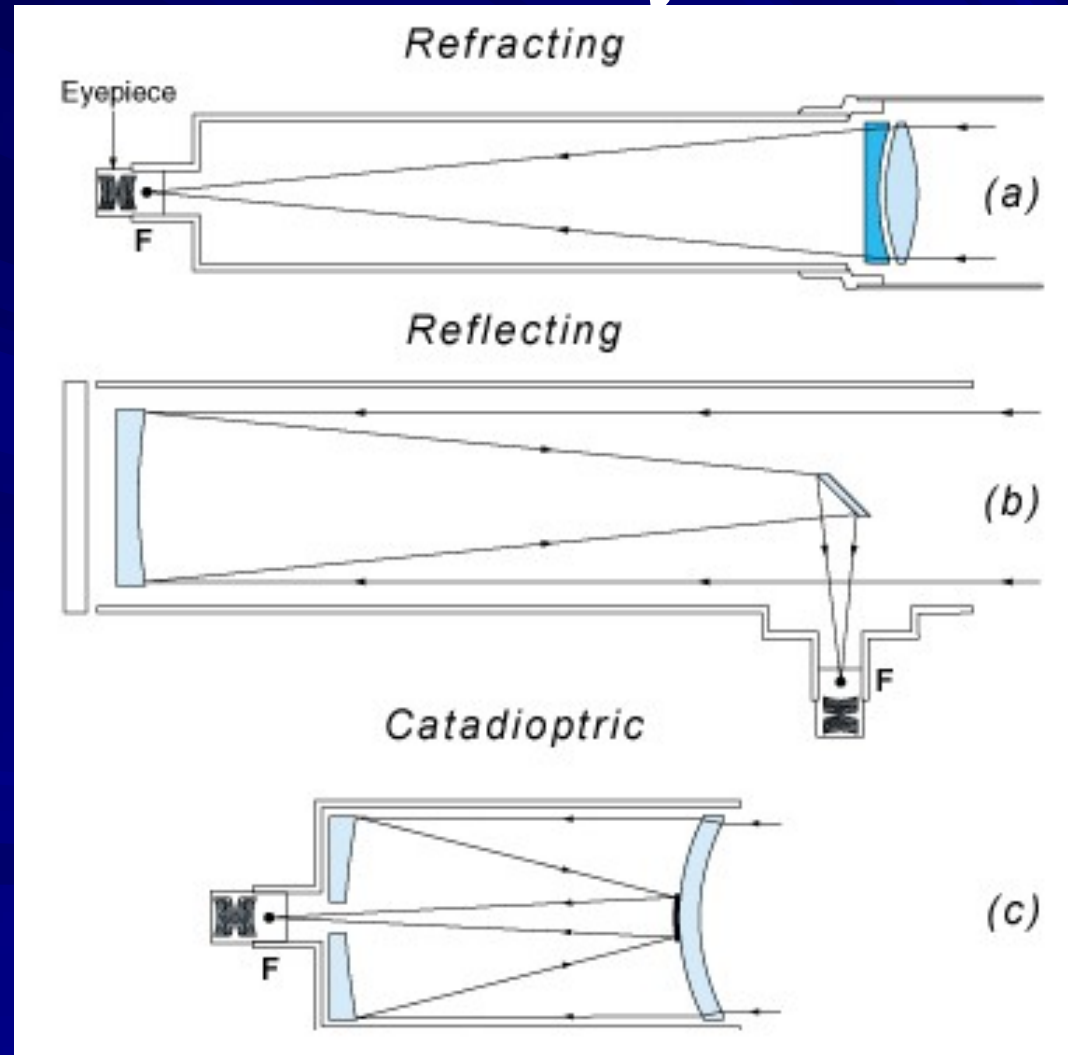


Telescopes come in three basic styles



Refracting telescopes use lenses



Refractors are either achromatic (some color distortion) or apochromatic (very little if any color distortion). Apo refractors use two or three lenses of high quality material to correct for chromatic aberration

APSU's Refractors

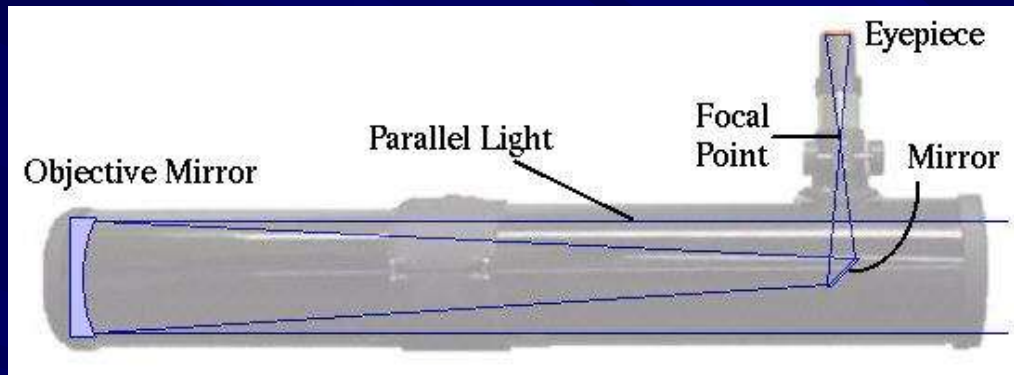
APSU owns three refractors, one achromat and two apochromats

The Orion 100mm apochromatic refractor on a Sirius mount is kept at the observatory while the 120mm apochromat on an Atlas mount is kept on campus



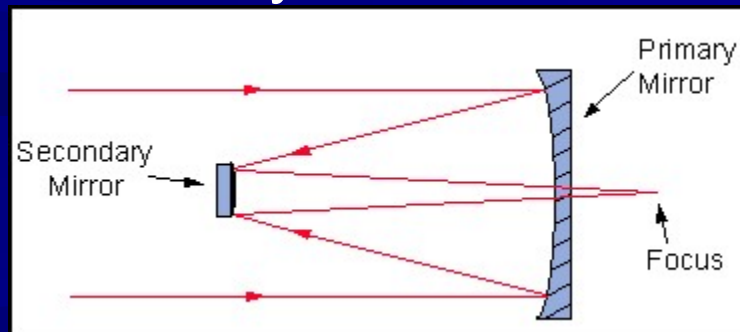
The 60mm achromat on a Celestron mount was purchased for the 2018 eclipse and is kept at the observatory

Reflecting telescopes use mirrors



A Newtonian reflector uses a concave objective mirror and a flat secondary mirror.

A Cassegrain reflector uses a concave primary and a convex secondary mirror



All the really big telescopes in the world are reflectors

APSU has two types of reflectors

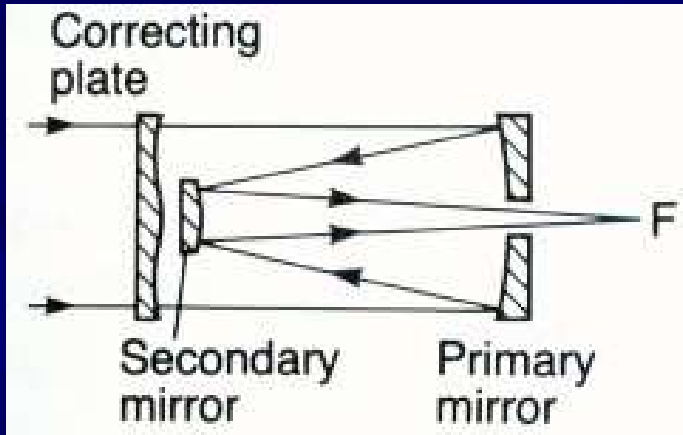


The Orion 8" Dobs is a Newtonian telescope on an alt-az mount



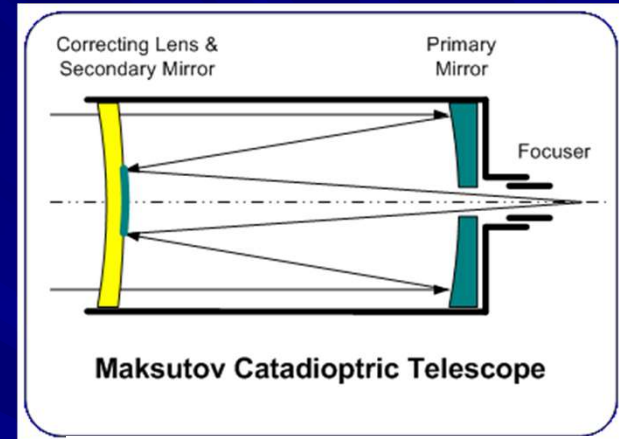
The 8" Ritchey-Chretien Cassegrain telescopes on Orion Atlas mounts are the workhorse of the department

Catadioptric telescopes use mirrors and “lenses”



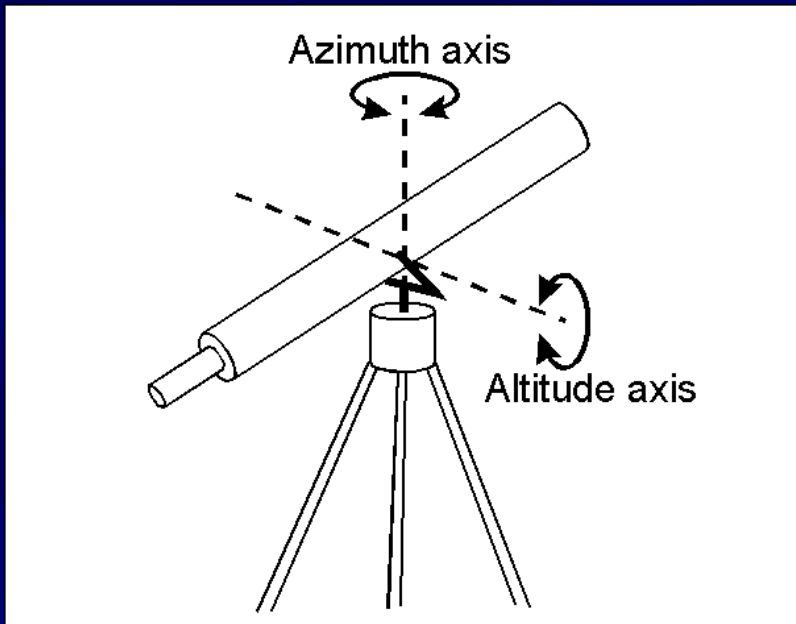
Schmidt-Cassegrain

APSU has two Meade LX-200 Schmidt-Cassegrain telescopes that are currently not used

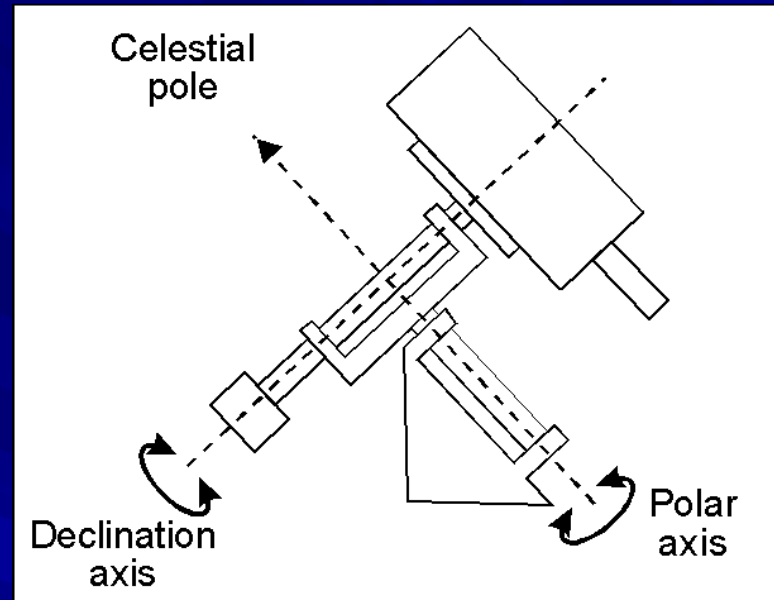


Maksutov-Cassegrain

There are two general types of telescope mounts



The Alt-Az mount moves in altitude (height above the horizon) and azimuth (angle around the horizon)



The Equatorial mount moves parallel to and perpendicular to the celestial equator

Different types of Alt-Az mounts



The Dobsonian mount, popularized by John Dobson, is inexpensive

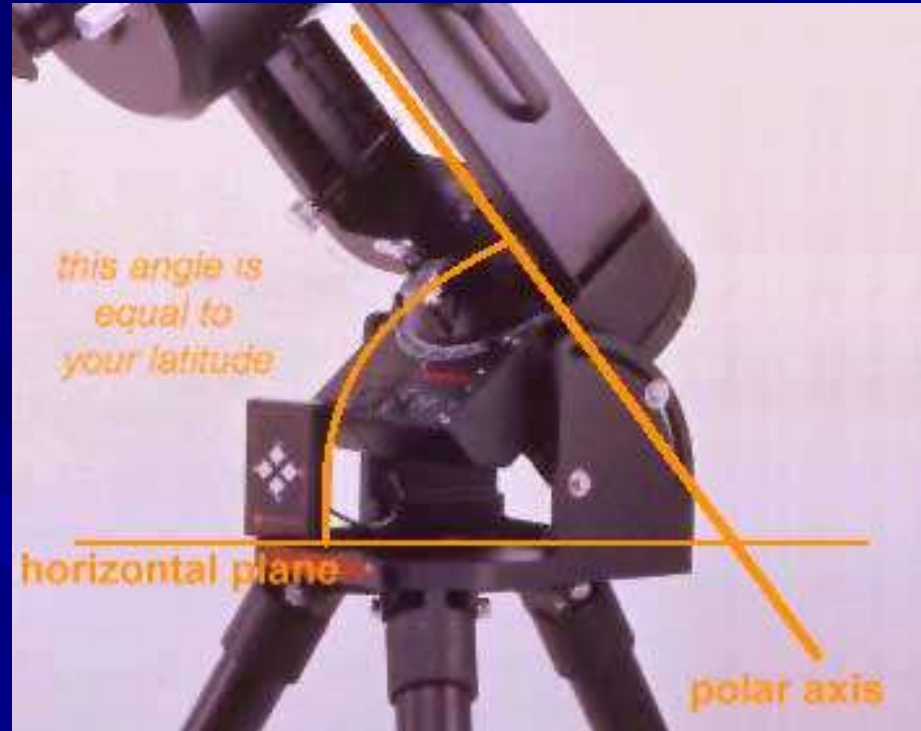


The fork alt-az mount is the standard for most catadioptric telescopes

Equatorial mounts track objects parallel to the celestial equator



The German Equatorial aligns one axis parallel with the celestial pole



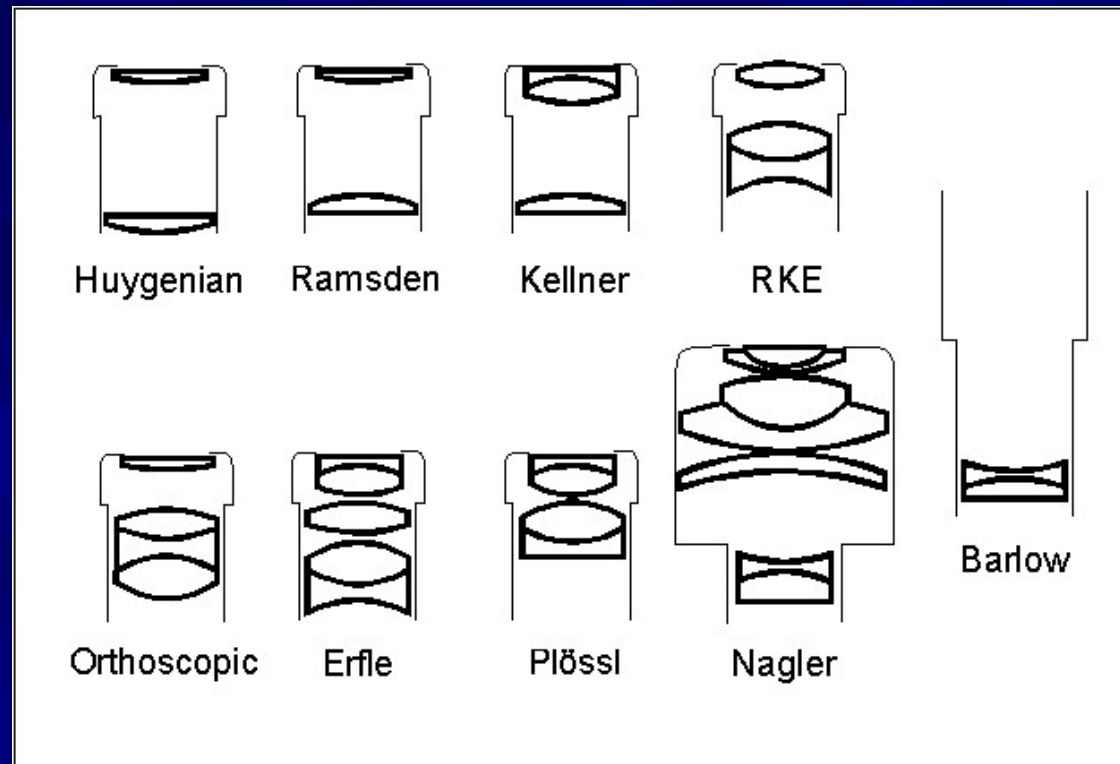
The Fork Equatorial mount uses a wedge to align the base parallel to the celestial equator

One accessory that every telescope needs are eyepieces



Since the magnification depends on the focal length of the eyepiece, you want to have three or four eyepieces.

Eyepieces come in a variety of different optical designs



The differences will improve the color characteristics (no color distortion), give good eye relief (how close does your eye have to be) and apparent field of view (how exact does your eye have to be lined up to see anything).

Finder Scopes are another useful accessory



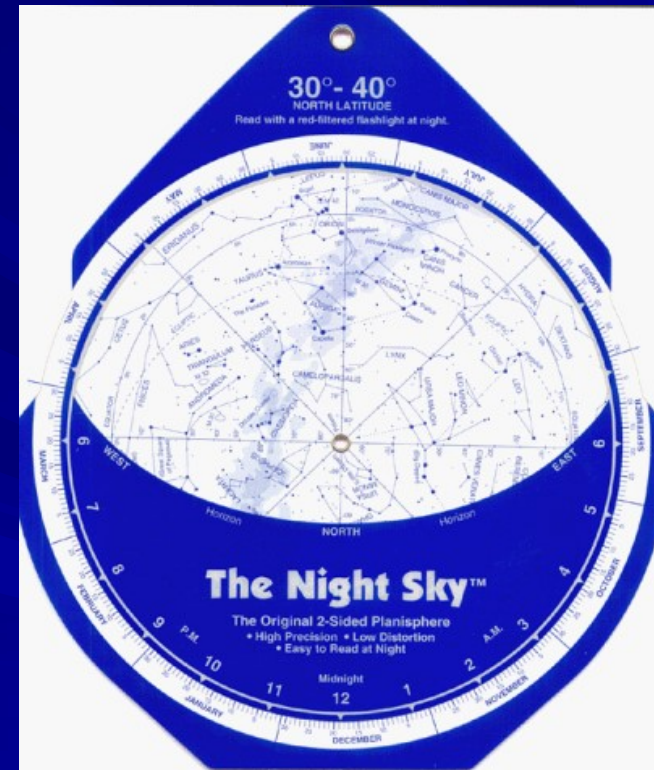
Straight finders flip things upside-down. Right-angle finders give a “correct” view. Telrads and EZ Finders have no magnification.



Filters are good for clearing up sky glow, color distortion or for viewing the sun or moon

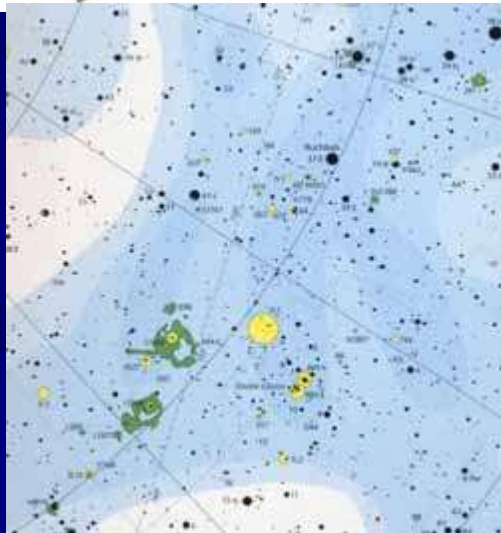
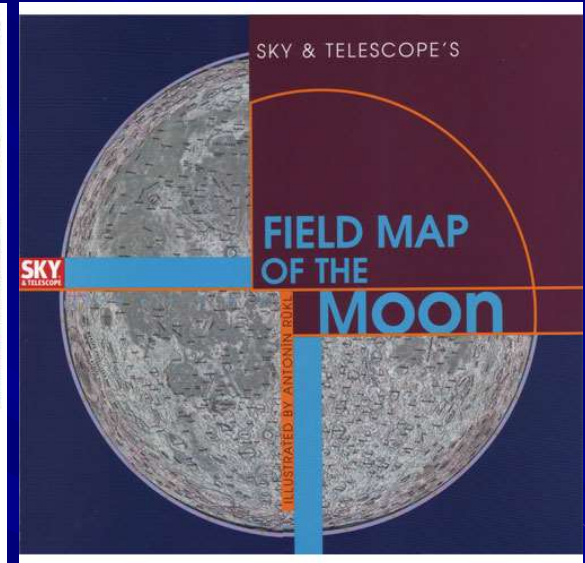


To find your way around the sky, start with a planisphere



A planisphere allows you to “dial-in” your date and time to see what stars and constellations are up in the sky. They don’t give much detail, though. For that you need a star map

Star maps come in all sizes with different levels of details

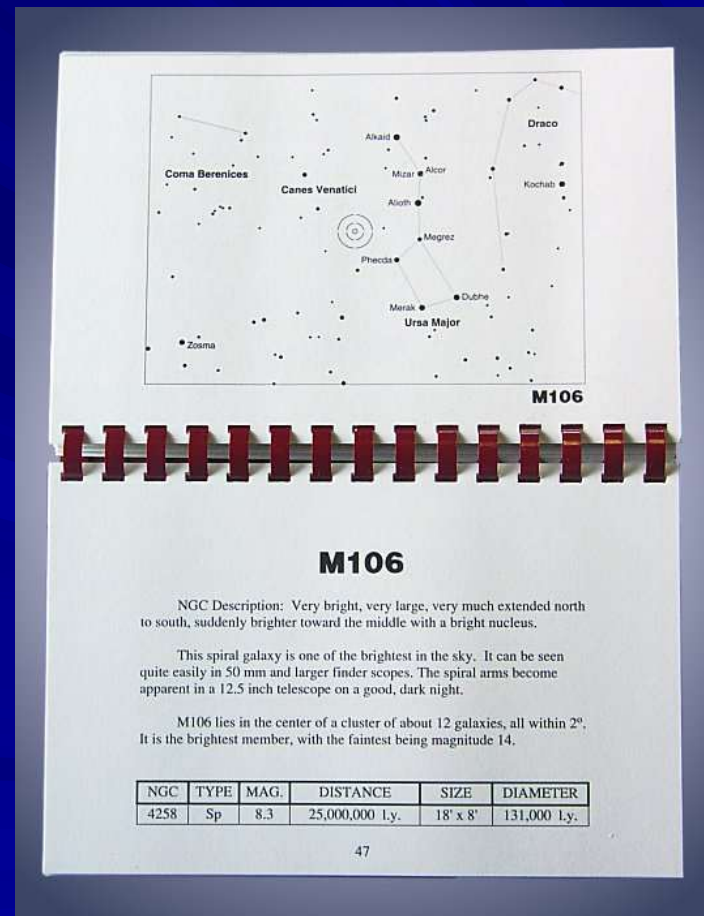


You can find the entire sky in a single map or an atlas of maps to cover the sky. There are also maps of the moon with varying levels of detail.

There are map books that show where the most interesting things to look at are



The Messier objects are 110 celestial objects like galaxies, nebulae and clusters that were catalogued by Charles Messier in the late 1700's and early 1800's



NGC Description: Very bright, very large, very much extended north to south, suddenly brighter toward the middle with a bright nucleus.

This spiral galaxy is one of the brightest in the sky. It can be seen quite easily in 50 mm and larger finder scopes. The spiral arms become apparent in a 12.5 inch telescope on a good, dark night.

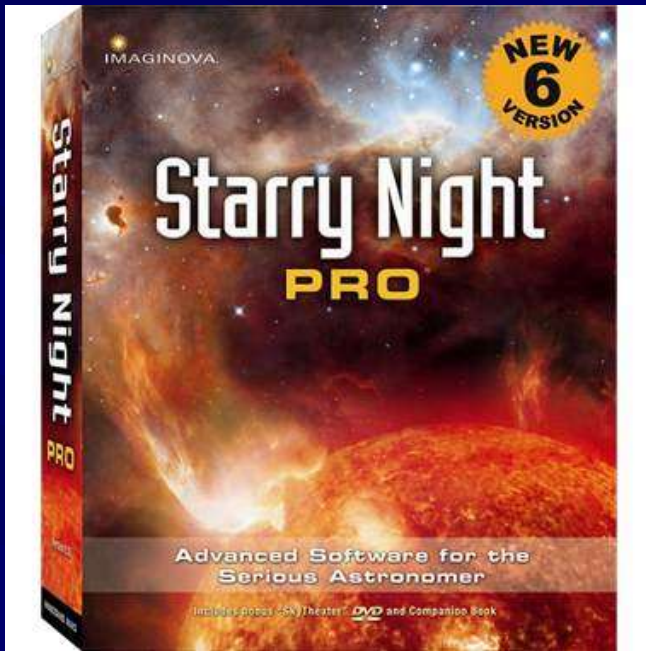
M106 lies in the center of a cluster of about 12 galaxies, all within 2°. It is the brightest member, with the faintest being magnitude 14.

NGC	TYPE	MAG.	DISTANCE	SIZE	DIAMETER
4258	Sp	8.3	25,000,000 Ly.	18' x 8'	131,000 Ly.

There are also lots of apps for phones that guide you around the sky

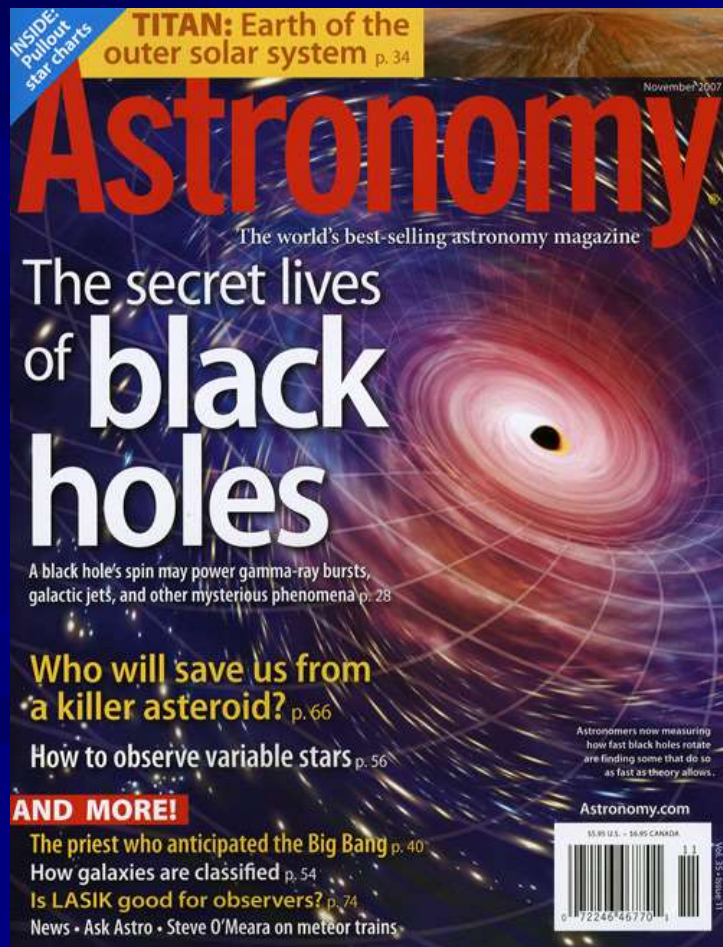


Astronomical Software makes your computer a planetarium



In addition to software that must be purchased, there is lots of freeware available on the internet. The freeware tends to be less sophisticated but it is free.

Magazines have lots of useful information about what's up as well as monthly sky maps



If you want to capture the view you can use a camera



You can get adapters that allow you to use a telescope as a telephoto lens for your SLR camera. You also need a remote shutter release for the camera to avoid shaking the telescope when you push the shutter button.

Other devices allow you to take a picture through the eyepiece



There are also adaptors to hold your phone for imaging

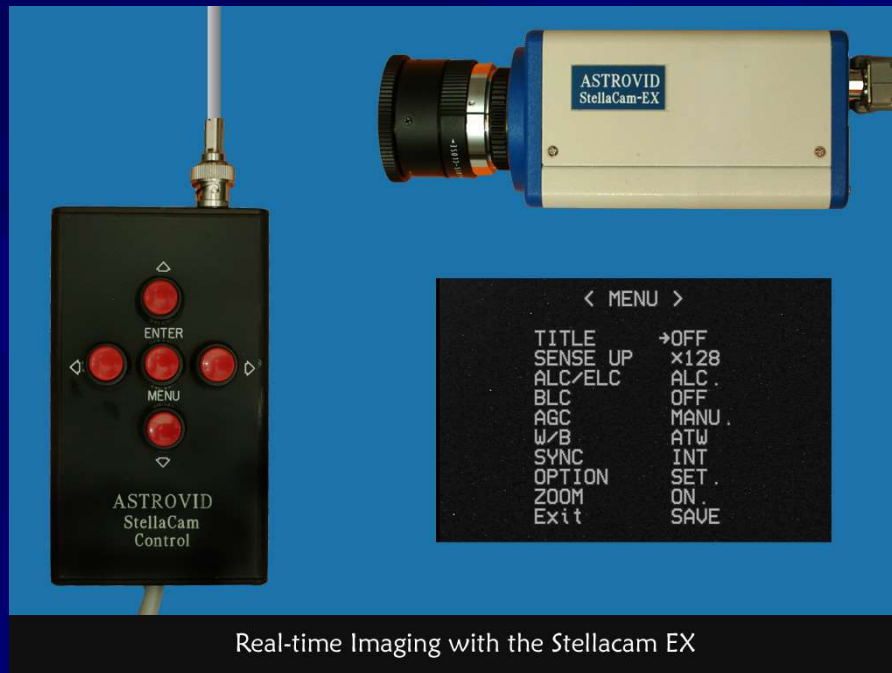


A webcam can be used to take images of the planets and moon



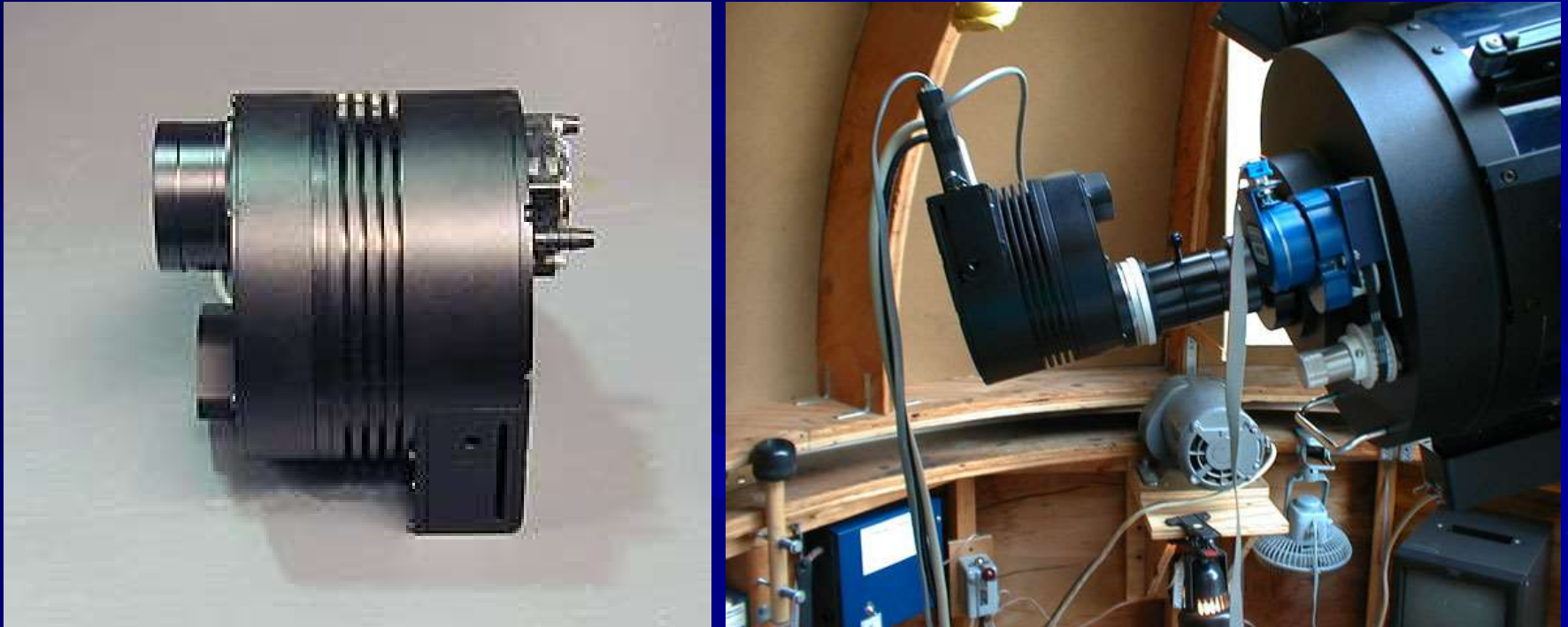
The camera lens must be removed and a nosepiece adapter put in its place. This allows the telescope to become the telephoto lens for the camera. The individual frames of a video are then digitally stacked to correct for atmospheric distortion to make a single still image

To get images of fainter objects, a low-light security camera is used



Like the webcam, the lens is removed and replaced with a nosepiece to insert it into the telescope. A video is made and then the best individual frames are selected to stack into a single image. Software is available that will do most of the work automatically.

The highest quality astronomical images are made with a CCD



The CCD takes black & white images so color filters (red-green-blue) must be used to produce a color image. The sensitivity is much higher than a digital camera and the resolution is usually better, too.

Finally, you don't want to use a regular white-light flashlight



You can buy flashlights that use red LED's or you can put red cellophane or a red filter over a regular flashlight. You don't want to use white light because it will cause you to lose your dark adaptation making things more difficult to see.