

Some Applications of Lenses

Microscopes

1600's: Microscopes enabled investigators to see new forms of life, and provided a window into both medicine and the germ theory of disease.

Soon after they were in use, humans made more progress in medical science than had been made in the thousands of years prior to their invention.

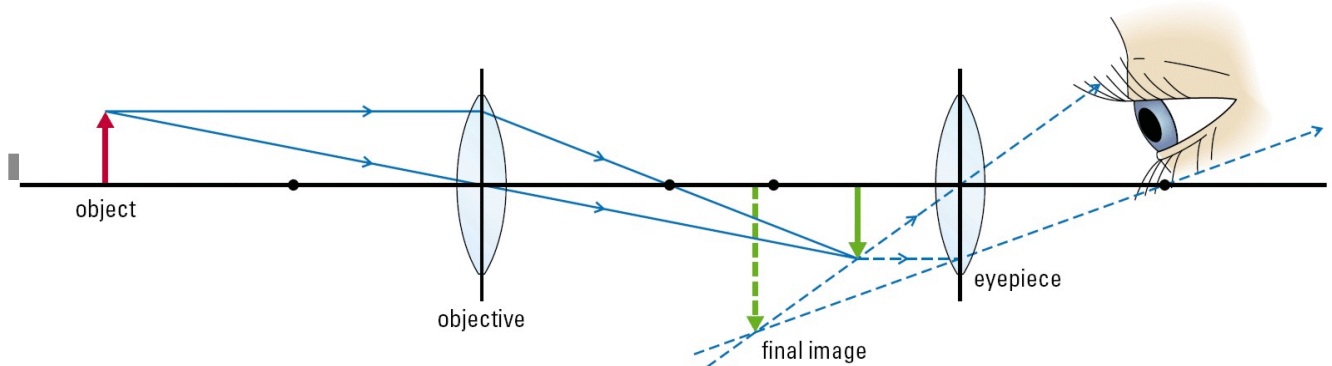
Microscopes gave investigators the tools to observe and make inferences about what they saw.

It became possible to see that organisms were made up of smaller parts we now call cells, which were made up of even smaller components.

(The suffix '—scope' is derived from the Greek verb 'to view'. Nowadays, a scope means an instrument for viewing. The prefix 'micro-' means tiny, 'tele-' means distant, and 'peri-' means around or above.)

A simple microscope or magnifying glass consists of a single converging lens. The object to be magnified is placed inside the focal length. This produces a larger, upright and virtual image.

A compound microscope uses two converging lenses of short focal length, arranged as shown below:



The specimen is placed on a glass slide and then illuminated with a light source. Light travels through the **objective lens**, this is a converging lens at the bottom of the tube close to the specimen.

The objective lens produces from the small object, an inverted, enlarged real image, which acts as the object for the second lens, called the **eyepiece**.

Since the new object is located inside the focal length of the eyepiece, the eyepiece acts as a magnifying glass, producing a virtual, enlarged image, of the real image.

The focussing of the final image is achieved by mounting the eyepiece in a tube that can be adjusted up and down by means of a geared wheel.

In most compound microscopes, two or more objective lenses of different focal lengths are mounted on a rotating disc, called the nosepiece. Each has a different power of magnification.

(The magnification of a compound microscope may be determined by multiplying the magnifying power of the eyepiece by that of the objective lens.)

Telescopes

A telescope is an optical device that provides enlarged images of distant objects.

There are two main reasons why it is difficult to see distant objects:

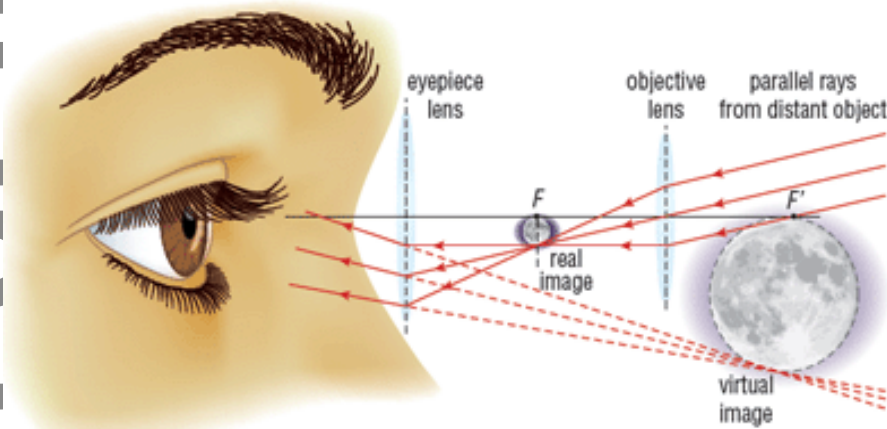
1. Any distant object appears very small,
2. The further away an object is, the dimmer the object appears.

The **Astronomical** telescope, (**Refracting** telescope) is constructed from two converging lenses. The objective lens has a long focal length and the eyepiece has a short focal length.

Since the telescope is used to view distant objects, the rays of light are nearly parallel when they enter the objective lens.

The objective lens forms, a real image just inside the principal focus of the eyepiece.

The eyepiece acts as a magnifying glass, producing a virtual image of great magnification. The image is inverted, but for astronomical purposes this does not matter.



Reflecting Telescopes: uses mirrors to reflect and form an image

