

Optical illusion and our brain

Worksheet 1 Teacher's notes

1. How do we see? Go to

<http://www.childrensuniversity.manchester.ac.uk/interactives/science/brainandsenses/eye/>

to go on a journey inside the human eye.

Students' own answers- check the understanding

2. What are optical illusions? What types of illusions do you know? Do you know any optical illusions that occur in the natural world? Go to <http://science.howstuffworks.com/mirage2.htm> and read about mirage.

What is it and what causes it?

*Mirages occur when there is a rapid shift in **air density** in the atmosphere -- when the air at one level is a lot hotter than the air at an adjoining level.*

This commonly occurs on summer days, when an asphalt road that has been baking in the sun heats the air directly above it, creating a sharp shift in air density levels near the ground. As light passes between the different levels, it bends, creating mirages.

Normally, sunlight bouncing off an object (let's say a car) reflects in all directions. You see the car when your eyes detect this light. On an overcast day, you only see the light that bounces off the car straight toward you. This is how you see things most of the time.

On a sunnier day, the light heading straight toward you acts just like it usually does -- it doesn't move through different layers of air density, so it doesn't bend much. But some of the light that would normally hit the ground actually bends in midair because it moves from the cooler, denser air level into the hotter, less dense air right above the ground. As you can see in the diagram below, this produces an interesting effect.

*The lower part of the light wave passes between the layers first, so it speeds up an instant before the upper part. The light that would ordinarily go straight to the ground bends upward and travels to your eyes. The effect is that you see the image of the car twice: once on top of the road, and once in the road surface. The light from the lower part of the car bends farther upward than the light from the top of the car, so the mirage image looks like a reflection. Your brain assumes that the light is traveling in a straight line, so it seems like there's a mirror image beneath the normal image. This mirage looks just like a puddle of water on the road because, like a puddle of water, it's reflecting what's above it. This sort of mirage is called an **inferior mirage** because it appears below the horizon.*

***Superior mirages** are mirages that form above the horizon. This occurs when there is a cooler level of air lower than a warmer level of air, typically over icy landscapes or very cold water. This mirage causes you to see a scene much higher than it should be. For example, you might see a mass of land or a boat floating in midair. This situation might also distort images, making a boat seem much taller than it actually is.*

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3. Do you think that the optical illusions are caused by the eye or by the brain ?

<http://phys.org/news145621013.html>

<http://abcnews.go.com/Health/EyeHealth/optical-illusions-eye-brain-agree/story?id=8455573>

❖ What is the difference between an optical and a visual illusion?

Visual illusions occur due to properties of the visual areas of the brain as they receive and process information. In other words, your perception of an illusion has more to do with how your brain works -- and less to do with the optics of your eye. Although people popularly call some brain teasers "optical illusions," this might not be the best term for them, as scientists make a distinction between optical illusions and what they call visual illusions. An optical illusion suggests that the illusion arises because of some properties of the eye, Bach pointed out. But since optical illusions are rare, a better and more accurate term is "visual illusions," because this helps to explain why these perceptions happen.

❖ Can you give examples of optical illusion?

A good example of an optical illusion – one that actually occurs inside the eye – is floaters. Floaters are small specks, spots or shadowy shapes that seemingly float in your field of vision. To some, they look like a bright white snow or flashes of light. Floaters are caused by tiny irregularities in the fluid that fills the eye. In other words, they're real. They become more common as one gets older.

❖ What are other examples of real life illusions?

There are other real-world examples of illusions. Pilots might encounter visual illusions while in flight, such as a false horizon, or when landing, such as a narrow runway. They are trained to recognize and ignore these illusions so they can safely fly their aircraft. But while some illusions may pose a safety threat, others may actually be used as safety measures. On Chicago's Lake Shore Drive, for example, visual illusions have been used to control drivers' speed on a hazardous curve. Stripes on the road are painted closer together as drivers approach the sharpest part of the curve. The illusion makes drivers think they're speeding up -- so they slow down and, it's hoped, have fewer accidents.

4. Have a look at some of the best visual illusions:

<http://www.optics4kids.org/home/content/illusions/>

<http://illusionoftheyear.com/2009/the-break-of-the-curveball/>

<http://illusionoftheyear.com/>