What can we Learn from Fossils?

BUILD UP YOUR KNOWLEDGE

DK Learning

purple mash

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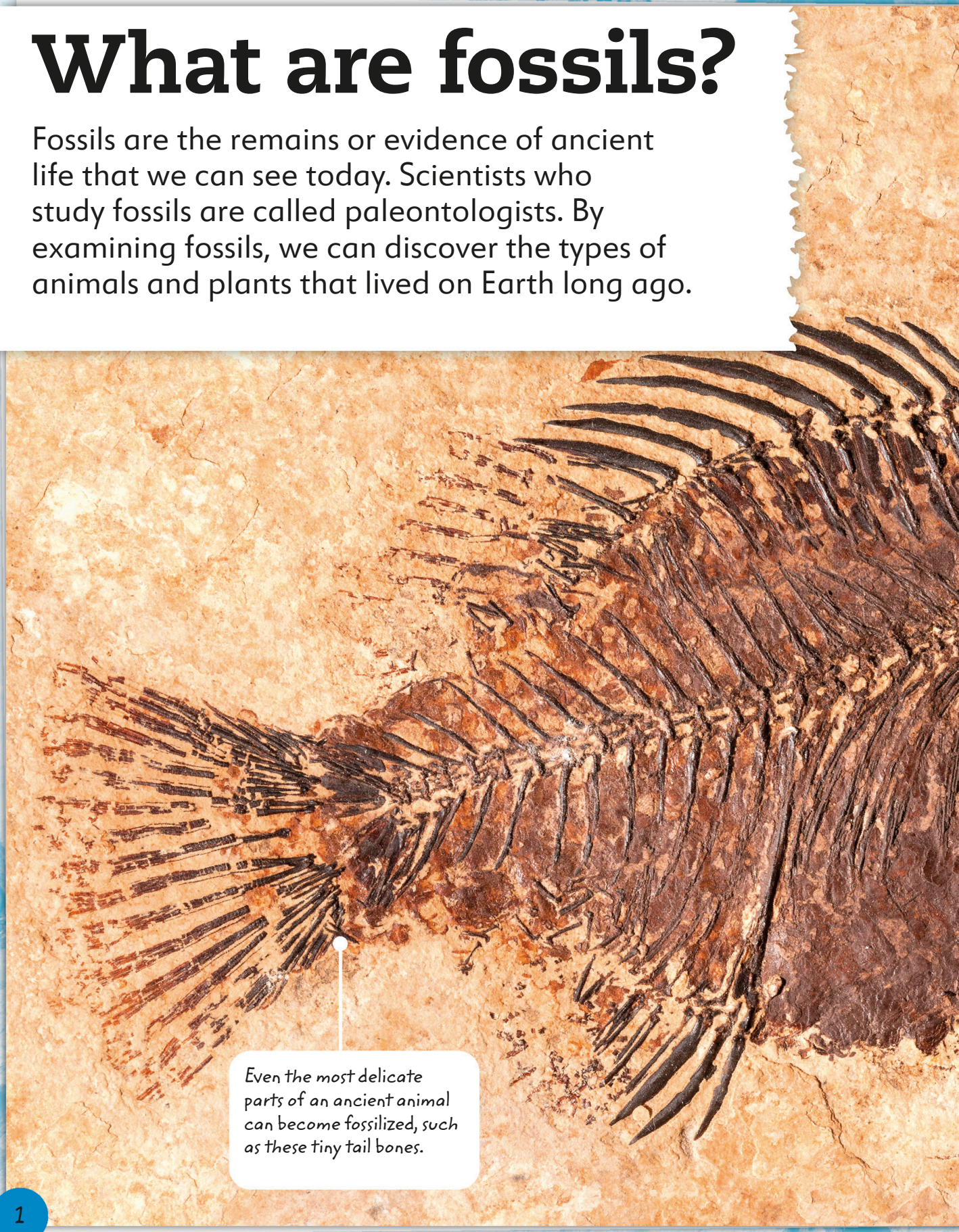
Dinosaurs and Fossils Category

What are fossils?

Fossils are the remains or evidence of ancient life that we can see today. Scientists who study fossils are called paleontologists. By examining fossils, we can discover the types of animals and plants that lived on Earth long ago.



Even the most delicate parts of an ancient animal can become fossilized, such as these tiny tail bones.

In the right conditions, fossils may preserve skin, fur, feathers, and even internal organs. The scales of this fish are still visible.

Usually, only small pieces of the original organism are found as fossils. However, some specimens can be completely preserved, such as this fossil fish, called Priscacara.

Some rare animal fossils are found with their last meal still inside their stomach.

Great finds

Sometimes, amazing fossils are found that show us not just what an animal looked like, but how it behaved. Certain fossils reveal how prehistoric animals cared for their young, how they built homes, what they ate for dinner, or even that they got sick.

This remarkable fossil captures a larger fish eating a smaller fish when they died. The event has been frozen in time since the Paleogene Period.

Eggs and babies of the dinosaur Maiasaura have been found inside a nesting ground. The babies were cared for by their parents.

Types of fossil

Fossils come in all shapes and sizes – from tiny grains of pollen to gigantic dinosaur bones. There are two main types: body fossils, which preserve the hard parts of a life form, and trace fossils, which are evidence of its existence.

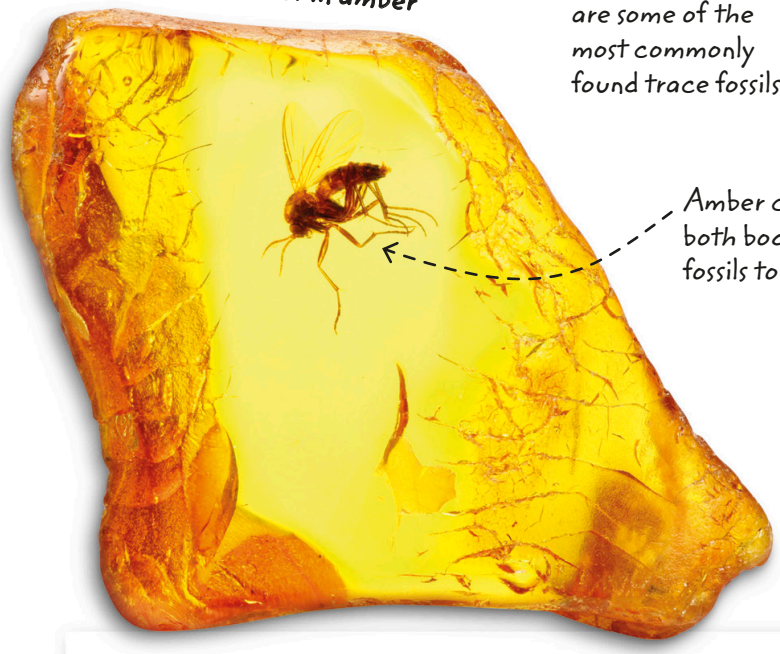
Trace fossils

Trace fossils record behaviours of ancient life. This can be in the form of tracks and trails, burrows and nests, and even fossilized poo, called coprolite.

Fossil footprints are some of the most commonly found trace fossils.

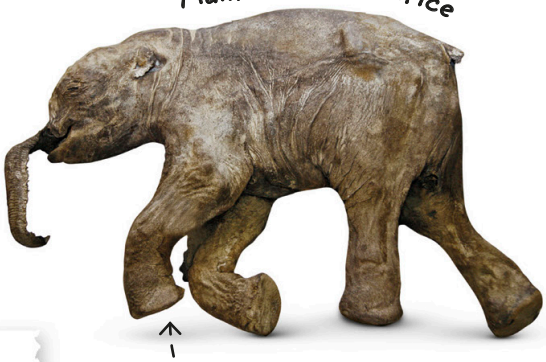
Chirotherium footprint

Fossilized insect in amber



Amber can preserve both body and trace fossils together.

Mammoth found in ice



This baby mammoth was discovered when ice in Russia melted.

Not just rocks

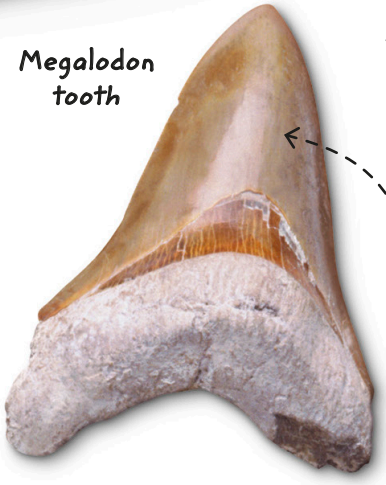
Not all fossils are formed inside rocks. Sometimes organisms can become trapped in amber or frozen in ice. These methods of fossilization often preserve more delicate body parts, such as fur and skin.

Body fossils

Body fossils are the direct remains of organisms that were once living, such as animals and plants. Usually, only hard parts, including bones, teeth, shells, and bark, fossilize.

This Triceratops skull is a perfect example of a body fossil. Both the bones and teeth are preserved.

Organisms may leave behind many trace fossils, but just one skeleton.



Shark teeth are among the most common body fossils found in the world.

Moulds and casts

If an animal or plant becomes buried, its body parts might break down, leaving behind a space (mould) in the rock. This space may be filled with minerals to create a three-dimensional copy (cast) of the original life form.

Mould fossil

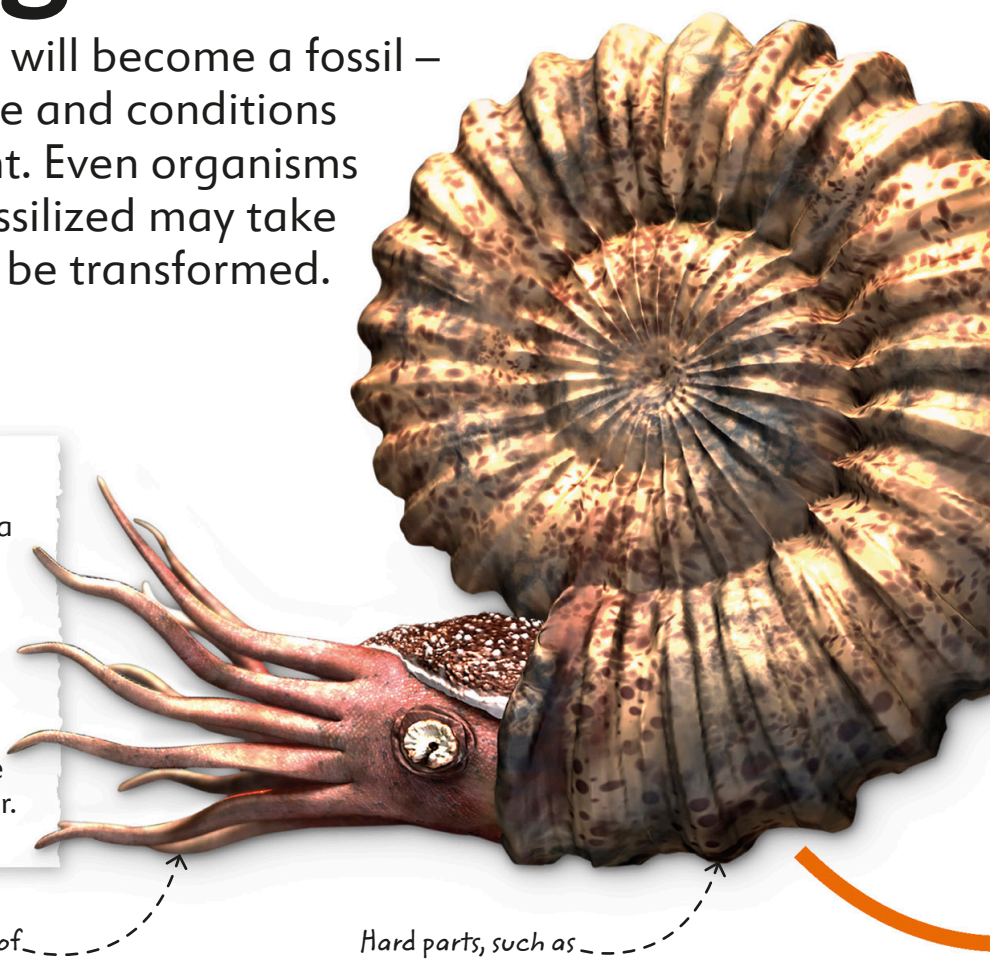
Cast fossil

Making a fossil

Not every life form will become a fossil – in fact, it is very rare and conditions have to be just right. Even organisms that do become fossilized may take millions of years to be transformed.

Ammonite

Ammonites were shelled sea creatures related to squid, and they are commonly found as fossils. Organisms must be quickly covered in sediment, such as mud and sand, for their remains to be preserved, which is more likely to happen underwater.



The soft parts of organisms rot away quickly and are not usually preserved.

Hard parts, such as shells, are most likely to fossilize before they break down.

Copal

Lignite

Partly fossilized

Fossilization is a very long process. Plants or animals transform gradually and partly fossilized specimens can be found. For example, tree resin becomes copal before it hardens into amber, and before plants fossilize into solid coal they turn into lignite.

Fine details of the original shell may be lost over millions of years.

Any colours or patterns on the original specimen are usually lost during fossilization.

The oldest fossils are almost 3.5 billion years old!

Rocks and minerals

To be preserved as a fossil, the parts of plants and animals must usually be replaced by minerals, which turns them into rock. Many fossils are made of the minerals calcite and quartz, as well as the rocks agate and phosphorite.

Calcite

Agate

Quartz

Phosphorite

Fossil record

By studying how old fossils are, scientists can create a record of life on Earth. Fossils show us when and where ancient organisms lived. The long history of the planet is divided into eras, which are further split into shorter periods.

Key
- Early Earth
- Paleozoic Era
- Mesozoic Era
- Cenozoic Era

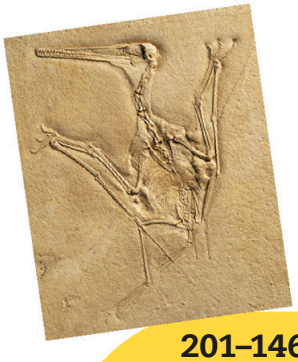
MYA Million years ago

Spriggina

3,500–542 MYA

First life

For billions of years, only single-celled life existed. The first larger animals, such as Spriggina, looked unlike creatures today.



Pterodactylus

Herrerasaurus

Dimetrodon

201–146 MYA

252–201 MYA

299–252 MYA

Jurassic

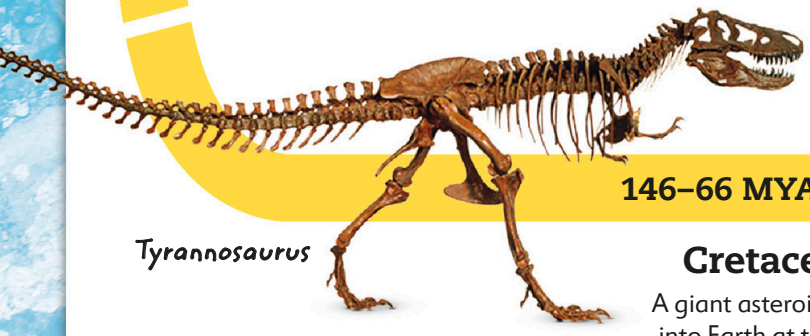
More types of small and large dinosaur evolved in the Jurassic. In the skies, pterosaurs, such as Pterodactylus, ruled.

Triassic

The first dinosaurs, such as Herrerasaurus, appeared in the Triassic. So too did the first mammals, but they were small and shrew-like.

Permian

Reptiles and mammal ancestors dominated in the Permian, including the huge Dimetrodon. However, most species went extinct at the end of the period.



Tyrannosaurus

Uintatherium

146–66 MYA

66–23 MYA

Cretaceous

A giant asteroid crashed into Earth at the end of the Cretaceous, killing the non-bird dinosaurs, and many other species.

Paleogene

Without non-bird dinosaurs to eat them, mammals, such as rhinoceros-like Uintatherium, got bigger. Birds also thrived and took over the air.

Elrathia

Conodonts

Baragwanathia

542–485 MYA

Cambrian

An explosion of different types of life in the Cambrian Period brought many new animal groups, such as arthropods, including the trilobite Elrathia.

485–444 MYA

Ordovician

Ocean life flourished in the Ordovician, including eel-like conodonts, which we know from their fossilized teeth. The first land plants also appeared.

444–419 MYA

Silurian

In the Silurian, land plants, such as Baragwanathia, grew taller – although most were around knee height. Arthropods also moved onto the land.

Sphenopteris

Eusthenopteron

359–299 MYA

Carboniferous

Ferns, such as Sphenopteris, grew across the planet during the Carboniferous. The Earth was lush with greenery and amphibians grew larger.

419–359 MYA

Devonian

The first forests grew in the Devonian. More fish evolved, including Eusthenopteron, which had limb-like fins and could breathe air.

Phorusrhacos

Mammuthus

23–3 MYA

Neogene

Fossils show more familiar animals and plants in the Neogene Period. However, many creatures were super-sized, such as the flightless, predatory bird Phorusrhacos.

3 MYA–today

Quaternary

We live in the Quaternary Period. Recently extinct animals that existed early in the period, such as mammoths, can still be found as fossils.

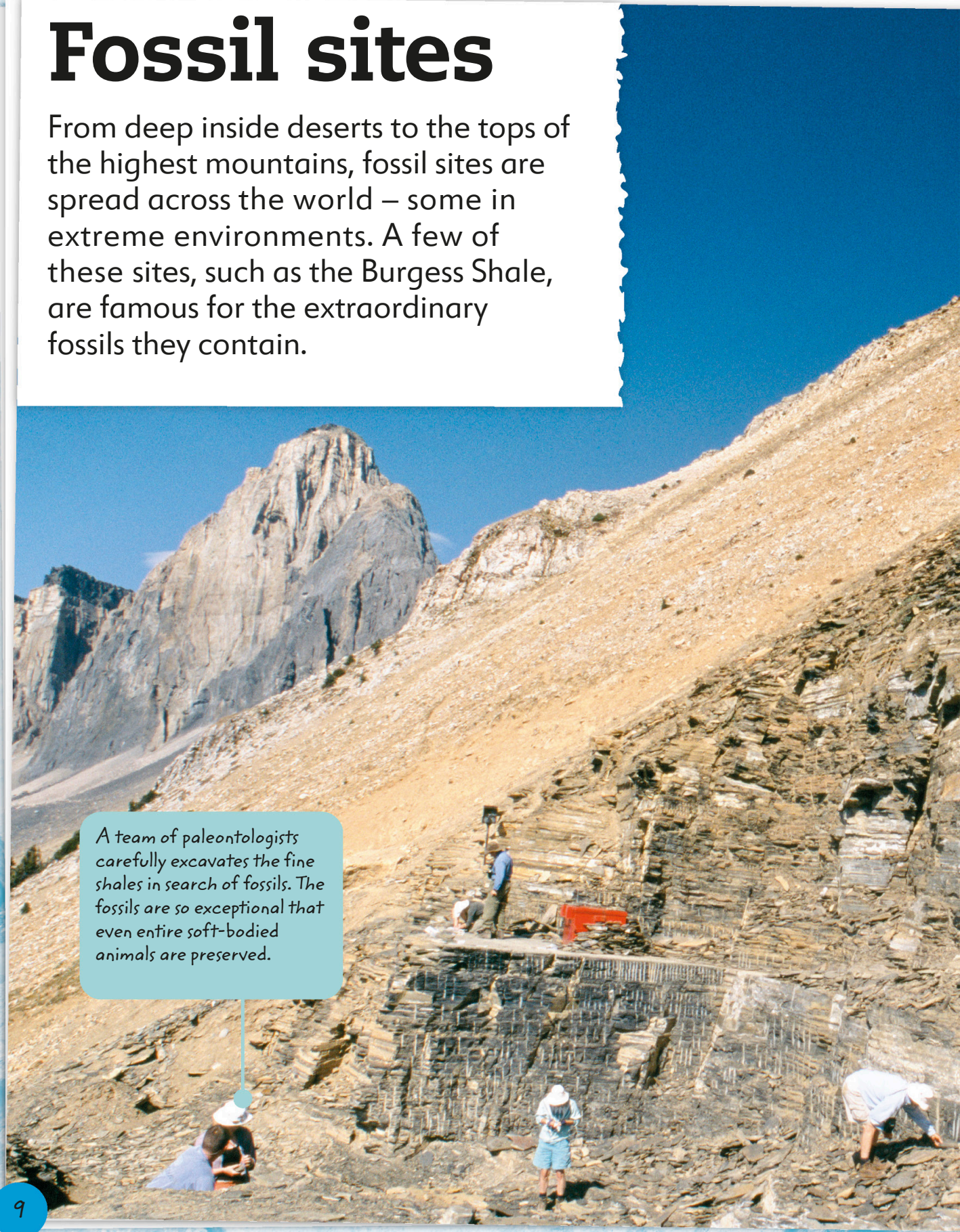
Digging through time

In many places, the deeper you dig, the older the rocks. Clear layers of different types of rock can tell us about big changes in the past, such as seas drying up or volcanoes exploding.

Rock layers

Fossil sites

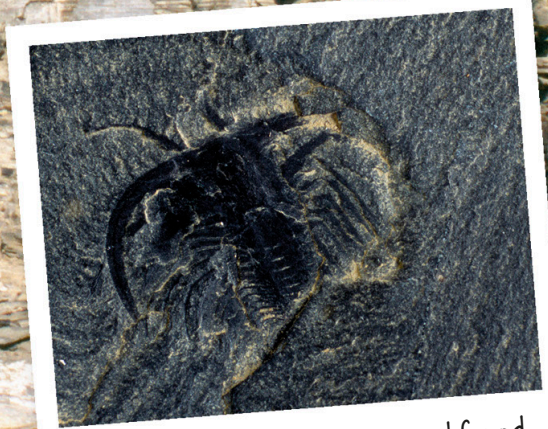
From deep inside deserts to the tops of the highest mountains, fossil sites are spread across the world – some in extreme environments. A few of these sites, such as the Burgess Shale, are famous for the extraordinary fossils they contain.



A team of paleontologists carefully excavates the fine shales in search of fossils. The fossils are so exceptional that even entire soft-bodied animals are preserved.

This spectacular fossil site is known as the Burgess Shale, and it is found in Canada. The first fossils were discovered here in 1909 by paleontologist Charles Doolittle Walcott.

Shale is a type of sedimentary rock. The shales at this site are from the Cambrian Period and contain fossils of some of the earliest animals to ever live.



Marrella was an early arthropod found by Walcott at this site in 1909.

Famous fossil sites

Certain fossil sites have helped paleontologists understand how organisms have evolved over time. Such sites may reveal rare fossils, including those with preserved soft parts.

The Valley of the Moon, in Argentina, is most famous for containing fossils of the earliest-known dinosaurs. They are from the Triassic Period.

One of the most fossil-rich areas in the world, the Solnhofen Limestone in Germany, contains millions of Jurassic fossils, including some with preserved feathers.

The Gobi Desert in China and Mongolia has revealed some spectacular finds from the Cretaceous, including the first dinosaur eggs and nests.

First fossil finders

Even though fossils have been hiding underground for millions of years, it is only in the last two centuries that scientists have really begun to understand them. The first people to find and name fossils had to work out what they were.

Mary Anning

(1799–1847)

English paleontologist Mary was just 12 when she found a huge fossil with her brother. It was an ichthyosaur – one of the earliest discovered. She also uncovered the first plesiosaur.

Ichthyosaurus skull

Georges Cuvier

(1769–1832)

Georges was a French scientist who compared the bones of animals. He used fossils to prove that species from the past had gone extinct, such as mammoth-like mastodons.

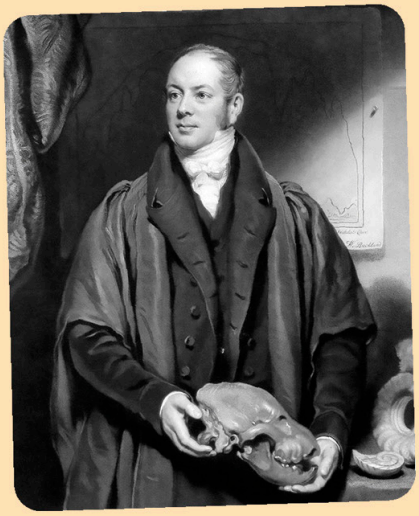
Mastodon tooth

The word "dinosaur" was invented in 1842 by paleontologist Richard Owen.

Ancient shark coprolite

William Buckland

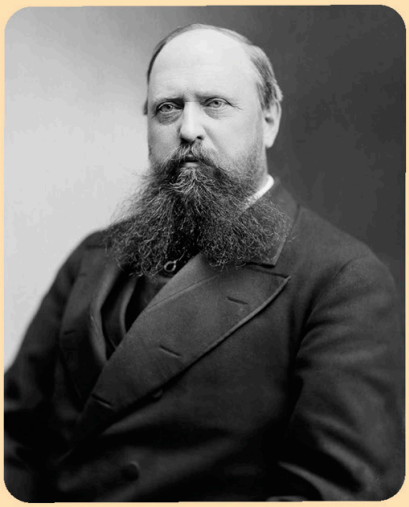
(1784–1856)



William was an English geologist who studied rocks and named the first dinosaur – Megalosaurus. He also gave coprolites their name, after being given some by Mary Anning.

Othniel Charles Marsh

(1831–1899)

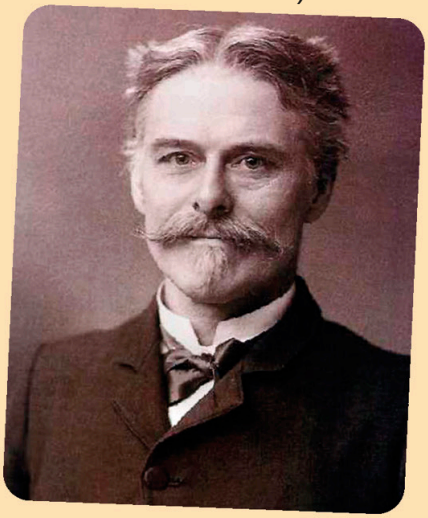


American paleontologist Othniel was a rival to Edward Drinker Cope. Othniel named around 80 new species of dinosaur, including Allosaurus and Triceratops.

Allosaurus skull

Edward Drinker Cope

(1840–1897)



Edward was an American paleontologist. He named 56 new species of dinosaur and hundreds of other ancient animals, such as the mammal ancestor Edaphosaurus.

Edaphosaurus vertebra with tall spine

The Bone Wars

Othniel and Edward were very competitive in trying to name new prehistoric animals. During these "Bone Wars" some creatures, such as Uintatherium, got named more than once!

Uintatherium

Acknowledgements

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