

## Photo Description



This large rock shows different types of organisms living on its surface. Green moss patches and light-colored lichen create a colorful pattern across the weathered stone. The rock sits in a forest setting surrounded by fallen leaves and grass, showing how living things can grow on non-living surfaces.

## Scientific Phenomena

The Anchoring Phenomenon is biological weathering and ecological succession on rock surfaces. This occurs when pioneer species like lichens and mosses colonize bare rock surfaces. Lichens produce acids that slowly break down the rock, creating small amounts of soil where mosses can then establish. Over time, this process creates conditions for larger plants to grow, demonstrating how living organisms can change their physical environment and create habitats for other species.

## Core Science Concepts

1. Biological Weathering: Living organisms like lichens break down rock through chemical processes, slowly creating soil over long periods of time.
2. Pioneer Species: Lichens are among the first organisms to colonize bare rock because they can survive in harsh conditions with minimal nutrients and water.
3. Ecosystem Interactions: The relationship between lichens, mosses, and the rock demonstrates how organisms modify their environment and create conditions for other species.
4. Matter Cycling: Organic matter from decomposing organisms mixes with weathered rock particles to form soil, showing how matter moves between living and non-living components.

### Pedagogical Tip:

Have students make detailed observations of the rock surface before explaining the science concepts. This builds their observation skills and allows them to construct their own explanations before learning the scientific terms.

### UDL Suggestions:

Provide hand lenses or magnifying glasses for students to examine similar rocks outdoors. Create texture rubbings of different rock surfaces to help tactile learners understand the concept of weathering through hands-on experience.

## Zoom In / Zoom Out

1. Zoom In: At the microscopic level, lichen organisms produce weak acids that chemically break the bonds between mineral crystals in the rock. Fungal threads (hyphae) grow into tiny cracks, physically expanding them as they absorb water and grow.

2. Zoom Out: This weathering process is part of the larger rock cycle, where rocks are continuously broken down and reformed. The soil created here will eventually support larger plants, contributing to forest ecosystem development and carbon cycling on a global scale.

### Discussion Questions

1. What evidence do you see that living things can change non-living things? (Bloom's: Analyze | DOK: 2)
2. How might this rock look different in 100 years, and what factors would cause those changes? (Bloom's: Evaluate | DOK: 3)
3. Why do you think lichens can grow on bare rock while other plants cannot? (Bloom's: Analyze | DOK: 2)
4. How does the weathering of this rock connect to soil formation in the forest ecosystem? (Bloom's: Synthesize | DOK: 3)

### Potential Student Misconceptions

1. Misconception: "Moss and lichen are the same thing."

Clarification: Moss is a simple plant, while lichen is actually two organisms (fungus and algae) living together in a partnership called symbiosis.

2. Misconception: "Rocks don't change or break down naturally."

Clarification: Rocks are constantly being broken down by weather, water, and living things through processes that happen very slowly over many years.

3. Misconception: "Only big things like hammers can break rocks."

Clarification: Tiny organisms can break down rocks through chemical reactions and slow physical processes, even though we can't see it happening day by day.

### NGSS Connections

Performance Expectation: 5-ESS1-1 - Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Disciplinary Core Ideas:

- 5-ESS2.A - Earth's major systems interact through physical and chemical processes
- 5-LS2.A - Organisms interact with the living and nonliving environment

Crosscutting Concepts:

- Systems and System Models
- Cause and Effect
- Stability and Change

### Science Vocabulary

- \* Weathering: The process of breaking down rocks into smaller pieces through natural forces.
- \* Pioneer species: The first organisms to live in a new or harsh environment.
- \* Lichen: A partnership between fungus and algae that can grow on rocks and trees.
- \* Symbiosis: When two different organisms live together and help each other survive.
- \* Ecosystem: All the living and non-living things in an area that interact with each other.
- \* Biological weathering: When living things help break down rocks through chemical or physical processes.

## External Resources

### Children's Books:

- The Magic School Bus Inside the Earth by Joanna Cole
- Rocks and Minerals by Steve Tomecek
- A Seed Is Sleepy by Dianna Hutts Aston

### YouTube Videos:

- "Weathering and Erosion for Kids" - Simple explanation of how rocks break down naturally (<https://www.youtube.com/watch?v=XjVm8jJFuE4>)
- "What is a Lichen?" by SciShow Kids - Kid-friendly explanation of lichen organisms and their partnerships (<https://www.youtube.com/watch?v=5yVZoKHRkQU>)