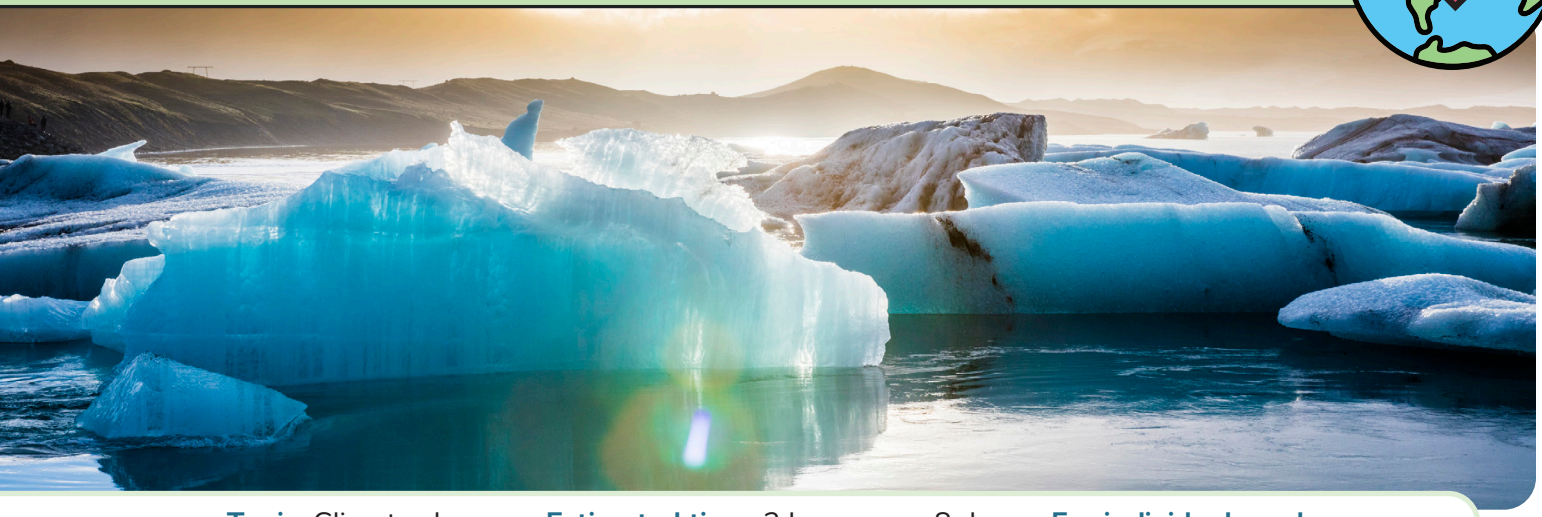
CFAES
COLLEGE *of* FOOD, AGRICULTURAL, *and* ENVIRONMENTAL SCIENCES

4-H Earth Is Our Home Activity



Topic: Climate change • **Estimated time:** 2 hours over 8 days • **For individuals and groups.**

Ice Cores

A Layer Cake of Snow

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You probably already know about tree rings, the layers of wood created each year a tree grows. They are visible in tree stumps and logs. The thickness of each ring is determined by the environmental conditions the year it was formed.

How does this relate to Earth's poles? A new layer of snow falls in the Arctic and Antarctica every year, with the newest snow being on top. The weight of the added snow each year eventually changes the layers below to ice. Like tree rings, these ice layers reveal the environmental conditions the year each layer was formed.

Learning Outcomes
Project skill: Understanding how scientists learn about Earth's poles • **Life skill:** Understanding systems
Educational standard: NGSS 3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. • **Success indicator:** Makes a model of an ice core

The Ohio State University Extension

ohio4h.org

Supplies

- 1 tube-shaped, waterproof container that can be torn apart, like a Pringles can, rinsed and dried
- liquid measuring cup
- about one quart of cold water
- about one quart of cold water with instant coffee added
- small amounts of gravel, dirt, sand, or dust
- plastic insect or small plant leaf
- blank sheet of paper
- pencil or pen
- rimmed cookie sheet or paint tray
- scissors
- ruler

What to Do

Ice cores are cylinders of ice pulled from ice sheets and **glaciers**. They show the horizontal layers of ice that have formed over time, sometimes over long periods. Make your own ice core to show the kinds of things scientists learn by studying them.

Make the Ice Core

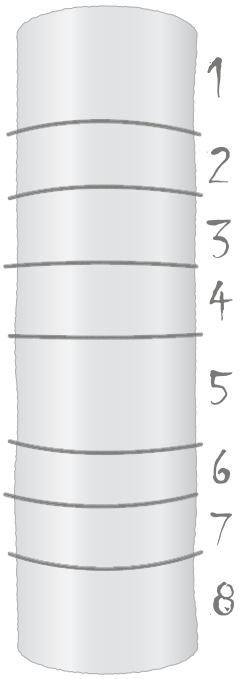
1. Pour the layers in the container, one at a time, following the layer descriptions in the chart below. You are creating an ice core with eight layers, or eight years, of evidence. Start with the oldest layer, which is at the bottom of the table and will be at the bottom of your container.
2. Allow each layer to completely freeze before adding the next one. This usually takes from 12 to 24 hours. Keep track of exactly what is in each layer and when it is poured.
3. After you add the last (top) layer, allow it to freeze. When the core is fully frozen, remove the container by cutting the top with scissors and tearing the cardboard away from the ice. Lay your unwrapped ice core on its side on the cookie sheet or paint tray.

Start here!

Ice Core Layer Descriptions	
Layer	**Material Used to Create**
1	1/2 cup water
2	1/4 cup water with dissolved instant coffee and a plastic insect or leaf
3	½ cup water
4	½ cup water
5	1/2 cup water and a teaspoon of gravel dirt, sand, or dust
6	1/4 cup water with dissolved instant coffee and a teaspoon of gravel, dirt, sand or dust
7	1/4 cup water with dissolved instant coffee
8	½ cup water

Having trouble with your ice core? This video may help! **vimeo.com/125214592**

Examine the Ice Core



1. Use the drawing on page 5 to describe your ice core. Draw and number the layers, starting with 1 at the top for the most recent layer. Use colors and labels to highlight special features, like insects, leaves, dirt, etc.
2. Closely observe each layer of ice. Imagine what each layer, if it were real, says about the history of the glacier. Here are some things to think about:
    - The thickness of the layer represents the amount of snow that year. Use the ruler to check for differences.
    - Brown layers indicate there was a lot of dust in the air and the climate was dry. A thin layer of ice that is brown is a good indication of a drought.
    - Gravel material can indicate a volcanic eruption. How many volcanic eruptions are recorded in your ice core? Label them in your drawing.
3. Use the space next to each layer to record your observations and conclusions.

Finally, on a separate piece of paper, write at least four general observations of your ice core. To get started, use your senses. No tasting, but what do you see, hear, feel, and smell?

More Challenges

Explore the polar regions right from your home. Visit **virtualice.byrd.osu.edu** to view several different expeditions. Share your favorite with your project helper.

Talking It Over

Write your answers to these questions on a separate piece of paper and talk about them with your project helper or another caring adult.

SHARE How many years are represented in your ice core. Explain.

REFLECT When you made the ice core, you used coffee to show dust that was in air and gravel to show a volcanic eruption. What other materials could you use, and what would they show?

GENERALIZE What can ice cores tell us about the past?

APPLY What can you do to educate others about the role of Earth's ice on humans?

Background

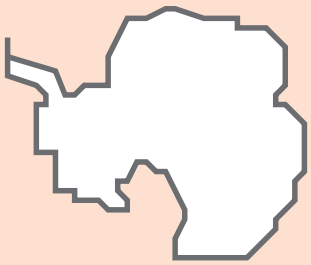
When snow falls, it brings with it anything in the atmosphere at that time. Layers of snow and ice, therefore, contain more than just water. They can contain particles from forest fires and volcanoes, pollen, dust picked up by wind blowing over dry regions, bubbles of gases from the atmosphere, and **chemical tracers**. These materials in ice are rarely visible to the human eye. Scientists need special tools to observe and analyze them.

We learn about the past environment not only from the particles in the layers, but also from the layers' thickness and color. A thick layer means the glacier received a great deal of snow that year. A thin layer means the glacier received little snow. Thin layers also tend to be brown, because during a dry period, the air contains more dust, especially if it was windy.

The layers of a glacier typically are visible in crevasses, the places where the glacier breaks. **Crevasses**, however, do not allow scientists to see the layers very clearly. To see more clearly, scientists have created equipment that allows them to drill ice cores through the entire thickness of the glacier.

Did you know?

The average thickness of the ice on Antarctica is over a mile!



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Career Connection

Climatologists are scientists who study the Earth's atmosphere and climate. They collect and analyze data from sources such as ice, soil, water, air, and even plant life. They use the data to find patterns in weather and to learn how those patterns affect the Earth and its inhabitants. To be a climatologist, plan to go to college to study environmental science, atmospheric science, geology, and geography.

Vocabulary Words:

chemical tracers. An element that moves with water and that can be detected in the atmosphere, in surface waters, and in the subsurface.

climatologist. Someone who studies Earth's atmosphere and climate.

crevasse. A deep open crack, especially one on a glacier.

ice core. A cylinder of ice typically extracted vertically from an ice sheet or mountain glacier.

glacier. A slowly moving mass or river of ice formed by the accumulation and compaction of snow on mountains or near the poles.

Learn More!

NASA's Jet Propulsion Laboratory introduces ice cores on this page: **climate.nasa.gov/news/2616/core-questions-an-introduction- to-ice-cores**.

Sources

Byrd Polar and Climate Research Center. "Create Classroom Ice Cores." 2021. byrd.osu.edu/create-classroom-ice-cores

This activity appears in Exploring Polar Science, an Ohio 4-H project book available at **extensionpubs.osu.edu**.