

# A wide-field imager's dream scope

As CCD chips have grown in size, so too have the demands they place on telescopes. In 2004, Tele Vue Optics of Chester, New York, started work on a new design to address this demand. The Imaging System ("is") series provides a suitable image field for use with these chips.

I participated in the development of the "is" series as a prototype-tester. During evaluation, I imaged with each of the scopes using several different CCD cameras. I took images of dense star fields from my observatory, which I scrutinized intensely to assess the image quality.

## The "is" series

Tele Vue's "is" series consists of the TV-60is (a 60mm f/6 APO doublet), the NP101is (a 101mm f/5.4 four-element Nagler-Petzval), the NP127is (a 127mm f/5.2 four-element Nagler-Petzval), and the TV102iis (a 102mm f/8.6 APO doublet). The NP101is is a modified version of the NP101, which traces its roots back to the original Tele Vue MPT designed by Al Nagler in 1980.

The Petzval telescope, whose lens is a four-element design with two widely-spaced groups, provides a flat field while still maintaining control over other aberrations. Designs using only front lenses, whether a doublet or a triplet, cannot accomplish this. The "is" series' short focal lengths and fast focal ratios make them the perfect telescopes for imaging wide fields. And all Tele Vue telescopes are handmade by a single technician in Tele Vue's factory.

## The NP101is

The NP101is contains larger rear elements and a larger focuser than its predecessors to

minimize vignetting (shadowing of the field that shows up as dark edges on images) on a focal plane up to 2" (51.9mm) across. Its focuser has an entrance aperture of 3" (76mm) and a full 2.4" (61mm) of clear aperture throughout its length.

Mechanically, Tele Vue's new focuser can support the heaviest CCD camera without flexing. The focuser has thick walls, and its drawtube rides inside a Teflon sleeve, which reduces friction. This sleeve doubles as a dust seal, keeping the inside of the focuser and the scope's rear elements clear of contaminants.

The focuser integrates a 6:1 reduction drive called the Focusmate, which allows the precise control required to focus a CCD camera on an f/5.4 system (or even f/4.3, when the optional 0.8x focal reducer is used). You can rotate the camera without

changing focus thanks to a four-point collar built into the focuser's drawtube.

## More than a scope

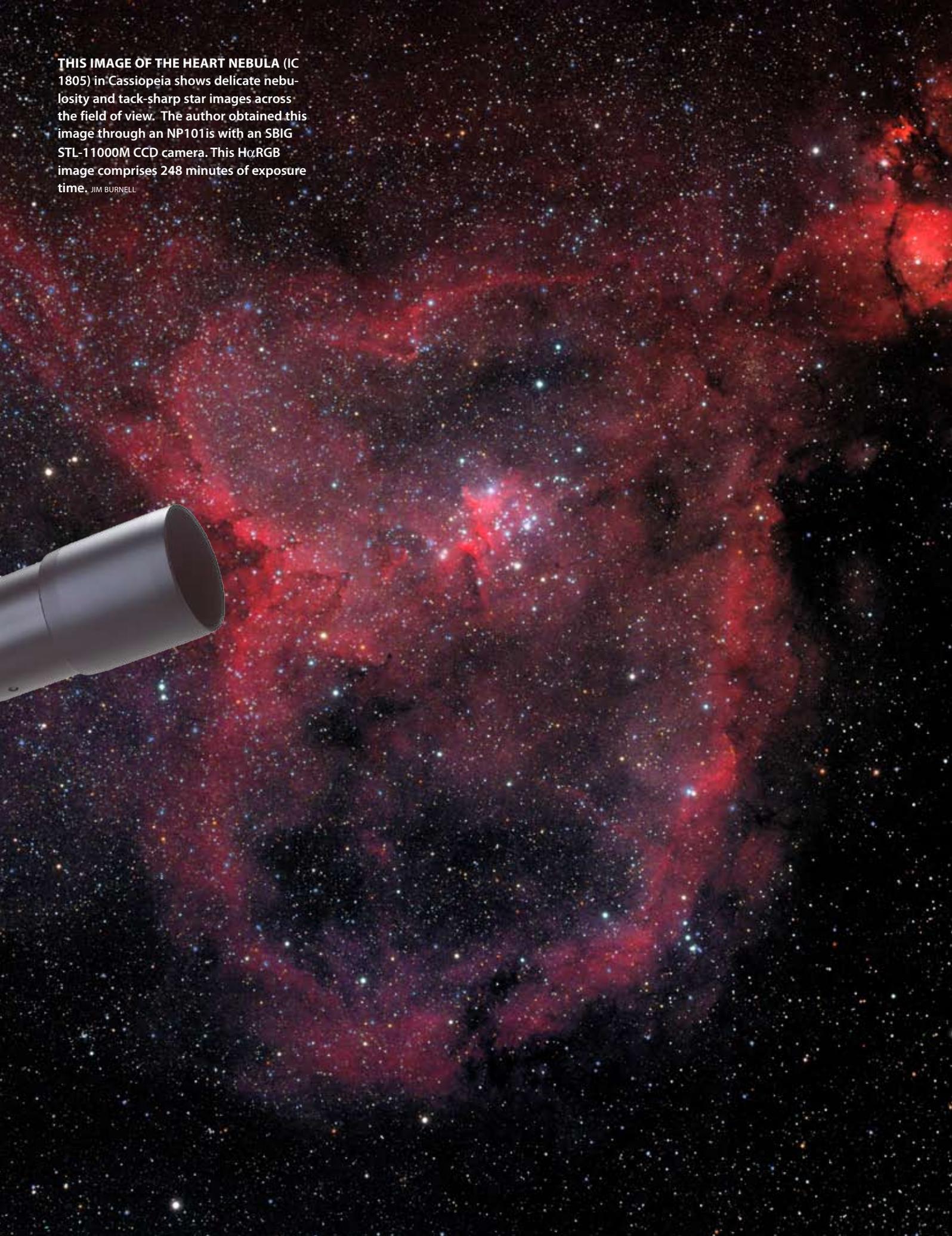
The "is" series has a comprehensive set of imaging accessories. Among them is a set of camera adapters, a 0.8x focal reducer, and a single-element large-field corrector (needed only for the largest CCD chips). Spacer rings go between the focal reducer or large-field corrector and the CCD chip to optimize performance.



**TELE VUE'S NP101is**, shown here set up for visual observing, operates at f/5.4. Attach SBIG's STL-11000M CCD camera, and you'll image a field of view 3.8° by 2.5° — 38 times larger than the Full Moon.

ASTRONOMY: WILLIAM ZUBACK

**THIS IMAGE OF THE HEART NEBULA (IC 1805) in Cassiopeia shows delicate nebulosity and tack-sharp star images across the field of view. The author obtained this image through an NP101is with an SBIG STL-11000M CCD camera. This H $\alpha$ RGB image comprises 248 minutes of exposure time.** JIM BURNELL





**THE RED EMISSION NEBULA** Sharpless 2–129 demonstrates the wide field and edge-sharpness of the NP101is. Color rendition also is excellent. The blue reflection nebula surrounding the star is Van den Bergh 140. TONY AND DAPHNE HALLAS

Tele Vue also makes a spacer that accommodates a 48mm filter. This allows imagers to insert a light-pollution reduction (LPR) filter in the image train. The filter proves useful for those who image under less than pristine skies.

The Focusmate is standard on all “is” scopes. Control of the Focusmate can be manual, remote (with the optional Focusmate Driver), or computer-controlled through a USB interface (with the optional FocusMaster). For repeatable precision focusing, the Fine Focus Indicator, a digital micrometer, is available with resolutions of 1 micron or 10 microns. Optional interface cables allow remote display of focus position on a computer via the FocusMaster or an RS-232 interface.

Tele Vue also offers a machined set of black-anodized mounting rings for the NP101is. Dovetail bases are available for the ring set in both 1.7-inch and 3-inch

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sizes to allow mounting the NP101is on most German equatorial mounts.

### Appearance, fit, and finish

Tele Vue has a reputation for producing telescopes as beautiful to look at as they are to look through, and the NP101is is no exception. From the optical tube’s pebble-grain, powder-coated ivory finish to the glass-bead-finished, black-anodized focuser, lens cell, and dew shield, the telescope exudes quality.

The felt-lined dew shield slid along the lens cell without slipping. It kept the lens dry on all but the most humid evenings.

The focuser worked smoothly in a variety of temperatures. It sports dual lock-screws, set 90° apart, which cause only the slightest image shift when tightened.

The Focusmate Driver also performed well. Unlike most electric focusers, you can disengage it by loosening a lock screw and rotating it. Combined with the Focusmate, it has a huge amount of torque and can move the drawtube even with the focuser lock moderately tight. It easily lifted 5

## /// SPECIFICATIONS

### TELE VUE NP101is

- Lens:** Nagler-Petzval, 4 elements in 2 groups
- Aperture:** 4 inches (101mm)
- Focal length:** 540mm
- Focal ratio:** f/5.4
- Focuser:** 6:1 reduction drive, 2.4" (61mm) of clear aperture
- Included:** Sliding, captive dew shield; 2" accessory adapter with clamp ring; custom-fitted hard-shell case.

pounds (2.3 kg) of camera and cables, even with the telescope pointed straight up.

I have only one minor complaint: The front cover, which is heavy aluminum, can be difficult to thread onto the front cell, especially in the cold with gloves on. Tele Vue addressed this minor deficiency with the NP127is, which has a metal-rimmed Plexiglas cover with a convenient knob.

### Testing

For the past 2 years, I have imaged through the NP101is using a Starlight Xpress SXV-H9 CCD camera, which has a 9.98mm by 6.7mm CCD chip with 6.45 micron pixels, and an SBIG STL-11000M CCD camera, which has a 24.7mm by 36mm CCD chip with 9 micron pixels.



**THE FOCUSMATE** focuser comes with all Tele Vue “is” scopes. You can control the Focusmate manually, remotely (with the optional Focusmate Driver), or by computer (with the optional FocusMaster).

ASTRONOMY: WILLIAM ZUBACK; BACKGROUND: JIM BURNELL



**IMAGING ACCESSORIES** for the NP101 is currently total more than a dozen camera adapters, a 0.8x focal reducer and a large-field corrector lens. ASTRONOMY: JAMES FORBES

The small pixels on the SXV-H9 camera at the focus of the NP101 sample the sky at 2.44" per pixel. This camera is typical of amateur CCD cameras and provides a good test of image quality. I also used this camera to test the optional 0.8x focal reducer, which Tele Vue recommends for use only on CCD chips of APS-size (24mm by 16mm) and smaller.

Through the NP101, SBIG's STL-11000M camera covers 3.8° by 2.5° of sky and serves as a demanding test for the NP101's field flatness and its field illumination. The camera's weight — more than 4 pounds (1.8 kg) with cables and hoses attached — tested the focuser's ability to hold the camera without slipping or flexing during a multi-hour exposure.

### Illumination and color

Imagers can enhance, or stretch, digital images to reveal details at low brightness levels. A telescope design that vignettes the CCD's field will create images with an uneven background, which becomes more obvious as the image is stretched. The NP101 is provided a well-illuminated, uniform field that dropped off by less than 10 percent at the extreme corners.

Because the typical CCD chip detects a wider range of wavelengths than the human eye, deficiencies in color correction are obvious. The usual symptom is blue-bloat, where blue halos surround stars. The NP101 was free of chromatic aberration, as demonstrated by the celestial images accompanying this article.



**ONE ACCESSORY** astroimagers especially like is the Fine Focus Indicator, a digital micrometer with resolutions of 1 micron or 10 microns. You can also display focus position on a computer with optional interface cables. ASTRONOMY: WILLIAM ZUBACK

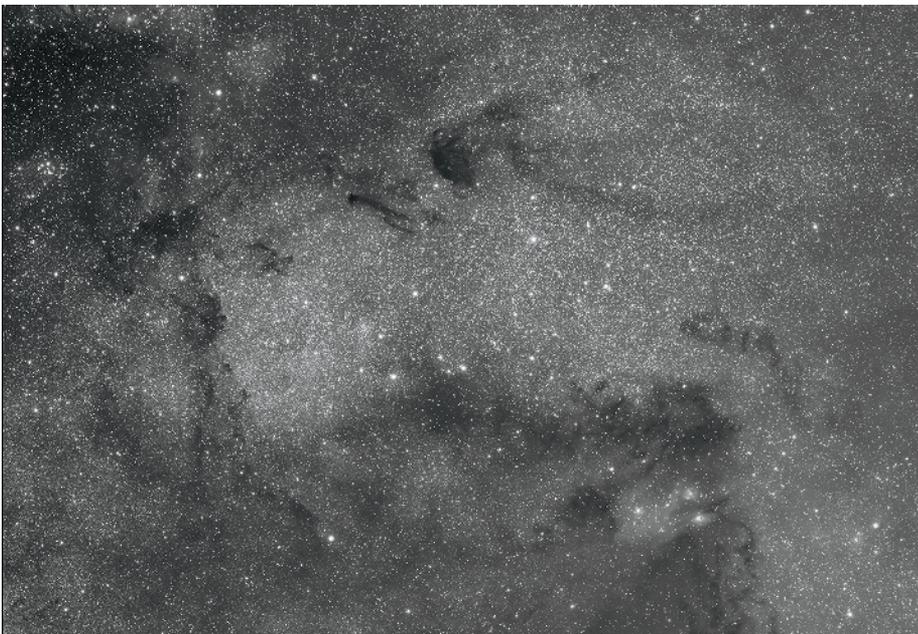
### Visual observing

This telescope offers a side benefit for non-imagers: It's an even-better observing telescope. A large-chip CCD camera with small pixels requires telescope edge-field performance that far exceeds the performance required for visual observation.

The NP101 is provided a visual observing experience unmatched by most similar-sized telescopes I have used. I routinely used this telescope for visual observations of Jupiter and Saturn with a 2.5mm Nagler Type 6 eyepiece (216x), and the images were stunning.

At the 2007 Winter Star Party in West Summerland Key, Florida, views of Saturn showed no color fringing. At 216x, the NP101 is rendered both the Encke Division and the Crepe ring easily visible.

Tele Vue's NP101 has a great reputation for visual use, much coveted by observers. The NP101 continues in this tradition, adding imagers to the ranks of its fans. ■



**A PERFECT TARGET** for evaluating telescope image quality is the Sagittarius Star Cloud (M24). The imagers compared stars in the field's center and corners. In each region, star images are identical, a testimony to the flatness of the field. TONY AND DAPHNE HALLAS

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