Did Dinosaurs Have Feathers?

Young children often go through a period of fascination with dinosaurs and prehistoric times. For some people, however, this fascination lasts a lifetime. Paleontologists are scientists who use fossils to learn about Earth's past. Through the study of fossils, paleontologists can learn about organisms that lived long ago, the climate these organisms experienced, and even the structure of Earth's surface throughout the ages.

Paleontologists make a career out of their interest in prehistoric times.

Studying Earth's Past Through Fossils

Fossils include the preserved remains of organisms that lived long ago. Fossils also include preserved traces of organisms, such as footprints and animal waste. From studying the fossils of organisms' bodies, scientists can most readily determine how the organisms once looked. If a fossil is fairly complete, the organism's size and shape can be deduced. Studying the physical appearance and structure of ancient organisms helps paleontologists see similarities between these organisms and modern ones. This gives scientists evidence that adds to the understanding of how organisms changed over time.

Paleontologists learn about how dinosaurs looked from fossilized dinosaur footprints. Scientists can also learn important information from the *location* of the footprints.

The location and types of fossils also help scientists learn about the climate of Earth long ago. For example, a fossil that is very similar to a living organism might be discovered in a dry area. Scientists may know that living relatives of the fossilized organism live in a marine ecosystem. The discovery then might indicate that, at one time, the dry area was covered in water. This has happened in parts of Kansas. There, the discovery of large fish fossils such as *Xiphactinus* provides evidence that much of modern-day Kansas was once covered in water. In fact, this is only one piece of evidence, among many, that a great deal of North America was once covered by a large inland sea.

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The location and types of fossils can also reveal other ways in which Earth's surface has changed. The existence of very similar fossils on either side of the Atlantic Ocean was one of the pieces of evidence that led German scientist Alfred Wegener to propose that Earth's separate landmasses had once been part of one large connected landmass.

All the organic matter that was once in this fossilized fish skeleton has been replaced by minerals.

Types of Fossils

Although there are many types of fossils, all fossils can be classified into two main groups. The first type, body fossils, includes the actual fossilized remains of organisms. Insects that are preserved in amber (fossilized tree resin) are one example. Some people also consider the frozen remains of mammoths from tens of thousands of years ago to be fossils. Body fossils also include mold and cast fossils, which form when an organism is buried in sediment. The organism slowly decays and dissolves, while the surrounding sediment hardens into rock around the organism. This leaves a space in the rock, the mold. Leftover carbon from the organism and other sediment can eventually fill some or all of the space. This forms the cast, a fossil with the same shape as the original organism.

The other main type of fossils, trace fossils, includes footprints and dung preserved as rock fossils. Because one organism can leave many footprints, this type of animal fossil is easier to find. Imprints of plants are another kind of trace fossil.

Did some dinosaurs have feathers like this bird?

Evidence of Feathered Dinosaurs

One of paleontology's most interesting recent discoveries is the possibility that some dinosaurs may have had simple feather-like structures as part of their body coverings. In the 1990s, discoveries began to be made that supported this idea. Not all scientists agreed, however. More recent discoveries are adding to the weight of evidence about "feathered" dinosaurs.

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In 2004, scientists in the Liaoning Province of China discovered a fossilized relative of *Tyrannosaurus rex* that showed evidence of having filaments, or hairlike threads, on its skin. (These threads are sometimes called “dino fuzz.”) The scientists named the new dinosaur species *Dilong paradoxus*. In 2010, more discoveries revealed that the filaments may have been of different colors. Fossilized pigments, material that gives color to an organism's tissues, were discovered in the fossils of *Sinosauropteryx*. The most common pigments found in the dinosaurs were those that produce gray and black and those that cause reddish-brown to yellow colors.

Scientists say that dinosaur “feathers” may have been similar to the fuzzy down of a baby chick.

Another recent discovery, *Yutyrannus huali*, also shows evidence of feather-like filaments. This dinosaur was over 9 meters in length and had a mass of about 1,400 kilograms. Researchers who made the find said that the filaments were probably more like the down of a bird than like modern bird feathers. The "feathers" would not have been used for flight, but perhaps for keeping the dinosaur warm or for helping to keep its eggs warm in a nest.

Scientists are still collecting and examining evidence that may connect these early structures, sometimes called "protofeathers," to the true feathers of modern birds. It is exciting to realize that discoveries are still being made about these ancient creatures from the fossils the creatures left behind.