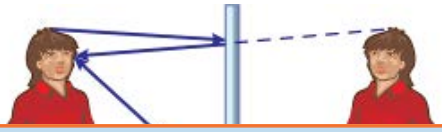
MIRRORS AND LENSES

Overview

The **reflection** of light can occur in different ways.

Since a mirror has a very smooth surface, all the light bouncing off of a mirror reflects in a **regular** manner. In a plane or flat smooth mirror, the image that forms is **virtual** which means it doesn't really exist. In the picture below, while the image is the same size as the object and is upright like the object, its left and right sides are reversed and it seems to be behind the mirror.



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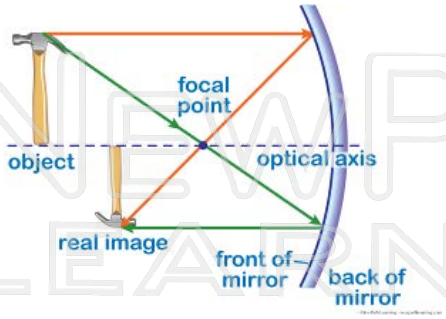
can be either virtual or real. A **real** image is one that looks upside down and can be smaller or larger than the object. Whether the image is virtual or real depends on how far the object is from the concave mirror.



LESSON CHECKPOINT: What kinds of images form off of a concave mirror?

Light Refraction

Refraction or the bending of light occurs when light enters at an angle through a different medium

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With the concave lens, the light rays get spread out and never form a focal point. The result of this is that **convex lenses** can form either real or virtual images depending on how far the object is from the lens. On the other hand, since light rays passing through a **concave lens** never meet, the image formed is always virtual.

Human Vision

Without our eyes and brain, vision would not be possible. The eye, shown below, takes in light through the small opening in the eye called the **pupil**. The light then goes through a convex lens (C) where it is focused exactly on the **retina** (A). Here, many sensitive nerve endings take the focused light image and convert it to a nerve message (B) which goes to the vision center in the brain. The brain interprets this nerve impulse as a vision.

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- **Microscopes** use a combination of two lenses to magnify a small, close object.
- **Cameras** use lenses to focus images to record on film or in digital format.
- Without lenses or mirrors, **lasers** use **coherent** light of only one wavelength to create precise beams that can be used to measure, to cut material, or even as a surgical tool.
- **Optical fibers** are thin strands of glass that carry confined laser beams. Because these fibers can carry the laser over very long distances they are extremely useful in communications technologies. Many homes have fiber optic service that brings in internet websites and television pictures. These fibers are also used to look inside our bodies. These fibers are so thin, doctors do not have to make large incisions in order to see inside the human body.