

Cambrian Explosion

Fact Sheet

An Explosion of Diverse Life

The Cambrian Explosion was a burst of animal evolution that occurred in the ocean about 540 million years ago. It's called an explosion because it happened in less than 20 million years, a relatively short period in Earth's 4.5-billion-year history.

Before the Cambrian Explosion, simple multicellular animals were living in the ocean. These were sponges, cnidarians, and ancestors of flatworms. Then the basic body plans of most of the animal phyla that have ever lived appeared during the Cambrian.

Most of the new body designs, 35 in total, had **bilateral symmetry**. This means the left side of the body is a mirror image of the right side of the body. This ancient body plan was passed down through organisms that became our modern-day insects, squid, fishes, amphibians, birds, and mammals.



Models of extinct animals from the Cambrian Period are shown in this diorama from the Carnegie Museum of Natural History.

A large trilobite is in the upper left. The white animals near it are *Marrella* arthropods. The long animal to their right is an annelid worm. The creature in the lower right is *Ayshecia*, a worm-like predator.

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Fossils: Clues about the Past

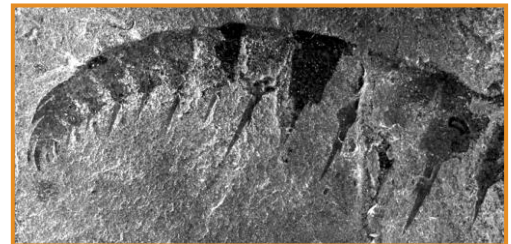
Fossils are the preserved remains or signs of animals and plants that lived more than 10,000 years ago. They are critical pieces of the puzzle that tell the story about life on Earth. Almost every creature that lives today can be traced back to animals found in Cambrian-age fossils.

Scientists who study fossil evidence of life, called **Paleontologists**, have found evidence of the Cambrian Explosion around the world. The most famous site of is the Burgess Shale in the Canadian Rocky Mountains.



Fossils, like this trilobite called *Eldredgeops*, are usually found in rock. Some fossils have even be found in amber (fossilized tree resin), oil, and coal!

James St. John, Flickr



Fossil of a grasping claw of *Anomalocaris canadensis* found in the Burgess Shale.

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What Caused the “Explosion?”

The causes of the Cambrian Explosion are still the topic of scientific debate. Multiple causes probably interacted with each other. Some theories are:

- **Genetic Revolution**

In the Cambrian, the genetic code was complex enough to allow genes to repurpose themselves. This allowed adaptations to a changing environment.

- **A Change in Oxygen Levels?**

Scientists think that pulses of high oxygen levels spurred the appearance of new animals. Higher oxygen levels allow for larger animals and more active predators.

- **An Evolutionary Arms Race**

New predators evolved. To escape them, prey evolved defenses. This led to new adaptations and new species. As prey developed better defenses, predators evolved new ways to get around those defenses.

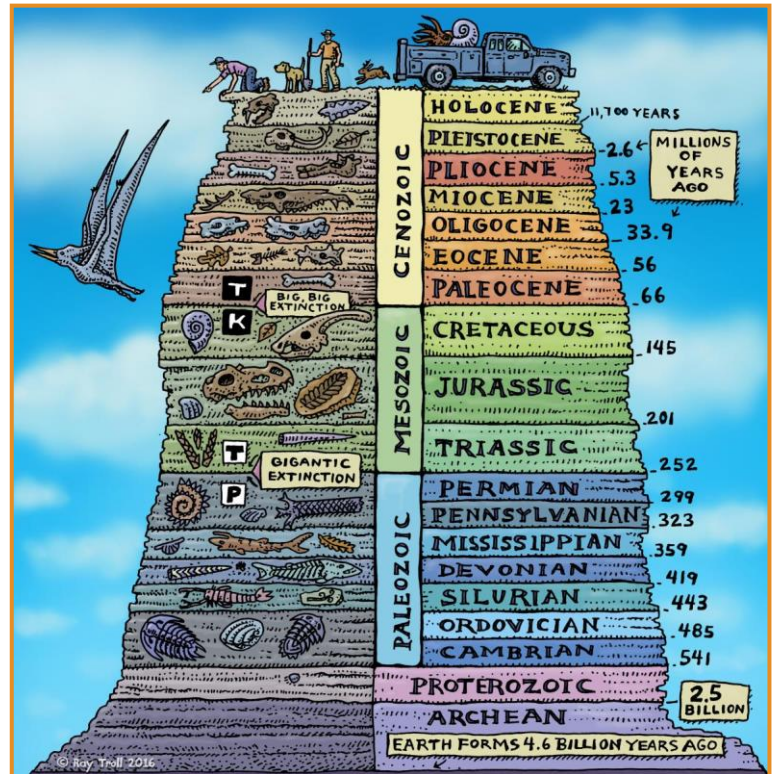
New predators also changed the relationships among animals and created new, more complex food webs. Food webs became complex enough that organisms developed even more specialized adaptations. It's a never-ending arms race that continues today!

- **A Change in Ocean Chemistry**

A changing sea level in the early Cambrian repeatedly flooded land. This caused erosion and an increase in minerals like calcium and phosphorus in seawater. These minerals then became available to organisms to build hard structures, such as shells and exoskeletons.

Learn More with Shape of Life Resources

- “Cambrian Explosion” video: shapeoflife.org/video/cambrian-explosion
- “Cambrian Explosion” resource page: shapeoflife.org/resource/about-cambrian-explosion
- “The Cambrian Explosion”: shapeoflife.org/sites/default/files/global/Cambrian-Explosion.pdf
- “Des Collins, Paleontologist: The Burgess Shale” video: shapeoflife.org/video/des-collins-paleontologist-burgess-shale



“Ages of Rock” by Ray Troll:
Why did the Cambrian Explosion begin 541 million years ago?
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More animals from the Cambrian Period are shown in this diorama at the Carnegie Museum of Natural History. The brown arthropod is *Sidneyia*. The tube-like animals are sponges.

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