Tips when buying a telescope

You have gotten the Astronomy “bug” and decided that you must buy your first telescope. Well hopefully you have come to the right place. Have a word with our observations officers Jonathan Rushworth and Samantha Hodgson; they can advise you on purchasing a good first telescope.

The first thing you need to do is attend one of our sister organisations observations night at Raygill Astronomy club, Lothersdale (Between Keighley and Skipton) and spend a bit of time looking through their telescopes. Ask lots of questions and spend several months learning a few sky objects and the different types of telescopes they use.

Regardless of what you might have heard there is NO one best telescope, there are dozens! Some are better on planets, some are better on splitting double stars, some are better for astro-photography, and some are for want of a better word, just better.

Never buy a telescope from a shop, store or Ebay unless you know exactly what you are buying. Many of the scopes sold at these locations are toy telescopes, which will frustrate you and wind up either on Ebay or in the garden shed.

All telescopes can be broken down into three main groupings. Refractors, reflectors, and a combination that includes BOTH of these two types, called catadioptrics. The most common catadioptrics (Cats) are the Schmidt Cassegrain (SCT) and Maksutov Cassegrain (Mak) telescopes. These have both a correcting lens in the front and a mirror in the rear.

Refractors

Typical refractor

Refractors are exactly what you think of when I say the word telescope. A long tube with one, two, or three lenses in the front. The light enters the front and goes straight through the telescope to the rear. An eyepiece is inserted into the rear, which can be focused by extending or reducing the length of the telescope. This is when it all stars to get complicated.

There are generally two types of refractors. Achromats, and Apochromats. The apochromatic (APO) has better colour correction and a higher cost. It uses multiple lenses and better lens glass to achieve good colour correction on bright objects.

The Achromat tends to show purple coloured fringing on brighter objects and false colours, depending on its focal length. Achromatic objectives are made with 2 pieces of glass, each with a different index of refraction, placed next to each other so their chromatic dispersion (rainbow effect) cancels out somewhat. Achromats made with extra-low dispersion (ED) glass can approach the colour correction of more expensive APOs, and are sometimes referred to as APOs, though they are technically not.

Apochromats (APOs) use three pieces of glass, one or more of which has very low dispersion. This makes the colour correction much better than achromats,

but increases the price substantially. APOs are extensively used in astro-photography to achieve the best photos possible. However, good quality APO refractors in larger aperture sizes are very expensive. Shown are two excellent examples of higher-end APOs.

Stellarvue 130mm

Takahashi 120mm

Reflectors (Newtonian)

If you are looking for an immediate recommendation for your first telescope then it probably should be a reflector. These scopes are usually the best that your money can buy for amateur astronomy because you can purchase a large aperture scope that will show you thousands of sky objects for a very reasonable cost.

The reflector employs two mirrors of different diameters to send the light into the eyepiece. A six inch or eight inch mirror size would make an excellent first choice.

Orion 10" Dobsonian

The telescope shown above is a 10 inch Dobsonian reflector. Dobsonian refers to the mount (not the tube). It has up-down, and left –right movements, which make pointing the scope very easy. However in its standard configuration it does not track the sky, so you will need to push the telescope along to keep objects inside the eyepiece. Notice that the eyepiece is on the front end of the telescope.

Light enters the front and bounces off a mirror in the rear onto a smaller tilted mirror called a “secondary”, mounted near the centre front of the telescope. When focused properly you cannot see the metal “spider” holding the smaller secondary mirror.

Buy the largest one you can afford, but not so big that you can't easily carry outside. About 10 inches is the maximum size to maintain easy portability. Remember the best scope is the one you will use the most. A 10 inch will probably fit across the back seat of a Ford Mondeo, but the 12 inch will not fit.

Think about how you will transport the scope to a dark observing site outside of town before you buy one. Measure the scope and the car.

Orion 12" Truss-Dob

Taking the scope apart and putting the pieces in the boot of your car can resolve the space problem. Truss-style Dobs are designed for this and this is the preferred design for scopes larger than 12" in diameter. Truss-style scopes can be broken down into a top, a bottom, a base, and the supporting tubes, thus allowing them to fit into small spaces for transport.

Shown at above is the new Orion 12 inch truss Dobsonian. This scope also has the hand controller that helps you find objects in the sky. Many Orion straight tube DOBs can be purchased with this same computer hand controller.

Obssesion is another brand of truss-style Dobs for those wanting higher-end scopes that are highly regarded.

Catadioptrics

Catadiptric telescopes employ a correcting lens in the front and two mirrors. The light enters the front of the telescope, bounces off a large mirror mounted in the rear, returns to the front, and bounces again off a smaller centrally mounted secondary mirror and back out the rear of the telescope.

There are two prevalent catadiptric designs, the Schmidt-Cassegrain (SCT) and the Maksutov-Cassegrain (Mak). The primary difference between these is the design of the corrector lens at the front of the scope.

Celestron C8 CPC

By folding the light path the telescope can be shortened and made more portable. SCTs and Maks are both considered general purpose scopes that can be used for planetary observation and deep sky observation. Usually the SCT will be mounted on a fork-style mount, however many amateurs mount them on a German Equatorial Mount (GEM) to use in taking photos of the night sky.

Shown above is the Celestron 8 inch CPC Schmidt Cassegrain. Notice that it is mounted on forks, and has a computer hand controller. This is commonly called an SCT GOTO scope, which means once aligned, the computer in the hand controller can point the scope to any object selected in its database. This is a wonderful general purpose scope for visual observation.

To align the scope, the beginner will still need to learn a few “alignment” stars in the sky, and there is a short learning curve using the hand controller. SCTs are really good general purpose telescopes.


Celestron C5SE

Above is an image of Celestron 5 inch SE with a single fork arm and computer GOTO. This style and size makes a great grab and go telescope. You can pickup the entire telescope and tripod and carry it outside in one trip, which is very handy when you are just too tired to set up the big telescope. There will also be a short learning curve with this telescope to get the hang of the GOTO computer.

Nexstar 4SE

Shown at above is an example of a Maksutov telescope in the Celestron Nexstar 4SE. Notice the curved lens in the front of the scope versus the SCT lens in the SE5 inch above. This telescope is also mounted on one fork arm and uses the same hand controller as the slightly larger SE5. It's even easier than the SE5 to quickly carry outside. The Maksutov design is excellent for planetary and solar visual observing.

So the Best of luck, lets hope you have clear skies and good observations.

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