

A RESTORATION OF THE CRANIO-CERVICAL SYSTEM IN *JOBARIA*

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*Jobaria tiguidensis*, a basal sauropod recently described from the Tiouraren Formation of Niger (Neocomian, ~140-130 Ma), is the most primitive Cretaceous sauropod, and one of the largest. As part of a traveling exhibition sponsored by Project Exploration, we constructed a life-size restoration of the head and neck of *Jobaria*, showing the muscular system, pneumatic air sacs, and skin. In reconstructing the soft tissues in the head and neck of *Jobaria*, we drew heavily on dissections of raites (*Struthio camellus* and *Rhea americana*). Most osteological characters in the cervical series of sauropods are homologous with those of birds, and indicate that the origins and insertions of most muscles are essentially the same in the two groups. Examples include epiphyses (= processes dorsalis) for the insertion of longus colli dorsalis and cervicalis ascendens muscles, cervical ribs for the insertion of the longus colli ventralis, and rugosities on the neural spine for the attachment of interspinous muscles and ligaments. Although the pneumatic characters in the vertebrae of *Jobaria* are less extensive and complex than those of either derived sauropods or birds, large pneumatic fossae are present on every cervical vertebra except the atlas. In birds, the vertebrae are pneumatized by diverticulae arising from pulmonary air sacs in the body cavity, and it seems likely that a similar system of air sacs was also present in the body cavity of *Jobaria*.

NEW THEROPOD AND BIRD TEETH FROM THE LATE CRETACEOUS (CAMPA-  
NIAN) JUDITH RIVER GROUP, ALBERTA

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Intensive screening of microvertebrate sites from the Judith River Group (Campanian; ~79.5-74 Ma) during the past 15 years by the Royal Tyrrell Museum of Paleontology has produced more than 1,700 theropod teeth. This sample was studied and many specimens in each taxon were measured. Several new taxa or morphotypes are recognized and described. The results include: a new morphotype of *Dromaeosaurus*, three new morphotypes of *Sauvornitholestes*, a new species of *Richardoestesia*, the recognition that '*Sauvornithoides*' is a valid taxon, two new morphotypes of *Paronychodon*, and the recognition of small bird teeth. This work increases the known diversity of theropods and birds from the Judith River Group, an exceptionally rich and well studied unit which is often used in comparisons of theropod diversity levels between the late Campanian and latest Maastrichtian. Understanding the reasons for this high diversity, and for the possible decrease in diversity during the Maastrichtian, is essential in any explanation for the theropod extinctions at the K/T boundary.

NEW VERTEBRATE ICHNOFOSSIL LOCALITIES FROM NATIONAL PARKS IN THE  
WESTERN UNITED STATES

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Dozens of new vertebrate ichnofossil localities have recently been identified in three National Park Service areas in the western United States. A high concentration and diversity of tracks have been discovered within the Glen Canyon Group at Zion National Park, Utah. Track localities have been documented from within the Whitmore Point Member of the Moenave, the Kayenta, and the Navajo formations between 1999 and 2000. A number of new and undescribed track localities were discovered during the Arches National Park Paleontological Survey initiated in 2000. Tiny tridactyl tracks (3-6 cm) were documented within the Moab Tongue Member of the Entrada Sandstone (Jurassic). The first theropod tracks and possible pterosaur feeding traces were found in the Lower Cretaceous Cedar Mountain Formation. Hundreds of vertebrate tracks have been documented from Late Miocene lacustrine sediments exposed in Death Valley National Park, California. The ichnofossil assemblage preserved in the Copper Canyon Formation consists of tracks associated with birds, carnivores, artiodactyls, perissodactyls (equids), and proboscidians. K-Ar age determination and the presence of proboscidian tracks indicate that the track-bearing unit occurs in the early to middle Hemphillian Land Mammal Age. During 1999, two individual tridactyl tracks were discovered for the first time in Copper Canyon. The track morphology suggests an affinity to ceratomorph perissodactyls and represents one of the youngest documented tridactyl tracks.

THE POSTCRANIUM OF *PTILOCERCUS LOWII* AND OTHER ARCHONTANS: AN  
ANALYSIS OF PRIMATOMORPHAN AND VOLITANTIAN CHARACTERS

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The mammalian orders Scandentia, Primates, Dermoptera, and Chiroptera have been grouped together by many systematists, using various methods and data sets, into the cohort Archonta. Within Archonta, some systematists have grouped Dermoptera and Chiroptera together in the Volitantia, while others have grouped Dermoptera and Primates together in the Primatomorpha. The order Scandentia includes the single family Tupaiidae, with two sub-families, Ptilocercinae and Tupalinae. The Ptilocercinae is represented only by *Ptilocercus lowii*, which has been said to be the taxon most closely approximating the ancestral tupaiid. However, most researchers working on archontan phylogeny typically do not treat the order Scandentia as being polymorphic. They usually use *Tupaia* to represent Scandentia, despite the fact that *Ptilocercus* is quite distinct from *Tupaia* and has been argued to be the more plesiomorphic of the two taxa. In this study, a character analysis was performed on postcranial features that have been used to support the competing Primatomorpha and Volitantia hypotheses. Additional features, particularly vertebral characters, were also analyzed. In recognition of the polymorphic nature of Scandentia, taxonomic sampling within Scandentia was increased to include *Ptilocercus*. The postcranium of *Ptilocercus* was analyzed functionally and compared to that of tupalines, plesiadapiforms, dermopterans, and chiropterans. Differences related to differential substrate use were found between *Ptilocercus* and the tupalines in several regions of the postcranium. Several character states used to support either Primatomorpha or Volitantia, while not found in *Tupaia*, were found in *Ptilocercus*. While these features may have evolved independently in *Ptilocercus*, it is perhaps more likely that they represent features that first evolved in the ancestral archontan and were then lost in one of the extant orders.

## ANATOMY OF AN UPPER CRETACEOUS ELASMOSAUR FROM SASKATCHEWAN

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The Elasmosauridae, a group of long-necked plesiosaurs, are common from Mesozoic marine sediments around the world. A new specimen from the Upper Cretaceous Bearpaw Formation (Campanian - Maastrichtian) of Saskatchewan includes the skull and partly articulated skeleton, permitting detailed anatomical study. This is a subadult individual in that ossification is almost completed. Compared to other elasmosaurids from the Upper Cretaceous of North America, the skull is relatively small and short-snouted (estimated beak index about 30). Inside of the roof of the braincase and internal ear cavities are exposed, showing the impression of the brain and semicircular canals. In addition to typical elasmosaurid characters, the Saskatchewan elasmosaur has unique characters including a single tooth on the median line of partly fused premaxillae, lack of splenial, and pointed coronoid process. Also, the left and right prezygapophyses are united to form a spoon-shaped articular surface to receive partly united postzygapophyses of anterior cervical vertebrae. Unlike most elasmosaurs, the humerus is slightly shorter than the femur. The right femur has a healed fracture in the middle of the shaft. The epipodial foramen is obviously marked in forelimbs, but less significant in hind limbs. An unusual feature is an enclosed foramen between metacarpals III and IV of both front limbs. The Saskatchewan elasmosaur is one of the latest records of plesiosaurs from the Western Interior Seaway of North America, and the first nearly complete elasmosaurid skeleton from Canada.

PRELIMINARY HISTOLOGICAL ANALYSIS OF A PTEROSAUR (PTERODACTY-  
LOIDEA, ANHANGUERIDAE) FROM THE ARARIPE BASIN (APTIAN-ALBIAN),  
BRAZIL

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Thin sections of pterosaur bones have not been extensively studied so far. Here we present the preliminary results of histological sections made from an incomplete pterosaur skeleton (Pterodactyloidea, Anhangueridae) from the Romualdo Mb. (Aptian-Albian), Santana Formation. The specimen (MN 4809-V; Museu Nacional/RJ) is formed by both wings (from humerus to third wing phalanx - F3D4) and one hindlimb (femur, tibia, and pes). All bones are extremely well preserved, showing no evidence of compaction. Thin sections of the diaphyseal portion of each bone were observed in cross and longitudinal view, particularly from the wing metacarpal (McIV) and F3D4. The examined histological sections show the presence of a developed Haversian system, with the canaliculi and numerous osteocyte lacunae. The external surface is formed by lamellar periosteal bone, suggesting that this specimen represents an adult individual. Among the observed features, we identified one line of arrested growth (LAG) in the sections of McIV and F3D4. In the McIV, the LAG is positioned closer to the medullary cavity while in F3D4 it is positioned closer to the external surface of the bone. This variation on the position of the LAG is not fully understood, but might represent differential growth rates of those two bones. The preliminary results obtained so far showed that histological features can vary among the bones of the same individual, limiting the information that can be obtained of such studies based solely on isolated elements. Furthermore, the