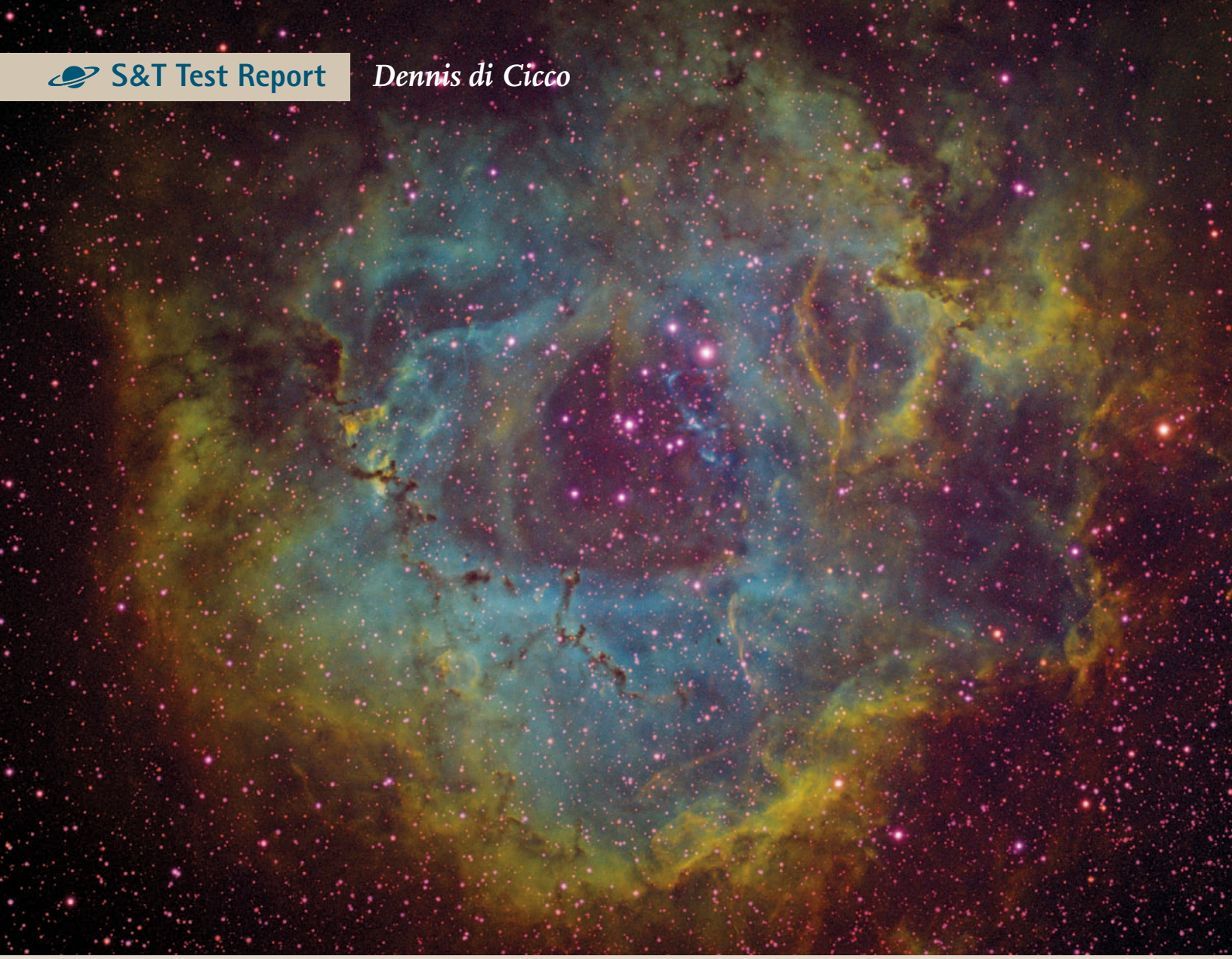
Dennis di Cicco



Officina Stellare's Veloce RH200 Astrograph

This 8-inch f/3 catadioptric system hits a lot of sweet spots for today's astrophotographers.

The Veloce RH200's f/3 focal ratio makes it a superb astrograph for imaging nebulae with narrowband filters. The author made this view of the Rosette Nebula using SBIG's new STT-8300 camera; H-alpha, SII, and OIII filters; and approximately 2 hours of exposure through each filter.

ALL PHOTOS BY THE AUTHOR WITH ADDITIONAL IMAGE PROCESSING BY SEAN WALKER

WHAT WE LIKE:

Ideal system for medium-field deep-sky imaging

Superb image quality across large CCD chips

Stable focus in changing temperatures

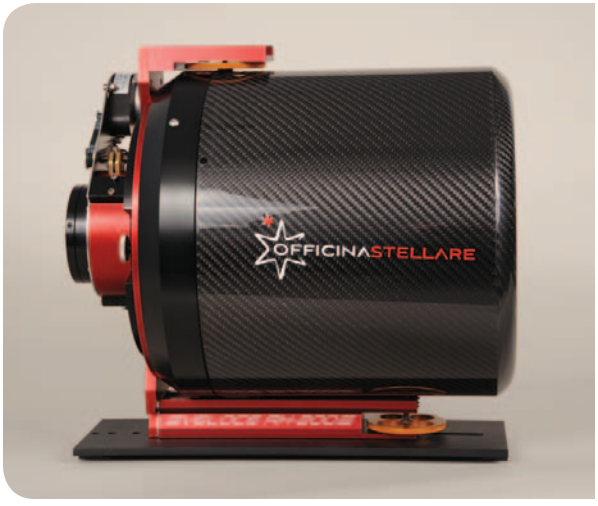
WHAT WE DON'T LIKE:

Unusually heavy for its size; requires substantial mount

While reviewing imaging equipment a few years ago, I envisioned an astronomical Rip Van Winkle awakening from his 20-year snooze to discover a world of astrophotography unlike anything that existed when he dozed off. Digital cameras, computerized image processing, and new telescopes made specifically for astrophotography were just some of the wonders he'd encounter. Well, it's time to dust off that literary conceit for use again, because today's awakening Rip would have even more new wonders to behold. And one that would surely boggle his mind is Officina Stellare's new Veloce RH200, a Riccardi-Honders 200-mm (8-inch) f/3 astrograph.

Indeed, old Rip could have taken a mere catnap and been surprised by the Riccardi-Honders design, since it was barely a blip on astrophotography's radar five years ago. New designs, not to mention new names for variations on older designs, continually turn up in the imaging marketplace. But the Riccardi-Honders design stands out from the others. Writing in their new book *Telescopes, Eyepieces, and Astrographs* (Willmann-Bell, 2012), Gregory Hallock Smith, Roger Ceragioli, and Richard Berry, state that "In principle, [the Riccardi-Honders design] is better than any other astrograph we know." That's a pretty powerful statement given the wide range of high-end imaging systems currently available.

These authors also note that while the Riccardi-Honders moniker is relatively new, the design has roots extending as far back as the early 19th century. Furthermore, during the latter half of the 20th century, systems "practically identical" to the Riccardi-Honders were proposed by various optical designers. For astrophotographers, however, the ball started rolling soon after the turn of the millennium when Klaas Honders introduced amateur telescope makers to a Newtonian variant of earlier designs. A few years later, Italian optical designer Massimo Riccardi worked Honders's system into the Cassegrain configuration found in today's astrographs.



With its dew cap retracted, the RH200 is not much longer than it is wide. But the dew cap must be fully extended (seen below) when the astrograph is used, since the dew cap's front aperture forms an integral part of the imaging system.

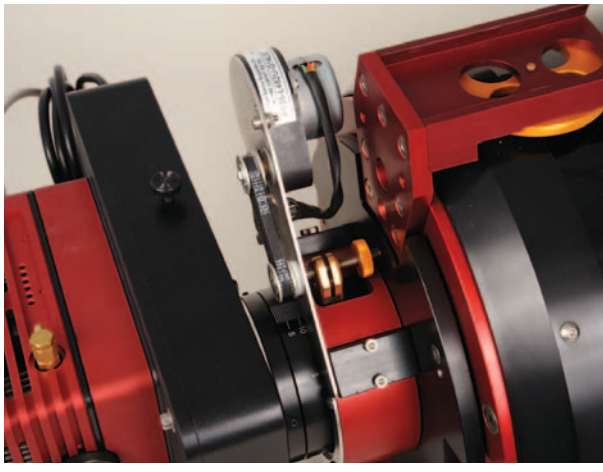
In a nutshell, these astrographs have a full-aperture, single-element meniscus objective, a Mangin-type primary mirror (basically a meniscus lens that light passes through twice due to a reflective coating on the *back* side of the glass), a convex Cassegrain secondary mirror, and a corrector lens near the focal plane. The system produces tight, round star images on a large, flat focal surface through a wide range of wavelengths. And it can be made with large apertures and very fast f/ratios. In other words, the Riccardi-Honders design has the qualifications required to make it the Holy Grail of astrophotographers.

We borrowed the Veloce RH200 from its Italian manufacturer for this review. The most basic form of the Veloce RH200 is the optical tube assembly with a Vixen-style dovetail mounting bar, but without a focuser. The model we borrowed came with Officina Stellare's robust Crayford-style focuser (a $200 option), which has precision

Although tested with several cameras, the RH200 astrograph worked particularly well with SBIG's STT-8300 CCD camera and autoguiding filter wheel pictured here. Officina Stellare makes an 80-mm guide scope that fits on the astrograph's top bracket.

RH200 Astrograph

U.S. price: from $8,395
Available from Officina Stellare dealers worldwide
officinastellare.com



Left: **As explained in the text, full-frame DSLR cameras work best when used with special adapter rings.** ***Center:*** **The Riccardi-Honders optical design in the RH200 has a full-aperture corrector with an aluminized spot on its back side forming the Cassegrain secondary mirror.** ***Right:*** **Some camera setups have limited clearance with the optional RoboFocus system (see the accompanying text for details).**

tip-tilt adjustments for squaring it to the scope's optical axis. The focuser was also fitted with an optional RoboFocus motor drive that has a starting price of about $400 and can run upward of $600 depending on the electronic package ordered with it.

Multiple Sweet Spots

The Veloce RH200 has a lot going for it. The one thing that immediately catches the eye of even casual astrophotographers is its unusually fast f/3 focal ratio, which makes it an ideal instrument for recording faint nebulosity. It also has 8 inches of aperture, and it is aperture, not f/ratio, that is the critical factor for imaging faint stars. Next on the list is its 600-mm focal length and corresponding image scale of 344 arcseconds per millimeter, which is enough to resolve fine detail in nebulous objects. And then there's field coverage. The RH200 is spec'd to cover a 43-mm imaging circle (spanning a 4.1° diameter field). This imaging circle is big enough to cover a full-frame DSLR or the popular Kodak KAI-11000 "full-frame" sensor used in many astronomical CCD cameras. But, as some of the images with this review show, I also had excellent results shooting with an even-larger-format KAF-16803 CCD camera, which requires an imaging circle 52 mm in diameter for full coverage. When I shot pictures with the RH200, only the very corners of the large-format chip had degraded star images.

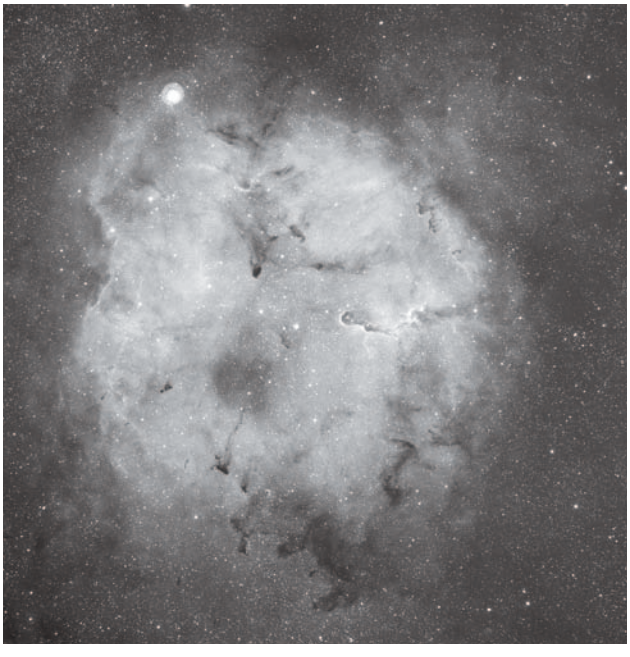
In my opinion, the real "sweet spot" for the RH200 is when it's connected to an astronomical CCD camera having the highly popular KAF-8300 chip. The result is a system with an image scale of 1.86 arcseconds per pixel and a very uniformly illuminated field of view covering 1.7° by 1.3°. In the interest of full disclosure, such a setup is ideal for the medium-field, deep, narrowband imaging that I like to do. But as much as I'm attracted to the RH200 because of these numbers, they are meaningless if the astrograph doesn't perform well under the stars. And that's where the RH200 really showed its mettle.

Left: **An unprocessed snapshot of the Pleiades in strong moonlight shows that only modest vignetting occurs when a full-frame DSLR camera is fitted with the large-aperture adapter shown above.** ***Right:*** **Even the brightest stars, such as Zeta Orionis in this 2-hour H-alpha exposure of the Horsehead Nebula, produce relatively small halos and no ghost images when recorded with the RH200.**

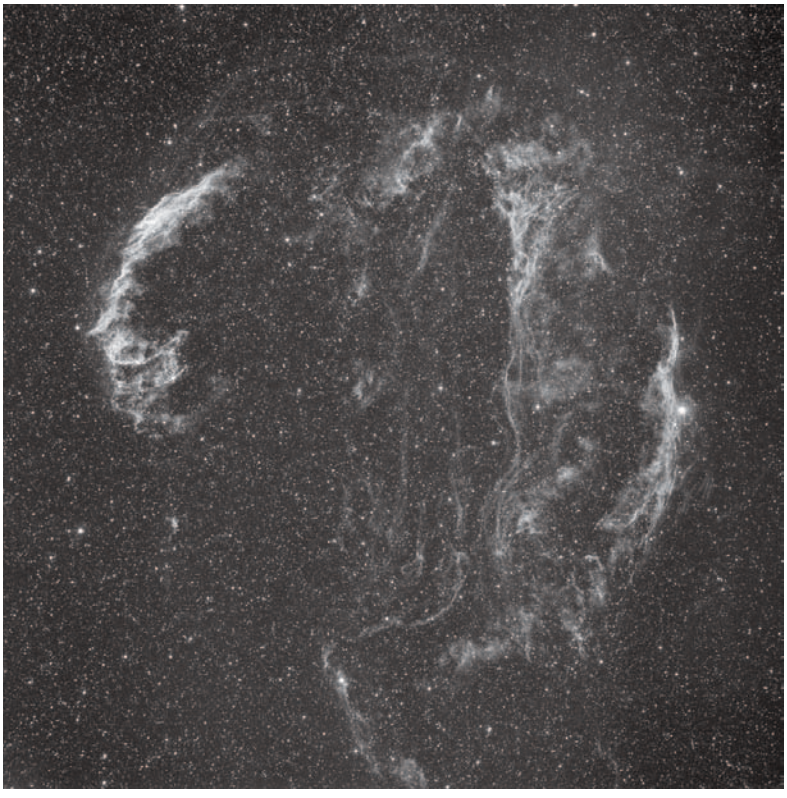
I tested the astrograph with a Nikon D700 full-frame DSLR; an FLI ProLine 16803 CCD camera, and the new SBIG STT-8300 CCD camera pictured on page 61 (which will be reviewed in an upcoming issue). Officina Stellare provided me with adapters for the Nikon and FLI cameras, and, because of its newness, I machined my own adapter for the STT-8300. However, I'm sure these will become commercially available very quickly. Although it's possible to use standard T-thread adapters to mount DSLRs to the RH200, these are only suitable for cameras with APS-size chips. Using full-frame cameras with T adapters will vignette the corners of the frame due to the restricted clear aperture of T-thread fittings. There are several sources, including Borg and Teleskop-Service, that offer large-aperture adapters made specifically for astrophotography with full-frame DSLR cameras.

Another caveat that goes with mounting cameras to the RH200 is its fixed backfocus, which falls about 60 mm beyond the astrograph's fully retracted focuser. That can be rather tight spacing for some setups. For example, the STT-8300 and its self-guiding filter wheel reached focus with less than a millimeter to spare between the plug on the RoboFocus electrical cable and the front of the filter wheel. And my Nikon would only reach focus when the camera body was turned such that the protruding front of the camera avoided the RoboFocus mechanism.

The last item worth mentioning is the RH200's weight. There's a lot of glass in the system, and despite its very compact appearance, it weighs almost 20 pounds (9 kg) without a camera attached. It thus requires a relatively substantial mount for astrophotography.



Another 200-minute H-alpha exposure made with the FLI ProLine 16803 CCD camera captures a 3.5°-wide field and the brightest portions of the well-know emission nebula IC 1396 in Cepheus.



Although the detector in the FLI ProLine 16803 CCD camera used for this 200-minute H-alpha exposure of the Veil Nebula covers a greater field than spec'd for the RH200, star images are excellent in all but the corners of the frame.

Overall, the RH200 performed superbly. Ghost images were never a problem, and halos around very bright stars were acceptable (see, for example, the image of the Horsehead Nebula on the facing page). The focus was remarkably stable over the temperature variations I experienced on most nights this past winter. During one 7-hour imaging sequence last January, I measured star diameters that tracked perfectly with my target's changing altitude despite a temperature drop of 10°F (5.6°C) from start to finish. I also found no need to refocus the telescope when I switched color filters while shooting broadband red, green, and blue images or narrowband images using H-alpha, SII, and OIII filters. When shooting multi-wavelength image sets, I'd always focus the RH200 using the filter closest to the middle of the wavelength range.

The accompanying photos pretty much speak for the imaging quality of the RH200. As I mentioned above, because the astrograph is ideally suited for the kind of imaging I most enjoy doing, I had very high expectations for the scope before it arrived. And there's no question that it lived up to all of them during the time I spent shooting with it. That, in my opinion, says a lot. ✦

Senior editor ***Dennis di Cicco*** *needed more than a few catnaps to catch up on all the sleep he lost while shooting images with the Veloce RH200 astrograph.*