

Molecular Switch Demo

Vision Box:

Materials

- 3 Colored Lights (Blue, Green, & Red)
- Vision Box
- Poster Paper (white)
- Dark Room preferably

The Demonstration:

Vision Box:

1. Introduce the eye to everybody. You also want to start this off by talking about scale. Tell them to picture their eye, which is on the cm scale. Inside their eye are rods and cones, which are Microscale. Even smaller is the retinal molecule, which is located inside of the rods and cones; these are nanoscale. This introduction brings them into the eye; hold up the picture to help them picture the interior of the eye.

2. Now that you have the participants familiar with retinal, introduce this molecule as a "molecular switch." You have a picture of retinal to use if you need it. Compare this switch to a light switch, which you turn on when you need light to see. Molecular switches obviously do not work in the same manner, however, in our eye, we need light to trigger the molecular switch.

3. Have a participant use a flashlight to shine on the retinal molecule. When light is present, retinal changes configuration, it goes from "cis" to "trans." When retinal is in trans configuration, this is the switch that sends messages to the brain enabling you to see.

Color Mixing:

1. At this point, you have already introduced cones. Tell the participants you are going to take a deeper look at cones and how they are responsible for vision. You may want to start out by asking what the three primary colors are. Remember, in optics these are red, blue, green and they are additive meaning when combined, they make white. In art, they are yellow, magenta, cyan or subtractive.

2. Going back to optics, we have cones that represent the three primary colors: red, blue and green. Now, ask for volunteers among participants for color mixing. Have 3 for color mixing, 1 for white board, one for color mixer. Make sure the person holding the color mixer is no more than 2 inches from the white board. Also, make sure the people doing the color mixing shine their light in at an angle. You want the colors to overlap, however, you don't want the lights to shine directly on top of each other.

3. Take turns here: red + blue = magenta, blue + green = cyan, green + red = yellow. red + blue + green = white. All colors seen by your eye are from overlaps of these three cones! If time permits, have the participants' shine the colored lights on objects to predict what color the object will look like under the light. For example, use a person's blue t-shirt. Have them predict what it will look like with red light, green light, and blue light. Then, have them shine the lights to see if they were right.

