



Annotated Object List:

Fossils of the West

Allophylus flexifolia Leaf (*real*)

Location: Colorado

Lived: 45-50 million years ago, Eocene Epoch

Matrix: Shale

This plant leaf was found in the Green River Formation in Colorado. Fossils of this type are often found in sedimentary layers like shale. This leaf has been fossilized by itself. When alive it would have been part of several leaflets growing together. Today, this type of flowering plant is found in the tropics around the margins of lakes and streams, which make scientists believe the Green River Formation was once a tropical or subtropical region.

An extraordinary feature of this specimen is the layering of sediment you can see on the sides. These layers take many, many years to build up. More fossils of this type or others could possibly be found within this specimen.

Bat (*cast*)

Location: Wyoming

Lived: 50 million years ago, Eocene Epoch

Matrix: Limestone

This is a cast of the original, oldest known bat fossil in the world. It was found in the Green River formation in Wyoming and is beautifully preserved. The discovery of this fossil was a huge event because the small, thread-like bones do not usually lend themselves to fossilization. If you look closely you can see the cartilage and even the wing membranes. The fossil suggests that bats had fully evolved flight by the Eocene.

An interesting fact - this bat was discovered with food still inside its body and waste not yet disposed, so some of the flora, algae, pollen, and arthropods of the time can be studied. It is rare that a complete fossil is found, and this makes the bat fossil very useful for paleontologists to study. The bat was preserved in a position that is common for dead bats. It is unclear, however, how the bat died. Scientists speculate that lightning or hail might be the cause of death.

Annotated Object List: Fossils of the West

Brontothere Leg Bone (*real*)

Location: Colorado

Lived: 40-30 million years ago, Oligocene to Eocene Epochs

This piece of bone is part of the femur (thigh bone) that makes up the kneecap of a Brontothere. This large mammal is related to rhinoceroses, tapirs, and horses. Its name means “thunder beast”. Their bony head plates protrude like that of a rhinoceros, but instead of consisting of keratin or other horn-like material, they were actually made of bone. Thus, the bony plates in males are much larger than with females.

Brontotheres only stood about 8 feet tall making the lower branches of trees, shrubs, and other fallen fruit their main diet.

This fossil has a unique story. Unlike most specimens and artifacts that make it into Education Collections, this came with documentation that indicated it was found at an archaeological site in 1978. In other words, it was not found by people looking for fossils (Paleontologists) but by people looking for remains of ancient peoples (Anthropologists). The scientist who found it wrote that it was found among the remains of ancient peoples. So, some “early inhabitant” collected this fossil bone much like we would to today if we came across such an object.

Equus Tooth (*real*)

Location: Florida

Lived: 2.6-1 million years ago, Pleistocene Epoch

Equus is the only surviving genus in the once diverse family of horses. They were small, pony-sized mammals that lived in North America during the last Ice Age. This specimen is from Florida, although they were abundant in the West. A fossil like this found around here would not be blackish in color; this is due to the sediments and geologic conditions that surrounded this fossil in the East.

Equus was approximately 4 feet tall and about 4.5 feet long. Relatives of Equus lived from 5 million years ago until the present. The species living today include horses, asses, and zebras. Domesticated about 3,000 years ago, the horse had a profound impact on human history in areas such as migration, farming, warfare, sport, communication, and travel. The horses living in North America today are all descendants of animals brought from Europe in historic times.

An interesting fact - Fossils of Equus are found on every continent except Australia and Antarctica. The neat thing about this fossil is that it represents the adaptive feature to eating grasses. About 50 million years ago, when “horses” were first evolving, they were eating mostly leaves, which are much easier to chew and digest, thus, requiring a much shorter, slow growing tooth than this one. This tooth, though about 4 inches long, would have only been above the gums about a ½-inch. This faster growing, dense tooth allowed horses to adapt to the ever-changing landscape of available food sources and denoting the evolution of grass.

Annotated Object List: Fossils of the West

Knightia Fish (*real*)

Location: Wyoming

Lived: 55-50 million years ago, Eocene Epoch

This fossil fish is a common find in the West. Knightia, a prehistoric herring that left countless fossils in Wyoming, was named that state's fossil. The genus was christened Knightia, after Wilbur Clinton Knight, the first Wyoming state geologist.

This fish is closely related to today's Clupea herring, except they lived 50 million years ago in a freshwater lake in what is now southwestern Wyoming. Their demise is a bit of a mystery. All that is really known is that they died very suddenly and in large groups. It is thought that poisonous volcanic gases, temperature fluctuations, food supply shortages, or algal blooms are to blame, which all are known to kill modern fish populations.

The genus Knightia likely grew to a length of 5-10 inches and was covered by layers of scales, similar to those seen in modern day fish. Knightia's diet likely consisted of plankton and algae, fossils of which have also been found in the Green River formation. In turn, larger fish and crocodiles probably ate Knightia, possibly even the boa constrictors which have been found fossilized alongside Knightia in Wyoming.

Mastodon Tooth (*cast*)

Location: North America

Lived: 3.5 million years ago-10,000, Cenozoic Era

The American mastodon was a large, elephant-like herbivore. It ranged in height from approximately 7 feet in females, to nearly 10 feet in males. An adult mastodon could weigh as much as 6 tons. Its head was equipped with a flexible trunk, small ears, and tusks. The tusks grew straight forward, nearly parallel to one another, and curved slightly upward. Unlike modern elephants and extinct mammoths, the mastodon had cusped molar teeth. The name "mastodon" is a Greek for "breast tooth", which references the animal's teeth that have crowns consisting of distinct rounded cusps.

Mastodons were widely distributed throughout the world, and their remains are fairly common and well preserved. The species may have persisted into post-Pleistocene times, bringing them into contact with early humans. Mastodon remains have been associated with fires, leading to the assumption that early humans hunted and ate them. Human predation may have hastened the extinction of this species; however it is not known why the mastodons died out.

Ophiomorpha Burrows (*real*)

Location: Wyoming

Lived: 270 million years ago, Permian Period

This is a marine trace fossil, a cast from a burrow that was probably inhabited by a shrimp. Ophiomorpha trace fossils have been found from about 250 million years ago to the

Annotated Object List: Fossils of the West

present. Today, their relatives form similar burrows in tropical shallow environments and are a powerful agent of bioturbation (biological sediment disturbance). This fossil is a unique look at an animal's fossilized home.

Petrified Wood (*real*)

Location: Colorado/Wyoming

Lived: 225 million-10,000 years ago, Triassic to Quaternary Periods

Petrified wood was formed 225 million years ago up until about 10,000 years ago. The word "petrified" literally means "turned to stone." Petrified wood is a tree that has turned to stone. This type of fossil, of a woody plant, is preserved by permineralization through time by chemical and physical processes. To identify fossilized species, scientists look at thin slices of the petrified wood under the microscope. The structure of the fossilized wood is then compared to the cellular structure of living species.

Petrified wood is 4 times as hard as granite and very colorful. The coloration is due to the effect of minerals such as iron, manganese, copper, and lithium present in the wood during the fossilizing process. These minerals come from the surrounding environment, usually from water or mud. Because wood is slightly spongy it absorbs the many different minerals present in its environment. These minerals fill in and replace features of the wood, thus allowing the fossil to keep its original physical characteristics. Details such as growth rings are noticeable, as you can see on this specimen. Each band indicates a year of growth. Other petrified wood specimens have been found that show termite "galleries" and fecal pellets. Petrified wood is a significant source of information about the environment from which it came from.

Predacious Diving Beetles (3) (*cast*)

Location: California

Lived: 1.5 million years ago, Pleistocene Epoch

These are replicas of the diving beetles found at the famous La Brea Tar Pits in California. Nearly fifty families of the class *Insecta* appear in the Tar Pits. The most numerous family is *Dytiscidae*, a predacious diving beetle still found in ponds today. The diving beetle is an active swimmer and both the adult and its larvae are voracious aquatic predators feeding on frogs, tadpoles, dragonfly nymphs, worms, snails, and small fish (all by sucking the liquefied juices from its prey).

Insects are not only the most abundant animals on the planet, but there are more beetles than anything else. To top off their success as a species, insects were the first flying creatures on Earth. The fossilized remains of insects have been found in rocks dating back 400 million years, from the Early Devonian Period. The first dinosaurs didn't appear on the earth until about 230 million years ago.

Annotated Object List: Fossils of the West

Tyrannosaurus Rex Tooth and Root (Cast)

Location: South Dakota

Lived: 68-65 million years ago, Cretaceous Period

T-rex, as this animal is better known, measured over 40 feet long and was tall enough to peer into a second story window. They were one of the last, largest, and most powerful of all the predaceous dinosaurs. This tooth shows serrations on both sides and the long deep root. Like many kitchen knives, the serrated edge allowed this creature to better tear flesh.

There is much debate about what T-rex's dined on. They are often coined as either being "scavengers" or "the fiercest predators". They do have large olfactory lobes (the part of the brain that deals with the sense of smell), which could have been used for either smelling out rotting carcasses or other prey. This was a successful predator that lived not only in the Dakota's but Colorado, Montana, New Mexico, and Wyoming.

Utahraptor Foot Claw (cast)

Location: Eastern Utah

Lived: 150 –125 million years ago, Jurassic-Cretaceous Periods

The Utahraptor is the oldest and largest in the family of raptors known as *Dromaeosauridae* (which includes the Velociraptor). The name dromaeosaur means "running lizard". This group is presently classified as the sister group to Aves-birds.

Utahraptors grew as large as 7 to 9 feet tall, and 16 to 18 feet long. This animal was especially remarkable for its unusually large hand claws and single giant sickle claw (slashing talon) on the second phalanx (toe) of both front feet. This replica shows the bone core of the animal's claw and the keratin sheath covering that core (unlike the kind of nails we grow).

It is a theropod, which is a diverse group of bipedal (walks on 2 legs) dinosaurs. This animal was definitely a carnivore. It is suspected that its claws were used for slicing and disemboweling its prey of other smaller dinosaurs.

Mammoth Tooth (real)

Location: North American and Northern Eurasia

Lived: 1.8 million years ago -11,000 years ago

Mammoths lived in North American and Northern Eurasia during the last ice age. They could grow to 12 feet high and could weigh as much as 8 tons.

Like the Mastodon, the Mammoth belongs to the order *Proboscidea* and is related to the modern elephant. Unlike the browsing Mastodons, Mammoths ate tough grasses. This caused their teeth to wear down over time; to compensate for this destruction Mammoths had teeth that grew in over the course of their lives. Although there are several differences

Annotated Object List: Fossils of the West

between the Mastodon and the Mammoth, these variations are most readily seen in their teeth. This was due to their different diets.

Mosasaur Tooth (*real*)

Location: World-Wide Oceans

Lived: 65 million years ago, Cretaceous

Although they might look one, the Mosasaur was not a dinosaur. They were actually a marine reptile probably most closely related to modern snakes. This animal most likely had to surface for air in between hunting for food. It was carnivorous, and it ate fish, squid, ammonites and other marine reptiles.

The Mosasaur could grow up to lengths of 40 feet long. They lived up until 65 million years ago, when the species died out during the Cretaceous-Tertiary Extinction.

Plesiosaur Tooth (*real*)

Location: World-Wide Oceans

Lived: 65 million years ago, Cretaceous

The Plesiosaur was a large, carnivorous marine reptile. Contrary to popular knowledge, it was not a dinosaur. It did exist at the same time period as the dinosaurs. The Plesiosaur could grow up to 46 feet long. Some had very long necks while other species did not. It also had large flippers. Some scientists argue that the Plesiosaur was not able to swim quickly, and these flippers were for maneuverability instead of speed.

Plesiosaurs ate fish and other marine animals. Scientists theorize that they went extinct when the Mosasaur supplanted the Plesiosaur in the food chain.

For more information and the sources of this document:

The Ultimate Dinosaur Book by David Lambert
ISBN: 1-56458-304-X

Prehistoric Horses = <http://www.flmnh.ufl.edu/natsci/vertpaleo/fhc/firstCM.htm> &
<http://www.flmnh.ufl.edu/natsci/vertpaleo/fhc/Stratmap1.htm>

The Green River Formation = <http://www.ucmp.berkeley.edu/tertiary/eoc/greenriver.html>

The Pleistocene = <http://www.ucmp.berkeley.edu/quaternary/ple.html>

General Information = www.pbs.org

Annotated Object List: Fossils of the West

Geologic Time Scale = <http://geology.er.usgs.gov/paleo/geotime.shtml> and
<http://www.nmnh.si.edu/paleo/dino/timescal.htm>

Petrified Wood = <http://www.northern.edu/natsource/earth/Petrif1.htm>

Mammoth = <http://exhibits.museum.state.il.us/exhibits/larson/mammuthus.html>

Mosasaur = <http://www.oceansofkansas.com/about-mo.html>

Mosasaur = <http://dinosaurs.about.com/od/typesofdinosaurs/a/mosasaur.htm>

Plesiosaur = <http://www.wild-facts.com/wild-fact-716-swim-at-your-own-risk-plesiosaur/>

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