

FEEL THE HEAT

This activity directly uses the sun's thermal (heat) and radiant (light) energy to heat water. Using darker materials causes more radiant energy to be absorbed, as can be seen by the greater increase in the water's temperature.

PHOTOVOLTAICS (solar), spotlighted in the video*, converts the radiant energy into electricity so that it can be harnessed for everyday things like lighting and heating our homes and powering our cars. The sun puts out an incredible amount of energy every day! Scientists are working hard to find better ways to capture more of the energy for our use.

If you'd like to take the activity a step further and CONVERT the energy, please google "Educational Photovoltaic Activity" for a variety of kits that include the necessary semiconductor materials to enable the conversion.

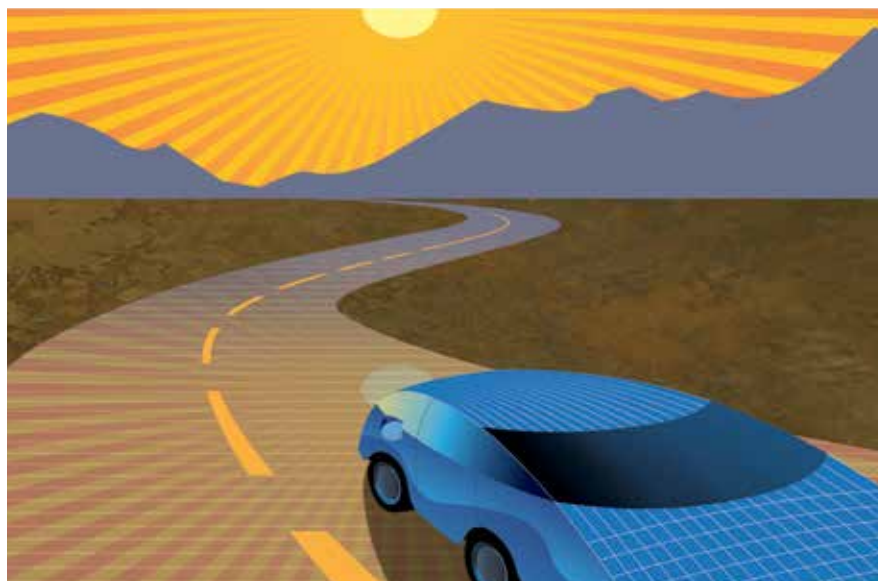
*See the video "The Awesome Capabilities of Solar Power!" at <http://www.discover.org/our-activities>

THE CHALLENGE

Design and build a solar hot water heater and see how big a temperature change you can get.

GRADE LEVEL

Grades 6-9



DISCUSSION

- What color should you make the tube and background?
- Being exposed to light is what heats water. How fast do you want water to flow through the tube?



- How can the way you zigzag the tube across the cardboard help the water in the tube absorb heat from the sun or light bulb?

MATERIALS

- Aluminum foil
- Large sheet of cardboard (11"x17")
- Gooseneck lamp with an indoor 100-watt floodlight light bulb (optional is using sunlight)
- Black marker
- Black paper
- 2 paper cups (medium size)
- 3 feet (0.9m) clear plastic tubing (Outside diameter: ¼ inch by 6mm)
- Pitcher of water
- Ruler
- Scissors
- Straws
- Duct tape
- An indoor-outdoor digital thermometer that can read tenths of a degree

BUILD/TEST/EVALUATE

- First, get water to flow through the tube. Poke a small hole near the bottom of a cup* (supply cup). Put the tube into the hole. Set a second cup under the tube's other end. Test your system with water. Seal any leaks.
- Then, build your hot water heater. Use the materials to design a system that can help the water absorb a lot of heat energy.
- Put your heater in strong sunlight or 8 inches below the lamp. (*Safety Note:* Keep water away from the outlet, lamp and bulb.)
- Measure and record the temperature of the water in the pitcher.
- Pour water from the pitcher into the *supply cup.
- Record the temperature of the water as it comes out of the lower end of the tube.

Check your students' results:

- What was the temperature change? How could you redesign your water heater to make an even bigger change?



REDESIGN

- Help the water absorb more heat – add materials above, below or around the tube.
- Slow the flow of water through the tube.
- Make your tube longer.

How will redesigning the water heater make bigger changes? Try each redesign and which had a bigger impact on heating the water?

- What other changes to your design might help heat the water?



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