First Telescope?

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We are usually reluctant to make specific recommendations about telescopes. The choice can vary widely depending on goals, price, and the context of how the telescope will be used. What is available also changes as manufacturers update product designs.

Binoculars: It might even be better and cheaper to start with binoculars if the interest is uncertain or the person is young. Some objects in the night sky actually look best through the lower power of binoculars. You can't beat the portability, speed, and ease of using binoculars, and if you do decide to get a telescope later, binoculars remain a useful investment. A telescope takes more effort to use.

If you decide to explore the idea of a telescope, a logical way to start is to get experience looking through telescopes – come out to Ashton Observatory on a Saturday Public Night and begin looking through different telescopes to sample the differences.

A telescope is comprised of two parts, (1) the optical tube and (2) the mount. Quality in each is important. The optical tube is what most people think of when they say "telescope." However, you need a way to hold and point the optical tube, and that is a "mount." It's not unusual for the mount to cost as much as the optical tube. Quality matters in both.

Design of the optical tube: There are different designs. A reflector will be less expensive than a refractor in larger sizes. Either design is good. In smaller sizes a refractor is affordable, and they are a closed tube so you won't have issues with interior dust, or collimation (alignment of optical elements) that applies to reflectors, not that those are serious problems with reflectors.

Aperture (diameter): What's the most important measurement of a telescope? Diameter. Larger diameters gather more light and show more detail, which means you will be able to see fainter light and more detail in the night sky. Quality of materials and workmanship matter too, and will affect cost. Cost also increases as aperture increases. If you want to see the fainter deep space targets, an aperture of 8 inches or more will be appreciated.

Sanity about aperture: A smaller diameter telescope (e.g., 3-4 inches or 70-100 mm) will work great on bright targets like the Moon and planets like Jupiter, Saturn and Venus. Those are some of the most satisfying targets, especially to young viewers. (*Warning: NEVER look at the Sun! That will instantly cause permanent eye damage.*)

Magnification: Most people tend to think more magnification is the goal. Not really. Many targets are best seen at lower magnification – magnifications in the 20-100 range are usually all you need. Magnification is the result of the focal length built into the optical tube combined with the focal length of the eyepiece that is being used. You can't change the focal length of the optical tube. To change the magnification you are seeing, change the eyepiece.

Use this formula to calculate magnification: P=FL/fl, where P is the magnification power, FL is the focal length of the optical tube in mm, and fl is the focal length of the eyepiece in mm. A 10 mm eyepiece will give you twice the magnification of a 20 mm eyepiece.

Eyepieces: Quality is important – even the best optical tube will deliver poor views if the eyepiece is poor quality. There are many designs of eyepieces, varying in focal length (longer focal length is lower power), angular width of the field of view (should be at least 50 degrees), eye relief (that's the distance your eye is from the surface of the eyepiece lens; over 10-15 mm is ideal especially if you wear glasses), and diameter (whatever fits your focuser; 1-1/4 and 2 inch are common). Many factors affect cost, but good choices exist at reasonable prices. One good idea is to have a 2x Barlow lens that you can stack with other eyepieces to double the magnification they deliver.

Seeing conditions: Even if you have the most expensive equipment, poor atmospheric conditions will prevent success with high magnification. It takes ideal seeing conditions to get good results from high magnification, and ideal conditions are rare.

Light pollution: Ground lights reflecting off the atmosphere will always be a big obstacle to seeing

well. The difference between views in a dark location and an urban location will be surprising.

Reality check about the views: You've seen those dramatic images from the Hubble Telescope. No, that is not what you will see through your telescope. Because the actual light is very faint, you will not see much color. Those beautiful photos are the result of combining hours of exposures using specialized cameras, processed by experts using the latest technology. Except for the Moon and the bright planets, what you will see will be faint and grey, but you will be seeing the real thing live!

Mount design: A simple design like an alt/az (it pivots left-right and up-down) is both cheaper and easier to use than other designs such as an equatorial mount (an equatorial mount can be a great design, but is confusing to set up for beginners). GOTO mounts with motors and computers to aim the telescope are complex and expensive, but do help point at targets that are difficult to find. A child will need adult help to operate a complex mount. That mentoring relationship might in the end be the biggest reward for both parties.

The most important attribute of a mount is that it be steady. It is maddening to use a telescope on a shaky mount. It will take the fun out of it fast, and can make it nearly impossible to use the telescope.

Dobsonian mount: A Dobsonian mount is about as simple, sturdy, and inexpensive a design as there is for an alt/az mount. There are alt/az tabletop telescopes too, but that requires a steady tabletop surface located where the telescope can point at the sky. That is a lot of limitation unless having the compact size is a requirement.

Finder scope: You will soon learn that using a telescope requires a "finder scope" in order to point the telescope accurately. The most usable design is a "red dot" type. It will do all that you need. If your telescope doesn't have one, you can usually add that for a modest price.

Star charts: Once you begin exploring the night sky you will quickly realize that you need to know what's in the sky in order to find anything. A monthly star chart is one way to get that information. We have links to several good ones on our website. There are also apps for smartphones that can show you what's in the sky. SkySafari and Stellarium are the best.

Price: No, a bargain price of $79 in a discount store is not a good telescope. Price is not a guarantee of quality, but good telescopes are available in the $150 to $400 range. If you want additional eyepieces they will cost more. Often a telescope is sold as a package or kit that includes useful accessories, so that increases the value of the deal.

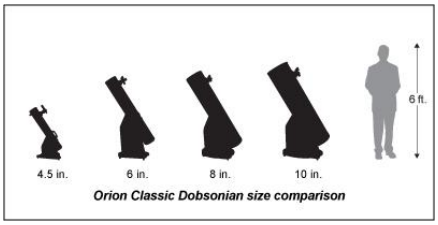
Biggest bang for the buck: It's hard to beat a reflector on a Dobsonian mount. There is nothing wrong with a tripod mount if it is sturdy, but solid designs are hard to find and come at a price. You will also have to make sure the specific tripod can attach to the specific optical tube you want to use.

Good examples of the Dobsonian design are available from Apertura, Zhumell, and Orion. While a smaller size might be easier to carry and store for some people, more aperture will deliver better views. Those can be purchased directly from various online sellers. Just the basic manual design is all you need to get started.

Celestron and Meade are two other respected brand names, and can offer quality in large and expensive products.

Bottom line: In the end, the best telescope is the one you will actually use. For normal humans that often means light weight and easy to use.

Classic Newtonian reflector on a Dobsonian mount.



Orion Classic Dobsonian size comparison