

# Colored Shadows

Who knew shadows could be so colorful.

## WHAT TO DO

Hold your hand up near the white wall where the colored lights are pointed to cast a shadow. What colors do you see? Where did all those extra colors come from?

## WHAT'S HAPPENING?

A shadow is created when you block a source of light, and the shadow cast from an ordinary "white" light is of course black (or really, dark). But "white" light really contains all the colors of the rainbow, it just appears white to us because of the way our brain interprets the signals it receives from the color sensors (called cones) in our eyes. We have 3 different types of cones: one is most sensitive to red light (and colors near red); one most sensitive to colors near green; and the last type most sensitive to colors near blue light. Thus red, green and blue are called the primary colors of light. All of the other colors we can see are due to our brain mixing the intensity signals it simultaneously receives from these cones.

If we shine a red light on a white board (a white board reflects all colors equally) our brain recognizes this a red light, but if we shine equally bright red, green and blue lights on the board at the same time our brain interprets this as white light. But this is not quite the same as shining one "white" light on the board, because now each light casts a shadow of your hand in a different location. Where these shadows overlap individual colors of red, green and blue light can mix together. When only red and green light mix our brain interprets this as yellow. Similarly red plus blue appears magenta, and blue plus green appears cyan. Cyan, magenta and yellow are the secondary or subtractive colors of light (or printer's primary colors).