Early Birds: Fossils and Feathers

A Reading A–Z Leveled Y Leveled Book
Word Count: 1,240

Connections

Writing

Create a Venn diagram that compares a dinosaur and a bird fossil from the book. Write a paragraph explaining how they are alike and why scientists think birds may be related to dinosaurs.

Science

Create a diagram that demonstrates the way two types of fossils are formed: fossils of animal skeletons and fossils of traces left behind by animals.

Reading A–Z

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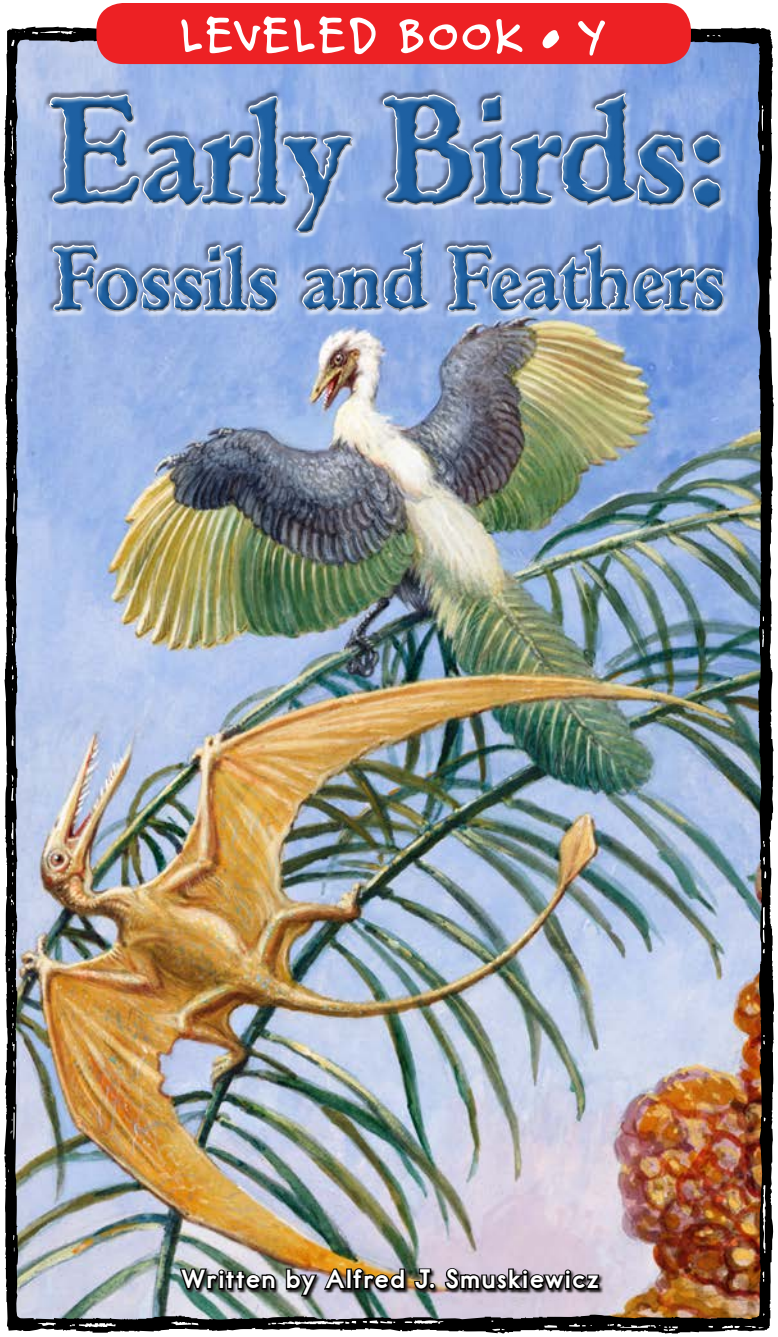

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Glossary

adapt *(v.)* to change to fit a new or specific situation or environment (p. 4)

carnivorous *(adj.)* meat-eating (p. 11)

decomposition *(n.)* the process of decaying and rotting (p. 5)

descended *(v.)* related to and developed from another species (p. 8)

impressions *(n.)* marks or prints that are made when something is pressed on or into surfaces (p. 4)

meteorite *(n.)* a piece of rock or metal that has landed on a planet's surface from outer space (p. 14)

paleontologists *(n.)* people who study plant and animal fossils (p. 4)

rudimentary *(adj.)* having an incomplete or undeveloped form (p. 10)

species *(n.)* a group of living things that are physically similar and can reproduce (p. 4)

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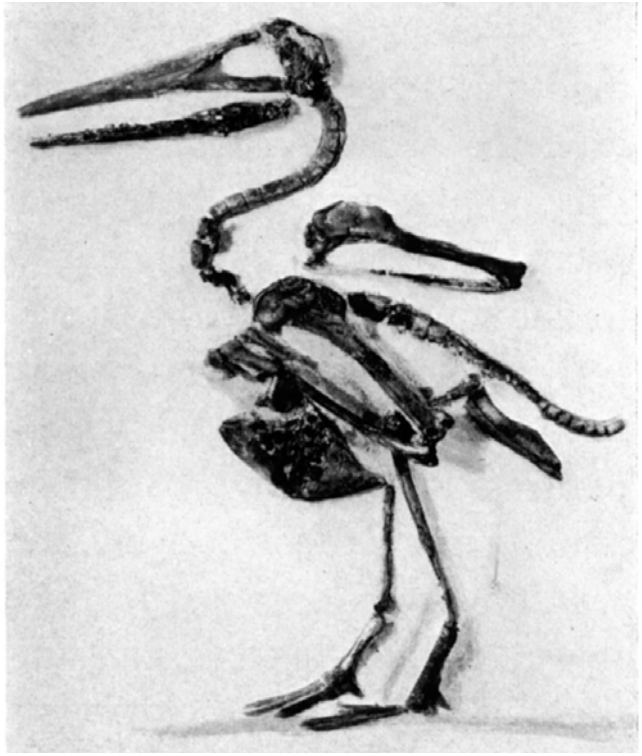
Early Birds:
Fossils and Feathers



Written by Alfred J. Smuskiewicz

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Focus Question

What can we learn from fossils?

Words to Know

adapt
carnivorous
decomposition
descended
impressions
meteorite
paleontologists
rudimentary
species

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Level Y Leveled Book

Written by Alfred J. Smuskiewicz

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Correlation

LEVEL Y	
Fountas & Pinnell	T
Reading Recovery	40
DRA	40

Era*	Period*	Life That Appeared
Cenozoic (65–present)	Quaternary (2–present)	Humans
	Tertiary (65–2)	Horses, apes
Mesozoic (248–65)	Cretaceous (145–65)	Flowering plants
	Jurassic (213–145)	Birds, mammals
	Triassic (248–213)	Dinosaurs
Paleozoic (543–248)	Permian (286–248)	Seed plants
	Carboniferous (360–286)	Reptiles, giant insects
	Devonian (410–360)	Sharks, amphibians
	Silurian (440–410)	Mosses, coral reefs
	Ordovician (505–440)	Squid-like nautiloids
	Cambrian (543–505)	Trilobites, mollusks, jawless fish
	Precambrian time (4.5 billion to 543 million)	Bacteria, worms, jellyfish

*in millions of years

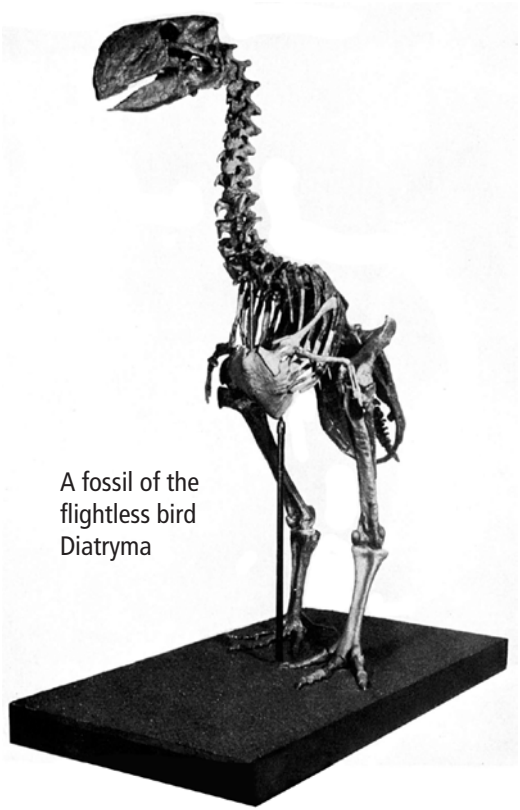
Scientists divide Earth's history into different eras and periods of time. During which era and period did birds first appear?

Conclusion

Much has been learned about prehistoric animal life from fossils. Some of the most fascinating fossils ever uncovered prove that, ages ago, there were creatures that had some characteristics of birds and other characteristics of reptiles. Fossils of these organisms lead scientists to theorize that birds developed from dinosaurs.

Dinosaurs roamed the Earth for more than 150 million years, but they were unable to adapt when environmental conditions changed about 65 million years ago. According to scientists, Earth's climate may have changed dramatically around that time, perhaps as the result of a **meteorite** impact. Although dinosaurs did not survive this change, birds did. Today, there are more than 9,700 species of birds thriving from the frigid Arctic and Antarctic to the torrid tropics.

Some scientists actually classify birds as living dinosaurs. So the next time you see a songbird singing outside your window, might you really be watching and listening to a dinosaur?



A fossil of the flightless bird Diatryma

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Introduction

Most of the **species** of animals that have ever lived on Earth suffer extinction. When the conditions of the environment change, such as when the climate cools or the quantity of food decreases, a species may die out if it cannot **adapt** to the new conditions. **Paleontologists** have learned about a wide variety of such extinct organisms from fossils—evidence of prehistoric life preserved in rock or other material.

Some fossils are simple marks that an animal produced while moving, such as footprints or trails left in the ground. Others are hollowed-out **impressions** of an animal's entire body made in rock. Still others are preserved remains of an animal's body, such as bones or shells.

These fossilized remains of a prehistoric bird contain many secrets of the past.

Fossils show how new kinds of species developed over eons. For example, scientists have discovered fossils that lead them to believe that birds developed from reptiles more than 150 million years ago; those reptiles may have been dinosaurs.

Scientists know what this dinosaur ate because one of the fossils of *Compsognathus* includes the remains of its last meal in its stomach. The type of lizard seen in the stomach had extremely long legs, so this lizard must have been a fast runner. Thus, *Compsognathus* had to be quick to capture this prey.

Compsognathus was a small dinosaur that was similar to a fast-running, insect-catching bird.

Fossil Bird in Its Egg

A 121-million-year-old fossil provides evidence that some prehistoric birds—unlike most birds today—could feed themselves immediately after hatching from their eggs. The fossil shows the outline of an egg with a baby bird still curled up inside. The unhatched bird had a complete set of feathers, strong-looking bones, and a large skull. Most birds today are weak and naked when they hatch and must be fed by their parents.

The features seen in *Compsognathus* and other coelurosaur fossils bear several similarities to the skeletons of modern birds.

One of the coelurosaurs that paleontologists understand best from fossils is *Compsognathus* (komp-SOG-nuh-thus). It is known from two well-preserved fossils, about 145 million years old, which were discovered in Europe.

Compsognathus was one of the smallest dinosaurs that ever lived—some of these creatures were only the size of a chicken. *Compsognathus* had a long, thin neck and tail and long hind legs. On each of its short front legs, it had only two claws—an unusual feature for a dinosaur. Like other coelurosaurs, *Compsognathus* hunted by running after insects, lizards, and other diminutive animals and grabbing them with its razor-sharp claws and teeth.

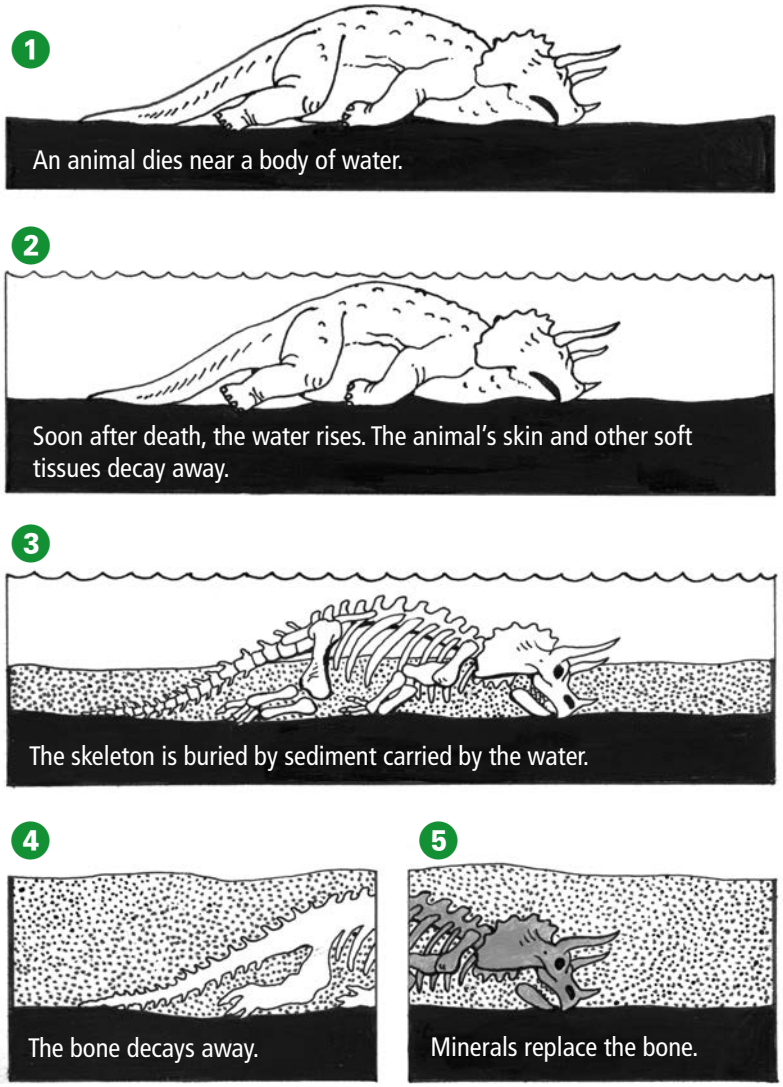
Information from Fossils

When the vast majority of animals die, the **decomposition** activities of bacteria and fungi cause their bodies to gradually break down and disappear. However, if conditions are suitable, a dead animal may transform into a fossil, leaving behind clues about its physical characteristics and how it lived.

John Day Fossil Beds in Oregon is typical of places fossils are found.

Typically, an animal that becomes immortalized as a fossil is buried in sediment—such as mud or sand—immediately after it dies. This is more likely to happen in or near rivers, the sea, or other bodies of water. Water that carries minerals, such as calcium, then soaks into microscopic spaces inside the bones of the body. As more and more of the bone tissue dissolves and decays away, increasing amounts of minerals take the place of the bone. In time, a rocky duplicate of the animal's skeleton is left.

When the body decays completely away, impressions of an animal's body form—showing such features as feathers or scales. All that then remains is the hollow space where the animal's body was, surrounded by sediment.

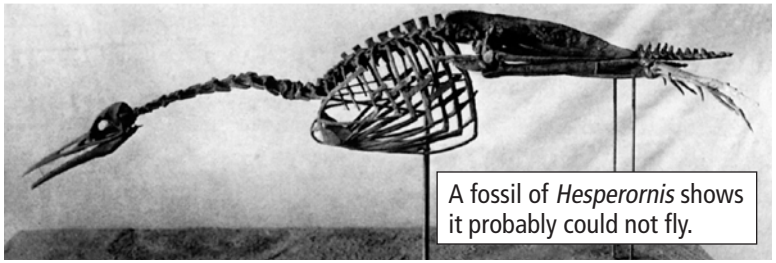


Birds from Dinosaurs?

Paleontologists theorize that fossils depicting birds with reptile-like characteristics are signs that birds developed from reptiles. Scientists have also uncovered fossils of dinosaurs that possessed feathers and other bird-like traits. These fossils provide evidence that dinosaurs were the reptiles from which birds developed.

Fossils indicate that **carnivorous** dinosaurs called *coelurosaurs* (sil-YUR-uh-sorz) were like birds in many ways—though scientists classify them as true dinosaurs. The fossils of the most birdlike members of the coelurosaur group are approximately 155 million to 135 million years old. They show that these animals were small for dinosaurs, most ranging in length from 2 to 10 feet (0.6–3 meters). They ran rapidly on two long, slender hind legs, which each had four, clawed toes. Their bones were hollow and lightweight. They had sizable eyes. Some even had feathers.

All of these traits are similar to those of birds. Since fossils exhibit these attributes, it's logical to conclude that coelurosaurs developed into birds.



A fossil of *Hesperornis* shows it probably could not fly.

Paleontologists have discovered several fossils younger than those of *Archaeopteryx* that depict other birds. These fossils reveal how birds developed progressively modern traits over time.

Hesperornis (hes-pur-OR-niss) and *Ichthyornis* (ik-thee-OR-niss) were two kinds of aquatic birds that lived approximately 90 million years ago. Fossils of *Hesperornis* show that this bird looked like a large loon, with big webbed feet to assist it in swimming. It also had a beak lined with tiny teeth to enable it to catch fish. However, *Hesperornis* had only **rudimentary** wing bones, so it could not fly. *Ichthyornis* resembled a gull, with elongated pointed wings. It was probably an excellent flyer that dived into the sea to capture fish.

Fossils prove that many of the main types of birds we know today had developed by about 35 million years ago. These included birds that bore resemblance to modern chickens, doves, ducks, parrots, penguins, owls, and songbirds.

The bones and other characteristics of a fossil tell scientists what the animal looked like. These features also enable scientists to compare the animal with species living today. Similarities and differences between the features in the fossil and those of living organisms may reveal how the extinct creature behaved. For example, if the bones in the fossil are similar to bones in bird wings today, maybe the animal was capable of sustained flight. Such traits may also indicate that modern birds are related to this extinct animal.

Paleontologists use different procedures to determine how old a fossil is—that is, to learn when the animal captured as a fossil lived. Because sediment accumulates year after year, fossils found in deeper sediment are older than fossils in sediment closer to Earth's surface. Scientists obtain their best estimates of a fossil's age by analyzing certain chemicals in the rock that contains the fossil.

Paleontologists discover fossils, study the fossils, and sometimes help display the fossils in museums.

Prehistoric Birds

Paleontologists have unearthed numerous fossils of extinct prehistoric birds. The earliest known bird fossils are of a primitive reptile-like bird called *Archaeopteryx* (AHR-kee-OP-tuhr-ihks), which lived approximately 150 million years ago. These fossils offer compelling evidence that birds **descended** from reptiles.

Fossils of *Archaeopteryx*, such as this one, are among the most important fossils ever discovered.

How Old Is That Fossil?

The main chemical technique that paleontologists use to estimate the age of fossils is called *radioisotope dating*. This method is based on the fact that chemicals called radioactive isotopes break down to form other chemicals at a known rate over time. By comparing the amount of radioactive isotopes left in a fossil with the amount of their breakdown products, scientists can calculate how long this decay process has been going on. That calculation, in turn, tells scientists how long ago the fossil formed.

The fossils of *Archaeopteryx* show that this crow-sized animal had some characteristics resembling birds and others resembling reptiles. Like modern birds, *Archaeopteryx* had feathers, wings, and a "wishbone" (a forked bone in the upper chest). However, like a reptile, it had teeth and a long, bony tail. It also had three "fingers" with claws on each wing.

Archaeopteryx probably flew rather poorly. Scientists base that conclusion on the structure of the animal's sternum (breastbone) seen in fossils. The sternum of *Archaeopteryx* was flat. Modern birds have a sternum with a protruding part where robust muscles used in flight are attached. Without such a sternum, *Archaeopteryx* would have lacked powerful flight muscles.

Archaeopteryx (top) and *pterosaurs* (left) were some of the first flyers besides insects.