Home Made Hologram

Supplies:

- Graph paper
- Sheet of transparency paper
- Tape
- Black pen
- Red pen
- White copy paper
- Hologram template
- Ruler
- Scissors
- Invisible tape
- Smartphone
- Hologram video websites:
  - www.youtube.com/user/HOLHOcollcetion/videos
  - holhocollection.com

Instructions:

1. Ask an adult to print out the **Hologram Template** on a sheet of white copy paper. (The radius of the circle should be at least 4 inches.)
2. Cut out the circle.
3. Lay the paper circle face down on the smooth side of the transparency sheet. (You should see only a white circle. The lines are facing down.)
4. Tape the circle on the transparency sheet. Use 4 small pieces of tape, and place them on the edges of the paper circle. (This is to keep the paper circle in place for the next step.)
5. Turn over the transparency sheet so the rough side is facing up. Notice that you can now see the circle's black and red lines through the transparency sheet.
6. Carefully trace along the dotted circle with a black pen. (Use a smooth line, disregard the dots.)
7. Cut out the large circle on the transparency sheet. (You may leave the white paper attached as a guide.)
8. Using a ruler, carefully trace the lines with the red and black pens. Be sure the colors match the lines.
9. Cut along the black lines.

10. Carefully crease along the red lines.
11. Using small pieces, tape the two opposite sides together to make a prism.
12. Set your prism on the table with the smallest point downward. Is the prism stable? If not, adjust the edges and re-tape.
13. Using a smartphone, go to a website that offers Hologram images, such as www.youtube.com/user/HOLHOcollcetion/videos
14. Play the video
15. Place the transparent prism in the middle of the Smartphone.
16. Get eye level to the table, and watch the amazing Holographic images!

Photograph by Bryan Edwards www.popsci.com

The Science Behind It:

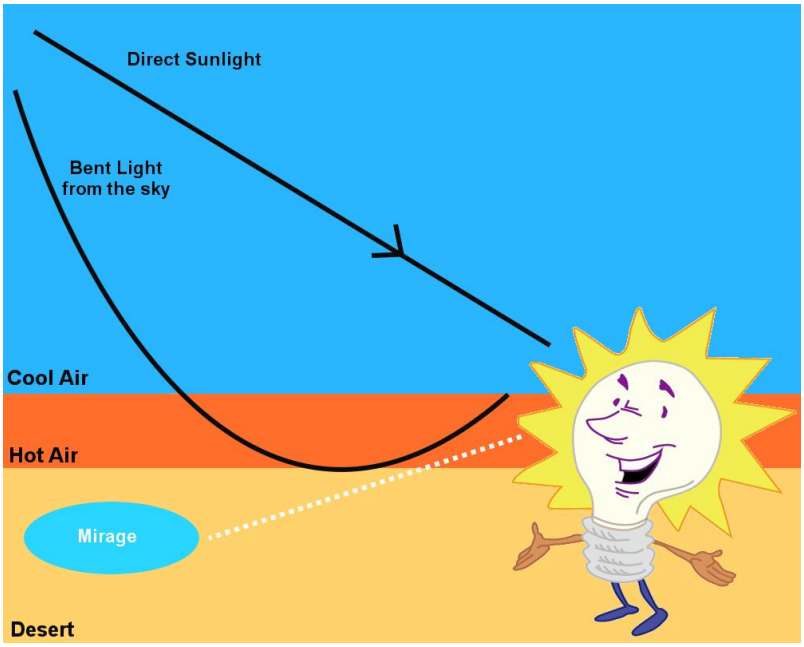
Imagine you are in a dry, hot desert with no water or shade from a tree. You are getting really thirsty. You look off into the distance and see a wonderful pool of water! But, as you get closer, all you can see is more, dry, hot sand. The refreshing pool of water you saw was actually a visual phenomenon called a ***mirage***. This ***optical illusion*** tricked your eyes and brain!

An ***optical*** illusion is caused by ***light refraction***. When light passes from one medium to another (from air to water, for example) – light bends! Light refraction is when light bends.

Light Refraction

Light waves from the Sun travel at blistering speeds (186,000 miles per second) through space. Light reaches Earth in just over 8 minutes! The light beams travel in a straight line towards Earth because there is nothing to slow it down. However, when light travels through Earth's atmosphere, it slows down. (Think of a soccer ball zipping down a flat sidewalk. It moves really fast! But, when the soccer ball rolls onto the grass, it slows down. The resistance of the grass is like the thick resistance of the atmosphere. The light waves slow down in the Earth's atmosphere.)

When the ground is very hot, and the air is cool, a warm layer of air sits on top of the ground. When light travels from the Sun through the cold air into the layer of hot air atop the ground, the light is ***refracted***, or bent. The light is refracted from the sky, hits the ground and goes upward into a U-shaped bend. Our brain thinks the light has travelled in a straight line, but we are actually seeing refraction from the ground. We see a shimmering mirage directly in front of us. This mirage is created by light refraction.



An ***optical illusion*** is a visual phenomenon. Optical illusions use light, color and patterns to create images that mislead our brains. Our brains misinterpret the image that the eyes perceive. Basically, optical illusions trick our brains into seeing something that isn't real!

Our eyes are amazing light detectors and constantly capture an impression of the world around us. Our brains work very hard to keep a permanent record of these images. But, once that view is gone, our brains cannot recreate those images. Our eyes are constantly seeing new things! This is why photographs are so important, because they capture and store these "dead" images.

Holograms are 3-dimensional images on 2-dimensonal (flat) surfaces that are "alive." If you look at holograms from different angles, you see the objects from different perspectives. They seem to move. Holograms appear to be real objects,

but they are actually created when light and your brain work together to create clear, 3-D images.

To better understand how a hologram is different from a photograph, place an object, such as an apple, on the table. Look at the apple. Light reflects off the surface of the apple into your two eyes. Your brain works to merge the two images (from both eyes) into one 3-dimensional image. Now tilt your head to the side, and look at the apple. Does it look different? The light reflecting off the apple has changed. When you tilt your head, light waves travel on new paths towards your eyes. You may notice that parts of the apple are darker or lighter. You can see a different perspective with your head tilted. Your brain is constantly recalculating the images.

Holography was first conceived and produced in 1948 by Dr. Dennis Gabor. Dr. Gaber received the Nobel Prize in Physics for his invention of holography.

Download More Experiments

Make a Reservation

Become a member of the High Touch High Tech Community!
Post pictures, leave comments, and stay up-to-date with new programs, fun post-program experiments, current events & more!

High Touch High Tech®

Science Experiences That Come To You™

Hologram Template

Cut along the solid black lines and crease along the red lines.