Technical Session XV, Saturday 9:00

DECREASED DORSOVENTRAL AND MEDIOLATERAL VERTEBRAL JOINT STIFFNESS IN THE TAIL, ALONG THE LINE OF DESCENT BETWEEN NON-AVIAN AND AVIAN THEROPODS

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The tail is an important structure in the dinosaurian origin of birds because this transition is correlated with a reduction of tail length and caudal number, as well as tail function. To improve our understanding of the form, function, and evolution of maniraptoran tails, we examined factors associated with dorsoventral and mediolateral vertebral joint flexibility in 20 taxa. We expect dorsoventral and mediolateral vertebral joint stiffness to decrease on the line to birds since greater tail flexibility would help make the tail feathers easier to manipulate. Approximately 3000 vertebral measurements were taken and normalized for body size using femoral length. Each vertebral parameter was plotted against percentage tail length to identify trends in flexibility along the tail, and differences in vertebral joint flexibility in each maniraptoran clade. We also used a principal components analysis (PCA) of four length measures in ten specimens to independently identify differences in vertebral joint flexibility between different clades. In the dorsoventral plane, factors associated with vertebral joint stiffness, particularly neural spine and chevron height, indicate that stiffness decreases along the line of descent between non-avian theropods and avian theropods. *Crocodylus* has stiffer vertebral joints compared to the taxa studied although oviraptors share similarly stiff vertebral joints. The troodontids have the least dorsoventrally stiff vertebral joints. Factors associated with mediolateral vertebral joint stiffness, particularly centrum length, indicate that mediolateral stiffness decreases along the same line of descent. Avian theropods have similar mediolateral stiffnesses to crocodiles, suggesting that dorsoventral vertebral joint stiffness is responsible for their functional tail differences. These changes in tail function should have allowed the tail to become increasingly more dynamic, and better equipped to manipulate the tail feathers. This biomechanical, morphometric and phylogenetic approach would be useful in reconstructing functional change associated with major shifts in locomotory patterns in the vertebral series of other animal groups.

Technical Session XVIII, Saturday 2:00

SKULL ANATOMY OF A NEW BASAL EUSAUROPOD FROM THE CAÑADON ASFALTO FORMATION (MIDDLE JURASSIC) OF CENTRAL PATAGONIA

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The Cañadon Asfalto Formation has provided a diverse Middle Jurassic vertebrate fauna, including two eusauropod taxa: *Patagosaurus fariasi* and *Volkheimeria chubutensis*. Recent work in this unit led to the discovery of abundant material of a new eusauropod taxon, including one of the most complete skulls and lower jaw from the Middle Jurassic of the Southern Hemisphere. The ascending process of the premaxilla is slender, posterodorsally oriented, and bears a distinct step at its anterior margin. The maxilla is low and elongated, has a rounded subnarial foramen on its lateral surface and ten neurovascular foramina that are not dorsoventrally aligned (the most posterior of which is moderately enlarged). The maxilla lacks an antorbital fossa and bears a lateral plate that partially covers its 13 spatulate teeth that are slightly procumbent and extend up to the posterior margin of the antorbital fossa. The teeth have wrinkled enamel, marginal denticles, buccal and lingual grooves, and many of them show v-shaped wear facets. The frontals are unfused and broader than long and the postorbital has a long and anteriorly curved cylindrical process for the jugal and a reduced squamosal process. The squamosal forms part of the supratemporal fossa and has an anteroposteriorly broad descending process. The quadrate bears a large, deep posterior fossa. The occipital surface is flat and the paroccipital processes project ventrolaterally, and lack a distinct expansion on their lateral ends. The basipterygoid processes are subtriangular in cross-section, slightly more than twice as long as wide, and directed ventrolaterally. Several features of the skull suggest that this taxon is more advanced than *Shunosaurus* (e.g., unaligned maxillary neurovascular foramina, supratemporal fenestra transversely elongated, elongation of basipterygoid process, depth of quadrate fossa, tooth count) but the presence of numerous plesiomorphic features indicates that the new taxon is basal to Neosauropoda (e.g., absence of preantorbital fenestra, cylindrical descending process of postorbital, laterally facing subnarial foramen, presence of external mandibular fenestra, teeth with marginal denticles).

Poster Session I, (Wednesday)

NEW SPECIMENS OF *ANGOLASAURUS BOCAGEI* AND COMMENTS ON THE EARLY RADIATIONS OF PLIOPLATECARPINE MOSASAURS

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New, well preserved material of the Turonian mosasaur *Angolasaurus bocagei* from the Tadi Beds of the Itombe Formation in northern Angola, allows detailed redescription of its morphology and reassessment of its phylogenetic relationships. *Angolasaurus* had been previously referred to the genus *Platecarpus*; however, phylogenetic analysis confirms the valid taxonomic status of *A. bocagei*, and reconstructs that taxon within a clade that also includes the genera *Selmasaurus* and *Ectenosaurus*. These forms are united by an elaborated infrastapedial process of the quadrate and a unique ridge-like descending process of the parietal forming the supraoccipital articulation, but also retain a relatively plesiomorphic configuration of the braincase. That clade is united with all other plioplatecarpines by a number of derived characters including the presence of a novel basicranial circulation pattern. In Africa, North and South America, early plioplatecarpines are known by the Middle Turonian and Angolasaurus and closely related forms appear by the Upper Turonian. *Selmasaurus* and *Ectenosaurus* are a rare faunal component of the Santonian and Campanian of North America. *Platecarpus planifrons* appears in the Coniacian of North America and represents the plesiomorphic condition of the clade containing the remaining species of *Platecarpus* and *Plioplatecarpus,* that appears in the Santonian and persist until the end of the Cretaceous, reaching global distribution. The temporal and geographic distribution of these radiations suggest influence of paleogeography and eustatic sea levels.

Poster Session IV, (Saturday)

A NEW TREMATOPID AMPHIBIAN FROM THE EARLY PERMIAN OF RICHARDS SPUR, OKLAHOMA

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A new trematopid amphibian from the fissure fill deposits of the Dolese Brothers limestone quarry near Richards Spur, Oklahoma is based on several excellently preserved, articulated cranial materials and scattered postcranial elements. While this prolific locality has yielded the most diverse assemblage of Paleozoic tetrapods, the majority of described taxa have all been of relatively small body size. Recently collected material has revealed the presence of larger forms, the largest represented by the uncrushed, nearly complete adult skull of the new trematopid described here. The skull measures 167 mm along its dorsal midline, with an estimated total length of about 200 mm. It most closely resembles *Acheloma cumminsi*, sharing with it the combination of a slit-like otic notch and internarial fenestra. The new taxon has several autapomorphies, including the presence of distinct lateral exposures of the palatine (L.E.P.) and ectopterygoid (L.E.E) that are completely enclosed within the suborbital elements and do not reach the orbital margin. Although the presence of L.E.P. and L.E.E. is common among dissorophoids, these structures have always been seen to contribute to the ventral margin of the orbit. This is not an ontogenetically variable feature in this new trematopid because two juvenile partial skulls show the same distinctive pattern as seen in the adult. Both skulls are considerably smaller than the adult, but exhibit clear trematopid features along with the lateral exposures of the palatine and ectopterygoid that do not contribute to the circumorbital rim. Functionally, the L.E.P. and L.E.E. are considered to play a role in dissipating strong compressive forces acting on the skull associated with feeding, indicating that this new trematopid may be one of the top predators of the faunal assemblage.

Technical Session I, Wednesday 9:30

PLEISTOCENE MAMMAL ASSOCIATIONS: IMPLICATIONS OF ECOLOGICAL NICHE MODELLING AND A METHOD FOR RECONSTRUCING PALEOCLIMATE

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The bioclimatic envelope of a species is a multivariate space whose axes are climatic variables and whose boundaries defined by the range of values on each variable across the species‘ geographic range. If climate limits geographic range, then the climate envelope can be used to predict which species can be plausibly expected to occur together in paleofaunas and to reconstruct paleoclimate based on its mammalian fauna. We explored these ideas using ten living mammal species found at Quaternary sites in Britain, four cold-weather species (Alopex lagopus, Lemmus lemmus, Ovibos moschatus and Rangifer tarandus), three warm-weather ones (Crocuta crocuta, Panthera leo, and Hippopotamus amphibius), and three generalist ones (Arvicola terrestris, Cervus elaphus, and Sus scrofa) for analysis. We used the WorldClim dataset of 19 climatic variables to characterize climate climate envelopes for these species and we used a maximum-likelihood function to estimate the most likely climate for a site given the species found in association there. Twenty-two of the possible 45 pairs of these ten species live allopatrically today and twelve pairs have climate envelopes that do not over lap. All of the species found together in British Pleistocene faunas were climatically compatible given their modern climate envelopes, except for associations between C. crocuta and R. tarandus and between C. crocuta and L. lemmus.