The Night Sky By Eric Erickson

Offered Title: Beyond Binoculars

As a portal to our universe our eyes serve us well, and binoculars give us a brighter, sharper, closer look. But, if you really want an affordable way to get more personal with our universe ya gotta go telescope!

Telescopes simplify, one eye instead of two. No issues with lining up two optics so you don't end up with a headache. And power! It is so much easier to bump up power to high levels with a telescope and retain good image quality.

There are two basic concepts with all optics: Refraction with lenses and reflection with mirrors. here are combinations as well, using both concepts in the same instrument. This week we will look at refraction.

Refraction

Refraction is the concept of refractor telescopes. They use lenses to bend light and focus an image of the object. These are the telescopes with a lens in front and a focuser in the back.

Basic refractors use a 2-lens element combination in the front called the objective. They are labeled achromatic, without color error but this is a misnomer. To approach its name it needs a focal length at least 15x greater than its objective diameter. For a 100mm objective the telescope length is 15 x 100mm or 1500mm. That's nearly 5 feet. Most basic refractors objective lenses are set at 10-12x the diameter for ease of use. This compromise results in color fringing around bright objects and some loss of contrast. They are good for low to moderate powers (up to around 1.6x per millimeter objective diameter). So, for a 60mm achromatic refractor the image should be good up to around 100x. As power increases beyond 100x color fringing and lower contrast reduces image quality.

The next step up is a 2-lens objective using one lens of extra low dispersion glass (ED). These telescopes are called apochromatic, also meaning without color error. They are better but still have a little color error. Nevertheless they are superior to achromatic lenses, with little fringing and can produce higher magnifications (2-3x per millimeter) while retaining good image quality.

The best refractors typically use 3 lenses up front, including two ED glass lenses or one ED lens and one fluorite crystal lens. They can achieve magnifications of 4x per millimeter while maintaining very good image quality.

Refractors come in sizes ranging from 25mm to over 200mm diameter. Their advantage is a straight through path for light, no obstructions as we will see with reflective telescopes. Refractors can produce very crisp and contrasty images, so they are especially good for lunar, planetary, double star, and star cluster observation. Larger refractors also do well on nebulae and galaxies. Their disadvantages - they get very front heavy as size increases and the ones using ED or fluorite elements are expensive.

What's in the Sky?

Get your optics ready for April 7th. Jupiter will be its biggest for 2017. Look east after 9pm.