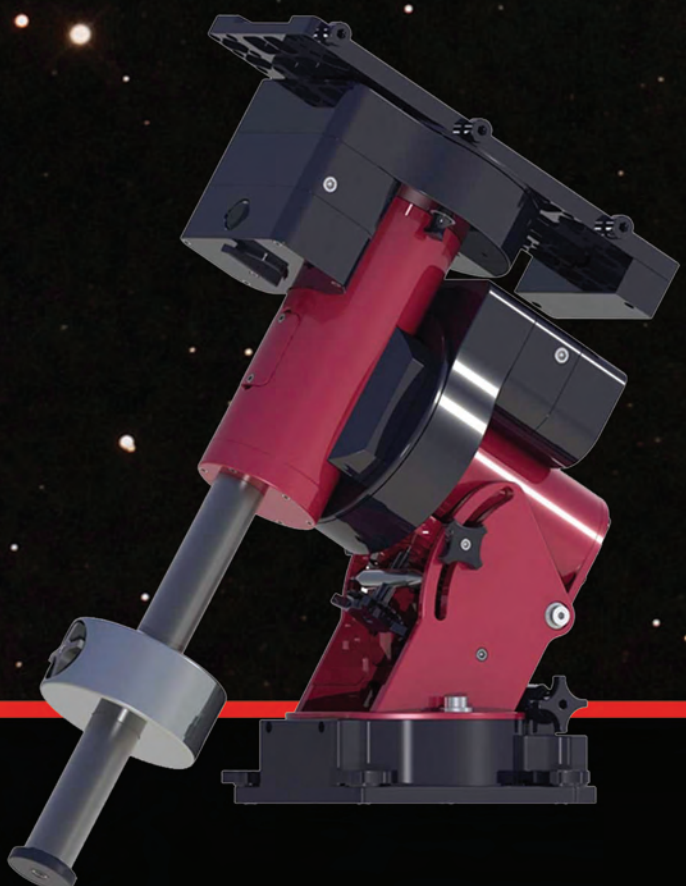
ASTRONOMY TECHNOLOGY TODAY

Your Complete Guide to Astronomical Equipment

STELLARVUE SV70T • PRIMALUCELAB AIRY APO65F
DESIGNING AND CONSTRUCTING A 28-INCH F/3.6 DOB • THE MELIOR APOCHROMAT
• LOOKING BACK SERIES: SEEING AND SOLAR IMAGING

The Paramount MYT

CAPABLE OF EVERY POUND OF ITS RATED CAPACITY



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Cover Story: Pages 33-41

Our cover features Software Bisque's MyT. With a unibody design that weighs just 34 pounds, it is the most portable of the Paramount series, yet is capable of a full 50-pound instrument capacity, with a total maximum payload of 100 pounds, including counterweights. The background image of NGC246 was captured by Dr. James Dire, who shares his impressions of this remarkable imaging platform.

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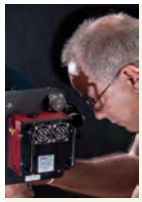

Joe Bietry has been an optical systems designer for over thirty-five years. The majority of his career was spent at Eastman Kodak Company designing optical systems for a wide variety of products from consumer cameras to space optics. The last project he worked on at Kodak was a laser-based cinematic digital projector. IMAX purchased the intellectual property and hired the Kodak design team to develop this into a commercial projector for their large theaters. After the completion of that project, Joe became a full-time independent optical-systems design consultant working for a variety of companies. In his spare time, he conducted a survey of known refracting telescope designs. From that research, Joe invented the Melior Apochromat and patented the design. He, along with two other partners, recently formed the company Quest Optics to develop this new design into a product.

Tony Bryan is an amateur astronomer, living in Jasper, Indiana and a member of the Evansville Astronomical Society (EAS), based in Evansville, Indiana with observatory facilities located in Lynnville, Indiana. He is currently serving as President of the EAS. Tony loves tinkering and is experienced in woodworking, car restoration, and electronics. His past ATM projects include: design and construction of an electronic telescope/camera clock drive, design and construction of portable power systems, design and construction of a roll-off-roof observatory, design and construction of various camera and telescope mount accessories, rebuild and electronics retrofit on a 16-inch Dobsonian, and rebuilding of several telescope drive systems.

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 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.

Alexandre Lhoest spent his youth in Zaire, now renamed as the Democratic Republic of the Congo. He was enthralled by its clear skies and its well-visible Southern Cross, rendered beautifully so many nights on the African high plateau. After studying in Europe, his interest for astronomy arose again in the early 2000s with the advent of CCD cameras. Already interested in photography, astrophotography has become his main hobby

Roy Parish lives in Shreveport, Louisiana, with his wife Bonnie and six cats, and is a member of the Shreveport-Bossier Astronomical Society. He is a retired Professor of Clinical Pharmacy in the School of Pharmacy, University of Louisiana, and is still active as Adjunct Professor of Internal Medicine in the LSU School of Medicine in Shreveport. He pursued deep-sky astrophotography with film and manual guiding from the 1990s until 2012, when he began learning digital imaging. He has exchanged his pharmacology research career for an astronomy career and is interested in astrometry and spectroscopy – always something more to learn.

Gary Parkerson discovered early in his amateur-astronomy career that he was as fascinated by the tools of astronomy as by the amazing celestial objects they reveal – perhaps more so. When not writing about astro-tech, he covers industrial technology for a variety of online resources.

Simon Tang was born in London, England, and moved to the US in 2006 to follow a career in TV & Film. He has always had a fascination of space and the sky and decided to take up astronomy. He purchased his first telescope at the beginning of 2016 and since then, has embarked on a journey of exploration all from the comfort of his own backyard.

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Industry News/New Products

THE PARAMOUNT MYT ROBOTIC TELESCOPE MOUNT

Capable of Every Pound of Its Rated Capacity

By Dr. James R. Dire

I am the observatory director for the Kaua`i Educational Association for Science and Astronomy (KEASA). We share our observatory complex with Kaua`i Community College. The complex consists of a roll-off-roof observatory, a building with a 10-foot diameter Ash Dome, and a Sky Shed Pod with three bays. The roll-off-roof observatory, built in 1990, is a 48- by 24-foot (14.6- by 7.3-meter) building where half of the roof rolls underneath the other half. The half with the permanent roof contains a classroom for meetings and equipment storage.

This observatory originally had a single pier on a raised deck with a Celestron C14 telescope on a homemade mount and pier. Approximately 10 years ago, a second pier was installed for a Celestron C11 on a CGE Pro mount. The Celestron telescopes have since been replaced with a PlaneWave Instruments 17-inch Corrected Dall-Kirkham (CDK) Cassegrain telescope on a Paramount ME II German equatorial mount and a RCOS 12.5-inch Ritchey-Chrétien Cassegrain telescope on an Astro-Physics 1200 German equatorial mount.

Last summer, I expanded the raised deck to allow more elbow room around these large instruments and added a third pier to hold a smaller 8-inch Ritchey-Chrétien telescope. I repurposed the old CGE Pro mount to use with the 8-inch RC while contemplating what mount to permanently use on the new pier. The 8-inch RC with the CCD camera, guidescope, guider CCD camera and finderscope combined weigh just under 50 pounds. So, I needed a mount that could carry this payload.

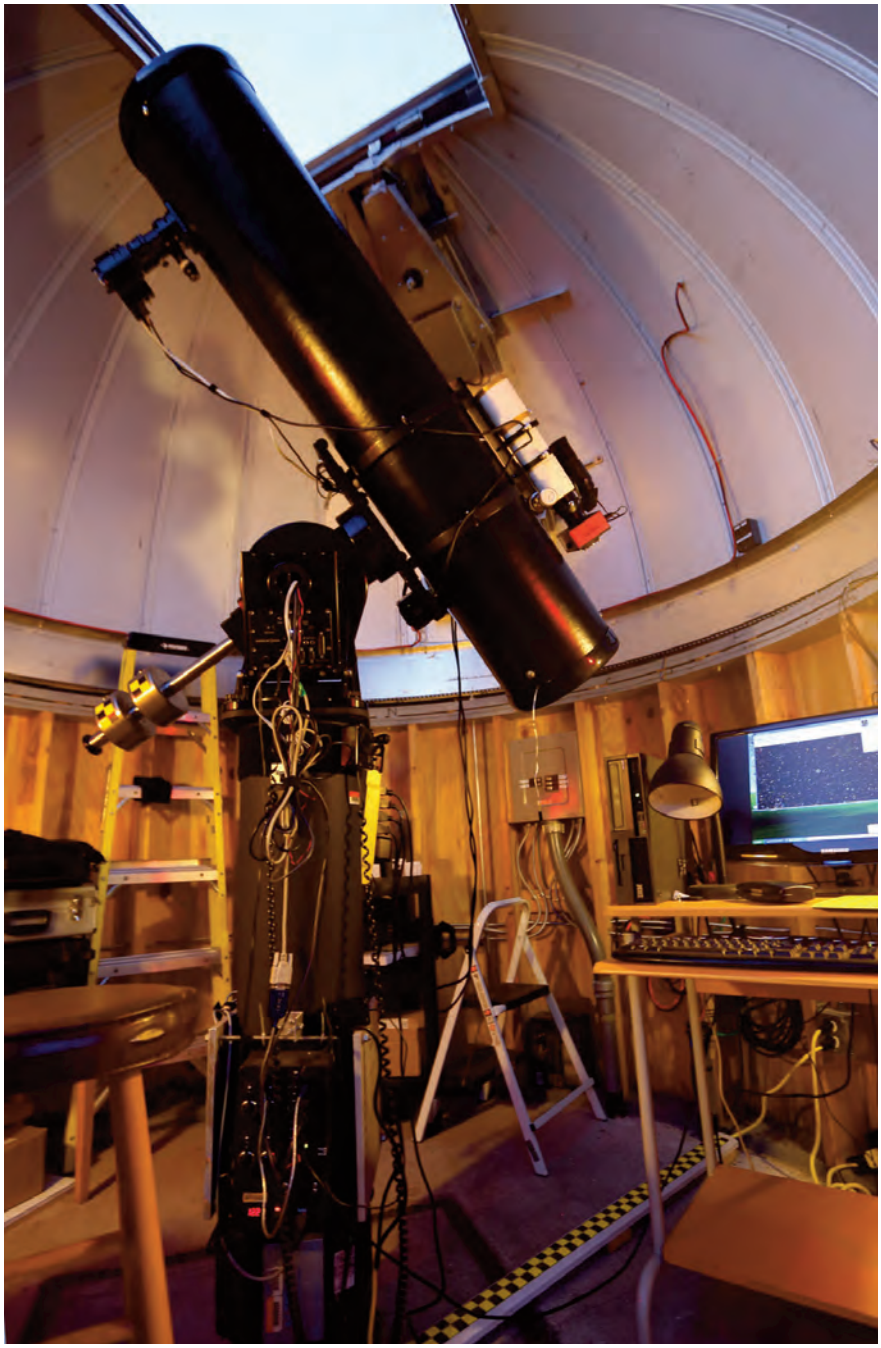

Image 1 - The Kaua'i Community College observatory houses a Discovery 10-inch f/6 Newtonian on a Software Bisque Paramount ME German equatorial mount.

Image 2 - The Kauai Educational Association for Science and Astronomy's largest telescope is a PlaneWave Instruments 17-inch Corrected Dall-Kirkham Cassegrain telescope on a Paramount ME II German equatorial mount.

I have had a lot of experience with Astro-Physics and Software Bisque (maker of the Paramount line) mounts over the years. Both are excellent. The 10-foot domed observatory I mentioned above houses a Discovery10-inch f/6 Newtonian (see *ATT* Volume 9, Issue 5) on a Paramount ME mount (**Image 1**). The mount is 15 years old and still works like new. We have had no problems with it (knock on wood!) The Astro-Physics 1200 mount is near the same age and also in excellent condition. When we bought the 17-inch CDK, we purchased a Paramount ME mount for it. In 2016, we traded up to the ME II (**Image 2**).

Selecting a Mount for the New Pier

I could have purchased a Paramount MX+ or an Astro-Physics 1100 for the new pier. They have payload ratings of 100 pounds and 110 pounds, respectively. Normally, I don't like to exceed 50 percent of a mount's payload specifications for serious astro-imaging, but I wanted to keep the cost down and wanted a mount that I could easily remove and set up on a tripod, if I needed to use it at a different location. The MX+ and A-P 1100 seemed a bit heavy for that.

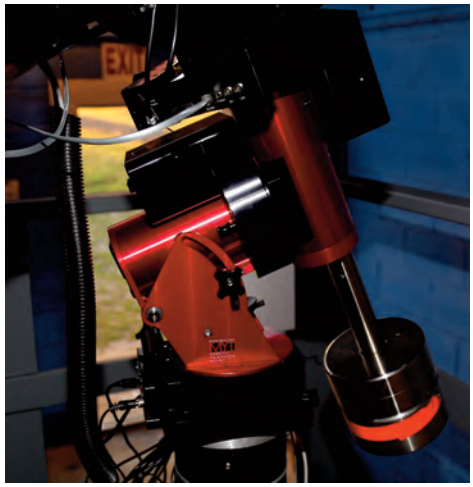

Image 3 - The MyT German equatorial mount is the smallest of three Paramounts made by Software Bisque.

I next considered the Astro-Physics Mach 1 and the Software Bisque Paramount MyT (**Image 3**). Both sell for around the same price and have nearly the same payload rating: 45 pounds for the A-P and 50 pounds for the MyT. I decided to go with the Software Bisque Paramount MyT due to its slightly higher payload, and because it is packaged with the amazing *Sky X Professional* software. More on the software later.

Setting Up the MyT

The MyT mount came nicely packed in foam and plastic (**Image 4**). The software came on a large-capacity thumb drive in the same box. I also ordered a Bisque pier plate for the mount, since I was using my own pier, not one from Bisque. My pier is a 6-

inch Le Seur Astro Pier with an insert adapter for the old C-14 wedge. Fortunately for me, Bisque's plate comes pre-drilled to use with various commercial tripods. Three of the Bisque plate's holes exactly matched the top of my pier adapter (**Image 5**)!

Once I attached the plate to the pier adapter, I lifted the mount onto the plate and attached it to the plate with the four supplied hand-turned screws. Three of them are shown with the yellow arrows in **Image 6**. Since the mount only weighs 34 pounds, I required no assistance to lift it up. I then leveled the mount using leveling bolts at the base of the pier and the mount's built-in bubble level (**Image 7**).

Next, I did a rough polar altitude adjustment. The mount's altitude can be set from 0 to 64 degrees. On the side of the mount are large tic marks and numbers every ten degrees, with smaller tics every two degrees in between (**Image 8**). My latitude is 21° 59', so I first I moved the horizontal bar (orange arrow Image 6) into the appropriate slot just below my 22° latitude mark. Then, using the fine polar altitude knob, I raised the mount to near 22 degrees. The final polar alignment would be done with the telescope.

I then attached the counterweight shaft and two 20-pound counterweights (Image 3). The mount only comes with one 20-pound counterweight, but I had several spare ones for the Paramount ME mount in the dome (Image 1), which uses the same counterweights.

The last piece to add to the mount was the Versa-Plate (**Image 9**). Four ¼-20 bolts hold it to the mount, and it, in turn, holds the telescope's dovetail plate. Image 9 shows the 8-inch RC telescope and piggyback 70-mm Apo refractor attached to the Versa-Plate.

Like all Paramount models, the MyT has through-the-mount cabling to an instrument panel (**Image 10**) located below the Versa-Plate. The instrument panel has jacks for Aux Power, two mini-USB ports, autoguider, focuser, and 5-volt and 12-volt power ports. As seen in Image 9, I am using the two USB ports for the two CCD cameras and the autoguider port. Since my SBIG ST-2000 CCD camera has a unique five-pin power cord, I cannot use the supplied power on the instrument panel for it. So, I have a series of cables running to the telescope (**black flex conduit in Image 11**) running power up to the CCD cameras and motor focus, and a third USB cable to control the focuser on the RC-8.

Image 11 shows the mount's Electronics Box and the through-the-mount cabling. The Electronics Box includes the mount power switch, USB 2.0 cable input, status lights, ports that can be used to run power through the mount to the Instrument Panel, a hardware park port and a jack for the mount's joystick. Inside the Electronics Box is the Bisque MKS 5000 motor control system. I have three things plugged into the MyT's electronics

Image 4 - The Paramount MyT comes nicely packed in a hefty box.

Image 5 - The Paramount MyT adapter plate installed on a six-inch Astro Pier.

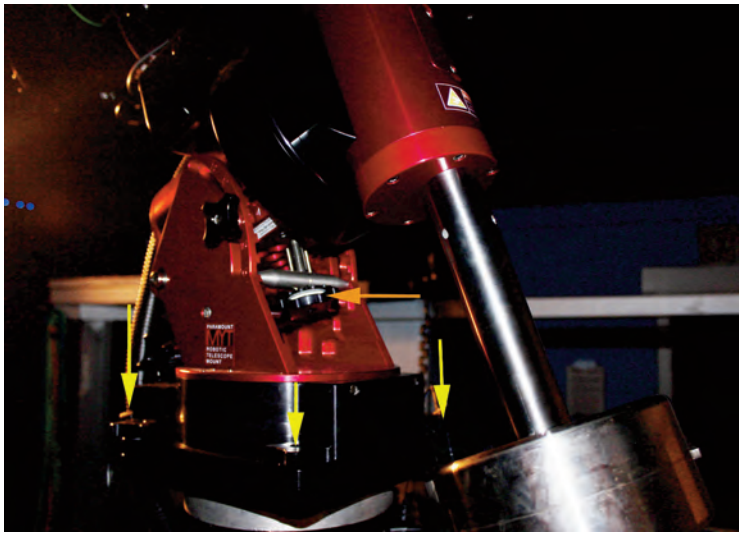

Image 6 - The yellow arrows show three of the four knobs used to attach the mount to the adapter plate. The orange arrow shows the fine-adjustment altitude control.

Image 7 - The mount has a built-in bubble level.

box: a USB cable running to the computer to control the mount and cameras, a Paramount joystick, and the 48-volt power supply that comes with the mount (and uses 110-volt AC).

Older Paramounts came with a real joystick to slew the mount at various speeds in both right ascension and declination directions. Double clicking the button on top of the joystick homes the mount. The new Paramount MyT instead comes with a very

simple hand controller that has the same functions. I prefer the joystick, so I am using one from an older Paramount with the MyT. Software controlling the mount can do everything the joystick can. The only advantage of the joystick is not having to have a computer within reach of the mount to manually slew it.

Assembling the mount, telescopes, cameras and all the cabling took under two hours! **Image 12** shows the completed set up. **Image 13** shows all three mounts under the KEASA roll-off-roof observatory: The Paramount MEII, the Astro-Physics 1200 and the Paramount MyT.

The SkyX Professional Edition

I mentioned earlier that one of the perks about buying a Software Bisque mount is that it comes with the *SkyX Professional Edition* (*SkyX Pro* for short) software. This amazing software has a planetarium-like chart and can control a telescope mount, imaging still or video camera, autoguider camera, dome or roll-off roof, focuser, and focuser rotator. Any ASCOM-compliant hardware in the above categories should have no problem communicating with the *SkyX Pro*. The software comes on a thumb drive with Macintosh and Windows versions.

Let me start off with the little that I don't like about the *SkyX Pro*. **Image 14** shows a sample of the display after launching the *SkyX Pro* and centering the field on M65. The symbols used for galaxies (red spiral icons seen in Image 14), open star clusters, globular star clusters, planetary nebulae, etc., do not conform to the normal symbols seen star atlases such as *Norton's Star Atlas, Millennium Star Atlas, or Star Atlas 2000*. That's why I prefer the

Image 8 - An altitude scale is etched on the sides of the mount to aid in a rough polar alignment.

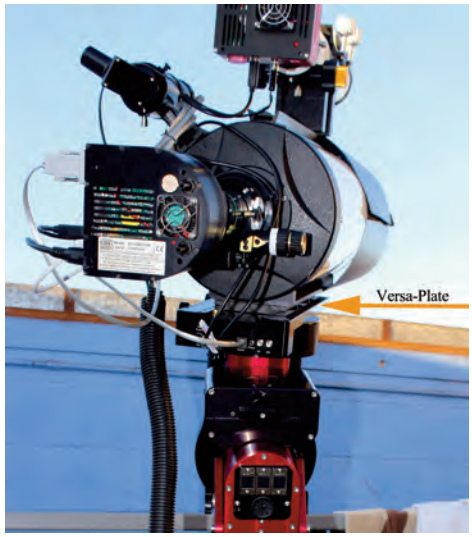

Image 9 - The Paramount Versa-Plate bolts to the mount. The Versa-Plate received the Losmandy-style dovetail plate, which holds the telescope.

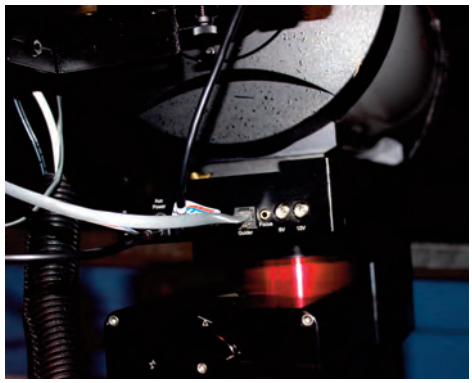

Image 10 - The instrument panel contains two USB ports, an autoguider port, a focuser port and 5- and 12-volt DC power jacks.

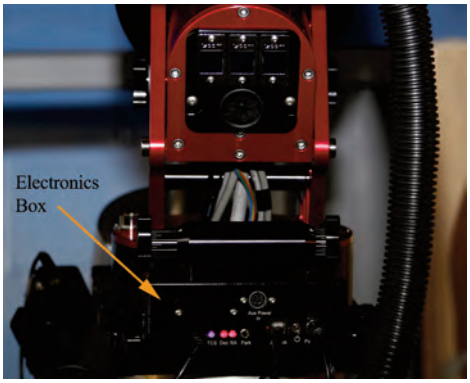

Image 11 - This view shows the electronics box and the through-the-mount cabling that runs up to the instrument panel.

Image 12 - The completely assembled MyT mount with an 8-inch Ritchey-Chrétien telescope and a 70-mm apo refractor.

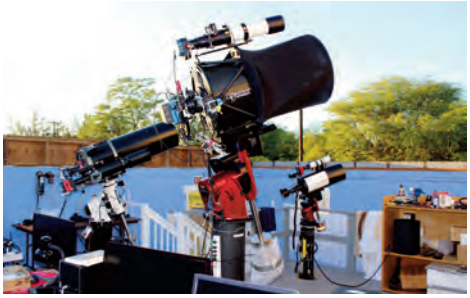

Image 13 - There are three telescope suites inside the KEASA observatory's roll-off roof: a PlaneWave Instruments 17-inch Corrected Dall-Kirkham (CDK) Cassegrain telescope on a Paramount ME II German equatorial mount, a RCOS 12.5-inch Ritchey-Chrétien Cassegrain telescope on an Astro-Physics 1200 German equatorial mount, and an 8-inch Ritchey-Chrétien telescope on a Paramount MyT mount.

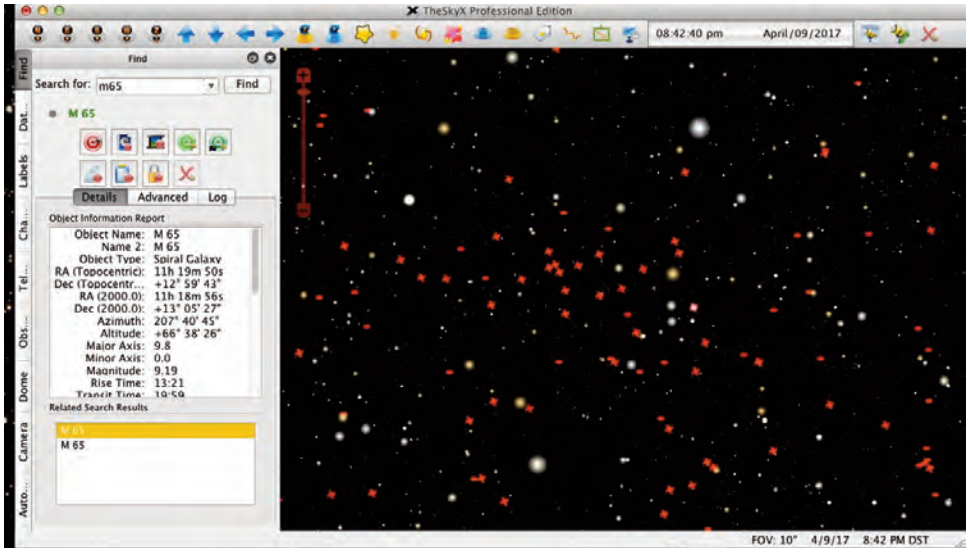

Image 14 - The default chart screen on the SkyX Professional Edition.

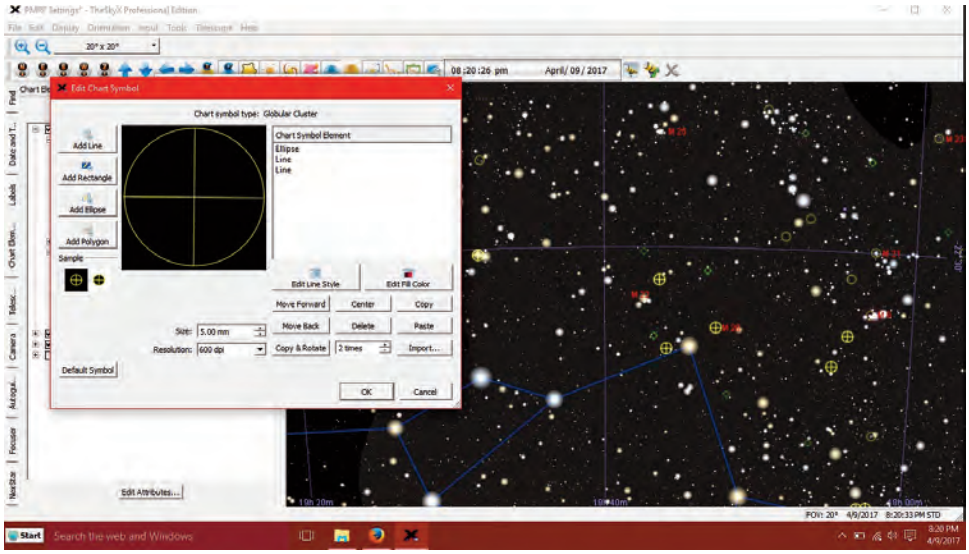

Image 15 - The SkyX Pro has an editor to customize symbols for deep space objects.

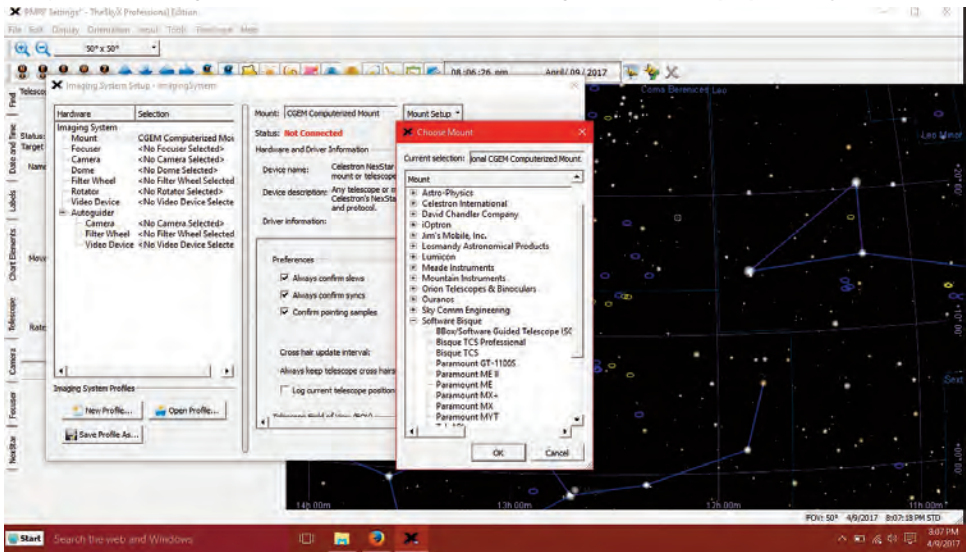

Image 16 -The SkyX Pro can controller most telescope instrumentation by selecting the manufacturer and model in the appropriate window.

charts on *Carina Software's Voyager 4.5*.

Voyager 4.5 uses the normal symbols plus the size of the symbol on the screen is proportional to the size of the deep space object. When zooming in *Voyager 4.5*, the symbol zooms proportionally until it gives way to a picture of the object. In *SkyX Pro*, the symbols stay the same nonproportional size no matter what the field-of-view scale. The default settings in *SkyX Pro* have no R.A. or Dec lines or numbers, nor any constellation information on the chart screen. But those can be turned on!

The good news is, *SkyX Pro* has a symbol editor to allow users to create different shapes and colors for any chart object. **Image 15** show the symbol editor where I have just created a new symbol for globular clusters. In this image, the sky chart is centered on M22 (Messier numbers turned on in red). There are many globular clusters (circles with crosshairs) in the region, along with open clusters (open circles) and planetary nebulae (green circles with four spikes coming out of them).

The symbols are not proportional to the cluster sizes, but at least they are the symbols I am used to. Zooming in does not change the symbols size, but at some point the symbol gives way to an image of the object, as it did for M25 in this chart view. Note, I have also turned on R.A. and Dec lines and labels, and blue constellation lines. In this view, part of the Teapot asterism is visible. I could have turned on a gambit of other labels (star names, NGC numbers, etc.), but didn't because at some point the charts get too cluttered.

Setting up the hardware within The *SkyX Pro* is pretty simple. **Image 16** shows, on the left, the different

types of hardware that can be configured. On the right, I have opened the mount setup window and scrolled down to Software Bisque mounts to select the Paramount MyT. It's that simple for cameras and other hardware. Most makes and models of equipment can be found in the *SkyX Pro*!

On **Image 17**, I have pulled down the Display menu where at the bottom are the various control and data windows that can be opened. Those with check marks have a tab visible on the left side of the window for quick access. Many of the control windows can be configured to have user-selected element visible in them. Also note the icons along the top of the *SkyX Pro* window. There are hundreds of toolbar and icon combinations that can be made visible there.

Most-Used Features of The SkyX Pro

I will now discuss a few of the *SkyX Pro* features I use the most. First on **Image 18**, I have opened the Find window and I found NGC 1893 in Auriga. Note the five icons in the row below the green NGC1893. The red target-symbol centers NGC 1893 on the chart. The fourth icon in that row, i.e., the green target symbol, is used to request a Slew to NGC 1893. The right-most icon is for Close Loop Slews. When selected, the telescope will slew to the object, take a predetermined-length image with the camera, if connected, and then compares the image to the chart. It then centers the telescope exactly onto the object and takes a second image to show that the object is now centered. Pretty cool! Below all the Find window icons is a list of information on the selected object.

Image 19 shows the Telescope control window. From this window, you can still search for and find objects, slew to them or do a closed-loop slew. The four green arrows allow the mount to be jogged a set distance in R.A or Dec, or just slewed with mouse

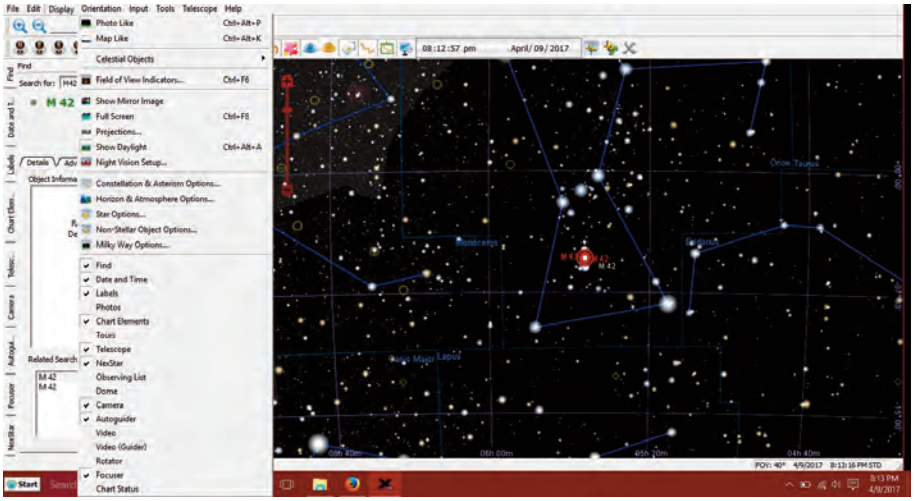

Image 17 - The SkyX Pro Display menu contains all the various control windows that can be made active by checking them.

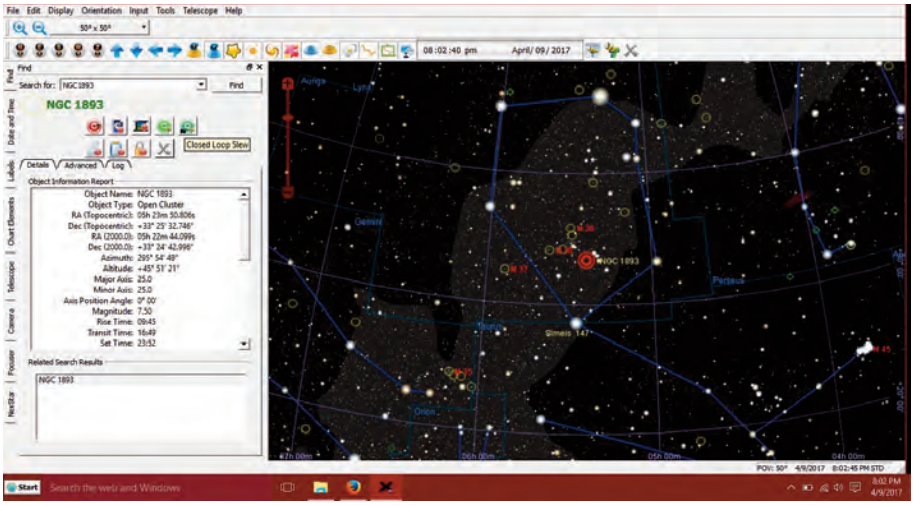

Image 18 - The SkyX Pro Find window can be used to search for objects, center them in the chart, and slew the telescope to them. Information about the current object is found in this window.

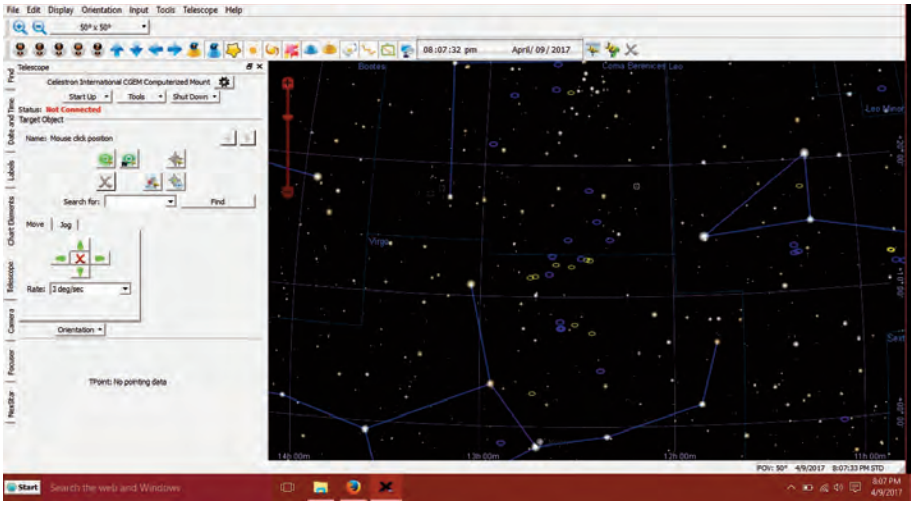

Image 19 - The Telescope control window can also be used to find objects and slew to them. The telescope can be slewed or jogged a set amount with the mouse and arrows in this window.

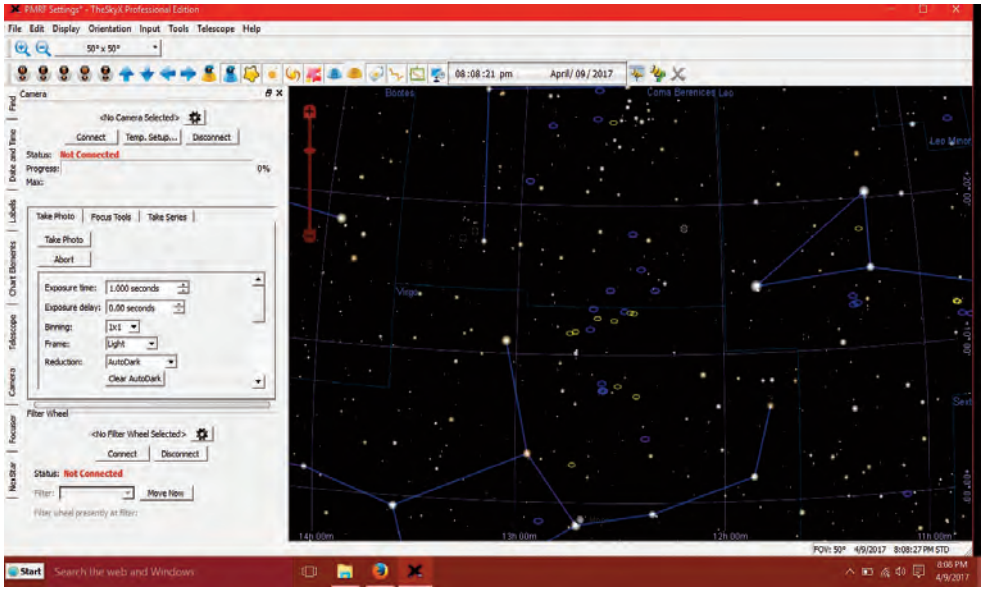

Image 20 - The Camera control window will control a camera for single images or for a series of images. A filter wheel can also be setup and controlled in this window.

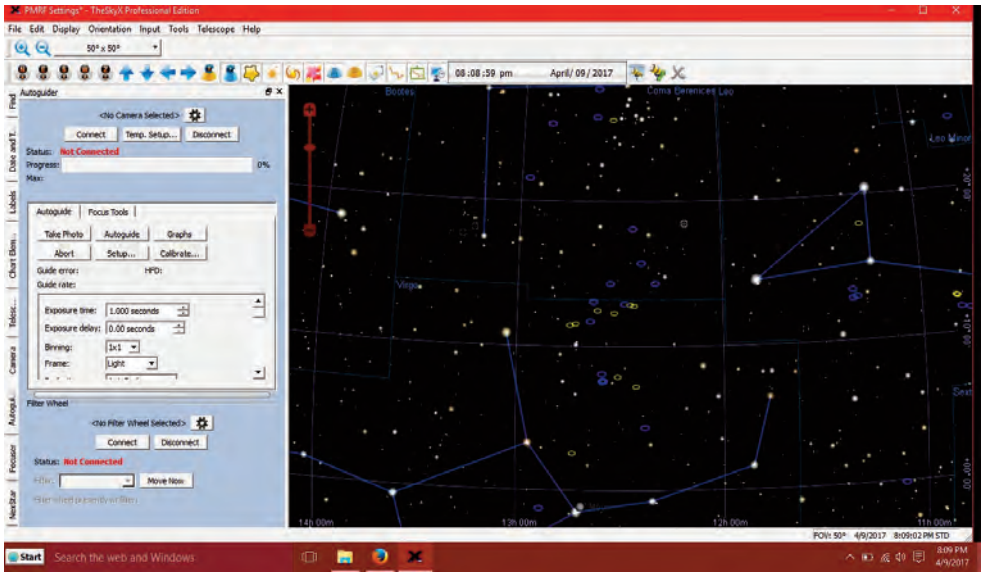

Image 21 - Equally important is the Autoguider window to control the guide camera or guide chip in a two-chip SBIG camera.

clicks at a user-selected speed. Note on the chart the oval galaxy symbols I created, which I have color-coded to indicate the galaxy type (spiral, elliptical, lenticular or irregular).

The Camera control window is shown in **Image 20**. There are myriad settings available for exposing single or a series of images. Filter-wheel control is also in this window. The Autoguider control is shown in **Image 21**. Like most camera-control software, the autoguider must be calibrated. Guider images and a graph of guider errors can be displayed.

One of the best add-on features in the *SkyX Pro* is the *T-Point* software. *T-Point* is used to create a mount model to improve the accuracy of finding targets. A minimum of six stars is required for a basic mount model. I find that a 20- to 30-star model gets most objects close to centered on my CCD camera with my 8-inch Ritchey-Chrétien telescope. For our 17-inch telescope on the Paramount ME II, we have a 200-star mount model. Fortunately, after six stars are obtained, the software will complete the mount model on its own as long as the camera is active.

So how well does the Paramount MyT perform with the maximum payload installed? **Image 22** is a 90-minute exposure (nine 10-minute subframes) of NGC246 taken with the R-C8 telescope and an SBIG ST-2000XCM CCD camera. An 0.8x focal reducer/field flattener was employed yielding a focal length of 1321 mm. Tracking with the camera's guide chip was great, yielding round stars throughout the field of view. NGC 246 is a magnitude-10.4 planetary nebula in the constellation Cetus. The nebula has a diameter of 4.0 arcminutes.

Image 23 is a two-hour exposure of the spiral galaxy NGC3621 using the same equipment, also with 10-minute subframes. This magnitude-9.5 galaxy is in the constellation Hydra.

These images show that the Paramount MyT is indeed a mighty mount for astro-imaging carrying a payload close to 50 pounds. I am quite pleased with the performance of this mount and look forward to many years of imaging with it! ATT

Image 22 - The author took this image of NGC246 with an 8-inch Ritchey-Chrétien telescope and a SBIG ST-2000XCM camera on the Paramount MyT mount. This guided exposure was 90 minutes using 10-minute subframes.

Image 23 - This image of NGC3621 taken with an 8-inch Ritchey-Chrétien telescope and a SBIG ST-2000XCN camera on the Paramount MyT mount was a combined 120-minute exposure.