

When detached from the original base, each skeleton and crate behaved as a rigid unit which could be moved easily and safely with minimum concern.

24

CARNIVORES FROM THE DUCHESNEAN AND CHADRONIAN OF SASKATCHEWAN

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The Cypress Hills Formation of southwestern Saskatchewan preserves the remains of vertebrate faunas that range in age from the Uintan to the Hemingfordian. Carnivoran taxa from two of these localities are described; recovered remains are fragmentary and include mostly isolated teeth. The Lac Pelletier Local Fauna is of Duchesnean age; of the over 2000 specimens that have been recovered only 15 are definitely or probably representative of the Carnivora. Nonetheless this sample adds important information regarding this poorly known period of carnivoran history. The fauna includes *Prodaphaenus* new sp., *Daphoenus* cf. *D. demilo*, *Hesperocyon*, and several indeterminate taxa. This may be the earliest record of *Hesperocyon*. The Calf Creek Local Fauna includes a typical, but diverse, early Chadronian fauna which includes daphoenines, *Hesperocyon*, *Campylodyon* cf. *C. parvus*, "Parictis," nimravids (possibly *Dinictis* and *Hoplophoneus*), and additional indeterminate taxa. A significant number of deciduous teeth of daphoenines and *Hesperocyon* are included.

25

GEOCHRONOLOGY OF A NEW EARLY BARSTOVIAN VERTEBRATE FAUNA, UPPER TORREYA FORMATION, EASTERN FLORIDA PANHANDLE

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The Willacoochee Creek Local Fauna (WCLF) has been recovered from nearshore marine sediments of the upper Torreya Formation, Hawthorn Group, exposed in clay mines in northern Gadsden County, Florida. The WCLF has at least 68 vertebrate taxa from marine and nonmarine environments, including 29 mammals. The age is early Barstovian based on the presence of *Copemys*, three primitive merychippines, and ranges of several other ungulates. Biogenic carbonates (marine molluscs) were analyzed for Strontium isotopic ($^{87}\text{Sr}/^{86}\text{Sr}$) chronostratigraphy. Results indicate ages of 14.9 to 16.2 ± 1.4 Ma based on linear regression of the global Strontium curve between 13.5 and 18 Ma. Magnetic polarity stratigraphy indicates the entire exposed section (about 15 meters) is reversed, and correlates best with Chron C5BR based on vertebrate and invertebrate biochronology, Strontium results, and single polarity of the sediments. Synthesis of all geochronologic methods restricts the age of the WCLF to between about 15.3 and 15.9 Ma.

26

A NEW MOSASAUR FROM THE UPPER DEMOPOLIS FORMATION OF SUMTER COUNTY, ALABAMA

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A mosasaur described from a well-preserved skeleton represents a new species. The fossil was found in a marl stringer at the contact between the Bluffport Marl Member and the unnamed middle member of the Demopolis Formation (Campanian/Maastrichtian boundary) in western Alabama. Consisting of a nearly complete skull, most of the vertebral column, ribs, cartilagenous elements, pectoral and forelimb material, it has provided detailed osteological information for the enigmatic Alabama plioplatecarpine mosasaurs.

Quite similar to *Platecarpus* cf. *P. somenensis*, whose affinities remain unclear, the new mosasaur possesses derived features such as enlarged pineal foramen, huge scapula, and increased number of pygal vertebrae, which place it closer to *Plioplatecarpus*. This new Demopolis mosasaur is not conspecific with the slightly younger Belgian forms, *Plioplatecarpus marshi* and

P. houzeaui.

27

THE BALLY MOUNTAIN LOWER PERMIAN VERTEBRATE LOCALITY, KIOWA CO., OKLAHOMA

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An inactive quarry on Bally Mountain, at the northwest-most end of the Slick Hills in southwestern Oklahoma, exposes a complicated system of fissures and sinkholes that were open to the surface during Leonardian time and in which accumulated a variety of reptiles and amphibians. The well-known Richard's Spur (Ft. Sill) locality lies approximately 35 miles to the southeast at the southern end of the Slick Hills.

The cave system exhibits a variety of speleothems and was largely filled with vadose cements, breccias formed during cave collapse, or with illite that filtered down from surface openings. Periodically, oil seeped into the system, resulting in oil impregnated speleothems and pseudovirved illitic cave fills.

Numerous bones and bone fragments appear to record a brief period of accumulation. The majority of the fragments are rounded and water worn, but identifiable vertebrate remains are abundant. Preliminary work suggests that there will be in excess of 50K bones/bone fragments. The most abundant taxon is *Captorhinus*. Other taxa include *Thrausmosaurus*, *Mycterosaurus*, *Edaphosaurus*, indeterminate labyrinthodonts, an indeterminate caseid pelycosaur, a microsauro, and unassigned, small, bladed teeth with accessory cusps.

28

A NEW RECONSTRUCTION OF THE SKULL OF A LATE JURASSIC TRICONODONT MAMMAL

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Since the description of *Priacodon fruitaensis* in 1981, much more of the skeleton of the holotype specimen has been found in association with the mandible figured in the original description. Nearly complete left and right maxillae, both mandibles, and a frontal bone are present from the skull and jaws. Several postcranial elements are present as well.

In addition to providing a definite association of postcranial elements with this taxon, a new reconstruction of the skull of *Priacodon* provides more information than previous reconstructions. The palate can be reconstructed with a high degree of confidence, and estimates of the overall shape and proportions of the skull and jaws are constrained by several anatomical landmarks. The resulting interpretive reconstruction is of a somewhat short-faced, wide skull that appears rather robust for a small animal.

Functional analysis of this specimen suggests an animal with a wide gape and a powerful bite. This, in turn, allows us to speculate on the functional and ecological roles of this taxon, and perhaps of Jurassic triconodontids in general.

29

TWO NEW DINICHTHYID ARTHRODIRES (PLACODERMI) FROM THE UPPER DEVONIAN OF ONTARIO (MICHIGAN BASIN) AND OHIO (CATSKILL BASIN)

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The family Dinichthyidae, named after *Dinichthys hertzeri*, has been based solely on plesiomorphic characters. *Heintzichthys* and *Gorgonichthys* have been removed from the family with the relationship of remaining members unclear. Hlavín (1976, unpublished dissertation, Boston Univ.) described a new species of *Dunkleosteus* from the Huron Shale of Northern Ohio, U. S. A. Material from the Kettle Point Shale, Ontario, Canada, is currently being acid prepared

and demonstrates the presence of a new dunkleosteid species in the Michigan Basin. The material from both localities is similar to *Dunkleosteus terrelli* from the Cleveland Shale. The new species differ in the presence of a fine dermal tuberculation. The Michigan Basin form is further characterized by a distinct anterior articular surface on the parasphenoid.

30

SCALING OF REPRODUCTIVE TURNOVER IN ARCHOSAURS AND MAMMALS: WHY ARE LARGE TERRESTRIAL MAMMALS SO RARE?

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In 1953, Kurtén suggested that mammals might be more limited than dinosaurs in reproductive turnover, with the result that mammals were less able to attain large body sizes in evolution. We address this hypothesis quantitatively, using data from life-history variables from non-passerine, predominantly terrestrial, birds as "dinosaur analogs" (including dinosaur data where available). We show that archosaurs differ profoundly from mammals in many reproductive parameters, most notably in the scaling of these factors with body size. Large dinosaurs have a far greater potential for producing large numbers of young over their lifetime than large terrestrial mammals (although whales show a somewhat different pattern). We suggest that, over evolutionary time, large dinosaurs would be better able to withstand environmental perturbations than large mammals, due to their capacity (at least) to rapidly rebuild population levels (an impossibility for large mammals), and that these reproductive differences might be a factor in the observed rarity of very large terrestrial mammals (> 5000 kg) versus the common occurrence of dinosaurs of this size and above.

31

HUPEHSUCHUS, AN AQUATIC REPTILE FROM THE TRIASSIC OF CHINA, AND THE PROBLEM OF ESTABLISHING RELATIONSHIPS

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Hupehsuchus, an aquatic reptile from the Triassic of China, represents a previously unrecognized diapsid order, the Hupehsuchia. *Hupehsuchus* exhibits a unique combination of skeletal features including very long, completely toothless jaws, bipartite neural spines, a complex pattern of dermal armor above the vertebral column, and laterally compressed, spindle-shaped body form. Many derived features of *Hupehsuchus* are also observed in other groups of Mesozoic diapsid reptiles, but no specific sister-group relationship can be established. The difficulty in determining the relationship of the Hupehsuchia may be attributed to the limited knowledge of the fossil record of diapsid reptiles in the Late Permian and Early Triassic, as well as the great amount of convergence exhibited by secondarily aquatic reptiles. The principle of parsimony cannot be used directly to identify homologous characters if the majority of derived characters are convergent. Patterns of vertebrate radiation may inherently limit the number of synapomorphies that might theoretically be expected to unite divergent sister-groups.

32

CUSP HOMOLOGIES IN AUSTRALIAN DIPROTODONTIAN MARSUPIALS WITH SELENODONT AND LOPHODONT UPPER MOLAR MORPHOLOGIES

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Two conflicting interpretations have been proposed as to the cusp homology of the two large buccal cusps in lophodont upper molar dentitions of diprotodontian marsupials. One view is that the large buccal cusps represent hypertrophied stylar cusps B and D and that the paracone and the metacone are incorporated into the medial portion of their respective lophs. The opposing view is that the paracone and metacone are the large buccal cusps in the two upper molar lophs.

The uncertainty of cusp homology in lophodont dentitions stems from two factors. First, the buccal shift of the paracone and the metacone to the margin of the tooth results in the loss or reduction of the stylar shelf and cusps, with the V-shaped centrocrista of the W-shaped ectoloph becoming secondarily linear due to the buccal shift of the paracone and metacone. Second, both the neoparaconule and the neometaconule develop anterobuccal and posterobuccal cristae analogous to, although smaller than, those of the paracone and the metacone. Thus, the form of the two intermediate conules mimics that of the paracone and metacone and can be mistaken for them, when the conules become incorporated into the lophs.

33

NEW "BATHORNITHINE" FOSSILS FROM SAN DIEGO COUNTY, CALIFORNIA

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Late Eocene and late Oligocene fossil birds from San Diego County, California were compared to "bathornithine" species from Colorado, Nebraska, South Dakota, and Wyoming. Olson has suggested that the genus *Bathornis* is not monophyletic and additional genera should be named for several of the species in *Bathornis*. However, upon investigation of the Bathornithidae, it appears that the family is polyphyletic.

34

IMPACT VOLCANISM AND DINOSAUR EXTINCTION AT THE K/T BOUNDARY, INDIA

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Plate tectonic reconstruction suggests that the western coast of India was attached to the Seychelles-Saya de Malha Bank at anomaly 29 (K/T boundary) time. The reconstruction reveals a large circular feature at the rift margin, and is interpreted as the proposed K/T impact structure. The structure is consistent with the size and age of the K/T event. The western rim of the crater is represented by the Amirante Arc, while the eastern rim of the crater survives in the Panvel Flexure near the Bombay coast. The crater shows the morphology of a complex impact scar: 1) the outer ring, about 900 km across; 2) an annular trough filled with basalt; and 3) the central uplift, represented by the Seychelles granitic core. The size and abundance of shocked minerals such as stishovite and coesite in the fine ejecta components support this impact scenario at India. The impact shattered the lithosphere and created a spreading ridge between India and the Seychelles. It was oblique along a SW-NE trajectory to produce radial and asymmetric fractures on the NE side of the crater exterior, through which the Deccan lava erupted. Stratigraphic data show that few dinosaurs survived the impact as well as the first eruption of the Deccan lava. The deleterious environmental consequences due to impact and long period of volcanic emissions may explain different tempos of extinction patterns across the K/T boundary.

35

POSSIBLE HERBIVOROUS DINOSAUR COPROLITES FROM THE TWO MEDICINE FORMATION (LATE CRETACEOUS) OF MONTANA

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Aggregations of permineralized plant material found near large concentrations of hadrosaur fossils may be herbivorous dinosaur coprolites. The aggregations are found isolated or in groups in fluvially-reworked volcanoclastic sediments. They appear to be scattered in the matrix without forming a continuous layer.

The specimens range up to 34x33x24 cm and consist predominantly of plant material permineralized with CaCO₃. They occur as irregular blocks without specific shape. Most plant fragments observed are less than 3 cm long, and have rough, angular edges.