

Dinosaurs and Dinosaur National Monument



The Douglass Quarry

History of Earl's Excavation...



Geology of the Quarry

Rock Formations and Ages...



Within the Dinosaur Quarry Visitor Center is a rock wall containing 1500 fossil bones, a paleontology laboratory, exhibits, and a bookstore.

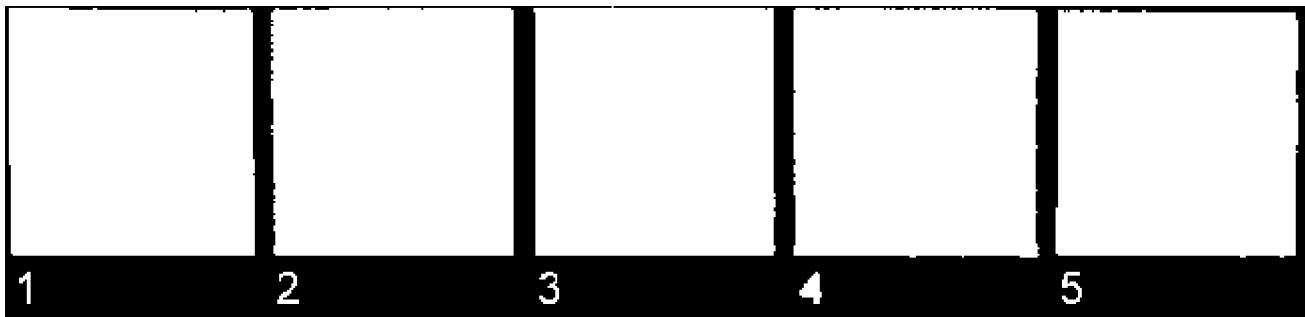
Dinosaur National Monument protects a large deposit of fossil dinosaur bones--remains of the so-called "terrible lizards" that lived millions of years ago. The dinosaurs weren't really lizards, and most of them weren't even terrible. But some of the first dinosaur fossils ever found were huge bones and teeth, very lizard-like except for their size, and so the idea of monstrous lizards was born. Today, many ideas about dinosaurs are changing, and the fossils at Dinosaur National Monument continue to help us learn more about these fascinating animals.

The fossils that give the monument its name were discovered in 1909 by Earl Douglass. He was a paleontologist (a scientist who studies prehistoric life) who worked for the Carnegie Museum of Pittsburgh, Pennsylvania. Douglass knew that some of the rocks in northeastern Utah were the same kind that had produced dinosaur skeletons elsewhere, so he went there hoping to find more bones for the museum. In fact, he found thousands of them, and spent many years digging them up and shipping them to Pittsburgh, where many skeletons are now on display. President Woodrow Wilson heard about the great dinosaur quarry that Douglass had started, and proclaimed the site as Dinosaur National Monument in 1915. Years later, the National Park Service began to develop the quarry as it is today. The rock layer containing the fossil bones forms one wall of the Quarry Visitor Center. On this wall, paleontologists have carefully chipped away the rock to uncover the bones and leave them in place.

More than 1500 fossil bones can now be seen in this unusual exhibit.

Why are there so many bones in one place? The rock around them is made up of sand and gravel, just like the sand and gravel you might see along a large river. Such a river flowed through this area 150 million of years ago, and many dinosaurs lived near it. Now and then some of them died near the river. During rainy seasons, the river overflowed its banks--just as many rivers do now--and picked up some of the dead dinosaurs lying nearby. A few of those bodies were whole, but many had probably decayed or been eaten by other animals, so that just the bones were left. The bones and bodies were carried by the river and deposited in the main channel. The current buried them with sand and gravel. The place that is now the Quarry was at one time a river channel.

As ages passed, that river vanished, but other rivers and seas came and went, leaving layer after layer of sand and mud that slowly solidified into rock. Even the buried bones became as hard as rock, as water seeping through the ground filled them in with dissolved minerals. Later still, strong vise-like forces began squeezing the Earth's crust in this area, bending and tilting the rock layers--just as the pages of a paperback book will bend if you push on it from opposite sides. But the more that the rocks were pushed upward, the more they were worn down by rain, snow, frost, and wind--layer after layer. Finally, some of the long-buried dinosaur bones began to show up near the top of a steep hill, and Earl Douglass saw them.



1. A river collected and buried thousands of dinosaur bones. 2. More layers of mud and sand covered the bones and hardened into rock. 3. Strong forces bent and tilted the rock layers. 4. Erosion wore away many layers and exposed a few bones. Earl Douglass saw them and dug into the rock to find more. 5. The Quarry protects the bones still in the rock.

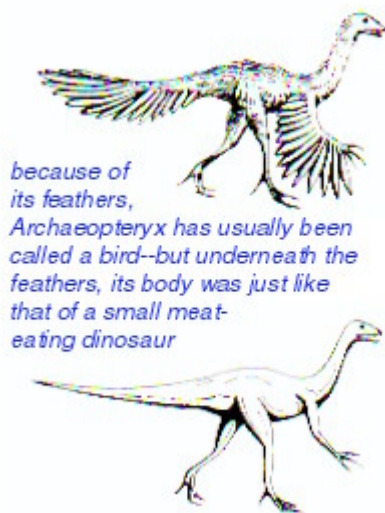
The bones found in the Quarry belonged to eleven kinds of dinosaurs. Some of them were very much like each other, while some were quite different. Paleontologists name and classify them according to the shapes of their hip bones, teeth, feet, and other parts:

Since we can't see a live Apatosaurus or Allosaurus these days, we have to guess, from their fossil bones and teeth, what they looked like and how they lived. The way the bones fit together gives us an idea of the animal's size and shape. Comparing the bones to those of living animals can give us more clues. For instance, a giraffe's long neck allows it to eat leaves from tall trees; maybe the long-necked sauropods did the same thing. Animals such as dogs and cats have sharp teeth for tearing and chewing tough meat, so dinosaurs with sharp teeth probably also ate meat. Some dinosaurs, though, are harder to figure out. No animal known today has two rows of bony triangles along its back, as Stegosaurus did. Some people think that these plates were a type of protective armor, like a turtle's shell. Recently, though, scientists discovered that the plates had many tiny channels that blood may have flowed through. In that case, sunlight shining on the plates might have helped Stegosaurus warm up, or a breeze blowing on them might have helped it cool off. We may never know for sure, just as we may never know what colors dinosaurs were, how old they got to be, or why they all died out.



The dinosaurs of the Quarry lived in the middle of the Age of Dinosaurs, about 150 million years ago. The earliest dinosaurs, which appeared around 200 million years ago, were small two-legged creatures, just another of Nature's experiments that might or might not work. This one did. The early dinosaurs multiplied, some got larger, some began to walk on four legs, and some grew into different shapes. Each new feature--a long neck, or sharp teeth, or bony plates--if it helped the animal survive, would be passed on to later generations, becoming the "trademark" of each new kind of dinosaur. Some groups of dinosaurs kept on multiplying for many centuries, and eventually lived all over the world. Some groups, such as the sauropods and Stegosaurus, became scarcer in later times, while others, such as the ornithopods, became more common.

But then, about 65 million years ago, all dinosaurs everywhere became scarcer and scarcer until they disappeared completely--and no one knows why. Rocks and fossils of that time tell us that many changes were taking place, but they don't tell us what change or changes caused the dinosaurs' extinction. Did the weather become too hot? Too cold? Too wet? Too dry? Did the meat-eating dinosaurs kill off all the plant eaters? Did the plant eaters starve because plants had changed too much, and the dinosaurs could no longer eat them? Did the early mammals eat too many dinosaur eggs? Or did something in the dinosaurs' diets make their eggshells too thin or too thick? Did a nearby star explode and shower the Earth with deadly radiation? Did an asteroid crash into the Earth and darken the skies for months with the dust of its explosion? All of these theories and many others have been suggested--but none of them can explain for certain what happened not only to the dinosaurs but to nearly half of all animal life on Earth at that time. This great extinction "remains a great mystery."



However, maybe one group of dinosaurs didn't all die out. These were the small meat eaters such as Ornitholestes. They had hollow bones and long arms and legs, so they were lightweight and could probably run fast. They may also have been warmblooded--that is, getting their energy from their food rather than from the sun's warmth, as living cold-blooded animals do. If they were warm-blooded, they probably had something like fur or feathers to help hold in their body heat. Such skin coverings decay faster than bones, so they are hardly ever found as fossils. Fossils of Archaeopteryx, a little animal that lived in the middle of dinosaur times, do show traces of feathers, so it has often been called the first bird. But the

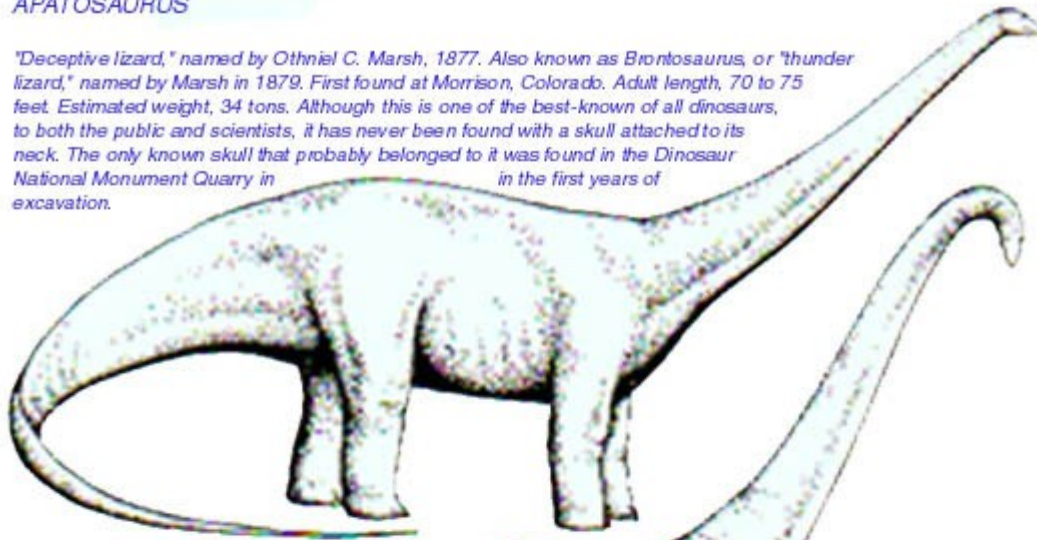
skeleton of Archaeopteryx looks almost exactly like that of a small meat-eating dinosaur, right down to its tiny sharp teeth. So what was it- -a bird or a dinosaur? Some scientists think that Archaeopteryx was both: a warm-blooded, feathered dinosaur that became the ancestor of the birds. If that's true, then some dinosaurs still live in Dinosaur National Monument, but in a different shape from those that lived there long ago.

DINOSAURS OF DINOSAUR NATIONAL MONUMENT: SAUROPODS, THE BIGGEST OF THEM ALL

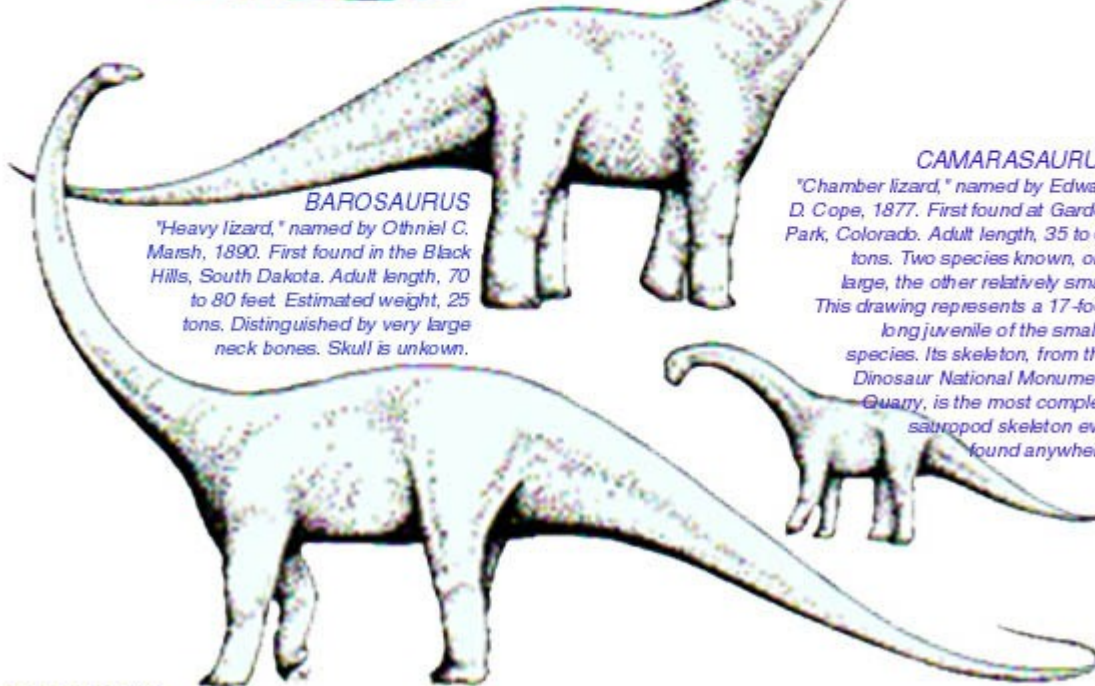
Sauropods, the huge, long-necked, long-tailed, plant-eating dinosaurs, were the largest creatures ever to walk on land. They were the dominant animals of the late Jurassic Period, and the bones of several kinds of them make up about three-fourths of all the fossils found in the Dinosaur National Monument Quarry.

APATOSAURUS

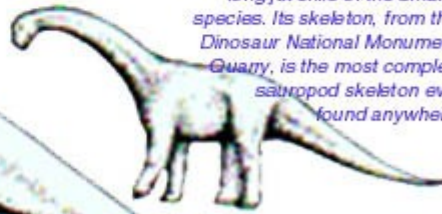
"Deceptive lizard," named by Othniel C. Marsh, 1877. Also known as *Brontosaurus*, or "thunder lizard," named by Marsh in 1879. First found at Morrison, Colorado. Adult length, 70 to 75 feet. Estimated weight, 34 tons. Although this is one of the best-known of all dinosaurs, to both the public and scientists, it has never been found with a skull attached to its neck. The only known skull that probably belonged to it was found in the Dinosaur National Monument Quarry in the first years of excavation.

**BAROSAURUS**

"Heavy lizard," named by Othniel C. Marsh, 1890. First found in the Black Hills, South Dakota. Adult length, 70 to 80 feet. Estimated weight, 25 tons. Distinguished by very large neck bones. Skull is unknown.

**CAMARASAURUS**

"Chamber lizard," named by Edward D. Cope, 1877. First found at Garden Park, Colorado. Adult length, 35 to 60 tons. Two species known, one large, the other relatively small. This drawing represents a 17-foot-long juvenile of the smaller species. Its skeleton, from the Dinosaur National Monument Quarry, is the most complete sauropod skeleton ever found anywhere.

**DIPLODOCUS**

"Double beam," named by Othniel C. Marsh, 1878. First found at Garden Park, Colorado. Adult length, 75 to 85 feet. Estimated weight, 13 tons. One skeleton found in Wyoming measures nearly 90 feet, the longest dinosaur skeleton known.

DINOSAURS OF DINOSAUR NATIONAL MONUMENT: MANY SHAPES AND SIZES

More than half of all the different kinds of dinosaurs that lived in North America in the late Jurassic Period are found in the Dinosaur National Monument Quarry. Besides the huge sauropods, the dinosaurs of the Quarry include other plant eaters ranging from large to small, and a few meat eaters as well.



STEGOSAURUS

"Plated lizard," named by Othniel C. Marsh, 1877. First found at Morrison, Colorado. Adult length, 20 to 25 feet. Estimated weight, 2 to 5 tons. After the sauropods, this is the next most common animal in the Dinosaur National Monument Quarry. Fossils of it include a partial skeleton of a juvenile that was only about the size of a large dog.

ORNITHOPODS

These two-legged plant eaters, small by dinosaur standards, are fairly rare in the Dinosaur National Monument Quarry. Some of the fossils that have been found, though, are the best specimens of their kind.



DRYOSAURUS

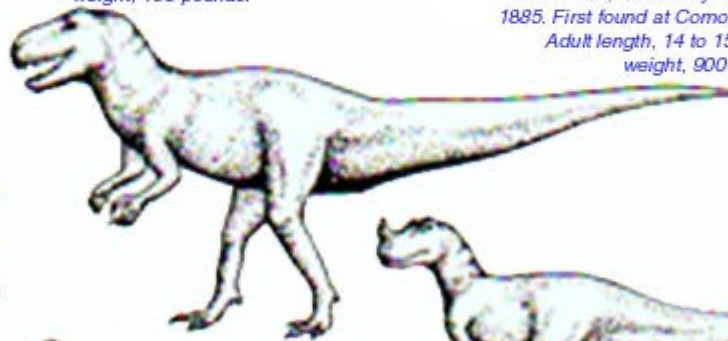
"Oak lizard," named by Othniel C. Marsh, 1984. First found at Como Bluff, Wyoming. Adult length, 4 to 6 feet. Estimated weight, 150 pounds.

CAMPTOSAURUS

"Bent lizard," named by Othniel C. Marsh, 1885. First found at Como Bluff, Wyoming. Adult length, 14 to 15 feet. Estimated weight, 900 to 1500 pounds.

THEROPODS

This group includes all the meat-eating dinosaurs, large and small. Three varieties have been found in the Dinosaur National Monument Quarry, but their fossils are rare and usually incomplete.



ALLOSAURUS

"Other lizard," named by Othniel C. Marsh, 1877. First found at Garden Park, Colorado. Adult length, 30 to 35 feet. Estimated weight, 1 to 2 1/2 tons. Two mountable skeletons, one including a nearly perfect skull, have been found in the Dinosaur National Monument Quarry.

CERATOSAURUS

"Horned lizard," named by Othniel C. Marsh, 1884. First found at Garden Park, Colorado. Adult length, 18 feet. Estimated weight, 1 to 1 1/2 tons. The only known meat-eating dinosaur that had a horn.



ORNITHOLESTES

"Bird robber," named by Henry F. Osborn, 1903. First found at Bone Cabin Quarry, Wyoming. Adult length, 6 to 10 feet. Estimated weight, 200 to 300 pounds.



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