ASTRONOMY TECHNOLOGY TODAY

Your Complete Guide to Astronomical Equipment

DEEP-SKY PLANNER VERSION 5.1 • ATM TELESCOPE SHELVES
WILLIAM OPTICS GRAND TURISMO 81 FD TRIPLET • THE INNOVATIONS FORESIGHT ONAG
THE SKYLIGHT 100-MMF/13 REFRACTOR • WHY CREATE ENGLISH VICTORIAN REFRACTORS?
RSPEC REAL-TIME SPECTROSCOPY • FIXING A BROKEN TELRAD

OBSERVING THE JUNE 2012 VENUS TRANSIT

THE RIGHT EQUIPMENT FOR THE JOB

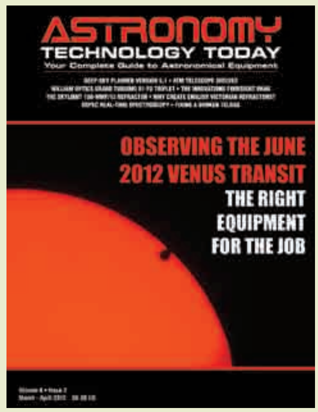
Volume 6 • Issue 2
March - April 2012 $6.00 US

ATT

Contents

Cover Story: Pages 33 - 37

The cover image was captured by Dr. James Dire during the 2004 transit of Venus while experimenting with eyepiece projection photography through a 10-mm Plössl inserted into an 80-mm refractor equipped with a 40-mm Coronado H-alpha filter. Although generally dissatisfied with the results of this afocal method due to complications introduced by the autofucus of his point-and-shoot camera – such was the state of digital astrophotography in 2004 – Dr. Dire managed to capture this excellent representation of the dramatic black-drop effect at point of third contact caused by atmospheric scintillation. Dr. Dire's feature article, Observing the June 2012 Venus Transit, covers equipment he has had success with, which still includes some decidedly old-school techniques, such as solar projection.



In This Issue

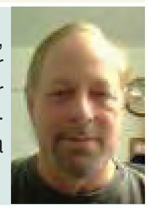
Industry News

ATT Contributing Writers

Dr. Gaston Baudat received his engineering degree 1982 in Switzerland and a Ph.D. in computer science in 2006. Following his passion he went to Madagascar in 1986 to take pictures of the Halley's Comet, one of which won a contest in the French magazine *Science & Vie*. In 2007, he cofounded Innovations Foresight.

Richard Day is originally from the west coast of Canada and has wandered a bit since then: From Radio DJ in Canada, backpacking through Europe and working as a Ski Instructor in Austria, to working as bar staff in Wimbledon, then full-time Dad and finally telescope maker in London. Richard believes no stars shine as brightly as those in the eyes of his son, Jackson.

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.



Rick Hiestand is a CNC machinist and shop owner with extensive experience in aerospace, motion-picture props and the medical field. Rick is an avid amateur astronomer with over twenty years experience in visual observation and video imaging. He is currently a volunteer for the National Park Service at Joshua Tree National Park, presenting night-time video imaging for the public night-sky program. During the day he offers solar views in H-alpha and a spectroscope at the park's visitors center.

"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.

John Nanson retired in 2007 from twenty-five years as a manager in the trucking industry and now spends much of his time under the dark skies of the northwest coast of Oregon (Manzanita). When he can convince the clouds and rain to go plague someone else, he patrols the scurrilous coastal skies for difficult double stars with over-length refractors. Many of those adventures can be found on the Star Splitter blog he co-writes with Greg Stone.

Doug Reilly is an amateur astronomer in the Finger Lakes region of New York State. He blogs about sharing astronomy with the public and organizes star parties at www.punkastronomy.com and he's building a bicycle-transportable ultralight 10-inch Dob.

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.

Pierre Stromberg works in the software quality-assurance industry in Seattle, Washington, and has indulged in amateur astronomy and astrophotography on and off over the past 30 years. Though he has a variety of scopes, Pierre still regards his first, a Celestron 8 from Roger Tuthill, as his favorite.

Contents

New Products

Observing the June 2012 Venus Transit

The Right Equipment for the Job

By James R. Dire, Ph.D.

Image 1 - The author's 4.5-inch Newtonian projects the Sun onto a screen while he captured H-alpha images using the refractor on the same mount.

Since no Venus transits occurred in the 20th century, professional and amateur astronomers took great interest in the June 2004 transit. Myriad articles and books were published in the last decade covering the history and physics of Venus transits. Now we are approaching the June 2012 transit, the last opportunity to witness this rare celestial event until the 22nd century! While many publications this year continue to focus on Venus transit history and where the best viewing will be, this article will concentrate on the equipment and techniques to use for observing and imaging the event.

Since the 2004 Venus transit began hours before sunrise on the U.S. East Coast, I decided to go to Europe to see the entire transit. I had the amazing experience of travelling to Germany and observed the entire six-hour event under perfect cloud-free skies.

I took along three telescopes: a 4.5-inch f/6 Newtonian, 5-inch f/10 Schmidt Cassegrain (SCT) and an 80-mm f/6 refrac-

Image 2 - The black dot on the left side of this solar projection is Venus in mid-transit on June 8, 2004.

tor. In addition, I carried two telescope solar filters, two equatorial mounts with tripods, one SLR camera, one non-SLR digital camera, a video camcorder, and two camera tripods. All of this fit into two large cases and four carry-on bags. My then 17-year-old son and I packed all of our clothes around the equipment for padding.

For viewing any solar event, I like to project the Sun's disk onto a screen using an unfiltered, small Newtonian telescope (see **Image 1**). Newtonians are the best telescopes for solar projection, since the tubes are open to the air and won't heat up on the inside due to the Sun's strong rays.

Now the eyepieces are a different story. I never use an expensive multi-element eyepiece for solar projection. These eyepieces usually have adhesives holding the elements together and would get hot enough to ruin them. A single element eyepiece (if such exist) or a two-element eyepiece where there is an air gap between the lenses works the best.

I use 18-mm and 30-mm Ramsden eyepieces for solar projection. The elements in each are about an inch apart. Yes they get very warm, but they have survived decades of use in this manner with no ill affect. Still, I wouldn't recommend an aperture greater than 3-4 inches for solar projection, even with these eyepieces. I once tried projecting the sun with a 10-inch Newtonian and I thought my eyepiece was going to melt. So, I made an aperture stop out of cardboard with an off-axis hole 4 inches in diameter and spray painted both sides black. The cardboard was cut to fit snuggly inside the tube just above the secondary's spider. This worked great as it stopped down the aperture from f/4.5 to f/11.25.

I like to attach a small screen directly to the telescope for solar projection (see **Images 1 and 2**). My screen is a 6-inch on side square of clean white construction paper glued onto a metal plate. Once focused, since the telescope is polar aligned and tracking, no adjustments need be made during viewing.

With the 4.5-inch aperture, the size and brightness of the Sun's image projected on this screen is perfect for seeing details like sunspots; the chromosphere, diamond ring, and corona during a solar eclipse; and in this case (**Image 2**) Venus passing in front of the Sun!

Other great reasons to do a solar projection are that you can record the event with a video camera on tripod, you can keep one eye on the event while fiddling with other telescopes and cameras, and a small group can all watch it together. If people come along and want to look through the other telescopes I am using for photography, I just point to the screen and say "the best view is right there!"

I have video-recorded many solar eclipses using this projection technique. To time the event, I just attach an accurate timepiece to the screen and/or play an audio short wave time signal which is recorded simultaneously by the video camera's microphone. In addition, with the camera recording, I audibly describe what I am seeing and doing with all my equipment for future playback, thereby eliminates the need to write notes.

Before GPS came into existence, to polar align an equatorial mount in broad

Image 3 - TPolar aligned and tracking the Sun, the author's SLR camera is attached to a 5-inch Schmidt Cassegrain telescope.

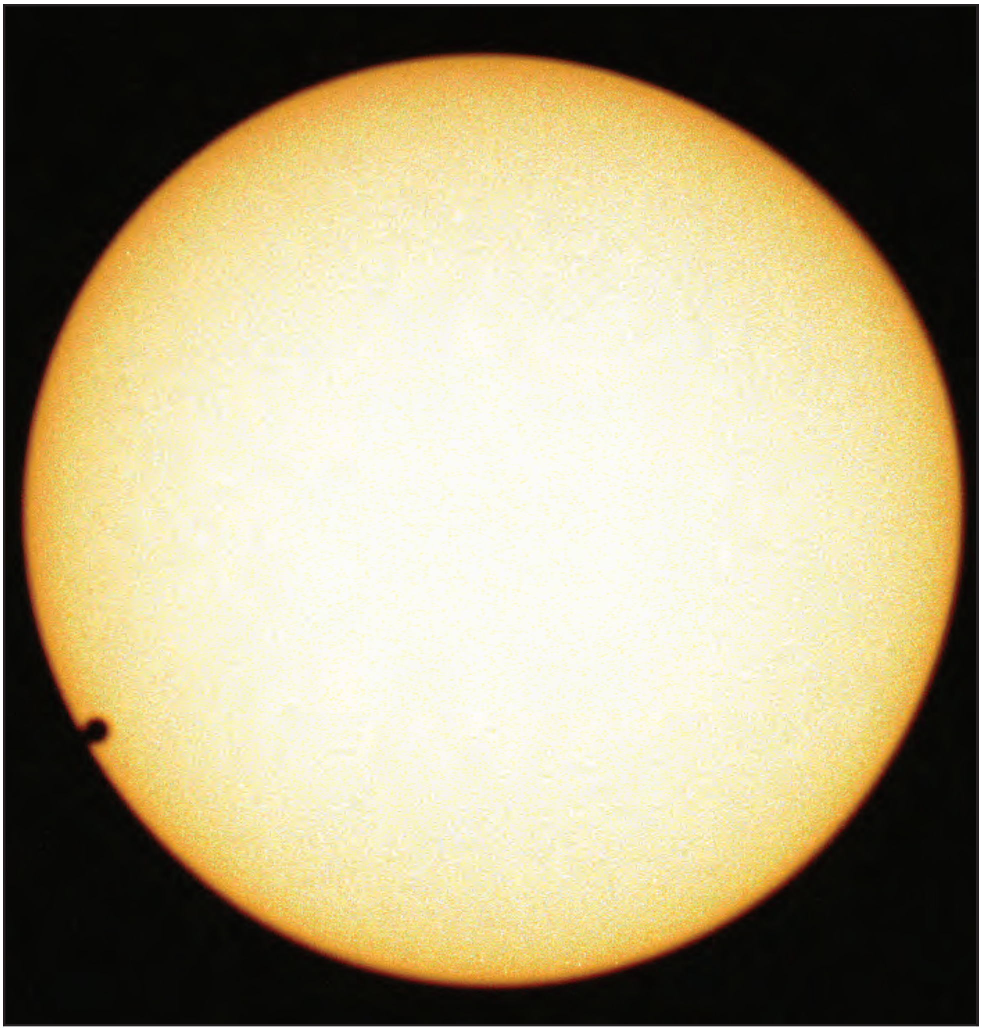


Image - 4: Image of the transit at second contact using the equipment in Image 3. Note the absence of sunspots in 2004!

daylight I used a magnetic compass to determine magnetic north and then staked out a true north-south line knowing the offset between true and magnetic north for my location. Now I use a handheld GPS receiver to map a true north-south line. Then I point the mount's polar axis along this line. Since most small portable equatorial mount's latitude gauges are not accurate enough, I use an inclinometer to adjust the mount for my latitude. This results in a decent enough alignment to keep the sun on my screen for tens of minutes, if not hours, without having to re-center the image.

The second mount I used for the last Venus transit (**Image 3**) hosted the C5 telescope with a Thousand Oaks solar filter. I attached my old Minolta X-570 SLR camera and photographed the transit using good old-fashion 35-mm film. **Image 4** shows an image of Venus at second contact (internal ingress). The actual instants of second and third contacts are difficult to determine due to the so-called black-drop effect caused by atmospheric scintillation. As seen in Image 4, this effect produces a black bridge between the edge of Venus and the apparent edge of the Sun. **Image 5** shows this effect at third contact.

The third telescope I used in 2004, an 80-mm refractor, rode piggyback on the Newtonian (Image 1). I used a 40-mm Coronado H-alpha filter on the refractor. With a 10-mm Plössl eyepiece, I projected the image into the lens of a small digital camera. Having never tried this before, this was an experiment to see how good an image I could get using this afocal method. Image 5 shows a typical image. It was an exercise in patience trying to tune the Coronado pre-filter, focus the telescope and hope that the autofocus on the digital camera would cooperate. It did not. In no image did I record any of the solar detail expected through an H-alpha filter. However, it did provide my best images of the black-drop effect.

For the June 2012 Venus transit, I plan to use a digital-SLR camera for prime-focus imaging with my SCT and 4-inch refractor. The pictures through the Thousand Oaks filter should look the same.

I now obtain good images showing solar granulations and prominences through the H-alpha filter attached to my 4-inch refractor. Venus silhouetted in front of the Sun will make these images spectacular! And since we're near the peak of its sunspot cycle, plenty of sunspots should appear in 2012 Venus transit images. ATT

Image 5 - The black-drop effect at third contact during the 2004 Venus transit.