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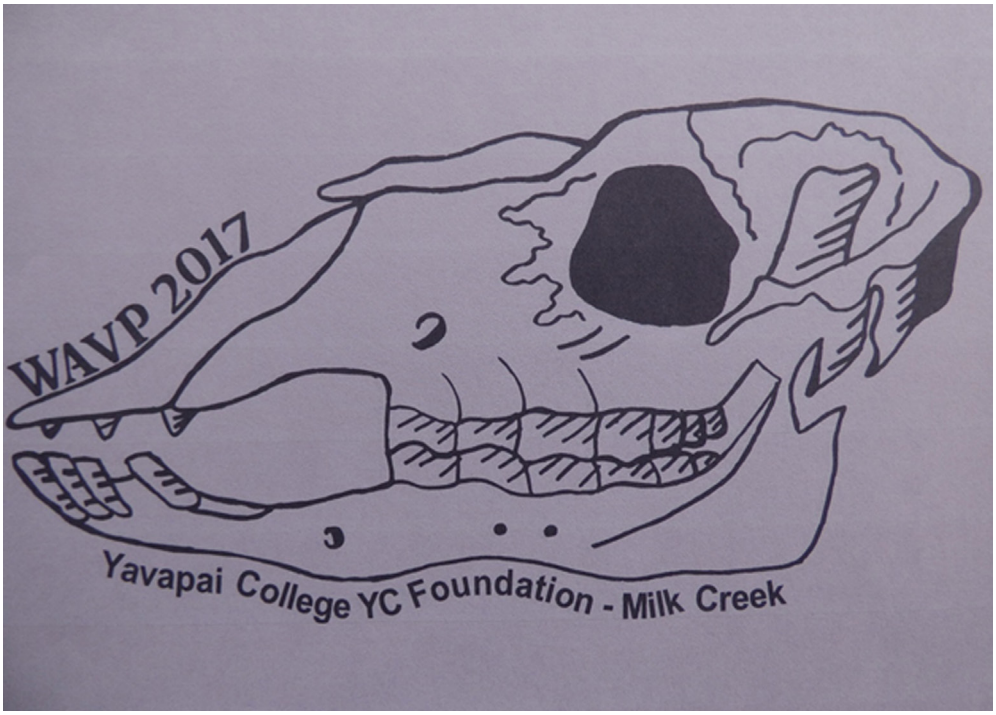
WESTERN ASSOCIATION OF VERTEBRATE PALEONTOLOGY ANNUAL MEETING



Calliandra Bevers

PROGRAM WITH ABSTRACTS

YAVAPAI COLLEGE

Prescott, Arizona

FEBRUARY 17–19, 2017

Host Committee:
Jeb Bevers, Dirilee Curtis, Ivy Morton, and **Beth Boyd**
Biology and Geology Departments
Yavapai College, Prescott, Arizona, USA

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2017 WAVP SCHEDULE OF EVENTS

Friday, February 17, 2017	**WELCOME—YAVAPAI COLLEGE COMMUNITY ROOM (LIBRARY)**
4:15–5:30 pm	**Keynote Address**: David Gillette: **"Ned: Life and Times of Edwin H. Colbert"** and Jeb Bevers**: "Darwin's Voyage and the Megafauna"**
Saturday, February 18, 2017	
9:00–10:05 am	**ORAL PRESENTATIONS**
Opening	**YAVAPAI COLLEGE, MULTIMEDIA ROOM (BLDG 3)**
Nydam	**Alone in the West: the Locally Iterative Mesozoic Fossil Record of the Snake** *Coniophis*
Thomson & DeBlois	**A New Computer Program in Development for Reconstructing and Analyzing Soft Tissue Structures in Fossil Vertebrates**
Townsend & Holroyd	*Protoreodon* **and the Diversification of Basal Ruminants**
10:00–10:25	**BREAK**
McCord	**Mammoth (Mammuthus) localities from Maricopa County, Arizona**
Bevers	**History of Paleontological Research at the Milk Creek Formation, Arizona**
Molnar	**Conscious Bias and the Origin of Birds**
Miller et al.	**Unusual Pleistocene Local Fauna from Coahuila, Mexico**
11:45–1:45 pm	**LUNCH AND POSTER VIEWING (BLDG 4, ROOM 102)**
12:15–1:30	**POSTERS**
Thrasher	**Fossil Tortoises of Southeastern Arizona, with an Earliest Pleistocene Range Expansion of** *Gopherus*
Gensler et al.	**New Additions to the Miocene Vertebrate Fauna of the Tesuque Formation, Española, New Mexico**
Ozolins et al.	**Student Interns, Museum Exhibits and Cave Building; Oh my: Lessons Learned During a College-Museum Collaborative Partnership**
Bevers	**The Milk Creek Mammal Fauna of Central Arizona (Late Miocene) with New Taxa and an Estimate of Body Mass of Camelids and Antilocaprids Using Astragali Areas**
Gay et al.	**A New Triassic Bonebed from the Bears Ears Region of Utah**
1:45–4:25	**ORAL PRESENTATIONS**
Smith et al.	**Newly discovered turtle specimens from the Uinta Formation (Middle Eocene) of Utah, including Baenidae, Carettochelyidae, Planetochelyidae, Testudinidae, and Geoemydidae**
Marsh & Parker	**Current paleontological research and opportunities at Petrified Forest National Park**
Gillette & Zurita	**The** *Glyptodont*, *Glyptotherium***, from the Pliocene and Pleistocene of North America: Update**

Sherzer	**A Possible Physeteroid (Cetacea: Odontoceti) from the Yorba Member of the Puente Formation, Orange County, California**
	BREAK
Dooley et al.	**Mastodons of Unusual Size: How do California Specimens of *Mammut americanum* compare to the rest of the country?**
Bevers	**Mary Anning and the First Jurassic Park**
McCullough	**BEER: The New Frontier of Paleontology Outreach and Museum Fundraising**
4:25–5:00	**DISCUSSION OF 2018 WAVP VENUE**
5:10–5:45	**Final poster viewing**

Sunday, February 19, 2017

8:30–9:45 am	**Examine Milk Creek Collections at Yavapai College**
10:00–11:30	**Hall of Beasts Tour with Sandy Lynch, Sharlot Hall Museum, Prescott, AZ**
11:45–5:30 pm	**Milk Creek site visit**

MARY ANNING AND THE FIRST JURASSIC PARK

BEVERS, Jeb, Yavapai College, Prescott, AZ, USA.

Early scientific investigations of fossil materials by John Woodward (1659) and Agostina Scilla (1670) were some of the first to support that these remains were of organic organisms, rather than inorganic oddities in the rocks. William Smith produced the first geologic map (1815) and in his companion guide to this *Strata Identified by Organized Fossils* (1816) utilized abundant invertebrate marine fossils to accurately identify geologic strata across England, Wales and southern Scotland. Mary Anning (1799–1847) is now identified as a central figure in the early interpretations of fossil materials from the Jurassic Coast of southern England. Though Anning did not herself have any publications, several geologists; including Adam Sedgwick, Charles Lyell, Henry De le Beche and William Buckland, used many of Anning's observations and conclusions in their own works. Anning's efforts to uncover salable fossils for her own livelihood and her abundant observations on the materials and keen mind assisted in popularizing the early field of paleontology. Many of Anning's collected specimens are on display at natural history museums in England. The interpretations of this antediluvian life, filled with ammonites, plesiosaurs and ichthyosaurs assisted in paving the way for both a scientific perspective of the history of life and in popularizing this information. Gideon Mantell's own discoveries of Iguanodon, made by his wife Mary in 1822, started another frenzied scientific search for such giant prehistoric beasts. Richard Owen published his studies of three taxa, *Iguanodon, Hylaeosaurus, and Megolosaurus* as a new group, the Dinosauria, which usurped his rivalry with Mantell's own work on this group. Early illustrations and popular works on the ancient life which science was becoming aware of made its way into the public mind with the first Jurassic Park. Benjamin Waterhouse Hawkins created, under the direction of Owen, several life-sized statues including *Iguanodon*, Icthyosaurs, *Megalosaurus* and thirty other replicas. These statues went on exhibit in the popular Crystal Palace of London in 1854 as the Dinosaur Court. These exhibits of were visited by countless thousands of amazed public citizens, including Charles Darwin.

THE MILK CREEK MAMMAL FAUNA OF CENTRAL ARIZONA (LATE MIOCENE) WITH NEW TAXA AND AN ESTIMATE OF BODY MASS OF CAMELIDS AND ANTILOCAPRIDS USING ASTRAGALI AREAS

BEVERS, Jeb and CURTIS, Dirilee, Yavapai College, Prescott, AZ, USA; WEIDEMAN, Carley, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ, USA.

The Milk Creek fossil site (Late Miocene) of Yavapai County, Arizona was initially surveyed in 1949 and first described in 1950. A more recent review of the Milk Creek collections and faunal diversity were conducted in 2015. This examination of the collections was to obtain a larger and more complete inventory of the mammalian fauna from this site. The largest of these holdings is in the Frick Collections of fossil mammals held at the American Museum of Natural History. Most of the other collections are in regional museums across Arizona. A description of fauna from this examination of collections is listed, with the majority of the taxa being from two types of Camelidae: *Michenia yavapaiensis* and *Protolabis coartatus*. In addition to these two listed genera of camelids, post-cranial remains were located; both in the field and from the University of Arizona Laboratory of Paleontology Milk Creek collections, of a third camel type for this locality. Also, a new Canidae, the first *Leptocyon* sp. known to the Milk Creek formation was located in the Sharlot Hall Museum Milk Creek collections. This specimen includes the upper left M1 and M2. The specimens for the recently located third camelid included a right astragalus. Using a linear regression model the body mass estimates for camelid and antilocaprid specimens from the Milk Creek formation and other Late Miocene localities (the Barstow formation in California and the Tesuque formation in New Mexico) were made.

HISTORY OF PALEONTOLOGICAL RESEARCH AT THE MILK CREEK FORMATION, AZ

BEVERS, Jeb, Yavapai College, Prescott, AZ, USA.

The vertebrate mammal fauna of the Milk Creek Formation of central Arizona represents a regionally important site for latest Barstovian to Clarendonian materials (est. 9.0 to under 14.2 Ma). Known collection holdings are held at the American Museum of Natural History, the University of Arizona Laboratory of Paleontology, The Museum of Northern Arizona, the Mesa Museum of Natural History, the Sharlot Hall Museum and at Yavapai College. The first collections, made jointly between the Museum of Northern Arizona and the Arizona State Museum (U of A) were published in 1950 by Charles Reed in Plateau Magazine. The current locations of this 1948 and 1949 collections are in question. They may be deposited jointly in the MNA and the UALP, with some materials possibly sent off to California. After this collection, the next major efforts were conducted by Ted Galusha, Assistant Curator of the American Museum of Natural History. Galusha's efforts between 1958 and 1962 amassed the largest single Milk Creek collection, held in the Frick materials at the AMNH. Galusha noted in field books that private collections, by local ranchers in 1938, spurred scientific interest in the Milk Creek deposits. Galusha had quite productive field seasons at the Milk Creek site. Following Galusha's work, John Lance (1963–1967) and Everett Lindsay (late 1960's to early 1990's) from the University of Arizona continued to collect materials from Milk Creek. The UALP materials, the second largest, represent important holdings for this site. Over 90 percent of all specimens from this formation are camelids. James G. Honey, in 2007, compared the two most common species *Protolabis coartatus* and *Michenia yavapaiensis* from the Milk Creek Formation with other camelids. Brief collections of Milk Creek materials have also been made by the Mesa Museum of Natural History and Norm Tessman from the Sharlott Hall Museum. Since the 1990's Beth Boyd (Geology) and Jeb Bevers (Biology) of Yavapai College have continued to survey and collect materials from the Milk Creek Formation.

MASTODONS OF UNUSUAL SIZE: HOW DO CALIFORNIA SPECIMENS OF *MAMMUT AMERICANUM* COMPARE TO THE REST OF THE COUNTRY?

DOOLEY, Alton C., Jr., Western Science Center, Hemet, CA, USA, SCOTT, Eric, Cogstone, Riverside, CA, USA; MCDONALD, H. Gregory, Bureau of Land Management, Utah State Office, Salt Lake City, UT, USA.

Several authors over the years have suggested that individuals of *Mammut americanum* from California, and specifically from Rancho La Brea, tend to be smaller and have different tooth proportions than those from the eastern United States, but little corroborative data have been presented. To test this hypothesis, measurements were obtained from second and third upper and lower molars (maximum crown length and width) and femora (length, distal width, and minimum shaft diameter) from mastodons from various southern California localities, particularly Rancho La Brea and Diamond Valley Lake, then compared to specimens from elsewhere in North America (nineteen states and one Canadian province). Preliminary results indicate that mastodons from California and Idaho tend to have lower third molar crowns that are narrower for a given length (L:W = 2.30, n = 16) than those from other areas (L:W = 1.91, n = 101). Similar trends are also present in upper third molars (CA-ID L:W = 1.96, n = 24; non-CA-ID L:W = 1.71, n = 39). Moreover, in California specimens the L:W ratio in m3 tends to increase with increasing length. These trends are not apparent in either upper or lower second molars. Among m3s, only two specimens out of 101 from outside of CA-ID had a L:W ratio that exceeded the CA average, and only four additional specimens were within one standard deviation of the California average. Of the 101 non-CA-ID m3 specimens, 69 had a L:W ratio lower than any California specimen. In addition, there are

indications that the size of the m3, particularly the width, does not track closely with body size. Diamond Valley Lake specimen WSC 18743 has a distal femoral width of 288 mm, which is larger than any other California mastodon and larger than the adult male mastodon from Watkins Glen, New York. The pelvic width of WSC 18743 is also greater than the Watkins Glen specimen, and the maximum tusk circumference of this specimen (56.6 cm) is typical for a large male mastodon. Yet the molars from WSC 18743 are not particularly long relative to other California specimens, and are among the narrowest molars measured.

A NEW TRIASSIC BONEBED FROM THE BEARS EARS REGION OF UTAH

GAY, Robert J., Museums of Western Colorado: Dinosaur Journey, Fruita, CO, USA; JENKINS, Xavier A., College of Liberal Arts and Sciences, Arizona State University, Tempe, AZ USA; MILNER, Andrew R.C., St. George Dinosaur Discovery Site at Johnson Farm, St. George, UT, USA; VAN VRANKEN, Nathan E., The Colony, TX, USA; DEWITT, Dylan M., Ralston Valley High School, Arvada, CO, USA; LEPORE, Taormina, Raymond M. Alf Museum of Paleontology, The Webb Schools, Claremont, CA, USA.

In the summer of 2016, field crews from the Museums of Western Colorado: Dinosaur Journey discovered a bonebed of large-bodied archosaurs in the vicinity of Fry Canyon, San Juan County, Utah. Nicknamed "Portal to NeCrocPolis" (P2N), the site preserves at least three armored archosaurs in brown mudstone with fine, <2 cm thick white sandstones. The bonebed extends over 64 m in a NNE by SSW exposure and appears to be present to the east of the main P2N outcrop across a draw, 80 m to the east, though colluvial deposits currently prevent precise correlation. The fossil-bearing deposit is situated approximately nine meters above a large, grayish-white channel sandstone that locally marks the boundary between the underlying Monitor Butte Member and the Church Rock Member of the Chinle Formation. The mudstone/sandstone beds are laterally extensive within lower Church Rock Member within the Fry Canyon-Red Canyon area, though additional extensive deposits like P2N have not been discovered in the areas prospected. We interpret the bonebed to be monotaxic based on the presence of one articulated individual discovered *in situ* during the initial discovery and surface-collected elements of consistent morphology matching that of the *in situ* material from the entirety of the 64 m exposure. Elements from all portions of the skeleton of the P2N animal have been recovered, and the *in situ* specimen preserves nine dorsal vertebrae, a partial pelvis, left and right thoracic ribs and gastralia. Additional material from the cranium, lower jaw, cervical, dorsal, and caudal vertebral series, limbs (including phalanges and unguals), and dermal armor have been recovered. While the taxa bears some resemblance to both phytosaurs and aetosaurs, several characters seem to be ambiguous. Unique characters include dorsoventrally flattened, spade-shaped unguals, osteoderms with a distinct lateral bend and anterior articular surface, and teeth with higher-than-normal serration densities (5–6/mm vs. 1–2/mm in phytosaurs). This bonebed likely represents an accumulation of a new taxon from the Bears Ears region; additional fieldwork in 2017 is planned in order to fully excavate the site.

NEW ADDITIONS TO THE MIOCENE VERTEBRATE FAUNA OF THE TESUQUE FORMATION, ESPAÑOLA BASIN, NEW MEXICO

GENSLER, Philip, Bureau of Land Management, Santa Fe, NM, USA; MORGAN, Gary, New Mexico Museum of Natural History, Albuquerque NM, USA; ABY, Scott, Muddy Spring Geology, Dixon, NM; WILLIAMSON, Garrett R., Stephen F. Austin State University, Nacogdoches, TX USA.

For over 140 years, outcrops of the Tesuque Formation in the Española basin of northern New Mexico have produced a diverse fauna of early to medial Miocene vertebrates from the Hemingfordian and Barstovian North American land mammal ages (NALMA). Edward Drinker Cope first collected Miocene vertebrates from the Española basin in 1874, describing 32 new species

of mammals, land tortoises, and a bird, many still recognized today. Paleontologists from the Frick Laboratory of the American Museum of Natural History, including Joe Rak, John Blick, and Ted Galusha, conducted a long-term survey of Miocene mammals in the Española basin from 1924 to 1965, resulting in an unparalleled collection numbering in the thousands of specimens. Beginning in 2008 and continuing to the present, the U. S. Bureau of Land Management (BLM) and New Mexico Museum of Natural History (NMMNH) have collaborated on a survey of Miocene vertebrates from BLM land in the Española basin, focusing on the Sombrillo Area of Critical Environmental Concern (ACEC) in northern Santa Fe and southern Rio Arriba counties. Unlike the Cope and Frick surveys, BLM/NMMNH paleontologists have access to GPS technology and accurate geologic and topographic maps to precisely document fossil sites. Three superposed members of the Tesuque Formation in the Sombrillo ACEC have produced vertebrate faunas: Nambé Member (Nambé Fauna, late Hemingfordian, late early Miocene, 16–17 Ma); Skull Ridge Member (Skull Ridge Fauna, early Barstovian, early medial Miocene, 15–16 Ma); Pojoaque Member (Pojoaque Fauna, late Barstovian, medial Miocene, 12.5–15 Ma). The BLM/NMMNH survey has recovered many new specimens of Miocene vertebrates from the Tesuque Formation; a sample is listed here. Late Barstovian Pojoaque Fauna: Carnivora–mandibles of the borophagine canid *Aelurodon*; mandible of the tiny felid *Pseudaelurus stouti*; maxilla of the large mustelid *Sthenictis*; mandibles of the large mustelid *Brachypsalis* and small mustelid *Martinogale*; Perissodactyla–skull, maxilla, and mandibles of the rhinoceros *Peraceras*; skulls, mandibles, and partial skeletons of the horses *Merychippus* and *Protohippus*; Artiodactyla—mandible of the oreodont *Merychyus*; mandibles of the camels *Aepycamelus*, *Procamelus*, and *Protolabis*; mandibles of the blastomerycine *Longirostromeryx*; numerous mandibles and horn cores of the antilocaprid *Meryceros*; Proboscidea—two skulls and mandibles of *Gomphotherium productum*; Small mammals—mandibles of shrews, humeri of moles, mandibles of the rodents *Copemys* and *Monosaulax* and the rabbit *Hypolagus*, and the first bat from the Española basin. Early Barstovian Skull Ridge Fauna: skull of the oreodont *Brachycrus*; skull and partial skeleton of the camelid *Protolabis*; and mandible of the mylagaulid rodent *Notogaulus*. Ongoing field work on Miocene vertebrates in the Sombrillo ACEC will allow us to more fully document the faunas from the Tesuque Formation, with an emphasis on microvertebrates and biostratigraphy.

THE GLYPTODONT, GLYPTOTHERIUM, FROM THE PLIOCENE AND PLEISTOCENE OF NORTH AMERICA: UPDATE

GILLETTE, David D., Museum of Northern Arizona, Flagstaff, AZ, USA; ZURITA, Alfredo E., Centro de Ecología Aplicada del Litoral (CECOAL-CO NICET) y Universidad Nacional del Nordeste (UNNE), Corrientes, Argentina.

Improved samples of *Glyptotherium* Osborn 1903 from the 111 Ranch fauna of southeastern Arizona (Late Blancan NALMA) and Guanajuato, central México (Early Blancan NALMA) allow assessment of ontogeny of the dorsal carapace, from baby to adult. The species identification for both faunas is *Glyptotherium texanum* (= *G. arizonae*), in which adults are large and robust. Previously postulated distinctions of these two species are now recognized as ontogenetic differences between juvenile and adult individuals. Males and females differ in the marginal row of osteoderms of the posterior half of the dorsal carapace and caudal rings. There are no morphological differences between the earliest *Glyptotherium texanum* from central México (3.9 Ma) and the 111 Ranch fauna (2.7 Ma), and no evidence that more than one species existed in North America during the Blancan NALMA and Irvingtonian NALMA. Late Pleistocene (Rancholabrean NALMA) *Glyptotherium cylindricum* (= *G. floridanum* and *G. mexicanum*) differ from *G. texanum* only in the relative size of central figures of mid-carapace osteoderms, a distinction that might be invalidated by new and better specimens. *Glyptotherium* is either anagenetic, with end-members *G. texanum*

and *G. cylindricum*, or an example of evolutionary stasis with no evolution following the origin of this genus no later than 4 million years ago. The paleogeographic record of *Glyptotherium* is generally low elevation coastal plain and low relief riparian habitats of the Gulf Coast from Central America to Florida and northward to South Carolina. New records in the interior of México indicate upland habitats and sites that are clearly situated in Pacific drainages. To date, there are no records of glyptodonts west of the Rio Colorado (Nevada and California). Research in progress indicates clear taxonomic distinction between the South American *Glyptodon* and the North American *Glyptotherium*.

CURRENT PALEONTOLOGICAL RESEARCH AND OPPORTUNITIES AT PETRIFIED FOREST NATIONAL PARK

MARSH, Adam D. and PARKER, William G., Petrified Forest National Park, Petrified Forest, AZ, USA.

The earliest collections made at Petrified Forest National Park (PEFO) were largely 'head-hunting' endeavors as paleontologists collected conspicuous phytosaur skulls in an effort to tie the park into European Late Triassic biochronology. PEFO has transformed in the last 100 years into a regional hub of Late Triassic paleontology thanks to an investment in modernized collections space, fossil preparation capabilities, trained and experienced staff, the introduction of phylogenetic methods and apomorphy-based identifications, and a synthesized stratigraphic and geochronologic framework. Ongoing research at the park focuses simultaneously on known fossiliferous localities as well as inventories of newly-acquired lands. In addition to the charismatic phytosaurs, aetosaurs, and temnospondyls for which PEFO is known, focused fieldwork in the last several years has revealed a diverse assemblage of previously-unknown non-archosaur archosauromorphs, including tanystropheids, *Doswellia*, and an azendohsaurid. The azendohsaurid is known from a monodominant bonebed comprising at least nine individuals from over 500 bones. Research undertaken from new expansion lands has uncovered an incredibly fossiliferous horizon consisting of a matrix-supported coprolite conglomerate that preserves chondrichthyans, actinopterygians, sarcopterygians, temnospondyls, procolophonids, rhynchocephalians, and what might be the earliest stem-squamate in the fossil record. This layer also preserves the first occurrence of *Saurichthys* from the Late Triassic of western North America. The first year of a new boundary expansion survey documented more than 100 new fossil localities, including several phytosaur skulls, and ongoing partnerships with Yale University, Harvard University, the Burke Museum, and the Petrified Forest Field Institute continue to make new discoveries every year. PEFO is looking to broaden its scope and is soliciting research interest in paleobotany, sedimentology, invertebrate paleontology, ichnology, and related fields. Research collaborators are vital components in advancing science and educating visitors in national parks, and scientists seeking research permits can submit applications at https://irma.nps.gov/rprs/.

MAMMOTH (*MAMMUTHUS*) LOCALITIES FROM MARICOPA COUNTY, ARIZONA

MCCORD, Robert, Arizona Museum of Natural History, Mesa AZ, USA.

Maricopa County, Arizona, has numerous *Mammuthus* localities, most of which have been covered to some detail by the news media. However their formal documentation and publication have been woefully lacking. Chronologically by discovery these are: the Fort McDowell, prior to 1969, elements unknown, possibly in the UALP collection; the Nichols Site, published 1971, humerus, molar, fragmentary molar, scapula, ASU; the Chandler I site, innominate AzMNH, mandible and femur whereabouts unknown; the Chandler II site, tusk, tooth, pelvis, rib, whereabouts unknown; the North Phoenix Site, 1999, femur, whereabouts unknown; the Gilbert Site 2005, abstract published 2006, two tusks and an atlas, AzMNH; and the Estrella Site,

2016, limb bone, AzMNH. In addition, a possible *Mammuthus* site has been located (2017) in Sun City and is pending permitting and excavation by AzMNH. ^{14}C dating has been attempted on a number of these sites, but has produced no results for Gilbert and Estrella, and a date of 8570 ± 130 on charcoal 4 inches (~10.2 cm) above the site with an age estimate of 11,200 BP on the Nichols Site, and 9560 ± 80 on the Chandler I Site. In addition, the Estrella mammoth was found on the level of the Lehi Terrace possibly constraining its age. Additional fauna is known from three sites: with *Equus*, ?*Nothrotherium, Gopherus* and unionid from the Nichols Site; rodent and shell from the Chandler II Site, and cf. *Hemiauchenia*, *Equus*, *Stockoceros*, and *Gopherus* (*Gopherus*) from the Gilbert Site. The lack of formal description and, more seriously, the misplacing of material, hampered this review, and any future understanding of the late Pleistocene of Maricopa County. The fauna of Chandler I remains unanalyzed and its whereabouts are unknown. It is entirely possible that some of the other localities contained further faunal elements as well. Investigation of the whereabouts of this material continues.

BEER: THE NEW FRONTIER OF PALEONTOLOGY OUTREACH AND MUSEUM FUNDRAISING

MCCULLOUGH, Gavin, Arizona Museum of Natural History, Mesa, AZ, USA.

The increasing visibility, variety, and availability of craft beer in recent years has proven a cultural and economic boon in many places where microbreweries are opening nationally. Inspired by the Dallas Museum of Nature and Science's sponsored craft beer nights and other "adults only" events common at art museums and botanical gardens across the country, the Arizona Museum of Natural History (AZMNH) has found success with an annual event that has increased its profile, been embraced by local businesses, enhanced its image, raised funds, and engaged an underserved demographic that yearns for intellectually stimulating special events. Keys to the success of the event have been: 1. Creating novel science-related evening activities, which have grown more popular with each year; 2. Securing donations of high-quality local and regional craft beer; 3. Cultivating the museum's status as part of the burgeoning "shop local" movement that has become a formidable economic force in the Phoenix area and in other cities; and 4. Marketing the event with a combination of online social media, word of mouth, print, and pub-style flyers placed in venues associated with nightlife such as bars, clubs, breweries, and record stores. Future plans include the possibility of paleontology outreach "scientist nights" or informal residencies onsite at local breweries and mixed-use venues.

AN UNUSUAL PLEISTOCENE LOCAL FAUNA FROM COAHUILA, MEXICO

MILLER, Wade E. Miller, Department of Geology, Brigham Young University, Provo, UT, USA; AGUILLÓN-MARTÍNEZ, Gómez-Núñez, Rosario, DELGADO-DE JESÚS, Carlos René, VALLEJO-GONZÁLEZ, José Ignacio and ROBLEDO-GARCÍA, Julio Alberto, Secretaría de Educación Publica de Coahuila y Museo del Desierto, Coahuila, C.P., México.

Many areas yielding substantial Pleistocene sediments occur throughout the state of Coahuila, Mexico. All have the potential of containing vertebrate fossils. However, exceptionally few reports have been published relating to them considering the size of this state, the third largest in Mexico. The fauna reported here comes from fluviatile sediments deposited within a one to two and one-half km wide fault-produced valley. It runs between the San Francisco de los Desmontes and San José de los Nuncios Mountains of the Sierra Madre Oriental Mountain Chain. Recovered fossils were discovered between the ejidos (villages) of Las Higueras and Paso Guadalupe. They were found over a distance of about two km within interbedded fine-grained sediments and very coarse gravels. The unusual aspect of the fauna is that after many days of close inspection of

the deposits by many people, only fossils ascribed to mammoths were found. An exception to this was the inclusion of tiny mollusc shells. Almost all the fossils observed come from within a one meter zone containing mostly gravels with clasts up to small boulder size. Lack of significant abrasion on the fossils suggests short transport. A probable scenario is that a small mammoth herd was caught in a flash flood within a steep-walled river bed. Faster and more agile animals were able to escape. After a period of time, allowing for scavenging of carcasses and weathering, bones and teeth were washed further downstream. Identified fossils include molar teeth, tusks, limb and foot bones, articulated and unarticulated vertebrae and an innominate girdle.

UNCONSCIOUS BIAS AND THE ORGINS OF BIRDS

MOLNAR, Ralph E., University of California Museum of Paleontology, Berkeley, CA, USA & Museum of Northern Arizona, Flagstaff, AZ, USA.

Cognitive (unconscious) bias has received much attention in the social sciences since the 1990's, and more recently in biological sciences. An evolutionary perspective of brain function implies not only that perception is filtered by cognitive processes, but also basic conceptual understanding may be biased. A case in point is the controversial dissent from the commonly held view that birds are maniraptoran theropod dinosaurs. This dissent is based on differing interpretations of observable features of specimens, not on the features themselves. It is in interpretation that bias may enter. Examination of a prominent exposition of this dissent, Alan Feduccia's 2012 book *Riddle of the Feathered Dragons*, reveals statements seemingly reflecting unconscious (hence unintentional) bias. More interesting are the underlying issues involved, which include (among others): 1, differing interpretations of the unique role of cladograms in establishing evolutionary relationships; 2, the role and extent of homoplasy; 3, tacit (and hence unrecognized) shifts in meaning and interpretation, and 4, limited focus dictated by the field of expertise (paleontology or neontology). For example, in neontology organisms may be seen not only as physical entities, but also as ensembles of functions and behaviors, whereas in paleontology the skeletal system is (necessarily) the main focus of attention. Cognitive biases in paleontology are not unique to the dissenting view, nor to this issue. Careful examination of the logic of how and why conclusions are reached, in particular regarding "obvious" assumptions, and explicit statements of what evidence would clearly contradict the conclusions reached might assist in resolving disagreements. Truth is not always obvious.

ALONE IN THE WEST: THE LOCALLY ITERATIVE MESOZOIC FOSSIL RECORD OF THE SNAKE *CONIOPHIS*

NYDAM, Randall L., Midwestern University, Glendale, AZ, USA. rnydam@midwestern.edu

Coniophis precedens Marsh,1892 was erected based on a single vertebra from the Lance Formation (Maastrichtian) of Wyoming. Subsequent recovery of morphologically similar vertebrae has resulted in the recorded presence of *Coniophis*—or alternatively *Coniophis*-grade—vertebrae from the Cenomanian–Eocene of North America (European and Asian occurrences are known, but now generally disputed). During the Late Cretaceous (Cenomanian–mid-Maastrichtian) these vertebrae are nearly the only evidence of North American snakes and have been found from southern Alberta to northern Mexico with greatest density of occurrences in the southern latitudes (e.g., Utah, New Mexico, Mexico). This Late Cretaceous North American record of *Coniophis* substantially post-dates the earliest known snakes (mid Jurassic–basal Cretaceous) and the oldest known vertebra attributable to *Coniophis* (Cenomanian of Utah) is contemporaneous with the apparent explosive global radiation of snakes. Ironically, *Coniophis precedens* from the Maastrichtian of Montana—vertebrae and recently referred jaws—has been proposed to represent a transitional form bridging the morphological gap between lizards and snakes.

Detailed review of the vertebral specimens of *Coniophis* suggest that only one snake was present in nearly all the constituent faunas (two vertebral morphotypes possibly co-occur in the Hell Creek Formation, but redeposition is highly likely). Variation in the vertebrae from one fauna to the next suggests each fauna has its own distinct taxon of *Coniophis*-grade snake, but specimen numbers are too limited and positional control/comparison is too limited to formally diagnose taxa. Review of the referred cranial material reveals a chimaera of lizard and snake jaws and rejection of the "transitional" status of *C. precedens*. *Coniophis*-grade snakes were clearly an isolated and conservative lineage of ophidians in North America during the Late Cretaceous. It is not clear why they did not radiate and diversify similarly to the co-occurring micro- and macrovertebrates (e.g., crocodylians, mammals, lizards, dinosaurs) during this time. Competitive exclusion is possible, but snakes in the Late Cretaceous of Argentina show only slightly more diversity (2–4 possible taxa) with significantly less apparent faunal density. By the end of the Maastrichtian additional snake taxa appear in North America and post K-Pg diversity increases rapidly.

STUDENT INTERNS, MUSEUM EXHIBITS AND CAVE BUILDING; OH MY: LESSONS LEARNED DURING A COLLEGE-MUSUEM COLLABORATIVE PARTNERSHIP

OZOLINS, Erik G., Mt. San Jacinto College, San Jacinto, CA, USA; DOOLEY, Alton C., Jr., Western Science Center, Hemet, CA, USA; DOOLEY, Brett S., Patrick Henry Community College, Martinsville, VA, USA.

The Mt. San Jacinto College (MSJC) Anthropology Department partnered with the Western Science Center (WSC) to develop an exhibit on hominin evolution, with a specific goal of involving 2-year college students in all stages of exhibit development. The project began with conceptual meetings between MSJC faculty and WSC staff in Spring of 2015. Beginning in January 2016 students signed up as WSC volunteers and, in most cases, registered for a 1-credit internship offered through MSJC. Students, faculty, and staff met approximately twice a month to discuss themes and structure for the exhibit, and to choose specimens and topics for inclusion. Each student involved in the internship was required to produce a written background report on one of the major specimens, which was used as an initial draft for exhibit text. Construction of the exhibit began in late Spring 2016, with the bulk of construction taking place in the Fall for a December 2016 opening. As with the planning stages, students, faculty, and museum staff worked collaboratively on construction and installation of the exhibit. Here we highlight some of the benefits of this partnership (such as educational opportunities for students, increased volunteer pool and media exposure for the museum), as well as some of the challenges faced (such as differing goals for colleges and museums, and high turnover rates of 2-year college students).

A POSSIBLE PHYSETEROID (CETACEA: ODONTOCETI) FROM THE YORBA MEMBER OF THE PUENTE FORMATION, ORANGE COUNTY, CALIFORNIA

SHERZER, Benjamin, Duke Cultural Resources Management, Lake Forest, CA, USA.

The Marywood Project was a 16-acre residential housing development project in the City of Orange, Orange County, California. Mass grading for the project began in June of 2016, reaching depths of 90 feet into deposits of the Yorba Member of the Puente Formation (Late Miocene, approximately 8–7 Ma). Over the course of four months, paleontological monitoring provided by DUKE Cultural Resources Management documented or collected over 70 fossil specimens, predominantly fragments of marine mammal bone, but also shark, teleost fish, marine gastropods, terrestrial and marine plants, trace fossils, and coprolites. The recovered marine mammal bone is interpreted to represent cetacean elements, including four teeth and two possible mandibular fragments tentatively assigned to physeteroidea (cetacea: odontoceti). The dimensions of the teeth and mandibular fragments are closest in size to the

published ranges for *Aulophyseter morricei*, but are also similar to *Preaulophyseter*. If the physeteroid material does represent *A. morricei*, this would be the first specimen found outside of Shark Tooth Hill (Round Mountain Silt Member of Temblor Formation, 15.2–16.0 Ma), as well as the youngest specimen of *A. morricei.*

NEWLY DISCOVERED TURTLE SPECIMENS FROM THE UINTA FORMATION (MIDDLE EOCENE) OF UTAH, INCLUDING BAENIDAE, CARETTOCHELYIDAE, PLANETOCHELYDAE, TESTUDINIDAE AND GEOEMYDIDAE

SMITH**,** Heather F., ADRIAN, Brent, TOWNSEND, K.E. Beth, Department of Anatomy, Midwestern University, Glendale, AZ, USA; HUTCHISON, J. Howard, Museum of Paleontology, University of California Berkeley, Berkeley, CA, USA.

Numerous fossil turtle specimens have been recovered from the Uinta Formation, Uinta Basin (46.2–42 MA), and provide a strong indicator of ecosystem evolution during the middle Eocene. Our study examines the distribution of turtle specimens collected from more than 265 stratigraphically constrained fossil localities, 66 of which have yielded turtle fossils. Here, we report on newly discovered Uintan specimens from the cryptodire families Baenidae, Carettochelyidae, Planetochelyidae, Testudinidae, and Geoemydidae. Each clade also provides different insight into Eocene turtle evolution and climatic conditions during this time period. Baenidae were an extinct clade of North American river turtles with an extensive radiation from the Early Cretaceous to the middle Eocene, with their last known occurrence during the Uintan North American Land Mammal Age (NALMA). Newly discovered cranial, postcranial, and well-preserved shell fossils of Uintan baenid turtles *Baena arenosa* and *Chisternon undatum* are described here. These specimens represent among the youngest known of the baenid clade, and they increase the known variation in these late-surviving taxa and indicate that several characters thought to delineate the species should be redefined. New discoveries of rare turtle taxa provide unique insight into the scantly reported distribution, taxonomy, and ecological diversity of Uintan turtles. These rare taxa have been identified in less than 5% of collected specimens: *Anosteira* (4.3%), *Planetochelys* (0.6%), cf. *Hesperotestudo* (1.8%), *Bridgeremys* (2.7%). The smaller-bodied, highly aquatic taxa, *Anosteira* and *Bridgeremys*, are predominantly located higher in the section (Uinta C, Ui3 biochron), while the more terrestrial cf. *Hesperotestudo* and *Planetochelys* have been collected primarily from the historically fossiliferous upper part of Uinta B (Ui2 biochron). These differences provide clues to understanding the biogeography of temperature sensitive turtles and the role of paleoclimate in middle Eocene vertebrate evolution. Numerous fossil geoemydid turtle specimens from the genus *Echmatemys* have been recovered from the Uinta Formation. Using geometric morphometrics, we determined that congeneric species *E. callopyge* and *E. uintensis* can be reliably differentiated based on 3D morphological differences in the curve of the gular sulcus on the epiplastron. ArcGIS revealed overlapping geographic ranges for these species and no significant differences in stratigraphic distribution of species.

A NEW COMPUTER PROGRAM IN DEVELOPMENT FOR RECONSTRUCTING AND ANALYZING SOFT TISSUE STRUCTURES IN FOSSIL VERTEBRATES

THOMSON, Tracy J., and DEBLOIS, Mark, University of California, Davis, Davis, CA, USA.

The rareness of soft tissue preservation in the fossil record has always been a limiting factor for interpreting the functional morphology of soft tissue structures (e.g., claw sheaths and flippers) with any confidence. Such tissues enclose and extend beyond their hard tissue counterparts (e.g., bony cores and skeletal elements) and accurate estimation of these tissues is essential for meaningful interpretations on the functional morphology of these structures. Here we report our initial development of a new program designed to reconstruct and analyze soft tissue structures in fossil organisms. The code is currently being written using the programming software MATLAB

with the end goal that a standalone version will be developed and made available to researchers in the future. The program quantifies and records parameters using X-ray and computed tomography (CT) images which describe relationships between hard and soft tissues in the structures of extant organisms. It then uses the resulting database of parameters to inform soft tissue reconstruction based on the preserved hard tissues of analogous structures in fossil organisms. Analytical features of the program include the ability to fit and describe equiangular (logarithmic) spirals for claws, determine ratios of hard/soft tissues, calculate angles of claw curvature, and iteratively quantify soft tissue outlines. The accuracy of the reconstructions produced by the program can be determined by comparing the results to rare fossil examples where the soft tissue is preserved or revealed by laser fluorescence. Preliminary results are promising with regards to its ability to reconstruct flipper tissue from skeletal elements in plesiosaurs. Claw sheath reconstruction, although still in the beginning phases, is expected to perform as well or better because claws are much simpler structures. It is hoped that the program may eventually be successfully used to reconstruct horn and wing tissues as well.

FOSSIL TORTOISES OF SOUTHEASTERN ARIZONA, WITH AN EARLIEST PLEISTOCENE RANGE EXPANSION OF *GOPHERUS*

THRASHER, Larry, Bureau of Land Management, Safford, AZ, USA.

Recent field work has revealed that there are three distinct tortoises of Plio-Pleistocene age in southeastern Arizona. The tortoises consist primarily of a large unnamed species of the gopher tortoise *Gopherus*, and an unidentified species of the giant land tortoise *Hesperotestudo*. A third, smaller tortoise similar to *Hesperotestudo* is rarely present. *Gopherus* and the smaller tortoise appear to be restricted to beds of late Blancan (earliest Pleistocene) age whereas *Hesperotestudo* occurs in those beds as well as in the older, middle Blancan (late to latest Pliocene) deposits of the area. *Gopherus* was known to undergo major range expansions during the Pleistocene, and these beds appear to document one of the first of that epoch, with a sudden late Blancan expansion throughout southeastern Arizona. Due to open, savannah-like conditions stretching unbroken from eastern Arizona to Florida during the Plio-Pleistocene, the tortoises and other faunas of this large area are strikingly similar, including having three tortoises in Florida and in the Rio Grande valley of New Mexico similar to the ones described here.

***PROTOREODON* AND THE DIVERSIFICATION OF BASAL RUMINANTS**

TOWNSEND, K.E. Beth, Midwestern University, Glendale, AZ, USA; HOLROYD, Patricia A., University of California Berkeley, Berkeley, CA, USA.

The middle Eocene was a time of significant diversification among artiodactyls with the appearance of basal ruminants (deer, sheep), suids (pigs, peccaries), tylopods (camels, llamas), and whales. The phylogeny of the initial splits among these clades is still poorly resolved, particularly when Eocene taxa are included. This lack of resolution stems in part from a lack of data for the postcranial skeleton and an underappreciation of the range of postcranial morphology exhibited by Paleogene artiodactyls. We fill some of this gap in our knowledge by focusing on the potentially polyphyletic complex of middle Eocene species of *Protoreodon* from the southwestern United States. *Protoreodon* has been considered either an agriochoerid oreodont or one of several Eocene taxa near the base of Ruminantia. Our work focuses on both restudy of the type material, detailed description and analyses of new collections from the Uinta Formation of eastern Utah that include the first associated skeleton of the type species *Protoreodon parvus* and other *Protoreodon* spp. partial skeletal associations. The postcrania of *P. parvus* shows many morphological differences from slightly younger and larger species that have been previously described. Notable differences are in the tarsal complex, ankle, and

elbow in features associated with both smaller body mass and a more cursorial gait. This variation among *Protoreodon* species suggests differences in locomotor behavior even among species currently thought to belong to this genus, as well as in comparison to other small Eocene artiodactyls. This finding suggests that previously published scorings in phylogenetic matrices based on species composites are not likely to be representative for the genus. Therefore, for each available species, we scored the new data available for the dentition and postcrania into two recent phylogenetic matrices and examined alternative interpretations of character polarities and reconstruction of ancestral locomotor modes for ruminants in light of alternative placements of *Protoreodon* spp. relative to one another and also to other early Paleogene artiodactyls. Although we cannot yet resolve the pattern of middle Eocene diversification of North American artiodactyls, our findings clearly highlight the utility of comprehensive restudy of basal artiodactyls to capture the full range of morphological diversity.

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