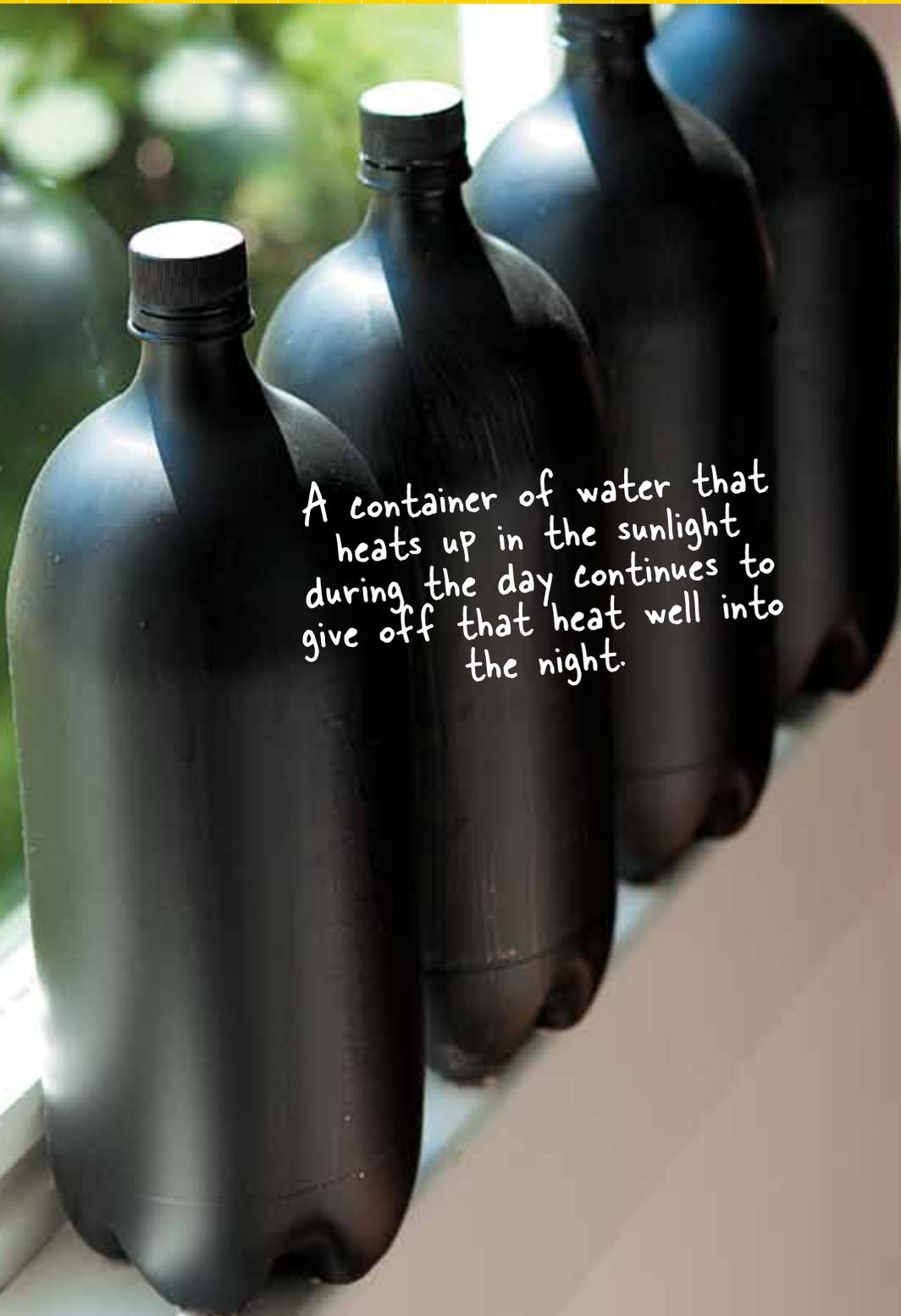


ACTIVITY

SOLAR HEAT BY THE GALLON

Four black plastic jugs are lined up on a windowsill. The jugs are positioned in a row, receding into the background. The background shows a window with a view of green foliage outside. The lighting is bright, suggesting sunlight is hitting the scene.

A container of water that heats up in the sunlight during the day continues to give off that heat well into the night.

SOLAR HEAT BY THE GALLON ISN'T VERY DIFFICULT TO MAKE. FOLLOW THESE STEPS TO CREATE YOUR OWN SMALL PASSIVE-CAPTURE SOLAR HEATER.

WHAT YOU WILL NEED

- * Dish soap
- * Four (or more) 2-liter beverage bottles with screw-on lids
- * Dish drainer
- * Drop cloth
- * Paintbrush
- * Can of flat black interior latex paint (any flat, dark color will do)
- * Clean, 1-liter container of water for cleaning paint brushes
- * Water for filling bottles

! SAFETY FIRST !

Use only water-based latex paint. Spray paints are toxic if inhaled and they often contain chemicals made from petroleum. Do your painting outside in a well-ventilated space.

DO THE DEED

1 Use the dish soap to thoroughly clean all the plastic beverage bottles. Save the caps. Remove labels from the outside of the bottles and wash the outside well so the surface is clean and paint will stick to it. Rinse the inside of each container well and put it upside down in the dish drainer to dry.

2 Once the beverage containers are dry, place them on the drop cloth and paint with flat black paint. It is best to do this outside or in an open garage or other well-ventilated space.

3 Use the container of water for cleaning the paint brush, then set the brush aside to dry.

4 Once the paint is dry, fill each bottle with water. Put the caps on snugly, leaving about 1 inch (2.5 cm) of air on top to allow space for the water to expand as it warms up. Be sure not to crush or bend the containers while handling them or the paint might crack off.

5 Place the black jugs full of water on the top of a bookshelf in a sunny window or on a windowsill to create a simple solar heat collector.

THE BIGGER PICTURE

Now that you have your own personal heater, you can experiment with ways to get the most output and be even more efficient.

THINK ABOUT IT

- ② Add more shelves and “Solar Heat by the Gallon” jugs to your homemade heat collector to increase its storage capacity.
- ② Experiment by placing other kinds of dark-colored containers full of water in the Sun to see which one holds the heat longest once the Sun goes down. Try using containers made from glass, ceramic, metal, and thicker plastic. Which kind of container works best? Why?

THINK HARDER

- ② On a sunny day: Open one of the bottles of water in the morning and immerse a cooking thermometer or a science-class dial thermometer inside it. If the bottle is taller than the thermometer, you may need to tie a string around the top of the thermometer.

Now make a graph showing the temperature along the left-hand side and the time along the bottom. Read the thermometer every half hour, capping the container after each reading. Use a dot to record the temperature at each half-hour time mark. Once the Sun goes down, observe how the temperature rose and fell during the day. When was the “heat of the day?” Was it exactly in the middle of the day? Why or why not?

Try this same experiment by recording and graphing the water temperature on a cloudy day. How does this temperature pattern compare with the results from the sunny day?

NOW, REALLY THINK

- ② Repeat the previous experiment using two bottles: one that sits in direct sunlight and one that rests in the shade. Using a different-colored marker for each bottle, chart the temperature of both bottles on your graph throughout the day. Compare the temperature changes that occurred in each bottle. Why do you think you got that result? Is it what you expected?

How does the temperature chart from the bottle that sat in the shade in this experiment compare with the graph you made earlier of the bottle kept exposed to the sky on a cloudy day?

