

# Fossils in the Classroom

## Annotated Object List



Museum of Natural History  
UNIVERSITY OF COLORADO BOULDER

### 1 Coprolite

Fossil Feces (Original fossil)

From: Eocene Epoch (55.8 – 33.9 million years ago)

Type of Fossil: Trace

Type of Preservation: Permineralized

Coprolites are fossilized droppings of animals. They have been petrified, so they are not messy like recent feces, and they are now safe to handle. Often, fossilized bits of food are present within coprolites. Paleontologists study coprolites and the pieces of food inside them to learn about what ancient animals ate.

It is nearly impossible to tell for sure which animal a piece of fossil feces came from. However, paleontologists can make informed guesses by looking for other fossils in the rock around the coprolite and by looking at the bits of food inside the coprolite. This particular coprolite is thought to have come from a Nimravid, an animal that looked much like a saber-tooth cat.

**Interesting fact: Scientists often study coprolites by cutting very thin slices from them and looking at the slices under a microscope.**

### 2 Trilobite

Trilobite Exoskeleton (Original Fossil)

From: Lower Cambrian Period to Upper Permian Period (521 – 252.3 million years ago)

Type of Fossil: Body

Type of Preservation: Recrystallization

Trilobites are animals that were once common on the seafloor but went extinct before dinosaurs even appeared. They are part of a group of animals called arthropods. Arthropods alive today include Insects, like beetles and bees; crustaceans, like crabs and lobsters; and arachnids, like spiders and scorpions. Arthropods all have exoskeletons, hard, protective shells on their outsides. The exoskeleton is the part of trilobites that becomes fossilized. Trilobites shed their exoskeletons when they grew, just like living arthropods today. Many trilobite fossils are actually just shed exoskeletons, not the whole animals themselves.

**Interesting fact: Some trilobites could roll up their bodies to defend themselves, like roly poly bugs, or pill bugs, do today.**

### 3 **Brachiopod**

Shell (Original Fossil)

From: Lower Cambrian Period to Recent (542 million years ago to recent)

Type of Fossil: Body

Type of Preservation: Recrystallization

Brachiopods, also called “lamp shells,” are a group of marine, shelled animals. Most brachiopods have a fleshy stalk called a pedicle that they use to anchor themselves to the sea floor. They look similar to bivalves (see the modern shell), but the top and bottom shells of bivalves are symmetrical with each other, whereas brachiopods have flatter bottom shells. Today, bivalves are very common and brachiopods are relatively rare, but in the fossil record, the opposite is true.

**Interesting fact: Some fossil brachiopods are found with their original, non-recrystallized shells more or less intact, even though they are millions of years old.**

### 4 **Dinosaur Bone**

Bone (Original Fossil)

From: Middle Triassic Period to Upper Cretaceous Period (231.4 – 65.5 million years ago)

(Non-avian dinosaurs)

Type of Fossil: Body

Type of Preservation: Permineralization

All dinosaurs have legs that are upright underneath them (instead of splayed out to the side like lizards). There were two main groups of dinosaurs; order Ornithischia and order Saurischia. Ornithischians include ceratopsians, which had horns and bone frills protecting their necks, hadrosaurs, which had mouths shaped like duck bills for grazing on plants, and ankylosaurs, which were covered in bony armor. Saurischians include sauropods, which were large and had very long necks, and theropods, bipedal and mostly carnivorous animals like *Tyrannosaurus rex*. Birds are also technically theropods. All of the dinosaurs except for birds went extinct by the end of the Cretaceous Period, 65.5 million years ago.

This particular bone is from the Jurassic Period. *Stegosaurus*, *Allosaurus*, and sauropods like *Apatosaurus*, *Diplodocus*, and *Brachiosaurus* were all dinosaurs that lived in Colorado during the Jurassic. Paleontologists rarely find whole or even mostly complete fossil skeletons. Most dinosaurs are found in the ground as isolated bones or pieces of bones. Often, it is impossible to tell which specific animal a single piece of bone came from. The most common Jurassic dinosaur bones in Colorado are from sauropods.

**Interesting fact: *Stegosaurus* is Colorado's state fossil.**

## 5 Horse Tooth

Tooth (Cast)

From: Eocene Epoch to Recent (52 million years ago to recent)

Type of Fossil: Body

Type of Preservation: Permineralization

Horses are mammals that belong to the family Equidae. The first horses were no larger than dogs, but this particular tooth is from a larger horse that ate tough grasses like modern horses do. There were North American horses, but they went extinct around 10,000 to 8,000 years ago. Almost all horses in North America today, particularly the wild ones, are descendants of horses brought here by Europeans within the last 500 years.

**Interesting fact: Teeth from older animals, including horses, are usually more worn down than teeth from younger animals. Over time, the act of chewing food slowly grinds down teeth. This is particularly true when the food includes coarse grasses.**

## 6 Wood from a Tree

Petrified Wood (Original Fossil)

From: Middle Devonian Period to Recent (385 million years ago to recent)

Type of Fossil: Body

Type of Preservation: Petrification

Petrified wood is very common in the fossil record. Usually, the wood is permineralized into minerals such as quartz or brightly-colored agate. Sometimes fossil insects can be found inside petrified logs.

**Interesting fact: Petrified Forest National Park in Arizona has the petrified logs and stumps of an entire Triassic forest. In Colorado, some of the largest petrified tree stumps in the world can be seen at Florissant Fossil Beds National Monument.**

## 7 Graptolite

Colonies of Graptolites (Original Fossil)

From: Middle Cambrian Period to Lower Carboniferous Period (510 – 350 million years ago)

Type of Fossil: Body

Type of Preservation: Compression

Graptolites were tiny worm-like animals that lived in colonies. They are from a group of animals called hemichordates, meaning they are more closely related to vertebrates than other invertebrates are. Graptolites make excellent index fossils (see Investigation 2: Using Fossils to Date Rocks) because they are common all over the world and evolved into a wide variety of species relatively quickly.

**Interesting Fact: The name “graptolite” comes from the Greek words for “written” and “rock,” because their appearance reminded people of hieroglyphs.**

**8****Knightsia (Fish)**

Fish Skeleton (Original Fossil)

From: Eocene Epoch (55.8 – 33.9 million years ago)

Type of Fossil: Body

Type of Preservation: Compression

*Knightsia* was a genus of small, slender fish that lived in freshwater lakes. They were fairly common in western North America, especially in what is now Wyoming. They were apparently food for many other types of fish, as their fossil bones have been found in the mouths and stomachs of various fossilized fish skeletons. *Knightsia* is related to today's herring.

**Interesting fact: Knightsia is the state fossil of Wyoming.**

**9****Leaf (smooth edge)**

(Original Fossil)

From: Eocene Epoch (55.8 – 33.9 million years ago)

Type of Fossil: Body

Type of Preservation: Compression

Smooth-edged leaves are more common in warm climates. Scientists are still not sure why, but smooth edges may affect the rate water moves through the leaf and prevent the plant from losing too much water in hot weather.

**Interesting fact: The aquatic plant duckweed has the smallest known leaves of any plant: less than 0.04 inches (1 millimeter) in diameter.**

**10****Leaf (jagged edge)**

(Original Fossil)

From: Eocene Epoch (55.8 – 33.9 million years ago)

Type of Fossil: Body

Type of Preservation: Compression

Jagged-edged leaves are more common in cold climates. Again, scientists are not sure why, but it may allow for more photosynthesis early in the growing season, so plants can maximize how much they grow before it gets cold again.

**Interesting fact: In autumn, as days get shorter, plants are able to get less light. This loss of light triggers the process of leaves changing color and falling off.**

## 11 Fern

(Original Fossil)

From: Middle Devonian Period to Recent (375 million years ago to recent)

Type of Fossil: Body

Type of Preservation: Compression

Ferns are some of the earliest land plants, appearing first in the Devonian Period, but they are still alive today. Ferns have a complex life cycle in which they produce spores, which grow tiny plants called gametophytes, which in turn produce seeds which grow into “sporophytes,” the fern plants we are used to seeing. The fern life cycle requires a lot of water, so they can only reproduce in moist environments.

**Interesting fact: Young sporophyte ferns are called “fiddleheads” because the way they are curled looks like the top of a violin.**

## 12 Shark Tooth

Tooth (Original Fossil)

From: Upper Silurian Period to Recent (420 million years ago to recent)

Type of Fossil: Body

Type of Preservation: Permineralization

Sharks first appeared in the Silurian, 420 million years ago. Most of a shark’s skeleton is made of cartilage, like your nose and earlobes, which doesn’t fossilize as well as actual bone. Only a shark’s jaws are actually bone. However, fossil shark teeth are very common, because sharks continually grow and lose teeth throughout their entire lives.

**Interesting fact: The ancient shark megalodon was so big an adult human could have stood up inside its mouth. Megalodon has been extinct for 1.5 million years.**

## 13 Modern Mammal Bone

Bone (Original)

Recent

Type of Fossil: N/A

Type of Preservation: N/A

This bone is from a species of mammal that is still alive today. Note how much lighter it is than the fossil bone. Inside the middle of a bone is more spongy material called “cancellous bone” or “spongy bone.” In this bone, the cancellous bone may have been mostly destroyed by the process of cleaning the bones, leaving a hollow space. The hard outside of a bone is called “cortical bone” or “compact bone.”

**Interesting fact: Bone marrow in the cancellous bone is where blood cells are produced.**

## 14 Modern Bivalve

Shell (Original)

Recent

Type of Fossil: N/A

Type of Preservation: N/A

This is a species of bivalve that is still alive today. It is a recent shell, not a fossil. Compare it with the fossil brachiopod. Bivalve shells look the same on the top and bottom – this could be either the top or bottom half of the shell. In brachiopods, the bottom is flatter than the top.

**Interesting fact: Scallops, clams, and oysters are all modern day bivalves that are eaten by humans.**

## 15 Cave Bear Tooth

Tooth (Cast)

From: Pleistocene Epoch (2.59 million years ago to 24,000 years ago)

Type of Fossil: Body

Type of Preservation: Permineralization

Bears are mammals that belong to the family Ursidae. Bears as a group have been around since the late Eocene Epoch, about 38 million years ago, and are still around today. Cave bears were large bears that went extinct only about 24,000 years ago. Cave bear skeletons are still plentiful in some European caves.

This tooth is a molar, one of the teeth at the back of the bear's mouth. Most mammals, including bears, horses, and humans, have molars. Mammal mouths also have premolars (the teeth in front of the molars), canines (the pointy, more cone-shaped teeth), and incisors (the teeth at the front of the mouth).

**Interesting fact: Cave bears are depicted in ancient cave paintings across Europe, and their remains have even been found near the burials of Neanderthals and humans.**

## 16 Spinosaurus Tooth

Tooth (Cast)

From: Cretaceous Period (112.6 – 70.6 million years ago)

Type of Fossil: Body

Type of Preservation: Permineralization

*Spinosaurus* is a type of large theropod dinosaur, maybe even bigger than *Tyrannosaurus*. It had a long, narrow snout and a sail on its back. Fossils of *Spinosaurus* are found in North Africa. *Spinosaurus* probably spent a lot of time in or near water and ate a lot of fish. A recent study claims that *Spinosaurus* may have actually spent more time swimming than it did on land, which would be extremely unusual for a dinosaur.

**Interesting fact: A German scientist found the first recorded *Spinosaurus* specimen in Egypt. Bombing destroyed it during World War Two.**

## 17 Theropod Footprint

Track (Cast)

From: Upper Triassic Period to Upper Cretaceous Period (231.4 – 65.5 million years ago)

Type of Fossil: Trace

Type of Preservation: Mold of a theropod's foot

Theropods are a group of bipedal dinosaurs. This group includes *Allosaurus*, *Tyrannosaurus*, *Spinosaurus*, and *Velociraptor* among others. Birds also are technically theropods, meaning that members of this dinosaur group are still around today. Many theropods were carnivorous, but some were omnivorous. Nearly all carnivorous dinosaurs were theropods.

Theropod tracks are very common among dinosaur tracks, even more so than tracks from herbivores. This is odd, as herbivores are usually more common than carnivores in land ecosystems. Some scientists think that we find more theropod tracks today simply because theropods were more active and moved around more than herbivorous dinosaurs.

**Interesting fact: Like modern birds, most if not all theropods probably had feathers.**

## 18 Synapsid Footprint

Track (Cast)

From: Upper Carboniferous Period to Lower Cretaceous Period (323 – 100 million years ago)  
(Not including modern mammals)

Type of Fossil: Trace

Type of Preservation: Mold of a synapsid's foot

Synapsids are also called “mammal-like reptiles” and are the ancestors of modern mammals. They were very common in the Permian, 299 to 251 million years ago. However, at the end of the Permian, many of them became extinct, making room for the first dinosaurs to appear. Once dinosaurs went extinct, mammals, the last surviving synapsids, had the chance to become the most common vertebrates on land once again.

**Interesting fact: Dimetrodon, though often mistaken for a dinosaur, is actually a synapsid and lived before the earliest dinosaurs.**

