Finder Scopes

Astronomical telescopes have a narrow field of view and are therefore difficult to point. Most are equipped with a smaller, low power scope attached to the larger scope and aligned to its axis. The finder scope has a larger field of view that aids in finding celestial objects.

Some say a good and proper alligned finder is more important than the telescope. Think about it ;-)

Telescope Mountings

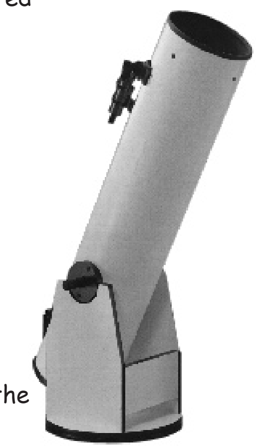
A good telescope mount must be stable . A pier anchored permanently into the ground is best, but a tripod provides portability. Check that the tripod is sturdy enough to support the scope without undue wobble.

Altazimuth

The altazimuth mount is the simplest, cheapest and lightest. It can be electronically driven. A popular version is the Dobsonian, which can be used to mount reflectors of large aperture.

Equatorial

The equatorial mount is polar aligned so that tracking of stars is accomplished with a single motion, usually clock driven. The most popular equatorial mounts are the German (figure 2) and the English Fork (figure 6).



Dobsonian Mount

What my **FIRST TELESCOPE** should be: Portable, low priced, easy to use, smooth mounting. Remember to put magnification at the <u>bottom of your list</u> and light gathering power <u>at the top of your list</u>. . . . kinda.

Instrument	Price Range	Apperature	Portability	FWAS Rating / comments
*Binoculars	$100-$400	2 inch(50mm)	Excellent	★★★★★ wide field! :-)
Astroscan	$410	4-1/4 inch :-)	Excellent	★★★★★ easy to use :-)
Dobsonian	$400-$600	8 inch :-)	Good	★★★★ serious 1st scope
*Reflector	$400	4-1/2 inch	Fair	★★★ equatorial mount :-(
*Schmidt/ Cassagrain	$2000-$3000	8 inch :-)	Fair	★★★ intensive learning
*Refractor	$350	3 inch f/5	Excellent	★★★ equatorial mount :-(
*Refractor	$200	2.4 inch f/15	Excellent	★★ shakey mounting :-(

*Available locally

The worst telescope is one that is not used!

The SECOND things you should know about TELESCOPES & BINOCULARS

The Fort Wayne Astronomical Society, Inc.

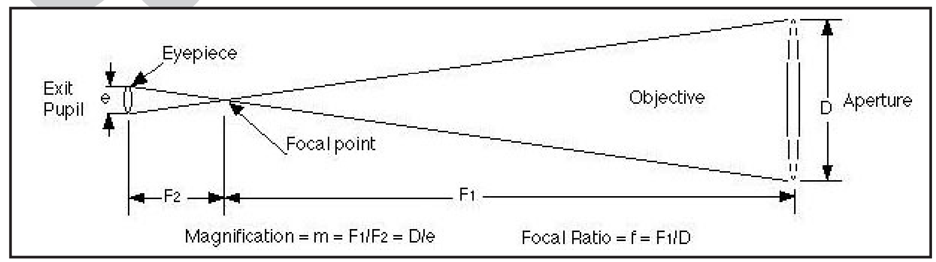


Figure 1

Optics In General

Don't be intimidated by a telescope. Learning about a few optical principles and terms will help you choose the best telescope or binoculars for your needs. Figure 1 shows a diagram of a simple optical system having an objective lens and an eyepiece.

Objective Diameter

The most important feature of any optical instrument is its ability to gather light. The larger the diameter the better. The aperture (diameter of the objective lens or primary mirror) may be specified in millimeters, inches, or meters (for large observatory telescopes).

Magnification Power

The Magnification (or Power) of a scope or binocular may be calculated (see Figure 1) as $m = F1/F2$, where F1 is the focal length of the objective and F2 is the focal length of the eyepiece. But magnification isn't everything! It can also be calculated as $m = D/e$ (see Figure 1), where D is the diameter of the objective and e is the diameter of the cone of light (called the exit pupil) exiting from the eyepiece. The higher the magnification, the dimmer the image. A useful magnification limit for any instrument is about 50 times D (inches) under rare ideal conditions, but 30 times times diameter is more common under Indiana skys.

Image Inversion

In a simple optical system as shown in Figure 1 the image seen through the eyepiece will appear inverted (upside down and reversed). For astronomical purposes this is not a major problem, but for terrestrial use (spotting scopes and binoculars) mirrors and prisms may be used to correct (up/down or left/right) the image.

Eyepieces

The diagram of Figure 1 shows a simple convex lens as an eyepiece. Many eyepieces are made from multiple lenses using different kinds of glass. Some are built into the scope, as in binoculars and spotting scopes. Others are interchangeable to allow for choosing diferent powers of magnitude. They also come in several diameters (.98, 1.25, and 2 inches are industry standards), but 1.25 inches is most common.

Binoculars

Binoculars are specified by power and aperture (such as 7 x 50, indicating 7 power and 50mm diameter objective). For astronomical work the 7 x 50 binocular yields an exit pupil of 7.1mm, matching the pupil diameter of a dark-adapted eye. In daytime a 5 x 35 binocular is lighter and gives an exit pupil of 5mm. In purchasing binoculars stay away from extreme prices. From $75 to $400 you get what you pay for. Look at the objective lenses for two reflections (green, blue, purple, amber, not white) that show coated optics (better images). Stay away from "Ruby" coatings! Check the eyepieces for similar coatings. The exit pupils should be round, not a pincushion shape (from cheap prisms). All moving parts should work smoothly, without binding.

The Refractor Telescope

A refracting telescope (similar to figure 2) uses an objective lens to focus the incoming light. Its performance can be the best or the worst, depending on how the objective lens is constructed. The best objectives are made from multiple air-spaced lenses of different kinds of glass (flint and crown) to reduce color aberation, and are coated to reduce reflections. The best refractors give crisp high-contrast images, best for viewing the moon or planets. The sealed tube is rugged, requiring little maintenance. But refractors cost the most per inch of aperture, and so are usually of smaller diameter with f ratios of 15 to 30 or higher.

Figure 2

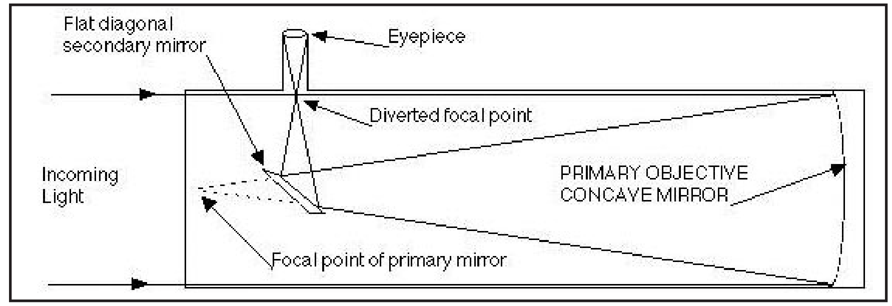


Figure 3

The reflector Telescope

A reflecting telescope (also called Newtonian) uses a mirror as the objective to focus the incoming light (Figure 3). It is the most versatile of telescopes, offering good compromises between light grasp, contrast, image sharpness, and a wide range (f3 to f10) of focal ratios. Optical quality can be high and the mounting can be low to the ground (Figure 4). Best of all, the reflector can give the most performance for its cost (and many build their own). However, the reflector requires more care and maintenance, can be affected by internal air currents, and can be cumbersome to store, transport and set up.

Figure 4

Folded Optics (Cassegrain)

Some telescopes, called "catadioptric", use a combination of mirrors and lenses (Figure 5) to compromise between aperture, f ratio, image quality, and portability. One such, the Schmidt Cassegrain (Figure 6), has achieved great popularity for its versatility and adaptability for astrophotography. However its cost is more than for a Newtonian, and internal adjustments may require factory repair.

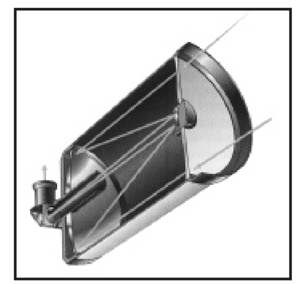


Figure 5

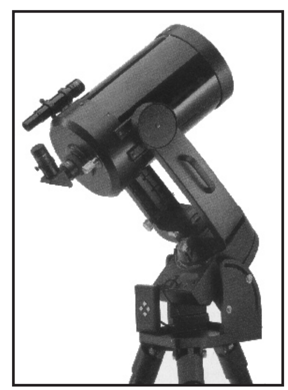


Figure 6