS OF CUSP PATTERNING IN THREE SPECIES OF RODENT

CARTER, Katherine, New York University, New York, NY, USA

Teeth make up a large proportion of the existing fossil record and are thus frequently used disproportionately when reconstructing fossil phylogenies. It is known that dental traits are not wholly independent from one another, but this presents an impasse as it negates using multiple lines of dental evidence for analysis. To resolve this problem, it is necessary to explore the relative dependence of any one trait to another, so that it can be properly weighted *a priori*. Examining the covariance of hypothesized developmental units such as cusps using different models of dependence is a necessary step in being able to reconstruct trait independence in dental characters. These models can then be tested in other species to determine the effect of phylogeny and allometry. Photographs of the occlusal surface of 120 mandibular molars of each *Mus musculus*, *Mus muscoloides,* and *Maxomys hellwaldii* were taken, and the occlusal surface area, cusp areas, predicted cusp apices and actual cusp apices were measured for all cusps. These measurements were then analyzed using both geometric morphometric and multivariate regression techniques to see how each cusp covaried with one another, and which cusps drove the overall variation in the dentition. These results were then expanded to look at how the cusps of each molar covaried with the cusps of other molars to see if the morphology reflected how the teeth develop. Preliminary results suggest a threshold model as the driving force behind cusp patterning within a particular molar. Surprisingly, these results were consistent in each species sampled, suggesting that the model is conservative and not highly affected by body size or phylogeny.

Poster Session III, (Friday)

DINOSAUR EGGSHELL AND EMBRYO LOCALITIES IN LOURINHA FORMATION, LATE JURASSIC, PORTUGAL

CASTANHINHA, Rui, Museu da Lourinhã, Lourinhã, Portugal; ARAÚJO, Ricardo, Museu da Lourinhã, Lourinhã, Portugal; MATEUS, Octávio, Museu da Lourinhã & Universidade Nova Lisboa (CICEGe/FCT), Lourinhã, Portugal

Four different localities from the Late Jurassic of Lourinhã formation with eggshells and embryos were studied: Paimogo (lower Amoreira-Porto Novo member), Peralta (Praia Azul member), Porto das barcas (Bombarral member) and Casal da Rôla (Amoreira-Porto Novo member). All but Casal da Rôla have embryonic material. Preliminary results show that eggshells from Paimogo correspond to obliquiprismatic morphotype (0.92mm thick), similar to those from Morrison Formation. Within Paimogo site a different type of eggshell was discovered, having a radial section of 153 μm with a mammilary layer measuring 65 μm. Porto das Barcas eggshells represent a discretispherulitic morphotype (1,23 mm thick). This locality presents a nest 60-cm diameter containing many eggshells but an indeterminate number of eggs. Some embryonic bones were discovered between the eggshells including teeth and skull bones showing that the eggs belong to a saurischian, tentatively a sauropod dinosaur. Peralta nest eggshells are preliminary ascribed to obliquiprismatic morphotype (column: 0,56mm and mammilla: 0,21mm) probably related to Paimogo's nest taxon (Lourinhanosaurus). Peralta site bears embryonic bones namely small theropod teeth associated with bone fragments, and unidentifiable dinosaur vertebra. Only eggshells have been collected at Casal da Rôla (ML1194). The eggshells (0,78mm thick) are prismatic morphotype and it was impossible to determine the pore system, the outer surface is smooth with no ornamentation.

Lourinhã formation has the oldest sauropod and theropod nest with embryos known so far.

Poster Session II, (Thursday)

THE MESOZOIC AVIAN FOSSILS OF THE IBERIAN PENINSULA

CHAMERO, Beatriz, Universidad Autonoma de Madrid, Cantoblanco, Madrid, Spain; MARUGÁN-LOBÓN, Jesús, Universidad Autonoma de Madrid, Cantoblanco, Madrid, Spain; BUSCALIONI, Ángela, Universidad Autonoma de Madrid, Cantoblanco, Madrid, Spain; SANZ, José Luis, Universidad Autonoma de Madrid, Cantoblanco, Madrid, Spain

The Mesozoic fossil record of the Iberian Peninsula has provided significant insights about the early steps of avian evolution. Las Hoyas (upper Barremian, La Huerguina Formation, Serrania of Cuenca), and El Motsec (early Barremian, Tremp Formation, Lleida) are two exceptional deposits, known for yielding almost fully articulated specimens attributed to four species: Iberomesornis romerali, Concornis lacustris, Eoalulavis hoyasi, Noguerornis gonzalezi, and other undescribed material. All of these taxa are phylogenetically placed within the Enantiornithes, whereby Iberomesornis and Noguerornis are among the most basal members of the clade. The discovery of Iberian Enantiornithes gave important keys to understand the early diversification of these animals, and also about their novel aerodynamic achievements. The first evidence of an alular feather in Eoalulavis suggested that low-speed flights and manoeuvrability were likely achieved during the Early Cretaceous. On the other hand, morphometric analyses have been carried out in order to underscore insight about their growth patterns, and how could these relate with early avian evolution. Enantiornithes occupy a reduced area of morphospace of forelimb proportions compared to non-avian theropods and Neornithes. Since forelimb disparity in Neornithes is so extensive, accurate inferences about enantiornithine are difficult to reach. Furthermore, Enantiornithine juveniles apparently reach adult limb proportion quite early in ontogeny, a finding which encouraged us to test growth regimes on paleohistological and bone surface textural ageing bases. Results revealed that the histodiversity of the studied specimen was larger than expected, and perhaps, that growth regimes were quite rapid at early stages, and in essence, that morphometric proxies need to be taken carefully when testing ageing and when inferring evolutionary processes from the fossil record related with ontogeny (e.g. heterochrony). Today, we pursue to understand the paleoecological role of enantiornithes in the Mesozoic.

Poster Session IV, (Saturday)

A PARTIAL TETRAPOD LOWER JAW FROM "ROMER'S GAP"

CHEN, Donglei, Uppsala University, Uppsala, Sweden; AHLBERG, Per, Uppsala University, Uppsala, Sweden

The first half of the Mississippian or Early Carboniferous (Tournaisian to mid-Viséan), an interval of about 20 million years, has become known as "Romer's Gap" because of its poor tetrapod record. Recent discoveries emphasize the differences between pre-"Gap" Devonian tetrapods, unambiguous stem-group members retaining numerous "fish" characters indicative of an at least partially aquatic lifestyle, and post-"Gap" Carboniferous tetrapods which are far more diverse and include fully terrestrial representatives of the main crown-group lineages. It seems that many crucial terrestrial features were acquired during "Romer's Gap", which probably also saw the cladogenetic events leading to the origin of the tetrapod crown group. Here we describe a partial right jaw ramus of a tetrapod from the Tournaisian of Scotland. The jaw displays a distinctive character combination, including a significant mesial lamina of the strongly sculptured angular, an open sulcus for the mandibular lateral line, a non-ossified narrow Meckelian exposure, a well-defined dorsal longitudinal denticle ridge on the prearticular, and a mesially open adductor fossa. These features support the establishment of a new genus and species of Carboniferous tetrapod. A phylogenetic analysis places this new taxon in a trichotomy with *Pederpes* and *Occidens* in the upper part of the tetrapod stem group, above *Whatcheeria* and below *Greererpeton*. It represents a small but significant step in the closure of "Romer's Gap".

Technical Session XVII, Saturday 4:00

THE EARLY CRETACEOUS SALAMANDER *LIAOXITRITON ZHONGJIANI* (AMPHIBIA: CAUDATA) AS A BASAL HYNOBIID BASED ON REDESCRIPTION OF NEW MATERIAL

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Mesozoic strata in northern China have yielded abundant early salamander fossils, which provided significant insights into the origins, early radiation and biogeographical history of modern salamander clades. Among these fossil salamanders, *Liaoxitriton zhongjiani* is a problematic taxon that has not been thoroughly studied, resulting in its unclear anatomical details and unresolved phylogenetic position. New samples of *Liaoxitriton zhongjiani* collected from the type locality and horizon in Huludao area of Liaoning Province, China, provide the material for a redescription and taxonomic revision of this problematic taxon. Study of the new specimens clarified several previously misidentified features including prefrontal and lacrimal present and posterolateral border of the vomer concave for choana. New knowledge was also supplemented in the otic capsule, mandible, hyobranchial apparatus and limb bones. Phylogenetic analysis was performed based on a data set of 41 morphological characters and 13 taxa including 11 extant cryptobranchoid species and the fossil species *Liaoxitriton zhongjiani* and *Chunerpeton tianyiensis*. The stem-group salamander *Karaurus* was chosen as the outgroup. The branch-and-bound search resulted in three MPTs, in all of which modern hynobiids form a monophyletic group and *Liaoxitriton zhongjiani* stably forms the sister-group with modern hynobiids. The derived character states grouping all hynobiids together include the presence of radial loops in hyobranchium, subarcualis rectus I encasing both the first and second ceratobranchials, transverse vomerine tooth row, and concave posterolateral border of the vomer for choana. Thus *Liaoxitriton zhongjiani* represents the earliest hynobiid record to date, supporting an Early Cretaceous origin of modern hynobiids in northern China.

Poster Session III, (Friday)

HOMOPLASY IN VERTEBRAL SERIAL IDENTITIES IN MESOZOIC MAMMALS AND EVOLUTIONARY DEVELOPMENT BY HOMEOBOX GENES

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Living mammals have a regional distinction of the cervical, thoracic, lumbar and sacral vertebrae. These regional identities are highly conserved in the majority of extant terrestrial marsupials and placentals, with a total of 19 or 20 thoraco-lumbar vertebrae and a distinctive thoraco-lumbar boundary. Recent fossil discoveries revealed that the thoraco-lumbar vertebral boundary is homoplastic in some Mesozoic mammal lineages. In the Cretaceous eutriconodonts, the thoraco-lumbar vertebrae range from 19 in Jeholodens in which the thoraco-lumbar boundary is distinctive, up to 23 in Yanoconodon and gobiconodontids in which the thoraco-lumbar transition is gradational and lacks a clear boundary. Similar variation in the thoraco-lumbar boundary also occurs in Zhangheotherium and Akidolestes in the spalacotheroid clade, and in some Jurassic mammaliaforms. Recent genetic and embryonic studies have shown that shifting of the thoraco-lumbar and lumbar-sacral