Weathering and Erosion

Sheer cliffs, rocks appearing to be impossibly balanced on one small tip, massive underground caves, and giant sand dunes: what do all these things have in common? These and other spectacular and bizarre landforms around the world are the result of the processes of weathering and erosion.

Weathering and erosion also create (and can destroy) the soils we depend on to grow the food humans need to survive. Soil erosion in Africa supports life in rain forests in South America and damages coral reefs in the Caribbean Sea.

How can weathering and erosion do all that? Let’s look at the investigations you have done so far to get some clues as to how these processes work. As you know, weathering is the breaking down of rock into smaller pieces. Erosion is the process of the smaller pieces being carried to a basin by water, wind, or ice.

Physical Weathering and Round Rocks

When you shook rocks in a jar, little pieces broke off to become sand. This is one example of physical weathering. Physical weathering occurs when large rocks are broken into smaller rocks that are still the same kind of rock. The sand you made was still the same material as the larger piece of granite, only smaller. (You will learn about chemical weathering, a different type of weathering, later.)

You saw that the shaken granite pieces were more rounded than the pieces of fresh granite. The sharp edges and corners had been worn away by hitting other rocks. This occurs naturally when rocks have tiny particles knocked off of them by being hit by wind-blown sand or rock particles in moving water. The name for this type of physical weathering is weathering.

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Investigation 2: Erosion and Weathering

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Ice Weathering and Rock Falls

The number of rocks decrease and the more they get broken around and

When the rocks are broken down

erosion is one kind of physical

sand and pebbles is one kind of physical
weather, they produce sediments. Rivers and wind transport these sediments into basins. Layers of past sediments make up the deep, rich soils of the Great Plains, the coastal plains, and interior valleys. We depend on the food that is grown on these soils. Sometimes these sediments are carried by wind or water from mountains hundreds of miles away.

Spectacular Scenery
You already know that weathering and erosion created Grand Canyon. These same processes created the spires and hoodoos of Bryce Canyon in Utah, the rugged Badlands in South Dakota, and the rounded Blue Ridge Mountains in North Carolina and Virginia. Even Mammoth Cave in Kentucky, the world’s longest cave system, was created by weathering and erosion. All of these scenic wonders were once solid rock. And now hundreds of millions of people a year visit these and other similar spots around the world. They come to marvel at the beauty that weathering and erosion have created.

Weathering and Erosion Produce Soil
As the Rocky Mountains, Appalachian Mountains, and other mountains and hills

curbs. Ice wedging caused pieces of brick to flake off.
Plant roots will also cause weathering by growing into cracks. The roots expand as the plant grows, breaking the rocks apart.
You have probably seen a tree root that lifted and broke a sidewalk or even cracked the foundation of a house.

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Differential erosion happens any time softer rock is eroded away leaving harder rock behind. Much of the scenery in Grand Canyon is due to differential erosion. Devil’s Tower in Wyoming consists of hard rock that was once covered and surrounded by softer rock. Over the past one to two million years the softer rock weathered and eroded away leaving the column of hard rock standing.

Niagara Falls on the New York/Canadian border is another example of differential erosion. The water going over the Falls erodes the edge of the thick, soft shale layer under a hard limestone layer. This undercuts the limestone causing it to give way. This picture of the American Falls, one part of Niagara Falls, shows huge limestone boulders that have fallen. For the past 10,000 years, the Falls have continued to move upstream, eroding the rock at the higher part of the river, at an average rate of about one meter a year.

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Think Questions

1. Choose one of the processes of rock erosion.
2. Describe the processes you think were involved you think were involved when million of years ago, the cliff was formed.
3. Think about the processes you observed when you did this experiment. What is your explanation of the formation of the cliff?

Wind Erosion and Rain Forests

In a rock or a soil, in a desert or a rainforest.

The wind carries the sand from the cliff. Sometimes, the wind carries the sand into the ocean.

Massive dust storms can carry dust across the ocean.

The wind can wear away the rocks, leaving shallow holes in the cliff. These holes can turn into small cracks that can eventually lead to the collapse of the cliff.

Strong winds can carry sand and dust into the ocean, creating dust storms near cliffs. These storms can erode the rocks, causing them to crack and break down.