

Chemical vs. Physical Weathering

Learning target: Explain how physical and chemical weathering lead to erosion and the formation of soils and sediments

Directions: As you read the text below, divide it into subsections. Circle each subsection and use the following subtitles for the sections you have chosen: **abrasion; acid rain; weathering vs. erosion; ice wedging; rust/oxidation; root wedging**

Weathering and erosion slowly chisel, polish, and buff Earth's rock into ever evolving works of art—and then wash the remains into the sea.

Weathering is the mechanical and chemical hammer that breaks down and sculpts the rocks. Erosion transports the fragments away. Working together they create and reveal marvels of nature from tumbling boulders high in the mountains to sandstone arches in the parched desert to polished cliffs braced against violent seas.

Water is nature's most versatile tool. For example, take rain on a frigid day. The water pools in cracks and crevices. Then, at night, the temperature drops and the water expands as it turns to ice, splitting the rock like a sledgehammer to a wedge. The next day, under the beating sun, the ice melts and trickles the cracked fragments away. These repeated swings in temperature weaken and eventually fragment rock, which expands when hot and shrinks when cold.

Bits of sand are picked up and carried off by the wind, which can then blast the sides of nearby rocks, buffing and polishing them smooth. On the seashore, the action of waves chips away at cliffs and rakes the fragments back and forth into fine sand.

Plants and animals also take a heavy toll on Earth's hardened minerals. Lichens and mosses can squeeze into cracks and crevices, where they take root. As they grow, so do the cracks, eventually splitting into bits and pieces. Critters big and small trample, crush, and plow rocks as they scurry across the surface and burrow underground. Plants and animals also produce acids that mix with rainwater, a combination that eats away at rocks.

Rainwater also mixes with chemicals as it falls from the sky, forming an acidic concoction that dissolves rock. For example, acid rain dissolves limestone which can create underground streams and caves like the cenotes of Mexico's Yucatán Peninsula.

Oxygen, the second most common element in the air we breathe, reacts with iron in minerals to form iron oxide minerals, or what is known as rust. As many minerals contain iron, it is not unusual to see red-colored rocks and materials form over time because the oxygen is reacting with the substance.

Without the erosive forces of water, wind, and ice, rock debris would simply pile up where it forms and limit the view of nature's weathered sculptures. Although erosion is a natural process, abusive land-use practices such as deforestation and overgrazing can expedite erosion and strip the land of soils needed for food to grow.