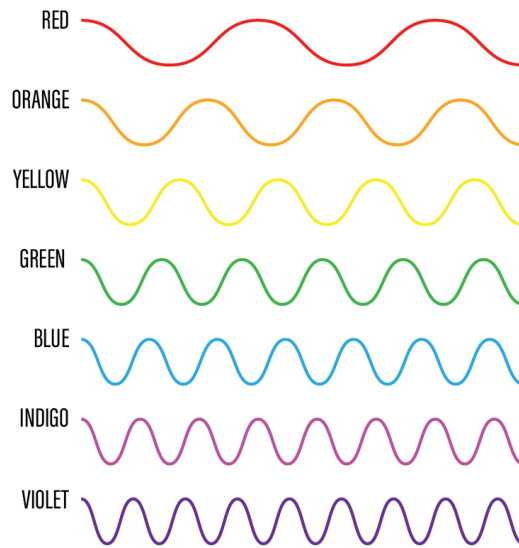


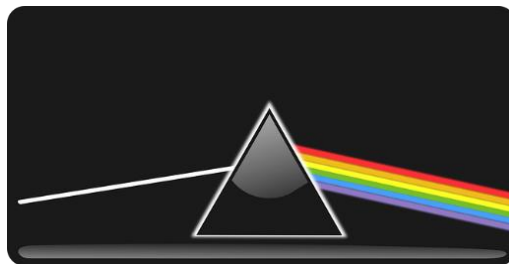
## WHY IS THE SKY BLUE?

Why is the sky blue and not orange, purple, or green? Although sunlight seems to be colorless, it is actually made up of all the colors of the rainbow. Light energy travels in waves, and every color of light has a different wavelength. As you can see in the illustration of different wavelengths below, a blue wavelength is shorter and smaller than most other colors.



Light also travels in a straight line unless something gets in the way. For example, a mirror, a prism, or even the molecules of gas in the atmosphere can all change the direction of a light wave. The Earth's blue sky is the result of sunlight being scattered in all directions by those gas molecules.

You can see the full spectrum of colors in white light if you shine a bright light, or focus sunlight, through a **prism**. A prism is a specially shaped crystal that separates light into all of its separate colors.



**An illustration of the separation of white light passing through a prism.**

You can also see this effect when light shines through raindrops. The light is bent and reflected, and a rainbow is formed.





Of all the colors in the visible light spectrum, blue is scattered more than the other colors because it has a smaller, shorter wavelength compared to most other colors. Violet has an even shorter wavelength than blue and scatters more, but human eyes are more sensitive to blue than violet. We perceive the color blue better than violet.

You may notice that the sky is not quite as blue near the **horizon** (the line where the earth seems to meet the sky). Lower on the horizon, the sunlight has been scattered many times more, and so it appears less blue or sometimes even white. The additional scattering of light as it is reflected from the Earth's surface also causes the color to fade near the horizon. The scattering of blue light in Earth's atmosphere is called **Rayleigh scattering**.

### **ACTIVITY: Let's scatter some light!**

#### **Materials**

- Two cups of water in clear glasses (one will be the **control** for comparison; the control in a science experiment is a sample that remains the same throughout the experiment)
- White soap or a small amount of milk or powdered milk
- Flashlight or other light that emits bright white light (in this example, an LED booklight was used).



1. Dissolve some soap or add a little milk to a glass of water until you have a cloudy solution. Do not do anything to the glass of clear water. We used milk in our example. You may need to experiment with



the addition of soap or milk. There seems to be a “sweet spot”. Adding too much or too little will not work as well.

2. In a dark room, shine a light at the solutions from the side onto the glass.
3. Observe.



**These images show a very light blue color in the “milky” water.**



**This glass of clear water is our control.**

*What happened?*

You should see a faint bit of sky-blue color. The reason you observed a blue color is similar to the reason the sky is blue (Rayleigh scattering), though not exactly the same.

The effect observed in your glass is called **Tyndall scattering**, which describes the scattering of light by particles in a fluid suspension. The white light from the flashlight is also made up of all the colors of the rainbow. The shorter wavelength of the blue light scatters more, and so you see a blue color.

## **ADDITIONAL RESOURCES**

Books available from the Washoe County Library System:

[\*Amazing Light\*](#) by Sally Hewitt

[\*A Book About Color\*](#) by Mark Gonyea

[\*Dazzling Science Projects with Light and Color\*](#) by Robert Gardner



[\*Exploring Light and Color\*](#) by Heidi Gold-Dworkin

[\*How Come?: Every Kid's Science Questions Explained\*](#) by Kathy Wollard

[\*Let's Make a Rainbow!: Seeing the Science of Light with Optical Physics\*](#) by Chris Ferrie

[\*The Rainbow and You\*](#) by E. C. Krupp

[\*Tell Me Why I See Rainbows\*](#) by Kathryn Beaton

[\*Why is the Sky Blue?\*](#) by Marian B. Jacobs

[\*Why is the Sky Blue?\*](#) by Wil Mara

#### Videos:

ABC Australia, "How rainbows form and what shape they really are | Colourful Weather"

<https://youtu.be/oz6yyGn-DbY>

NASA Space Place, "Why Is the Sky Blue?" <https://youtu.be/ehUIhKhzDA>

SciShow Kids, "Why is the Sky Blue? – Physics for Kids" <https://www.youtube.com/watch?v=bcVr13Fw7w8>

#### Websites:

[NOAA, SciJinks – All About Weather, Why Is the Sky Blue?](#)

[Royal Museums Greenwich, Why is the Sky Blue?](#)

