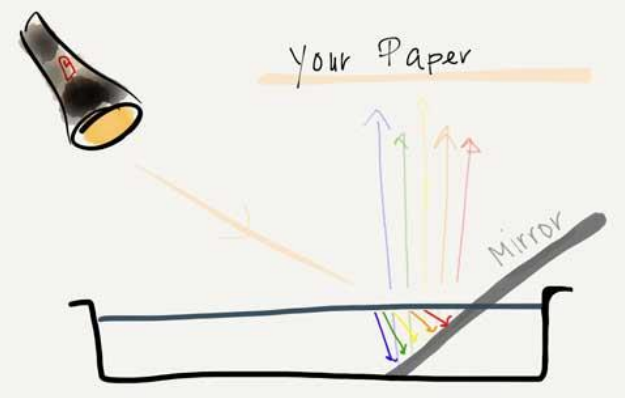
RAINBOW SCIENCE

With St. Patrick's Day coming up we associate March with green, leprechauns, shamrocks, and rainbows with pots of gold at the end! In this activity we will create our own rainbow (without the gold unfortunately) and learn what causes rainbows here on Earth!

Photo by Jeffery Heizer – A rainbow lights up the sky over Colorado Springs amid summer storms (July 2019)

Materials

- A shallow pan
- Water
- A flashlight
- A white surface or piece of paper
- A mirror



Credit: Aliya Merali, APS Physics

Time – 20 minutes

Instructions

1. Fill the shallow pan about halfway full with water.
2. Place the mirror in the water at an angle.
3. Shine the light into the water where the mirror is under water (or, using the sunlight, bring the pan and mirror outside so the sun can shine on the mirror underwater)
4. Hold the white paper above the mirror; adjust the angle until you see the rainbow appear!

Background Information

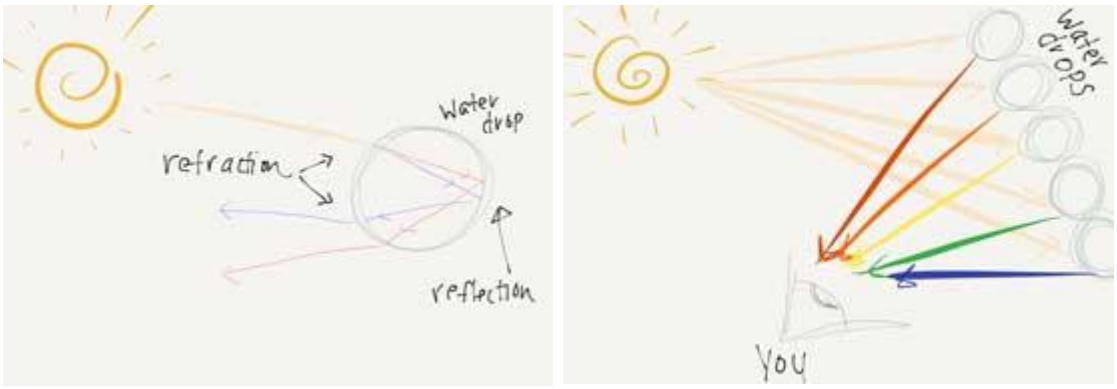
This doesn't look exactly like the rainbow you see in the sky after a storm, but it shares the same general characteristics of colors and order — but why? This demo and the rainbows that appear in the sky share the same principles: refraction & reflection. Refraction is the concept of how light bends when it passes through different mediums, like glass or water. Refraction can even make arrows appear to reverse directions when viewed through a glass of water!

When you shine the white light of your flashlight into the water, the light bends. But white light isn't just one color; instead, it's a combination of all the visible colors. So, when white light bends, all its components (red, orange, yellow, green, blue, and indigo light) also bend. Each of these colors bends at a different angle because each color travels at a different speed inside water or glass.

When you reflect the light back out of the water using the mirror, you're reflecting the white light that has been broken up (from refraction) into the full rainbow of colors, and a rainbow appears!

When a rainbow forms in the sky, the same principle applies. Many little water droplets refract the sun's light. The angle at which we view these water droplets determines which color we see from them.

Where else do you see the full spectrum of colors? Mini rainbows? In a water sprinkler? In a glass of water? What's happening there?



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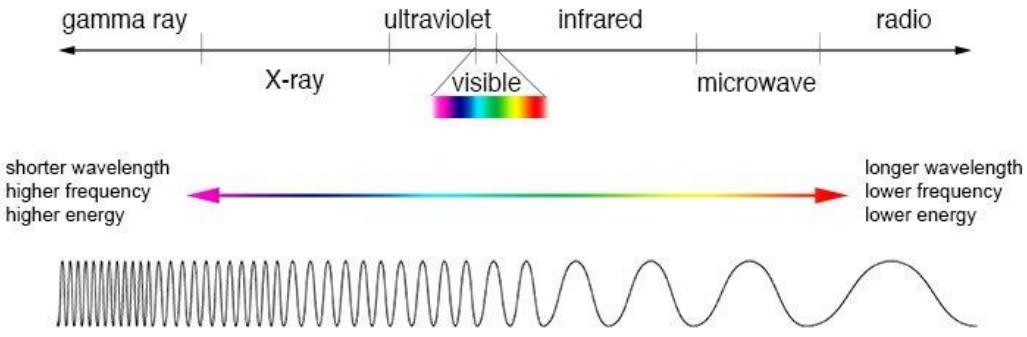

Electromagnetic Spectrum. Credit: NASA's Imagine the Universe

References

https://www.physicscentral.com/experiment/physicsathome/rainbow.cfm