

# It Isn't Easy Being Green

from Celebrating Chemistry



**A**lmost all plants are green. Did you ever wonder why? It is because their leaves contain chlorophyll. Chlorophyll is a chemical that plants produce to capture the energy of the Sun. The plants then use this energy to make sugars and oxygen from carbon dioxide and water. But new plants cannot make chlorophyll in the dark. They must first have a source of light. Prove it to yourself by doing the following activity.

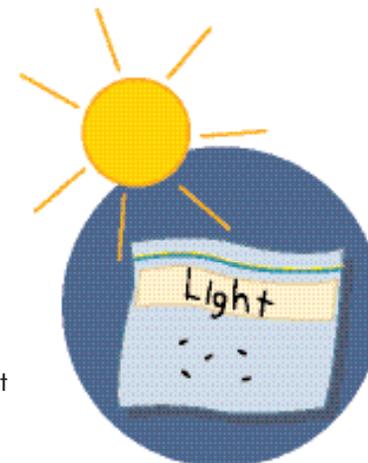
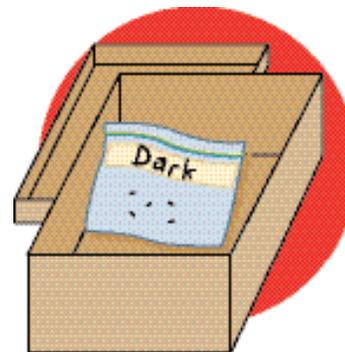
## Materials

2 Paper towels  
2 Plastic zip-closing bags (pint size)  
Masking tape  
Pen  
Bean seeds (pinto beans work well)  
Disposable plastic spoon  
Water  
Shoe box, or dark cabinet

*SAFETY: Be sure to follow Milli's Safety Tips! Do not eat or drink any of the materials used in this activity.*

## Procedure

1. Fold the paper towels into fourths and place one inside each of the plastic bags.
2. Using the masking tape and pen, label one bag "Dark", and the other one "Light".
3. Lay the bags down onto a flat surface with the labels facing up.
4. Place five seeds in each bag. Arrange the seeds on top of the paper towel so that you can see them through the bag.
5. Without lifting the bags, use your plastic spoon to carefully add enough water to each of the bags to wet the paper towel completely.
6. Seal the bags, and press down on the tops of the bags so that the seeds are pushed down into the paper towel.
7. Place the bag labeled "Light" in a sunny spot like a window sill, and place the bag labeled "Dark" in a very dark place like the inside of a shoebox, or a cabinet.
8. Draw a picture of the seeds in each bag in the "What Did You Observe?" section.
9. Without moving the bags, examine the seeds once a day for a week, and draw a picture of them in the "What Did You Observe?" section.
10. When the experiment is finished, throw the baggies and their contents into the trash. Clean your work area thoroughly, and wash your hands.



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### What Did You Observe?

Each day, draw a picture of your seeds in the boxes below starting with day one.

<p>"Light" Day One</p> <p>"Dark" Day One</p>	<p>"Light" Day Five</p> <p>"Dark" Day Five</p>
<p>"Light" Day Two</p> <p>"Dark" Day Two</p>	<p>"Light" Day Six</p> <p>"Dark" Day Six</p>
<p>"Light" Day Three</p> <p>"Dark" Day Three</p>	<p>"Light" Day Seven</p> <p>"Dark" Day Seven</p>
<p>"Light" Day Four</p> <p>"Dark" Day Four</p>	



## What Did You Observe? (continued)

Which seeds grew faster, the ones in the light, or the ones in the dark?

What color were the plants that grew in the light?

What color were the plants that grew in the dark?

## Try this...

Plant a bean seed in some potting soil in a small cup or pot. Be sure to water the seed daily so that the soil stays moist. Once the seedling pushes its way out of the dirt, place the plant in the corner of a shoebox. Cut a small hole in the top of the shoebox on the corner furthest away from the bean plant. Each day open the box just long enough to water and observe the plant. The plant will bend over and grow toward the hole in the box.

## Where's the Chemistry?

If you pry open the two halves of a bean seed, you can see the small developing plant inside. You can also see the very large seed halves that the plant will use for food. When plants begin to grow, they must use this stored food until they can make food on their own. If they cannot find a source of light in time to start making food on their own they will die.

In our experiment, we looked at two sets of seeds, those in the light, and those in the dark. The seeds in the light very quickly began to

make chlorophyll and began to turn green. These young plants could then begin to use the chlorophyll to harvest the Sun's energy to make sugars, carbohydrates, and oxygen. But the plants that sprouted in the dark were unable to form chlorophyll. They did not turn green. Instead they used up their precious energy reserves to grow longer in search of a light source. They will continue to grow at a very rapid pace until all of their food reserves are used up, and then they will die. On the other hand, the plants that were placed in the light grew more slowly, because they had everything that they needed.

Natural systems are very efficient. They only use energy when they have too. In our experiment, the plants that were left in the dark had to grow very fast so that they could find a source of light, while the plants that were in the light did not have to grow very much to find the light. Instead they used their energy stores to make chlorophyll so that they could live long healthy lives.



The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at [www.acs.org/kids](http://www.acs.org/kids).

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## Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

### Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

**Never** eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

**Never** experiment on your own!

**For more detailed information on safety go to [www.acs.org/education](http://www.acs.org/education) and click on "Safety Guidelines".**

