DOWNLOAD PDF FOSSILS OF THE SOUTHWESTERN STATES (BLOMSTROM, DAVID. FIRST IMPRESSIONS.)

Chapter 1 : Fossil - Wikipedia

First Impressions.), Fossils of the Southern States (Blomstrom, David. First Impressions.), Fossils of the Southwestern States (Blomstrom, David. First Impressions.), (Ir)rational parks, Teacher with an Attitude.

During the Late Cambrian, the southern third of New Mexico was a marine environment. This habitat was home to a few kinds of brachiopods, a species of graptolite , and trilobites. Local trace fossils include bore marks left by ancient worms. The southern third of New Mexico remained submerged by the sea throughout the entire ensuing Ordovician. More than two hundred kinds of invertebrate lived in Ordovician New Mexico. Groups present included brachiopods, bryozoans, corals, gastropods , nautiloids, pelecypods, sponges, and trilobites. Algae made reefs up to three hundred feet high. Marine conditions in southern New Mexico persisted on through the Silurian. At least 66 kinds of invertebrates made their home here. Groups familiar from the Ordovician, including brachiopods, bryozoans, corals, gastropods, a nautiloid, and a pelecypod, were among them. Over two hundred kinds of Devonian marine life lived and died in the region. The familiar invertebrate groups including bryozoans, cephalopods, corals, gastropods, and pelecypods were all present. Notably these were joined by vertebrates, including placoderms from two different suborders, cartilaginous fishes and more. Areas still submerged were home to brachiopods and clams. The islands themselves were thickly vegetated with forests and swamps. Into the Mississippian, crinoids and other fossil life built huge bioherms. The local Mississippian biodiversity included at least 6 kinds of blastoids brachiopods, 33 bryozoans, 57 corals, 85 crinoids, 22 gastropods, 7 nautiloids, 8 pelecypods, 9 trilobites, and others including foraminiferans and starfishes. On land primitive plants grew in New Mexico. Pennsylvanian New Mexico experienced both marine and terrestrial conditions over time. Marine life included more than species of brachiopods, 41 bryozoans, 34 cephalopods, 34 corals, foraminiferans, 87 gastropods, 25 ostracods and 85 pelecypods. Exceptional brachiopod specimens from this time still retain traces of their shell colorations. The foraminiferans were present in "tremendous abundance", with the most common varieties being fusulinids. Other important fossils provide paleoecological evidence for Pennsylvanian parasitism. Early in the ensuing Permian period the local climate dried significantly. Local rivers dried up and fields of sand dunes took their place. Sea levels dropped and the water became extremely salty. During the middle part of the Permian the seas returned to a more typical state. At this time a huge reef system began to form at El Capitan in the southeastern part of the state. Most of New Mexico was under seawater during the ensuing Permian. More than kinds of marine life have been discovered in the state. On land, at least 20 kinds of plants including early conifers , horsetails, and seed ferns grew. Restoration with scale bar, made for Petrified Forest National Park. A similar modern depositional scenario is found in the Great Basin of Nevada and Utah. The presence of lime nodules that formed in the ancient soils provides evidence for a strongly seasonal climate. For part of the year the climate was very dry. Contemporary algae was preserved in local freshwater deposits. The local streams and lakes held animals such as freshwater clams, fish, ostracods, and snails. A lush flora grew in the local floodplains. At the same time, plants such as conifers , cordaitales, cycads, and horsetails, greened the New Mexican landscape. The early dinosaur Coelophysis inhabited the region. Prosauropods were also present but rare in Late Triassic New Mexico. The Jurassic of New Mexico is poorly known. Evidence suggests that the state had a relatively dry climate. The local environment was a coastal plain. Local dinosaurs were preserved in the sediments of the Morrison Formation. Eastern New Mexico was inundated by seawater once more during the Cretaceous period. This sea was home to ammonites and oysters. Throughout the Cretaceous over different kinds of life are known to have lived in New Mexico. Most fossils known from Early Cretaceous times were of marine invertebrates. At least species lived in New Mexico during the Late Cretaceous. Most of the marine invertebrates of that era were much larger than modern types. The largest known local ammonite from the Late Cretaceous was Mantelliceras canitaurium, whose shell could be up to 16 inches in diameter. The Cretaceous sharks of New Mexico were very similar to their contemporaries in Kansas. On land a diverse

flora grew that included at least 14 different kinds of fern , 16 figs , 8 honeysuckles , 5 willows , and trees that left behind petrified logs more than 30 feet long. The local vertebrates included crocodiles , at least 16 different kinds of turtles. Examples include ceratopsians, Gorgosaurus , ornithopods , and sauropods. Some of these dinosaurs left behind an abundant trace fossil record. At the time the Dakota Formation was being deposited in northeastern New Mexico, more than dinosaur tracks were imprinted in the sediments of Clayton Lake State Park. Another New Mexican Dakota exposure contains 55 parallel trackways left by ornithopods moving northward on all-fours. This site, the Mosquero Creek site, also preserves a series of ten or more parallel trackways left by even larger two-legged ornithopod moving in the opposite direction as the other ornithopods. These New Mexican tracks provide important evidence of social behavior in dinosaurs. The landscape was divided by rivers and dotted by lakes. Garfish inhabited the local lakes while magnolias grew in the floodplains between rivers. Many volcanic eruptions occurred in the region at this time. The Raton area was covered in swamps during the Paleocene epoch of the Cenozoic era. The individual leaves from some of the contemporary palms could be more than 9 feet wide. At least 42 different kinds of mammals lived in New Mexico at the time. Groups including the amblypods, carnivorans , condylarths, marsupials , multituberculates, and taeniodonts. Other kinds of animal life included two kinds of crocodiles, fishes, snails relatives of the modern tuatara , and 16 kinds of turtle. The Eocene fossils of New Mexico include different animal species. Aquatic life included clams, fishes, and snails. On land, the mammals were very diverse, represented by more than eighty species from 23 families and 10 orders. The Eocene Baca Formation of Socorro County preserves 18 footprints in three separate parallel trackways. The trackmakers were probably pecorans, but may have been members of the camel family. Since the trackways share a parallel orientation they provide important evidence for social behavior in ancient mammals and are among the oldest known fossil footprints left by cloven-hoofed mammals. Another interesting local Eocene inhabitant was the 7-foot tall flightless bird Diatryma. Very few identifiable fossils have been discovered in New Mexican Oligocene deposits, so this epoch of time remains mysterious to paleontologists. From the Miocene to Pliocene New Mexico was home to creatures such as four-tusked relatives of modern elephants. Other inhabitants included an abundance of beavers , three toed horses, and rhinoceroses. Trees growing in New Mexico have been preserved as petrified wood, some specimens have opalized into a gem-like substance. As the Cenozoic proceeded, the local climate began to cool. During the Quaternary period, the Rio Grande became the most prominent local river system. During the Pleistocene epoch, large trees, probably pines , were preserved as impressions left in ancient San Jose Valley lava flows. At this time the state was home to camels and mammoths. American mastodon remains were found on the east slope of the Sandia Mountains at an elevation of 8, feet, the highest ever recorded for the species. Many Pleistocene fossils were preserved in local caves. History Indigenous interpretations The Jicarilla Apaches in southern New Mexico told a myth about the origin of fire that also served to explain the existence of petrified wood. They believed that in the beginning, trees were all fireproof. However, Coyote ran around the world with a torch tied to his tail. As he ran his used his tail to start raging fires all over the world. Trees Coyote accidentally missed remained stone -like and fireproof, but the ignited trees can be used by modern people to light fires. The Jicarilla had another fossil-derived legend about the predatory monsters Giant Elk and Giant Eagle. Early in history, these predatory creatures killed many men, women, and children. A brave young man named Jonayaiyin decided to hunt these monsters down. He traveled far to the south, where he found the Giant Elk. He succeeded in killing it and took one of its horns to use as a weapon. He traveled to the west where the giant eagle lived high up on a ledge. The giant Eagle grabbed him in her claws and carried him to her nest. Scientific research Coryphodon restoration by Charles R.

Chapter 2 : David Blomstrom | Open Library

*Fossils of the Great Plains States (First Impressions) [David Blomstrom] on racedaydvl.com *FREE* shipping on qualifying offers. An overview of the geologic history, ancient biology, and fossils of the Great Plains states.*

The indigenous people of the United States interpreted the fossil record through a mythological lens. Some of the tactics they used to understand the fossil record were nevertheless similar to scientific approaches. Native American fossil legends often derived from observation and rational speculation based on fossil finds. The indigenous people of the United States also frequently attempted to verify and modify interpretations of the fossil record in order to make sense of new discoveries. Since contact with Europeans, the ensuing epidemics, colonial violence, the Indian Wars, and forced displacement of Native peoples to reservations has resulted in the loss of much of their fossil-related culture. Indigenous fossil legends also frequently show motifs resembling major themes in scientific paleontology like deep time , extinction , change over time and relationships between different life forms. The first reasonably correct identification of a vertebrate fossil in North America was made in , at a South Carolina plantation called Stono. The slaves unanimously identified the teeth as elephant molars , which they would have recognized from life in Africa. In the early 19th century, Georges Cuvier authored an translated account of the discovery at Stono. He remarked that the African slaves understood the similarity between mammoth remains and elephants before European naturalists. While on their journey down the Ohio River towards the Mississippi , they camped in what is now Kentucky. When they returned that evening their canoes were laden with massive fossils including long tusks, massive teeth, and a thighbone almost as tall as a person. Longueuil left the remains at the Cabinet du Roi. These fossils were first speculated on by eminent French scientists like Jean-Etienne Guettard [10] and Georges Cuvier. In fact the teeth belonged to the same individual, in the present day identified as an American mastodon Mammut americanum. He speculated that maybe earth was in a different position in the past and its climate correspondingly different. Modern scientist suspect this bone was actually a metatarsal from a duck-billed dinosaur, which are known from the same sediments. Among the earliest major fossil discoveries in America occurred in Massachusetts during the spring of The Silurian -aged reefs of the Milwaukee area were the first Paleozoic reefs in the world to be described for the scientific literature. The town of Greenfield was paving its streets when residents noticed fossil footprints on the sandstone slabs that resembled turkey tracks. These rocks were taken from what would turn out to be the most productive dinosaur tracksite in the Connecticut Valley. He thought the tracks were made by giant birds. In , fossils were found on a plantation owned by a man named Judge Creagh. Local doctors identified the fossils as belonging to an ancient marine reptile , and called it Basilosaurus. However, some of the fossils were shipped to Sir Richard Owen in England. After examining the remains Owen realized the bones actually belonged to a whale, rather than a reptile. A member of the Academy of Natural Sciences named William Foulke heard about fossil bones that had been found on a local farm while spending the summer in Haddonfield. Roughly 10 feet down they found bones. He interpreted the fossils as the remains of a bipedal amphibious reptile that had been swept out to sea by the river it lived alongside. Leidy called the creature Hadrosaurus foulkii after Foulke. This became both the first mounted dinosaur skeleton ever mounted for public display but also one of the most popular exhibits in the history of the Academy. Tyson found the first documented dinosaur fossils of the Arundel Formation in an iron pit at Bladensburg, Maryland. Tyson took the dinosaur teeth to a local doctor named Christopher Johnston. Johnston cut thin sections of one tooth to examine it under a microscope. Johnson named the teeth Astrodon. This represents the first formal naming of a sauropod species in North America. Condon went along with them and prospected for fossils when the troops passed back through the Crooked River area. He went fossil collecting again in and found rich fossil deposits north of Picture Gorge in the John Day River Valley. He realized that he had stumbled on a find of major scientific importance. Since he himself had no scientific qualifications or references to use in identifying fossils, Condon sent some fossils to O. Marsh of Yale

University. Marsh replied with a request for Condon to guide and expedition to the area in which he found the fossils. Condon obliged and over the ensuing years a series of fossil hunting expeditions ventured into the John Day fossil beds. Later, dinosaur remains were found in a marl pit near Barnsboro owned by the Wet Jersey Marl Company. He called it Laelaps aquilunguis. While there, Marsh secretly made arrangements with some of the workers for them to send any fossils they find to him at the Yale Peabody Museum instead of to Cope at the Academy of Natural Sciences of Philadelphia. This may have been the "first shot" of the Bone Wars , a bitter long-running feud between the two scientists. Theophilus Turner found a nearly complete plesiosaur skeleton in what is now Logan County while stationed at Fort Wallace. This was the first plesiosaur specimen of this caliber found in all of North America. He in turn gave the bones to paleontologist Edward Drinker Cope , who identified them as the remains of a very large plesiosaur. Cope wrote a letter to Dr. Turner requesting that he send him the remainder of the skeleton. Turner obliged and in mid-March Cope received the remainder of the fossils. The next year, O. Marsh led a paleontological expedition into the western United States on behalf of Yale University. Late that November they visited the area around Fort Wallace. These were the first scientifically documented fossils of the pterosaur that would later be named Pteranodon. While in the area he found the first known Eocene mammal from the southwestern United States, Coryphodon. This was a major boon to his reputation as his research was foundational to understanding that interval of American geologic history. He wrote to both Cope and O. Marsh, the famous rival paleontologists of the bone wars to alert them about his discovery. Although Marsh never responded, Cope did, and Oramel Lucas and his brother Ira began digging up local fossils and sending them to Cope. By August of the same year, Cope had formally named the new species excavated by the Lucas brothers Camarasaurus supremus. Later, a crew working on behalf of O. Marsh under Mudge and Williston started a quarry nearby. They made several important finds like the new species Allosaurus fragilis and Diplodocus longus. Following the initial excavations in the quarry field work stopped until That year brothers Marshall and Henry Felch reopened excavations there, again on behalf of O. They worked for five years collecting many dinosaurs already known from the formation, but also the new species Ceratosaurus nasicornis. In March , Reed noticed fossil limbs and vertebrae at Como Bluff. He spent several weeks collecting fossils with foreman William E. They continued collecting into early , uncovering several Camarasaurus specimens, one being a new species, Camarasaurus grandis. Nearby they made another significant find, Dryolestes priscus , the first Jurassic mammal known from North America. Major participants included Henry Fairfield Osborn , W. Scott , and Thomas Speer. Williston began periodic excavations. He quickly dispatched his own fossil hunters into the area. Marsh hired additional help for Reed, but none of his workers stayed on the job long term. The partnership would be fruitful that year and several major discoveries happened. They found a ninth site early in July that would be the most productive of any fossil site in the Morrison Formation. In September they found a thirteenth quarry that produced more dinosaur skeletons than any of the others. Camptosaurus and Stegosaurus were the most common. New dinosaurs found here included Camarasaurus lentus , Camptosaurus dispar , and Coelurus fragilis. A major Cenozoic fossil find also happened in That year, a scout and rancher named Captain James H. These rich deposits are so dense with bones that single forty foot slab of sandstone preserved more than bones from at least individual animals. The total number of fossils preserved here may number in the millions. The tiny rhinoceras Diceratherium cooki composed about one quarter of the remains in the Agate Springs beds. This was the first paleontological discovery to attract public attention to the fossils of Nebraska. Hatcher recovered hundreds of bones and teeth, which helped the region between Maryland and Washington D. Between and hundreds of thousands of Pleistocene fossils were uncovered in central Los Angeles. Douglass agreed and they set off to the Uinta Mountains the next day. They found so many fossils that Douglas built a home near the Green River and his family moved in from Pittsburgh. He spent the rest of his career in the area excavating fossils. However, eventually the scientific significance of the fossils was realized and paleontologist J. Gidley conducted fieldwork at the cave between and Bird to Texas in search of dinosaur trackways reportedly uncovered by local moonshiners. While he was cleaning mud from these footprints, he noticed another kind of

footprint, apparently left by a long-necked sauropod dinosaur. They uncovered tons of fossils from at least different species of Oligocene life.

Chapter 3 : History of paleontology in the United States - Wikipedia

Anthro Exam 1. Ch. the study of the history of human evolution through the fossil record. a Native American group in the southwestern United States, the.

Cetotherium Cetotheriidae , Mysticeti cca 18 Ma The aquatic lifestyle of cetaceans first began in the Indian subcontinent from even-toed ungulates 50 million years ago, over a period of at least 15 million years, however a jawbone discovered in Antarctica may reduce this to 5 million years. The traditional theory of cetacean evolution, first proposed by Van Valen in , [4] was that whales were related to the mesonychids , an extinct order of carnivorous ungulates hoofed animals that resembled wolves with hooves and were a sister group of the artiodactyls even-toed ungulates. This theory arose due to similarities between the unusual triangular teeth of the mesonychids and those of early whales. However, molecular phylogeny data indicates that whales are very closely related to the artiodactyls, with hippopotamuses as their closest living relative. Because of this, cetaceans and hippopotamuses are placed in the same suborder , Whippomorpha. However, the earliest anthracotheres , the ancestors of hippos, do not appear in the fossil record until the Middle Eocene, millions of years after Pakicetus , the first known whale ancestor, appeared during the Early Eocene, implying the two groups diverged well before the Eocene. Since molecular analysis identifies artiodactyls as being very closely related to cetaceans, mesonychids are probably an offshoot from Artiodactyla, and cetaceans did not derive directly from them, but possibly sharing a common ancestor. The skeletons of Pakicetus show that whales did not derive directly from mesonychids. Instead, they are artiodactyls that began to take to the water soon after artiodactyls split from mesonychids. Archaeocetes retained aspects of their mesonychid ancestry such as the triangular teeth which modern artiodactyls, and modern whales, have lost. Whales, however, retained their carnivorous diet because prey was more available and they needed higher caloric content in order to live as marine endotherms warm-blooded. Mesonychids also became specialized carnivores, but this was likely a disadvantage because large prey was uncommon. This may be why they were out-competed by better-adapted animals like the hyaenodontids and later Carnivora. Indohyus Possible relationships between cetaceans and other ungulate groups. Indohyus is identified as an artiodactyl because it has two trochlea hinges , a trait unique to artiodactyls. Pakicetidae The pakicetids were digitigrade hoofed mammals that are thought to be the earliest known cetaceans, with Indohyus being the closest sister group. Their fossils were first discovered in North Pakistan in , located at a river not far from the shores of the former Tethys Sea. Based on this discovery, pakicetids most likely lived in an arid environment with ephemeral streams and moderately developed floodplains millions of years ago. The shape of the ear region in pakicetids is highly unusual and the skull is cetacean-like, although a blowhole is still absent at this stage. The jawbone of pakicetids also lacks the enlarged space mandibular foramen that is filled with fat or oil, which is used in receiving underwater sound in modern cetaceans. This eye placement helps submerged predators observe potential prey above the water. This method of hearing did not give directional hearing underwater. Hence pakicetids were most likely aquatic waders. Ambulocetidae Ambulocetus , which lived about 49 million years ago, was discovered in Pakistan in They were vaguely crocodile -like mammals, possessing large brevirostrine jaws. In the Eocene, ambulocetids inhabited the bays and estuaries of the Tethys Sea in northern Pakistan. The fossils of ambulocetids are always found in near-shore shallow marine deposits associated with abundant marine plant fossils and littoral mollusks. It is clear that ambulocetids tolerated a wide range of salt concentrations. Hence, ambulocetids represent a transition phase of cetacean ancestors between fresh water and marine habitat. In modern toothed whales, this fat pad in the mandibular foramen extends posteriorly to the middle ear. This allows sounds to be received in the lower jaw, and then transmitted through the fat pad to the middle ear. Similar to pakicetids, the orbits of ambulocetids are on the top of the skull, but they face more laterally than in pakicetids. The skeletal structures of the knee and ankle indicates that the motion of the hindlimbs was restricted into one plane. This suggests that, on land, propulsion of the hindlimbs was powered by the

extension of dorsal muscles. This suggests that complete abandonment of the land evolved much earlier among cetaceans than previously thought. Remingtonocetidae Remingtonocetids lived in the Middle-Eocene in South Asia , about 49 to 43 million years ago. Remingtonocetids were also found in shallow marine deposits, but they were obviously more aquatic than ambulocetidae. This is demonstrated by the recovery of their fossils from a variety of coastal marine environments, including near-shore and lagoonal deposits. This suggests that vision was not an important sense for them. The nasal opening, which eventually becomes the blowhole in modern cetaceans, was located near the tip of the snout. The position of the nasal opening had remained unchanged since pakicetids. According to a study done by Spoor et al. Protocetidae The protocetids form a diverse and heterogeneous group known from Asia, Europe, Africa, and North America. They lived in the Eocene, approximately 48 to 35 million years ago. The fossil remains of protocetids were uncovered from coastal and lagoonal facies in South Asia; unlike previous cetacean families, their fossils uncovered from Africa and North America also include open marine forms. Great variations in aquatic adaptations exist among them, with some probably able to support their weight on land, whereas others could not. If they gave birth in the water, the fetus would be positioned for a tail-first delivery to avoid drowning during birth. Increasingly lateral-facing eyes might be used to observe underwater prey, and are similar to the eyes of modern cetaceans. Furthermore, the nasal openings were large and were halfway up the snout. The great variety of teeth suggests diverse feeding modes in protocetids. However the air-filled sinuses that are present in modern cetaceans, which function to isolate the ear acoustically to enable better underwater hearing, were still not present. Hence, the method of sound transmission that were present in them combines aspects of pakicetids and modern odontocetes toothed whales. However, it is clear that they were adapted even further to an aquatic life-style. In Rodhocetus, for example, the sacrum a bone that, in land-mammals, is a fusion of five vertebrae that connects the pelvis with the rest of the vertebral column was divided into loose vertebrae. However, the pelvis was still connected to one of the sacral vertebrae. The ungulate ancestry of these archaeocetes is still underlined by characteristics like the presence of hooves at the ends of the toes in Rodhocetus. A study done by Gingerich et al. Terrestrial locomotion of Rodhocetus was very limited due to their hindlimb structure. It is thought that they moved in a way similar to how eared seals move on land, by rotating their hind flippers forward and underneath their body. Basilosauridae and Dorudontinae Archaeocetes like this Basilosaurus had a heterodont dentition Basilosaurids and dorudontines lived together in the late Eocene around 41 to 35 million years ago, and are the oldest known obligate aquatic cetaceans. This is supported by their fossils usually found in deposits indicative of fully marine environments, lacking any freshwater influx. Basilosaurids are commonly found in association with dorudontines, and were closely related to one another. They had small brains; this suggests they were solitary and did not have the complex social structures of some modern cetaceans. The mandibular foramen of basilosaurids covered the entire depth of the lower jaw as in modern cetaceans. Their orbits faced laterally, and the nasal opening had moved even higher up the snout, closer to the position of the blowhole in modern cetaceans. The large size of basilosaurids is due to the extreme elongation of their lumbar vertebrae. They had a tail fluke, but their body proportions suggest that they swam by caudal undulation and that the fluke was not used for propulsion. They too had a fluke and, unlike basilosaurids, they probably swam similarly to modern cetaceans, by using caudal oscillations. The two tiny but well-formed hind legs of basilosaurids were probably used as claspers when mating. The pelvic bones associated with these hind limbs were not connected to the vertebral column as they were in protocetids. Essentially, any sacral vertebrae can no longer be clearly distinguished from the other vertebrae. However, according to a study done by Fordyce and Barnes, the large size and elongated vertebral body of basilosaurids preclude them from being ancestral to extant forms. As for dorudontines, there are some species within the family that do not have elongated vertebral bodies, which might be the immediate ancestors of Odontoceti and Mysticeti. The other basilosaurids became extinct. Filter feeding is very beneficial as it allows baleen whales to efficiently gain huge energy resources, which makes the large body size in modern varieties possible. A large-scale change in ocean current and temperature could have contributed to the radiation of modern mysticetes. Multiple

mutations have been identified in genes related to the production of enamel in modern baleen whales. Generally it is speculated the four modern mysticete families have separate origins among the cetotheres. Modern baleen whales, Balaenopteridae rorquals and humpback whale, Megaptera novaengliae , Balaenidae right whales , Eschrichtiidae gray whale, Eschrictius robustus , and Neobalaenidae pygmy right whale, Caperea marginata all have derived characteristics presently unknown in any cetothere and vice versa such as a sagittal crest [34]. This happened around 34 million years ago in a second cetacean radiation. Echolocation also allowed toothed whales to dive deeper in search of food, with light no longer necessary for navigation, which opened up new food sources. Sound pulses are emitted, reflected off objects, and retrieved through the lower jaw. Skulls of Squalodon show evidence for the first hypothesized appearance of echolocation. Squalodon featured several commonalities with modern toothed whales: However, it is thought unlikely that squalodontids are direct ancestors of modern toothed whales. For example, Scaldicetus had a tapered rostrum. Genera from the Oligocene and Miocene had teeth in their upper jaws. These anatomical differences suggest that these ancient species may not have necessarily been deep-sea squid hunters like the modern sperm whale, but that some genera mainly ate fish. Livyatan had a short and wide rostrum measuring 10 feet 3. Species like these are collectively known as killer sperm whales. In , a large number of fossil ziphiids were discovered off the coast of South Africa, confirming the remaining ziphiid species might just be a remnant of a higher diversity that has since gone extinct. After studying numerous fossil skulls, researchers discovered the absence of functional maxillary teeth in all South African ziphiids, which is evidence that suction feeding had already developed in several beaked whale lineages during the Miocene. Extinct ziphiids also had robust skulls, suggesting that tusks were used for male-male interactions. Indohyus has a thickened ectotympanic internal lip of the ear bone. This feature compares directly to that of modern cetaceans. Another similar feature was the composition of the teeth, which contained mostly calcium phosphate which is needed for eating and drinking by aquatic animals, though, unlike modern day toothed whales, they had a heterodont more than one tooth morphology dentition as opposed to a homodont one tooth morphology present dentition. Their transition from land to water led to reshaping of the skull and food processing equipment because the eating habits were changing. Ultimately, the change in position of the eyes and limb bones is what led the pakicetids to become waders. The ambulocetids also began to develop long snouts, which is seen in current cetaceans.

Chapter 4 : Foran Glennon Nabs Snell & Wilmer Insurance Team - Law

Finding Ediacaran and Cambrian fossils in Nevada opens up the southwestern United States as a new place to find these extremely rare signatures of life, Smith said.

This series consists of correspondence with scientists and financial and governmental advisers. Nutt, Telluride Association, and Telluride Power Company ; his participation on several committees relating to the development of aeronautics see especially Newton D. Victory ; the development of a national irrigation program and the construction of reservoirs in the western United States see especially Cyrus C. Babb, Morris Bien, C. Bowles, Washington Lee Capps, William Crozier, and Theodore Roosevelt ; and the centralization of national health bureaus into one federal department see especially Irving Fisher and Theodore Roosevelt. Box 1 Folder 1 A, Correspondents include Cleveland Abbe, Charles G. Abbot, Alexander Agassiz, Frederick H. Box 1 of Folder 2 B, Baker, Charles Barrois, Walcott D. White Bushey, and Nicholas Murray Butler. Box 1 of Folder 3 C, and undated. Correspondents include Washington Lee Capps, R. Box 1 of Folder 4 D, William Dawson, David T. Box 1 of Folder 5 E, Correspondents include Clarence R. Eliot, and Samuel Franklin Emmons. Box 1 of Folder 6 F, Correspondents include Herman Leroy Fairchild, J. Frothingham, and Melville Weston Fuller. Box 1 of Folder 7 G, Graves, and Gilbert Hovey Grosvenor. Box 1 of Folder 8 Ha-Hi, Heard, John Grier Hibben, and F. Box 1 of Box 2 Folder 1 Ho-Hy, and undated. Huntington, and Alpheus Hyatt. Box 2 of Folder 2 I, , Box 2 of Folder 3 J, Correspondents include Herman Jennings, Albert M. Johnson, and David Starr Jordan. Box 2 of Folder 4 K, Correspondents include Edward M. Kindle, Clarence King, Alfred L. Box 2 of Folder 5 L, Correspondents include Franklin K. Box 2 of Folder 6 M, Correspondents include Sir Patrick T. McMahon, Jules Marcou, G. Maxwell, Elwood Mead, John C. Michelson, Gerrit Smith Miller, Jr. Box 2 of Folder 7 N, Box 3 of Folder 2 O, Includes correspondence from Henry Fairfield Osborn. Box 3 of Folder 3 P, Box 3 of Folder 4 Q, Box 3 of Folder 5 R, and undated. Correspondents include Richard Rathbun, William deC. Box 3 of Folder 6 Sa-Sm, Correspondents include Orestes Hawley St. Box 3 of Folder 7 So-Sw, and undated. Correspondents include George O. Squier, Andrew Squire, O. Stafford, Frederick Steigmeyer, Amelia T. Box 3 of Folder 8 T, , , and undated. Box 3 of Folder 1 U, Includes letter to Edward Oscar Ulrich. Box 4 of Folder 2 V, Box 4 of Folder 3 W, and undated. Correspondents include Ellis P. Box 4 of Folder 4 Y, Includes correspondence from Robert Sterling Yard. Correspondents include Alexander Agassiz, J. White, and William Pierrepont White. Earnest, Daniel Coit Gilman, A. DeLaney Walcott, Ellis P. White, William Pierrepont White, S. Topics discussed include the sickness and death of his son, Charles D. Box 4 Folder 8 Holmes B. Includes correspondence from his sister, Helena B. Box 4 of Folder 9 Mary M. Vaux, , , and undated. Stuart Walcott and Charles D. Box 4 of Folder 10 B. Stuart Walcott, , , , and undated. Correspondents include Charles D. See also under Sidney S. Box 4 of Box 5 Folder 1 Charles D. Codman, Helen Garfield, Holmes B. Stuart Walcott, Charles D. Walcott, and Sidney S. Box 5 of Folder 2 Charles D. Correspondents include Helen B. Box 5 of Folder 3 Charles D. Box 5 of Folder 4 Charles D. Correspondents include Horace D. Box 5 of Folder 5 Charles D. Walcott, undated or incomplete dates. Box 5 of Folder 6 Charles D. Box 5 of Folder 7 Ellis P. Walcott, , , Includes correspondence from his brother Charles D. Walcott and his father Charles D. Box 5 of Folder 8 Frederick C. Includes correspondence from Charles D. Box 5 of Folder 9 Helen Walcott, , , and undated. See also under Anna Horsey in Series 1. Box 5 of Box 6 Folder 1 Helena B. Correspondents include John D.

Chapter 5 : Evolution of cetaceans - Wikipedia

While in the area he found the first known Eocene mammal from the southwestern United States, Coryphodon. In total he discovered about 90 species. This was a major boon to his reputation as his research was foundational to understanding that interval of American geologic history.

These formations may have resulted from carcass burial in an anoxic environment with minimal bacteria, thus slowing decomposition. Stromatolites Lower Proterozoic stromatolites from Bolivia , South America Stromatolites are layered accretionary structures formed in shallow water by the trapping, binding and cementation of sedimentary grains by biofilms of microorganisms , especially cyanobacteria. While older, Archean fossil remains are presumed to be colonies of cyanobacteria , younger that is, Proterozoic fossils may be primordial forms of the eukaryote chlorophytes that is, green algae. One genus of stromatolite very common in the geologic record is Collenia. The earliest stromatolite of confirmed microbial origin dates to 2. The most widely supported explanation is that stromatolite builders fell victims to grazing creatures the Cambrian substrate revolution , implying that sufficiently complex organisms were common over 1 billion years ago. Factors such as the chemistry of the environment may have been responsible for changes. Cyanobacteria use water , carbon dioxide and sunlight to create their food. A layer of mucus often forms over mats of cyanobacterial cells. In modern microbial mats, debris from the surrounding habitat can become trapped within the mucus, which can be cemented by the calcium carbonate to grow thin laminations of limestone. These laminations can accrete over time, resulting in the banded pattern common to stromatolites. The domal morphology of biological stromatolites is the result of the vertical growth necessary for the continued infiltration of sunlight to the organisms for photosynthesis. Layered spherical growth structures termed oncolites are similar to stromatolites and are also known from the fossil record. Thrombolites are poorly laminated or non-laminated clotted structures formed by cyanobacteria common in the fossil record and in modern sediments. Index fossil Examples of index fossils Index fossils also known as guide fossils, indicator fossils or zone fossils are fossils used to define and identify geologic periods or faunal stages. They work on the premise that, although different sediments may look different depending on the conditions under which they were deposited, they may include the remains of the same species of fossil. The best index fossils are common, easy to identify at species level and have a broad distributionâ€”otherwise the likelihood of finding and recognizing one in the two sediments is poor. Trace Cambrian trace fossils including Rusophycus , made by a trilobite A coprolite of a carnivorous dinosaur found in southwestern Saskatchewan Trace fossils consist mainly of tracks and burrows, but also include coprolites fossil feces and marks left by feeding. Many traces date from significantly earlier than the body fossils of animals that are thought to have been capable of making them. They were first described by William Buckland in Prior to this they were known as "fossil fir cones " and " bezoar stones. List of transitional fossils A transitional fossil is any fossilized remains of a life form that exhibits traits common to both an ancestral group and its derived descendant group. Because of the incompleteness of the fossil record, there is usually no way to know exactly how close a transitional fossil is to the point of divergence. These fossils serve as a reminder that taxonomic divisions are human constructs that have been imposed in hindsight on a continuum of variation. Micropaleontology Microfossil is a descriptive term applied to fossilized plants and animals whose size is just at or below the level at which the fossil can be analyzed by the naked eye. Microfossils may either be complete or near-complete organisms in themselves such as the marine plankters foraminifera and coccolithophores or component parts such as small teeth or spores of larger animals or plants. Microfossils are of critical importance as a reservoir of paleoclimate information, and are also commonly used by biostratigraphers to assist in the correlation of rock units. The oldest fossil resin dates to the Triassic , though most dates to the Cenozoic. The excretion of the resin by certain plants is thought to be an evolutionary adaptation for protection from insects and to seal wounds. Fossil resin often contains other fossils called inclusions that were captured by the sticky resin. These include

bacteria, fungi, other plants, and animals. Animal inclusions are usually small invertebrates , predominantly arthropods such as insects and spiders, and only extremely rarely a vertebrate such as a small lizard. Preservation of inclusions can be exquisite, including small fragments of DNA. The internal structure of the tree and bark are maintained in the permineralization process. Polished section of petrified wood showing annual rings Fossil wood is wood that is preserved in the fossil record. Wood is usually the part of a plant that is best preserved and most easily found. Fossil wood may or may not be petrified. The fossil wood may be the only part of the plant that has been preserved: This will usually include "xylon" and a term indicating its presumed affinity, such as Araucarioxylon wood of Araucaria or some related genus , Palmoxylon wood of an indeterminate palm , or Castanoxylon wood of an indeterminate chinkapin. Subfossil A subfossil dodo skeleton The term subfossil can be used to refer to remains, such as bones, nests, or defecations, whose fossilization process is not complete, either because the length of time since the animal involved was living is too short less than 10, years or because the conditions in which the remains were buried were not optimal for fossilization. Subfossils are often found in caves or other shelters where they can be preserved for thousands of years. Additionally, isotope ratios can provide much information about the ecological conditions under which extinct animals lived. Subfossils are useful for studying the evolutionary history of an environment and can be important to studies in paleoclimatology. Subfossils are often found in depositionary environments, such as lake sediments, oceanic sediments, and soils. Once deposited, physical and chemical weathering can alter the state of preservation. Chemical fossils See also: Biosignature Chemical fossils, or chemofossils, are chemicals found in rocks and fossil fuels petroleum, coal, and natural gas that provide an organic signature for ancient life. Molecular fossils and isotope ratios represent two types of chemical fossils. Furthermore, organic components biosignatures that are often associated with biominerals are believed to play crucial roles in both pre-biotic and biotic reactions. Manganese dendrites on a limestone bedding plane from Solnhofen , Germany; scale in mm Main article: Pseudofossils Pseudofossils are visual patterns in rocks that are produced by geologic processes rather than biologic processes. They can easily be mistaken for real fossils. Some pseudofossils, such as dendrites , are formed by naturally occurring fissures in the rock that get filled up by percolating minerals. Other types of pseudofossils are kidney ore round shapes in iron ore and moss agates , which look like moss or plant leaves. Concretions , spherical or ovoid-shaped nodules found in some sedimentary strata, were once thought to be dinosaur eggs, and are often mistaken for fossils as well. History of the study of fossils See also: Timeline of paleontology Gathering fossils dates at least to the beginning of recorded history. The fossils themselves are referred to as the fossil record. The fossil record was one of the early sources of data underlying the study of evolution and continues to be relevant to the history of life on Earth. Paleontologists examine the fossil record to understand the process of evolution and the way particular species have evolved. Before Darwin Many early explanations relied on folktales or mythologies. In China the fossil bones of ancient mammals including Homo erectus were often mistaken for " dragon bones" and used as medicine and aphrodisiacs. In addition, some of these fossil bones are collected as "art" by scholars and they left scripts on it, indicating the time they got the collection. One good example is the famous scholar Huang Tingjian of the South Song Dynasty during the 11th century, who kept one seashell fossil with his poem engraved on it. If what is said concerning the petrifaction of animals and plants is true, the cause of this phenomenon is a powerful mineralizing and petrifying virtue which arises in certain stony spots, or emanates suddenly from the earth during earthquake and subsidences, and petrifies whatever comes into contact with it. As a matter of fact, the petrifaction of the bodies of plants and animals is not more extraordinary than the transformation of waters. Aristotle previously explained it in terms of vaporous exhalations , [57] which Avicenna modified into the theory of petrifying fluids succus lapidificatus , later elaborated by Albert of Saxony in the 14th century and accepted in some form by most naturalists by the 16th century. If the Deluge had carried the shells for distances of three and four hundred miles from the sea it would have carried them mixed with various other natural objects all heaped up together; but even at such distances from the sea we see the oysters all together and also the shellfish and the cuttlefish and all the other shells which congregate

together, found all together dead; and the solitary shells are found apart from one another as we see them every day on the sea-shores. And we find oysters together in very large families, among which some may be seen with their shells still joined together, indicating that they were left there by the sea and that they were still living when the strait of Gibraltar was cut through. In the mountains of Parma and Piacenza multitudes of shells and corals with holes may be seen still sticking to the rocks His observations on fossils, which he stated to be the petrified remains of creatures some of which no longer existed, were published posthumously in He observed that rocks from distant locations could be correlated based on the fossils they contained. He termed this the principle of faunal succession. Georges Cuvier came to believe that most if not all the animal fossils he examined were remains of extinct species. This led Cuvier to become an active proponent of the geological school of thought called catastrophism. Near the end of his paper on living and fossil elephants he said: All of these facts, consistent among themselves, and not opposed by any report, seem to me to prove the existence of a world previous to ours, destroyed by some kind of catastrophe. Darwin and his contemporaries first linked the hierarchical structure of the tree of life with the then very sparse fossil record. Darwin eloquently described a process of descent with modification, or evolution, whereby organisms either adapt to natural and changing environmental pressures, or they perish. He worried about the absence of older fossils because of the implications on the validity of his theories, but he expressed hope that such fossils would be found, noting that: However, macroscopic fossils are now known from the late Proterozoic. The fossil record and faunal succession form the basis of the science of biostratigraphy or determining the age of rocks based on embedded fossils. For the first years of geology , biostratigraphy and superposition were the only means for determining the relative age of rocks. The geologic time scale was developed based on the relative ages of rock strata as determined by the early paleontologists and stratigraphers. Radiometric dating has shown that the earliest known stromatolites are over 3. The Virtual Fossil Museum [66] Paleontology has joined with evolutionary biology to share the interdisciplinary task of outlining the tree of life, which inevitably leads backwards in time to Precambrian microscopic life when cell structure and functions evolved. The study of fossils, on the other hand, can more specifically pinpoint when and in what organism a mutation first appeared.

Chapter 6 : Alumni :: Florida Museum of Natural History

First appeared in the Permian,[4] million years ago. Became extinct by the end of the Pliocene; the exception is the sole living species, Ginkgo biloba, which is only found in the wild in China, but is cultivated across the world.

Early investigations into the Pleistocene archaeology of Arizona were led by Byron Cummings, first Head of the Department of Archaeology. Between and , Cummings investigated mammoths and other fossil bone finds from southeastern Arizona , including what he believed to be a pair of Pleistocene human burials from Cienega Creek. Although poorly documented, these discoveries led him to speculate that people had been in Arizona for 50, years Cummings In October of , just three months after the first human artifact was uncovered at the Folsom site, Cummings led four students to Whitewater Draw. Discovered by a schoolboy, the Double Adobe site contained the skull of a mammoth overlying a sand layer containing milling stones and handstones. This situation received only local attention until Ted Sayles and Ernst Antevs initiated an intensive survey of the draw in and named the Archaic-period Cochise culture Sayles and Antevs The association of groundstones with extinct fauna eventually attracted the scrutiny of Gordon Willey and Philip Phillips In response to criticisms aimed at the stratigraphic associations at Double Adobe, Haury wrote, As one of several who participated in the excavations of the mammoth and who removed a horse jaw amidst artifacts in the deeper layer, as well as numerous bones in later years from the same layer, I feel obligated to try to answer the questions voiced and to stave off the rejection of what I regard to be valid evidence. Haury certainly entertained the possibility that mammoth hunters and plant gatherers were the same people following different seasonal pursuits, a prospect that he maintained for the duration of his career Haury Emil Haury right at Naco mammoth kill site, April The mammoth remains are being prepared for a plaster jacket Arizona State Museum. The deepest artifacts from Ventana Cave were recovered from a layer of volcanic debris that also contained Pleistocene horse, antelope, sloth, and other fossil and modern species. A projectile point from the volcanic debris layer was compared to Folsom and later to Clovis , but the assemblage was peculiar enough to warrant a separate name â€" the Ventana Complex. Radiocarbon dates from the volcanic debris layer indicated an age of about 11, BP. A witness block and thorough sampling allowed Bruce Huckell and C. Vance Haynes to revisit the site stratigraphy and artifact assemblage in New radiocarbon dates and artifact analysis indicates that the volcanic debris layer was laid down between 10,, BP, and that vertical turbation is responsible for the association of extinct fauna with stone tools. The site was reported to Haury by Marc Navarrete in September of after his father, Fred, found two Clovis points while uncovering the remains of a mammoth. Excavations were carried out April , In only five days, Haury recovered what remained of a single mammoth with seven Clovis points in direct association. The Naco site was the first Clovis-mammoth association to be identified after the Clovis type was recognized as typologically distinct and stratigraphically separated from the younger Folsom type. Nearly two months of fieldwork in and yielded the remains of nine mammoths, the isolated remains of horse, bison, and tapir, 13 Clovis points, eight flake tools, one chopping tool, a small amount of flake debris, and two hearths Haury et al. He brought his pioneering interests and activities from Flagstaff to the UA in It grew to include studies in archaeology, botany, geology, paleontology, and paleoclimatology. A radiocarbon laboratory was installed at the University in , the same year that a committee was formed to direct studies in this field. The UA lab was one of the first in the country, established just two years after the method was initially developed. His arrival heralded decades of primary research into radiocarbon dating and isotope geochemistry that continues today http: Damon along with Austin Long, Vance Haynes, their students and other colleagues worked on a variety of archaeologically and geoarchaeologically significant topics of dating various materials in an array of depositional settings around the world. In , the Accelerator Mass-Spectrometry radiocarbon lab http: This was one of the first AMS 14C labs in the world. Excavations at the Lehner site, , with the bone bed well exposed Arizona State Museum. Vance Haynes at the Lehner Mammoth site. Through the s C. A series of fortuitous military postings in Albuquerque, Austin, and Fairbanks, coupled with his

choice of the Colorado School of Mines near Denver for an undergraduate degree, brought him into contact with some of the leading Paleoindian archaeologists of the day, including Frank Hibben, Fred Wendorf, Alex Krieger, E. As a graduate student, he and George Agogino began a systematic search for charcoal among the many Paleoindian sites on the Great Plains , personally processing the samples in the then new UA radiocarbon laboratory. Their work resulted in the first reliable date for Folsom based on work at the Lindenmeier site in Colorado Haynes and Agogino , the first reliable age control for the Dent site, Colorado, and the Agate Basin site, Wyoming Haynes , and a landmark predoctoral paper in Science Haynes that first laid out an accurate Paleoindian chronology based on careful application mostly by him of the then still relatively new radiocarbon method. Our understanding of both Clovis and Folsom chronology began with that paper. Both sites contain long and extensive records of Paleoindian habitation, each providing a more or less complete record of the regional Paleoindian sequence. The work at Hell Gap was one of the single biggest advances in understanding the Northern Plains Paleoindian chronology following the development of the radiocarbon dating method itself. Until the Hell Gap work, the stratigraphic relationships of the Paleoindian record in the region largely were inferred based on data elsewhere, especially the Southern Great Plains. Vance Haynes at the Clovis site V. Because this work was part of the HPPP, it also formed a stratigraphic and geochronologic basis for refining and revising the regional Paleoindian geoarchaeological stratigraphic sequence. Hell Gap and Clovis were and are spectacular sites in their own right, but Vance brought something unique to his work in the early s: Attention to detail in recording and sampling is not unusual in archaeology or in the geosciences, but Vance brought a unique combination of a solid training and experience in field geology, a passion for archaeology, and an understanding of radiocarbon geochemistry. This has provided him with a perspective at a subcontinental scale that is probably unique in all of North American geoarchaeology. During this time he began his own long-term interdisciplinary archaeological project in the San Pedro Valley of Arizona e. In the mids, during a systematic search of the San Pedro Valley for additional mammoth sites as well as pollen localities, Vance Haynes and Peter Mehringer, then both graduate students at UA, discovered and tested a series of sites in the area. In the winter of , Louis Escapule discovered the partial remains of a large mammoth eroding from the surface of a tributary to the San Pedro River. The most significant archaeological find in the valley, the Murray Springs site, was excavated over the course of six field seasons between and , with limited geochronological, paleoenvironmental, and archaeological exploration and research still in progress. The site was exposed by headward arroyo cutting sometime between and the time of discovery in It provides a remarkable record of Clovis hunting activities as reflected in both mammoth and bison kill areas, and an accompanying camp area. Excavated mammoth at Murray Springs. Haynes The Bigger Picture The decades of the s, s, and s saw Haynes involved in addressing similar sorts of research questions in familiar patterns. For example, he continued using microstratigraphy and careful application of radiocarbon dating the AMS method in particular to clarify artifact chronologies. Radiocarbon dating of the Mill Iron bone bed in Montana and analysis of the associated Goshen artifacts has raised a number of questions regarding the age and typological relationships between the Goshen style of the Northern Great Plains and the Plainview style of the Southern Great Plains Frison et al. His microstratigraphic work at the Clovis site Haynes has shown how short the Clovis-Folsom transition was, something he first proposed in Additional work at Clovis , Folsom, and Lindenmeier, combined with data from the San Pedro Valley and from other research on the Great Plains tightened the age range for Clovis to between 11, and 10, radiocarbon yrs BP, and for Folsom to between 10, and 10, radiocarbon years BP Haynes et al. Significantly, these age ranges, based on dozens of dates, are not substantially different from the original age ranges of 11, to 11, for Clovis and 11, to 10, for Folsom, published in the Science article based on a handful of samples from a few sites. The dating of Clovis and Folsom also bring up the thorny issue of radiocarbon calibration Taylor et al. In the s Vance began research into geoarchaeology of middle and late Paleolithic sites in the Western Desert of Egypt. In four decades of research he delved into such diverse topics as the geochronology of playas, landscape evolution, remote sensing, processes of sand movement literally following in the footsteps of the renowned desert

naturalist Ralph Bagnold , and climate change, and documented previously unknown Paleolithic sites and the historic camps of early desert travelers. Exposed mammoth track impressions at Murray Springs. Haynes Vance Haynes retired from the UA in , but continues an active program of research, including, among other commitments, a summary publication of over three decades of work in the San Pedro Valley. Although AARF is focused explicitly on the Southwest, other Paleoindian archaeological and geoarchaeological research is underway by faculty and students. Antevs, Ernst Geologic-climatic Dating in the West. American Antiquity 25 1: Cummings, Byron Cochise of Yesterday. Arizona Old and New I, no. University of New Mexico Press, Albuquerque. Excavated bone shaft straightner at Murray Springs. Haynes Haury, Emil W. American Antiquity 25 4: Jefferson Reid and David E. University of Arizona Press, Tucson. Their Age and Dispersion. The Search for a Cause, edited by P. Projectile point from Murray Springs. University of Kansas Press, Lawrence. Canadian Journal of Anthropology 1: National Geographic Society Research Reports In Cordilleran Section, edited by M. Geological Society of America , Boulder , Colorado. In From Kostenki to Clovis: Jull, and Owen K. In Ice Age hunters of the Rockies , edited by D. Jodry, Joanne Dickenson, John L. Shelley, Irwin Rovner, and George A. The Oldest Prehistoric Well in America. Journal of the Arizona Academy of Science 5: American Antiquity 68 2: Paleo-Indian Occupation on the High Plains. Stuiver Clovis and Folsom Age Estimates: Stratigraphic Contexts and Radiocarbon Calibration. University of Chicago Press, Chicago.

Chapter 7 : Weekly Roundup: Oct. | PSSI

The first of these four divisions, the Precambrian, extends from the beginning of the Earth, around billion years ago, to the beginning of the Cambrian period, around million years ago.

This flora contains leaves, wood, and reproductive structures from multiple horizons. In contrast to the nearby Green River Formation, little paleobotanical work has been done in the Bridger Formation even though it is well known for its vertebrate fossils. The Blue Rim flora allows for research opportunities in systematics, paleoclimate, and paleoecology. In addition, temporal and geographic comparisons both within the stratigraphic section and throughout the Greater Green River Basin can be made. My work included both systematic and paleoclimate analyses. Nareerat Boonchai Aom , Ph. Her work responsibilities include research, organizing educational programs, foreign affairs, and planning and caring for the exhibits. She conducted research on systematic affinities and paleoenvironment of Eocene petrified wood from Southwestern Wyoming, USA, under the Ph. Her research focuses on Cenozoic fossil woods comparative anatomy, systematic, ecological aspects of fossil dicot woods and their paleoenvironmental implication. Additionally, she is interested in museum exhibition and developing paleontological parks and museums. She is building a multidisciplinary team with national and international colleagues for scientific research collaboration at the Petrified Forest Park in Tak Province, northwestern Thailand, to share and develop knowledge on petrified trees conservation practices. This conservation effort aims to conserve in situ outdoor fossil trees properly and preserve the integrity of the fossil trees for future generations to learn and enjoy this significant natural heritage. For more information about this project, please visit http: Phylogeny of the grape family Vitaceae based on morphology. For my dissertation I investigated features of flower, fruit, stem, pollen, seeds, and development among modern and fossil species of Vitaceae to gain an improved understanding of phylogeny and improved classification of this family which is now widely distributed in both the Northern and Southern Hemispheres. In addition, my work in paleobotany has included a review of the fossil seed record of water lilies Nymphaeceae with emphasis on a new species we recovered from the Eocene of Shandong Province, Northeastern China Chen et al, , and I have made a palynological investigations of the Middle Eocene Huadian flora of Jilin Province, Northeastern China using micromanipulation techniques to study isolated fossil pollen grains by both Scanning Electron and Light microscopy. Iju Chen and Steven R. Seed morphology of Vitaceae. International Journal of Plant Sciences. American Journal of Botany. Manchester and Iju Chen. International Journal of Plant Sciences, 3: Iju Chen, Steven R. Manchester, and Zhiduan Chen. American Journal of Botany Steven Manchester Corbett, Sarah Lynn, After conducting a paleofloristic study including leaves, seeds, fruits, and pollen at Alum Bluff, implications for understanding Miocene climate, biogeography, and paleoecology of the region were inferred. The first study of the flora of the Alum Bluff site was conducted on leaf impressions by E. Berry in the early twentieth century. Berry studied only leaf macrofossils and identified 12 leaf species. Recent collections and further examination of specimens reveals 22 identified taxa, seven morphotypes of uncertain taxonomic affinity, and 21 examples of unknown taxonomic affinity are also present in the flora. The composition of the flora was compared with modern floras and other Miocene floras to determine the environmental conditions present at Alum Bluff in the Miocene. It was found that the Alum Bluff flora an elm-hickory-cabbage palm forest similar to that of North central Florida today occurring along a river or near a river delta. Biogeographical implications of the Florida panhandle region during the Miocene were inferred based on the floral composition of Alum Bluff. The use of fruit, seeds, pollen, and leaves increased the known diversity of the Alum Bluff flora, making it a paleobotanically important case. David Dilcher My interests are in the fields of Paleobiology and Paleoecology, with emphasis in Paleobotany. I am interested in biotic diversity, its causes and how it relates to ecological stability. I am also interested in how vegetation communities have responded to environmental crises in the present and geological past. I would like to approach these questions using paleobiological

information by applying mathematical and statistical methods and by constructing theoretical models to understand the dynamics of the vegetal communities in the geological past. I think this information can help us to understand modern communities and their response to the present environmental pressures. Taxonomic rates in plants and its measurement it in the fossil record. The effect of sampling and incompleteness of the fossil record in the measure of taxonomic rates. Construction and use of confidence intervals on discrete sampling schemes. Quantitative analysis of palynological information. Use of geometric morphometrics in palynomorphs. Mass extinction events and their evolutionary consequences. The ecological role of rare species in vegetation communities. Development and construction of strong biostratigraphic frameworks. Measurement of diversity in the fossil record. Testing hypothesis about plant diversification patterns in the tropics. Evaluate the response of the vegetation to climate changes. Modeling and selectivity of extinction and origination episodes. Time series analysis and cyclostratigraphy in continental sediments.

Chapter 8 : Inspiring - Review of Creation Museum, Petersburg, KY - TripAdvisor

Fossil collecting (sometimes, in a non-scientific sense, fossil hunting) is the collection of fossils for scientific study, hobby, or profit. Fossil collecting, as practiced by amateurs, is the predecessor of modern paleontology and many still collect fossils and study fossils as amateurs.

There seem to be no end of things to do in this area. That is if you are willing to drive a bit. After really enjoying the two county parks with springs yesterday, David went into research mode looking at the other parks in both Alachua and Columbia Counties. While most of them appear to be recreational facilities for sport type things, when he looks at the map of Alligator Lake in Columbia, 18 miles from us, it looks like hiking and birding. It rained last night and this morning and more is predicted for later in the day. But we head out during what is supposed to be an early afternoon break in the rain equipped this time with raincoats, camera bag and binocular bag. Big points for us for memory. Perhaps being so well prepared will keep the rain away. If you missed our hiking downpour experience from Monday you can find it here. Lots of water, lots of birds. The map is from their kiosk which was very foggy so my photo of it is difficult to see. But look at all the water and all the trails. But another thing to return for. There is a boat launch just off the parking lot. It goes into a canal and then into the lake. But today we are hiking not paddling. We choose the Old Canal Trail the blue line between north and south dike because we can see from the parking lot that it goes out into the middle of the lake and that there are birds on both sides. IF the window stays open when we finish this relatively short 1. It is in green on the map. In the water, in the grass, in the marsh, in the trees.

Chapter 9 : Paleontology in New Mexico Facts for Kids

The fossils of Dipteronia were collected along with other winged fruits such as Acer, Ailanthus, Fraxinus, Ostrya, Palaeocarya, and Carpinus from the upper part of the Oligocene lacustrine deposits, which are composed of laminated greyish-yellow mudstones with numerous remarkable fossil impressions.