

Cl~~o~~verbud ~~I~~nvestigators: STEM for Every Season

April

Everything Rainbow

Background:

A rainbow is a wonderful light show seen in the sky. That's right, a light show, but how does it work? Rainbows are somewhat rare; you can only see one when there is rain in front of you and sun behind you. The rain or water molecules need to be at a distance and the sun needs to be fairly low on the horizon.

In nature, rainbows are produced by light passing through tiny drops of water. When the light passes through a clear material like water, it changes direction due to a process called refraction. This is how the rainbow is formed, but how do you get all the colors? The sunlight is seen as a white light but it contains all the colors of the color spectrum. The angle of the light shining through the water determines which color you see. Isaac Newton was the first person to discover that sunlight contains a spectrum of different colors.

The colors we can see in the rainbow are called the visible light spectrum. The colors that make up the visible light spectrum have different wavelengths, with the color red having the longest wavelength and the color violet the shortest. The seven main colors that make up the visible spectrum are: red, orange, yellow, green, blue, indigo, and violet. However, the visible spectrum actually contains many colors in between these colors and we can begin to see this in the rainbow. When we look at a rainbow not all the color bands are equal in size and some of the bands blend together. This is due to the wavelengths of those colors.

Let's look at the shape of a rainbow. Why do you think the rainbow is curved like an arch? The shape of the rainbow and the pattern of the colors are determined by the length of the light wave. Every rainbow you ever see will have the same color pattern and the same shape. The top most outer band of the rainbow will always be red because the red light has the longest wavelength. The next color will be orange, then yellow, then green, then blue, then indigo and finally violet. Violet has the shortest light wavelength so it will always be the center bottom color of the rainbow. The different lengths in the color bands bend the rainbow into the arch we see and recognize as a rainbow.

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Updated T. Winters, 1/2019

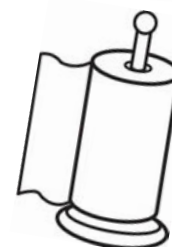
In this investigation, we are going to learn about refraction and reproduce a rainbow using water, a mirror and flashlights.



April's Mystery: Can I make a rainbow show up on the wall?

Supplies:

Large, Clear drinking glass
Small mirror (Make sure it fits in the cup)
Small water pitcher
Water
Flashlight
Paper towels



Science Behind the Rainbow:

Refraction is the process in which pure white light shines through a clear object, like water, and that clear object reflects some of the color waves which allows us to see the colors hidden within the light. The colors we see will be dependent on the angle at which we are looking. To make a rainbow appear, all we need is a bright light, and a substance like water molecules to create the refraction process.

What to Do:

Step 1: Fill the glass about $\frac{3}{4}$ full of water.

Step 2: Slowly put the mirror in the glass. Be sure to set the mirror in at an angle on the bottom of the glass. The face of the mirror should tilt slightly upwards.

Step 3: Make your room dark.

Step 4: Shine the flashlight on the mirror.

Step 5: Find the rainbow around the room.

Go Over Findings:

How did the colors you see get on the wall?

How many colors of the rainbow did you find?

What were the colors?

Were all the colors the same thickness? Why or why not?



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Investigate, Create, & Take: Investigators can take with them:

- ✓ Rainbow Noodle Art

Sources:

National Science Teachers Association, Light and Color Science Object,
<http://learningcenter.nsta.org/lcms/default.aspx?a=groupedit&gid=1304&tid=424&soid=80>

Additional Links:

Liberty Treehouse, “The Science of Rainbows”,
<https://www.youtube.com/watch?v=rGV4XzPYc2Y>

HooplaKidz Tv, “What is a Rainbow?”, <https://www.youtube.com/watch?v=JZsq3DjTIKY>

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