Poster Session III (Friday, October 16, 2015, 4:15 - 6:15)

**REVISION OF EOCENE ANTARCTIC CARPET SHARKS AND GROUND SHARKS (CHONDRICHTHYES, ORECTOLOBIFORMES, CARCHARINIFORMES)**

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Seymour Island (Antarctic Peninsula) is known for the wealth of its Paleogene cartilaginous and bony ichthyofauna. Eocene marine vertebrate remains are common in the sediments of the La Meseta and Submeseta formations. Most vertebrate remains recovered up to now are isolated teeth of elasmobranchs. So far, 24 species of chondrichthyans belonging to 15 families have been described. The distribution of cartilaginous fishes is very patchy throughout the La Meseta and Submeseta formations. Generally, diversity is very low in TELMs 1 to 3 (late Paleocene–early Eocene). The highest diversities can be found in TELMs 4 and 5 (early–middle Eocene), where a predominantly cold-adapted chondrichthyan fauna seemingly emerges, indicative of a temperate marine habitat with some warm water elements like orectolobiform and carchariniform sharks. Consequently, these sharks are considered to be immigrants into the Southern Ocean during the Eocene.

For the first time, abundant new elutriated teeth of carpet and ground sharks from TELMs 4 and 5 (early–middle Eocene) of Seymour Island are available, allowing for a detailed analysis of the taxonomic composition of these shark groups in the Southern Eocene during gradually cooling conditions. Up to now, only two extinct species of carpet sharks (*Pseudoginglymostoma* cf. *brevicaudatum*, *Stegostoma* cf. *fasciatum*) and two fossil species of ground sharks (*Carcharhinus* sp., *Scoliodon* sp.) have been described from the Eocene La Meseta Fm, Seymour Island. Their species assignment however, remains ambiguous. Here, we present new material of the four currently known but also new records of carpet and ground sharks of the La Meseta and Submeseta formations on Seymour Island enabling a revision and taxonomic assignment of these sharks. Interestingly, the diversity of carpet and ground sharks in the Eocene of the Southern Ocean shortly before establishment of the Antarctic convergence is larger than previously assumed, depicting interesting faunal relationships.

Colbert Prize (Wednesday - Saturday, October 14-17, 2015, 4:15 - 6:15)

**PALAEOTHENTID MARSUPIALS (MAMMALIA: PAUCITUBERCULATA) FROM THE MIDDLE MIOCENE LOCALITY OF QUEBRADA HONDA, BOLIVIA**

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During the Oligocene and Miocene, paucituberculatan marsupials were a significant and abundant component of most South American mammal communities, with over 60 species identified from this interval. These extinct paucituberculatans were much more diverse than modern forms, occupying ecological roles filled by rodents, eulipotyphlans, and primates on other continents. Nevertheless, during the middle Miocene, paucituberculatans abruptly declined in diversity, leaving only seven morphologically stereotyped extant species in a single family (the Caenolestidae), all of which are currently restricted to cool-temperate habitats in southern Chile and the Andes Mountains. The most speciose extinct paucituberculatan clade is the Palaeothentidae, which is last recorded at late middle Miocene sites in Colombia, Bolivia, and possibly Argentina. Here, we describe six new and seven previously undescribed specimens from one of these areas, the late middle Miocene site of Quebrada Honda, Bolivia. These specimens include (1) the first identified lower dentitions of *Acdestis maddeni*, (2) two new species of *Palaeothentes*, and (3) a third new species representing a new genus. The lower dentition of *A. maddeni* differs from other members of this genus in having a longer m1 paracristid and a reduced, single-rooted m4. The two *Palaeothentes* species from Quebrada Honda demonstrate that this genus survived into the late middle Miocene. One of these species is distinguished by a well-developed anterior cusp on P3 and the absence of an anterior trigonid crest on m1; the other is distinguished by its incomplete postcristid. The third new species differs from species of *Palaeothentes* and all other palaeothentids in having the unique combination of a straight entocristid on m2, a curved entocristid on m3, a cristid obliqua that is mesially directed towards the protoconid, and an m4 that is proportionately smaller than in palaeothentines but larger than in decastines. The relatively high taxonomic and ecomorphological diversity of palaeothentids at Quebrada Honda prior to their extinction is surprising given that clades tend to exhibit relatively low diversity before going extinct. This suggests that the extinction of these marsupials was relatively rapid, particularly considering the group's wide geographic distribution just prior to its extinction.

**Grant Information**

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Poster Session III (Friday, October 16, 2015, 4:15 - 6:15)

**WEAR BIOMECHANICS IN THE SLICING DENTITION OF THE GIANT HORNED DINOSAUR, *TRICERATOPS***

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Herbivorous reptiles rarely evolve occluding dentitions allowing for the mastication (chewing) of plant matter. Conversely, most herbivorous mammals possess occluding teeth with complex tissue architectures that self-wear to complex morphologies for orally processing plants. Dinosaurs stand out among reptiles in that several lineages acquired the capacity to masticate. In particular, the horned ceratopsian dinosaurs, among the most successful Late Cretaceous dinosaurian lineages, evolved slicing dentitions for the exploitation of tough, bulky plant matter. Here we show how *Triceratops*, a nine-meter long ceratopsian, and its relatives evolved teeth that wore during feeding to create fullers (recessed central regions on cutting blades) on the chewing surfaces. This unique morphology served to reduce friction during feeding. It was achieved through the evolution of a complex suite of osseous dental tissues rivaling the complexity of mammalian dentitions. Tribological (wear) properties of the tissues are preserved in ~66 million year old teeth, allowing creation of a sophisticated three-dimensional biomechanical wear model (the first for a slicing dentition) that reveals how the complexes synergistically wore to create these implements. These findings, along with similar discoveries in hadrosaurids (duck-billed dinosaurs), suggest that tissue mediated changes in dental morphology may have played a major role in the remarkable ecological diversification of these clades and perhaps other dinosaurian clades capable of mastication.

**Grant Information**

NSF EAR 0959029 to GME and MAN

Technical Session XI (Friday, October 16, 2015, 8:00 AM)

**THE EVOLUTION AND DEVELOPMENT OF HOMININ TOOTH SIZE**

EVANS, Alistair R., Monash University, Melbourne, Australia; DALY, E. Susanne, Arizona State University, Tempe, AZ, United States of America; CATLETT, Kierstin K., Arizona State University, Tempe, AZ, United States of America; PAUL, Kathleen S., Arizona State University, Tempe, AZ, United States of America; KING, Stephen J., University of Massachusetts, Amherst, MA, United States of America; SKINNER, Matthew M., University of Kent, Canterbury, United Kingdom; SCHWARTZ, Gary T., Arizona State University, Tempe, AZ, United States of America; JERNVALL, Jukka, University of Helsinki, Helsinki, Finland

The variation in molar tooth size in humans and our closest relatives has strongly influenced our view of human evolution. The reduction in overall size, and disproportionate decrease in third molar size, have been noted since Darwin, and have been attributed to reduced selection on the dentition due to changes in diet or the acquisition of cooking. The systematic pattern of size variation along the tooth row has been described as a 'morphogenetic gradient' in mammal and more specifically hominin teeth. However, the underlying controls of relative tooth size have not been well understood, with hypotheses ranging from a morphogenetic field to the clone theory. In this study, we make the first comprehensive examination of the morphogenetic gradient in hominin primary postcanine teeth (deciduous premolars and permanent molars). Tooth sizes of modern humans were represented by the averages of at least 59 populations for each molar, and eight populations for deciduous premolars. These were compared with data from 289 specimens of 13 species of fossil hominins, including the genera *Ardipithecus*, *Australopithecus*, *Homo*, *Kenyanthropus* and *Paranthropus*. Here we show that the inhibitory cascade, an activation-inhibition mechanism that affects relative tooth size in mammals, generates patterns equivalent to a morphogenetic gradient. Multiple regression of tooth proportions with absolute size of the first molar shows that the inhibitory cascade pattern, including a reversal of the direction of the morphogenetic gradient, explains the majority of variation in tooth size proportions in hominins (weighted average $R^2 = 0.65$). We conclude that the inhibitory cascade mechanism produces the default tooth size patterning for primary postcanine teeth in mammals, including hominins. Based on the relationship of changing inhibitory cascade patterning with size, we can use the size of a single tooth to predict the sizes of the remaining four primary postcanine teeth in the row for most hominins. *Ardipithecus* appears to be the largest outlier in this relationship among hominins, showing larger posterior molars than predicted for the size of the first molar. Our study shows the major influence of this developmental patterning mechanism in the evolution of the unique proportions of human teeth.

**Grant Information**

Australian Research Council (A.R.E.), Academy of Finland (J.J.), Wenner-Gren Foundation (K.K.C.), National Science Foundation (K.S.P.)

Technical Session VII (Thursday, October 15, 2015, 1:45 PM)

**A NEW CENTROSAURINE CERATOPSID FROM THE OLDMAN FORMATION (MIDDLE CAMPANIAN), ALBERTA, CANADA, AND THE EVOLUTION OF CERATOPSID NASAL ORNAMENTATION**

EVANS, David C., Royal Ontario Museum, Toronto, ON, Canada, M5S 2C6; RYAN, Michael, Cleveland Museum of Natural History, Cleveland, OH, United States of America

The fossil record of ceratopsids between the occurrence of their proximate sister taxa in the Turonian and the beginning of their well-documented radiation from the late Campanian of North America onwards (between approximately 90 and 77 Ma) is poor, with only seven taxa described from this early period in their evolution. We describe a new taxon of a highly adorned basal centrosaurine from the lower part of the Oldman Formation (middle Campanian, approximately 78-79 Ma), Alberta, Canada. Almost 200 bones derived from virtually all parts of the skeleton, including numerous well-preserved specimens of the parietosquamosal frill were collected from a medium-density, monodominant bonebed. The new taxon is apomorphic in having epiparietals at loci 2 and 3 developed as broad-based, pachyostotic processes that are strongly procurved anterodorsally to overhang the parietal fenestrae. Although the morphology of the nasal is incompletely known, it clearly had large, upright nasal ornamentation located close to the orbits, which represents the oldest occurrence of a prominent nasal horn in Ceratopsia.

The most inclusive phylogenetic analysis of centrosaurine ceratopsids to date was conducted to assess the systematic position of the new taxon. The analysis resulted in 18 most parsimonious trees, with the new centrosaurine recovered as the sister taxon of *Sinoceratops zhuchengensis* in all of the most parsimonious trees. This clade forms a polytomy with *Xenoceratops foremostensis* and a much larger clade that includes *Centrosaurus apertus* and Pachyrhinosaurini. Overall, the topology within Centrosaurinae is very similar to that recovered in recent analyses, with *Diabloceratops* recovered as the sister taxon to all other centrosaurines, and a *Nasutuceratops* +