INGROUPS AND OUTGROUPS: A PERTURBATION ANALYSIS

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Accurate identification of the first or first two closest outgroups is necessary for the polarization of the characters pertaining to ingroup taxa. But what if ingroup-to-outgroup relationships are not known a priori? In order to assess the influence of misidentification of proximate outgroups on character polarity, we conducted perturbation analyses on 1) two idealized character sets drawn from a fully-resolved Hennigian comb and a fully dichotomized symmetrical "bush", both fully-resolved and consisting of 14 terminal taxa, and 2) the character set provided in Holtz's recent cladistic analysis of non-avian theropods. Terminal ingroup taxa were employed as "outgroups" in successive PAUP analyses in order to assess changes in tree topology, tree length, and consistency indices (C.I.) that result from alterations in character polarity. Perturbation analyses produced either a decrease or an increase in C.I. accompanied by changes in tree topology and tree length. Increases in C.I., which occur more frequently in trees characterized by extensive homoplasy, is especially significant in that an inappropriately-chosen outgroup may lead to the acceptance of an incorrect tree.

PALEOCOLOGY OF AN EOCENE COASTAL COMMUNITY FROM GEORGIA.

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Open pit mines in the well forested and topographically low lying kaolinite mining district near Macon, Georgia provide temporary windows into covered Eocene strata and access to their incorporated fossils. Early late Eocene (Jacksonian) nearshore deposits of the Clinchfield Formation (Barnwell Group) are exposed in the Wilkinson kaolinite mine near Gordon, Georgia. These sands have yielded remains of a diverse coastal vertebrate community. Fish teeth and bones belong to 10 shark species, 6 rays and sawfishes, and 5 osteichthyans. Reptilian material comes from crocodilians, turtles, and the giant sea snake Pterosphenus schucherti. Skeletal fragments of the archaeocete whales Basilosaurus cetoides and Zygorhiza kochii are common.

The association of the lamnid shark genera Lamna, Isurus and Carcharodon implies that water temperatures may have been somewhat similar to those found in the northern Gulf of Mexico today. Living Isurus prefer waters 16°C and warmer, Lamna resides in waters 18°C and cooler, while Carcharodon inhabits warm temperate and colder waters. The Wilkinson mine thanatocoenose may reflect seasonal change in the shark community as water temperatures changed because of variation in solar warming, upwelling, or through shifts in coastal current directions. Isurus may have replaced Lamna seasonally as cool waters warmed and exceeded whatever warm-water threshold Jacksonian lamnids held.

HOMOLOGIES OF THE PROOTIC CANAL IN MAMMALS AND NON-MAMMALIAN CYNODONTS

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A prootic canal is a synapomorphy of Mammalia, the clade of Recent mammals and various primarily Mesozoic outgroups (e.g. morganucodontids, multituberculates). Our study reveals that the term has been applied to four morphologies. It encloses: the prootic sinus (most extinct "non-tribosphenic" mammals); prootic sinus and stapedial ramus superior (platypus and most multituberculates); prootic sinus and lateral head vein (echidna); and lateral head vein alone (some marsupials). We restrict the term to the canal for the prootic sinus at its endocranial exit. As so defined, the prootic canal: 1) in extinct "non-tribosphenic" mammals passes through the petrosal's lateral trough; 2) in the platypus forms between the petrosal and lamina obturans and also transmits a ramus superior branch; 3) in the echidna forms within the petrosal; and 4) in marsupials forms between the petrosal and squamosal. The echidna and some marsupials also have a lateral head vein canal. Several vascular canals in non-mammalian cynodonts have been proposed as precursors of the prootic canal in mammals. We conclude that the most likely one is a canal through the lateral flange of the prootic similar to those in *Probainognathus* and *Massetognathus*. However, until a prootic canal is found in other non-mammalian taxa, the canals in these two cynodonts are most reasonalby viewed, given current phylogenies, as acquisitions independent of the prootic canal in mammals. (Supported by NSF: BSR-8906619 and BSR-9119212.)

PHYLOGENY OF THE PRIMATE FAMILY OMOMYIDAE: A CLADISTIC ANALYSIS "BACKBONED" WITH STRATIGRAPHY

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The Omomyidae, along with the Adapidae, are the earliest true primates. To understand omomyid cladogenesis and to assess omomyid relationships with *Tarsius* and anthropoids, 136 dental characters were scored for 51 taxa, and the resulting data matrix subjected to computerized parsimony analysis. Stratigraphic information was incorporated into this analysis through a series of "backbone" constraints in PAUP. The way in which the stratigraphic data is incorporated is novel. Taxa are added successively as they occur temporally in the fossil record. The most parsimonious outcome of each heuristic search becomes the "backbone" upon which subsequently occurring taxa are fit.

Results of this analysis indicate that omomyids are a natural group divisible into two traditionally recognized subfamilies: Anaptomorphinae and Omomyinae. Washakiins are removed from Omomyinae, as they appear to be more closely related to anaptomorphines such as *Tetonoides* than to taxa here considered omomyines. Omomyines share a number of features with adapids, but these are probably primitive retentions and not indicative of a sister-group relationship. European microchoerines may have evolved from a form near North American *Anemorhysis*. *Tarsius* links most parsimoniously with omomyids. Linkage of anthropoids with either adapids or omomyids is nearly equally parsimonious. Therefore, dental evidence does not resolve the problem of anthropoid origins.

NEW GENUS AND SPECIES OF EARLY PALEOCENE (TORREJONIAN) LEPTICTID? FROM THE NACIMIENTO FORMATION, SAN JUAN BASIN, NEW MEXICO

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A new genus and species of leptictid? is represented by several specimens consisting of numerous isolated teeth, a mandible fragment, and a partial skull and nearly complete postcranial skeleton of a single individual (NMMNH P-22051). The postcranium includes numerous vertebrae, the pelvis, most of the fore and hindlimb elements, and some pedal elements. All referred specimens are derived from the *Mixodectes pungens* range zone of the Nacimiento Formation from the head of Escavada Wash and the west and east flanks of Torreon Wash and are housed at the New Mexico Museum of Natural History and Science.

The new taxon shares numerous dental and postcranial characters with leptictids including a molariform posteriormost lower premolar with a prominent paraconid, labially positioned paracone and metacone, a narrow ectocingulum, an enlarged deltoid crest present on the anterior surface of the humerus, a fore limb much shorter than the hindlimb, a distally fused tibia-fibula, a hindlimb with elongate tibia, fibula and pes, and an astragalar foramen present ventrally, but not dorsally. However, the new taxon lacks some dental characters previously used to diagnose leptictids such as molar pre- and postcingula and hypocone. The enlarged deltoid crest combined with a laterally expanded olecranon process on the ulna indicates emphasized adduction and retraction of the forelimb and is presumably an adaptation for digging.

HIGHER-LEVEL PHYLOGENY OF SAUROPOD DINOSAURS

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Although sauropod dinosaurs constitute a significant portion of dinosaur diversity during the Jurassic and Cretaceous Periods, their evolutionary history has not been studied in detail. Traditionally, sauropods have been placed into two families based on tooth shape (narrow vs. spatulate). More recently, sauropods were divided among six families based on a sampling of characters. Familial monophyly and interrelationships have rarely been addressed. We present a numerical cladistic analysis of approximately 150 characters across 15 genera that encompass sauropod diversity.

Substantial cranial and postcranial evidence support the early divergence of several basal taxa, including *Shunosaurus*, from a newly-recognized clade including all other sauropods, here termed Neosauropoda. Neosauropoda includes two subclades: Diplodocidae, and an as yet unnamed group of large-nostrilled forms. Within the latter subclade, *Camarasaurus* and *Haplocanthosaurus* form successive sister taxa to a well-supported clade consisting of *Brachiosaurus* and titanosaurs.

These results suggest that early in their history sauropods evolved a digitigrade manus which was subsequently lengthened within non-diplodocid neosauropods. In addition, at least three subgroups independently lengthened their necks, and narrow-crowned teeth evolved in parallel in titanosaurs and diplodocids.

SYSTEMATIC POSITION OF THE ENIGMATIC TELEOST *PLATACODON NANUS* MARSH, FROM THE UPPER CRETACEOUS OF NORTH AMERICA

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