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What's Up?

BY BARRY DECRISTOFANO

Refractor

Newtonian Reflector

Schmidt-Cassegrain Reflector

Dobsonian Reflector

It's that time of year when I get asked, "What telescope should I buy for my child/spouse/self?" This week's article will give you some starting points for your decision.

Background questions (change "you/I" to "them/he/she" as applicable):

-- how into astronomy am I? A good book on astronomy, maps, and a pair of binoculars may be preferable to a telescope that sits in the closet.

-- how much do I know (or want to learn) about the night sky?

-- how much money am I willing to spend? The total purchase may be more than just the telescope. Items such as books, a red flashlight, warm mittens, a magazine subscription, additional eyepieces, and camera mounts may be desired adjuncts to the basic purchase.

Telescope basics

Based on physical principles, there are two categories of telescope -- refracting and reflecting. A refractor is your stereotypical telescope -- it has a big lens (a curved piece of glass, the "objective") at one end and a smaller lens (the eyepiece) at the other. You point it at something and look through the end of it. A reflecting telescope has a large mirror at one end instead of a large lens (still called the "objective"). The eyepiece is located either up on the side of the tube -- a Newtonian telescope (named after you-know-who) -- or at one end, behind the objective -- a Schmidt-Cassegrain telescope (or SCT). There is a popular design now-a-days called a Dobsonian. These are actually Newtonian telescopes that have a very simple mounting for portability. Their inexpensive construction allows you to get a big mirror (aperture) for low cost (with trade-offs, of course).

There are two types of mounts used. One is called an alt/az mount. It's like a camera tripod – you can move it up-and-down (altitude) and side-to-side (azimuth). It's very easy to use because most of us are familiar with the notions of up-and-down and side-to-side. Since astronomical objects appear to move east-to-west in the sky and get higher and lower as time passes, telescopes need to be repositioned periodically. You may not think it's very noticeable, but the more you magnify a piece of the sky, the more noticeable its movement is. So with this mount, the telescope needs to be moved both in altitude and azimuth to keep an object in sight.

As the earth turns (the reason for the above-mentioned motions) everything appears to rotate around a fixed axis running through the Earth from the North Pole to the South Pole. Presently, the North Pole points towards the star Polaris – the North Star. If you set a telescope at just the right angle to point up at Polaris, there would be only one movement needed to follow things in the sky – a rotation around the imaginary north-south axis. This is just what the other type of mount, an equatorial mount, lets you do. This combination of motions isn't something most of us are used to, so at first, an equatorial mounting can be difficult to use – and be a reason for dust accumulation on a telescope. Once mastered, it's far more practical. For relaxed viewing, contemplation of the universe, and photography I think it's essential. Also, since only one, rotational movement is needed, a simple motor can be attached to move it automatically. In the past few years, there have become available computer controlled, two-motor setups that allow alt/az mounts to be driven automatically as well. The mount's motions should be smooth and controllable. If you can visit the telescope before you buy it, grab a tripod leg with one hand and the top of the mount with the other, and try to wiggle the structure in between. If you feel any loose play or wobble, move on.

The magnification that a telescope can provide may be greatly exaggerated by unscrupulous manufacturers. The magnification is equal to the focal length of the objective divided by the focal length of the eyepiece. For instance, if a telescope had an objective with a 900-mm focal length and you were using an eyepiece with a focal length of 25-mm, the magnification would be 36x. Multiply the diameter of the objective (in inches) by 50 and that's about the highest you should expect to use with the instrument (examples: a 60-mm (2.4 inches) telescope would, give 120x at the top end; a 4.5-inch telescope would handle 225x). Beyond this, the image will be pale and blurred. On extremely goods nights, under very dark skies, with a well-trained eye, you could up it to 60x or so – this isn't often. Beware of claims above this – ask yourself, "What else are they trying to con me on?"

The eyepieces should have 1.25-inch barrels. Some starter telescopes have 0.965-inch barrels. These restrict the field of view of the lower power eyepieces, and if you want to expand your eyepiece set at a later time, 1.25-inch eyepieces are the standard (though on very large telescopes, a 2-inch barrel is often used). The telescope should come with at least two eyepieces – one for low-power viewing and one for higher-power viewing. If the higher power eyepiece (the one with the smaller focal length) puts you above that 50x per inch of objective diameter as I explained above, it won't be of any use. I'd stay away from that telescope package. Sometimes a Barlow lens will be included with the telescope's accessories. This lens multiplies the magnification provided by any given eyepieces by 2 or 3 times, and can be a useful add-on.

Two of the largest manufacturers are Celestron and Meade and they have good reputations. Orion's equipment looks pretty good as well, though I don't have first-hand knowledge about their telescopes.

Look around, go online, and/or go out and buy either, Sky & Telescope or Astronomy magazine and look at the adds. Get some ideas about what's available in the range of what you want to spend, ask me to clarify anything, and I'll gladly give you feedback. You can reach me by email at astroblog@comcast.net.

I'll be back with more night sky info in a couple of weeks.

Keep looking up!

Barry