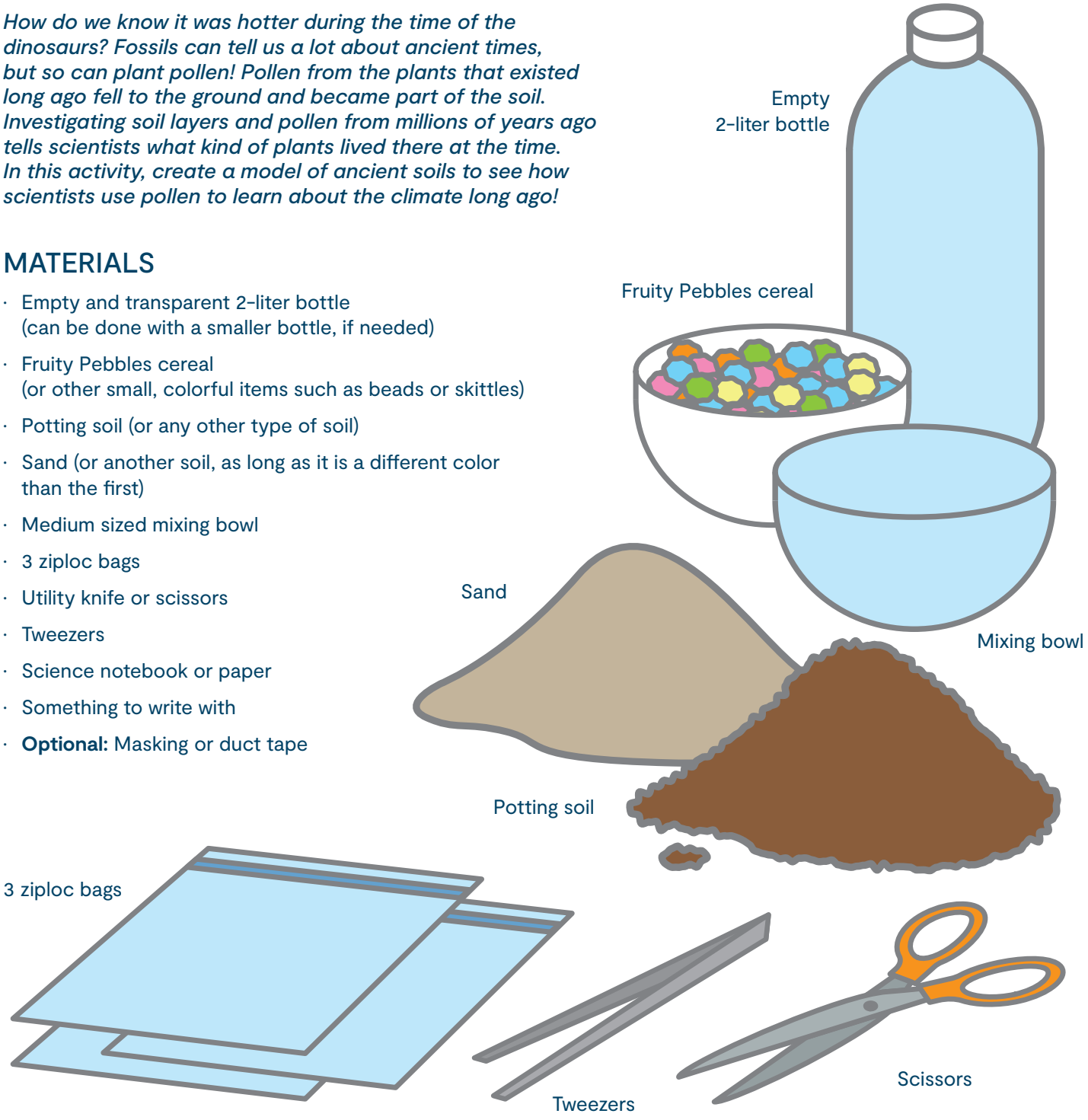
CURIOSITY AT HOME

POLLEN FOR BREAKFAST

How do we know it was hotter during the time of the dinosaurs? Fossils can tell us a lot about ancient times, but so can plant pollen! Pollen from the plants that existed long ago fell to the ground and became part of the soil. Investigating soil layers and pollen from millions of years ago tells scientists what kind of plants lived there at the time. In this activity, create a model of ancient soils to see how scientists use pollen to learn about the climate long ago!

MATERIALS

- Empty and transparent 2-liter bottle (can be done with a smaller bottle, if needed)
- Fruity Pebbles cereal (or other small, colorful items such as beads or skittles)
- Potting soil (or any other type of soil)
- Sand (or another soil, as long as it is a different color than the first)
- Medium sized mixing bowl
- 3 ziploc bags
- Utility knife or scissors
- Tweezers
- Science notebook or paper
- Something to write with
- **Optional:** Masking or duct tape



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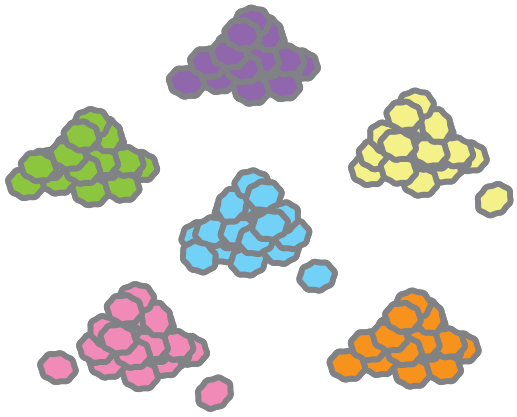
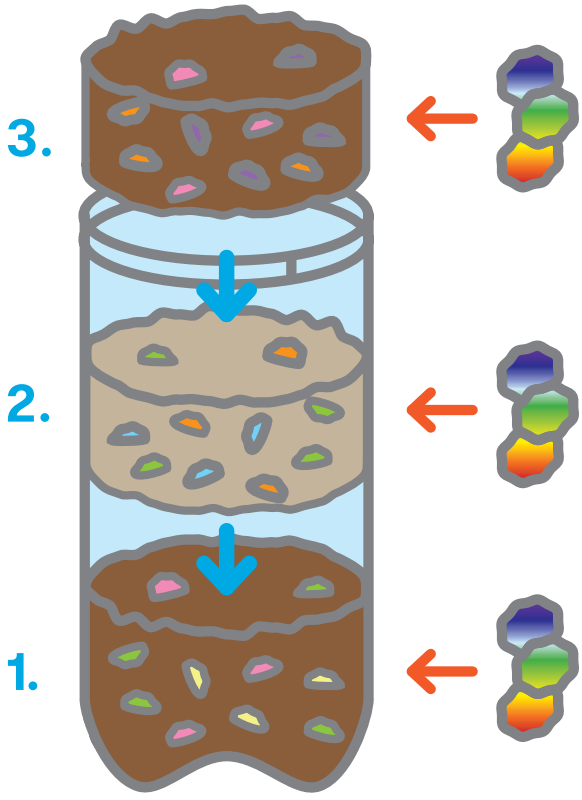
PROCEDURE

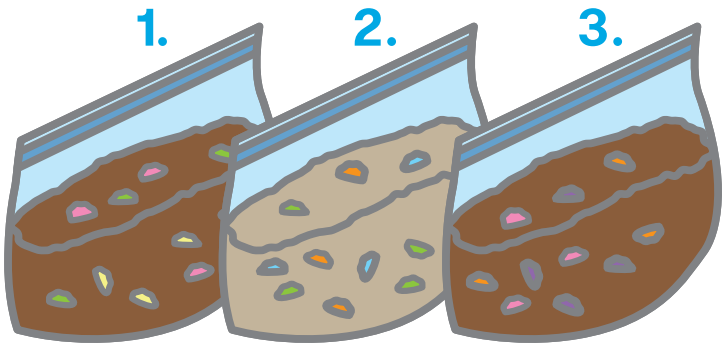
- Using about half a box of cereal, separate the fruity pebbles by color. These pebbles will represent pollen spores that have fallen into our soil. Normally, pollen is much, much smaller than our cereal, but today we are using the large cereal as a representation in our model. The different colors represent pollen from different plants.
- Remove the label from 2-liter bottle. Cut the top off the bottle using scissors (or a utility knife with adult supervision). This can leave a sharp edge. It is recommended to cover the edge with tape.



CREATE THE LAYERS OF SOIL:

- Randomly choose 3 colors of fruity pebbles to mix into your soil layer.
- Combine about 3 cups of soil with about 1 cup of pebbles (a mix of the 3 chosen colors) in the mixing bowl.
- Pour 3 cups of the mixture into the bottle. Press down on the sample and make sure you can see some cereal pieces from the outside.
- Place the rest of the soil/pollen mixture into a Ziploc bag. Label the bag as Layer 1.
- Repeat this same procedure to create a layer with sand (label Ziploc bag Layer 2) and a second layer of soil (layer Ziploc bag Layer 3). Each time select three random colors of pebbles to include in the mixture. In the bottle, the sand layer should separate the two soil layers.





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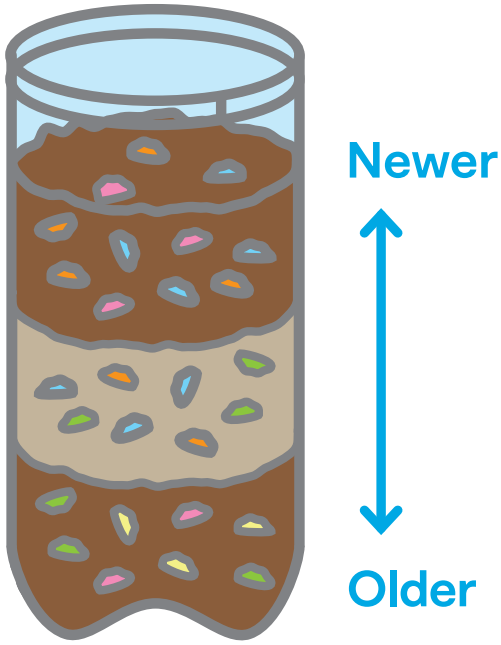
PROCEDURE *continued...*

We now have a cross section, or vertical sample, of soil with each layer representing a different time period. The oldest layer is on the bottom and the newest layer is on the top, with each layer also containing a record of the pollen that fell in the soil during that time period. Each color pollen came from a different plant, which helps us understand how many and what types of plants existed during the time period that each layer was deposited.



- Observe the outside of the bottle. What colors do you see in each layer? Is there a difference in colors between the layers?
- Look back at your 3 ziploc bags labeled Layer 1, Layer 2 and Layer 3. Each bag is a sample of each layer of soil that you can further investigate without disturbing the cross section in the bottle.
- Using tweezers, carefully remove every piece of cereal from the Layer 1 bag. Count each color of cereal you find for each layer and record the numbers in the table below. Some colors will have 0 pieces. You can also copy this table into your science notebook to record your findings.
- Repeat this process for the Layer 2 bag and the Layer 3 bag.

	Layer 1	Layer 2	Layer 3
# of Purple Pollen			
# of Red Pollen			
# of Orange Pollen			
# of Yellow Pollen			
# of Green Pollen			
# of Blue Pollen			

Experiment continued on next page...

CURIOSITY AT HOME

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PROCEDURE *continued...*

- What color pollen did you find in each layer of soil? For each layer, which color had the most pollen pieces?
- Each color represents the pollen of a different plant. See the table below for a key of which color represents which plant. This table is based off of plants found in the Pacific Northwest region now and in the past.
- Using the table below, what plants dominated the area of your soil sample at the time period of each layer? These dominant plants can give us the best guess of what the climate was like at the time. In each of your layers, was the climate warm, cool or cold? Wet or dry?
- The climate of the Pacific Northwest region right now is wet and cool. Do you think it has always been wet and cool? How might the climate have changed over time?

Cereal Color	Plant Species	Climate Characteristics
Purple	Alpine Sagebrush	Woody, low-growing shrub related to the sagebrush of eastern Washington and Oregon. Found only at high-altitude, cold sites.
Red	Western Red Cedar	Found only in temperate, very moist climates.
Orange	Alder	Widespread throughout the Pacific Northwest, often colonizing gravel bars or other poor soils, prefers abundant water and can grow in cool climates.
Yellow	Oak	Found in warm - temperate sites characterized by dry, warm summers such as can be found from Oregon's Willamette Valley south into California.
Green	Grasses	These grasses are typically found in very cool alpine/subalpine meadow sites characterized by very cool summers, harsh winters, and short growing seasons.
Blue	Douglas Fir	Broadly distributed throughout the Pacific Northwest from moderately cool to warm sites. Grows best under temperate, somewhat moist conditions.

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TRY THIS

Scientists obtain real cross sections of soil from sediment cores. Want to collect your own? Cut the top off a transparent ½ liter bottle. Find an outdoor spot with some exposed soil. Drive the bottle into the ground and twist. Keep twisting until the soil separates and the bottle is at least half way submerged underground. Pull the bottle out of the ground slowly, being sure to keep the soil contained. Examine the sides. You have a real-life soil core!

DID YOU KNOW

Evidence found in the fossil record indicates that in the distant past, the earth's climate was very different than it is today. Since these changes are important to understanding potential future climate change, scientists have developed methods to study the climate of the recent past.

Paleoclimatologists (scientists who study ancient climates) can use pollen and fossil records to identify the kinds of plants that grew in a given area during different time periods. Because plants are generally distributed across the landscape based on temperature and precipitation patterns, plant communities change as these climatic factors change. By knowing the conditions that plants preferred, scientists can make general conclusions about the past climate of that region. For example, they can infer that a sediment layer with large amounts of western red cedar pollen was deposited during a cool, wet climatic period, because those are the conditions most conducive to the growth of that species.

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K–2 GRADE EXPLORATION

Plants create pollen every year. Many types of pollen are very hard to see because they are very, very small. Some plants create larger pollen.

- How many types of plants do you have in your neighborhood?
- Place double-sided tape all over a piece of black construction paper. On a spring or summer day, place the paper close to plants. This works best on a day with wind. Wait awhile. What collected on the paper?
- How many different types of pollen do you see? Are there more of one type or another?

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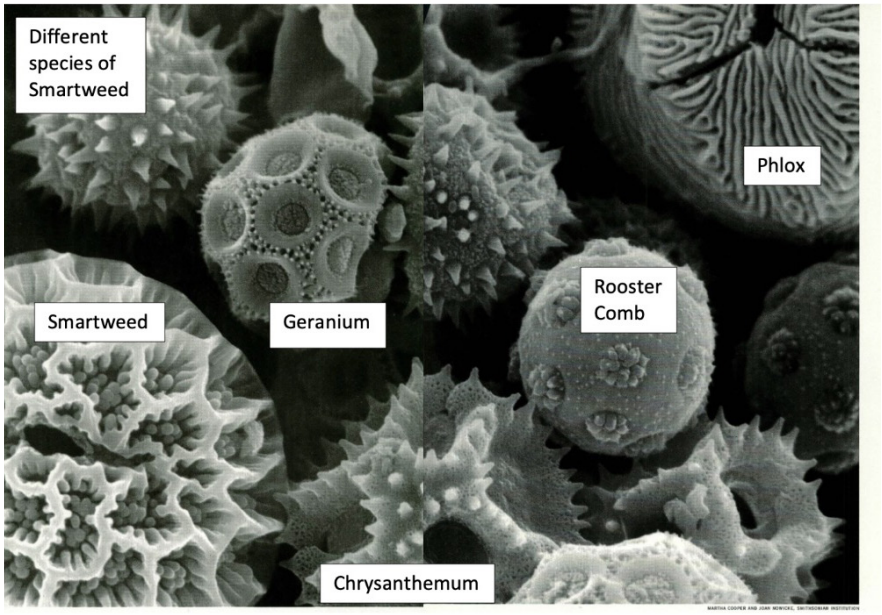
3–5 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Pollen is microscopic. Using a scanning electron microscope, scientists can create pictures like the one below. How do they identify different pollens? The picture below, from the October 1984 National Geographic, is labeled with the family type of several pollens.
- Try researching the plant pollens we modelled today. What family do they belong to? Draw a picture like the one below of what your pollen assemblage might look like under a microscope.
- Why do you think there is so much variety in the appearance of the pollens?



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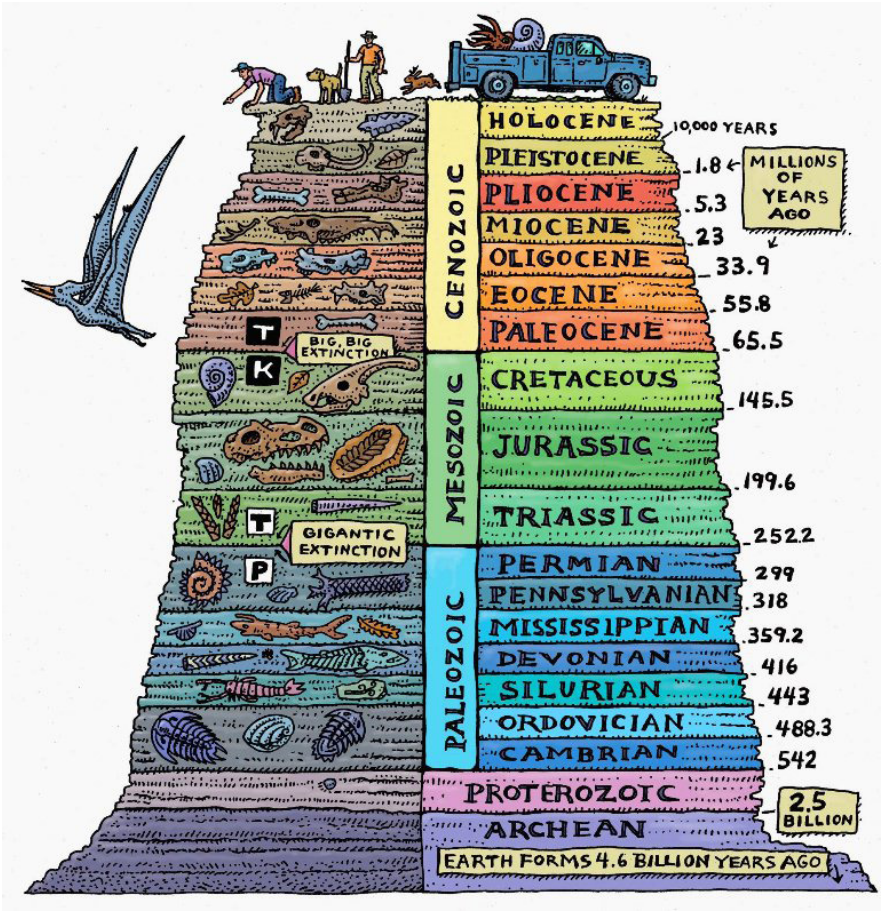
6–8 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Each of our layers had different climate conditions. Did your layers transition from cool weather to dry? Dry to wet? What natural phenomenon could change the climate long enough for our pollen to be deposited?
- Try writing your ideas into a geologic history of your cross section. This can be in words or pictures.
  - What changes occurred in your cross section? How did the climate shift? What would it have been like to live through one of these transitions?
  - What other plants or animals live in the climate conditions of each layer? What would the ecosystem of the area have looked like?
  - Consider the thickness of your layers. The thicker the layer, the longer those climate conditions existed. Which layer was the thickest in your model?
- What other information would you like to have to make your history more complete? What kind of evidence would you need in order to obtain the missing information?



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