ASTRONOMY TECHNOLOGY TODAY

Your Complete Guide to Astronomical Equipment

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FIRST CONTACT POLYMER OPTICS CLEANER • NEAIC AND NEAF 2014
CALCULATING THE PERFECT TELESCOPE SIZE POST PARACORR TYPE-2

Vixen SLV Eyepieces

High-Quality, Flat-Field Eyepieces

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ATT Contributing Writers

Ryan Goodson is the owner of New Moon Telescopes. He is consumed with all matters astronomy, particularly public outreach. Ryan is a cofounder of the Central New York Observers and Observing. He serves as an officer and on the boards of directors of both it and the Syracuse Astronomical Society. Ryan is also a 2014 Solar System Ambassador and will be involved in several NASA related presentations throughout Central NY as one of its representatives.

Austin Grant, a high-school Chemistry and Biology teacher, is a self-described perpetual hobbyist, experienced in such areas as building computers and repairing arcade equipment. Austin stumbled into astronomy several years ago and it soon became his primary interest. Being a child of the digital age, it didn't take long for him to find digital astro-imaging and he sold his last pinball machine to fund his current imaging rig. Austin shares his passion for stargazing with his students and is in the process of building a school astronomy club.

David Ellison is a retired anesthesiologist who lives with his patient wife of 27 years, and an old gassy dog. He's an amateur machinist, an advanced woodworker, and he runs the "Astronomy Hacks" user group on Yahoo. David has a small home observatory in Chattanooga, TN, and travels to star parties for dark site imaging. He uses his photographs to introduce younger people to astronomy.

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.

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.

Erik Wilcox lives off the grid on the Big Island of Hawaii, and has been observing for over 20 years. When he's not viewing from his dark backyard sky, he works for a natural foods chain, and spends his spare time hiking, kayaking, snorkeling, and performing music.

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Calculating the Perfect Telescope Size

Post Paracorr Type-2

And the perfect telescope size is…?

By Ryan Goodson

The perfect telescope size is… It's a line that invites critique and insight from every corner of the astronomical community. Having built a number of telescopes for clients all over the U.S., I have called three of my New Moon Telescopes my own: a 12.5-inch f/4.9, a 16-inch f/4.5, and a 27-inch f/3.9. Outside of those three Dobsonian-style telescopes, I have also owned various refractors and binoculars and a large arsenal of eyepieces. But since I build Dobsonians-style telescopes (okay, "Dobs") for a living, however, I will limit my opinion to that particular style. My opinion of the perfect Dob size has changed over the years as my observing habits have also evolved.

I use "size" as a catchall to describe the combined effects of aperture and focal length. There's a big difference in the relative size of a 20-inch f/4 versus a 20-inch f/5, just as there is a big difference in the sizes of a 15-inch f/5 and a 20-inch f/3.75. In the first case, the apertures are the same, but an eyepiece in the f/5 is 20 inches farther from the ground when viewing near zenith; in the second case, the focal lengths are the same, but the 20-inch has much greater reach and weighs more, all else being equal.

Image 1 - Despite its considerable aperture, the eyepiece of this 20-inch f/3.3 New Moon Telescope remains within comfortable feet-on-the-ground reach of most observers – even when the Dob is aimed at zenith. Gone are the days of fumbling with ladders in the dark.

The Basic Formula for My "Perfect-Sized" Dob

For a telescope to qualify as the "perfect size" for me, it must meet a number of criteria:

(1) It must have a well-corrected primary mirror and beautifully-flat secondary mirror.

(2) The scope must be light enough for me to handle and pick up alone, but massive enough to give a stable image at the eyepiece, even at the highest powers.

(3) There must be enough aperture to go deep – very deep!

(4) My observing list can be somewhat eclectic, so one night I may be viewing large galaxy clusters and open clusters, requiring a wide field of view, and the next I will be trying to split close doubles and doing planetary work, needing higher magnifications.

(5) The primary mirror must not be so thick and heavy as to take too much time to reach ambient temperature.

(6) Balance is also an important piece of the perfect-scope puzzle. I jump all over the sky and enjoy using and testing a number of Paracorr/Barlow/bino/eyepiece combos, so the telescope must be able to handle large weight changes on the business end without drifting.

(7) I often take a smallish vehicle to various observing sites, so the telescope cannot be moved even partially assembled. The upper cage, truss tubes and mirror/rocker box hit the field unassembled, so it is important that I am able to get all pieces out of the van and set up, assembled and collimated in less than five minutes.

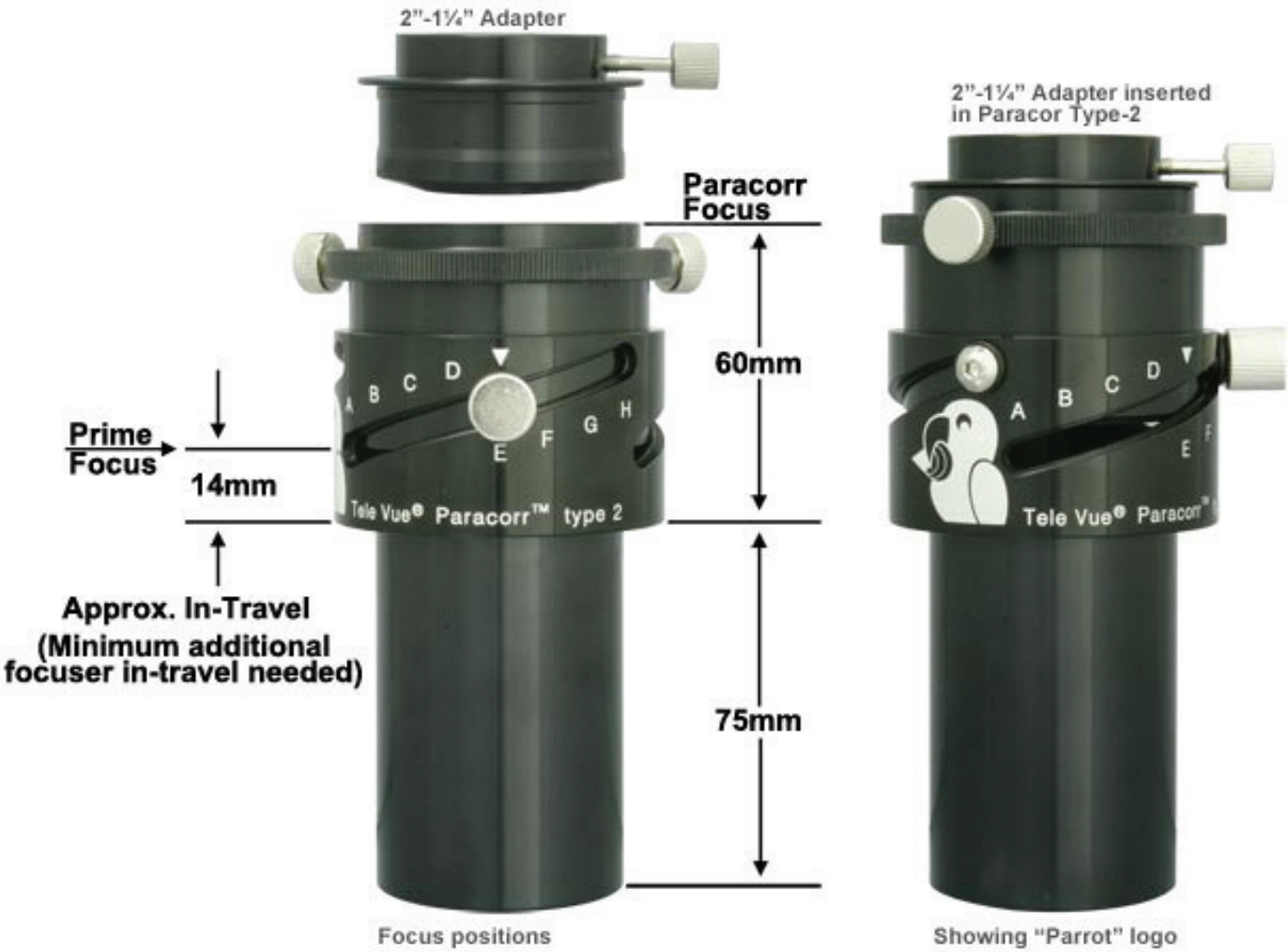
(8) And finally, I most enjoy seated observing, so I would rather not scurry up and down a ladder if I don't have to.

Criteria One: Excellent Optics

That first criteria has always been met for me when I use Lightholder Optics for my primary mirrors and Antares Optics for the secondaries. Regardless of focal ratio, Lightholder Optics has proven to me that I can expect a beautifully corrected figure, with a smooth polish and no zoning issues from edge to edge. Since toward the edge of the mirror is where most of the light is being gathered, the edge cannot exhibit any sign of being turned down or turned up, and no Lightholder mirror we have tested to date has exhibited those negative characteristics.

This is not to say that other opticians cannot or do not achieve the same type of results, as I am quite sure they do. In fact, I have used various other opticians in the past, typically with excellent results. But having used Lightholder Optics so often, I have developed a particular fondness and trust for the firm.

This brings up Antares Optics, which is located only a couple of hours from my shop, so I get the satisfaction of buying local. They are also willing to provide interferometry reports with their secondary mirrors, and the tests have yet to contradict anything we have seen at the eyepiece.



Focus positions | Showing "Parrot" logo

Criteria Two: Light Enough

As for my second criteria – light enough to handle, heavy enough for stability – since everyone's definition of what constitutes "lightweight" is different when it comes to astronomy gear, here's mine: I must be able to move the scope about alone without exerting much energy. Since stargazing (other than the close star) is best done at night, and I also sleep nights; I need all the extra energy I can get – from the beginning of the night to the (sometimes) long trek home. I would rather not lift anything over 40 pounds if I can help it.

Criteria Three: Aperture Matters

Bottom line: aperture matters – a lot! I realize this is subjective and depends on the type of object one enjoys viewing, but the bigger the mirror is, the happier I am. Larger mirrors can also achieve higher magnifications (subject to seeing conditions, of course) than their smaller counterparts, and the more I observe, the more I like to push a primary's capabilities.

Criteria Four: Wide Enough; Powerful Enough, Too

Criteria four dictates that the perfect-sized telescope will frame the Andromeda galaxy with her two satellite

galaxies and, with a quick switch of the eyepiece, tease out a globular cluster hidden in her dust ring. Making out subtle detail in galaxy clusters is also far easier with the bigger mirrors, so this is an important deciding factor as well.

Criteria Five: Fast Cool Down

Criteria five demands that the primary mirror must cool to ambient within half an hour of arrival. Fans help to achieve this particular goal, but primaries of more than two inches thickness are out of the question for me!

Criteria Six: Doesn't Require Counterweights

I'll get to this one later. Let's do criteria seven first.

Criteria Seven: Lightweight Components that Assemble Quickly

When going out to observe, I want to spend my time observing, not unloading and assembling. If the event is a dedicated two-day-plus star party, then that's a different story, but those are few and far between for me. My typical night under the stars consists of a 45-minute, or longer, drive to a dark site (I have dark skies where I live, but I also have a high canopy of trees in every direction), so quick set up is imperative.

After reaching the dark-sky destination, ideally, I am unloaded, set up, and collimated within five minutes or less, without requiring breaths so deep that those around me need oxygen tanks. After a four or five-hour observing session, I would rather not start fixating on the pain in the neck breaking everything down is going to be, so size also plays an important role here. As much as I love viewing through 25-inch and larger scopes, between the sheer size and mass of the mirror alone, my perfect size telescope is going to be a little smaller.

Criteria Eight: Eyepiece Height

For me, a comfortable eyepiece height is imperative for a Dob to compete for the coveted perfect-size title. Although I want to do most of my observing seated, I also enjoy public outreach, and when the line inevitably starts to lengthen, standing up becomes essential. I am 5 foot 7 inches on a good day, so I must be able to view flat-footed when the scope is pointed near zenith. This is probably the biggest limiting factor of the size telescope that is going to fit all of my personal criteria.

In the past, this factor would narrow the field down quite a bit. Thank goodness mirror makers' capabilities and testing procedures have also evolved over time, and thank goodness for the Tele Vue Paracorr Type-2, too, without which those mirror makers would have had no incentive to produce primaries that are so much faster! Without the Paracorr Type-2 and the ultra-fast revolution it spawned, my criteria would limit me to 12 or so inches of aperture.

My Perfect Aperture Is...

My perfect-size telescope is not one I currently or ever have called my own: a 20-inch f/3.3. After building and testing this size telescope for a client, we quickly expanded our current line to include other large-aperture, "flat-footed" telescopes. I am able to view a vast array of DSOs with this aperture. My personal favorite galaxy clusters, planets, or double stars are all well within reach.

Since a 20-inch primary mirror theoretically reaches to around 17.1 magnitude, it packs an admirable punch when it comes to going deep, and the rather large 4.5-inch secondary required at f/3.3 isn't the contrast

robber one might think. Close examination of Jupiter over several nights revealed generous swaths of subtle detail.

Cool down is quick with an active cooling system built into the telescope. Being a "shorty," using a huge range of ocular combos of various weights, including some that are decidedly heavy, never requires the use of a counterweight system, which satisfies my sixth criteria. Of course, a Paracorr Type-2 is essential for a fully corrected field, but it's always nice to have an excuse to purchase another Tele Vue product whenever possible.

Gone are the days of needing a ladder for a 20-inch scope. Keeping your and especially your children's two feet on the ground under a 20-inch f/3.3 is a simple way for amateur astronomers to keep their blood pressure down. Couple the 20-inch f/3.3 with an equatorial platform or a drive system, and you can even start thinking about astrophotography with a big Dob! I could not be happier with this size of telescope. Now, if I can only talk my wife into adding another "child" to the mix.

Quantifying the Paracorr Type-2 at f/3.3

To confirm the critical importance of the Paracorr Type-2 at very fast focal ratios, Damian Allis, Steve Capp and I tested a range of eyepieces in the 20-inch f/3.3 on November 29, 2013, from 17:00- to 22:00-Eastern Standard Time (22:00 to 03:00 GMT), with and without the Type-2. We let the big primary cool for a full hour prior to testing to ensure that it had reached ambient temperature, which ranged from 8- to 13-degrees Fahrenheit (-13.3- to -10.6-degrees Celsius). Seeing was roughly 6/10, and we rated transparency at 7/10.

Using a Tele Vue 31-mm Nagler without the Paracorr Type-2, I detected coma beyond the central 40 percent of the field of view (FOV), while Steve and Damian detected it at 50 percent. With the Type-2, Damian and I found no evidence of coma or other aberrations within the central 90 percent of the FOV, but noted that eye placement played a large role in whether we could detect any coma. Steve found things to be perfect for the central 95 percent of the field.

Using a Tele Vue 22-mm Panoptic, the results were even worse sans the Paracorr Type-2. Damian and I detected coma beyond the central 30 percent and Steve beyond 35 percent. With the Type-2, I judged the central 95 percent FOV to be perfect, while Damian and Steve thought the entire field showed no aberrations whatsoever.

Using an Explore Scientific 14-mm 82-degree eyepiece, our results varied from those with the Panoptic only in that Damian and I switch roles in finding 95- versus 100-percent perfection.

Using a 9-mm Type-1 Nagler, Steve judged the middle 40 percent perfect with-

out the Paracorr, and I the central 45 percent. With the Type-2 Paracorr installed, Steve thought the entire field was perfect, and I agreed as to the middle 95 percent. Damian didn't evaluate these combinations.

Next up was a 10-mm Delos where we all thought the middle 50 percent was perfect sans the Paracorr Type-2, and only Steve thought the entire field was less than perfect with the Type-2, rating it at 95 percent, instead.

With a 4.5-mm Delos, things took a dramatic turn: Steve and I rated the perfect field at 90 percent sans Paracorr, and Damian at 95 percent. Of course, we all found perfection from edge to edge with the Type-2 Paracorr installed.

To shake things up a bit more, we tested a 40-mm Konig, with and without the Paracorr. Without the Type-2, Steve and I rated the perfect field at 25 percent, and Damian at just 20 percent. With the Type-2, I rated the perfect field at 85 percent, and Steve and Damian at 90 percent. Eye placement again played a large role.

I was shocked when we actually measured the FOVs and noted the coma-free areas. If you were to average all eyepieces, I would say around 40 percent of the field was coma-free field to our eyes without Paracorr 2. With the Paracorr 2, our observing eyes enjoyed pinpoint stars almost from edge to edge, or indeed from edge to edge. The extra magnification that accompanies the Type-2 was barely noticeable, and the "crispness" of the stars made the image appear brighter.

Another surprise was the Delos 4.5-mm, which was almost as good without the Paracorr 2 as it was with it! I'm still trying to figure that one out, but when Al Nagler and Paul Dellechiaie are the designers, optical wizardry is the rule rather than the exception.

Unfortunately, Jupiter was too low on the horizon, and the below-freezing temperature made testing (and waiting for Jupiter to rise higher) unappealing after a few hours! We easily split Epsilon Lyrae, the Double-Double, but most coma testing was done on the double cluster because of the coloring of the stars and the large field they require. I find it to be the most demanding cluster for eyepieces. With the 31-mm Nagler and the 40-mm Konig, M31 and her two satellite galaxies fit easily in a single field of view. M33 clearly showed her spiral structure and hydrogen knots. Seeing wasn't good enough to make out the central star in the Ring Nebula. Damian noted that he was amazed at the subtle coloring detail shown in star clusters. All three of us agreed that the scope holds a superb optic.

To sum up, the original Paracorr revolutionized practicality of big Dobsonians, with 16- to 18-inch f/4.5 to f/5.0 Dobs becoming commonplace, albeit still requiring short ladders for viewing at zenith by some. The Paracorr Type-2 takes things to ultra-fast extremes considered impractical just a few years ago.

The perfect-size Dob? For me, its aperture got much, much larger thanks to the Paracorr Type-2, and I couldn't be happier! ATT

NEAIC and NEAF 2014

The Gang Was All There

By Gary Parkerson

I traveled to NEAIC and NEAF alone last year - manned its exhibits alone, too, vowing to never do that again. So this year there were four of us: Associate Editors Austin Grant and Chad Patterson made the trip, along with our newest Contributing Writer, Stan Westmoreland. It was Stan's first trip to these big events, so we saw little of him during show hours. Given all there was to see and do, who can blame him?

I've no idea how to best measure the relative success of each new edition of NEAIC and NEAF. Is it quantity or quality, or both? What I do know is that I had a great time and am, once again, very glad to have invested the time and energy. Having Stan, Chad and Austin along to assist… Oh, who am I kidding? They did all the hard work – I assisted them. Anyway, making the trip with them made it especially enjoyable, and I hope they each make the journey next year. Thanks, guys!

All of the following photos were taken by either Stan or Austin, many with the same Canon 60Da that Austin used in testing the TPO Imaging Newt and Baader MPCC Mark III that he reports on in this issue. We arrived home with more than a thousand good images and hundreds of great ones, so there's too little room in these pages for even the really great ones. What follows, in no particular order, are some of my favorites. You can see over 100 images with descriptions in the online version of this issue, though. Hope you enjoy them!

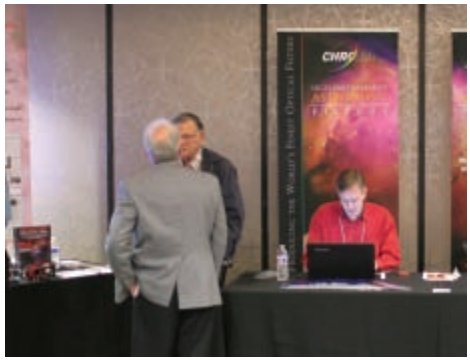
What's the first group photo any self-respecting group of astro-gearheads would want taken at NEAIC? Surrounding one of the great mounts and scopes displayed there, right? Not these guys. From left to right: Stan Westmoreland, Austin Grant, Al Nagler and Chad Patterson.

Steve Chambers and Rui Tripa of Atik Cameras at NEAIC.

Celestron CEO Dave Anderson addresses the hundreds assembled for Celestron's Friday-evening product-launch reception.

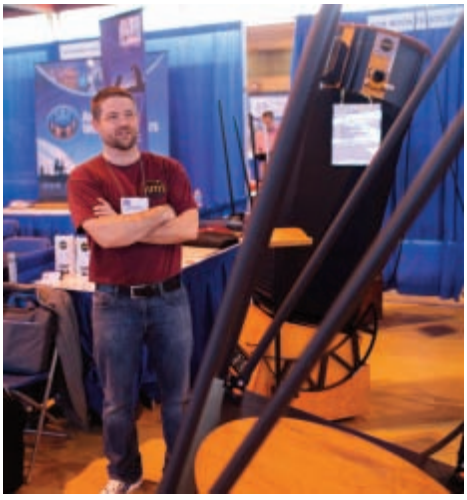
Software Bisque President Stephen Bisque was joined at NEAIC and NEAF 2014 by his daughter Sarah Bisque, a production engineer with the company.

Astro-Physics' Roland and Marg Christen at NEAIC.



We captured the Chroma team during enjoying the lull NEAIC exhibitors experience each hour when its seminars are back in session.

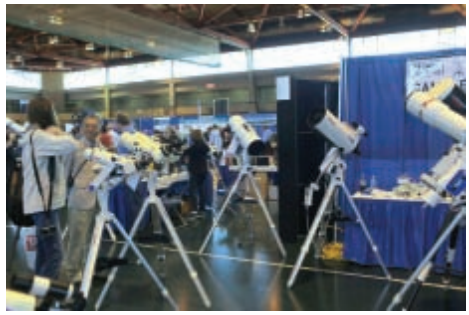
The marriage of William Optics refractors and iOptron mounts makes for some stunning rigs. This shot was taken Saturday morning at NEAF before the hall opened to guests.



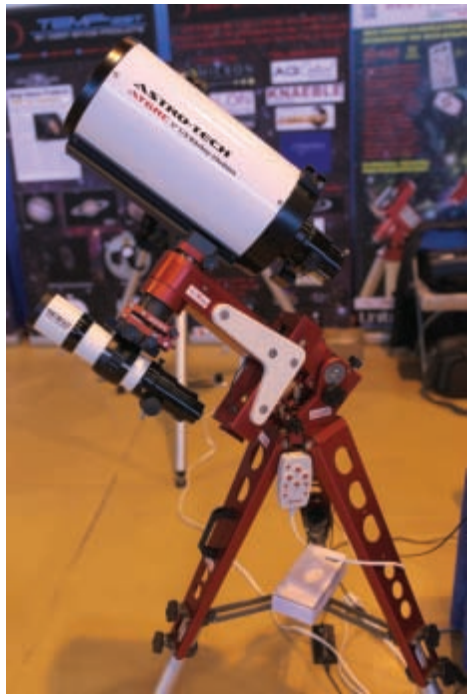
New Moon Telescopes' Ryan Goodson has contributed an article to this issue of ATT that provides thoughtful insight into the significance of Tele Vue's Paracorr Type 2 to the makers and users of modern premium Dobsonians. He and wife Heather are among my favorite examples of the family enterprises that are essential to this unique industry.

APM's Marcus Ludes confirming the optical excellence of Lunt Engineering's new 100-mm ED-Apo binoculars. I had a chance to test a sample under clear skies recently and, yes, they're indeed excellent.

Howie Glatter setting up at NEAF.



All the pretty Vixens lined up in a row, including some new products mentioned in the news sections of this issue.



An Avalon M-Zero carrying a 6-inch Astro-Tech R-C and a little 50-mm Apo. Yes, the M-Zero accommodates dual saddles. One of ATT's contributing writers currently has the M-Zero in hand, and his report should be filed within the next few issues … imaging conditions permitting.

Yes, Explore Scientific's eyepieces are drool-worthy, but so are its refractors.

Brian Deis, President of Vixen Optics, shows off a drive component of the Vixen modular "Transformer" mount previewed at NEAF 2014. I don't know that he could have more proud had it been a baby boy.