For Creative Minds

Biologist or Paleontologist?

Scientists who study living things (biologists) often observe animals to learn about them. If they are working in the field, they might even see different animal signs (nests with eggs, footprints, or poop) that help them to better understand the animal they are studying.

Scientists who study dinosaurs (paleontologists) learn about the animals by studying body or trace fossil clues. They sometimes use knowledge of today's animals to help them understand the dinosaurs.

Identify whether you think the following statements describe the work of a biologist or a paleontologist. Can you explain "why" to someone?

1. The scientist dissected the owl pellet to see what it had eaten.
2. The scientist discovered that the round-looking rock was fossilized poop (coprolite) containing bits of bone from a plant-eating dinosaur.
3. In 2011, scientists found several dinosaur feathers trapped in amber.
4. In 2007, scientists found a duckbilled dinosaur that was so well preserved that even the skin had fossilized.
5. Scientists watched the birds care for their young.
6. Scientists found fossils of an animal sitting on eggs in a nest in Mongolia.
7. Scientists used medical scanners to see inside fossils of a dino skull. Inside the crest were hollow passages similar to the inside of a horn. Using computer simulations, they were able to recreate the sound made when air passed through the dinosaur's crest.
8. Scientists followed the footprints to the animal's burrow and then watched the animal care for its young.
9. Scientists can identify a general type of dinosaur from its footprints (tracks) but not the exact species.
10. In 2012, a scientist discovered fossilized footprints in a stream near Washington, DC.

Answers: 1) Biologist. 2) Paleontologist. 3) Paleontologist. 4) Paleontologist. 5) Biologist. 6) Paleontologist. 7) Paleontologist. 8) Biologist. 9) Paleontologist. 10) Paleontologist.

Body and Trace Fossils: Reading the Clues

Fossils are signs of things that have lived in the past. Fossils can be of plants or animals but all of the fossils mentioned in this book relate to dinosaurs.

Body fossils are physical proof of dinosaurs' existence. They are the body or body pieces (bones, claws, or teeth) of the actual dinosaur. In some cases, the body pieces turned into rock. In other cases, the bodies or body pieces were preserved in amber (fossilized tree resin).

Dinosaurs left traces: footprints, chew marks, nests, burrows, and even eggs. Sometimes those traces turned into fossils so that scientists can find them today. These trace fossils help scientists to learn about dinosaur behavior: what they ate, how they moved, and how they raised their young.

Paleontologists "read" the fossilized rock clues to learn about the dinosaurs. They use their knowledge of rocks (geology), living plants and animals (biology), and other science subjects to help them put together some of the puzzle pieces.

Several different fossilized nests and eggs have been found. One nest had 34 baby hatchlings with an adult nearby; all were sitting up with legs tucked underneath them. A nest found in Mongolia even had an adult male sitting on the eggs. Dinosaur's closest relatives, birds and crocodiles, also lay eggs and care for their young. Paleontologists can infer that at least some dinosaurs raised young the way birds and crocodiles do.

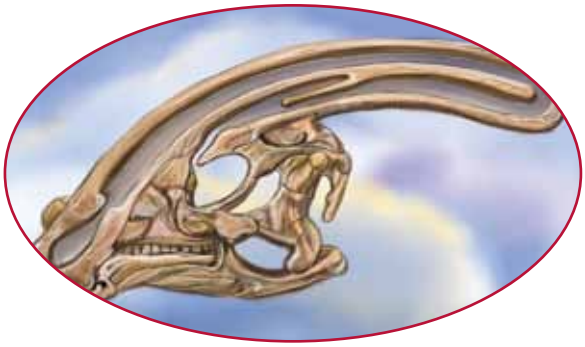
In 1999, a young teenager found a mummified dinosaur buried on his family farm in North Dakota. Scientists spent years digging the body out. The body was buried so quickly that the skin turned to stone, keeping its form and texture. The skin has geometric patterns, similar to a soccer ball. Using electron microscopes, scientists see that the skin had cell structures similar to modern-day birds and reptiles.

Some dinosaur fossils show a few feathers as impressions around the skeleton. Other dinosaur fossils show the dinosaurs were fully covered with feathers, much like today's birds. In 2011, scientists found several dinosaur feathers trapped in amber. The 78- to 79-million-year-old amber preserved the feathers in detail, including traces of their colors.

Bird feathers and human hair have tiny structures in their cells that carry color. The shape of the structure shows what color it is. For example, a round shape indicates a reddish color. Scientists can see the shapes under a powerful microscope and can infer that the dinosaur cell structures and colors would be similar to or the same as those today.

Fossilized poop is called coprolite. By studying it, scientists can tell what kinds of things the ancient animal had eaten. A coprolite thought to have come from a *Tyrannosaurus rex* (*T. rex*) has pieces of bone from a plant-eating dinosaur, confirming that *T. rex* were meat eaters.

Studying coprolites is not the only way that scientists can learn what dinosaurs ate. Some fossils have items in their stomachs. The bone of a pterosaur was found in the stomach of a Velociraptor. A duckbilled dinosaur's stomach had the remains of more than 40 kinds of plants! Fish scales and teeth were found in the stomach of a *Baryonyx walkeri*.

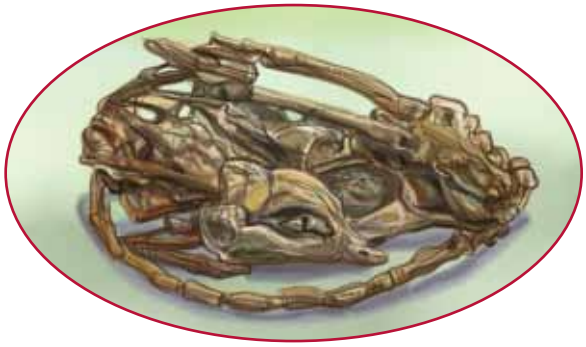


Parasaurolophus had a large bony crest on its head, but scientists didn't know what it was for. They used medical scanners to see inside the skull. The scientists found hollow passages similar to the inside of a horn. Using computer simulations, they recreated the sound made when air passed through the crest. Scientists think the dinos called to others over long distances similar to the way wolves and coyotes do.

"Sue" is the nickname of the largest and most complete *T. rex* skeleton ever found. Even though she was a fierce predator, her bones show evidence of a very hard life. Just like a doctor might see your broken bone with an x-ray, scientists can see that Sue had several broken bones in her ribs that had healed. Some scientists think this mighty predator may have died from an infection in her jaw.

Just as wild animals may fight for survival today, dinosaurs fought too. Two fighting dinosaurs, a *Velociraptor* and a *Protoceratops*, must have been caught in a collapsing sand dune in what is now Mongolia. The collapsing sand buried them so quickly that their bodies were fossilized.

Discovered in China in 2004, the *Mei long* fossil is of a sleeping feathered dinosaur. Scientists think it was buried by volcanic ash or died by poisonous gas from a volcanic eruption. The dinosaur was sleeping with its feet tucked under its body and its head under a wing—just as many birds sleep today. The dinosaur would have been about the size of a duck.



Just as you might leave footprints in mud, so did the dinosaurs. Sometimes these footprints, or tracks, fossilized so that we can see them today. Many tracks together make a trackway. These tracks and trackways help tell us how large the dinosaurs were, whether the dinosaurs were walking, running, slipping in the mud, or even swimming! The shape of the prints also tells us whether the track maker ate plants or meat.

Studying the skulls of *Pachycephalosaurus wyomingensis* ("thick-headed lizard"), scientists found signs of injury. They can't say for sure, but think head butting may have caused the injuries. Since male bighorn sheep head butt to see who will get the females, scientists infer that the dinosaurs probably did the same.

Most scientists agree that birds are living dinosaurs. Birds are the only present-day animals that have feathers and hollow bones. Many scientists are most excited about the way that birds still stand and run on the balls of their three-toed feet. Just like many dinosaurs, all birds have long and mobile S-shaped necks. Scientists were able to remove the remains of proteins from a *T. rex* fossil. The proteins were most similar to the proteins of an ostrich and a chicken.