ASTRONOMY TECHNOLOGY TODAY

Your Complete Guide to Astronomical Equipment

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MAKING A GUIDESCOPE FROM A SURPLUS CAMERA LENS • QHY5L-II
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WILLIAM OPTICS
GRAN TURISMO 81-MM REFRACTOR

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ATT Contents

Cover Story: Pages 37-41

The cover features William Optics' new 81-mm, f/5.9 Gran Turismo, a true Apo that incorporates a total of five lens elements in the form of a front-mounted, air-spaced triplet crafted from high-quality FPL-53 extra-low dispersion glass followed by a doublet of ED glass located at the focuser end of the OTA, all fully multi-coated. The scope is fitted with a 2-inch, two-speed Crayford-style focuser, of which Dr. James Dire reports, "This is the first telescope I have done CCD imaging with that tightening the focus locking screw did not slightly shift the focus!" The background image of globular cluster Omega Centauri (NGC5139) was captured with the Gran Turismo from Hawaii when the target was just 20 degrees above the horizon. Aggregate exposure time was 20 minutes.

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ATT Contributing Writers

Greg Comegys graduated from Purdue University with BSME & MSME degrees, and retired after 43 years as an aerospace engineer. He is an active member of the Grand Rapids, MI, Amateur Astronomy Association, (GRAAA), and has taught adult education astronomy classes as well as seminars for the GRAAA. He has built several Newtonian telescopes for himself and his grandkids. He and his wife live in Caledonia, MI.

Dr. James Dire has an M.S. degree in physics from the University of Central Florida and M.A.and Ph.D. degrees from The Johns Hopkins University, both in planetary science. He has been a professor of physics and astronomy at several colleges and universities. Currently he is the Vice Chancellor for Academic Affairs at Kauai Community College in Hawaii. He has played a key role in several observatory projects including the Powell Observatory in Louisburg, KS, which houses a 30-inch (0.75-m) Newtonian; the Naval Academy observatory with an 8-inch (0.20-m) Alvin Clark refractor; and he built the Coast Guard Academy Astronomical Observatory in Stonington, CT, which houses a 20 inch (0.51-m) Ritchey–Chrétien Cassegrain telescope.

"Uncle" Rod Mollise, despite a demanding day job as an engineer with an aerospace firm, still finds time to teach astronomy to undergraduates at the University of South Alabama, write books and magazine articles about astronomy, and observe.

Rick Saunders is an amateur astronomer, inveterate tinkerer and member of the Royal Astronomical Society of Canada, London Centre. His passion is DSLR imaging and on cloudy nights he spends his time designing and building equipment to help further that passion.

Ernest Shekolyan was born in 1962. He has been a keen astronomer since childhood. Ernest graduated from Leningrad Institute of Precision Mechanics and Optics (LITMO), and taught optical courses there for a number of years. He helped develop collimation computerization theory as well as unique optical schemes. Currently, he is programming applied software.

Dave Snay is a retired software engineer living in central Massachusetts. He graduated from Worcester Polytechnic Institute and has been an astronomer and astrophotographer for more than 10 years. David currently pursues fine art photography, specializing in traditional black/white images. He also is involved in solar outreach.

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Industry News

The William Optics Gran Turismo 81-mm Refractor

Test Driving William Optics' Latest Innovative Telescope

By James R. Dire, Ph.D.

I have owned many refractors over the course of my life, both acromats and apochromats (often called Apos for short). See my article in the January/February 2011 for an explanation of the differences. Apochromatic refractors are the choice among most imagers due to their excellent color correction. Unfortunately, most short-focal length Apos suffer an aberration due to field curvature. This aberration causes off-axis stars to be elongated in the radial direction; the effect increasing with distance from the center of the image.

I currently use a 102-mm f/7.9 (800-mm focal length) refractor for imaging. I don't notice the field curvature with my small-format SBIG ST-2000XCM CCD camera. When the stars are in focus on the imaging CCD, they are pinpoint across the field of view. However, this model also has a guiding CCD, and I notice when stars are pinpoint on the imaging CCD, they are elongated on the guiding chip. In addition, when I switch to a larger-format camera, the field curvature near the edge of the images is unacceptable.

Image 1 - The Gran Turismo 81 refractor.

One solution to the refractor field curvature problem is to use a field flattener between the focuser and the camera. Many commercial field flatteners also reduce the focal length, making the optical system faster. I use a 0.8x field flattener/focal reducer with my 102-mm Apo, giving it a 640-mm effective focal length (f/6.3). When the stars are pinpoint on the imaging CCD, they are also very round on the guiding CCD. This optical accessory allows me to use a large-format camera to obtain very flat images (pinpoint stars across the image).

I recently had the privilege to test drive William Optics' latest innovative new telescope, the GTF81 Apo. While

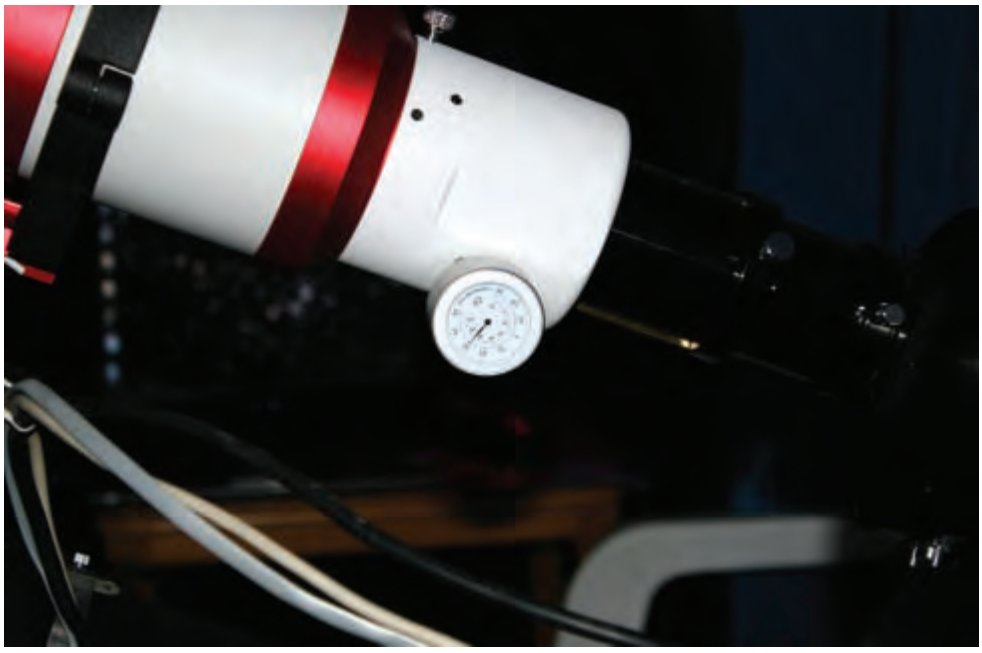

Image 2 - The left focus knob has a built-in analog thermomoter!

most true Apos have a three lenses in the optical train, the Gran Turismo line of telescopes have five optical elements. The objective is an 81-mm (3.2-inches) diameter optical air-spaced triplet containing high-quality FPL-53 extra-low dispersion glass. The second group, located at the focuser end of the optical tube assemble, is an air-spaced doublet containing ED glass that serves as a built-in field flattener. Each lens is fully multi-coated with a special super-high transmission coating on all surfaces. The focal length is 478 mm creating a fast f/5.9 imaging system. The advantages of the built-in field flattener are it shortens the overall distance from the focuser to the camera and requires one less accessory to store in the equipment case and attach for each observing run.

Image 1 shows the Gran Turismo 81. The optical tube assembly is beautifully crafted and made of aluminum. The tube is white with a metallic-red finish on the trim, clamshell ring, Vixen-style dovetail plate, tube cover, finder bracket and the focusing knob. The telescope does not come with a finder scope, diagonal, or any eyepieces, so they must be purchased separately. However, it does come with a 1.25 inch-to-2 inch eyepiece adapter. The dovetail plate is tapped to accept a ¼-20 tripod screw. The finder bracket should hold most 50-mm finder scopes (the finder pictured in Image 1 is a 9x50 scope). The six

Image 3 - The nearly full moon taken with an SBIG ST-2000XCM CCD camera.

alignment screws make it easy to adjust the finder parallel to the main telescope!

The GTF81 is very compact. Its storage length is 17.3 inches (440 mm) and when the dew shield is extended it is still only 19 inches (484 mm) long. The OTA weighs just over 8 pounds (3.7 kilograms).

The telescope comes with a great two-speed 2-inch Crayford focuser with left and right focusing knobs and a 1:10 fine focusing knob on the right side. Two cool things I have never seen on a focuser before are a cover for the fine focusing knob to protect it during transport and an analog thermometer built into the left focusing knob (see **Image 2**) displaying the temperature in both Fahrenheit and Celsius! The drawtube has 3.15 inches (80 mm) of travel and is graduated to aid in returning to a focal position. Although the model I tested did not have it, the telescope can be ordered with a Digital Display Gauge.

By loosening a locking screw on top of the assembly, the focuser assembly fully rotates 360 degrees. I found the rotation to work very smoothly, and rotation does not affect the focus. This is great for reframing images or looking for off-axis guide stars for imaging work. There is another locking screw beneath the focuser to keep it from slipping once a sharp focus has been achieved. This is the first telescope I have done CCD imaging with that tightening the focus locking screw did not slightly shift the focus!

Visually, the telescope performed superbly. I tested the Apo's color correction with viewing of the Moon and Venus and found it to be perfect. At low and high powers, stars were pinpoint across the field of view. I viewed Saturn with my 5-mm Nagler eyepiece (128x). The rings were in their splendor with the Cassini Divisions easily seen.

With only 3.2 inches of aperture, this is not a telescope for deep-space observing. It will perform well viewing Andromeda Galaxy and its satellites, the Orion Nebula, and brighter star clusters. But it doesn't have enough light gathering power or focal length to significantly resolve globular clusters or to view fainter nebulae or galaxies.

This telescope is designed to be a small, light-weight imaging instrument. The 640-mm focal length will capture

Image 4 - The globular star cluster M3 in Canes Venatici. The brightest star in the image is SAO 82944, magnitude 6.2. This 15-minute exposure captures stars down to magnitude 15.5.

Image 5 - Globular star cluster Omega Centauri, NGC5139. This cluster is 57 arcminutes in diameter.

wider fields of view than larger instruments, but it is still capable of resolving many deep-space objects.

My first image with the GTF81 was of the nearly full moon (**Image 3**). Since the Moon is one-half degree in diameter, this image provides a good measure of the field of view with my CCD camera. Notice the sharpness of the image! Also, this is a color image. With proper color correction expected from an Apo, the Moon should not display any colors, especially around the edges.

My next image taken with the GTF81 was a 15-minute exposure of the globular cluster, M3, when it was high overhead (**Image 4**). The telescope does an excellent job resolving the stars in the cluster, and all stars are pinpoint to the edge of the image. This confirmed what I saw visually. On the right side of the image, halfway down from the top is the 14th magnitude spiral galaxy NGC5263 which measures a mere 1.1 by 0.4 arc minutes in size!

A difficult object to image from the northern hemisphere is NGC5139, Omega Centauri, the largest globular cluster visible from Earth. I was able to capture Omega Centauri with the GTF81 from Hawaii when it was only 20 degrees above the horizon (**Image 5**). The seeing was 2-3 arc seconds and the exposure was 20 minutes. The Gran Tursimo 81 readily resolves an uncount-

able number of stars in the cluster. The focal length is perfect for framing the entire cluster on the CCD.

Although small in aperture, the GTF81 will perform well imaging galaxies and nebulae. **Image 6** shows a 120-minute exposure of the galaxy M101. Because of its face-on orientation and large angular diameter, M101 has low surface brightness. A 4-6 hour exposure would have provided an exceptional image with the GTF81.

With its short focal length and wide field of view, this telescope is ideal for imaging galaxy groups such as Markarian's Chain or large nebulae such as the Rosette Nebula, Heart Nebula or the Veil Nebula.

In conclusion, this telescope is superb. It is lightweight, compact and easy to take on the road. Its optics are outstanding and the telescope performs just as good as much more expensive refractors in its class. ATT

Image 6 - Spiral Galaxy M101 in Ursa Major.