

Magic Wand



Description:

A wand is waved in thin air and an image miraculously appears. Is this magic?

This simple exhibit consists of a slide projector, a slide and a white dowel rod to serve as the magic wand. When the slide is projected out into space with no screen, no image is visible. However, when the "magic wand" is waved through the beam of light, the image can be clearly seen.

What is happening? At any instant, the light is hitting the wand creating a partial image of the slide. When the wand moves, other partial images are created. The brain retains these partial images and puts them together as a single complete image, in this case the skull seen in the picture below.

Purpose:

This exhibit demonstrates the phenomenon called "**persistence of vision.**" The eye/brain systems retains partial images long enough to construct a complete picture.

Applications & Connections:

Television and motion pictures take advantage of persistence of vision to create complete pictures from a single moving dot or a succession of projected still images.



References:

This exhibit is based on recipe #110 in the [Exploratorium Cookbook II.](#)

Details for

Magic Wand

Materials needed:

- one 1/4" dowel rod 18-24 inches long
- white paint
- wooden thread spool, large wood dowel, or tape for handle
- slide projector
- slide of your choice

Instructions: This is a very simple exhibit to construct!

masking tape



1. Paint the dowel rod white. Let dry
2. Prepare an optional handle for your dowel rod "wand". (A wooden handle can be made from a wooden thread spool or a larger dowel rod with a hole drilled on one end. A simple handle can be made by wrapping tape around one end of the wand.)
3. Insert slide into projector. Aim projector so that the picture is projected into empty space so that the image does not focus clearly on a screen or wall.
4. Place a sheet of white paper in the beam of projected light to find the location where the beam is in focus. Mark this location on the floor with masking tape. (The tape should be perpendicular to the beam of light.)

5. Instruct the user to stand at the spot marked with masking tape and move the wand up and down quickly through the beam of light. They should see the image of the slide appear, seemingly in mid air.





To Do and Notice:

Hold the "magic wand" in your hand and wave it rapidly back and forth in the direction indicated by the piece of tape on the floor. Look at the side of the stick that faces the projector. What do you see?

What Is Going On:

The slide projector produces a focused image in the empty space above the tape. This image is there even when you aren't waving the wand, but you can't see it because there is nothing to reflect the light into your eyes.

When you wave the wand, the image appears piece by piece on the moving stick. Your eye-brain system retains each of these pieces for about a tenth of a second – long enough to allow your visual system to construct a complete picture. This phenomenon is called persistence of vision.