SkyWAAtch

The Pinwheel Galaxy

Olivier Prache took this image of M101, the Pinwheel Galaxy in Ursa Major, from Pleasantville with his Hyperion 12.5" telescope. The image was taken with over three nights (April 11-13) for a total of 7.6 hours of exposure. Notes Olivier: In spite of relative lack of data, it came out reasonably well thanks to the sophisticated tools in PixInsight.

An impressive face-on spiral galaxy, M101 lies at a distance of approximately 21 million light years. It's an enormous object, about 170 light years in diameter.

In This Issue . . .

Events for June

WAA June Lecture

"Kepler's Hidden Gems: In Search of Exomoons"
Friday June 1st, 7:30pm
Lienhard Hall, Pace University, Pleasantville, NY

In the last two decades we've discovered thousands of planets orbiting nearby stars. But do these planets have moons? And if so, could they be hospitable for life? In this talk Alex Teachey will discuss the latest developments in the search for exomoons, how we go about looking for them, and his recent observations of an exomoon candidate with the Hubble Space Telescope.

Mr. Alex Teachey is a third-year graduate student at Columbia University's Department of Astronomy. His work focuses on the search for exomoons in large survey datasets. He also loves teaching and public outreach. As an undergraduate (BA in Physics, CUNY Hunter College) he worked as a research intern at both the American Museum of Natural History and the National Radio Astronomy Observatory, studying giant molecular clouds in the Milky Way with radio, near-infrared and gamma-ray data. Free and open to the public. Directions and Map.

Upcoming Lectures

Pace University, Pleasantville, NY

There will be no lectures for the months of July and August. Lectures resume in September.

Starway to Heaven

Saturday June 9th, Dusk.
Ward Pound Ridge Reservation, Cross River, NY

This is our scheduled Starway to Heaven observing date for June, weather permitting. Free and open to the public. The rain/cloud date is June 16th. **Important Note**: By attending our star parties you are subject to our rules and expectations as described here. Directions and Map.

Call: 1-877-456-5778 (toll free) for announcements, weather cancellations, or questions. Also, don't forget to visit the WAA website.

Courtesy of John Paladini is this image of Jupiter taken through cloudy, wet skies with his Orion 7-inch Maksutov and an ASI120mc camera.

Tom Boustead took this picture of the MMT observatory on Mt. Whipple during a recent trip to Tucson.

RAC SUMMER STAR PARTY
August 10th through August 19th

The Rockland Astronomy Club is sponsoring its summer star party August 10th through August 19th. RAC holds the longest and most exciting star party, geared to both the serious observer, imager, and the whole family. The location in the Berkshires is known for its pristine dark skies, and gorgeous arching Milky Way. Don't miss the Opening Festival and StarBQ with live music. For details go to:

http://www.rocklandastronomy.com/ssp.html.

ALMANAC
For June 2018 by Bob Kelly


Jun 6


Jun 13


Jun 20


Jun 28

Watch for the parade of outer planets as Jupiter, Mars and Saturn all rise by local midnight to start June.

Jupiter is up and bright in our prime-time skies after dark. The giant planet spins once in 9 hours, 51 minutes. Your view of Jupiter (and its four brightest moons) will change as night progresses. Check web sites for times when the Great Red Spot is visible, but Sky and Telescope projects the GRS to be on our side of Jupiter during prime time on the 9th, 21st, 26th and 28th. It's smaller than previous years, but redder.

We reach opposition with Saturn on June 27th. In June, Saturn's rising time moves from 10pm to sunset, so even as we approach opposition, it's better to see later in the night. But, what a sight! Saturn's 26-degree tilt toward Earth affords a wonderful view of its rings. The Full Moon pulls up next to Saturn on the 27th, trying to drown Saturn in its brightness. Titan, the most atmospheric moon in the Solar System, should be visible in most telescopes at magnitude +8. Many will be able to find Iapetus, showing its bright side, at magnitude +10. Iapetus will be out ahead (west) of Saturn, farthest on the 12th.

Mars still looks tiny in most telescopes, but at 15.5 arcseconds wide, we can start to see some detail. Even our smaller scopes may be enough to discern the white southern polar cap contrasting with the salmon and tan tones of its landscape – the white/dark contrast helps. Mars will be more than 15 arcseconds wide from now through September, so this summer will be a great time to get a closer look.

When you hear 'Mars won't be this close again until 2035', don't panic! Mars will be less than 10 percent further away at its next opposition in 2020. Hey, we are only four percent further away than we were at the 'closest in 60,000 years' opposition in 2003, so this is a great year for Mars and you and your telescope! For June, Mars will be highest in the sky at dawn; it will be up in prime time by early July. Mars' orbit is more elliptical than Earth's orbit. So, our closest approaches to Mars are in August, when Mars is near perigee. That leaves Mars low in the southern sky, but overhead for mid-latitudes in the Southern Hemisphere.

Venus sears the twilight almost three fist-widths above the horizon, setting 2½ hours after the Sun. The best telescopic views are early in twilight, or in daylight. Now that you have found her, never let her go! Watch as the nearest inner planet sinks slowly in the west from week to week. Venus' shape changes at it goes through a phase behaving like a waning gibbous moon wannabe.

Mercury glides back into the evening sky during mid-June. It's well to the lower right of Venus. The young Moon points out Mercury on the 14th. Moon-watchers will be looking to see it as its sighting will end the daytime fasting month of Ramadan. Mercury will wane after that, showing a gibbous phase as it fades past zero magnitude, even as it sets 90 minutes after the Sun.

The Teapot of Sagittarius may lie low, but that's where lots of fun stuff lives. Mars and Saturn shine like laser pointers in Sagi's neighborhood. When the moon isn't around, this part of our Milky Way, near the center of the Galaxy, is visible. Asteroid 4Vesta is hanging out there. We pull up opposite to it on the 19th. If you are at a dark location with a map with Vesta marked on it, you can try to pick out magnitude +5 Vesta without optical aid. Pluto, and the New Horizons spacecraft, are also out there. Don't expect to see Pluto, at magnitude +14, but it's fun to be able to point in its direction, about halfway between Saturn and Mars in our skies. Got problem with all this good stuff being so low in our skies? Either get over it, or move to the southern hemisphere for a while, where it's winter and the nights are long and dark, and the galactic center is overhead.

Our evening skies stay light late this month, as usual near the solstice. The latest sunset is around the 27th, with latest twilight on the 24th. Astronomical darkness occurs as late as 10:35pm local daylight time at our latitude, even later if you are further north.

The International Space Station will be visible in the evening skies, but only through June 10th.

Quirky fact: At the end of June, the Sun, Mercury and Venus will be about the same distance from Earth. Perhaps a good time to compare their sizes?

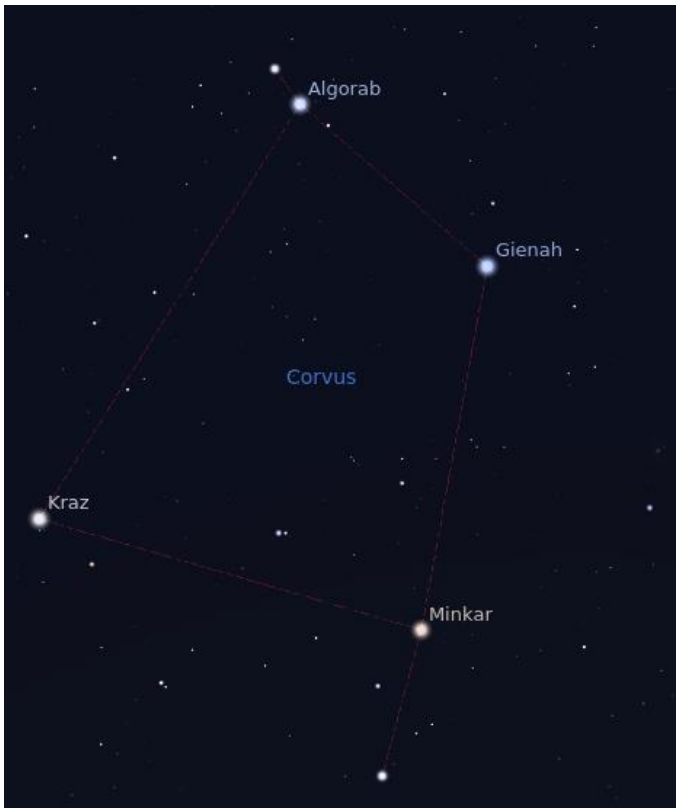
In The Naked Eye Sky

For June 2018: The Triangle and the Arch

by Scott Levine

I sometimes like to imagine the stars are cities, and the imaginary lines we've drawn in the constellations are the roads from one city to another on the greatest map in the galaxy. Scientifically accurate? Not a chance, but if you think of it like that, you get to say ridiculous and fun things like "The capital of Virgo is Spica" to your friends who then, suddenly, remember they needed to shampoo their hair.

Over in the Virgo-Libra end of the sky are lots of exciting deep-sky objects. The Virgo Cluster of galaxies is out thataway, and it's kind of easy with even a pair of binoculars to see something just by scanning the skies. As my tired arms brought the lenses down from my eyes a few nights ago, I sat and stared for a while; just enjoying the wide view, like I usually do.



Hiding behind the trees to the south was an odd, sort of rectangular grouping of stars sitting low in the sky, like it was hiding in the curtains. It was really more like a rectangle with a handle. That's the same part of the sky that I always like looking at in the summer when Antares and the stars of Scorpius are there.

It took a little while, but then I remembered: Corvus!

Perched near Virgo, which is one of the sky's biggest constellations, the crow is one of the smallest. It's only 70th biggest of the 88 modern constellations. If you're looking for a way to kind of move past the big, bright hotshot constellations, Corvus is a great choice. It's only up and visible in the evenings for a relatively short time each year. It has no famous stars, and you really need to look for it to find it. Unlike the stars of Orion, Ursa Major or Cygnus, it's not going to jump out and look for you. You need to go track it down, low to the horizon in Westchester's southern sky.

The good news is, with the naked eye, there isn't a lot else happening over that way. There aren't any bright stars there to complete with the modest brightness of Corvus's mostly third-magnitude stars. Corvus has a few galaxies and planetary nebulae, and the NGC 4038 group straddles the Corvus-Crater border, but they're all hidden by the tremendous distances to them. Light pollution doesn't help.

All you need to do is head out the next time the clouds give you a break, and look to Jupiter for some help. It's high and brilliantly bright toward the southeast by mid-evening. The bright star about 20° away is Spica (α Vir). Just follow the two farther toward the south, lower in the sky, to make a broad but still humble triangle with Algorab (δ Crv), about 85 light years away. Algorab isn't its brightest, that's Gienah (γ Crv), but it's the highest in the sky, so I find it the easiest to see.

It's a neat little group of stars to look for and track down, and it's one more constellation in your pocket. I hope you'll head out and have a look this month.

Westchester Amateur Astronomers

Punching Past Pollution: Target Selection Part 1

Mauri Rosenthal

"The weather will finally be good this weekend! What should I shoot at now?" For an intermediate imager like myself, this is one of the thoughts that leads to selection of a target. Alternatively, I'll see something like this as I browse astronomy sites and publications:

Figure 1. Thor's Helmet Emission Nebula (NGC 2359) by Martin Rusterholz. (Cxielo Astrophotography) (https://commons.wikimedia.org/w/index.php?curid=31955631

I think this object is pretty cool looking and I don't know if I can do it justice, but I'd love to try. When and where do I aim my telescope? And if I can find it, which equipment should I use to image it?

There are two free tools which I consider invaluable in addressing these questions. Next month I'll discuss a great piece of freeware that helps match equipment choices to specific targets. But first let's discuss how to find invisible targets in the city or suburban sky.

For a visual observer in the city, the starting point can be just looking up and aiming the scope at the Moon, Jupiter, Saturn, or other bright target. But astrophotography lets us explore things you can't otherwise see, so sky charts are essential. Although many great "Planetarium" programs are available, with varying degrees of connectivity to telescope mounts, I will only discuss the one that I know best, which is *Cartes du Ciel* ("CDC", French for "Sky Maps"). CDC is free and very robust, and can be downloaded for Mac, PC, or Linux. If you prefer to use a different program, e.g. *Stellarium*, that's fine as long as you can gain good control over the features that I'll emphasize below.

The first step to "power use" of the software is setting up your observatory. If you're bringing your scope to wide open fields, this isn't that important. But urban and suburban backyard imagers typically don't have 360° views. From my backyard trees, hillside, and houses block about 180° from the southwest to the northeast. And my own roof blocks the first 30° up from the horizon. If you do the arithmetic I can only see 1/3 of the sky. But the sky is a big place! There's plenty up there, it's just imperative for me to know what is passing through my third and when.

CDC allows you to customize your horizon by modifying a simple text file. To create a custom horizon you just need a good estimate of the elevation of any obstructing buildings or trees, and the compass points at which the obstruction begins and ends. My lowest horizon is almost due south – at 180º on the compass, and I estimate that my neighbor's roof blocks about 20º up from the ground. After the entry 180 20, the next entry 195 35 is for the giant maple tree a bit towards the west, and so on to due north at 0 (or 359) where everything up to 75° is blocked. The text file can include comments and looks in part like this:

```
0 75# neighbor house end trees
80 75
85 25# neighbor house end roof
94 25# my roof start
95 30
110 30
111 40 #chimney start
```

I drew mine based on rough guesses and refined it over a few weeks as I learned more about exactly where the tree-tops open towards the top of the sky.

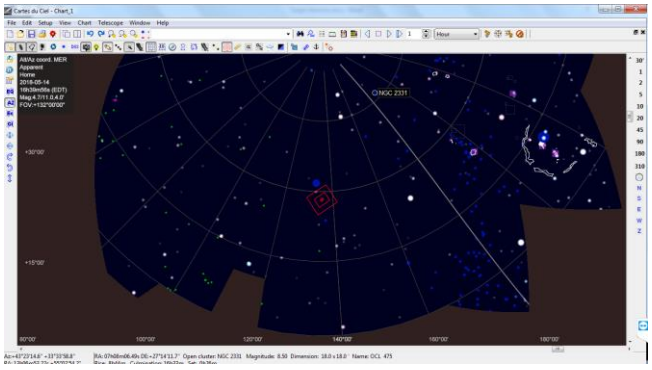


Figure 2. Screenshot from CDC of the one-third of the sky that I can see when I set up behind my house, facing southeast. That's my chimney at 110°. The bright diagonal through the sky shows the meridian, the line connecting due south at the horizon to the zenith (highest point in the sky). Orion is still visible in the west, but will soon be in the trees.

The next helpful step is to use CDC's setup menus to customize the symbols used to mark deep sky objects. My galaxies are little green circles; planetary nebulae are purple circles with a line through them; and big nebulae are outlined in white. As the night progresses, the program updates the positions of items in the sky as they move from east to west. With the time control, it is easy to advance or go back to any specific time. So I can easily check for what's in the sky tonight, just by opening the program and clicking through the nighttime hours. Does every galaxy above my house represent a good target? No, some are too small or faint or devoid of interesting detail – more on this in next month's installment. But what if I have a specific target in mind?

Thor's Helmet is NGC 2359. Can I shoot it tonight? I use the search tool in CDC and immediately learn that by the time it is dark enough for imaging this object is well behind the trees defining my horizon.

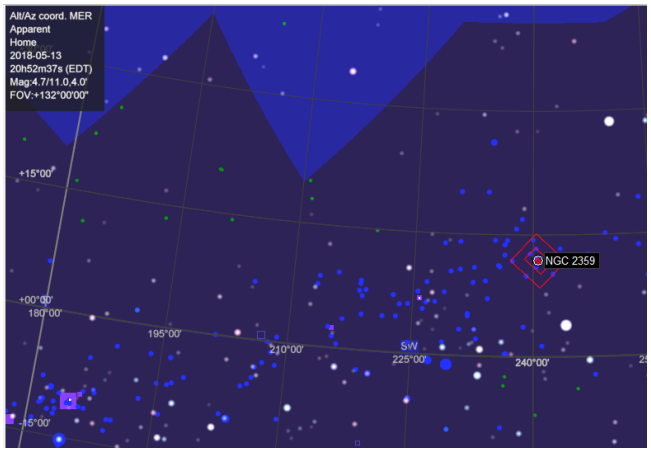


Figure 3. CDC screenshot showing Thor's Helmet below my "effective" horizon by 9pm tonight.

So when do I have a clear shot at this object? CDC has a set of time controls that allow me to answer this in two steps. First, I step through one hour at a time to find the highest point the target reaches during the day. With a few clicks I get this screen on CDC:

Figure 4. CDC screenshot showing a clear shot at the target but during daytime

I next try going back in time 2 months and discover that the target can be found in this slot–after dark–in mid-March.

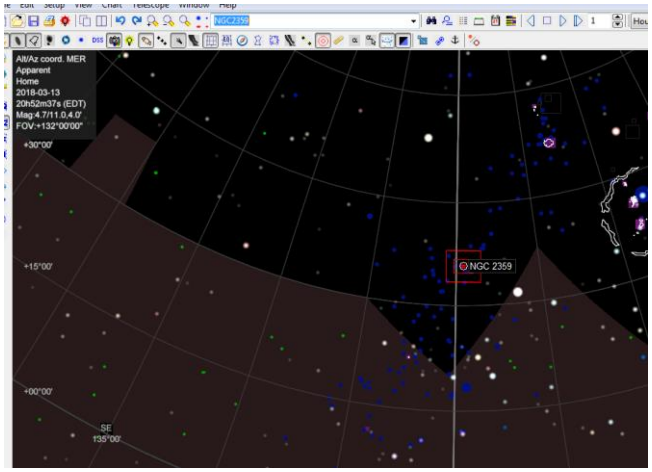


Figure 5. CDC screenshot showing that on March 13 near 8 pm I could access this target from my yard.

With a few more minutes of exploration, I learn that the target can be found in this spot as early as October, but at dawn, and during reasonable imaging hours (midnight plus or minus two hours) from December through March. I've missed it for this year but I understand why. With other interesting targets well positioned over my house, this one, requiring a lot of attention to timing, has simply fallen through the cracks. But it can be a high priority for next year.

This is good news, however, since it gives me a lot of time to select my ideal equipment combination for the image! We'll cover this next month.

Note: This article is appearing simultaneously in *Eyepiece*, the newsletter of NYC based Amateur Astronomers Association of New York and *SkyWAAtch*, the newsletter of Westchester Amateur Astronomers. I'm a member and supporter of both organizations.

A Case for an Upgraded Mount

Larry Faltz

How many times in the dark have you heard (or said yourself) "Damn, I left my eyepieces at home!" or "Help! Does anyone have a laser collimator?" The practice of modern amateur astronomy involves the use of a wide range of small parts as well as some sophisticated and sometimes fragile equipment. The days of the home-made telescope on a mount made from plumbing supplies is long gone. Since most of us don't have home observatories, we're constantly packing and re-packing our sophisticated gear for transportation to observing sites. We use cardboard boxes, tote bags, and tool cases of various sizes and shapes. This ad hoc process doesn't always work. Keeping your equipment organized means you don't have to think about of every single knob, wire, eyepiece or adapter when you are rushing to get out the door. Protecting your gear from trauma is obviously important. Keeping it secure pays in the long run.

Home-made containers might work when you are doing all the handling, but sometimes to find dark skies we need to travel by air, and that means a perilous journey, perhaps an airplane cargo hold, for sensitive telescopes, mounts, eyepieces and imaging equipment. Tool boxes, even if you line them with foam, are simply not strong enough.

Some telescopes come in handsome foam-cushioned boxes, but most of these are hardly air travel or UPS worthy. The original orange-tube Celestron C5 and C8 telescopes came in what looked like a small steamer trunk. It looked substantial but the sides were actually made of cardboard. The foam inserts were snug and supportive, but one doubts that the case could survive rough handling or getting crushed underneath a stack of heavier luggage. Baggage handling is a full-contact sport, and even if your bag is placed gently in the cargo hold, it may end up with 7 or 8 bags weighing up to 50 pounds each on top of it. Luggage is often flung onto conveyor belts or into the baggage compartment. A Boeing 747 pilot wrote that cargo loaders "use momentum to get it onto the belt or stacked in the compartment. It's like a game of Tetris where the blocks weigh 50 lbs. The big, blocky suitcases get stacked orderly and the squishy duffel bags get smooshed into the blank spaces. Gravity is a big help to make it all fit, tough luck for the bag at the bottom of the heap." I recall reading many years ago that someone, perhaps Consumer Reports, tried to determine how much abuse airplane luggage got, so they took a flight and packed accelerometers in their luggage to measure the G forces. When they opened the baggage to check the devices, the handling was so rough they were all broken, the G forces having exceeded their maximum range!

Putting a "Fragile" sticker doesn't help. Apparently that only targets your stuff for extra-rough handling. One forthright baggage handler posted "If it says 'fragile' it's getting thrown harder. If it says 'this side up' it's going to be upside-down. We have to fit freight and 100+ bags in a cargo pit. It has to fit how it's going to fit."

Giro-II DX. The main body is 5.3" high and 3.7" in diameter. It can carry an 8" SCT without a problem.

Freight shipping companies may do a better job of shipping fragile items, but protecting your gear starts with a properly made impact resistant case with a foam insert specially designed to cradle your equipment. Ready-made cases use "pick and pluck" foam that is very soft and doesn't hold up to repeated uses, but for small items needing cushioning during routine handling, they may be adequate. I've found pluck foam to get ratty with frequent use, and you can't make it conform exactly to a curved surface. It's as if they expect all your gear to be made of Legos.

You can make a better container yourself by buying an impact resistant case like a Pelican, purchasing foam, cutting it (hint: use an electric knife to cut foam, otherwise the edges fray) and gluing it into the case. However, it's hard to cut interior shapes. There's a better way. I learned about this when I decided to upgrade an

old Giro-II DX with encoders to make it a "push-to" alt-az mount.

A digression might interest readers of the gearhead wing of WAA, of which I consider myself a member. I got the Giro-II DX about a dozen years ago for use with my smaller telescopes. It's a very solid and simple alt-az mount that uses an oil bearing to manage the weight of the telescope and provide smooth movement without "stiction." Shortly after I got it, which was before the days of commercially available go-to alt-az drives like the iOptron Minitower, I added a Tech2000 "Giro-Driver" track-and-train drive, a device that provided sidereal tracking but was not a go-to. Two encoder-containing motors mate to the mount through rubber belts. The mount doesn't actually know exactly where it is pointed on the celestial sphere, but it learns how to move relative to the earth's axis by making calculations based on a few manual corrections with the hand control, which contains a chip that solves the polar coordinate equations. You find your object using the traditional method of star hopping, then start viewing, pressing direction buttons a few times to keep the object centered, and in less than a minute later it starts tracking and keeps the target in the eyepiece even at high magnification.

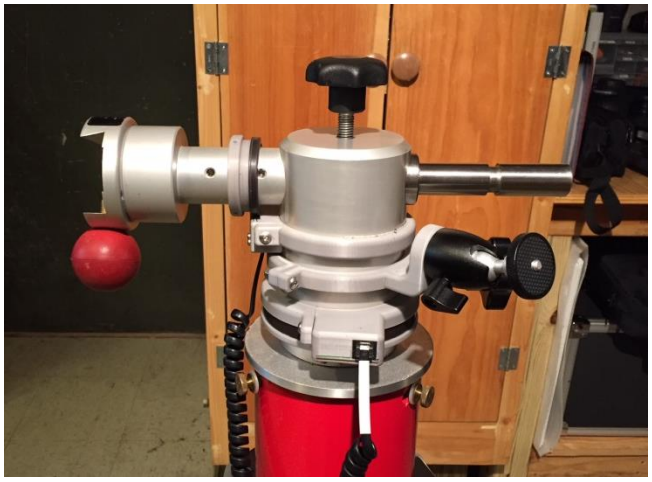
The Giro-Driver is now quaintly archaic but it was not bad for its time. It's clearly a creation of the late 1980's or early 1990's, once sophisticated but now way out of date. The computer code was apparently written in old DOS Basic. You could make it a kind of go-to by running Tech2000's software on a computer connected to the hand control via the LPT1 printer port. The software requires direct addressing of LPT1, which is not possible with any Windows version after Windows2000 (and that OS requires a software patch). Modern computers don't have printer ports anyway. Having by now several other true go-to mounts, I found this drive no longer useful. It was time to sunset it.

At the Medomak Astronomy Retreat last year, several attendees were using alt-az mounts with encoders connected to the tiny but extremely capable Nexus DSC computer by AstroDevices, an Australian company. AstroDevices makes encoders for Dobs and other mounts and electronics that translate them into celestial coordinates. I contacted Serge Antonov at AstroDevices by email, who responded that he could make magnetic encoders for the Giro-II. These encoders are far more sensitive than the mechanical or optical encoders made by other suppliers. Serge, a computer engineer who emigrated to Australia some years ago, uses 3D-printing to make the parts to exacting specifications. The azimuth axis encoder has over 655,000 steps per revolution, compared with 10,000 or even fewer for encoders using other technology. The encoders feed their signals to the tiny Nexus DSC computer via coiled cables with RJ-45 connectors (Ethernet sized). Like the Orion Intelliscope computers, after a two-star alignment, you choose an object from an enormous number of catalogs. Directions for scope movement are given by numbers and arrows. You move the telescope in the direction of the arrows until the registers read "0.00". The Nexus DSC, which has a lithium ion rechargeable battery, can be ordered with a wi-fi hub, so you can link it to a star map on your phone, tablet or laptop (it uses the Meade LX-200 protocol) and simply move the scope while watching the cursor on the star map until it is on the object you're seeking. Within a couple of months from our initial contact, including some telephone discussions (the first time I had ever spoken to someone in Australia!), Serge made the parts and sent them to me. He also made a bracket that allows the DSC to ride on the mount so it's always in the right position relative to the scope. It wasn't inexpensive, but it works and anyway I suspect I have the only Giro-II DX in the world with magnetic encoders.

Nexus DSC. 5.5" x 4.7" x 1.5", weighing just 10 ounces

The encoders, being mounted on the outside of the solid Giro (perhaps an astro-analogy of the Pompidou Center in Paris, with its external ducts and stairways), means they are potentially vulnerable and so the mount needs to be properly protected for storage and travel. Fortunately, a custom foam case-manufacturing company, MyCaseBuilder, comes to NEAF each year. I was going to meet Serge for the first time at NEAF and so I figured I'd bring the Giro so he could see the finished product in person. MyCaseBuilder has a sophisticated

but easy-to-use on-line application (at MyCase-Builder.com) that you can use to design your own inserts for any one of a number of cases that they sell (or you can supply your own). I figured that since I'd have the mount at the show, I'd let MyCaseBuilder take a look at it and get some advice. It turned out that this year our WAA booth was right next to theirs, and so I struck up a conversation with Paul Russo, MyCase-Builder's Director of Sales and Business Development. I showed him the mount, we talked a bit about cases and foam, and he invited me to MyCaseBuilder's Paterson, NJ factory to meet Hugh Conway, the firm's head engineer, who could design my case. Paul graciously offered to give me and Elyse a tour as well. A week after NEAF, we made a field trip.



The upgraded Giro-II DX with encoders (top) and with Nexus DSC mounted on its acrylic shelf, which rotates with the body of the mount (bottom).

The factory is not far from I-80 in Paterson. On one end are two levels of offices, but the bulk of the floor space in the block-sized building is given over to manufacturing and storage. About 50 people are employed by the company: an administrative and sales staff, five engineers and a workforce of craftspeople who make the actual products.

A project starts with choosing a case and designing the insert. MyCaseBuilder's team of 5 engineers can design the inserts for you (starting at $100 for their time, expertise and effort) or you can do it yourself with the on-line application. For a fairly simple project you'd definitely have fun working the software and coming up with your own layout. You can buy "fail-safe" insurance for a small fee that will allow you to have a "do-over" within 30 days if your design turns out not to be as functional as you imagined. If you were making an eyepiece or camera case, you could use their "shape library," which has a large number of actual products. You can also trace outlines from photos (png files will create outlines automatically). A 3D rendering engine allows you to rotate your design. The very capable and easy-to-learn software was designed by MyCase-Builder's CEO Steve Holand, whose father founded the firm in the 1980's. I took the engineering route since my pimped-out Giro has such a complex shape and I thought the odds of me doing something wrong were too great. But having looked at the software, I'm itching to do an eyepiece case!

Hugh took a look at the upgraded Giro and we discussed how it works and what its vulnerabilities might be. We decided on some basics for the case, but I left the details of the layout to his greater knowledge and experience. I chose a Doro case, MyCaseBuilder's own line of Italian-made cases. It's waterproof and highly impact resistant. It differs primarily from Pelican cases in having nylon pins in the hinges, which reduce cost but are still very durable. All cases today have a pressure relief valve to ensure that they don't end up vacuum-sealed after traveling in an airplane's cargo hold. Apparently this lesson was learned the hard way. Hugh would develop the insert design and case size and email the drawing to me for approval.

The main factory area is a very large, well-ventilated and generally quiet space (cutting foam doesn't make a lot of noise) containing assembly areas, equipment, and supplies. A large amount of foam of various sizes and densities is stacked throughout the facility. Domestic foam producers provide the material to MyCaseBuilder in bulk as large blocks taller than a person. It's then sliced into sheets of various thicknesses to be ready for further processing. Foam comes in two main types: ester (polyurethane) foam, the soft, compressible foam of the kind used in those "pick and pluck" cases, and PE (polyethylene) foam, that's denser and less

compressible. The ester foam is useful for delicate items that need to be firmly nested or for objects that have irregular shapes. You might keep your diamond-encrusted Fabergé egg in that kind of foam. PE foam is better and more durable for heavier items and items that can withstand a bit of shock. In the "skiving room," foam from large blocks is cut into layers. The actual shapes are cut by workers using a range of table-mounted power tools and special foam cutting machines. For cases that are going to be made in bulk for commercial products, die cuts are made from templates that get mounted on a large press.

Complex cuts can be made using the WaterJet, a computer-controlled device that maximizes the number of shapes that can be cut out of a large layer of foam. It functions like a table saw, except that the cutting device is a pressurized jet of water that shoots from a diamond nozzle less than 0.5 mm in diameter at 60-100,000 psi. We saw a large piece of foam from which a couple of dozen 18" diameter semi-circular forms had been cut. The remained slab looked to me like it could pass for a piece of modern sculpture. WaterJet forms are dried by large fans for at least 24 hours.

Egg-crate foam for lids (properly called convoluted foam) is made in a specially-designed machine. The ester foam used is generally of the softest, most compressible type. Large slabs of this foam are fed in one side of the machine and egg crate foam comes out the other side. The specific lid inserts are subsequently cut to size.

The final shaping and exact sizing to the case needs hand-cutting using table saws, of which there were several types. When a die-cut form is made, the sides are slightly convex. A table saw is used to cut the sides of the final foam inserts so they are flat and tapered, if need be, to the pitch of the sides of the selected case. The foam layers with their various cutouts are glued together and then inserted into the cases.

Individual custom cases are only a part of MyCaseBuilder's business. They provide cases in volume for manufacturers of fragile or transportable goods. We saw a large stack of small cases for a maker of sophisticated medical equipment and surgical implants. These cases had rather complex cut-outs and plastic inserts to hold small items needed during a medical procedure.

Obviously the production of foam case inserts leaves a lot of detritus. What do you do with the plastic that used to be in what is now a hole or cut-out? Plastic is non-biodegradable, but fortunately about 90% of the waste the MyCaseBuilder generates from its two forms of foam can be recycled. The unused cutouts and trimmed material are collected and fed into a machine known around the factory as the "Pooper." Foam goes in the top. The machine melts it, collapsing the air cells. A stream of thick black goo comes out the side, looking a bit like what you'd expect from the machine's nickname (although pitch black), and is formed into blocks which solidify when cooled. They are sent back to foam manufacturers and turned into new foam. Considering how light foam is, the weight of a pooped de-aerated block the size of a shoe box was quite substantial. The small amount of plastic that can't be recycled is still usable as ground-up material for products like no-slip carpet pads.

Giro-II DX in its case

After a couple of weeks, and apparently after a couple of re-dos because the Quality Control department at MyCaseBuilder insisted on perfection, the case was ready. It had complex cut-outs to properly secure and protect the mount, the DSC computer and accessories.The encoder wires resided in an extension cutout connected to the main compartment so they wouldn't have to be disconnected. Underneath, the foam was stepped to cradle the bottom of the Giro and seat it properly. I never could have designed it myself.

This may have been one of the strangest designs MyCaseBuilder has ever had to produce, a unique challenge for a one-off piece of equipment. You may never need something this bizarre, but it's likely that you have gear that needs protection, so consider checking out MyCaseBuilder.com. ■

What Is the Asteroid Belt?

Linda Hermans-Killiam

There are millions of pieces of rocky material left over from the formation of our solar system. These rocky chunks are called asteroids, and they can be found orbiting our Sun. Most asteroids are found between the orbits of Mars and Jupiter. They orbit the Sun in a doughnut-shaped region of space called the asteroid belt.

Asteroids come in many different sizes—from tiny rocks to giant boulders. Some can even be hundreds of miles across! Asteroids are mostly rocky, but some also have metals inside, such as iron and nickel. Almost all asteroids have irregular shapes. However, very large asteroids can have a rounder shape.

The asteroid belt is about as wide as the distance between Earth and the Sun. It's a big space, so the objects in the asteroid belt aren't very close together. That means there is plenty of room for spacecraft to safely pass through the belt. In fact, NASA has already sent several spacecraft through the asteroid belt!

The total mass of objects in the asteroid belt is only about 4 percent the mass of our Moon. Half of this mass is from the four largest objects in the belt. These objects are named Ceres, Vesta, Pallas and Hygiea.

The dwarf planet Ceres is the largest object in the asteroid belt. However, Ceres is still pretty small. It is only about 587 miles across—only a quarter the diameter of Earth's moon. In 2015, NASA's Dawn mission mapped the surface of Ceres. From Dawn, we learned that the outermost layer of Ceres—called the crust—is made up of a mixture of rock and ice. The Dawn spacecraft also visited the asteroid Vesta. Vesta is the second largest object in the asteroid belt. It is 329 miles across, and it is the brightest asteroid in the sky. Vesta is covered with light and dark patches, and lava once flowed on its surface.

The asteroid belt is filled with objects from the dawn of our solar system. Asteroids represent the building blocks of planets and moons, and studying them helps us learn about the early solar system.

For more information about asteroids, visit: https://spaceplace.nasa.gov/asteroid

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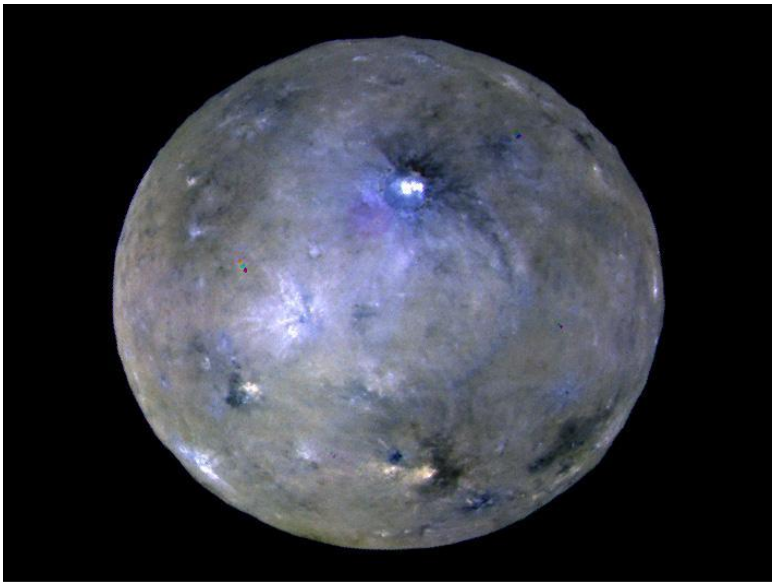

This image captured by the Dawn spacecraft is an enhanced color view of Ceres, the largest object in the asteroid belt.

Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Member & Club Equipment for Sale
June 2018

Item	Description	Asking price	Name/Email
Celestron 8” SCT on Advanced VX mount	Purchased in 2016. Equatorial mount, potable power supply, polar scope, AC adaptor, manual, new condition.	$1450	Santian Vataj spvataj@hotmail.com
Celestron CPC800 8” SCT (alt-az mount)	Newly donated to WAA. Like new condition, perfect optics. Starizona Hyperstar-ready secondary (allows interchangeable conversion to 8” f/2 astrograph if you bought a Hyperstar and wedge). ADM top rail, Starizona counterweight bottom rail. Telrad finder. Many counterweights. ADM 100 mm diameter rings with ADM saddles for piggy-back mounting. SCT-to-T adapter for prime focus imaging with Canon EOS adapter. 2” CPC steel tripod. AC power supply. No eyepieces or diagonal.	$1500	WAA ads@westchesterastronomers.org
ADM VCW Counterweight system	Clamping plate for a V series dovetail. 5" long ½" thick threaded rod for counterweights. Original ADM 3.5 lb counterweight plus a second weight. New condition. Lists at $55. Link.	$35	WAA ads@westchesterastronomers.org
Celestron Ultima-LX 5 mm eyepiece Celestron Ultima-LX 8 mm eyepiece	70° FOV, fits 2” and 1¼”. 16mm eye relief. 28 mm clear aperture eye lens. 8 elements. Rubber coated bodies. Ergonometric contours. Extendable twist-up eyeguards. Takes 1¼” filters. These are large, impressive eyepieces, no longer in production! New condition.	$50 each	WAA ads@westchesterastronomers.org
Meade 395 90 mm achromatic refractor	Long-tube refractor, f/11 (focal length 1000 mm). Straight-through finder. Rings but no dovetail. 1.25” rack-and-pinion focuser. No eyepiece. Excellent condition. A “planet killer.” Donated to WAA.	$150	WAA ads@westchesterastronomers.org

Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to ads@westchesterastronomers.org. Member submissions only. Please only submit serous and useful astronomy equipment. WAA reserves the right not to list items we think are not of value to members.

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