Acadiana Sky

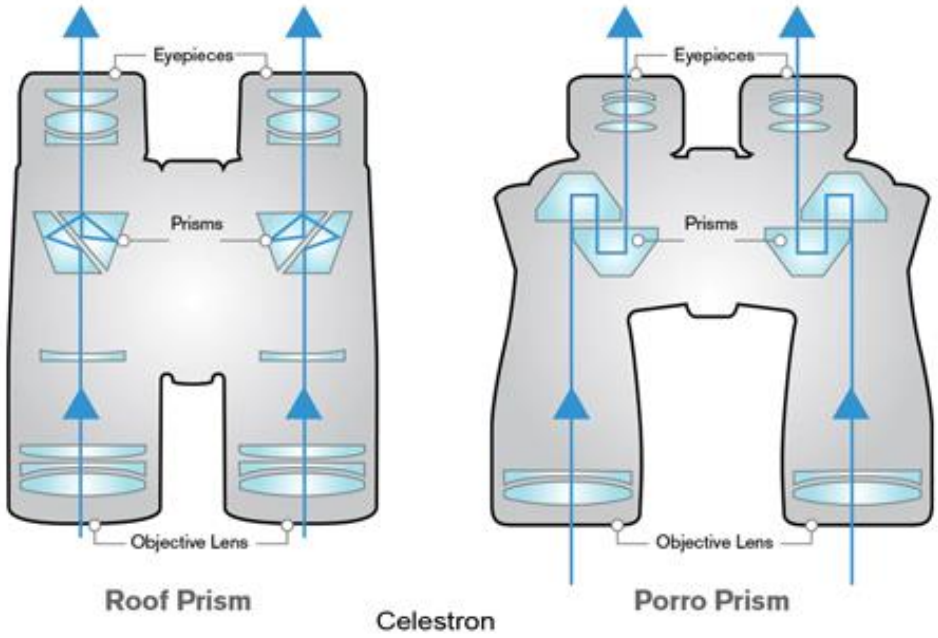
Buying Binoculars—The Basics

If you already have binoculars, try using them on the sky before spending the money for new ones! If you decide to buy new ones, consider the following basics.

How Binoculars Work

Think of binoculars as a pair of low power, short telescopes working side by side, one for each eye. As with a telescope, light from a celestial object passes through the front lens and is bent ("refracted") to form an image. The eyepiece lens magnifies that image. It also magnifies any defects in the binocular optics, so quality counts! Because the binoculars will also magnify any tremors or turbulence in the atmosphere, expect a good, but not perfect, focus.

Binoculars come as roof prism or Porro prism designs. Porro prism binoculars are what most people envision for binoculars—each side has a section near the eyepiece that juts out a bit because of the shape of the prisms they contain. Roof prism binoculars look sleeker and more "straight-through" because their prism arrangement is different. Good roof prisms give excellent performance and may be lighter (and easier to hold) than Porro prisms, but can be quite expensive and are often "high-end" binoculars. Particularly if you are a beginner, or want general purpose binoculars, Porro prisms are just fine. They'll give you the performance you need.



Binoculars By the Numbers

The size and magnification of binoculars is given by a number set such as 7 X 50 (pronounced "7 by 50"), 6 X 42 ("6 by 42"), 10 X 70 ("10 by 70"), and so on. The first number is the magnification and the second number is the diameter of the front lens in millimeters (50 millimeters is almost 2 inches). The bigger the diameter, the more the binoculars can reveal, but at the cost of increasing weight and cost, more difficulty holding the binoculars without shaking, and seeing less of the sky in one view. Very small binoculars don't perform well with the small, faint things in the sky. The sweet spot seems to be 7 X 50 or 10 X 50 binoculars, big enough to be useful and light enough to hand-hold.

7 X 50 or 10 X 50 binoculars (top) are much smaller than 10 X 70 binoculars (bottom).

Using binoculars in the low light of the night sky is much different than using them in daytime. Most experienced binocular observers like an "exit pupil" of 5 to 7 millimeters. Think of the exit pupil as the diameter of the light bundle as it comes to a final focus outside the eyepiece. As a rule of thumb, you can find your binocular exit pupil size by dividing the diameter by the magnification. For 7 x 50s, it's about 7 and for 10 X 50s, it's 5. Generally, a bigger number is better, and 7 X 50s are probably the most popular astronomy binocular because of that. However, the eyes of people over about 40 begin to change and become less efficient at garnering faint light; as a result, it's often suggested that older observers might like 10 X 50s better. It's not a certain rule, though.

One of the biggest advantages that binoculars hold over telescopes is in field of view (FOV), a measure of how big a part of the sky can be seen in one view. A low power telescope may show a 1-degree FOV, about twice the diameter of a full moon, but binoculars often will give a whopping 5-to-7-degree FOV! As the FOV gets smaller, though, aiming becomes more difficult. The size of the FOV is sometimes given as a certain number of feet at a thousand yards. A 5-degree FOV is 260 feet at a thousand yards; a 6-degree field is 315 feet at a thousand yards, and

a 7-degree field is 370 feet at a thousand yards. These big FOVs are great for comets and star clusters that are so big that they can't be seen in one view in a telescope.

7 X 50 binoculars with a field of view of 420'at 1000 yards

7 X 50 binoculars with a field of view of 5°

Weight is another number to consider. If you plan to hold your binoculars instead of placing them on a tripod, keep the weight around a kilogram (a bit more than 2 pounds). Heavy binoculars make your arms tired and shaky pretty quickly.

The Glass

As with a telescope, the quality of your binocular glass is important. Check for BAK-4 or BK-7 glass, with BAK-4 being considered superior. Expect advertising about coated, fully coated, multi-coated, fully multi-coated lenses. These seem to mean different things to different companies, and are not very helpful. Ruby-red coatings should generally be avoided for

astronomy, though. They are great for certain daytime applications, but at night they can dim the image and cause some odd colors in the stars. Avoid zoom binoculars. They seem like a great idea and work well in daytime, but seldom give satisfactory images of stars (unless they are *very* expensive binoculars!).

Focus is critical

Getting a good focus on faint points of light at night is a tougher optical challenge than focusing on a daytime scene. A traditional roller focus mechanism is better for astronomy than the very common rocker focusers. The rockers are great in the daytime when you may need a quick focus on something moving like a bird or a sports event, but the slower-moving roller focus gives more precision at night. Be sure the binoculars can be adjusted wider or smaller to match the distance between your eyes, and that one side of the binocular has an additional focus mechanism at the eyepiece.

Roller focus
Recommended for astronomy

Rocker focus
Not recommended for astronomy

Dew is the Enemy

Particularly in damp regions like Acadiana, binocular lenses and eyepieces can become covered with dew very quickly. Older or less-expensive binoculars can even get dew inside their barrels, and the ways to get rid of the dew are ineffective when that happens—your viewing is just over until the binoculars have been inside long enough to clear themselves, which can take an hour or more. If you can afford them, consider water-proof, nitrogen-filled binoculars if you live in such a damp area. They are well-sealed. My problems with dew inside my binoculars went away when I switched to water-proof, nitrogen-filled binoculars.

Dew-covered binoculars are a challenge in damp environments

Testing Those Binoculars

The Internet can give you a tremendous selection of brands and types of binoculars, but if you are lucky enough to have something like a science or birding store nearby, you might prefer buying locally, giving you a chance to give the binoculars a careful look before buying!

With light coming from behind you, look at the front lenses. They should look fairly dark. That indicates good coatings on the lenses, transmitting light into the binoculars rather than reflecting it back to you. You want the most efficient

coatings you can afford. The coatings pictured are not perfect, but are good.

Do the same type of check while looking at the eyepieces. Hold the binoculars at arm's length facing a brightly lighted, empty wall and look at the exit pupils (which appear as light at the center of the eyepieces). They should be round, not with squared- off edges. That commonly indicates the use of less desirable BK-7 glass, and that will reduce the quality of the image.

Round exit pupils for preferred BAK-4 glass

Squared-off exit pupils for less desirable BK-7 glass (the binoculars can still be used, but are less efficient than similar ones with BAK-4 glass)

If you wear glasses, can you see the whole field of view while wearing them? If not, can you accept that? If not, it might be possible to focus each side of the binocular without your glasses, (but only your glasses can help if you have something like astigmatism).

How is image at the edges of the binoculars? Blurry or sharp? Darker than the center, or bright to the edge? Good focus and even brightness across as much as the image as possible is really important in astronomy.

How do the binoculars *feel*? Are they well-balanced and comfortable to hold?

No matter where you buy your binoculars, keep the receipt until you've had a chance to see how they do under the stars!