

## Photo Description



This image shows a fossil of an ancient sea creature called a brachiopod preserved in rock. The fossil has a fan-like shell with many straight lines that spread out from the bottom to the top, like the ribs of an umbrella. This creature lived in the ocean millions of years ago and is now turned to stone.

## Scientific Phenomena

The anchoring phenomenon here is fossilization - the process by which ancient organisms become preserved in rock over millions of years. This brachiopod fossil formed when the original sea creature died and was quickly buried by sediment on the ocean floor. Over vast periods of time, minerals replaced the organic materials in the shell while sediments around it hardened into rock, creating a stone replica that preserves the creature's shape and structure for us to study today.

## Core Science Concepts

1. Fossils as Evidence of Past Life: Fossils are remains or traces of organisms that lived long ago, providing evidence that different types of life existed on Earth in the past.
2. Environmental Change Over Time: This marine fossil found in rock on land shows that environments change dramatically over millions of years - areas that are now dry land were once covered by ancient seas.
3. Preservation Processes: Under special conditions, hard parts of organisms (like shells, bones, and teeth) can be preserved in rock, while soft parts usually decay away.
4. Scientific Observation: Scientists study fossils by carefully observing their shapes, patterns, and features to learn about ancient life and environments.

### Pedagogical Tip:

Use the "Think-Pair-Share" strategy when introducing fossils. Have students first observe the image individually and write down what they notice, then discuss with a partner, and finally share observations with the class. This builds observation skills and scientific vocabulary.

### UDL Suggestions:

Provide multiple ways for students to engage with fossil concepts: tactile experiences with fossil replicas, visual diagrams showing the fossilization process, and kinesthetic activities like acting out how sediments bury organisms. This supports learners with different sensory preferences and learning styles.

### Zoom In / Zoom Out

**Zoom In:** At the microscopic level, fossilization involves mineral replacement where dissolved minerals in groundwater slowly replace the original calcium carbonate in the shell, molecule by molecule, preserving even tiny details of the shell's structure.

**Zoom Out:** This fossil is part of Earth's larger story of changing climates and moving continents. The rock layer containing this fossil represents an ancient sea environment, and studying many such fossils helps scientists understand how life on Earth has changed over millions of years and how our planet's surface has transformed.

### Discussion Questions

1. What can this fossil tell us about what Earth was like millions of years ago? (Bloom's: Analyze | DOK: 3)
2. Why do you think we find fossils of sea creatures in places that are now far from the ocean? (Bloom's: Evaluate | DOK: 3)
3. What conditions do you think would be best for making fossils? (Bloom's: Apply | DOK: 2)
4. How is this ancient brachiopod similar to and different from sea creatures living today? (Bloom's: Compare | DOK: 2)

### Potential Student Misconceptions

1. Misconception: "Fossils are just old rocks that happen to look like animals."

Clarification: Fossils are actual remains of once-living organisms that have been preserved in rock through natural processes over millions of years.

2. Misconception: "All dead animals and plants become fossils."

Clarification: Fossilization is rare and requires special conditions - most organisms decay completely without leaving fossils behind.

3. Misconception: "Fossils form quickly, like in a few years."

Clarification: Fossil formation takes millions of years and involves slow processes of burial, mineral replacement, and rock formation.

### NGSS Connections

Performance Expectation: 2-ESS1-1 - Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Disciplinary Core Ideas:

- 2-ESS1.C - Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

Crosscutting Concepts:

- Patterns - Patterns in the natural world can be observed and used as evidence.
- Scale, Proportion, and Quantity - Natural objects and observable phenomena exist from very small to very large scales.

### Science Vocabulary

\* Fossil: The preserved remains or traces of an organism that lived long ago.

\* Brachiopod: An ancient sea animal with two shells that lived attached to the ocean floor.

- \* Sediment: Small pieces of rock, sand, and mud that settle in layers.
- \* Preserved: Kept safe and unchanged over a very long time.
- \* Ancient: Very, very old - from millions of years ago.
- \* Environment: The surroundings where an organism lives, including water, land, and air.

### External Resources

Children's Books:

- Fossils Tell of Long Ago by Aliki
- Digging Up Dinosaurs by Aliki
- National Geographic Readers: Fossils by Katharine Kenah

YouTube Videos:

- "What is a Fossil? | Natural History Museum" - Simple explanation of fossil formation with clear visuals: <https://www.youtube.com/watch?v=1QX8Hkz5qT0>
- "Fossils for Kids | Learn about the different types of fossils" - Kid-friendly overview of different fossil types with engaging animations: <https://www.youtube.com/watch?v=H9pS0Hz2XM>