ed from the Two Medicine. The structures, evident as sand-filled tubes in an abandoned levee deposit, may have been overlooked because of their superficial resemblance to inorganic nodules. A thorough morphological description of the structures and assessment of their paleoenvironmental context support their trace fossil affinity. They are thus worthy of attention from vertebrate paleontologists because of their probable relation to mammalian behavior during the Campanian in this area.

A mammalian origin is interpreted on the basis of their dimensions, complexity, and facies occurrence. The structures have extremely regular cross-sectional dimensions (5.8 ± 0.8 cm x 9.0 ± 1.2 cm; n = 17), are flattened parallel to bedding, straight to curved with rounded terminations, horizontally oriented, restricted to thin zones, and branch in places. Moreover, one specimen shows an enlarged junction between three branches, a typical characteristic of a multibranched burrow system. Minimum and maximum sizes of the tracemakers can be inferred from cross-sectional areas of the burrows (25-60 cm^2) and pouch-like protrusions (about 2.5 x 4.5 x 8 cm) lateral to main burrow shafts also may reflect approximate body sizes.

Previously reported body fossils of possible mammalian tracemakers in the Two Medicine include multituberculates, such as *Cimexomys judithae;* testing of the hypothesis presented here should thus include looking for co-occurrences of mammalian body fossils with these structures. Identification of such trace fossils should add considerably to better understanding relations of mammals to Two Medicine paleoecosystems.

PHYLOGENETIC INTEGRITY OF ASIATIC DOCODONTS

MARTIN, Thomas, Institut für Geologische Wissenschaften, Fachrichtung Paläontologie, Freie Universität, Malterserstrasse 74-100, D-12249 Berlin, Germany; AVERIANOV, Alexander O., Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, St. Petersburg 199034, Russia.

There are five genera whose attribution to Docodonta is unquestionable: *Borealestes, Haldanodon, Docodon, Simpsonodon*, and *Tegotherium*; all, except the latter, are Euroamerican in distribution. *Tegotherium* from the Late Jurassic of Mongolia is the only Asiatic docodont described so far. We announce the discovery of another Asiatic docodont taxon, based on a single lower molar from the Middle Jurassic (Callovian) Balabansai Svita at Tashkumyr, northern Fergana Depression, Kirghizia. The new taxon exhibits the typical structure of a docodont lower molar with the main cusp a connected by crests to the lingual cusps (c and g) and mesial cusp b (cusp nomenclature after Butler). It is primitive in retaining well developed crests c-d and d-f, and derived in reduction of the crest b-g. By formation of crests b-e and e-g, greater separation of cusps a and b, and longitudinally projecting crests a-d and a-b the new taxon is similar to *Tegotherium*. We unite it with the latter in one clade. *Tegotherium* is more derived than the new Kirghizian docodont by formation of a prominent anterior basin ("pseudotalonid") and reduction of crests distally to cusp c. The Asiatic clade of docodonts is the sister group for all remaining (Euroamerican) docodonts, which are characterized by retention of the b-g crest and reduction of cusp e and crest b-e. The similarity of *Simpsonodon* from the Middle Jurassic of England to *Tegotherium* is due to convergent development of a "pseudotalonid" and reduction of distal crests.

DINOSAUR REMAINS FROM THE PRINCIPALITY OF ASTURIAS, SPAIN

MARTINEZ, Ruben D., Lab. Paleovertebrados, Univ. Nac. de la Patagonia, C.C.360-(9.000) Comodoro Rivadavia, ARGENTINA; GARCIA-RAMOS, Jose C., PIÑUELA, Laura, LIRES, Jose, Dept. Geologia, C/Arias de Velasco S/N, Oviedo, SPAIN; LUNA, Marcelo, Lab. Paleovertebrados, Univ. Nac. de la Patagonia, C.C.360- (9.000) Comodoro Rivadavia, ARGENTINA.

The Upper Jurassic (Kimmeridgian) strata of Asturias that appear in the coastal cliffs between Gijon and Ribadesella have traditionally provided numerous and well preserved footprints of saurischian and ornithischian dinosaurs, that have revealed the presence of varied lineages. Because sedimentologically the conditions that allow for the preservation of footprints hinder the good fossilization of bony remains, the material made known here has special importance. All the remains come from the fluvial Vega Formation and deltaic Lastres Formation. In Asturias there was only one reference until now of dinosaur remains: one theropod tooth. From the rockfalls of the high coastal cliffs come the materials that are announced here.

Within Theropoda there are several teeth with primitive characters such as the presence of denticles in the mesial and distal carinae, high crown, absence of constriction between the crown and the root, and subequal denticles on both carinae. Two other teeth have a constriction in their base, with sinuous distal carinae and mesial carinae restricted only to their apical third, characters that suggest affinities with Dromaeosauridae. An incomplete anterior caudal vertebra of great size is similar to the caudals of *Megalosaurus* although without diagnostic characters.

The sauropod materials include some large caudal vertebrae (one of which could belong to Camarasauridae); a tooth,damaged in its mesial and distal borders, of "peg-like" appearance, with a wear facet that recalls that present in Diplodocidae, although it has been considered of brachiosaurid type; a tooth with the typical "spoon-like" morphology and cingulum of Camarasauridae; and an indeterminate caudal vertebra. The tooth of Camarasauridae represents the first occurrence of that family for Asturias and its oldest occurrence in Spain.

A PREPARATOR'S DREAM: SOFTENING AND DISAGGREGATION OF SANDSTONE WITH DIMETHYLSULFOXIDE (DMSO)

MASON, Jane, University of California Museum of Paleontology, Berkeley, CA; TRIPLEHORN, Don, Department of Geology and Geophysics, University of Alaska, Fairbanks, AK

Quartz, the most resistant of commonly occurring minerals, is the major component of sandstones. Fossils in sandstones can be some of the more difficult specimens to prepare. If the sandstone is well cemented, complete separation from the bone may be extremely difficult. Often the bone, mineralized or not, is softer than the sandstone matrix. When geologists were searching for shocked quartz they serendipitously noted that DMSO, a common chemical reagent, caused the mineral kaolinite surrounding the quartz grains to expand and separate the grains. This disaggregation response of sandstones to DMSO has been tested on Morrison, Kaiparowits, and Navajo sand/mudstones with varying degrees of success. It has been shown to work well on a large percentage of numerous sandstones sampled. DMSO works on phosphatic fossils, as well as those with mineral replacement of silica, apatite, pyrite, or carbonate. When used judiciously, DMSO offers a nontoxic, inexpensive means of retrieving fossils otherwise difficult to prepare. Masking can be achieved with But-Var or cyanoacrylates. At its minimum effectiveness, DMSO allows for easier mechanical preparation by softening the matrix. At its maximum effectiveness, it allows the total disaggregation of some matrices containing microfossils and small invertebrates that would otherwise be accessible only with acid preparation.

DINOSAUR ONTOGENY: THE CASE OF *LOURINHANOSAURUS* (LATE JURASSIC, PORTUGAL)

MATEUS, Octávio, Centro de Estudos Geologicos, Faculdade de Ciencias e Tecnologia/ Quinta da Torre, 2825-114 Caparica, Portugal, Museu da Lourinha, 2530 Lourinha, Portugal; ANTUNES, Miguel Telles, Academia das Ciencias de Lisboa, Centro de Estudos Geologicos, Faculdade de Ciencias e Tecnologia/ Quinta da Torre, 2825-114 Caparica, Portugal, Museu da Lourinha, 2530 Lourinha, Portugal; and TAQUET, Philippe, Academia das Ciencias de Lisboa, Academie des Sciences, Paris, Laboratoire de Paleontologie, 8 rue de Buffon, 75005 Paris, France, Museu da Lourinha, 2530 Lourinha, Portugal

The Late Jurassic, Lourinha Formation/Sobral Unit is very rich in dinosaur remnants. One of the major findings was that of dinosaur nestings at Paimogo. These nestings yielded dozens of dinosaur eggs, some still containing embryo's bones. All this material allowed the study of ontogenesis, anatomy and growth rates of the embryos, as well as the recognition of some key morphologic characters that clearly point out to a carnosaur theropod. Which one? This question is most interesting. It could probably be ascribed to one of the already known theropods from the same Formation. Let us recall that several Late Jurassic theropod genera could be present: *Ceratosaurus, Torvosaurus, Allosaurus* and *Lourinhanosaurus*. The last one could be a likely "candidate": the holotype of *Lourinhanosaurus antunesi*, a partial skeleton, has been found just 7 km far from the nesting site. Sixty presacral vertebral centra from embryos were compared with those from *Lourinhanosaurus* and *Allosaurus*. Of course, ontogenetic differences could be expected. Nevertheless, comparison has shown that proportions are closely similar between the embryos and *Lourinhanosaurus* and even may be identical and superposing in graphs. Both are strikingly different from *Allosaurus*.

On the other hand, in other theropods as *Coelophysis* and *Archaeopteryx* the neck elongates with age. Long vertebral centra are also typical of *Lourinhanosaurus*. This ontogenetic trend seems in good agreement with both the embryonic and *Lourinhanosaurus* centra proportions. On the other hand, the embryo's hindlimb anatomy differs significantly from those of Portuguese late Jurassic *Torvosaurus* and *Ceratosaurus*. In conclusion, it may confidently be concluded that eggs and embryos can be ascribed to *Lourinhanosaurus antunesi*.

TRIPODS AND DERRICKS, REMOTE CONTROLLED PLANES AND BLIMPS: VERTEBRATE PALEONTOLOGICAL PHOTODOCUMENTATION IN THE WEST

MATTHEWS, Neffra A., Bureau of Land Management, National Science and Technology Center, Denver, CO 80225; BREITHAUPT, Brent H., Geological Museum, University of Wyoming, Laramie, WY, 82071.

Awesome beauty and phenomenal natural resources drew early explorers and scientists to the American West in the 1800s. F.V. Hayden, C. King, and O.C. Marsh all employed photographers on their expeditions to utilize state-of-the-art photodocumentation techniques to create monoscopic and stereoscopic images of unique western resources. As photography evolved, so did its utility for paleontological documentation. The value of photographing fossil resources from above was realized in the 1930s. At the Howe Quarry in Wyoming, American Museum of Natural History crews applied an innovative approach to low-level aerial photography by using a derrick to suspend cameraman R.T. Bird in a barrel 10 meters above the dinosaur bonebed.

Today, paleontological resources in the West continue to be documented utilizing the latest photographic methods. These techniques include close-range photogrammetry where the camera is held several centimeters above the subject or mounted on tripods of various heights (e.g., 175 cm, 3.5 m, and 12 m). Photography from low-level flyovers utilizing remote con-