provided by recognition of the proximity of the Paleozoic Hangenberg extinction withboth actinopterygian diversity increases and deep phylogenetic branching events. The first study of Paleozoic ray-fin morphospace reveals two surprising phenomena: 1) the diversification of early actinopterygians occurred along functional lines recognizable from extant teleosts; 2) expansion in cranial morphospace occurred in the immediate aftermath of the end-Devonian Hangenberg extinction, while post-cranial diversification lagged by one stage. The functional signal suggests hydrodynamic limits on aquatic vertebrate form were hit early in actinopterygian evolution. The lag between head and body morphospace expansion indicates a changed relationship between functional modules falling under different selective pressures. Actinopterygian diversification was likely first driven by occupation of feeding niches, while locomotory specialization occurred only later, as competition increased. This pattern was suggested to occur among living species (e.g. cichlids) at a microevolutionary scale, but had not been observed at larger temporal or taxonomic levels. Such modular lags – gaps between the diversification of otherwise related functional structures such as heads and bodies - might be a common feature of adaptive radiations.

Poster Session III, (Tuesday)

ECOLOGICAL STRUCTURE AND HABITAT OF TWO MIDDLE MIOCENE SOUTH AMERICAN MAMMAL PALEOCOMMUNITIES

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Middle Miocene South American land mammal communities include many species with few or no close living relatives. This can hamper inferences of habitat and community structure or, in some cases, result in erroneous conclusions. One way to deal with such challenges is taxon-free analysis, which focuses on attributes of species rather than their taxonomic affinities. When used with a sufficiently broad comparative data set of modern taxa, taxon-free analysis can provide robust insights into extinct communities.We performed a taxon-free analysis on 120 modern-day mammal communities representing diverse habitats, spread throughout the globe, and two middle Miocene localities: La Venta, Colombia and Quebrada Honda, Bolivia. Our goal was to: (1) test whether the vegetational structure of these localities could be inferred using modern communities; and (2) determine which modern communities were most appropriate models. The fact that the vegetational structure of La Venta has been studied extensively provided a baseline to judge the accuracy of the results. We coded each nonvolant land mammal species for size, locomotor range, and diet. The six size categories were based on an exponential scale. The locomotor categories included arboreal, semi-arboreal, terrestrial, semi-fossorial, fossorial, semi-aquatic, and cursorial. Dietary categories included fruit, grasses, insects, invertebrates, leaves, seeds, bark, and vertebrates. There was also a true omnivore category, for species that had many categories make up their primary diet.These data were used to calculate the percentage of species in each fauna in each category. We then arcsin transformed the data, and used the statistical and graphing program,JMP, to perform a cluster analysis and principal components analysis (PCA). The cluster analysis matched previous findings, in that La Venta clustered with many forested areas. Quebrada Honda grouped with open habitats and temperate broadleaf forests. Additionally, La Venta grouped with South American, North American, and African faunas, while Quebrada Honda grouped with Australian ones.

Technical Session V, Sunday 1:45

IMPACTS OF CENOZOIC CLIMATE AND HABITAT CHANGES ON RODENT COMMUNITIES

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A well-documented paleoclimatic record shows a general trend of later Cenozoic global cooling and increased aridity, corresponding with large scale environmental changes from predominantly forest to more open habitats. Previous studies of large mammalian herbivores show ecomorphological and community structure changes corresponding with environmental changes. Here we use the fossil record of rodents from the Cenozoic of North America to improve our understanding of the history of the herbivore component of terrestrial communities. Rodent adaptations for jumping and burrowing should reflect more open environments, and higher crowned teeth should reflect increased aridity and the presence of grasses. Morphological data were gathered for nearly 150 extant rodent genera, including: tooth crown height, incisor shape, relative grinding area, overall limb proportions, and the size of muscular attachments. Discriminant function analysis, analysis of variance, and linear regressions were used to build an ecomorphological framework to infer the dietary and locomotor habits of extinct rodents. 51 extinct species were measured and supplemented by data from literature sources. Broad scale patterns within North American rodent communities were analyzed, as well as finer scale changes within the fossil records of Oregon and Nebraska.Jumping adaptations first appear in rodents around the early Miocene, similar timing to ungulate cursoriality. Burrowing adaptations are seen in multiple lineages as early as the mid Oligocene (30 Ma), and highly fossorial beavers are seen by the late Oligocene (26 Ma). Multiple rodent lineages display parallel increases in herbivorous adaptations over time, such as increased crown height, enlarged grinding area, and broad incisors. The proportion of rodents within communities displaying these adaptations increased dramatically between 30 – 20 Ma. The origin and subsequent radiation of rodents with these ecomorphological adaptations corresponds with environmental changes. This suggests that, in contrast to larger mammals, rodents responded very quickly to mid Tertiary environmental changes, possibly as a result of their shorter generation times.

Poster Session IV, (Wednesday)

MORPHOLOGICAL DIVERSITY OF THE EARLY MIOCENE TRAGULIDAE (CETARTIODACTYLA, RUMINANTIA)

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Tragulids comprise small and primitive ruminants that survive as relics in the Old World tropical belt, the genus *Hyemoschus* in Africa and *Tragulus* and *Moschiola* in Asia. The Tragulidae belong to an ancient radiation of basal non-pecoran ruminants that were very common during the Paleogene. The genus *Archaeotragulus*, from the late Eocene of Thailand, is the oldest known tragulid so far. However, with the exception of *Archaeotragulus*, the Tragulidae are unknown from Paleogene deposits. Tragulids suddenly reappear in the basal Miocene, revealing a surprisingly high diversity. These very first Miocene forms are recorded in Africa (ca. 19-20 Ma) represented by *Dorcatherium* and the recently described genus *Afrotragulus*. Shortly after, tragulids are also registered from Asia (*Dorcabune* and *Siamotragulus*) and Europe (*Dorcatherium*). We present here a comparative anatomical analysis of the early Miocene tragulids *Dorcatherium*, *Afrotragulus*, *Dorcabune* and *Siamotragulus*, focusing on published data and new unpublished material from Kenyan and Ugandan localities. We discuss their dental features and their biogeographical distribution. Our results show that, when tragulids are first recorded in the early Miocene of Africa and Asia, two advanced selenodont forms (*Afrotragulus* in Africa and *Siamotragulus* in Asia) existed along with two more primitive bunoselenodont genera (*Dorcabune* in Asia and *Dorcatherium* in Africa). The lower cheek teeth of the selenodont tragulids show a characteristic array of features including flat cusps with expanded cristids, which easily set them apart from the bunoselenodont genera. These features are highly developed in *Afrotragulus*, which also shows elongated molars with very reduced 'M'-structure and an interrupted contact between the anterior and posterior lobes. In fact, *Afrotragulus* will help to clarify the taxonomy and systematics of the group, hitherto obscured by the excessive use of body size as the main criterion used by specialists to diagnose extinct tragulid species. Finally, this early Miocene diversity of tragulids suggests that the family underwent a yet-unknown and important radiation event previous to their first Miocene record.

Poster Session III, (Tuesday)

THE PULMONARY ANATOMY OF *ALLIGATOR MISSISSIPPIENSI*: A UNIDIRECTIONAL AIR FLOW SYSTEM THAT FORESHADOWS THE AVIAN RESPIRATORY SYSTEM

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Recently we suggested that unidirectional airflow was present in the common ancestor of birds and crocodilians based on our observations of a bird-like pattern of airflow in the lungs of alligators. Furthermore we hypothesize that there are key features of the lung that give rise to this pattern of airflow that are shared by birds and crocodilians. Here we re-examine the anatomy of the alligator lung with the aim of gaining insight into the mechanisms by which this pattern of flow is generated and of elucidating pulmonary features that may be homologous with the avian lung-air sac respiratory system. Like previous workers we find a similar structural plan is present in the crocodilian and avian lung. Using computed tomography and gross dissections, we revisit the anatomy of the crocodilian lung. The topography of the lung of juvenile American alligators is highly similar to the embryologic topography of the avian bronchial network and air sac system. We describe in greater detail the macroscopic anatomy of the alligator lung, homologize avian similarities, and identify the various morphological characters associated with the unidirectional flow-through system including: a Hazelhoff loop-like aerodynamic valve that separates inhaled and exhaled airflow, dorsally located hypervascular gas exchange lung zones, nested spiral inhalational intrapulmonary conductive bronchi, ventral exhalational intrapulmonary bronchi, and hypovascular ventrally located rudimentary intrapulmonary air sacs.

Evolution of the Modern African Fauna, Wednesday 8:45

AFRO-ARABIA AS THE CRUCIBLE OF PROBOSCIDEAN EVOLUTION

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Since the last major review of African proboscideans three decades ago, new fossil discoveries and chronostratigraphic, systematic, and paleoecological advancements have established Afro-Arabia as the locus of most major proboscidean evolutionary events, extended the record of the order >20 million years older to the late Paleocene, and have more comprehensively documented its phylogeny and temporal, geographic, faunal, and paleobiological contexts. Proboscideans, and constituent taxa including phosphatheres, numidotheres, barytheres, moeritheres, palaeomastodonts, deinotheres, mammutids, gomphotheres, and elephants are now known to have originated in Afro-Arabia, with greatest taxonomic diversity in the Miocene. Comparative study of features such as loph(id) number, accessory conule/crescentoid distribution, half-loph(id) configuration, and tusk shape and construction, indicates that mammutid-gomphothere divergence occurred earlier than previously recognized, possibly within early Oligocene Palaeomastodontidae. It has also helped identify basal members of initial early Miocene gomphothere radiations of gomphotheriines, amebelodontines, and choerolophodontines. As well, this work facilitated development of phylogenetic schema outlining progressive morphometric transformations in these subfamilies and mammutids