Return of the Original "Newtonian"

Vixen Optics Introduces Historically Correct Replica of Isaac Newton's Original Reflector Telescope

By Brian Deis

As a telescope enthusiast I am personally thrilled that Vixen Optics has introduced a historically correct replica of Isaac Newton's original reflector telescope. This limited edition telescope replicates the material and handmade technology that existed in Newton's era and allows the owner to view the skies as Newton did in 1672 with this operational replica.

It's an amazing piece of technology, blending Newton's ground breaking design with today's state of the art optics. The Newtonian replica comes complete with a fully functional optical tube incorporating Vixen's highest quality mirror technology, two eyepieces and an ash wood globe pedestal mount. The complete package is wrapped in waxed parchment paper reminiscent of the era and enclosed in an antique style cargo box.

Prior to Newton's introduction of his reflector, refractor types telescopes focused the various colors of light at different locations from the lens, which produced chromatic aberration (color blur). Attempts to correct this produced longer telescopes that were difficult to stabilize and focus. Newton realized the limit of the telescopes that existed and searched for a solution.

An 1866 graduate of Cambridge University, Newton' solution was driven by a breakthrough discovery about telescope design. He realized that the color spectrum was seen when light passes through a prism. At first, Newton predicted that this "rainbow," which consisted of different colors, was not due to the characteristic of the prism, but due to the characteristic of the light. He also reasoned that a white-colored light was a combination of light rays of different colors. Next, he discovered that the white light split into the rays that have different foci as it entered the prism. Finally, he discovered that the size of the spectrum depended on the prism. He concluded that when a weak prism was used, light was bent by a small angle and the rays of different colors were dispersed in a short spectrum, but when a prism which deflected light at a large angle was used, the dispersion of the color spectrum also became large.

The conclusion drawn from these observations by Newton was based on the refractory telescope designed by Dutch astronomer Christiaan Huygens, who discovered Saturn's moon, Titan, in 1655. The refractory telescope was limited in its performance due to the objective lens used. Since the light from a star focused at different locations from the lens, chromatic aberration was inevitably created. Also, the focal distance became longer if a weak prism was used to reduce the color blur.. Even if the telescope were designed with great precision, or if an excellent lens was manufactured, the telescope required great length to produce better optical performance.

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Based on these parameters, Newton created his reflecting-type telescope. His solution was to use a concave mirror to collect light and focus the light at one point instead of using a prism. A lens focuses the various wavelengths of light at different focal points, but a mirror focuses the light at a single focal point. Thus, the Newtonian telescope does not create the chromatic aberration produced with the refracting telescope.

There had been earlier attempts to theories were not satisfactory since a mirror reflected the light that hit it and required an observer to look in the mirror to see the images. Consequently, the observer's head blocked the light coming from sky. Newton found a solution to the problem in which a small secondary mirror was placed above the mirror to reflect light one more time.

After solving these problems, the Newton telescope was presented to the Royal Society Conference in 1672. The Royal Society was impressed with Newton's design and he was elected as a special member of the Royal Conference.

For more than 60 years prior to this invention, astronomers were striving to explore the universe by increasing the design a telescope made of a mirror instead of lens. An Italian physicist, Nicolas Zucchi, and a French mathematician, Marin Mersenne, wrote theoretical papers about a telescope made with a mirror. However, their

size of Galilean telescopes while still realizing the limitations of a refractory telescope. The stellar images obtained by this telescope were always blurry, because no sophisticated lens manufacturing technology existed at the time. In addition, the field of view of the telescope became significantly narrower as the magnification increased.

Despite this disadvantage, the refracting-type telescopes continued to improve as a result of German astronomer Johannes Kepler's design in which two convex lenses were combined and by an improvement made by Huygens. But the improvement always required a large optical tube. In 1656, for example, a telescope designed by Huygens had an enormous length of 37 meters. Scientists were unable to develop improvements that could be made on a giant telescope because of its size rather than the optical limitations.

Newton's reflecting telescope, with a compact size of only 30 centimeters, was unprecedented and made the giant-sized telescopes obsolete. It was the beginning of a new era in telescope design that has blossomed into the incredible range of technology available to astronomers today.

The introduction of the Vixen Optics limited edition replica is a unique opportunity for any enthusiast (like myself!) who will find that it is both a beautiful conversation piece warranting a position of honor in the library and a fully functional telescope that will draw a crowd at any star party.

The Newton telescope is available from Vixen dealers in the US and Canada. For a dealer list visit www.vixenoptics.com

Specifications:

Optical Tube Type: Flexible-Tube Focus Adjustment Type
Primary Mirror Diameter: 70 mm
Focal Distance: 280 mm
Magnification: 14x (K 20 mm) / 28x (K 10 mm)
Optical Tube Material: Aluminum Alloy
Coating: Triple-layer antique color hand-coating
Mount Type: Globe Pedestal
Mount Material: Pure ash
Coating: Antique-color varnish
Storage Box Material: Plywood
Coating: Antique cargo box coating
Optical Tube Length: About 300 mm
Optical Tube Diameter: 90 mm
Globe Diameter: 100 mm
Pedestal Diameter 220 mm
Total Height: About 305 mm (Optical tube at horizontal position)
Storage Box: Width 370 mm X Height 355 mm X Depth 240 mm