How Does a Telescope Work?

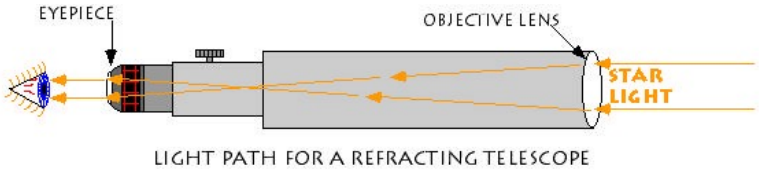
Telescopes do three things: **Magnify**, **resolve**, and **gather Light**.

Magnification is by far the best known of these three functions, but it is the least important. Stars are so far away, no matter how much you magnify them, they still look the same, the only difference is they get dimmer as the magnification goes up. Magnification is most useful for viewing planets and the Moon.

What really allows you to see distant objects better is to make them brighter, this is done by **gathering light**. The larger in diameter the lens or mirror, the more light it's able to capture, and the brighter the object appears. This enables you to see much more than you can by simply magnifying the view. Any telescope can change its magnification by simply changing the eyepiece. The easiest way to understand light gathering is to think about the pupil in your eye. On a sunny day it gets small. In the dark it gets big. The larger pupil that lets more light into your eye so that you can see better in the dark, but your eyes can only get so big. With a telescope that has an aperture of 8 inches, it essentially makes your pupil 8 inches in diameter! This will allow you to see very faint objects.

Resolution is perhaps the most difficult to understand. At first it may seem to be the same as magnification, but it's not. Resolution is the ability to see fine detail. A telescope's resolution is determined by its aperture, not its magnifying power. For example when you view a double or binary star with an 8 inch telescope you can clearly see it is two stars at say 50 X, but if you look at the same star system with a 4 inch telescope at 50 X again, you may not be able to separate the pair of stars, even though it's the same magnification. It requires more light to be able to split those close binary star systems. The larger the aperture of a telescope, the better the resolution and the finer the detail that you will be able to see.

Refracting Telescopes



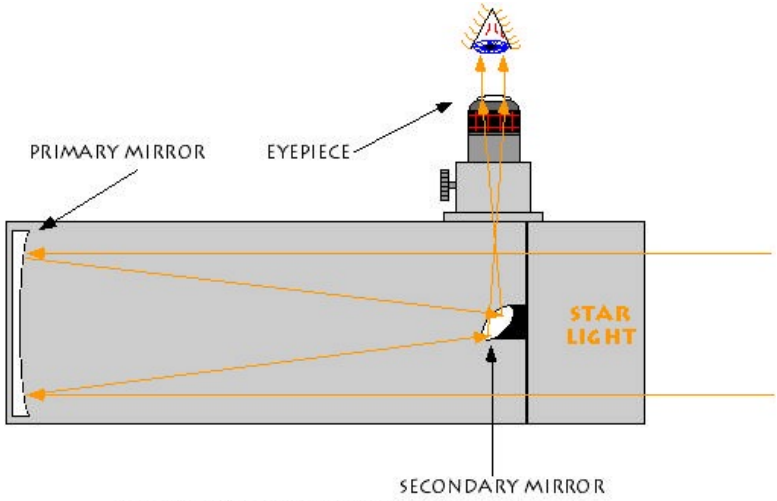
LIGHT PATH FOR A REFRACTING TELESCOPE

Refracting Telescopes use a lens to gather light and bring the image to the eyepiece. These are the type of instruments that most people often think of when they think of a telescope. Galileo used a refractor when he first viewed the craters of the Moon and Jupiter's four largest moons. Refractors are fairly maintenance free and generally provide superb images of the moon, planets, star clusters and general sky gazing.

Strengths: Great for viewing planets, the moon, star clusters, and splitting binary and multiple star systems. They have the classic telescope appearance.

Weaknesses: Because of their small aperture they are less well adapted for viewing very faint objects such as galaxies and nebulae. Quality refractors are expensive, beware of cheap refractors!

Reflecting Telescopes



LIGHT PATH FOR A REFLECTING TELESCOPE

Reflecting Telescopes use a mirror to gather light and bring the image to the eyepiece. These telescopes are often referred to as *Newtonians* because they were first conceived of by Isaac Newton. Reflectors utilize a parabolic mirror that reflects the image to a focal point. Since the mirror reflects the image back towards the source, a small secondary mirror set at an angle reflects the light perpendicular to the tube so that the eyepiece is attached to the side of the telescope, rather than the end. They are among least expensive telescopes and provide the most light-gathering abilities for the dollar, this makes reflectors are a favorite choice of many amateur astronomers.

Reflecting telescopes continued . . .

Strengths: Great for viewing faint objects such as galaxies and nebulae, reflectors also provide good general viewing of clusters, planets, the moon and binaries. Affordable.

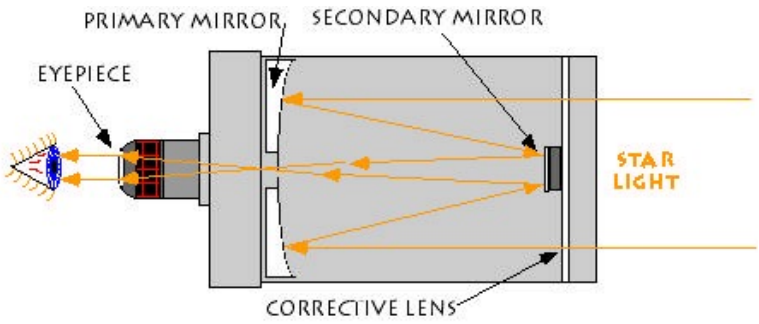
Weaknesses: They tend to be more bulky to move about and store. They also require periodic maintenance to keep the optics properly aligned.

Catadioptric Telescopes

Catadioptric Telescopes use a combination of both lenses and mirrors. The most common variety of *cats* would probably be the Schmidt-Cassegrains. They come in many sizes, but the 8" variety is by far the most popular. Today many use computer GOTO systems that will find sky objects for you.

Strengths: Great for viewing all objects in the sky. They provide good aperture and magnification. They are compact and relatively easy to move about. Abundant peripherals make it easy to dabble in astrophotography or computerization. Low maintenance.

Weaknesses: Relatively expensive.



LIGHT PATH FOR A CATADIOPTRIC TELESCOPES