What Telescope Should I Buy?

A Few Points to Keep in Mind

Before committing yourself to buying a telescope you should consider the following points:

- ***Light Pollution:*** Telescopes work best well away from city light pollution. The Moon, Venus, Jupiter and Saturn are bright enough to deliver satisfying telescope views from light-polluted city locations. But just about every other astronomy target is badly masked by light pollution. So be prepared to take your new telescope away from city lights.
- ***Telescope Light Collection Ability:*** Most astronomical objects, such as nebula, comets, galaxies and even star clusters, are rather dim. Your telescope needs to collect sufficient light to make these objects sufficiently bright to observe. The size of your telescope's light collection area, usually a mirror, is important. As a rough guide, a 4-inch (100mm) diameter mirror should be about the minimum telescope size to consider purchasing. You might apply the formula for the area of a circle (Area = πr^2) to the telescopes you consider purchasing and see how their light collecting abilities compare.
- ***Bigger Does Not Necessarily Mean Better:*** As the size of the telescope mirror increases, so does the weight, bulk and awkwardness of the telescope. Transportability, set-up speed and convenience decrease as mirror size goes beyond about 12 inches, or even less.
- ***The Best Telescope is the One You Use the Most:*** A big telescope that sits in a cupboard because it is too heavy and inconvenient to use is just a home for spiders, it is not a telescope. When shopping for a telescope you should see it in-person and physically pick it up and try carrying it and assembling it in-store. Then decide how big a telescope you need.
- ***Electronics Brings Issues:*** It can be tempting to pay extra and buy a computerised GoTo telescope (a telescope with electronic controls that slews the telescope to desired objects in a database list). But beginners often find these electronic controls baffling and difficult to make work as suggested on the box. Additionally, telescope manufacturers are poor at providing useful User Manuals. These telescopes are a major cause of early frustration and people exiting the hobby and writing their telescope off as garage-sale junk.
- ***Astrophotography Doesn't Necessarily Need a Telescope:*** It is tempting to think a low-cost telescope will allow you to both visually observe deep-sky objects and undertake astrophotography. While you might achieve a satisfying photo of the Moon through your new telescope, the rotation of the Earth and dim nature of most other astronomical objects severely limits what you can achieve in astrophotography. This is particularly the case with small and non-computerised telescopes, and often even some that are computerised.
  If you have a digital camera, or even a smartphone with night-mode function or app, and a tripod, you can achieve some amazing astrophotography images without using a telescope. Simple camera-on-tripod-astrophotography is where you should start if this is your interest in astronomy.
- ***Learn More – Join an Astronomy Club:*** There are many sources of equipment and astro-knowledge frustration in this hobby. By joining an astronomy club you can tap into the knowledge of lots of people who have trod the path before you. Clubs also conduct frequent telescope evenings at dark-sky sites where you can get the best from your new telescope.
- ***Finding Astro-objects is Easier with an App:*** Space is big. Astro-objects are small and dim. Space lacks name tags and signposts. Free and modest-cost versions of apps such as

SkySafari (https://skysafariastronomy.com/) are a fantastically useful tool to have with you on your telescope session. Load the app on a tablet for a more useful screen size and search YouTube for some user-guide videos.

A solid-tube Dobsonian telescope design.

So, What Telescope Should I Consider Buying?

Most experienced telescope users suggest beginners start with what is called a **Dobsonian telescope**, named after its investor, John Dobson. Mr Dobson just invented the rotate/tilt base the telescope sits on. Mr Newton was the actual designer of the optical tube bit with the mirror, way back around 1668. Clever fellow Mr Newton. What we current call a Dobsonian telescope is, in fact, a Newtonian telescope (the white cylinder in the adjacent photo) on a Dobsonian base, or mount. For simplicity, we just call this a Dobsonian telescope.

The Dobsonian telescope is recommended to beginners largely because:

- You get a big mirror, and lots of light collecting ability, for the lowest cost. (Sure, you can find lower cost (cheaper) telescopes, but they are probably not worth buying.)
- The best "objects-observed-to-dollars-spent" ratio of any telescope design.
- Even with a 4-inch mirror you will be able to see planets, nebula, star clusters and even galaxies at mind-bending distances.
- The physical design is robust and can handle transport and bumps.
- Easy to transport and quick to set-up or pack-up.
- The physical design is intuitive to use – you simply point the tube to where you want to look (rotate and tilt). Children can quickly learn to use it – and therefore want to use it again and again. (Minimising spider collection time.)
- No electronics to cause frustration or find your batteries are flat or at home.
- Reasonably easy to store at home.

Small collapsible Dobsonian suitable for a child

Dobsonian telescopes come in two basic designs:

- Solid tube.
- Collapsible tube.

The solid tube provides the biggest mirror size at the lowest relative cost. But it is bulkier and a bit more awkward to transport and store. The collapsible tube design costs more but is less bulky and easier to fit into a car boot or cupboard.

For a child, there are small versions of the collapsible Dobsonian telescope that are ideal. But you will need a stable table and chair to place the telescope on for comfortable use. A version of this telescope with a 6-inch diameter mirror will fire and reward the interest of a young astronomer for years – until they collect sufficient pocket money to buy their next, and larger, telescope.

A more recent innovation in telescope design for beginners is the "**smart telescope**". The ZWO SeeStar S50 is a revolutionary compact telescope controlled via a user-friendly mobile-device app.

The key feature of this telescope design is it makes astrophotography simple. There is no traditional eyepiece on this telescope where the user would normally view the light from stars and space. Rather, this telescope has an integrated digital camera and sky-tracking capability that allows the user to select a target object from a database and the telescope then autonomously tracks the object while capturing and stacking multiple digital images. The result, after a minute or two of tracking and imaging, is an amazing deep-space image displayed on the mobile control device (phone or tablet). These devices truly make astronomy easy, and amazing, for beginners with minimal astronomical knowledge or experience. The ZWO telescope is just one of a number of smart telescope products, including the Celestron Origin, Dwarf III Smart Telescope, and the Unistellar range of smart telescopes. Some of these lower-cost products could be a very rewarding purchase choice for beginner astronomers.

Buy Why Not These Other Telescopes?

A **refractor telescope** uses a lens at the front of the optical tube and looks like you would expect a telescope should. But lenses are expensive to make and usually suffer from problems trying to bring light of different colours to focus. Unless you pay a lot of money for a very fine lens you may find images by these telescopes have coloured haloes around them.

They also have a small light collecting area and so are mainly useful for just the Moon and brighter planets. They can also be hard on necks and knees when trying to observe objects high in the sky or overhead. (Give this a try in the shop when considering what to buy.)

But, they are light, compact and easy to transport. Assembly time can be reasonably quick.

In summary, for the same money spent on a Dobsonian telescope, your get to see fewer objects with this design.

Refractor telescope

Another common design is the **Cassegrain telescope**, which uses both a rear mirror and a lens at the front. These tend to be quite expensive, however some versions do allow astrophotography. The adjacent photo shows a computerised control Cassegrain telescope on an alt-azimuth mount. These telescopes can also be mounted on an equatorial mount. The equatorial mount is far superior for astrophotography than the alt-azimuth version.

Cassegrain telescope on an alt-azimuth mount

However, neither version of the Cassegrain telescope is recommended as an entry-level purchase for an astronomy beginner. The potential for confusion and frustration is very high. Start with a Dobsonian telescope.

Another problematic telescope for beginners is any telescope design (refractor or Newtonian) that is mounted on a **German Equatorial Mount with manual slow-motion controls**. These have two distinctive long flexible handles that are manually rotated to keep a target object in the eyepiece field of view.

The problem with this design is they require the polar axis of rotation to be aligned, at least roughly, with the celestial pole. Astronomy beginners usually find this task almost impossible. The design is also slow and difficult to slew between objects and difficult to use with a finder scope. Low-cost designs are also prone to excessive vibration. Experienced astronomers often disparage such telescopes as "hobby killers" as frustration sets in quickly and telescopes soon confined to dusty storage.

German Equatorial Mount with slow motion controls

Additional Accessories to Consider Purchasing

Okay, so you decided to buy the Dobsonian. But be prepared to also purchase a couple of accessories.

- A **laser collimator** is recommended with either Dobsonian design, particularly the collapsible. This device helps you get the clearest views by ensuring the mirrors in the telescope are accurately aligned relative to each other. There are plenty of YouTube videos that explain how to do this.
- Dobsonian telescopes are often supplied with a red-dot finder rather than an optical finderscope. If you get frustrated with the red-dot finder you might consider buying an optical finderscope. If you do, make sure to select a **right-angle finderscope** as it will save your neck and make finding targets much more comfortable.

In the case of a smart-telescope, perhaps the only additional accessory might be a second mobile device displaying a comprehensive planetarium representation of the night sky and database of objects to image. Such a planetarium resource would actually be of great value to the user of any telescope, traditional or smart in design.