

**3M****Young Scientist Lab**in partnership with: **Discovery**  
EDUCATION

# Science of Summer Family Activities

## Solar Cooking

### Overview

Did you know that the sun is the greatest source of energy on our planet? It can help plants grow, warm our beaches and bodies of water, and cook a hot dog! That's right! The sun is a great source of energy for cooking. In this activity, you will harness the mighty energy of the sun and give solar cooking a try!

### Materials

- Cardboard
- Pizza box or shoe box
- Aluminum foil
- Plastic wrap
- Black paper
- Scotch® Magic™ Tape
- Box cutter or Scotch™ Precision Cutter
- A sunny day!

### Thought Starters

Ask these questions before you begin:

- *Where does the Earth get most of its energy?*
  - *A: From the sun.*
- *What is the energy called that is sent out from the sun's light?*
  - *A: It is called solar energy.*
- *How does solar energy travel?*
  - *A: It travels in rays. Some rays we can see. Other rays we can't see. The ones we can't see are called radiant energy. When the rays reach the Earth, some bounce back to the clouds. The Earth absorbs most of the solar energy and turns it into heat. Without this heat, it would be too cold to live on the Earth.*
- *Is solar energy new?*
  - *A: No! We have been using energy from the sun for five billion years! Using solar panels to turn the sun's light directly into electricity is new, though. That technology was only invented only 50 years ago.*
- *How could we capture energy from the sun to heat our homes or cook our food?*
  - *A: One way is with a solar collector. Solar collectors capture energy from the sun and turn it into heat. A solar home uses special equipment to collect sunlight.*
- *What kind of materials do you think you would use to build a solar cooker?*
  - *A: Solar cookers can be made from many things. Materials often include aluminum foil or a mirror (light bounces off the foil or mirror into the oven); plastic wrap (so that the heat can't escape); and*

*black paper (black absorbs all colors of light, and absorbed light is turned into heat. So if you want something to warm up in sunlight, paint it black!)*

- What can I cook in a solar oven?
  - A: Anything you can cook in a normal oven--the limit is your imagination. Just remember to use a dark colored pot, and use potholders! Solar ovens get hot!

### **Activity**

- Begin by brainstorming and sketching different designs for a solar cooking device. In addition to a flat cooking surface, you will want a 3-D device to reflect the rays of the sun onto the food item. The rest of the design and engineering is up to you!
- You can make a small cooker out of a shoe box (will fit 2 hot dogs or 2 s'mores) or a large cooker out of a pizza box (to cook dinner for your whole family).
- Cut a 3-sided flap in the lid of the box and bend it open. Now cover the inside of the flap with smooth aluminum foil and fold and tape the edges on the top.
- For an oven design, you can tape a layer of plastic wrap to the sides of the cut-out portion of the box. This helps seal in the heat. For a stovetop design, leave it open.
- Experiment with the best surface to use for the base of the box. Aluminum foil? Black paper covered with plastic wrap?
- Experiment with the best angle for the lid, using sticks of different sizes to prop it up.
- Point the cooker toward the sun. Put some food inside of the cooker. Ideas include hot dogs, s'mores, or pizza!
- Watch, wait and enjoy! Try different designs and different recipes (just avoid anything with raw meat or eggs, as the oven may not get hot enough to cook them properly).

### **Discussion Points**

- Solar energy is by far the Earth's most available energy source. Solar power is capable of providing many times the total current energy demand.
- The sun radiates more energy in one second than the world has used since time began! Only a small portion of the energy radiated by the sun strikes the Earth. Yet this amount is still enormous. Enough energy strikes the U.S. every day to supply the nation's energy needs for one and a half years. Yet we are not using all of this energy!
- About 92% of the energy on the Earth comes from non-renewable energy sources like oil, natural gas, petroleum and coal. A non-renewable energy source is one that cannot be replaced. Many non-renewable energy sources are fossil fuels that were formed from the remains of plants and animals that lived millions of years ago. The downsides of using fossil fuels are that they are limited and that burning them impacts the environment negatively. Solar energy is a renewable energy source. The sun's energy will never run out and collecting solar energy has no negative impact on our environment so many scientists and engineers are trying to come up with easy ways to harness solar energy.
- We use energy from the sun in many ways. We use sunlight to see where we are going. We eat plants that grow from the sun's energy. And we eat meat and animals that eat the plants that grow from the sun's energy. Solar energy also powers our water cycle and wind cycle. Some people (maybe even you!) even use solar energy to heat their homes and cook their food.
- Even though the sun's energy is abundant, there are many reasons why we don't use the sun for all of our energy needs. At night time or rainy days, there is no sun or limited sun so we can't get energy from the sun during those times. Changing the roofs of our homes or buildings to collect solar energy can also be expensive.

- Solar electric panels are made up of something called silicon, the same thing that makes up sand. There is more silicon on the planet than almost anything else. Even though you can find silicon almost everywhere, making a solar panel is difficult and expensive.
- One of the many cool things about solar ovens is that they don't need electricity, gas, or wood to work--they cook food using only sunlight! Basically, you put food in a box and trap the sun's heat by covering the box with glass or plastic. Solar cookers are great because they save money and energy, and produce no pollution. People don't have to cut down trees for firewood, and they make no smoke to hurt people's lungs, things that are big problems in countries that don't have as much money as we do. Solar cookers can also be used to make water safe to drink, make doctor's tools safe to use, and heat water for laundry.
- A closed car on a sunny day is like a solar collector. Sunlight passes through the car's windows and it is absorbed the seat covers, wall, and floor of the car. That absorbed energy changes into heat. The windows let the radiant energy in but they don't let all the heat out.

### **To Learn More**

- Meet Roofus the solar energy dog and see his solar-powered home at <http://www1.eere.energy.gov/kids/roofus/>