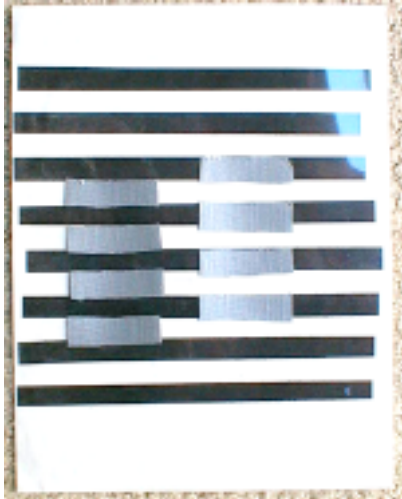


# Sliding Gray Step

*The color you see depends on what's around it*



How can you make one shade of gray look like two? By putting it against two different color backgrounds! This snack allows you to perform this sleight of hand very easily. You will be startled by how different the same color looks when its background changes.

## Materials

- 1 sheet white paper, 8 1/2" x 11" (or use white poster board if you want to make the snack a little more durable)
- 1 sheet black construction paper (size not critical, since you will be cutting it into strips)
- paper cutter (if available)
- scissors
- ruler
- glue stick
- 1 sheet transparency film for overhead projector, 8 1/2" x 11"
- gray electrical tape, 3/4 inches wide, or gray duct tape, 2 inches wide
- paper clips

## Assembly

1. Cut eight strips from the black construction paper, each 1/2" wide and 8" long.
2. Using the glue stick (or some other adhesive), glue the black strips to the white paper to form horizontal bars a half-inch apart from each other.
3. Place the overhead transparency film over the black and white striped pattern, and use paper clips to hold it in place.
4. If you are using the 3/4"-wide gray electrical tape, cut eight strips of tape 3 inches long. If you are using 2"-wide gray duct tape, it will be easiest to cut directly across the tape to create 8 strips 2 inches long and 1/2" to 3/4" inches wide, rather than to cut the tape in both dimensions.
5. Carefully place four of the gray pieces of tape on the transparency sheet so that they are centered on top of adjacent white bars. Then, about an inch away from this first

set of tape strips, center the other four tape strips on black bars, as shown in the photo at the top of the page.

6. Remove the paper clips so that the transparency film can move freely over the black and white bars.

## **To Do and Notice**

Notice that the gray strips between white bars appear lighter, while the gray strips between black bars appear darker.

Slide the transparency slowly up and down, and notice how the shades of gray change as the strips move to positions between black bars instead of white bars, and vice-versa. Notice that the strips that were light become dark, and vice-versa.

Slide the transparency so the gray strips are half on a white bar and half on a black bar. Notice that the two sets of gray strips appear the same.

## **What's Going On?**

Both sets of gray strips are the same shade of gray (they came from the same roll of tape!). Yet, when you change the position of the strips relative to the black and white bars, they seem to get lighter or darker. This illusion is not fully understood, but it seems to have something to do with the way your eye determines relative shading.

Your eye focuses an image of the striped pattern on your retina, a layer of light-sensitive cells at the back of your eye. Nerve cells in the retina begin processing the light and dark information in two different ways:

Some nerve cells in the retina take a look at the big picture, receiving information from a large area of the retina. These cells blend light from several bars and react as if the light were mixed together. When the gray strips are between white bars, you see pale gray—a mixture of white and gray. When the gray stripes are between black bars, you see dark gray—a mixture of black and gray.

At the same time, other nerve cells receive information from a small area of the retina, and are sensitive to the contrast at the boundaries of the black, gray, and white areas, allowing you to see the striped pattern.

Both of these processes—one which diminishes contrast, and one which enhances contrast—would seem to play a part in your overall perception of the sliding gray step phenomenon.

When all is said and done, however, a big idea to take away is that your perception of an object can be profoundly affected by its surroundings. In particular, the perceived color of an object can be significantly affected by its background or the colors adjacent to it.

## **Credit**

This snack is based on the Exploratorium exhibit of the same name.