Ace Astronomical Telescope Basics

10 South Walk, Yate, Bristol, BS37 4AU
Tel: 01454 325 615
Email: astro@acecameras.co.uk
Web: www.acecameras.co.uk

If you are thinking of buying a telescope but don't know what to buy, or how much to pay, then read on. This guide will hopefully make the choice a bit clearer.

Expectations

It's a pretty useful to have some idea what to expect from a small telescope. It's easy to look at the spectacular photos in astronomy books and let your expectations soar. Some people do expect a bit too much out of a small scope. Most of the photos in books are taken with extremely large telescopes in the middle of Australia or Mexico. They are often multi exposure photos taken with different filters that bring out all the colours in the subject. This isn't what you will see from your back garden with a £200 scope.

Having said that a good small telescope can capture a lot of beautiful celestial sights. In conjunction with a moon map you will be able to view the moon and go crater hopping, you will be able to see Jupiter with its largest four moons strung out alongside it, Saturn and its unmistakable rings, the ever changing crescent of Venus and the fiery red of Mars. You will be able to see nebula, star clusters and the Great Andromeda galaxy that lies about 2m light years beyond our own galaxy, the Milky Way.

Budget

Telescopes don't come cheap and generally you get what you pay. That being said a budget of £80-£150 will be a fantastic place to start. These should provide the budding astronomer with a good taste of what's in our solar system and beyond. Why not check out the Skywatcher range offering fantastic value for money.

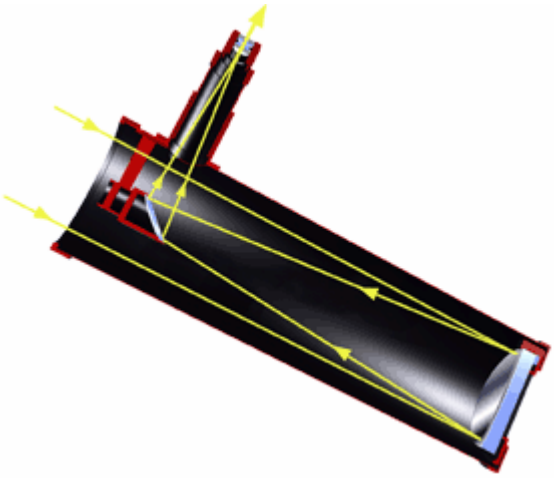
Magnification

The most important thing about magnification is not to get too hung up about it. If you walk into a high street shop and somebody starts trying to tell you that the £250 telescope they are selling can go up to 400x magnification then they are talking rubbish. The scope will not be big enough or good enough to be usable at that magnification.
The good news is that you can see plenty at much lower magnification. At 32x you will be able to see Jupiter and its moons, Saturn and its rings, the Orion Nebula etc. All of them will appear quite small but the image should be bright and sharp.

As you increase the magnification to say 50x, the images will be slightly larger, slightly dimmer but hopefully still clear. If you were to increase the magnification up to about 100x, the images would be appreciatively bigger but dimmer still and maybe slightly fuzzy. You would now be finding out how good your viewing conditions are. At night in towns, as everything cools down (especially after a hot day) heat rises and causes turbulence in the air. When looking through a telescope at high magnification this causes the image to swim in and out of focus. If this is happening you are often better off lowering your magnification and enjoying a smaller and crisper view. So magnification isn't everything.

The Newtonian Reflector

This most common type of reflector telescope uses a concave objective mirror (primary mirror) at the back of the tube and a secondary mirror, which directs the light to the eyepiece.

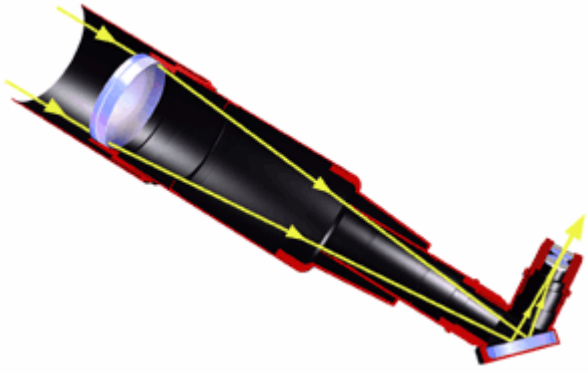


Since the light rays entering the telescope reflect off the mirrors and don't pass through the glass, no false colour is produced. Orientation of the image is not important for astronomy so the image is left uncorrected.

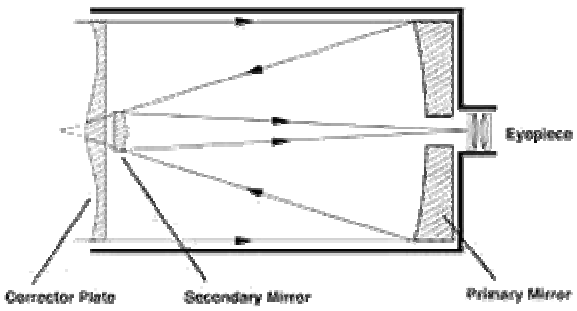
The Newtonian reflector represents excellent value for money as typically they offer more apertures for a given price than other types of telescope.

The Refractor

Refracting telescopes have an objective lens at the front of the tube. The light exits out through the back of the tube to the eyepiece. Since many observations are made high in the sky, a right-angle diagonal is used to avoid neck strain. This also provides an upright image making them suitable for terrestrial observations. A refractor has several advantages over other designs. The tubes are enclosed so that dust and moisture do not enter the tube, they have fixed optics that does not normally require collimation, and they do not have a central obstruction which reduces the light entering the tube. A refractor typically will give higher quality images of planets than other telescopes of similar aperture.



The Catadioptric



Telescopes using a combination of both mirrors and lenses are called catadioptrics. There are many different designs. Examples of these are the Schmidt-Cassegrain and the Maksutov-Cassegrain.
Usually a full aperture lens is used to correct aberrations in a compound reflecting telescope. The corrector lens also increases the performance of the instrument as air currents are eliminated. The main advantage of the design is that, because the light path is folded back on itself, it provides a very portable, short physical length telescope with a long focal length.

Tips on using a telescope

Once you've bought your first scope there are a few things to bear in mind. Spend a bit of time reading the instructions and if necessary balancing the telescope. It will avoid frustration.

A telescope is an outdoor instrument. If you only use it inside the house pointing it out of a window you will never get steady images because of the thermals created by the house. Get it outside, preferably on a nice patch of grass. When you take a telescope outside on a cold night, allow it to cool down for twenty minutes or so. After this time you will get clearer images. Let your eyes adapt to the darkness. Once you have let them grow accustomed to the dark, you will be able to see more through the telescope. When looking through the telescope at a very dim object, try looking around it instead of directly at it. By using averted vision you may be able to see it clearer.

Telescope Mountings

A mounting with a tripod is necessary to point a telescope at its target, and to hold it there securely. A larger, sturdier mount is necessary for heavier telescopes. There are two basic types of mountings, and each is suitable for different applications.

The Equatorial Mount

There are several different models of equatorial mount offered in this website, and the principle of all of them is the same. The principle is to correct for the rotation of the Earth with one motion during astronomical observations. The Earth's rotation causes objects to rise in the East, follow a circular path across the sky and set in the West. When using an astronomical telescope at high power, it will be only take approximately 30 seconds for the object to move out of the field of view. The equatorial mounting allows the telescope to track the objects and to keep the image in the centre of the eyepiece. When the equatorial mount is correctly aligned, tracking can be achieved either by turning a gear manually or with a motor drive which tracks objects automatically.

The Alt-Azimuth Mount

The Alt-azimuth mounting is a simple system which moves in two directions; sideways, and up and down, and is sometimes provided with slow motion cable controls to accurately point the telescope. This type of mounting is ideal for terrestrial observations and can also be of use for basic astronomical observations

The Greatest Show on Earth

Since the earliest civilisations, mankind has studied the stars. Heroes and gods have been placed among them. Great stories have been woven in the constellations. Perseus, Andromeda, Hercules and Pegasus all look down on us from the sky. So many people throughout history have been enthralled by the stars, why not join them?