

# 2.9

## GLACIER DYNAMICS

### How do glaciers change Earth's landscape?

Activity Time: 45 minutes

#### Background

They change/erode the Earth, not by pushing rocks, but by two mechanisms: plucking and abrasion. Plucking is when a glacier pulls pieces of rock from the land under the frozen ice. This occurs when glaciers melt at the bedrock and the water seeps into the cracks of the rock and freezes. It then expands and breaks off pieces of rock which are then contained in the frozen ice of the glacier. As glaciers move, the plucked rocks shift with the ice. This melting and refreezing can occur many times so rocks are dropped and moved again with refreezing. The larger deposited rocks are called glacial erratics. Glaciers also change landscape by sanding rocks that are attached to the base of a glacier's bedrock. Scraping is evident in grooves on rock surfaces called glacial striations; the sand and silt left behind is called till. In this lesson, students will make a model of a glacier and discover how a glacier moves rocks and soil.

#### Directions

1. Show students a picture of a glacier with deposited rocks (moraine):  
[http://upload.wikimedia.org/wikipedia/commons/thumb/8/86/Moraines\\_Surlej.jpg/800px-Moraines\\_Surlej.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/8/86/Moraines_Surlej.jpg/800px-Moraines_Surlej.jpg)  
and a large rock (erratic) deposited by a glacier:  
<http://www.physicalgeography.net/fundamentals/images/lmg0036.jpg>
2. Make a glacier model
  1. Place a layer of dirt 1 inch thick in the container.
  2. Add some pebbles and small rocks (the bedrock).
  3. Pour enough water on top so that the top layer is saturated and there is some pooling (melted glacial ice).
  4. Place 6 ice cubes (unmelted glacier) on top of this mixture.
  5. Put the container in the freezer overnight.
  6. Ask students to choose and write one of these answers to "How do glaciers change landscapes?"
    - Glaciers change landscapes by pushing rocks as they move.
    - Glaciers change landscapes by picking up rocks as they move. (BEST ANSWER)
    - Glaciers change landscapes by pushing and picking up rocks as they move.
  7. Remove the frozen glacier from the foil pan and place it on the "roller" end of the paint tray.
  8. Put a book under the "roller" end so that the tray slants and catch the remains in the "paint" end.
  9. Wait for the ice to melt to see the results.

#### Discussion

- What do each of the materials represent in your glacier model?
- What will happen to the soil, rocks and ice cubes when the water freezes?
- Which of these materials will be frozen in the block of ice: rocks, soil, or ice cubes?
- What will happen when we put the frozen block (glacier model) on the paint tray to melt?
- Draw a diagram of the location of the soil, rocks and ice after the ice block (glacier model) melts.
- How do glaciers change landscapes? (picking up rocks as they move) Show students 2.9 diagrams and animation. (For animation, see Extension)

#### Assessment

**EXIT Ticket:** How do glaciers move rocks and soil?

#### Extension

<https://www.cresis.ku.edu/education/glaciers-in-motion>

#### Materials

*Per Team:*

- 8 x 8 foil pan
- Dirt (enough for 1 inch in foil pan)
- Pebbles
- Small rocks
- Water
- 6 ice cubes
- Paint tray
- 1 book

#### Vocabulary

**Glacial Erratic:** a piece of rock that is different from the size and type of rocks in the area.

#### ALIGNMENT TO NGSS:

*Scientific and Engineering Practices*

- Asking questions
- Using models
- Planning and carrying out investigations
- Constructing explanations
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

*Crosscutting Concepts*

- Cause and effect
- Systems and models
- Stability and change

*Disciplinary Core Ideas*

- K-5: ESS1.C; ESS2A; ESS2.C
- 6-8: ESS1.C; ESS2A; ESS2.C