Breaking Boredom

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Got S'mores?
Make Your Own Solar Oven

Several scientific phenomena are involved in making your oven the best heater it can be.

Vocabulary

Heat is the form of energy (sometimes called thermal energy) that is transferred by a difference in temperature. You want to transfer the sun's heat to your solar over.

Reflection is the throwing back of light, heat, or sound by a body or surface, like a mirror. The shiny foil you'll use in your oven will reflect the sun's light and heat inside your oven.

During **absorption**, energy is taken into a material rather than reflected. You will line the inside of your oven with black paper so it can absorb the light and heat reflected into it.

Another energy process you should be familiar with for this project is **convection**, which is the transfer of heat by the movement of a gas or liquid. You'll use plastic wrap to make your oven airtight, so the air warmed by the sun doesn't leave your oven through convection.

One final energy term important to this project is **insulation**. Insulating materials prevent heat from leaving your oven through radiation. That's why you are going to line the inside of your oven with a cheap and effective insulator—newspaper!

Problem: Build and use a simple solar oven.

Materials
Cardboard pizza box
Pencil
Ruler
Box cutter or scissors
Aluminum foil
Clear type of tape Black construction paper
Plastic wrap or large, transparent plastic bag
Newspapers
Oven mitt

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Dish or pie plate
Cooking Ingredients, like those for some mores or nachos (don't use your oven to prepare raw meat)
Optional: a thermometer that goes up to 250 degrees F.

Procedure

1. Clean any stray bits of cheese, sauce, or crumbs out of your pizza box.
2. Using the ruler and pencil, draw a square one inch from the edges of the top of the box.
3. Use the box cutter or knife to cut out three of the four sides of the square.
4. Make a crease along the uncut side of the square to create a flap that stands up.
5. Cut a piece of aluminum foil large enough to cover the inner side of the cardboard flap.
6. Wrap the foil tightly and secure it with tape. What purpose does the foil serve?
7. Line the bottom of the pizza box with black construction paper. What purpose does the black paper serve? Would white paper work as well? Why or why not?
8. Cut two pieces of plastic wrap that are the same size as the top of the pizza box.
9. Use tape to secure the plastic wrap to the inside edges of the square window you cut into the box. You are creating an airtight window. Why do you want to make your oven airtight?
10. Roll up some newspaper pages into tubes to stuff into the sides of the box. Make sure you are still able to close the lid of the pizza box. Remember —what purpose does the newspaper serve?
11. Now it is time to cook something! The best time to use your oven is between 11 AM and 2 PM. Make sure to set the food on a dish so you don't mess up the interior of your oven.
12. One food option is a solar s'more. Place one or two marshmallows on top of a graham cracker. Put two to three squares of chocolate on top of the marshmallow. Wait until it's done cooking to top it with the second graham cracker. Any idea why it might be smart to have the chocolate on top?

Results

On a sunny, warm day, your oven could reach about 200 degrees F. You will notice that food takes longer to cook in a solar oven than a regular one.

Why?

Let's recap: You covered the flap with foil so that the foil would reflect sunlight into the oven. The black paper on the bottom of your oven absorbed the sun's energy (white

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paper would have reflected a lot of that energy). You made your oven airtight so that the warm air inside your oven would not leave the pizza box via convection. You put the newspaper inside your oven to insulate it and prevent heat loss through radiation. It is best to use your oven between 11 AM - 2 PM because that is when the sun's rays are strongest. If you are making a s'more, it is a good idea to have the chocolate on top because its dark color will absorb heat better than the lighter graham crackers. Food takes longer to cook in a solar oven because solar ovens don't get as hot as conventional ovens. That's okay for many dishes and using an educational oven like the one you made yourself adds an extra special taste.

Going Further

Try making chocolate fondue or baked potatoes! Find out how solar ovens are being distributed in areas where there is little fuel but lots of sun.