



Buying a Telescope

Thinking about buying a telescope? Remember that it's a piece of specialized equipment, so you need some specialized knowledge to help you select the instrument that's right for you. Here are some hints to think about before you spend your money.

Think about how you will use it. Why do you want a telescope? For beginning stargazing? Variable star observations? Spectroheliokinematigrams? Bird watching? It'll make a difference in the type of instrument you buy.

What a telescope does. There are three basic functions of a telescope: magnifying power, resolving power and light-gathering power. Most people have heard only of the first one and it's the least important! Magnifying power is just how much bigger the telescope makes an object appear to be. Resolving power measures how close together two objects can be and still be seen separately, and indicates how small a detail can be seen on the moon or planets. The third function, light-gathering power, indicates how faint an object can be seen in a given telescope compared to another telescope. The last two functions, and indirectly the first, get better as the diameter of the telescope increases. Remember this and don't get snowed by a manufacturer's claim of high power — it's not really that important!

Two other things an astronomical telescope usually does are to look at only a small part of the sky with each view, and turn the image upside-down or backwards. Both are distinct problems for bird-watchers. If you want the telescope for astronomy don't worry — you'll get used to it and there are good reasons for doing it that way.

What a telescope doesn't do. First, it doesn't turn the stars into blazing suns with circling planets — no telescope does! It also won't give you pictures of the planets to rival the space probes', or views of galaxies like you see in books. Remember, those are all done with sophisticated techniques and equipment. However, the view of something you found in your own telescope can be more satisfying than the best of pictures in a book.

What to look for. A telescope for astronomy requires a good, solid mount that won't vibrate in the wind and ruin your image. An "equatorial mount" can be expensive, but is worth every penny. Get the largest diameter telescope you can afford. Get a telescope with removable eyepieces and a Barlow lens. If you are *sure* you don't want to take pictures through the telescope, consider a Dobsonian reflector (but you may need to add a finder telescope or red light finder at some extra cost). That lensed or red light finder is a must — reject telescopes with simple spotting tubes. Unless you like sore muscles, get a tripod

that's not too short (too high can be fixed with a plastic step). As a test, look at how low the eyepiece of the telescope is when the telescope is pointing straight up — could you look through it comfortably? In fact, check to be sure the mount allows the telescope to *be* pointed straight up (and at all parts of the sky). If you buy a refractor (see below), get one with a “star diagonal” lens holder. Above all, buy from a manufacturer or retailer with a good reputation for telescopes!

What to look out for. Watch out for sun filters. They screw into an eyepiece where the sun's energy is most concentrated and tend to crack, which can cost you your eyesight. For small telescopes, use a solar projection screen instead ("objective solar filters" may also be safe, but expensive). Don't buy an astronomical telescope smaller than 2.4" (60 mm) in diameter; try hard not to buy one smaller than 3" (76 mm). Ignore extravagant claims of magnification. To find out the maximum power for a telescope, multiply its diameter in inches by 50 or its diameter in millimeters by two (so a 60 mm or 2.4" telescope could use about 120 power at most; significantly higher powers would be virtually useless). Remember there are different diameters of eyepieces — get a telescope that uses 1¼" diameter, “standard” eyepieces. Smaller diameter eyepieces work, but are getting hard to find if you want to buy more. Whichever size you have, be sure to get the right size if you order new ones. In general, avoid telescopes whose names suggest they will actually be useful to children or beginners.

Types of telescopes. There are three basic types of telescopes. Refractors get light to you by bending it through a lens at the front of the telescope and are very effective on solar system objects. Reflectors bounce the light off mirrors, showing galaxies and such nicely. They are generally cheaper than refractors, giving you more diameter per dollar, but require some very simple maintenance in exchange. The third type is called a catadioptric and is a combination of the first two. These are good, highly portable, general-purpose telescopes, but very expensive. For beginners, there's not much difference in performance among the three types.

“Go To” Telescopes. Computerized telescopes with drives designed to point at celestial objects with the press of a button are an exciting new trend in amateur astronomy. However large “go to” telescopes are designed not for beginners but for experienced amateurs, and small “go to” telescopes are still, well, *small*. Beginners may be better off getting a simpler, larger diameter telescope for the same or less money, and using it to learn to find things in the sky. Don't consider stepping up to a “go to” telescope until you know the sky well, have had the rewarding experience of finding things on your own, and know you can find things even if the computer fails. “Go to” telescopes can be of limited usefulness if they don't go to an object accurately, if they point at objects too faint to see, or if you don't know what you should be seeing in the eyepiece!

What about binoculars? You might be surprised at how useful a pair of binoculars can be for astronomy! They won't help much on the planets, but will give very pretty wide-field views of the moon, hydrogen gas clouds, some double stars, and the Milky Way. Binoculars can also reveal some of Jupiter's moons, and give perhaps the best views of bright comets. Attach them to a camera tripod if possible. Any binoculars will help, but 7x50s are most useful (in some ways superior to a 2.4" refractor!). A model with “fast

focus” will do in a pinch, but one with an old fashioned rotating knob focuser is much better. Look for a field of view of 350' or more at 1000 yards and a design specified for night use. A lawn chair with reclining back will make binocular use more comfortable. Get a binocular observing guide to the sky — some list as many as a hundred accessible objects! If you are not familiar with astronomy or telescopes, binoculars and a planisphere star map are your best entry into observing. Why pay big money for a telescope until you know you will enjoy using it?

What it will cost. Few refractors under \$300 work. Vastly superior Dobsonian reflectors start around \$350; good equatorial reflectors, for about \$400. Catadioptrics cost more than \$1000, and generally are of high quality. Small, useful, “go to” telescopes begin around \$800, and big ones range from \$2500 to \$4000. Useful binoculars start around \$70 – \$150.

Where to look. Generally speaking (but not always), department store and catalogue telescopes are seldom satisfactory. Check the description and too often you'll find that list of "what to look out for." If you can't find a good telescope in town, go to the library and look at the ads in astronomy magazines to find a telescope that fits your needs. Most reputable dealers have excellent web sites. You can often get a break on the price if you buy from an independent outlet rather than directly from the manufacturer. Don't buy a second-hand telescope without a nighttime test run first.

Useful accessories. Most reputable manufacturers offer a large number of accessories matching the quality of their telescopes. Since every accessory makes you want more, to avoid going bankrupt you should carefully evaluate each one in terms of your needs, budget, and the above guidelines before you buy it. Two items you will use every night are a good star map or atlas and a red-light flashlight to preserve night vision. Planispheres are best for learning constellations. Read some good library books about amateur astronomy and using telescopes—otherwise you'll have little hope of actually finding interesting celestial objects. You have to do your homework to be successful!

A telescope for the kids. The best way to kill a child's interest in astronomy is to buy a cheap, badly made telescope. Why not strike a deal instead? Try binoculars, a planisphere and library books for 6 – 12 months. If your child's interest remains strong and lots of observing gets done, then spend the money for a real telescope (not a toy).

The Planetarium can help. The purpose of a planetarium is to be a resource for astronomy information. Call the staff if you have questions. Public shows will give you a better acquaintance with the universe. Watch for telescope and astronomy classes, observing nights and star parties.