The Ever-Changing Surface of the Earth - Part 2: Weathering

By Laura G. Smith

1. From mountaintops to deserts to seashores, rocks are being tossed and turned, heated and cooled, cracked and crumbled by a process called weathering.

2. Weathering involves the physical disintegration and chemical decomposition of rocks, minerals, and immature soils at or near the Earth's surface. Weathering also initiates the erosion of rock, causing changes in the surface layers of the Earth.

3. In "The Ever-Changing Surface of the Earth - Part 1," you learned that erosion occurs when running water, sea waves, wind, and glaciers pick up rock and soil materials and carry them to other locations. These rocky materials are transported after the process of weathering has broken bedrock down into smaller, moveable pieces. The primary agents of weathering are water, ice, and gases in the atmosphere. Although weathering and erosion often occur at the same time, they are not the same process. Weathering is considered to be only a component (or part) of erosion, because it does not involve transportation of any material.

4. Physical (or mechanical) weathering breaks larger rocks into smaller rocks without actually changing the minerals in them. When water seeps into cracks and holes in rocks and temperatures fall below freezing, the water turns to ice. As the liquid changes to a solid, it expands, forcing the crack to open even wider. When the ice melts, it allows more water to seep in. Then the process of freezing and expanding continues, and the crack eventually splits the rock apart.

5. In many deserts it is hot and dry during the day and very cool at night. Such daily heating and cooling makes rocks expand and contract, which helps break apart rocks weakened by weathering.

6. Plants also cause rocks to split as their root systems grow into the cracks in the rocks, causing the cracks to open wider and even form new ones. Sometimes animals alter the physical condition of rock material as they burrow into the Earth to seek food or shelter.

7. Chemical weathering involves changes in the mineral composition of rocks, causing them to weaken and eventually crumble or decompose. Oxygen in the air attacks rocks that contain minerals with iron in them. The oxygen combines with the iron and turns it into powdery rust or iron oxide. Iron oxide colors some rocks and soils red or brown. The soil we depend on for so much of our food is a mixture of bits and pieces of weathered rock.

8. Rainwater causes chemical weathering too. As rain falls, it combines with some of the carbon dioxide gas that is in the air and becomes a weak acid, like soda water. This acid changes many minerals and even dissolves some away, causing them to fall apart over time. The rocks containing these minerals fall apart, too.
Tons of loose, weathered rocks sometimes pile up on mountain slopes. After heavy rains, these rocks can suddenly slide down in an avalanche. At the bottom they break up even more as one rock smashes into another. Heavy boulders and cobbles remain where they fall in the river, while pebbles, silt, sand, and clay are carried by fast-moving waters toward the ocean. Rivers deliver millions of tons of weathered rocks into the ocean, where they become part of the erosion process.
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1. The two major types of weathering described in this article are:
   - A. Rain and snow
   - B. Dissolving and crumbling
   - C. Physical and chemical
   - D. Freezing and expanding
   
   **2.** Weathering is different from erosion because __________.
   - A. It involves breaking down rocks.
   - B. It does not involve transporting materials.
   - C. It happens gradually.
   - D. It is affected by water and ice.

3. The primary agents of weathering are:
   - A. Rocks, boulders, and cobbles
   - B. Solids, liquids, and gases
   - C. Water, ice, and gases in the atmosphere
   - D. Silt, sand, and clay

4. Name one other thing that can cause physical weathering besides the process of thawing and freezing.

5. What basic part does weathering play in the erosion process?
   - A. It provides fertile farmland.
   - B. It carries rock material downstream.
   - C. It breaks down rock material into smaller, moveable pieces.
   - D. It provides homes for small animals.

6. __________ weathering changes the mineral composition of rocks.
   - A. Chemical
   - B. Mechanical
   - C. Mineral
   - D. Atmospheric

7. When rain combines with __________, it becomes a weak acid that can dissolve minerals and make them fall apart.
   - A. Natural gas
   - B. Iron
   - C. Oxygen
   - D. Carbon dioxide gas

8. After heavy rains, large piles of weathered rocks can suddenly slide down a slope in an __________.
   - A. Accidental fallout
   - B. Earthquake
   - C. Avalanche
   - D. Ice fall