

Telescopes

Introduction

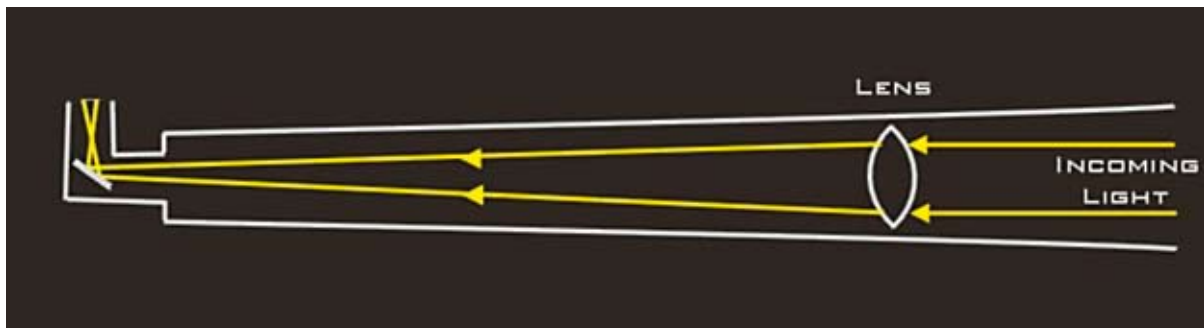
Telescopes collect and magnify light from faint and distant objects, allowing us to look further into space than can be seen with the naked eye. The first telescopes were used in the early 17th century and there are three types now used today: Refracting, Newtonian and Schmidt-Cassegrain telescopes. The image they produce can be viewed through an eye-piece or the light collected by a detector for analysis.

Types of Telescope

There are three main types of telescope. These are refracting telescopes, Newtonian telescopes and Schmidt-Cassegrain telescopes.

Refracting Telescopes

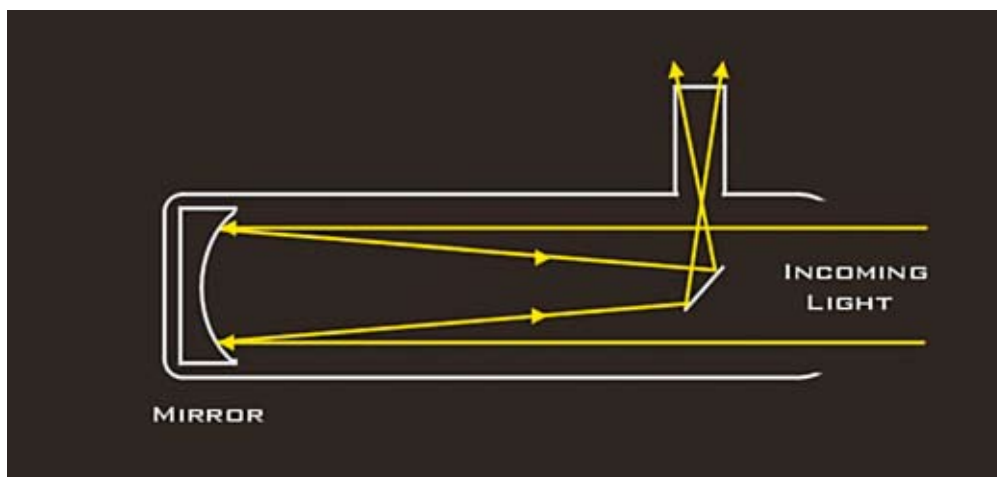
Refracting telescopes use lenses to gather light and focus it to a point. This was the first type of telescope to be invented, in the early 17th century, and was first used for serious astronomy by Galileo, 400 years ago. The images produced are upright, which makes refractors good for ground based observations.



Modern refracting telescopes use two or more lenses to reduce an effect called chromatic aberration that causes different wavelengths of light to focus at different points. Refractors with two lens elements are called achromatic refractors. Apochromatic refractors use three or more lenses, at least one of which has special properties, to completely eliminate chromatic aberration. These telescopes give the best quality image, and are very good for photography, but they are also very expensive for their size. Refractors also need to be longer than Schmidt-Cassegrain telescopes for the same aperture size and are hard to build on large scales.

Newtonian Telescopes

Newtonian telescopes are reflectors. They use a mirror, rather than a lens, to focus light from distant objects. Reflecting telescopes were first invented by Isaac Newton to avoid the problems of chromatic aberration found with refractors. They use a curved mirror to focus light onto a second flat mirror, from which the light is directed to an eye-piece.



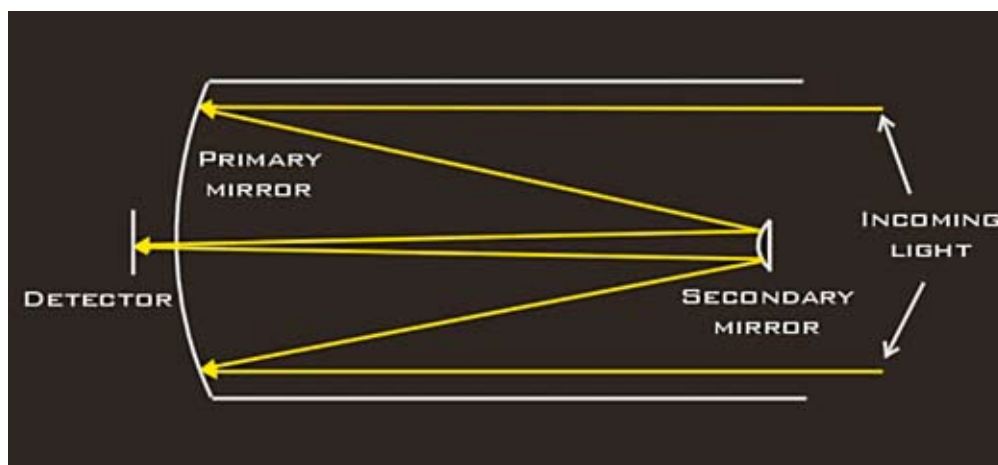
In order to work properly, Newtonian telescopes must have their mirrors perfectly aligned. This is called collimation, and is necessary to make sure that the optics of the telescope are effective. Reflectors are the least expensive telescopes for their aperture size and large reflectors are easier to build than refractors of the same size. They are, however, still longer than an equivalent Schmidt-Cassegrain telescope.

Dobsonian telescopes are Newtonian telescopes held on a special mount by friction. They are very cheap to build and simple to operate, making them very popular with beginners and amateur astronomers

Schmidt-Cassegrain Telescopes

Schmidt-Cassegrain telescopes (SCT) have the advantage that they are much smaller than other types of telescope because they use a series of mirrors to fold the light path. All professional telescopes, including the Faulkes telescopes, are now of the SCT design.

SCTs use a spherical primary mirror to focus the parallel rays of incoming light onto a convex secondary mirror. This then reflects the light back through a hole in the primary mirror to the eyepiece or detector.



The only drawback with these telescopes is that the shape of the primary mirror introduces spherical aberration. This happens because a spherical mirror will focus the light to slightly different points, blurring the image. This can be corrected either by using a corrector plate or by using a parabolic primary mirror instead of a spherical one, although these are more expensive to make.