AstroPointers

ORAS
Oil Region Astronomical Society

Astronomy Knowledge from ORAS

BUYING A TELESCOPE

Shopping for a telescope can be an intimidating experience due to the many choices of telescopes and accessories that are available. These pointers were selected to help you make wise decisions when buying a telescope.

If you don't know the terms in **bold underlined** print, you can find them in the **definitions** that follow.

1. Advertisements that emphasize the magnifying power (**magnification**) of their telescope as the main selling point usually represent inferior products. Telescopes seldom give good views at powers exceeding 50x per inch of **aperture**. This rule means that a telescope of 3 inches (75 millimeters) aperture has a maximum useful magnification of 150x. For most views with any telescope, except for views of the brighter planets and the moon, magnifications from 30 to 50x give the most pleasing view.
2. Look for a product with a good **mount** and a sturdy **pier** or **tripod**. If these components are undersized or inadequate, the telescope will be too shaky to give satisfactory views. Remember that a telescope working at even a modest magnification of 30x not only magnifies the celestial object 30 times, but magnifies vibrations in the mount equally.
3. The aperture of a telescope is its most important feature. For satisfactory views, a **refractor** should have a minimum aperture of 70 mm (2.75 inches); a **reflector** should have an aperture of at least 100 millimeters (4 inches); and a **catadioptric** should have an aperture of at least 90 millimeters (3.5 inches). Larger telescopes than these will show even more, but don't buy a telescope that's too bulky for your physical ability or living situation. Smaller telescopes will lack sufficient **light gathering power** (often called light grasp) and resolving power (or **resolution**) to give good views of a wide variety of celestial objects.
4. Long **f-ratios**, f/8 or more, are better for the planets and moon; short f-ratios, f/6 or less, are best for wide field views of star clusters, nebulas, and galaxies (deep sky objects); moderate f-ratios, f/6 to f/8, are good general-purpose telescopes.
5. Look for quality accessories with the telescope. Avoid cheap **eyepieces** (sometimes called **oculars**) such as Huygenian and Ramsden. Eyepieces such as Kellners, achromatic Ramsdens, Edmund RKEs, orthoscopics, and Plossls are good eyepiece designs often supplied as package deals with new telescopes. The Plossl design is perhaps the best type for the money.
6. The telescope should be provided with a **finderscope** with a magnification of 6 to 8x and a minimum aperture of 30 millimeters (i.e., a 6x30 or 8x50 finderscope).
7. Buyers of computerized **"Go-To" telescopes** can get by with a 5x finderscope; however, Go-To technology should not substitute for learning one's way around the night sky. You're depriving yourself of a rewarding experience if you don't at least learn the major stars and constellations.
8. Consider your physical ability and living situation now and in the future before purchasing. How much weight can you carry? Will you have to carry the instrument up or down stairs? Will you be transporting the telescope to a dark location in the country for better views? Large

telescopes are great, but only as long as they're not collecting dust in a closet because they're too large to use often.

9. Consider stargazing with a pair of 7x to 10x binoculars before graduating to a telescope. Although any binocular will show you more than your naked eye, choose a pair with front lenses of at least 35 millimeters aperture. Hand-holding binoculars introduces motion in the images they produce. This motion can be tolerated in low-magnification binoculars. However, little can be seen with binoculars over 10x magnification unless they are mounted on a **tripod**. Examples of good "stargazing" binoculars are 7x35, 8x40 and 7x50.
10. Whether you use a telescope or binoculars, you need good reference materials to help you navigate. The lists of references and resources on www.oras.org are a good place to start.
11. Do your homework before you buy. Members of your local astronomy club can be a great help. Attend one of their events to see a variety of telescopes in use. Ask plenty of questions and listen to the recommendations of the members.
12. If you still have questions, contact ORAS. We can help.

DEFINITIONS:

aperture: the diameter of the main mirror of reflectors or the front lens on a refractor or catadioptric, given in inches, millimeters, or centimeters (note: 1 inch = 2.5 centimeters; 1 centimeter = 10 millimeters).

catadioptric: A telescope that uses lenses and mirrors. It is more expensive than similar-sized reflectors but is a compact telescope that can be easier to handle and transport.

eyepiece or ocular: a system of lenses at the eye position of a telescope. Astronomical telescopes have the provision of changing eyepieces to alter magnification. When purchasing eyepieces, be sure to buy the diameter that matches the size of your telescope's focuser drawtube. Drawtubes of at least 1¼ inches diameter are preferred over smaller 0.965-inch drawtubes.

finderscope: a small, wide-field, crosshair telescope attached to the main telescope. It's an aiming device.

focal length: the distance from a lens or mirror in which light from distant objects comes to a focus. For example, the focal length of a magnifying glass can be determined by concentrating a bright artificial light (don't try this test with sunlight due to risk of eye damage and fire hazard!) through the lens onto a sheet of paper. When the light is concentrated into the smallest point possible, the distance between the paper and the lens is the lens' focal length. Eyepieces also have an associated focal length.

f-ratio: this is a proportion of the telescope's focal length divided by the telescope's aperture. An f/8 telescope's focal length is 8 times its aperture. When calculating f-ratio, be sure to use the same units of measurement for aperture and focal length.

Go-To telescopes: these use computer control to automatically slew to (go to) celestial objects. They are expensive for the size, and a larger non-computerized telescope could be had for the same money. However, if you feel that you want a Go-To telescope, don't cheat yourself by not learning the night sky. Knowing your way around the night sky is half the experience!

AstroPointers: Buying A Telescope

light gathering power: ability of a telescope to show faint objects. Light gathering power is more important than magnification. It is primarily determined by the telescope's aperture. Doubling the aperture increases light gathering power fourfold.

magnification (or magnifying power): the degree of enlargement provided by a telescope or pair of binoculars. The magnification of an astronomical telescope can be varied up or down by changing the eyepiece. Binoculars are generally of fixed magnification. A magnification of 30x provides an enlargement of 30 times the diameter of the object when viewed with the naked eye.

mount: a mechanical device supporting a telescope. Altazimuth mounts are simple and are easy for the beginner to use. Equatorial mounts are more sophisticated and can track objects with only one motion, rather than two (as required by the altazimuth). However, equatorials require more set-up time and have a greater learning curve. Equatorials are often equipped with electric drives that keep objects in the field of view without manual tracking.

reflector: a telescope using a curved mirror as the primary light collector (a good dollar value).

refractor: a telescope using a lens as the primary light collector. A refractor is the instrument most people think of as a telescope. It is more expensive than similar-sized telescopes of other designs, but well-made refractors are great performers.

resolution: the ability of a telescope to show fine detail on the moon or planets, or to resolve close double stars or tight star clusters. Larger telescopes produce greater resolving power than smaller telescopes. Doubling the aperture doubles the resolving power.

tripods and piers: these stands support the telescope's mount. A tripod is a wooden or metal stand with three legs. A pier is usually a metal pipe with legs. Most beginner scopes have tripods, which are more easily portable, but should be of sturdy construction.

AstroPointers are brought to you by the

Oil Region Astronomical Society
P.O. Box 1535
Oil City, PA 16301
www.oras.org