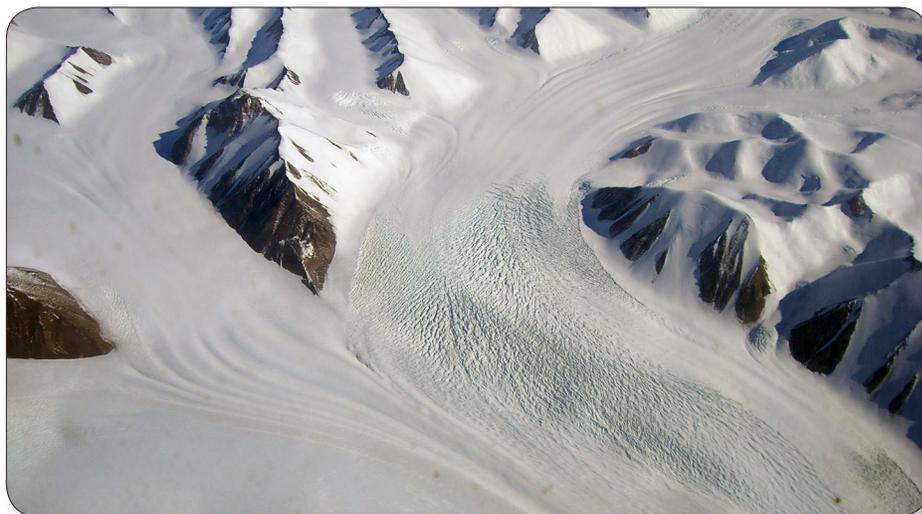


Build a Model Glacier

Preview

Imagine what would happen if more snow fell every winter than could melt away in the summer. During the first storm of each winter, fresh new snow would land on top of the previous year's dirty old snow. More new snow would be added to the top of the pile with each storm. During summers, the surface would get darker from dust and experience some melting. After a century or more of adding such layers, the pile of snow would grow quite thick. The darker summer surfaces would form layers on the top of each winter's snow.

Layers of snow near the bottom of the pile would eventually get compressed by the weight above them. Individual snowflakes would be squeezed together so tightly that they'd merge together into solid ice. When the snow-turned-to-ice begins to flow downhill under the force of gravity, a **glacier** has formed.



Glacier-filled valleys in Antarctica. Photo by Michael Rynbrandt, National Science Foundation

At the bottom of the glacier

Even when a pile of snow gets larger every year, some of the snow melts during the warmer months. Liquid water trickles down to the land below the snow. When this water refreezes, it expands, and rocks from the land's surface get frozen into the bottom of the glacier. As the glacier moves downhill, it carries these rocks with it, and the rocks and ice grind over the land.

Time

⌚ 45 minutes

Tools & Materials

- ✦ Disposable paper or styrofoam bowls
- ✦ Mixture of gravel, sand, and silt-sized sediments (2-3 cups)
- ✦ Pepper
- ✦ Clear plastic wrap
- ✦ Corrugated cardboard (3-4 pieces, each 18" x 10")
- ✦ Clear packaging tape
- ✦ Scissors
- + Snow, shaved ice, or crushed ice.
- + Ice chest or cooler for storing ice
- + Freezer
- + Large sheets of poster board or construction paper
- + Towels (for cleanup)

📖 Items found in this book

- ✦ Items included in the Flexhibit Kit, available from <http://www.andrill.org/flexhibit>.
- + Additional items

Prepare

The Preview section tells how real glaciers form. While you're building your model glacier, refer to that description and discuss which part of a real glacier you are modeling in each step.

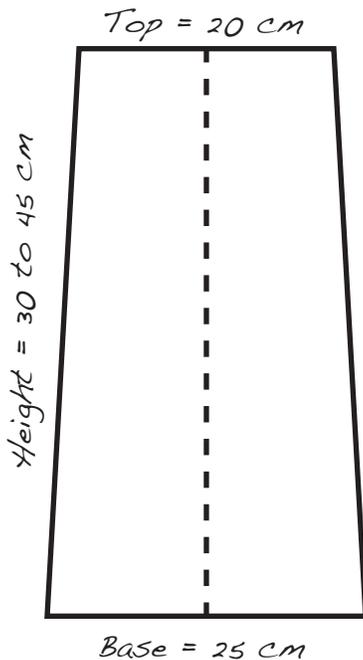
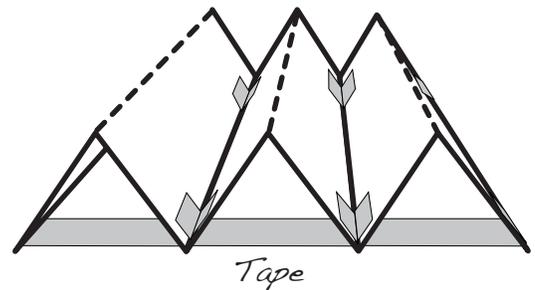


1. Pour a spoonful of mixed sediments into the bowl. Add three spoonfuls of snow, shaved ice, or crushed ice plus a tablespoon of water. Stir the mixture and flatten it into the bottom of the bowl.
2. Add 2-3 spoons of ice on top of your first layer and flatten it again. Press the surface for a while so the warmth of your hand causes a little melting. Add a very light dusting of pepper.
3. Repeat step 2, adding thin layers of ice until your glacier fills the bowl.

An Optional Extension: Make some mountains and grow an ice sheet

If snow continues to accumulate, a glacier can get so thick that it fills its entire valley. Individual glaciers can grow so large that they overflow their valleys and cover the mountains between them. When glaciers merge with other glaciers to form a blanket of ice over a huge area of land, an **ice sheet** has formed.

1. Use the dimensions at left to cut three trapezoids of cardboard. Fold along the center line and use tape across the open side to hold the cardboard in a triangular prism. These are your model mountains.
2. Wrap the individual mountains in plastic wrap, then line them up parallel to one another. Use tape across the bottom to connect them, forming a model landscape of three mountain ranges with two long valleys.



3. Place two or three model glaciers in a line in each of your valleys.
4. Use your imagination to consider how the valley glaciers could continue growing to form an ice sheet.
5. When you are ready to demonstrate how an ice sheet forms, you'll pack crushed ice around the model glaciers and add more layers of ice over your model landscape. You'll keep adding "snow" until the valleys fill up and cover the mountains.
6. Cover all the model glaciers with plastic wrap and store them in a freezer so they are ready to use at your Flexhibit.

Ponder. . .

Tree rings offer one way of studying past climates. From spring through fall, a ring of light-colored wood grows around the outside of a tree trunk, just under the bark. When winter comes, a layer of darker wood grows. During years when trees have plenty of water for growing, they produce more of the light wood than they do during dry years.

Consider how annual layers of snow are similar to and different from tree rings. What do you think you could find out by studying snow layers and tree rings?



Photo © Henri D. Grissino-Mayer,
The University of Tennessee

Practice

Got the Big Idea?

In places where more snow falls than can melt each year, layers of snow build up and glaciers form. Glaciers show annual layers that are similar to tree rings. If glaciers keep growing, they can merge together to form an ice sheet.

Plan your presentation

Consider how you can set up this station so that your visitors will have a chance to interact with ice. You can invite visitors to add a layer of snow or ice on the top of model glaciers, or they can add ice to show the formation of an ice sheet in your model landscape. Explain that the model shows how Antarctica became the icy continent it is today, one snowstorm at a time.

Special preparations for this station

At your Flexhibit, this station needs to be set up in a way that you can keep the water produced by melting ice from getting everywhere. You might place the downhill edge of your model landscape on a tray, or place the whole model inside a shallow plastic bin. Plan to have several sponges or towels on hand to soak up melting ice.

This station also requires a considerable supply of crushed ice. Athletic departments at high schools or school cafeterias may be places where you can fill a large cooler full of ice for your Flexhibit event. Consider how long your Flexhibit will last and how fast the ice will melt to figure out how much ice you'll need for the whole event.

Present

As visitors add ice to your models, ask them to imagine that it is winter and lots of snow is falling. Afterwards, encourage them to "make summer happen" by warming the ice surface with their hands. Be ready to explain that solid glaciers move downhill without melting, though your model does have solid ice turning to liquid. Share the fact that the same process that builds glaciers (accumulating snow) on a local scale results in formation of an ice sheet on a larger scale.