

taxa. Invertebrates are represented by the steinkerns of gastropods, lamellibranchs and cirripedes. The bone-bed has an areal extent of 8 square km and is up to 1.0 m thick. It is composed of up to four layers or coarse to fine grained phosphate-rich arkose, with vertebrate fossils concentrated at a strongly erosive base.

It occurs in a sequence of fine to medium sands and coquinas. Formation was strongly influenced by subduction at the Peru-Chile Trench, and localized multiple bone-bed developments occur due to fault related uplift/subsidence. The Chilean coast is known to have been arid at the time of bone-bed formation, and terrestrial sediment input was low. Severe wear on the vertebrate fossils is consistent with an extended reworking event. Active margin uplift is thought to have been dominant during the Neogene. However, as normal deposition is seen to resume after the condensed bone-bed horizon, reworking was most likely due to lowering of storm wave base in response to sea-level fall, rather than to uplift. Consequently, the condensed bone-bed horizon probably represents a regressive system tract followed by phosphate precipitation and rapid transgression.

The fauna is similar to that found in the area today, but the presence of certain selachians and teleosts (e.g., *Carcharhinus*, *Rhinoptera*, and *Istiphorus*) suggests somewhat warmer water. Because of the similarity of the modern and fossil faunas, and the overall physiography of the basin, the deposit represents a unique opportunity to assess taphonomic filters that operate during bone-bed formation.

NEW MATERIALS OF AMPHICTICEPS (CARNIVORA, MUSTELOIDEA) FROM MONGOLIA, AND BASAL ARCTOID RELATIONSHIPS

WANG, Xiaoming, Dept. Biology, Long Island University, C. W. Post, Brookville, NY 11548; McKENNA, Malcolm, Dept. Vertebrate Paleontology, American Museum of Natural History, Central Park W., at 79th Street, New York NY 10024. Since its first publication in 1924, *Amphicticeps shackelfordi* Matthew and Granger, a small, badger-sized carnivore from the early Oligocene Hsanda Gol Formation in Tsagan Nur Basin of Mongolia, has largely remained in obscurity despite a well-preserved skull as its holotype. Recent investigation in the Hsanda Gol Fm. led to the discovery of additional materials of *Amphicticeps*, the new materials complement the holotype skull of *A. shackelfordi* and include a naturally associated lower jaw, a part of the anatomy that has been unavailable thus far. In addition to the genotypic species, two new forms can now be recognized from the new collection. The new forms feature primitive characters linking the Mongolian *Amphicticeps* to certain undescribed materials from the Quercy fissure fills in France, lending further support to a post-Grande Coupure correlation of the Hsanda Gol Formation.

Preliminary phylogenetic analysis of *Amphicticeps* indicates a relationship within the basal arctoids. Furthermore, *Amphicticeps* shares derived features common to the North American promartians and the Holarctic *Potamothereum*, such as short and broad rostrum, short infraorbital canal, laterally expanded mastoid process, transversely broadened M1, small angle between labial borders of P4 and M1, reduced and lingually positioned M2, and reduced m2. Despite these features, however, a basal musteloid relationship for *Amphicticeps* remains uncertain for its presence of other homoplasies.

DIVERSE DINOSAUR HABITATS OF DJADOKHTA AGE (LATE CRETACEOUS) IN THE GOBI DESERT, MONGOLIA

WATABE, M., Hayashibara Mus. Nat. Sci., Okayama 700, Japan; FASTOVSKY, David E., Dept. Geology, Univ. Rhode Island, Kingston, RI 02881. Rocks attributed to the Djadokhta Formation (Campanian-Maastrichtian) are widely distributed through the central Gobi desert. The Djadokhta Fm. is characterized by a distinctive dinosaur and non-dinosaurian fauna, including *Protoceratops*, *Oviraptor*, and *Velociraptor*. Large dinosaurs such as hadrosaurs and carnosaurs are represented by fragmentary finds. Dinosaur localities attributed to this age include Bayn Dzak, Tugrikin Shireh, Alag Teg, and Abdrant Nuru. These localities show a high diversity of sedimentary environments: including alluvial fans, to eolian dune fields, to fluvial systems. Eolian beds of Tugrikin Shireh yield rich, commonly-articulated, skeletons of *Protoceratops* and *Velociraptor*, lizard and mammal skulls, dinosaur eggs and nests, and dinosaur juveniles. The extraordinary preservation is closely related to the sedimentary environment: a combination of quick burial and desiccation probably aided preservation. Nonetheless, dinosaur skeletons buried in the sands are intensively bored by worms, possibly the larvae of coleopteras. Dinosaur carcasses may have been good food-resources for animals in desert. The fluvial beds in Abdrant Nuru and Alag Teg, for example, are characterized by a different fauna from those of eolian localities. This fauna consists of Pachycephalosauria, Ankylosauria and Hadrosauria. Isolated dinosaur footprints as well as trackways are abundant there. Those environments co-existed in the period in the central Gobi area, and provided a diversified habitat which may account for much of the dinosaur diversity during this interval. These diverse dinosaur habitats are similar to equivalent-aged localities in the Inner Mongolia.

HEWETT'S FORESIGHT ONE: A NEW AND UNUSUAL LANCIAN MAMMAL LOCALITY, SOUTHWESTERN BIGHORN BASIN, WYOMING

WEBB, Michael W., Department of Geology and Geophysics, The University of Wyoming, Laramie, WY 82071-3006. A study of Lancian mammals from the southwestern Bighorn Basin of Wyoming represents a significant addition to knowledge of latest Cretaceous mammals of North America. The approximately 2000 specimens from Hewett's Foresight One (University of Wyoming fossil vertebrate locality V-81013) comprise one of the largest collections of Lancian mammals available for study. Of special interest are sedimentologic conditions that led to the concentration of fossils representing species of small body size. Fine-grained channel sandstones of the Lance Formation preserve small isolated bone elements, theropod teeth, lizard jaw frag-

ments, and mammal teeth and jaw fragments. Although most known Cretaceous mammals were smaller than a housecat, this locality preserves truly minuscule (most linear dimensions less than 1 mm) teeth and jaw fragments of species previously considered rare. The faunal composition is similar to the type Lance local fauna, and no mammals of Paleocene aspect have been identified in the collection. The exact stratigraphic position of Hewett's Foresight One is problematic. It is contained within a large slump block of Lance Formation that is seemingly detached from local stratigraphy, and fossil-bearing strata do not bear strong resemblance to nearby outcrops of Lance Formation. However, the mammalian fauna indicates a Lancian age for the Hewett's Foresight One fauna, and the sedimentology of the deposit does not preclude it from being considered Lance Formation. Regardless of its stratigraphic position, the fauna from V-81013 will comprise a notable addition to the data set for Lancian mammals, increasing the applicability and total scientific value of all Lancian mammals.

SCIENTIFIC VALUE OF STRATIGRAPHICALLY AMBIGUOUS FOSSIL LOCALITIES

WEBB, Michael W., LILLEGRAVEN, Jason A., Department of Geology and Geophysics, The University of Wyoming, Laramie WY 82071-3006. Despite occasional statements to the contrary, fossils from stratigraphically ambiguous localities may have major scientific value. Fossils and surrounding strata can provide evolutionary, paleoecological, paleobiological, and/or paleogeographical information. Evolutionary value may be attributed to a fossil that possesses a phylogenetically significant suite of characters. Sedimentological, geochemical, and biotic analyses of a locality can provide valuable paleoecological information. Insight to species diversity, variability, or other paleobiological features may be derived from individual specimens or statistics of large samples. Locally ambiguous stratigraphy usually does not invalidate geographical interpretations of taxon ranges. It is only when specific research questions depend for answers upon known superpositional relationships that stratigraphically ambiguous fossils must be dismissed. 'Hewett's Foresight', a stratigraphically ambiguous series of localities in northwestern Wyoming, has yielded one of North America's largest collections of Lancian mammals; the assemblages clearly indicate a very late Cretaceous age. The sites occur within a slump block, which has prevented lithostratigraphic correlation with local strata. Nevertheless, these typical Lancian assemblages may be compared confidently with temporally correlative faunas from across the continent. Fossils from 'Hewett's Foresight' hold a richness of potential scientific values and thus deserve serious enquiry.

COMPARATIVE ANATOMY AND FUNCTIONAL MORPHOLOGY OF THE CERVICAL SERIES IN AVES AND SAUROPODA

WEDEL, M.J., Okla. Mus. Nat. Hist., Dept. Zool., Univ. Okla., Norman, OK, 73019; SANDERS, R.K., Univ. Hospital, Dept. Radiol. Sci., Oklahoma City, OK, 73190. The presacral vertebrae of all saurischians except prosauropods are pneumatized by diverticula of an air-sac system. The morphology of these vertebrae represents the interaction between the air-sac system, which in most forms is as extensive as possible to reduce weight, and the bony skeleton, which must support the muscular system and resist biomechanical stress. In this study we used a variety of radiographic techniques to investigate the functional morphology of the cervical series in raites and various sauropods.

In birds, the longus colli ventralis muscles insert on the cervical ribs via an elaborate series of overlapping tendons. The long cervical ribs of some sauropods may have evolved as an expanded attachment for or ossification of these tendons. The nuchal ligament in sauropods has previously been postulated as a continuous structure running along the tops of the neural spines, as in artiodactyls. However, in raites the nuchal ligament is discontinuous, connecting only the bases of the neural spines. We propose that in sauropods the nuchal ligament attached between the suprapre- and suprapostzygapophyseal laminae, and that the neural spines served to anchor the dorsal musculature. The bifid neural spines of some taxa probably held the biventer cervicis muscle.

The homology of vertebral characters across Saurischia makes birds the most suitable models for interpreting the axial skeleton of sauropods and making inferences about soft-tissue anatomy. The influence of the pneumatic air-sac system on every aspect of vertebral form and function is so profound that inferences drawn from taxa outside of Saurischia should be regarded as suspect unless similar inferences can be derived from studies of avians.

SURVIVAL OF MULTITUBERCULATE LINEAGES ACROSS THE CRETACEOUS-TERTIARY BOUNDARY IN NORTH AMERICA

WEIL, Anne, Dept. of Biological Anthropology and Anatomy, Duke University, Durham, NC 27708-0383. The description and interpretation of mammalian survivorship across the K/T boundary is a significant component of several hypotheses about the cause of this extinction. Because robust phylogenetic hypotheses of these often poorly known mammals are lacking, mammalian survivorship has often been determined by comparing Lancian and Puercan species lists. This method does not allow us to distinguish between actual termination of a Cretaceous lineage and 'extinction' by evolutionary transformation. The percentage of survivors may therefore be underestimated.

A study of North American multituberculate mammal phylogeny based on dental characters resulted in the identification of seven islands of equally parsimonious trees. Consenses of the islands were treated as seven hypotheses of relationship. These consenses exhibit different degrees of resolution, but the number of lineages crossing the boundary does not vary inversely with degree of resolution, indicating that apparent survivorship depends on specific hypotheses of relationship. Among the hypotheses, survivorship of multituberculate lineages ranges between 55% and 72%. The lower end of this range is higher than any estimate of mul-