

Lesson 14: The Cambrian Explosion

Imagine an ocean that has spent hundreds of millions of years nearly empty, with just a few soft, drifting mats of life, nothing with eyes or legs or armor. Then, in what amounts to a blink of geological time, the ocean fills with an astonishing variety of complex animals. Creatures with compound eyes that can see in every direction. Creatures with jointed legs and grasping claws. Creatures protected by hard shells called **exoskeletons**. Scientists call this the **Cambrian Explosion**, and it remains one of the most dramatic and mysterious events in the entire history of life.

It happened about 541 million years ago, and scientists still debate exactly why it unfolded so quickly. Rising oxygen levels may have given organisms enough energy to build large, complex bodies. The appearance of the first true **predators**, animals that hunted and ate other animals, likely triggered an arms race: prey animals that developed better armor or faster movement survived more often and passed those traits on. **Natural selection**, the process by which traits that help survival spread through populations, drove this explosion of new body plans. Among the most successful of the new animals was the **trilobite**: an armored creature with a segmented body and compound eyes, and one of the first animals we know of that could truly see.

Fossils from a site in Canada called the Burgess Shale preserve some of these creatures in astonishing detail. Anomalocaris, nearly a meter long with circular grasping claws, was the ocean's top predator. Hallucigenia was so bizarre that scientists originally studied it upside down. Opabinia had five eyes and a clawed trunk. The **biodiversity** on display in the Burgess Shale, the extraordinary variety of life forms, is staggering even today. Each of these animals represents a completely new experiment in what a body could be.

The Cambrian Explosion matters more than almost any other event in the story of life, because it gave us ours. The ancestors of every major group of animals alive today, including fish, insects, worms, starfish, mollusks, and eventually humans, appeared during this brief window. The basic body plans were set. Life had discovered the animal, and a world of extraordinary diversity had begun.