

Piecing Together the Story of Dinosaurs from Fossils

by American Museum of Natural History

This text is provided courtesy of the American Museum of Natural History.

You've probably seen pictures, models, or movies about dinosaurs that lived millions of years ago. But how do we know so much about these animals? How do we know what they looked like and how they lived? Since the early 1800s, scientists have been piecing together this mystery with fossils.

Fossils are the remains of ancient life that are usually buried in rock. Most fossils formed from the hard parts of organisms such as teeth, shells, and bones. They also form from things a plant or animal leaves behind, like a footprint, a leaf print, and even eggs. Fossils show us what Earth was like long ago. They give us a picture of ancient environments. Scientists compare fossils from different time periods to investigate how life on Earth has changed over time.



Photo Credits: © AMNH

From left to right: fossil skin impressions, fossil eggs, fossil theropod foot, fossil dinosaur trackway

Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like. And sometimes when you find and add new pieces, the picture looks very different from how you thought it would be.

Egg Thief or Egg Protector?

In 1923, a team of paleontologists from the American Museum of Natural History made a surprising discovery in Mongolia's Gobi Desert. They found three large rocks that turned out to be fossilized dinosaur eggs. Then they discovered another fossil nearby: a toothless dinosaur.

The leader of the expedition, Roy Chapman Andrews, guessed that the dinosaur had been stealing the eggs from the nest. He named it *Oviraptor* (OH-vee-rap-tor) or "egg thief."

Seventy years later, in 1993, another team from the Museum found very similar fossil eggs in the same desert. One of the eggs held an embryo, or developing baby dinosaur. It turned out to be a baby *Citipati* (sit-uh-PAH-tee), a kind of dinosaur very similar to *Oviraptor*. Later, the team discovered an adult *Citipati* over a nest. It was brooding, or sitting on the nest, the same way birds do: with its arms spread to protect the eggs. And if its arms were covered with feathers, as scientists suspected, these wings would have shielded the eggs from heat and cold. Paleontologists realized that these dinosaurs nested like birds living today.



Photo Credit: © AMNH / M. Ellison

This is one of the Citipati fossils. The feathered wings are spread over the nest to protect the eggs, the same way birds do today.

These dinosaurs didn't steal eggs. They were caring parents!

When the discovery was made, the group of dinosaurs that includes *Citipati* and *Oviraptor* had already been named "oviraptorids." Even though scientists no longer think these dinosaurs were "egg thieves," the name stuck.

The Link Between Ancient Dinosaurs and Birds

Over 100 years ago, scientists started to notice similarities between birds and a group of dinosaurs called theropods (THERE-uh-pods).

This group included *Tyrannosaurus rex*, *Velociraptor*, and *Citipati*. As new theropod fossils were discovered, the link with birds became even clearer. Scientists discovered that like birds, theropods laid eggs. And they walked on two feet with their legs directly underneath them. They also had three-toed feet with claws, an s-shaped neck, and hollow bones. Some even had sharp, bird-like beaks. And many theropods had feathers!



Illustration Credit: Zhao Chuang, Courtesy of Peking Natural Science Organization

Citipati lived about 80 million years ago. These bird-like theropods grew to about nine feet long, with a toothless beak and feathered tail and front limbs.

Because birds are so similar to these animals, scientists have placed them in the same group. Birds are theropods. This means birds are a kind of dinosaur! By piecing together fossils of extinct dinosaurs, we've learned that dinosaurs aren't extinct after all.

Name: _____ Date: _____

1. What are fossils?

- A. dinosaurs that were once thought to steal eggs out of nests
- B. feathers that the *Citipati* dinosaur may have had on its arms
- C. remains of ancient life that are usually buried in rock
- D. s-shaped necks and other similarities between birds and dinosaurs

2. To organize this text, the author has divided it into sections. In the section called "Egg Thief or Egg Protector?" what does the author compare to *Citipati*?

- A. *Tyrannosaurus rex*
- B. living birds
- C. leaf prints
- D. fossil eggs

3. Birds are theropod dinosaurs.

What is one piece of evidence that supports this theory?

- A. *Tyrannosaurus rex* and *Citipati* were theropod dinosaurs.
- B. Some extinct theropod dinosaurs laid eggs, just like birds do today.
- C. Birds have feathers, but not all extinct theropod dinosaurs had feathers.
- D. Scientists once thought that some theropod dinosaurs were egg thieves.

4. The author describes *Citipati* dinosaurs as "caring parents." What evidence supports this description?

- A. *Citipati* walked on two feet with their legs directly underneath them.
- B. *Citipati* and *Oviraptors* are known as "oviraptorids," which means "egg thieves."
- C. *Citipati* laid eggs, had three-toed feet with claws, an s-shaped neck, and hollow bones.
- D. An adult *Citipati* was discovered sitting on a nest with its arms spread to protect the eggs.

5. What is the main idea of this text?

- A. Fossils can form from teeth, shells, bones, footprints, leaf prints, and eggs.
- B. In 1923, a team of scientists from the American Museum of Natural History made a surprising discovery in the Gobi Desert.
- C. Theropods are a group of dinosaurs that included *Tyrannosaurus rex*, *Velociraptor*, and *Citipati*.
- D. Discovering fossils of extinct dinosaurs helped scientists figure out that birds are a kind of dinosaur.

6. Read these sentences from the text.

"Scientists compare fossils from different time periods to investigate how life on Earth has changed over time.

"Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like. And sometimes when you find and add new pieces, the picture looks very different from how you thought it would be."

Why might the author have compared fossils to puzzle pieces?

- A. to help readers understand how scientists use fossils
- B. to prove that being a scientist is hard work
- C. to argue that studying fossils is more fun than putting together puzzles
- D. to explain why some puzzles are more difficult than others

7. Read these sentences from the text.

"Scientists discovered that like birds, theropods laid eggs. And they walked on two feet with their legs directly underneath them."

What or whom does "they" refer to here?

- A. "Scientists"
- B. "birds"
- C. "theropods"
- D. "eggs"

8. Read these sentences from the text.

"In 1923, a team of paleontologists from the American Museum of Natural History made a surprising discovery in Mongolia's Gobi Desert. They found three large rocks that turned out to be fossilized dinosaur eggs. Then they discovered another fossil nearby: a toothless dinosaur."

What did the leader of this expedition guess the dinosaur had been doing?

9. Describe the adult *Citipati* fossil that led scientists to realize "oviraptorids" were caring parents. Support your answer with information from the text.

10. The title of this text is "Piecing Together the Story of Dinosaurs from Fossils." Its author compares studying fossils to putting together a puzzle. Later, the author writes, "Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like."

Explain how "piecing together" fossils has helped scientists learn more about dinosaurs. Be sure to discuss the adult *Citipati* fossil discovered in the Gobi Desert. Support your answer with information from the text.

1. What are fossils?

- A. dinosaurs that were once thought to steal eggs out of nests
- B. feathers that the *Citipati* dinosaur may have had on its arms
- C. remains of ancient life that are usually buried in rock**
- D. s-shaped necks and other similarities between birds and dinosaurs

2. To organize this text, the author has divided it into sections. In the section called "Egg Thief or Egg Protector?" what does the author compare to *Citipati*?

- A. *Tyrannosaurus rex*
- B. living birds**
- C. leaf prints
- D. fossil eggs

3. Birds are theropod dinosaurs.

What is one piece of evidence that supports this theory?

- A. *Tyrannosaurus rex* and *Citipati* were theropod dinosaurs.
- B. Some extinct theropod dinosaurs laid eggs, just like birds do today.**
- C. Birds have feathers, but not all extinct theropod dinosaurs had feathers.
- D. Scientists once thought that some theropod dinosaurs were egg thieves.

4. The author describes *Citipati* dinosaurs as "caring parents." What evidence supports this description?

- A. *Citipati* walked on two feet with their legs directly underneath them.
- B. *Citipati* and *Oviraptors* are known as "oviraptorids," which means "egg thieves."
- C. *Citipati* laid eggs, had three-toed feet with claws, an s-shaped neck, and hollow bones.
- D. An adult *Citipati* was discovered sitting on a nest with its arms spread to protect the eggs.**

5. What is the main idea of this text?

- A. Fossils can form from teeth, shells, bones, footprints, leaf prints, and eggs.
- B. In 1923, a team of scientists from the American Museum of Natural History made a surprising discovery in the Gobi Desert.
- C. Theropods are a group of dinosaurs that included *Tyrannosaurus rex*, *Velociraptor*, and *Citipati*.
- D. Discovering fossils of extinct dinosaurs helped scientists figure out that birds are a kind of dinosaur.**

6. Read these sentences from the text.

"Scientists compare fossils from different time periods to investigate how life on Earth has changed over time.

"Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like. And sometimes when you find and add new pieces, the picture looks very different from how you thought it would be."

Why might the author have compared fossils to puzzle pieces?

- A. to help readers understand how scientists use fossils**
- B. to prove that being a scientist is hard work
- C. to argue that studying fossils is more fun than putting together puzzles
- D. to explain why some puzzles are more difficult than others

7. Read these sentences from the text.

"Scientists discovered that like birds, theropods laid eggs. And they walked on two feet with their legs directly underneath them."

What or whom does "they" refer to here?

- A. "Scientists"
- B. "birds"
- C. "theropods"**
- D. "eggs"

8. Read these sentences from the text.

"In 1923, a team of paleontologists from the American Museum of Natural History made a surprising discovery in Mongolia's Gobi Desert. They found three large rocks that turned out to be fossilized dinosaur eggs. Then they discovered another fossil nearby: a toothless dinosaur."

What did the leader of this expedition guess the dinosaur had been doing?

Suggested answer : The leader of the expedition guessed the dinosaur had been stealing the eggs from the nest.

9. Describe the adult *Citipati* fossil that led scientists to realize "oviraptorids" were caring parents. Support your answer with information from the text.

Suggested answer : Answers may vary in detail but should reflect the text.

For example: The adult *Citipati* fossil was brooding over a nest "the same way birds do: with its arms spread out to protect the eggs."

10. The title of this text is "Piecing Together the Story of Dinosaurs from Fossils." Its author compares studying fossils to putting together a puzzle. Later, the author writes, "Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like."

Explain how "piecing together" fossils has helped scientists learn more about dinosaurs. Be sure to discuss the adult *Citipati* fossil discovered in the Gobi Desert. Support your answer with information from the text.

Suggested answer : Answers may vary but should be supported by the text and discuss the adult *Citipati* fossil. For example:

In 1923, a group of scientists discovered a few "puzzle pieces" in the Gobi Desert. The pieces were three fossilized dinosaur eggs and the fossil of a toothless dinosaur nearby. The group's leader concluded that the toothless dinosaur had been stealing the eggs. Later on, more fossils were discovered in the same desert. One of them was the fossil of an adult *Citipati* . It was found brooding over a nest "the same way birds do: with its arms spread out to protect the eggs," according to the text. By "piecing together" the new fossils with the old ones, scientists realized that the earlier conclusion about "oviraptorids" had been wrong. These dinosaurs didn't steal eggs after all. They protected eggs by sitting on nests with their arms spread out.

Students may also discuss other pieces of skeletal evidence (for example, hollow bones) that scientists have pieced together to learn about dinosaurs.