

Color Wheel #CLRWHL

Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **California Proposition 65**
Warning: This product can expose you to chemicals including lead, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



Introduction

This color wheel, sometimes referred to as a Newton Disc because of Sir Isaac Newton's vital contributions to discovering how color works, is a famous experiment used to teach **additive color mixing** and part of how color functions.

Color is used to describe our brain's interpretation of the appearance of electromagnetic radiation within the spectrum of visible wavelengths of light. Structures in our eyes called **cones** send signals to our brain for it interpret the wavelengths of light entering

our eye. There are three types of cones. Each type specializes in interpreting a different wavelength range of light. L cones see **red light**, M cones see **green light**, and S cones see **blue light**. By mixing various amounts of these three colors, the cones in our eyes allow our brains to make sense of a seemingly endless amount of color for us to see.

In the 1660s, Newton discovered that he could separate light from the sun into its component colors by directing it through a glass prism. Once the light hit the prism, he observed it separate, or **refract**, into the following colors: **red, orange, yellow, green, blue, and violet**. This led him to believe that the natural light from the sun, or **white light**, consists of many different colors of light combined. By understanding of the presence of all colors in white light, you can also understand what gives everything around you its own distinct colors. When light hits an object, pigments on its surface absorb most of the rays of light and reflect back the rays that correspond to the color you see. A red shirt, for example, looks red because its color pigments absorb every color except for the red in the white light hitting its surface. This red light is then reflected back towards your eyes where your brain then sees the shirt as red.

There are two kinds of mixing colors: **subtractive** and **additive**. **Subtractive color mixing** relies on various combinations of the colors cyan, yellow, and magenta, and it refers to the mixing of pigments. **Additive color mixing**, which is focus of this demonstration, refers to the mixing of different colors of light, and relies on combinations of the colors red, green, and blue.

The following page will explain how to use your color wheel.



How to Use

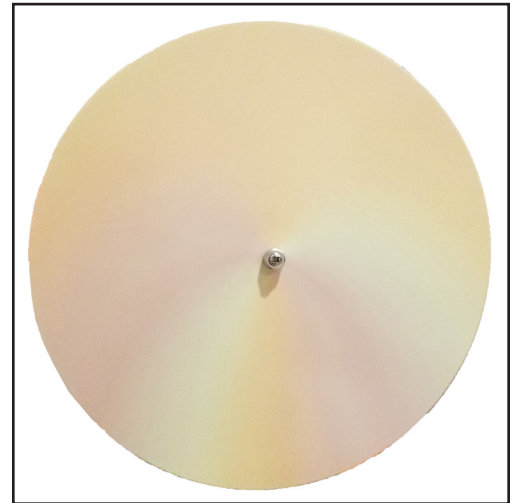
Your color wheel uses the optical illusion known as **persistence of vision** to demonstrate additive color mixing. This illusion works on the idea that your eyes continue to see images for a brief period after the light rays reflecting from them stop reaching your eye. It is one of the core ideas behind animation and film. By showing you hundreds of frames in quick succession, your eyes see and interpret the film or animation as a fluidly moving image instead of a bunch of flickering pictures back-to-back.

This demonstration involves you spinning your color wheel quickly. Much like each frame in the film described above, each colored section on your wheel persists in your vision as it spins. By spinning your wheel quickly enough, the colors on the wheel will persist and blur together. This blur illusion will add all of the colors reflecting off of the wheel together in your head, and the disc will appear to you as either white or nearly-white.

If this is your first time using your color wheel, or if it was disassembled for storage, use the assembly instructions. If it already assemble, proceed to the instructions for spinning your wheel.

Assembly

1. Remove the screw from the wheel handle, and place it through the hole in the center of your wheel. (The head of the screw should be on the colored side of your wheel.)
2. Attach the wheel handle back onto the screw. (**Note:** Be careful not to cross thread the screw into your handle. This can cause damage to your demonstration.)



Additive Color Mixing



Assembled Wheel

Spinning Your Wheel

1. Tightly wrap the loose end of the string on your ripcord around the metal cylinder on the back of your wheel. (**Note:** With the white side of the wheel facing you, do this wrap clockwise around the cylinder. This will allow your wheel to spin freely without the risk of its spin over-tightening the handle and impeding free motion.)
2. Grip the wheel handle firmly with your non-dominant hand, and use your dominant hand to grab onto the ripcord handle.
3. Pull the ripcord handle quickly so that your disc will spin fast.
4. Observe the colors on the wheel as they mix when the wheel is in motion.