LIGHT and COLOR 3RD Grade

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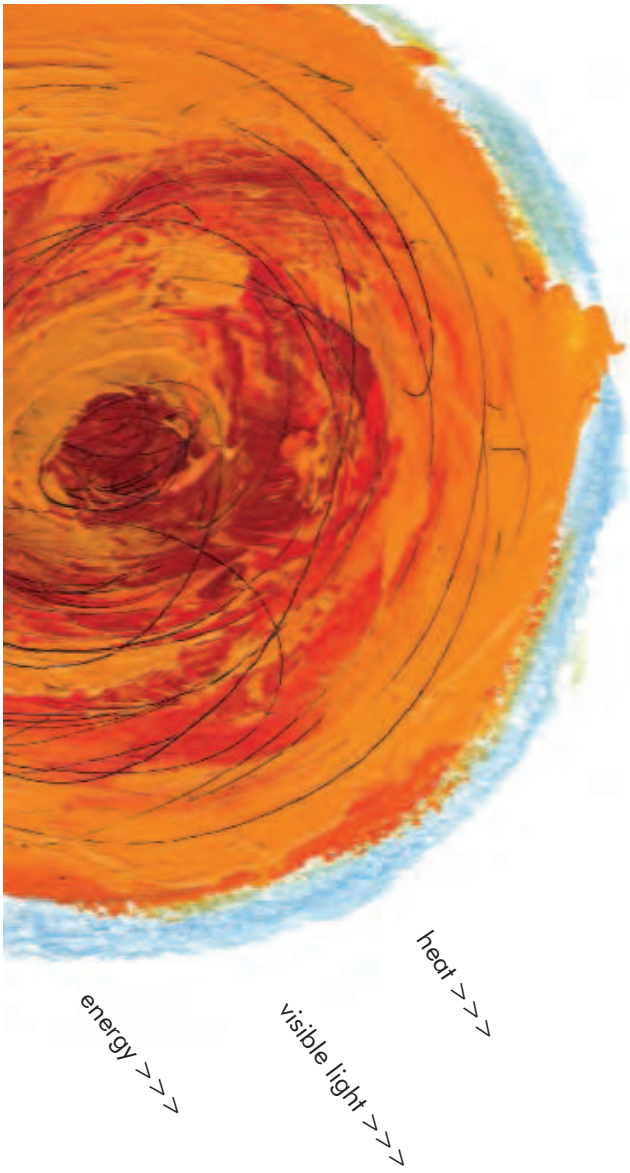
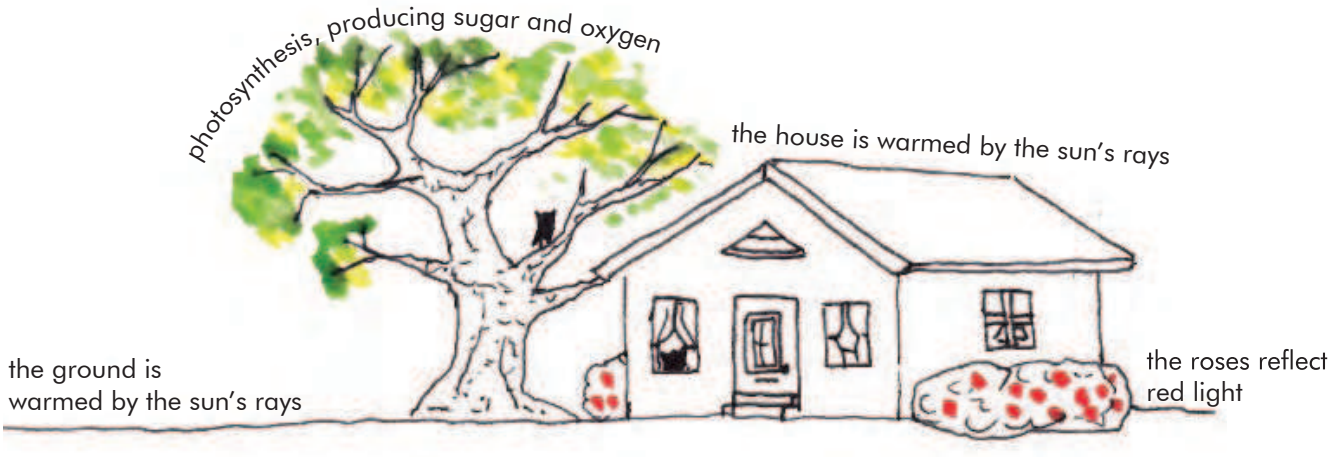
Light and Color

Light



Light is one of the most mysterious parts of nature. It allows your eyes to see objects and colors, but if you close your eyes you can still feel warmth and even sense color! Light is the fastest traveling force that we know of in nature. Even though it has no weight, light can also act like an object - it can be slowed down and it can be moved (bent).

Sunlight is essential for all life on the planet. It gives energy and heat. Plants require sunlight to breathe and make energy. Without sunlight, plants would not be able to produce the oxygen that animals need to breathe.



Light Sources

Anything that produces its own light is called a **light source**. Some are natural and some are manmade. Can you classify the following light sources as natural or manmade?

candle, fire, star, sun, flashlight, lamp, lightning, TV, light bulb, glow sticks, red hot iron, burning coals

Natural	Manmade

Did You Know?

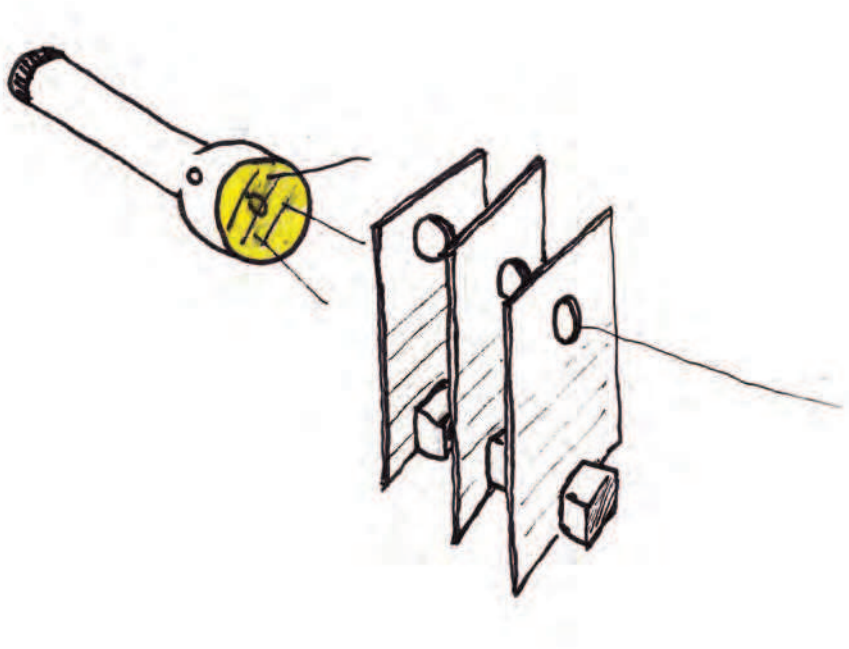
Bioluminescence - is a biochemical process where an animal creates light but no heat. This light is used for communication, camouflage, or attracting a mate or prey. This is a picture of a bioluminescent fish!

The Direction of Light

Light travels through the air in straight lines.

TRY THIS!

Get three index cards. Punch a hole near the top, going through all three cards at once to make sure the holes line up later. Tape the cards to blocks or other small objects to make them stand upright. Set the three cards up in a row and shine a flashlight through them.



What do you notice? _____

_____

Now, move one of the cards slightly out of line. What happens?

_____

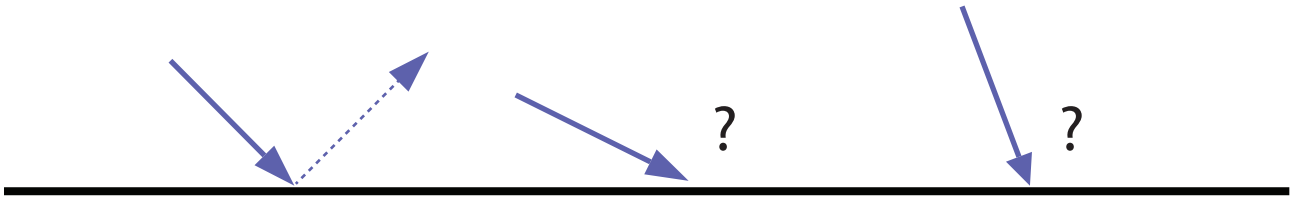
_____

Reflection

Some objects do not produce their own light but do reflect it. Light does not come from within these objects. Light shines on the object and reflects, or bounces off of it. A mirror is an example of a reflective surface. It does not make its own light, but instead reflects it.

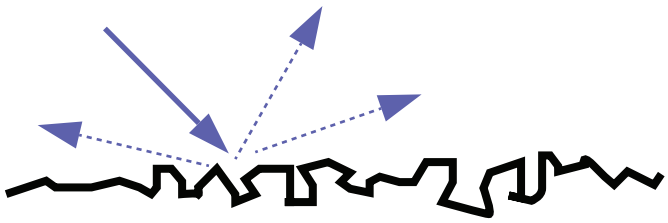
When light from an object is reflected by a surface, it changes direction. It bounces off the surface at the same angle as it hits it.

Use a ruler to draw the angle of reflection below:



Try This!

Smooth surfaces tend to reflect light well, while rough surfaces tend to scatter the light in many directions.



You can test this with a sheet of tin foil. Shine a light on it while it is flat and note what you see. Then crumble it. What is the difference?

Think About It!

Would you be able to see a mirror in a completely dark room? Why or why not? Use the back of this page to explain your answer.

Reflective Surfaces

Color in and list five reflective surfaces in this scene, illuminated by the car's headlights, that are helping to keep the driver and the bicyclist safe.

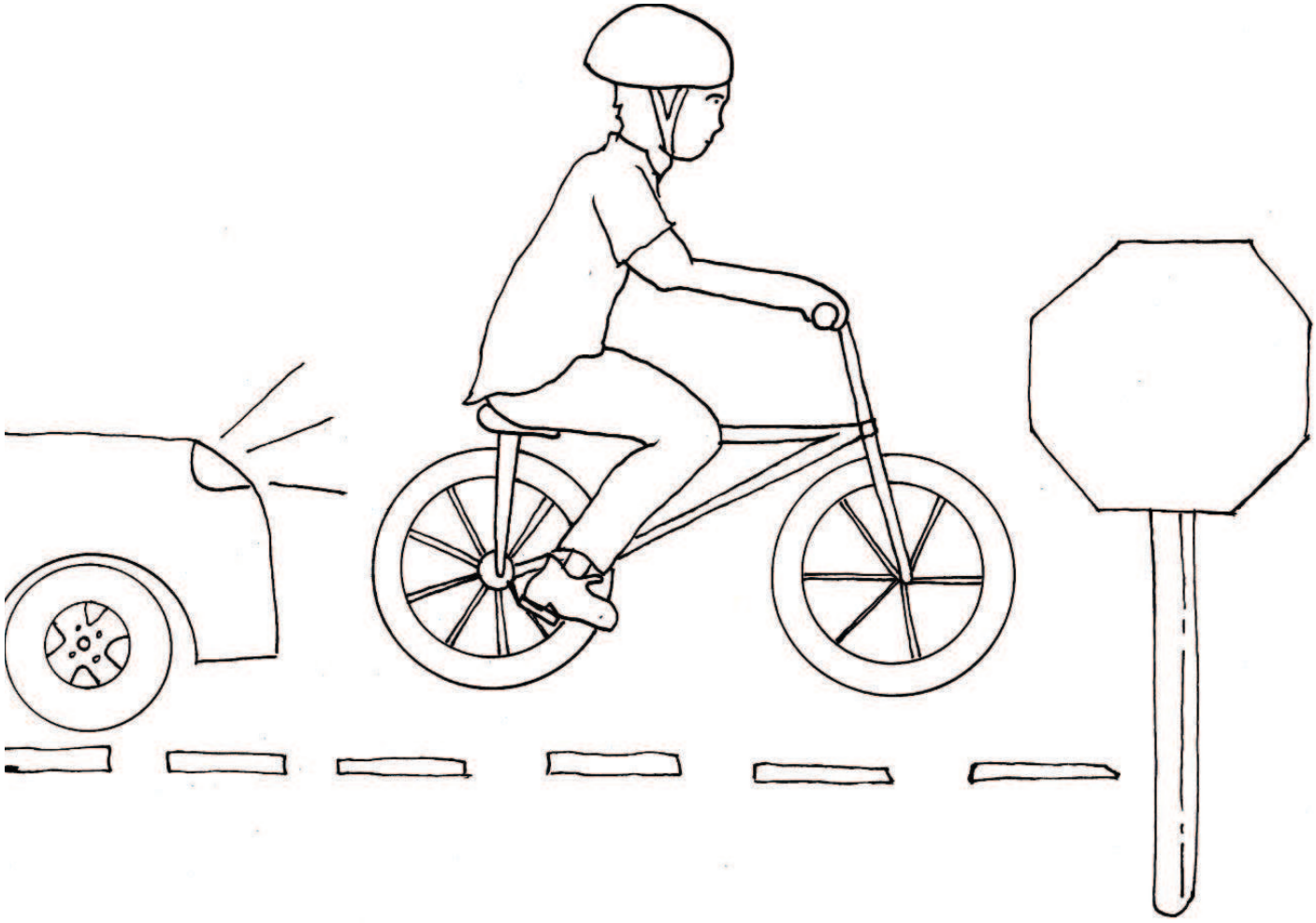
1.

2.

3.

4.

5.

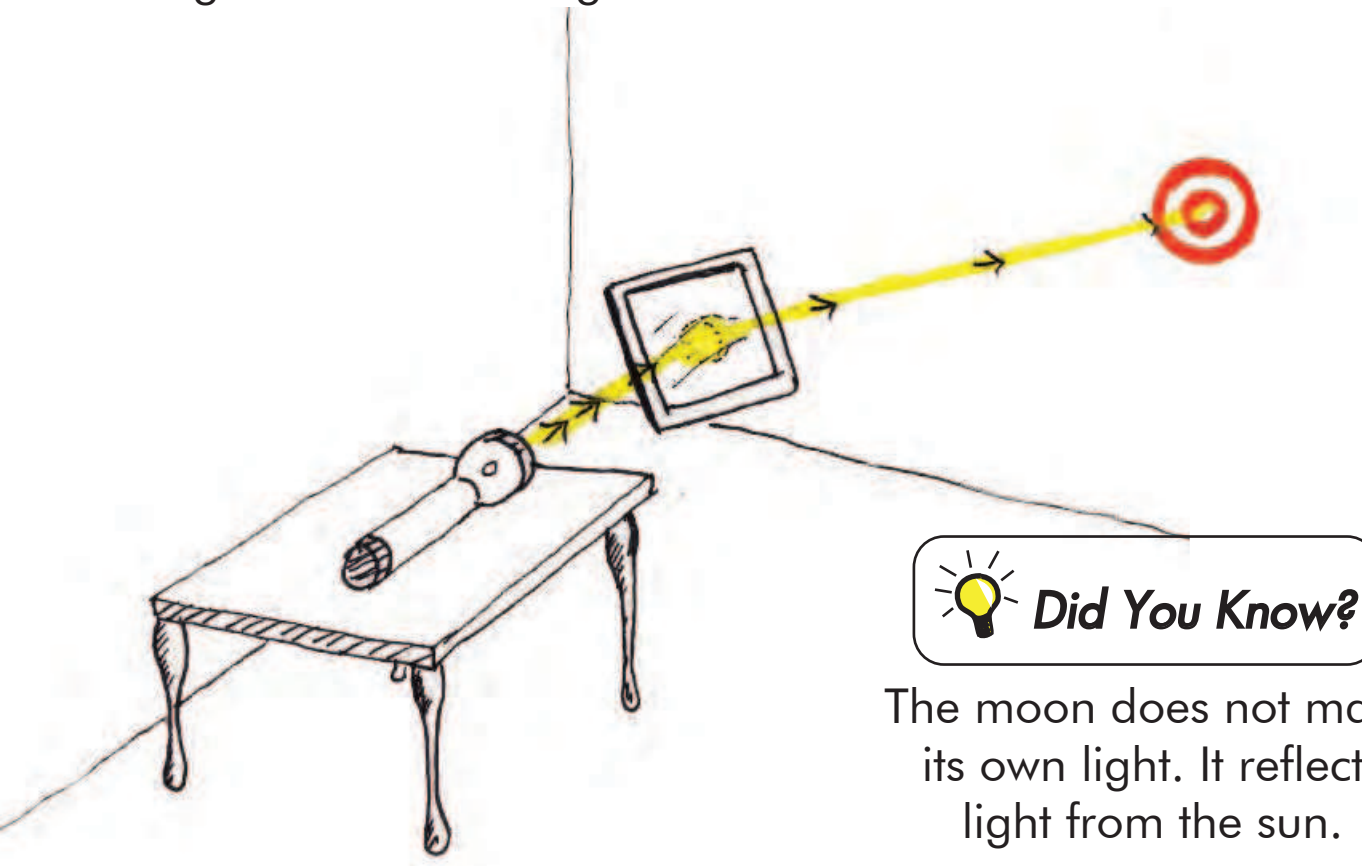


Light Bounces

We can only see objects because they are either producing light or light is bouncing off of them. If light did not bounce we would not be able to see anything around us. A mirror is the best way to test this because a mirror reflects nearly all the light that hits it without distorting it.

TRY THIS!

Take a powerful flashlight and set it down somewhere. Turn it on and don't move it for the entire experiment. Now, pick several places or targets in your room. Turn the lights down low and using a mirror in your hand, adjusting it to different angles, try to hit the targets with the light beam bouncing off of the mirror.

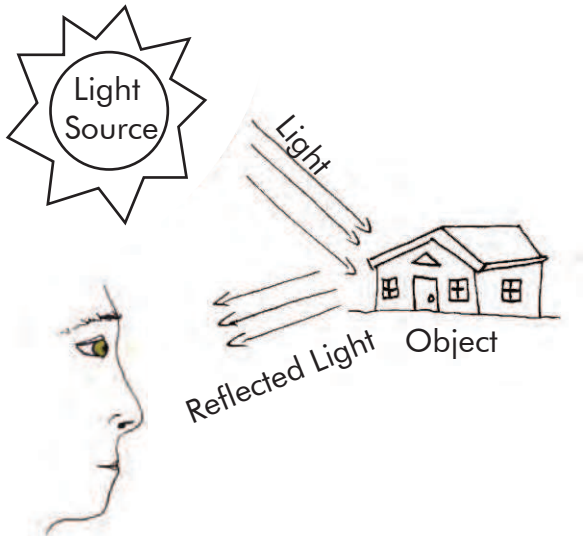


Did You Know?

The moon does not make its own light. It reflects light from the sun.

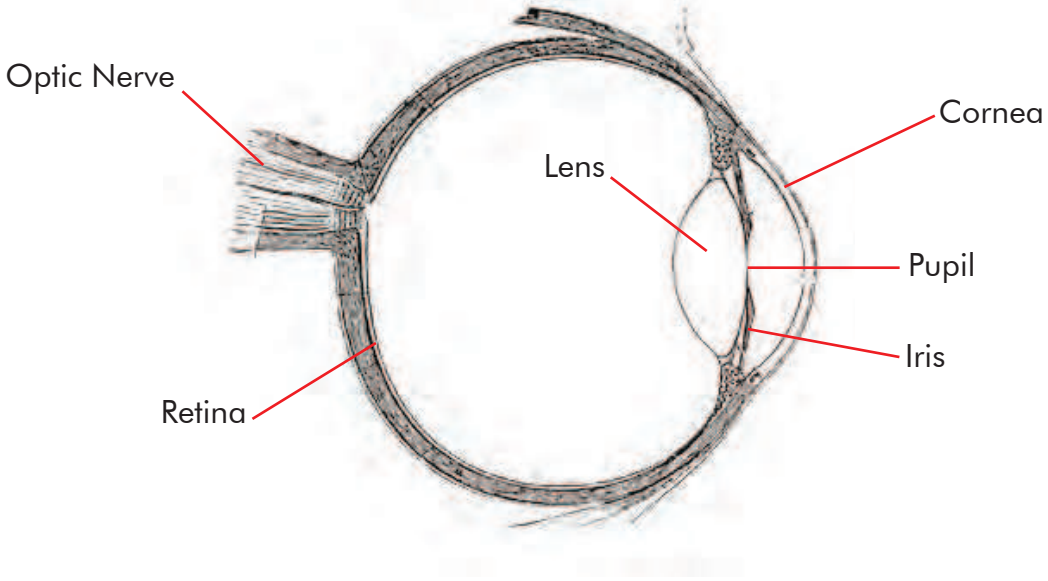
How Do We See?

Light travels in straight lines. When light hits an object, it is reflected and enters our eyes. This is how we see the object.



Check it out

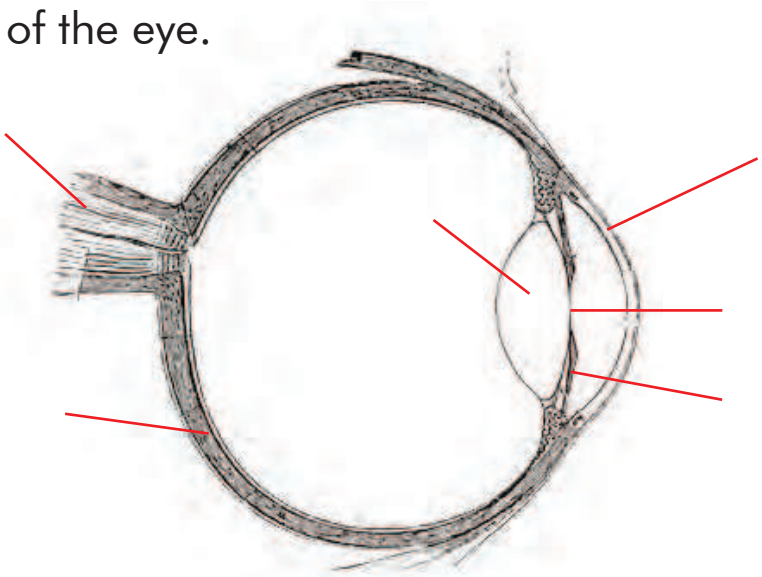
The Eye



How Do We See?

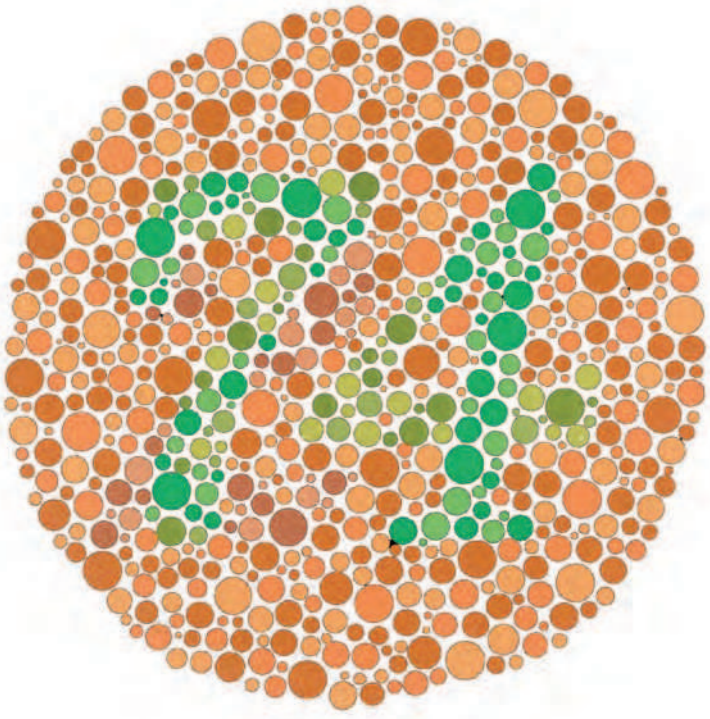
The iris is the colored part of our eyes. It expands and shrinks to adjust how much light is let into the eye. The pupil is the black hole in our eyes. It what the Iris controls to let in light. The cornea is a thin, clear film that protects our eyes from the environment. The lens converts the light coming into our eyes and projects it onto the retina. The retina has thousands of light-sensitive nerves that send a message through our optic nerve and into our brain, which is where we see.

Fill in the diagram of the eye.



TRY THIS!

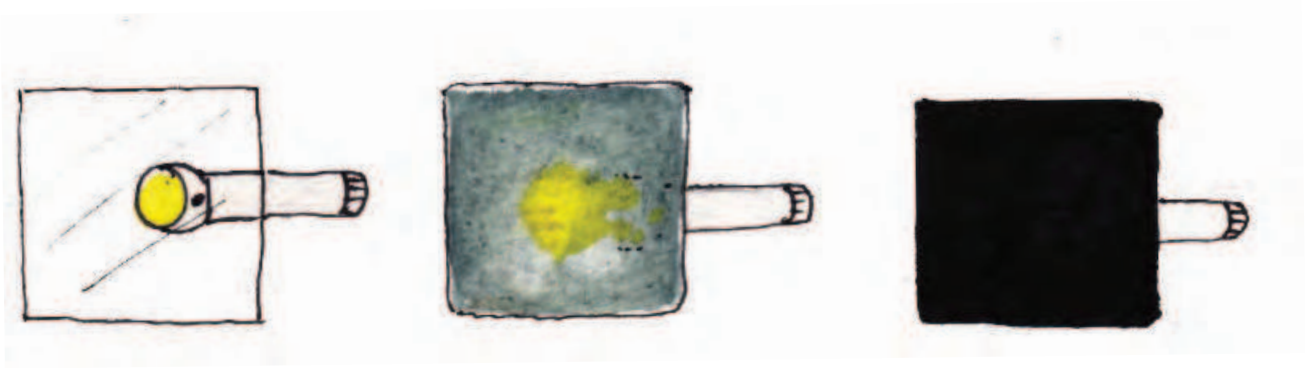
Color blindness is a very common condition. In extreme and rare cases it means that the person cannot see any color, only shades of gray!
In more common cases, a person cannot tell the differences between certain colors. The most common example of this is red/green color blindness, where a person has difficulty seeing the differences between these two colors. This diagram is a test. Can you see the number?



Light Through Objects

When light shines on an object, one of three things can happen:

1. If light passes through, the object is **transparent**.
2. If light is blurred, the object is **translucent**.
3. If light is blocked, the object is **opaque**.



Transparent Translucent Opaque

TRY THIS!

Try shining a flashlight through plastic wrap, wax paper and tin foil. Fill in the sentences below to show what you observed.

Wax paper is _____.

Plastic wrap is _____.

Tin foil is _____.

Light Through Objects

Transparent objects allow light to pass through completely, translucent objects blur light, and opaque objects do not allow any light to pass through them.

Can you tell which of the following objects are:
transparent, translucent, or opaque?

_____ lemonade

_____ dish soap

_____ window

_____ sunglasses

_____ cardboard

_____ clear plastic cup

_____ construction paper

_____ tissue paper

_____ brick wall

Refraction

A light ray travels in a straight line, but it can **bend** when it changes speed. When a light ray enters a denser medium such as water, it slows down. This results in a "bent" or distorted image.

TRY THIS!

Put a pencil or straw in a cup of water. Kneel down to the level of the cup and look at the pencil or straw through the water. You will notice that the pencil looks like it is bent!

What's Happening?

The pencil appears bent due to a property of light called **refraction**. The distortion happens because the light ray slows down and changes direction as it passes into the water, which is denser than air.

Try positioning the pencil or straw at different angles.
What do you notice? Is there a point at which the distortion is lessened?
Note your observations on the back of this page.

Bending Light Experiment

If your science savy third grader is up for a challenge, introduce her to refraction. Refraction is a fancy science word for bending light, but you won't need any fancy supplies for this activity. Using just a couple of household items, your scientist will be bending light like a pro!

What You Need:

- Opaque casserole dish
- Small stone
- Pitcher of water
- Glass cup
- Spoon

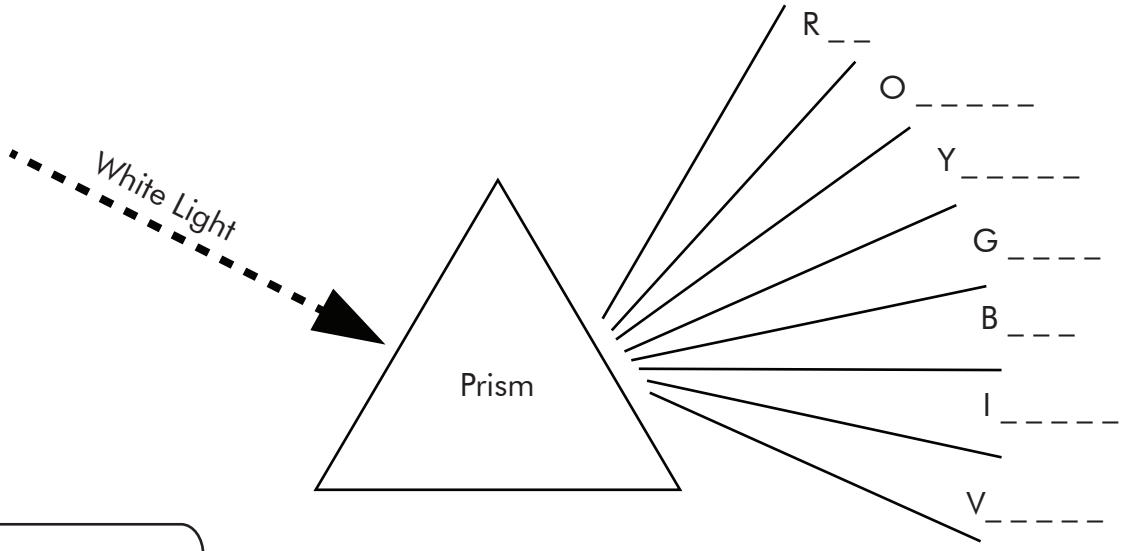
What You Do:

1. Have your child place the stone at the bottom of the casserole dish.
2. Ask her to take a comfortable seat at the table – she will have to hold her position for several minutes. Have her pull the casserole dish towards herself so that she can see the stone. Now have her push the dish away, stopping when the stone is just out of sight.
3. Explain to her that she cannot see the stone because there is not a straight line between her eyes and the stone. Instead, you are going to make the stone reappear by bending the light.
4. Slowly pour water into the dish. Be careful not to shift the stone. Ask her to tell you when she can see part of the stone.
5. Because light is refracted as it travels from the air to the water, she should be able to see the stone. Water has a different density than air. The light beams bend and the stone is visible as if she was looking around a corner.
6. Expand on this by showing her another example of refraction. Take a plain glass and place a spoon handle inside of it. Pour water into the glass and the handle of the spoon will seem to change positions.
7. Encourage your child to try out other bending light experiments. Anything with water will do the trick!

The Prism

While light appears white, it is made up of the colors of the rainbow. The colors can be separated by shining light through a **prism**, or a triangular glass object. This separation is called **dispersion**. This can be observed in a rainbow, when sunlight is refracted by droplets of water.

Use crayons or colored pencils to fill in the color spectrum below.



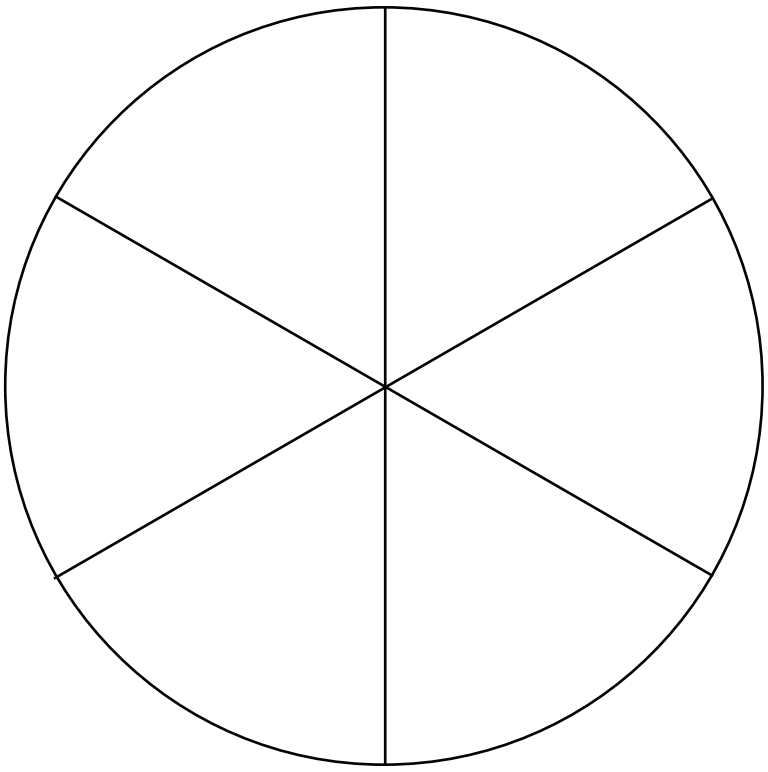
TRY THIS!

Make your own prism by shining light down through a glass of water onto white papers below, or shine a light on the back of a CD.

Be patient and experiment until you get the angle just right. Draw what you observe below.

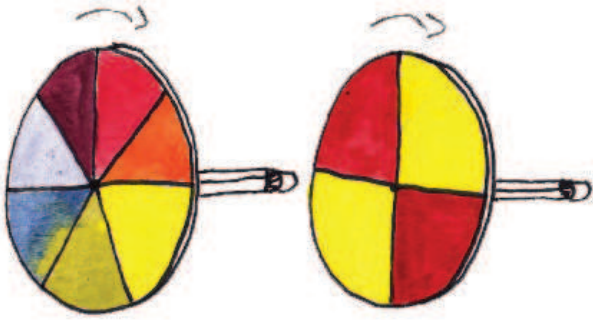
The Color Spectrum

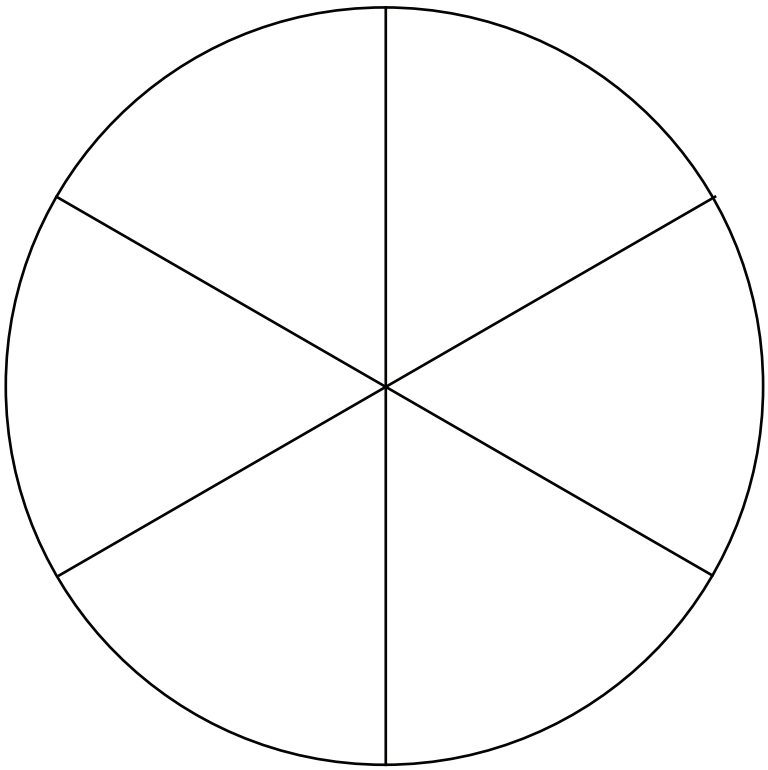
The things we see come in an amazing variety of colors because of visible light. We see different wavelengths of light waves as different colors. All of the colors together make up white light.



TRY THIS!

To test this, cut out these 4-inch circles and glue them onto card-stock. Color the wedges with the ROYGBIV colors (red, orange, yellow, green, blue, indigo, violet). Spin the wheel on the end of a pencil and note what happens. What color do you see? Experiment with different color combinations and see what you can make.





Spinning Color Wheel

Want to help your curious third grader become a color magician? Help him construct a dazzling spinning wheel that will teach him about the science behind colors while providing some silly entertainment!

What You Need:

- White paper
- Cardboard
- Glue
- Scissors
- Pencil
- Hole punch
- Markers
- Yarn

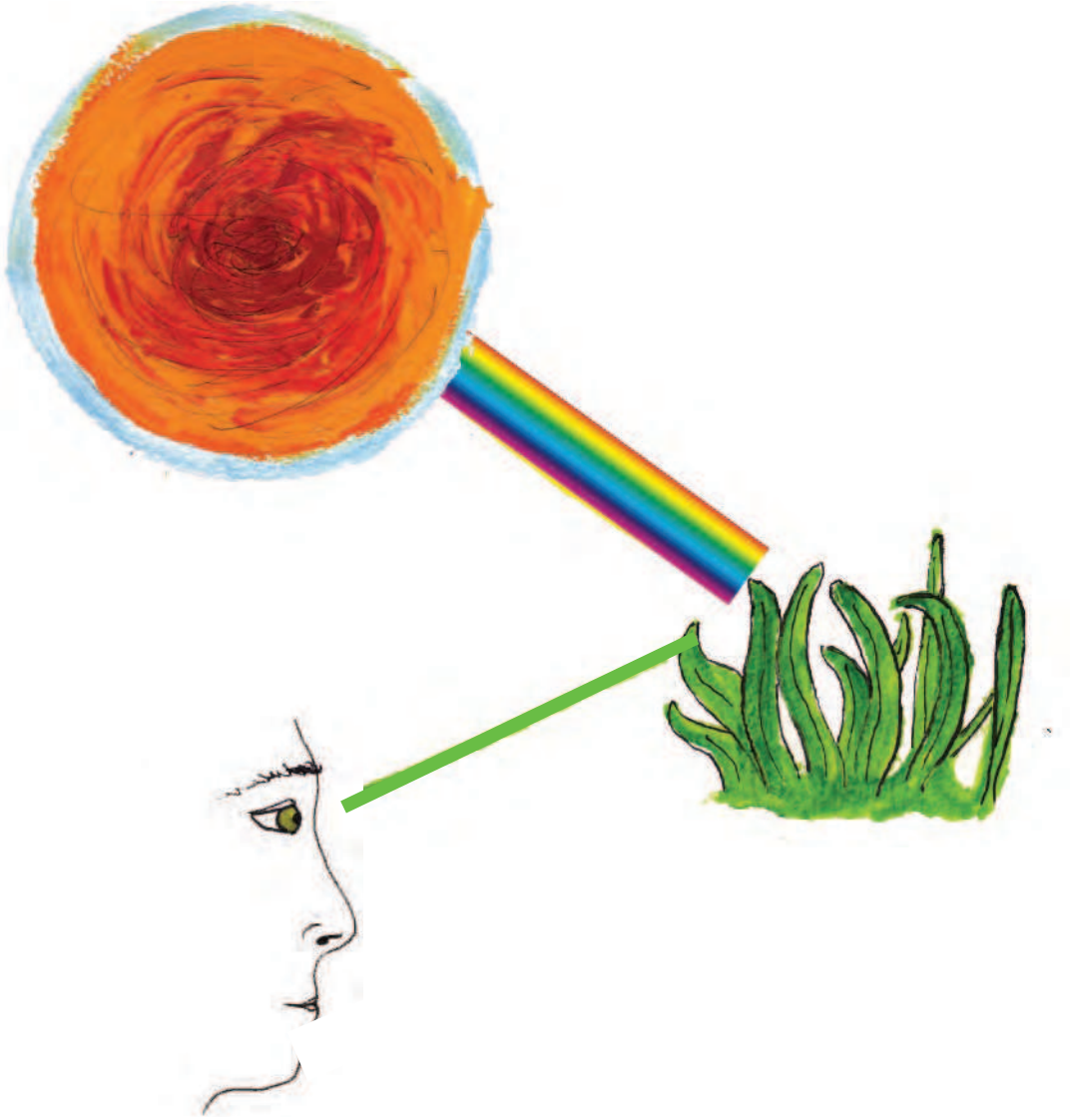
What You Do:

1. Check out the Color Spectrum worksheet as a template for this activity. It has some awesome facts about colors that your child might not be familiar with. Did he know that all the colors together make up white light? If this fact seems too difficult for him to grasp, don't worry! That's what this activity is meant to illustrate!
2. Have your child glue the white paper onto the cardboard. Cut out a circle from the cardboard. Make sure the circle is at least six inches in diameter.
3. Tell your aspiring scientist to divide the circle into six wedges. Color the wedges in this order: red, blue, green, yellow, orange, purple.
4. Use the hole punch to make two holes in the center of the circle. Thread a three foot piece of yarn through the holes and then tie the yarn into a loop.
5. Wind things up. Twirl the yarn like you would turn a jump rope. Once the yarn is tightly twisted, pull your hands apart, then bring them back together. Continue bringing your hands in and out as if you are playing an accordion. If your cardboard is too light, the winder will flop not spin. To fix this issue, take apart the winder and layer the cardboard.
6. As the wheel begins to spin faster, watch as the colors begin to blur together. Ask your child what color he sees. Depending on the quality of the marker shades you used, you should see a light grey. The goal, of course, is to see white, but that might take some more experimenting.

Encourage your child to try out some more color combinations on his color wheel. If he tries alternating two primary colors like blue and yellow, what color does he predict will show?

Light & Color

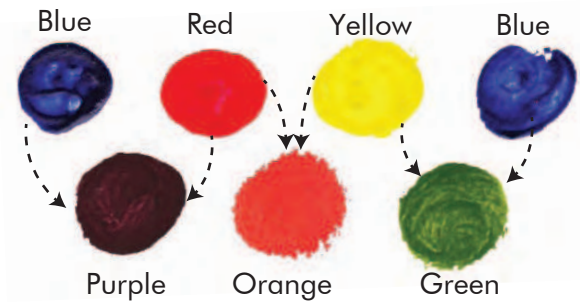
When white light strikes an object, some of the colors are **absorbed** and some are **reflected**. The reflected colors are the ones we see. For example, grass appears green because all other colors are absorbed while green is reflected.



Green light is reflected by the grass, but what about the other colors we see? A black shirt reflects very little light. A white shirt reflects a lot of light. Which one do you think will feel warmer to wear in the sun? Explain your answer on the back of this page.

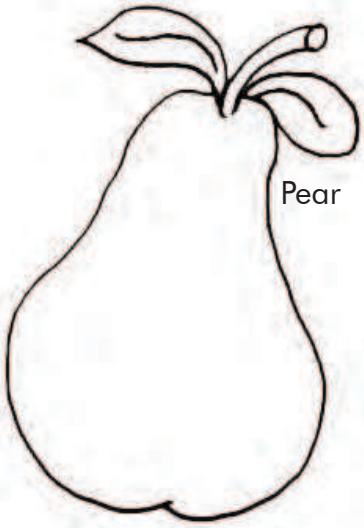
Mixing Colors

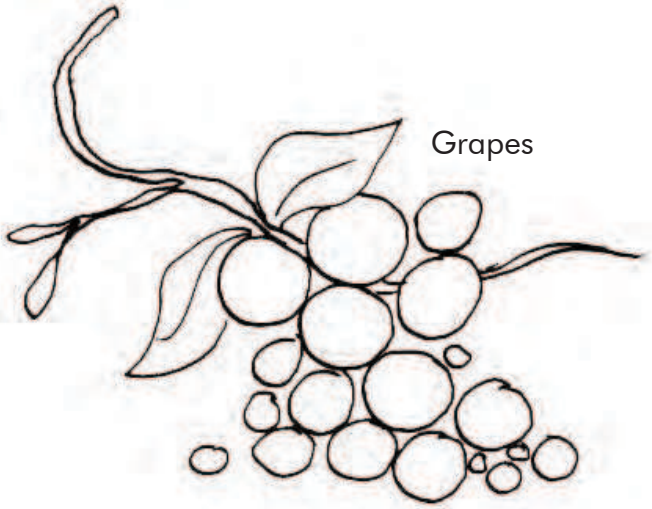
Red, yellow and blue are called the **primary colors**. From these three colors all colors can be made by mixing them.

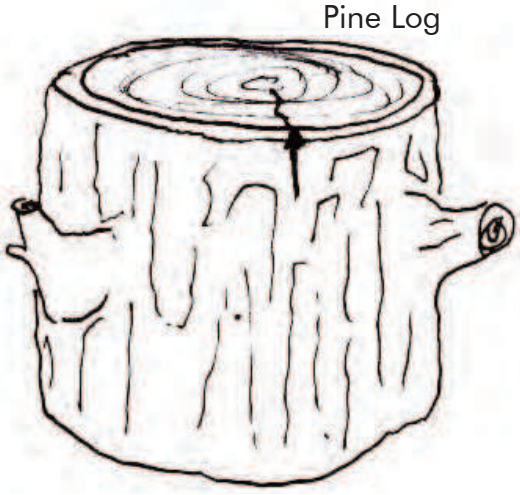


TRY THIS!

Coloring Challenge: Using some paints (acrylic works best, but tempera washable paint works too) try mixing the three primary colors in different ways to create some special colors that match the drawings that are not in the ROYGBIV spectrum. If you're having trouble, try adding some white or black into the mix.







Complementary Colors

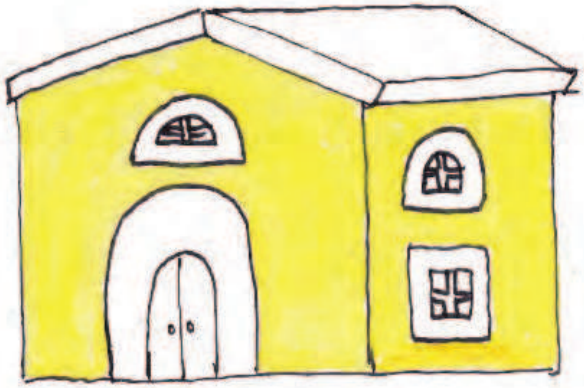
The colors that are opposite each other on the wheel are called **complementary colors**. For example, blue and orange are opposite each other on the wheel. They are complementary. If complementary colors are mixed, they will make different browns and grays.

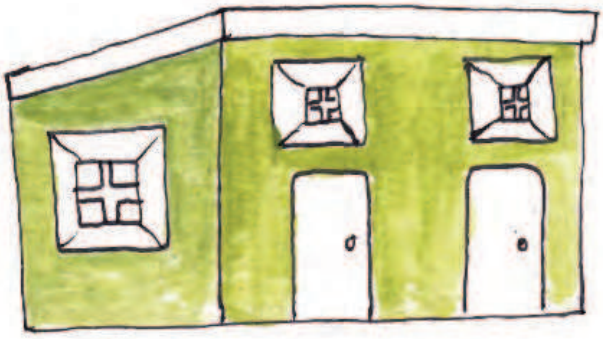
Purple & Yellow

Green & Red

Orange & Blue

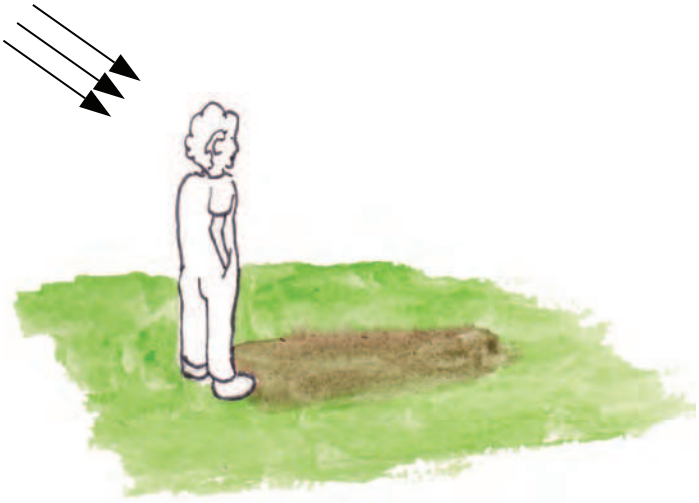
Paint the roofs, doors and trim of the houses with the right complementary color.





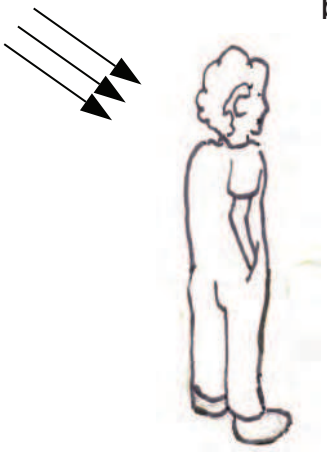
Light & Shadow

Shadows occur when an object blocks a light source from reaching a certain area. Shadows are darker, but there is always some light that reaches them. We can still see the color of something that is shadowed, even if that color is very dark.

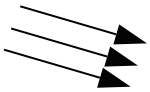


TRY THIS!

The location of a shadow depends on where the light source is coming from. Color the ground next to this boy with the shadow he casts. *The sun is behind him.*



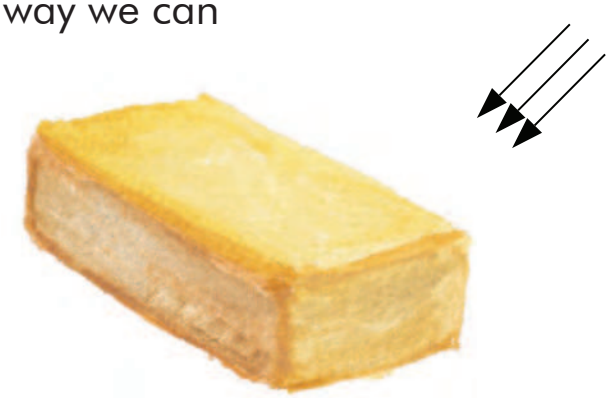
If a light source is lower, the shadow will be longer. Draw an object in the space below. Then color the ground and the shadow that it will cast.



On a separate piece of paper, paint a scene that has a light source and an object that casts a shadow.

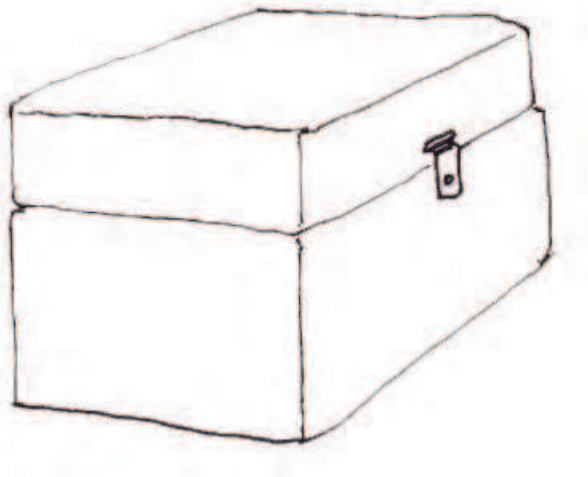
Drawing Light

We see all forms and objects in color. The way we can can tell their shape and surface is by the different tones and shadows. These come from light bouncing off each type of surface at different angles and reflecting different colors.



TRY THIS!

Paint the box using the light source to know which sides will be darkest or lightest.



Draw and paint your own object using the light source to color it.

Great job!

_____

is an ThuVienTiengAnh.Com science superstar