Concave Lens

by Matt Williams on December 10, 2010

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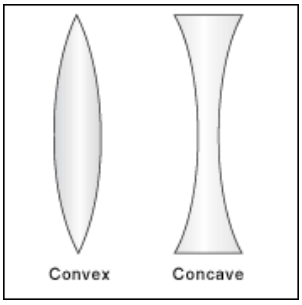

Concave & Convex Lens

For centuries, human beings have been able to do some pretty remarkable things with lenses. Although we can't be sure when or how the first person stumbled onto the concept, it is clear that at some point in the past, ancient people (probably from the Near East) realized that they could manipulate light using a shaped piece of glass. Over the centuries, how and for what purpose lenses were used began to increase, as people discovered that they could accomplish different things using differently shaped lenses. In addition to making distant objects appear nearer (i.e. the telescope), they could also be used to make small objects appear larger and blurry objects appear clear (i.e. magnifying glasses and corrective lenses). The lenses used to accomplish these tasks fall into two categories of simple lenses: Convex and Concave Lenses.

A concave lens is a lens that possesses at least one surface that curves inwards. It is a diverging lens, meaning that it spreads out light rays that have been refracted through it. A concave lens is thinner at its centre than at its edges, and is used to correct short-sightedness (myopia). The writings of Pliny the Elder (23–79) makes mention of what is

arguably the earliest use of a corrective lens. According to Pliny, Emperor Nero was said to watch gladiatorial games using an emerald, presumably concave shaped to correct for myopia.

After light rays have passed through the lens, they appear to come from a point called the principal focus. This is the point onto which the collimated light that moves parallel to the axis of the lens is focused. The image formed by a concave lens is virtual, meaning that it will appear to be farther away than it actually is, and therefore smaller than the object itself. Curved mirrors often have this effect, which is why many (especially on cars) come with a warning: Objects in mirror are closer than they appear. The image will also be upright, meaning not inverted, as some curved reflective surfaces and lenses have been known to do.

The lens formula that is used to work out the position and nature of an image formed by a lens can be expressed as follows: $1/u + 1/v = 1/f$, where u and v are the distances of the object and image from the lens, respectively, and f is the focal length of the lens.

We have written many articles about concave lens for Universe Today. Here's an article about the telescope mirror, and here's an article about the astronomical telescope.

If you'd like more info on the Concave Lens, check out NASA's The Most Dreadful Weapon, and here's a link to Build a Telescope Page.

We've also recorded an entire episode of Astronomy Cast all about the Telescope. Listen here, Episode 150: Telescopes, The Next Level.

Sources:
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