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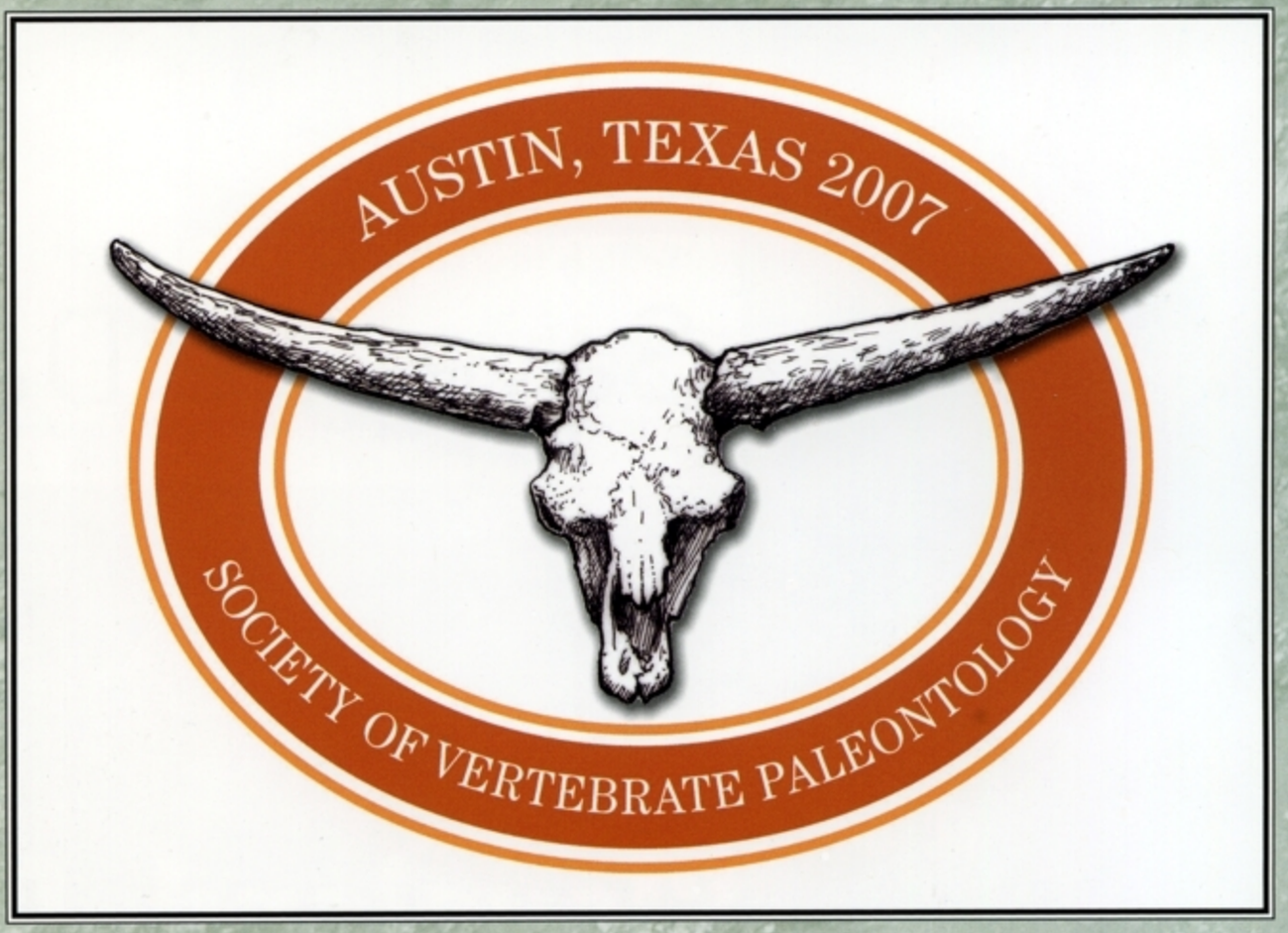

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ABSTRACTS OF PAPERS

SIXTY-SEVENTH ANNUAL MEETING

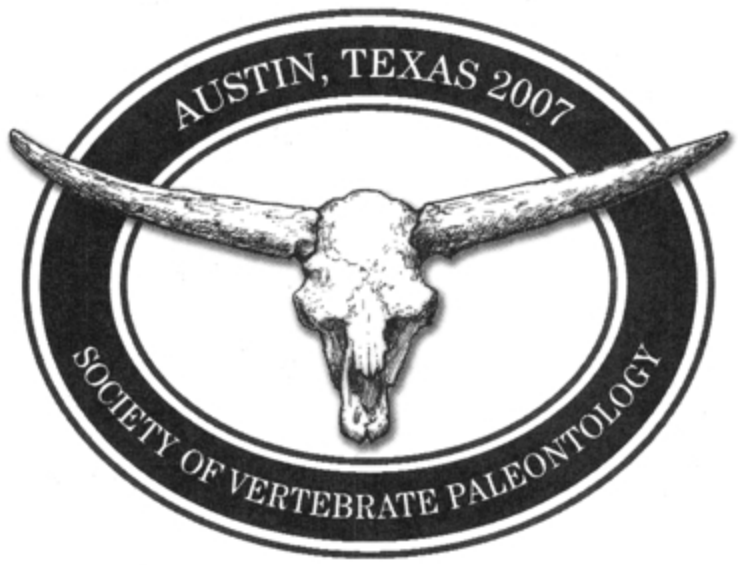
SOCIETY OF VERTEBRATE PALEONTOLOGY

THE JACKSON SCHOOL OF GEOSCIENCES AT THE UNIVERSITY OF TEXAS, AUSTIN

HILTON AUSTIN

AUSTIN, TEXAS

OCTOBER 17–20, 2007



The presence of *Tribosphenomys minutus, Eomylus bayanulanensis, Pseudictops lophiodon, Palaeostylops iturus* and *Hyracolestes ermineus* decisively confirms the Gashatan age of this fauna. The presence of the carpolestid *Subengius*, the neoplagiaulacid *Mesodmops* and the cimolestid *Tsaganius* however narrows the faunal gap with the Early Eocene Bumbanian faunas of Asia. Finally, the presence of *Subengius*, *Mesodmops* and the nyctitheriid *Asionyctia*, links the Asian Subeng fauna to older or contemporaneous North American faunas. The overall fauna thus seems to be a mixture of endemic and immigrant taxa and we provide a paleobiogeographic analysis of this complete fauna. We also present an analysis of the paleoenvironment based on the mammals, and compare the results with our previous paleoenvironmental data inferred from sedimentology and microfossils. Based on this, we evaluate how the paleoenvironment influenced the endemism of mammal faunas in the Gashatan and their transition into the Bumbanian.

Poster Session III (Friday)

NEW INFORMATION ON THE INTERNAL CRANIAL ANATOMY OF *EUOPLOCEPHALUS* (ORNITHISCHIA, ANKYLOSAURIDAE)

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Because of their highly ossified skulls, the internal cranial morphology is the most poorly understood aspect of the ankylosaurid anatomy. A partial ankylosaurid skull from the Dinosaur Park Formation (Campanian, Late Cretaceous), southern Alberta, provides an opportunity to document the lower side of the skull roof and the upper half of the braincase in detail. Identified as *Euoplocephalus* sp., this specimen aids reconstruction of the soft tissues and homology of the ossified elements inside the ankylosaurid skulls. Clear vascular impressions on the roof of the nasal cavity are noted for the first time in ornithischians. Unlike *Talarurus*, there is no evidence of the canal for the olfactory nerve on the ossified nasal septum of the nasal cavities. Although no sutures are visible, the orbitosphenoid-preshenoid, the sphenethmoid, and the interorbitalis all seem to be distinct elements, arranged differently from previously proposed schemes. The paranasal cavity is connected with the endocranial cavity posteriorly, with a descending process of the frontal in the way of this communication between the two cavities. This connection implies a functional relationship between the paranasal cavity and the endocranial cavity. The descending process houses a deep groove occupied by hitherto unknown soft tissue. The specimen's incomplete endocast is nearly identical to that of AMNH 5337, which represents the morphotype of *Euoplocephalus* with four osteoderms on the first cervical half ring. No endocast has been prepared for specimens of the other *Euoplocephalus* morphotype with six osteoderms on the first cervical half ring, including the holotype of the genus. These new data open the possibility of more extensive comparison among ankylosaurs in the understudied lower side of the skulls, and will contribute to future taxonomic and phylogenetic studies. Variation in internal cranial anatomy would be particularly important in *Euoplocephalus* to resolve the problem of two recognized morphotypes within the genus.

Poster Session III (Friday)

PHYLOGENETIC ANALYSIS OF TROGOSINAE (TILLODONTIA, MAMMALIA)

MIYATA, Kazunori, Fukui Prefectural Dinosaur Museum, Katsuyama City, Fukui, Japan

The subfamily Trogosinae, which has been viewed as a monophyletic group, is primarily composed of large tillodont species having rootless second incisors (I2s and i2s): *Trogosus* and *Tillodon* from the late Early to early Middle Eocene in North America, and three genera (*Kuanchuanius*, *Chungchienia*, and *Higotherium*) from the possible late early and middle Eocene in East Asia. Previous hypotheses of tillodont relationships suggest the monophyly of the *Trogosus* + *Kuanchuanius* + *Tillodon* clade, but the relationships within the clade and the phylogenetic positions of the more hypsodont *Higotherium* and *Chungchienia* have been unclear because of the lack of comprehensive comparisons at the species level and the incompleteness of their fossil materials. A parsimony analysis using PAUP*4.0 beta 10 Win and employing an exhaustive search for all possible tree topologies was performed based on 12 taxa (including the closely related *Azygonyx*, *Esthonyx*, *Adapidium*, and *Megalesthonyx*) and 31 characters (27 dental and four mandibular characters). K.? *danjiangensis*, *Higotherium*, and *Chungchienia* were excluded from the analysis owing to their incompleteness. The PAUP analysis produced two equally parsimonious trees of 44 steps with a consistency index (CI) of 0.932. The two trees indicate the stable monophyly of the *Kuanchuanius* + *Trogosus* + *Tillodon* clade and agree with each other in topology except for the relationships among an unnamed new species of *Trogosus*, *Trogosus latidens*, and *Tillodon fodiens*. The result produces a solution for previously unresolved relationships of the *Kuanchuanius* + *Trogosus* + *Tillodon* clade; it shows that the non-monophyletic genus *Trogosus* consists of successive species to *Tillodon fodiens*. *Kuanchuanius* is allocated as a sister taxon to the *Trogosus* + *Tillodon* clade, or as a basal trogosine, suggesting the Asian origin of North American trogosines.

Poster Session I (Wednesday)

NEW MATERIAL OF THE PARAREPTILE *COLOBOMYCTER PHOLETER* FROM THE LOWER PERMIAN OF OKLAHOMA

MODESTO, Sean, University of Cape Breton, Sydney, NS, Canada; REISZ, Robert, Department of Biology, Mississauga, ON, Canada

A new specimen of *Colobomycter pholeter* from the Lower Permian Dolese Brothers Quarry near Richards Spur, Oklahoma, preserves previously unknown portions of the skull of this acleistorhinid parareptile. It consists of much of the snout, preserving elements of the skull roof, the palate anterior to the orbit, and the sphenethmoid. The premaxilla has two teeth, of which the first is the largest tooth of the marginal dentition. Fortuitous damage to the maxillary caniniform teeth reveals that the crown bases of the marginal teeth are unusually thin, and infolding of the bases of these teeth may have served to strengthen the crowns. The serial pattern and the morphology of the upper dentition, with the conspicuous caniniforms of the premaxillary and the maxilla probably forming the upper part a 'food trap', suggests that *C. pholeter* was as a rare faunivorous member of the Richards Spur fauna that specialized in the predation of other small tetrapods, most likely the small captorhinids that dominate the assemblage numerically.

Poster Session II (Thursday)

IDENTIFYING THE CAUSES OF TAPHONOMIC VARIATION IN FOSSIL BONES USING X-RAY DIFFRACTION: A CASE STUDY FROM THE OLIGOCENE OF SOUTH DAKOTA

MOORE, Jason, University of Cambridge, Cambridge, United Kingdom; MARRON, Alan, University of Sheffield, Sheffield, United Kingdom; REDFERN, Simon, University of Cambridge, Cambridge, United Kingdom

A large sample of vertebrate material (approximately 2800 specimens) was collected from a previously unstudied horizon within the Scenic Member of the Brule Formation, White River Group in Badlands National Park, South Dakota. The specimens were preserved in reworked loessic mudstones with extensive evidence of palaeosol development, primarily alfisols. The sampled bones take one of two distinct morphologies - white and robust (type 1) or pink/brown and friable (type 2). Mammalian bones of both morphologies were common, however the sampled chelonian bones were almost entirely of a type 1 morphology. X-ray diffraction analysis of bones of both morphologies, teeth and the Scenic Member sediments was used to investigate any mineralogical differences between these morphologies. Type 2 bones were found to be mineralogically similar to type 1 bones, irrespective of taxon, but were also found to contain clinoptilolite: a zeolite mineral commonly formed by the devitrification of volcanic glass. It is suggested that, during diagenesis, the growth of clinoptilolite crystals precipitating within micro-scale cavities in the bone is causing the breakdown of the bone structure converting type 1 into type 2 bones. The variation in the abundance of type 2 bones between mammalian and chelonian elements is attributed to the thicker, less porous compact bone layer found in the chelonian elements.

Poster Session III (Friday)

DINOSAUR ICNOCENOSIS AND THE CAMEROS BASIN AS AN OBLIGE PASS AREA DURING THE LOWER CRETACEOUS OF THE IBERIAN PLATE

MORATALLA, Jose, Instituto Geologico y Minero de España, Madrid, Spain; HERNAN, Javier, Escuela Tecnica Superior de Ingenieros de Minas, Madrid, Spain

The Cameros Basin is especially well known by its abundant Early Cretaceous dinosaur tracksites (more than 300 already known). This basin (about 8000 Km2) was developed during the early Tithonian-Albian rifting phase at the northwestern part of the Iberian Range (Spain). This synrift infill (about 8000-m-thick) consists of continental (fluvial and/or lacustrine) sediments with occasional marine influences, displaying abundant dinosaur tracksites. The Enciso Group, predominantly lacustrine and Aptian in age, yields the best and greatest number of dinosaur track localities (about 150). During the Aptian, the extensional regime facilitated the marine transgression of the Atlantic sea from the north (Basque Cantabrian Basin) and the Tethys from the southeast (Maestrat Basin), resulting in a partition of the Iberian Plate in two main emerged areas bounded by the sea: the Ebro Massif (north-east) and the Iberian Massif (southwest). Therefore, the Cameros Basin constituted the only continental area connecting both and, as a result, it was the unique oblige/required pathway for dinosaurs (and others terrestrial fauna). An analysis of three Enciso Group significant areas with abundant dinosaur trackways (Enciso, Cornago and Munilla) has been carried out. The directions of these trackways have been measured on the outcrops and subsequently these data have been unfolded to horizontal. The studied areas illustrate that the trackways show a preferential bidirectional pattern of movement on each tracksite, especially evident with the theropod ones. This fact would be consistent with the presence of the mentioned restricted pass area that would also explain the existence of such amount of dinosaur tracks in the Enciso Group. Moreover, the dominion of medium-big theropod dinosaur tracks (about 85%) in the Cameros icnocenosis could be consequence of the superior movement capability for these searching-hunting predatory dinosaurs.

Their behaviour probably made the theropods to move through relatively long distances and, in consequence, they were potentially capable of producing a higher number of tracks than those made by other no theropod dinosaurs from the Cameros area.

Poster Session I (Wednesday)

KOMODO DRAGON CRANIAL MECHANICS AND KINESIS AS REVEALED BY HIGH-RESOLUTION FINITE ELEMENT ANALYSIS

MORENO, Karen, University of New South Wales, Sydney, Australia; WROE, Stephen, University of New South Wales, Sydney, Australia; MCHENRY, Colin, University of Newcastle, Sydney, Australia; CLAUSEN, Philip, University of Newcastle, Sydney, Australia; D'AMORE, Domenic, Rutgers University, New Brunswick, NJ, USA

The Komodo dragon (*Varanus komodoensis*) is among the most charismatic of living taxa. However, although its biology and ecology have received considerable attention, and despite the potential to elucidate feeding behaviour in dinosaurs and other extinct reptiles, there have been no detailed investigations into its cranial mechanics. Cranial kinesis, feeding kinematics and jaw adductor anatomy in living and extinct reptiles have also generated interest and a large body of research, but how, or in many cases, even whether movement between skull bones occurs is also not well understood. Here, using anatomical dissection data combined with newly developed high resolution 3-D computer-modelling and finite element (FE) techniques, we show that the skull of the Komodo dragon is moderately kinetic, with surprisingly weak masticatory muscles and that the structure is optimised to resist tensional loads. Postcranial, particularly cervical, musculature plays a major role. These mechanical attributes are consistent with detailed observational data on feeding behaviour. Our findings expand understanding of extant reptilian feeding ecology and provide insight into the behaviour of carnivorous dinosaurs with which *V. komodoensis* shares many cranial and dental features.

Student Poster Session (Thursday)

SIZE AND PALAEOECOLOGY OF GIANT MIOCENE SOUTH AMERICAN CROCODILES (ARCHOSAURIA: CROCODYLIA)

MORENO-BERNAL, Jorge, Universidad Nacional de Colombia, Bogotá, Colombia

This work is intended to provide body length and mass estimates for the Tropical South American Miocene crocodiles *Purussaurus* (Alligatoroidea) and *Gryposuchus* (Gavialoidea). Size estimates were done from skull and femoral measurements, using regressions published for extant crocodile species. Most *Purussaurus* specimens were estimated at lengths between 7-8 meters, with body masses between 1.7-2.7 metric tones. A P. *brasiliensis* specimen was estimated in a maximum of 10 meters and 5 tones. *Gryposuchus* length was between 7 and 10 meters, without accurate body mass estimates, due to the lack of proper studies in longirostral forms such as *Gavialis* and *Tomistoma*. *Purussaurus* and *Gryposuchus* are longer and heavier than the biggest extant *Crocodylia* (with maximum sizes of 6 meters and 1 ton), and close to giant Cretaceous forms such as *Deinosuchus* or *Sarcosuchus*. Comparisons between skull-based and femur-based estimates suggests that while in *Purussaurus* femur size, relative to body size, is as expected in crocodilians, *Gryposuchus* has reduced femora, suggestive of more aquatic habits. Robustness of *Purussaurus* limbs can be related to the foraging of big terrestrial prey on the shores of water bodies. Gigantism in crocodilians implies higher and more stable body temperatures, with a risk of overheating, and reduced basking habits. Huge nares seen in giant fossil Crocodiliformes such as *Sarcosuchus*, *Mourasuchus amazonensis* and *Purussaurus* could have been related with a heat exchange mechanism. This study was possible thanks to the collaboration of the Smithsonian Tropical Research Institute.

Evolutionary History of Bats Symposium, Thursday 9:15

EVOLUTIONARY HISTORY OF THE NEOTROPICAL CHIROPTERAN FAUNA

MORGAN, Gary, New Mexico Museum of Natural History, Albuquerque, NM, USA; CZAPLEWSKI, Nicholas, Oklahoma Museum of Natural History, Norman, OK, USA

Our work on bats from the Oligocene and Miocene of Florida and the Miocene of Colombia has produced fossils representing 8 of the 9 New World (NW) chiropteran families, only 3 of which (Phyllostomidae, Vespertilionidae, Molossidae) were known previously from pre-Pleistocene faunas in North America (NA) or South America (SA). Paleokarst deposits in Florida have produced the oldest fossils of 3 Neotropical groups: Mormoopidae (new genus) and a basal noctilionoid (new genus) from the Oligocene (28-30 Ma) I-75 and Brooksville 2 (Br2) faunas and Natalidae (†*Primonatalus*) from the early Miocene (18 Ma) Thomas Farm (TF) fauna. Eocene bats from western NA now under study may be crucial to resolving the origin of the Noctilionoidea (Noctilionidae, Mormoopidae, Phyllostomidae, Thyropteridae, Furipteridae) and the NW Vespertilionoidea (Vespertilionidae, Molossidae, Natalidae). Two new genera from the Florida Oligocene and Miocene are the earliest NW records of the pantropical Emballonuridae. Pre-Pleistocene records of the pantropical Molossidae from NA include: the earliest member of the family from the Eocene of Saskatchewan (†*Wallia*), an undescribed genus from Br2, *Tadarida* or *Mormopterus* from TF, *Eumops* from the Pliocene of Arizona, and *Tadarida* from the Pliocene of Florida. A Pliocene vampire bat (*Desmodus*) from Florida is the oldest NA phyllostomid. The oldest bats from SA are teeth (indet. family) from the Eocene of Argentina and Peru and the molossid *Mormopterus* from the Oligocene of Brazil. The mid Miocene (12-13 Ma) La Venta (LV) fauna in Colombia documents the earliest SA records of 4 Neotropical families: Emballonuridae (*Diclidurus*), Noctilionidae (*Noctilio*), Phyllostomidae (†*Notonycteris*, †*Palynephyllum*, genus near *Tonatia* or *Lophostoma*), and Thyropteridae (*Thyroptera*). LV also has 3 genera of molossids (*Eumops*, *Mormopterus*, †*Potamops*) and the only pre-Pleistocene vespertilionid from SA. Beginning in the early Pliocene, the Great American Biotic Interchange led to an extensive mixture of NW chiropteran faunas, including Pliocene records of *Eumops* and *Desmodus* in NA (both of SA origin) and the migration of mormoopids and natalids to SA (both of NA origin).

Carnivora: Phylogeny, Form and Function Symposium, Saturday 11:30

MORPHOLOGY OF *PATRIOFELIS* AND *SARKASTODON:* TRENDS IN LARGE-BODIED OXYAENIDAE (CREODONTA)

MORLO, Michael, Forschungsinstitut Senckenberg, Abt. Messelforschung, Frankfurt am Main, Germany; GUNNELL, Gregg, University of Michigan, Ann Arbor, MI, USA;

NAGEL, Doris, University of Vienna, Vienna, Austria

Oxyaenidae (Creodonta) is a group of carnivorous mammals encompassing three to four subfamilies, including Tytthaeninae and Oxyaeninae. Tytthaenines (late Paleocene, North America) are small and primitive and may be ancestral to all other oxyaenids. Oxyaenines, best represented in North America, first appear in the late Paleocene in the form of small, carnivorous *Dipsalidictis*. The last occurrence of North American oxyaenines is in the early middle Eocene represented by large, hypercarnivorous *Patriofelis*. Oxyaenines are known from the European early Eocene and perhaps the Asian late middle Eocene (very large, bone and meat eating *Sarkastodon*) but were neither diverse nor abundant in the Old World. We compared cranial, postcranial, and dental morphology of tytthaenines, oxyaenines and *Sarkastodon* with a sample of extant carnivorans including canids, felids, viverrids, mustelids, hyaenids and ursids. Results document an evolutionary tendency towards shorter and broader skulls in terminal taxa (*Patriofelis* and *Sarkastodon*); a trend towards increased shearing capacity in P4 and m1 with *Tytthaena* and *Dipsalidictis* possessing limited shearing, *Patriofelis* with highly developed carnassial shearing, and *Oxyaena* and *Sarkastodon* with intermediate shearing capacities; *Oxyaena* and *Patriofelis* (only taxa represented by postcrania) resemble living felids and ursids in having somewhat longer femora compared to humeri. In general, oxyaenines exhibited tendencies towards shorter and wider skulls, better development of dental shearing mechanisms, and overall increases in body size from the late Paleocene into the late Eocene - in most cases converging on extant felid morphology in end members of lineages. In all oxyaenids, however, p4 is much more hyena-like than cat-like and was probably used for bone crushing. The pattern of increasing skull breadth with increasing body mass is similarly found in large mesonychids, hyaenodontids, and felids, but not in giant hyaenas (skull higher instead of broader). An additional observation based on our analysis is that if *Sarkastodon* is derived from North American oxyaenines it must have split from the *Oxyaena* lineage in the early Eocene.

Poster Session II (Thursday)

ARCHIMEDES' GIFT: X-RAY FLUORESCENCE IMAGING, A NEW PALEONTOLOGICAL TOOL FOR SOFT TISSUE ANALYSIS AND A TEST FOR FOSSILIZATION PROCESS HYPOTHESES

MORTON, Robert, Children of the Middle Waters Institute, Bartlesville, OK, USA; HUNTLEY, Ken, Children of the Middle Waters Institute, Bartlesville, OK, USA; MORTON, Nick, Missouri Western State University, Bartlesville, OK, USA; LARSON, Peter, Black Hills Institute, Hill City, SD, USA; BERGMANN, Uwe, Stanford Linear Acellerator Center, Menlo Park, CA, USA

X-ray fluorescence spectrometry (XRF) has been used since the early 1990s to generate elemental images of chemically nonuniform and irregular shaped materials. However, conventional XRF imaging techniques have proven too limited and time consuming for the retrieval of sufficient data for the study of fossils. The XRF surface imaging techniques modified and utilized in recovering the only surviving manuscript of Archimedes (287-212 BC) have been applied to the study of fossils with spectacular results. The high-energy monochromatic beam of x-rays generated by the Stanford Linear Accelerator (where the Archimedes manuscript was scanned) provides an opportunity to create elemental x-ray area maps for large (0.5 m2) specimens. Single element and composite multi-element images reveal soft tissue information not available through other techniques. Because the elemental x-ray images depict the chemical fossil, the potential for unraveling the secrets of fossilization processes is unprecedented.