PRISM POWER

Raccoon Creek Explorers Activity #30

Supplies:

- A clear, smooth glass or jar
- water
- a piece of paper
- colored markers

Vocabulary:

concave- a surface that curves inward, like the inside of a circle or sphere
convex- a surface that curves outward, like the outside of a circle or sphere
focal point- the point where waves meet after reflection or refraction
light- electromagnetic radiation, a form of energy
light waves- the movement of light can be thought of as a wave.
opaque- objects that reflect light and do not let it pass through
prism- a three dimensional, triangular, transparent object with refracting surfaces
refraction- the deflection of waves (of light) after passing through one medium into another
translucent- objects that allow some but not all light to pass through
transparent- objects that allow light to pass through (see-through)

Background:

The human eye can see by detecting the light that bounces off of the objects around us, and our brains interpret those reflections as objects and colors. The frequency of the wavelength of light determines the color we see, and some frequencies can't be detected by the human eye at all! If light bounces off of objects, than what is it made of and how does it travel? The science of light is a little complicated and tricky to explain. This is because light travels in waves but also sometimes as particles. It has no mass and isn't considered matter; instead, light is considered a form of energy made of photons. Depending on the type of matter light comes into contact with it behaves differently. Light can pass through transparent objects like air or water. Other objects are opaque and completely reflect light, like a book or a rock. Some objects do both and block some of the light but allow some to pass through. These objects are translucent.

In this experiment we'll investigate how light works by examining what happens when light passes through a curved jar filled with water.

Let's Get Started:

1.) Fill the jar or glass with water.

2.) Use the colored markers to draw a rainbow, some arrows, or write a word on the piece of paper.

3.) Place the paper behind the jar and look through the jar at your paper. Slowly move the paper closer and further away behind the jar until you see the image flip so it is reversed!

4.) Once you get the image to reverse you've found the focal point! Move the paper around and watch what happens. The angle can make a difference in how much of a dramatic flip you get.

Reflect:

Refraction, or the bending of light, happens when light travels between two mediums (or substances), like the jar and the water in this experiment. The curved surface of the glass jar acts like a convex lens, which bends the light to a focal point, the point at which the light from an object crosses. This gives us a reflected, mirror image that is opposite to what we originally drew.

You can experiment with refraction more by shining a light through the water glass and watching what happens to the beam. Try using different glasses to see if that changes anything!

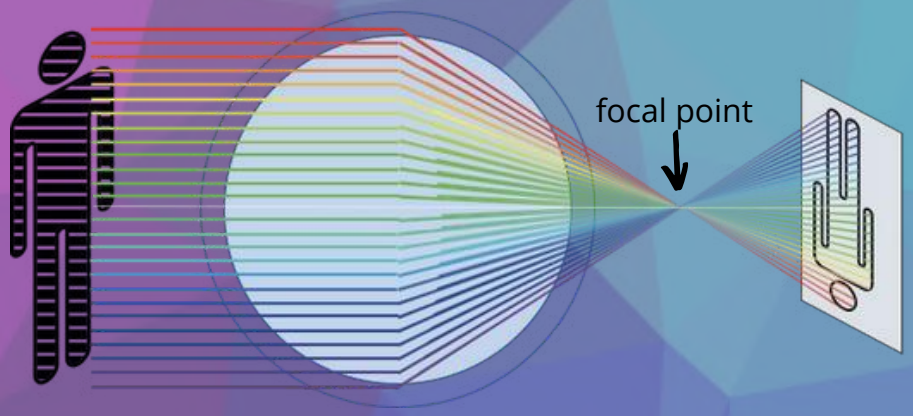
Apply:
Think about the behavior of light as a wave and how it interacts with objects. How might the physics of light be related to the following situations and things?

-A person who is colorblind.

-An animal like the mantis shrimp, which can see colors humans can't see.

-Using a camera to take photographs.

-It can be difficult to tell where something is underwater, like a fish, when you are looking down from the surface. (Try holding a pencil or straight stick so half of it is under water. Does it look bent? Why?)



Wrap-Up:

When we see objects our eyes are detecting the light they reflect. When light hits and object some of the wavelengths are absorbed and some are reflected. The reflected wavelengths are perceived by our eyes and the frequency of the wavelength determines the color of the object.

Light is a form of radiation or energy that can be described both as a wave and as a stream of particles called photons. Because it behaves like a wave, we can observe light following laws that other waves follow (like sound waves), which includes Reflection and Refraction.