



# my planet diary

## Why Are Glaciers Blue?

If snow is white, why do glaciers look blue? When sunlight hits snow, it bounces right back. Snow is made up of microscopic crystals. It is light and not very dense. As more snow falls, its weight turns some of the crystals underneath into water and vapor. The water and vapor refreeze. This process creates larger, denser ice crystals. Over time, the weight of the snow and the ice on the surface makes these crystals even denser. These are the kind of ice crystals that make up glaciers. When sunlight hits glaciers, these dense ice crystals absorb the red and yellow light. Only the blue light escapes!

## FUN FACTS

After you read, answer the questions below with a classmate.

1. What makes glaciers look blue?

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2. In addition to color, what might be some other differences between snow and glacial ice?

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Go to Planet Diary to learn more about glacial erosion and deposition.

### Vocabulary

- glacier • continental glacier
- ice age • valley glacier • plucking
- till • moraine • kettle

### Skills

- 🕒 Reading: Relate Cause and Effect
- 🔍 Inquiry: Draw Conclusions

## How Do Glaciers Form and Move?

On a boat trip off the coast of Alaska you sail by evergreen forests and snowcapped mountains. As you round a point of land, you see an amazing sight. A great mass of ice winds like a river between rows of mountains. This river of ice is a glacier. Geologists define a **glacier** as any large mass of ice that moves slowly over land. 🚚 **Glaciers can form only in an area where more snow falls than melts.** There are two kinds of glaciers—continental glaciers and valley glaciers.

**Continental Glaciers** A **continental glacier** is a glacier that covers much of a continent or large island. It can spread out over millions of square kilometers. Today, continental glaciers cover about 10 percent of Earth's land. They cover Antarctica and most of Greenland. 🚚 **Continental glaciers can flow in all directions as they move.** They spread out much as pancake batter spreads out in a frying pan. Many times in the past, continental glaciers have covered larger parts of Earth's surface. These times

are known as **ice ages.**

About 1 million years ago, continental glaciers covered nearly one third of Earth's land. The glaciers advanced and retreated, or melted back, several times. They most recently retreated about 10,000 years ago.

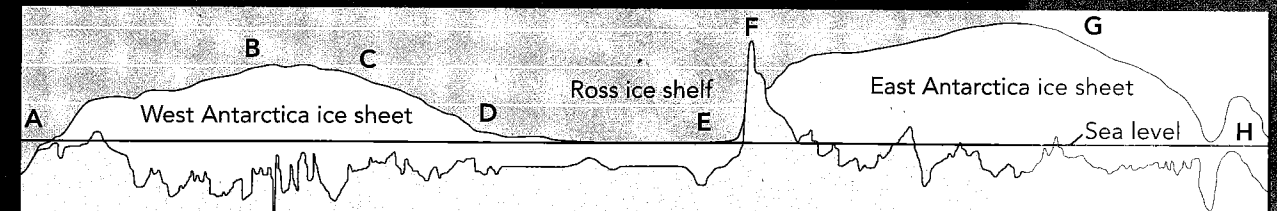


FIGURE 1

### Continental Glaciers

You're traveling across Antarctica from Point A to Point H on the route below. The cross section shows changes in the ice sheet along your journey.

📝 **Interpret Diagrams** What changes in elevation and ice depth will you encounter?

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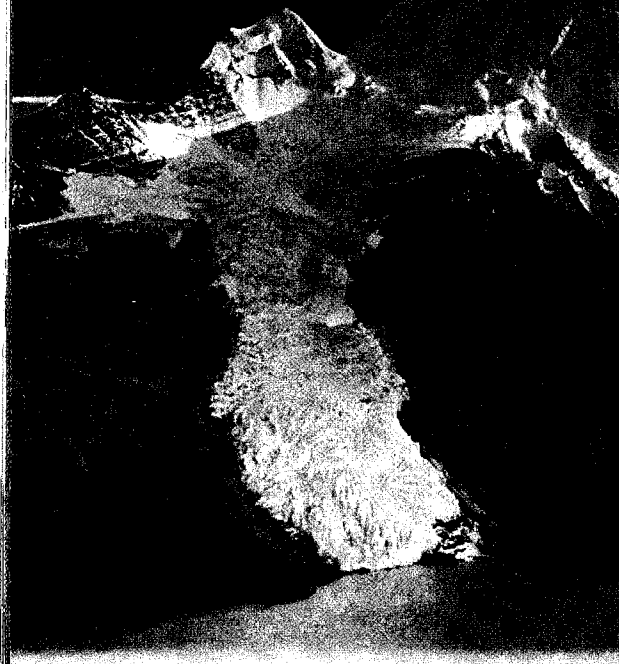
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Do the Inquiry Warm-Up  
How Do Glaciers Change the Land?



**Valley Glaciers** A valley glacier is a long, narrow glacier that forms when snow and ice build up high in a mountain valley. The sides of mountains keep these glaciers from spreading out in all directions. Instead, they usually move down valleys that have already been cut by rivers. Valley glaciers are found on many high mountains. Although they are much smaller than continental glaciers, valley glaciers can be tens of kilometers long.

High in mountain valleys, temperatures rarely rise above freezing. Snow builds up year after year. The weight of more and more snow compacts the snow at the bottom into ice.

**Gravity constantly pulls a glacier downhill.** Once the layer of snow and ice is more than about 30 to 40 meters deep, the glacier begins to move.

Valley glaciers flow at a rate of a few centimeters to a few meters per day. But a valley glacier that surges, or slides quickly, can move as much as 6 kilometers in a year.

## apply it!

When glaciers recede, they leave behind evidence of their existence.

**1 Observe** What was the landscape like before glaciers formed?

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**2 Draw Conclusions** What did the glaciers do to the area?

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Before glaciers form

After glaciers have melted

**Lab zone** Do the Quick Lab *Surging Glaciers.*

## Assess Your Understanding

got it? .....

I get it! Now I know that glaciers differ in how they move: \_\_\_\_\_

I need extra help with \_\_\_\_\_

## How Do Glaciers Cause Erosion and Deposition?

The movement of a glacier changes the land beneath it.

Although glaciers work slowly, they are a major force of erosion.

**The two processes by which glaciers erode the land are plucking and abrasion.**

**Glacial Erosion** As a glacier flows over the land, it picks up rocks in a process called **plucking**. Beneath a glacier, the weight of the ice can break rocks apart. These rock fragments freeze to the bottom of the glacier. When the glacier moves, it carries the rocks with it, as shown in **Figure 2**. Plucking can move huge boulders.

Many rocks remain on the bottom of the glacier, and the glacier drags them across the land. This process, called abrasion, gouges and scratches the bedrock.

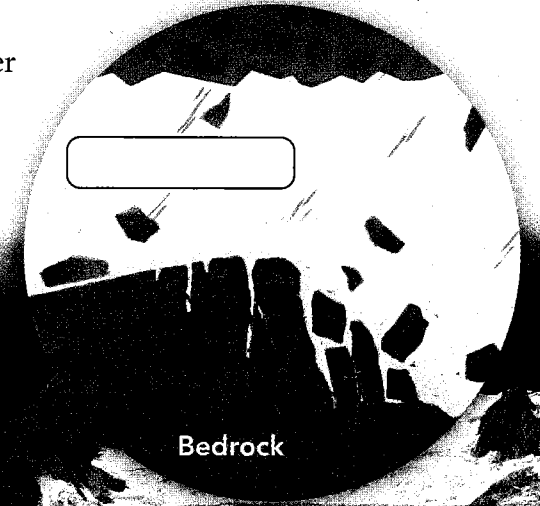


FIGURE 2 .....  
**Glacial Erosion**

After you read about glaciers, do the activity.

**1. Identify** Draw an arrow in the diagram above to show the direction the ice is moving.

**2. Explain** In your own words, describe the glacial erosion taking place in the diagram.

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**Relate Cause and Effect** As you read, underline the cause of glacial deposition and circle the effects.

**Glacial Deposition** A glacier gathers a huge amount of rock and soil as it erodes the land in its path. **When a glacier melts, it deposits the sediment it eroded from the land, creating various landforms.** These landforms remain for thousands of years after the glacier has melted. The mixture of sediments that a glacier deposits directly on the surface is called **till**. Till is made up of particles of many different sizes. Clay, silt, sand, gravel, and boulders can all be found in till.

The till deposited at the edges of a glacier forms a ridge called a **moraine**. A terminal moraine is the ridge of till at the farthest point reached by a glacier. Part of Long Island in New York is a terminal moraine from the continental glaciers of the last ice age.

Retreating glaciers also create features called kettles. A **kettle** is a small depression that forms when a chunk of ice is left in glacial till. When the ice melts, the kettle remains. The continental glacier of the last ice age left behind many kettles. Kettles often fill with water, forming small ponds or lakes called kettle lakes. Such lakes are common in areas such as Wisconsin, that were once covered with ice.

Glaciers have shaped the land in Glacier National Park, Montana.

Features of Erosion

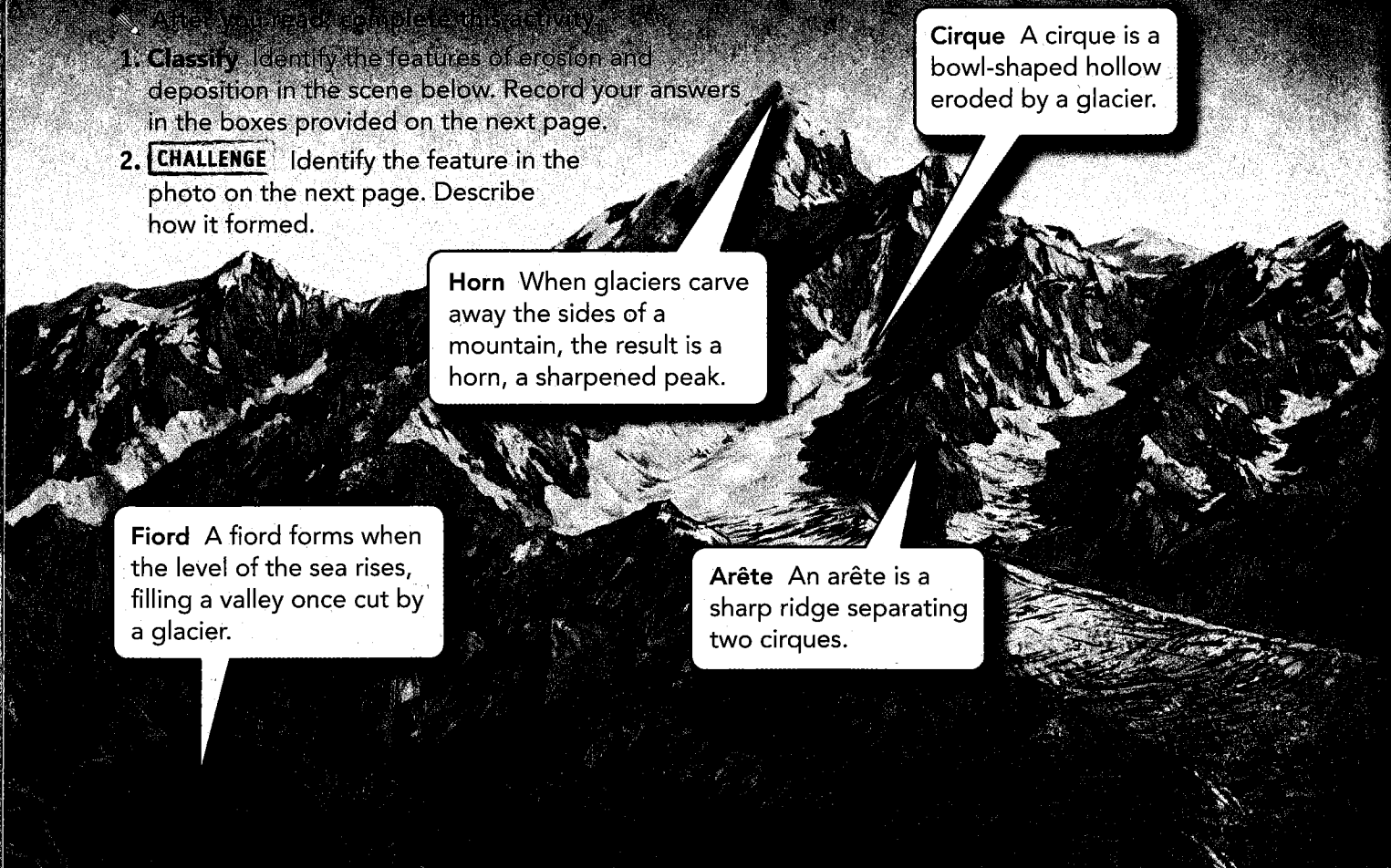

Features of Deposition


Photo Feature


**ART IN MOTION**

After you read, complete this activity.

- Classify** Identify the features of erosion and deposition in the scene below. Record your answers in the boxes provided on the next page.
- CHALLENGE** Identify the feature in the photo on the next page. Describe how it formed.



**Horn** When glaciers carve away the sides of a mountain, the result is a horn, a sharpened peak.

**Cirque** A cirque is a bowl-shaped hollow eroded by a glacier.

**Arête** An arête is a sharp ridge separating two cirques.

**Fiord** A fiord forms when the level of the sea rises, filling a valley once cut by a glacier.

**Glacial Lake** Glaciers may leave behind large lakes in long basins.

**U-Shaped Valley** A flowing glacier scoops out a U-shaped valley.

**Moraine** A moraine forms where a glacier deposits a mound or a ridge.

**Drumlin** A drumlin is a long mound of till that is smoothed in the direction of the glacier's flow.

**Kettle Lake** A kettle lake forms when a depression left in till by melting ice fills with water.

**Lab zone** Do the Quick Lab Modeling Valleys.

**Assess Your Understanding**

- Review** How do glaciers erode by abrasion?  
 \_\_\_\_\_  
 \_\_\_\_\_
- Describe** How does a moraine form?  
 \_\_\_\_\_  
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**got it?** .....

I get it! Now I know that glaciers shape the landscape through the processes of .....

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I need extra help with .....

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