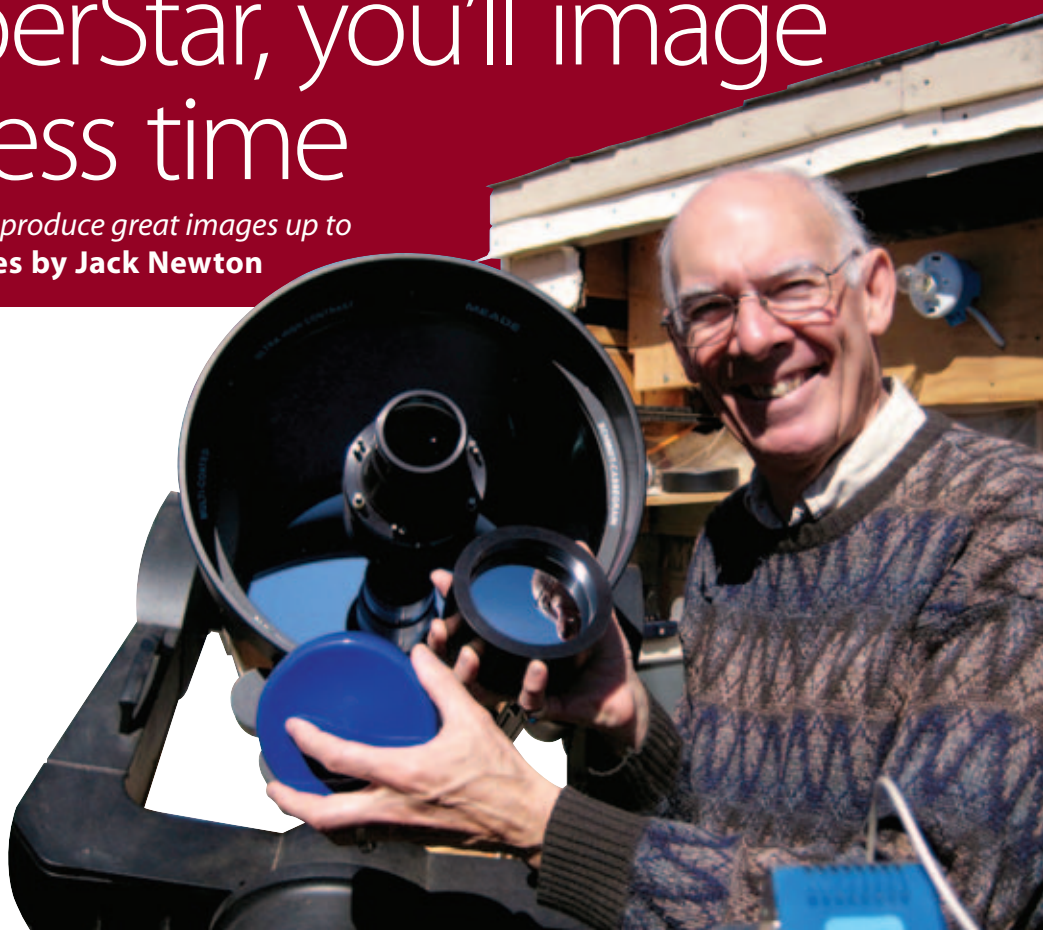
Equipment review

With HyperStar, you'll image more in less time

After a quick alteration, you can produce great images up to 30 times faster. **text and images by Jack Newton**



The author stands near his HyperStar-converted 14-inch Meade Schmidt-Cassegrain telescope.

For years I bought bigger and bigger telescopes so I could get higher magnifications and brighter images. Unfortunately, the trade-offs were bloated stars and tougher guiding. Not anymore. The HyperStar lens system, manufactured by Tucson-based Starizona, allows me to transform narrow-aperture telescopes so they gather light like much bigger instruments.

Lightning fast

With an f/2 focal ratio, the HyperStar lens allows me to take exposures up to 31 times faster than through a standard Schmidt-Cassegrain telescope (SCT) at f/10. A 60-second exposure with the HyperStar at f/2 equals a 30.9-minute exposure at f/10. This makes it simple to take advantage of sky conditions, even when they're short-lived.

I have recently been using Canon digital SLR cameras for color astroimaging. I often couple them with a 4-inch f/4.1 astrograph for wide-field shots. The Canons respond well at fast f-ratios, and that shortens exposure times and results in better images. With the excellent transparency I enjoy by living at Arizona Sky Village, I wanted to acquire a larger-aperture, fast-focal-ratio instrument. The HyperStar lens system was the answer.

Easy to install and use

I was pleased to find that I could transform a Meade or Celestron 8-, 10-, or 14-inch SCT easily into a wide-field f/2 system. Even older models can accept this alteration. What's more, Starizona designed the HyperStar's field flattener to deliver a flat field with no coma.

I love the fact that the HyperStar is threaded for 2" filters. This is perfect for light-pollution control. The conversion from f/10 to f/2 is straightforward. First, remove the three restraining screws that connect the secondary mirror to the corrector plate. Then lift the secondary mirror off its mounting ring, and replace it with the HyperStar. The whole conversion takes about 5 minutes.

Mounting the HyperStar lens system to a Schmidt-Cassegrain telescope takes minutes.

You collimate HyperStar with three push/pull adjustment screws. Because HyperStar increases the weight at the front of the telescope, the manufacturer

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Specifications

Starizona HyperStar

Focal ratio: f/2.0
Largest usable CCD chip: 27mm (diagonal); up to 42mm is possible on some models with some vignetting
Size: Varies by telescope — up to 6.6 by 4.1 inches (168mm by 104mm)
Weight: Varies by telescope — up to 3.5 pounds (1.6 kg)
Features: Fully multicoated optics, black anodized finish, independent camera rotation
Includes: Secondary mirror holder and counterweight
Price: $595 to $1,295

This composite image of the Horsehead Nebula (B33) and the Flame Nebula (NGC 2024) illustrates how quickly HyperStar produces images. This picture required only 37 minutes of exposure. Also note the wide brightness range captured. The bright star Zeta (ζ) Orionis shines at magnitude 2.0.

The Seagull Nebula (IC 2177) in Monoceros reveals great detail in full color after only 60 minutes total exposure with HyperStar.

The Andromeda Galaxy (M31) is a treasure in the autumn sky. Capturing detail in its outer spiral arms without burning in the core, however, can prove difficult. This image required only 60 minutes of exposure.

The Rosette Nebula (NGC 2237–9) in Monoceros combines a star cluster with emission nebulosity. Through HyperStar, the author captured this image with 36 minutes of exposure.

Perhaps the sky's greatest nebula is the Orion Nebula (M42), a showpiece of the winter sky. This image required 25 minutes of exposure.

A 1-minute exposure of the Pleiades star cluster (M45) surprised the author because behind the brilliant stars and nebulous glow, he captured more than 50 faint galaxies. This 30-minute exposure shows many more. Here, we've zoomed into a portion of it and circled the galaxies.

The Lagoon Nebula (M8) in Sagittarius is a colossal cloud of glowing hydrogen crossed by a dark lane. This 20-minute exposure captures the red color of the Lagoon and its surrounding nebulosity.

Recording the coma and denser pseudonucleus of Comet 17P/Holmes against the background stars took mere seconds with HyperStar.

With a Canon digital SLR camera mounted to a HyperStar-ready telescope, the author is equipped for one-shot color astrophotography.

Meade's Deep Sky Imager PRO III camera mounts easily on the HyperStar. This is just one of the many CCD and digital cameras the HyperStar lens system will accept.

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provides a threaded counterweight to screw onto the back. The counterweight replaces the star diagonal and eyepiece.

A flexible system

The star images I'm producing with the HyperStar lens are amazing. With my 14-inch Meade SCT and a Canon digital SLR camera set to ISO 1600, I took a 1-minute exposure of the Pleiades star cluster (M45). When I studied the image, I counted more than 50 galaxies buried behind the brilliant stars.

Over many years, I have used a variety of cameras from several manufacturers. Each instrument requires an adapter to fit the critical focal length of the HyperStar lens system.

Various cameras exhibit differing degrees of vignetting (which cuts off the field of view's edges) with HyperStar. Canon's full 35mm frame 5D has substantial vignetting caused by its CCD chip's deep recess. By contrast, Starlight Express mounted the chip at the front of the camera, resulting in no vignetting.

With a focal ratio of f/2, HyperStar offers the additional advantage of requiring no guiding up to exposures of 1 minute or so. For longer exposures with my 14-inch Meade SCT, I use a Meade DSI coupled to a 300mm lens to auto-guide.

My favorite digital SLR is a "cold" Canon XT. The company Central DS (www.centralds.net) modifies Canon XT and 40D models in its South Korea factory. Central DS retrofits these models with a cold chamber that surrounds the CMOS chip and cools it to around the freezing point of water. This is desirable because each 6° reduction in temperature cuts the thermal noise (which shows up as imperfections in the image) in half. The modification necessary to produce this true cold camera also includes a Peltier cooler. A side-mounted copper heatsink pulls the heat from the camera.

Also, a new expanded-frequency infrared (IR) blocking filter helps capture deeper red and Hydrogen-alpha frequencies if you're imaging the Sun. Central DS fits the IR-blocking filter with a heater to remove frost should the CMOS chip's temperature drop below the dew point.

In my opinion, the modified Canon camera available from Central DS used in combination with HyperStar is an unbeatable combination. The modified Canon D40 color images are dramatically better than any I have produced. It performs with so little noise that images don't require a dark frame. If you're a serious astroimager who wants maximum image capture in minimum time, check out the HyperStar.

Jack Newton *is a world-renowned Canadian astroimager who spends half the year at Arizona Sky Village in Portal, Arizona.*

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