Amateur Astronomy WITH AN ATTITUDE *from Chaos Manor South!*

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Skywatch
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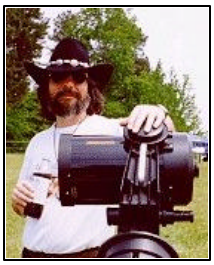
Rod Mollise's

Skywatch



Building a 14.5 inch Telekit

Len Philpot

After having used the 10" f5.5 Dob that I built in 1991 for more than twelve years, I was starting to notice the telltale signs of aperture fever. I tried to inoculate myself with observing projects, and for a while I was successful. The Herschel 400 yielded to this scope, for the most part. However, by century's end I found myself looking at various websites featuring names like Starmaster, Obsession, StarSplitter, Discovery and others. "Just a few more inches of aperture", I told myself. However, I managed once again to quell any illusions of grandeur. For a while.

Then, in 2003, a dear friend passed away and left me a 14.5" f4.5 Sky Designs Dobsonian. After using this scope for a while, it became obvious at the very least I'd need to do some further repair on the it, since it had accumulated knocks, dings and a certain degree of damage over the years (not to mention being blown over one afternoon at the Texas Star Party). The more I looked, the more there was to do, it seemed.

And then, I got a nice close look at a few TeleKits from AstroSystems in LaSalle, CO. They were NICE! And no matter who assembled them, the quality was consistently high, which speaks well of the actual kit quality, given variances in individual skill. The quality of the wood, fabricaton, design and overall appearance were as good as any telescopes I'd seen, bar none.

And so it was - When I returned from the Texas Star Party in May of 2003, it took about a week for me to decide to call Randy Cunningham at AstroSystems and order mine. Their website predicts delivery in two weeks to three months, and Randy told me to count on three months,

just in case. No matter, since he immediately mailed the assembly manual to me and I spent many an evening looking over it in advance, just to become as familiar with the kit as possible. The first box arrived in late December, followed by a few more shipments over the next month or so. The last component to arrive was the Quickswitch filter slide in February, since AstroSystems was apparently dependent on someone else's production run for the actual filter holder piece. I ordered a Rigel Systems QuikFinder (instead of a Telrad) and a secondary mirror DewGuard from AstroSystems in addition to the kit. I didn't opt for the upgrade to a Feathertouch focuser, though. Rounding out the scope was an Orion 9x50 RACI finder in a Losmandy ring mount.

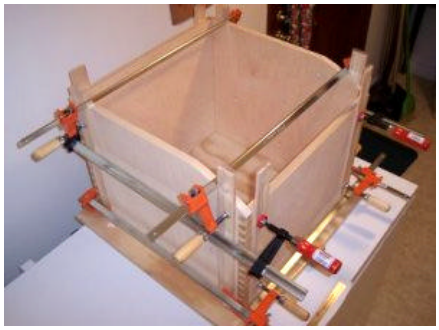
I won't try to describe the entire assembly process in extreme detail - There are excellent descriptions of that already on the web (see http://www.astrosystems.biz/telekits.htm for several links). Hopefully, though I'll be able to present a general idea of what it's like to assemble and use one of these fine scopes.

The Parts

I think my wife had second thoughts about her blessing on my endeavor when she saw this collection of parts in her living room! And, there were still a few pieces yet to arrive. The wooden parts are beautifully CNC routed from 13 to 15 ply Russian Baltic Birch plywood. This wood is hardwood veneer and core, with virtually no voids (I think I filled only about 4 or 5 very small spots over the entire scope). This wood is also very moisture-resistant. I live in Louisiana ('nuff said, moisture-wise), and despite being unprotected in my carport and/or storage building for three months, a raw piece of scrap ply from Randy exhibited NO signs of warping or other damage.

All of the parts, wood and hardware, were packed very well and sustained no damage en route. In fact, there were so many plastic "peanuts" around the house for a while that I had to be careful not to let our cats get into them! It was very much like Christmas morning as I went through the boxes with all that incredibly neat Stuff in them...

Assembly



The fundamental fastening method on a TeleKit is epoxy, epoxy and some more epoxy. It works very well, but just get ready to spend some quality time with the sticky stuff. As the manual states, it makes a great gap filler - Note the epoxy filler in between the finger joints of the rocker box.

AstroSystems provides the epoxy, as well as rubber gloves, brushes, wooden "popsicle" sticks and several plastic cups for mixing it up.

My sequence of assembly was to do the easy parts first, hoping that any lessons learned along the way would be applied to the more difficult operations later on. And, by the way, nothing on the kit was difficult, per se - it just takes time, persistence and attention to detail. The first epoxy to go down was on the mirror board, where I had to attach the travel posts, mirror sling support posts and mirror box lid support posts.

Next came the ground board, mirror box, rocker box and end cage. The epoxy supplied by AstroSystems is a slow cure formulation that allows plenty of time for repositioning (almost too much time; more on that later).

Once the epoxy cures (three to four days, just to be safe), a router comes in VERY handy to knock off the excess wood as well as round over the edges. The job could be done with nothing but sandpaper, but I wouldn't try it!

Speaking of sandpaper, there's sanding... sanding... sanding... sanding, and did I say, there was sanding? Not that the wood is rough. On the contrary, it's already very smooth, but there just seems to be no end to how it improves with sanding, so you tend to keep on and on and on and on and on, trying to reach Baltic Birch *Nirvana*. Plus, I always seemed to notice some little patch that I had missed, just before starting the next stage of assembly,

so that meant doing some more sanding, and sanding, and san.... Anyway, you get the picture. Lots and lots of flour-fine white sawdust everywhere. This is one of the junctures in assembly where I found peer pressure setting it - I had seen all those beautiful TK photos on the web, with all those other flawless TeleKits exuding perfection. I finally realized that if I were looking at those scopes in person, they'd have small little flaws as well, so finally stopped sanding...

Finishing

When everything was sanded (or was it?), I started applying the finish. The first coat is recommended to be a 50/50 mix of varnish and solvent, to act as a sealer coat. I used Minwax Helmsman Spar varnish, in a semi-gloss finish. The wood immediately takes on a much richer character with the first application of finish, despite the thinned mixture. Two to three full-strength coats later, I called it *done*. The last coat for most of the pieces was a spray of the same varnish. The inside sections that were painted flat black didn't get quite as many coats, since I wasn't interested in a perfectly smooth finish on them. Weeks later, the varnished surfaces were still aging and darkening to a beautiful honey gold color.

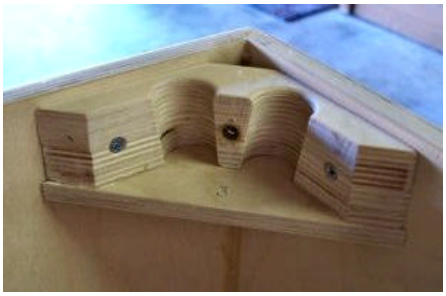
Final finishing included blackening the inside of the mirror box, rocker box bottom and end cage. The hardware got attached, the DewGuard installed in the secondary mount and the laminate light baffle in the end cage (unpainted, more on this later). I also ran a power cable from the two (supplied) gel-cell batteries on the mirror board to a jack in the mirror box by one of the truss tube clamp blocks. There's another jack in the end ring that feeds power to the DewGuard. A wire with a plug on each end runs the length of one of the truss tubes. The batteries, mirror fan, control panel and other hardware installed without a glitch.

Lessons-Learned

These stories are not meant as a knock toward AstroSystems or anyone else, but rather just as a general heads-up, in the "FYI spirit". All in all, I had very few problems with the Kit and remain very impressed with its overall quality. That being said...

I mentioned above that there was almost too much time for repositioning epoxied parts - Here's why I say that, and what I did to prevent problems in one area. After clamping up the rocker box, I checked it for square about six or eight times over the next few hours, at half hour intervals more or less. Using a large drafting triangle, I verified all angles were square on the inside of the rocker box. Once it cured, was sanded, finished and the scope assembled, I discovered much to my chagrin that it was noticeably out of square (at least, noticeably with a carpenters square). Apparently it slipped after my last check that night. Fortunately, it wasn't enough to affect the operation of the scope, and a small (hidden) square of Teflon on the mirror box reduced the net effect to zero.

I think part of the problem is the fluidity of the epoxy under pressure. It's thick enough not to simply run, but not stiff enough to hold tightly. All in all, it works fine and there may well be no better solution, but latent stresses in clamps (for example) can cause things to slip if they're not otherwise registered. To avoid the possibility of movement in the lower truss tube clamp blocks (inside the mirror box), I opted for a positioning method more positive than the simple "clamp while curing" method suggested in the manual.



Aligning and pre-drilling holes for the screws allowed for a very positive, non-moving alignment and clamping device during the curing period.

The other lesson learned may well be due to my inexperience with the product, but I opted to line the upper cage with ProtoStar flocking paper instead of painting it flat black. First of all, let me say that I'm highly impressed with just how absolutely BLACK this stuff is! In fact, it's so black that it's almost difficult to work with. I had to use a strong light shining directly into the end cage just to see what I was doing! Once I finished covering the inside of the (laminate) light baffle, filter slide box and small brass disc counterweight, it looked like I had sprayed black flocking all over everything. Black, black and delightfully black!

After using the scope a few times in the damp, cool air of Louisiana and Mississippi spring nights however, I started to be less pleased. Edges started curling up, wrinkles developed and it just started looked tacky. I'll be the first to admit that the rough side of counter top laminate is hardly the best surface for adhesion, but the adhesive on the flocking paper didn't hold on the brass or smooth wood, either. On the one place where it did hold (the filter slide box), it wrinkled nonetheless, indicating a lack of dimensional stability in my opinion.

So, I eventually disassembled the end cage (with the exception of the carefully collimated focuser and filter slide), peeled off the flocking paper, masked it all up and applied seven

coats of flat black paint before it looked proper again. Once again, I'm not ready to criticize ProtoStar too much, since this is the sum total of my experience with their product. However, I would have like to have seen a more robust adhesive on it.

I've since heard from the manufacturer on this issue and their recommendation is to apply the flocking paper in narrower strips to minimize the dimensional instability (when compared to the average telescope tube). They also suggest gluing it in place. Both approaches may well have avoided my problem, but now that I'm back to flat black paint, I'll think I'll leave it as it for the time being.

The Scope in Use

At any rate, by the end of March 2004 it was done and I was ready to go observing! I was immediately impressed with the accuracy of balance. When I placed the order for my kit, Randy asked what I would be putting on the end cage, etc. I provided a typical eyepiece, finderscope/bracket weight, mirror diameter, thickness and focal length and diagonal size. After all was said and done, the scope was perfectly usable as is. An additional 8 oz. of weight inside the upper cage made up/down motions equal and prevented "creep" when a heavy eyepiece was removed. The roller bearing and laminate/Teflon combination on the motions provides for smooth and partially adjustable movements, although my personal jury is still out on whether it's better, worse or just different from a traditional "pure" laminate/Teflon Dob. At any rate, the movements are smooth and backlash isn't a problem. There's no positive stop to prevent the altitude bearings from rolling off the roller bearings at low altitudes, but that's not even really a problem. In fact, which "storing" the scope during the day at the Texas Star Party, I would just push it down gently until the front ends of the altitude bearing rolled off the roller bearings and then cover the scope. No problem, and it didn't have a tendency to move up in a breeze.

Setup and takedown is easy and quick. The truss tubes are four assemblies of two each, connected at the top by clamp blocks with flip-cam levers. I can do it myself start to finish in about 15 minutes, including wheeling it in and out of my truck. The four-knob, two-axis secondary mount is very nice and quick to adjust. Randy provided me with cable and plugs so I could make custom-length DSC cables, which are routed up the altitude encoder stay arm. I even had a custom vinyl cover made by a local upholstery shop - After using a similar cover I made for the 10" scope, I was sold on the protection and ease of us inherent in the "box" design. It has since survived, without damage, some thunderous Texas Star Party storms one evening and the day's heat that is a part of the TSP experience.

The Bottom Line

Do I like it? You bet! Is it perfect? No, but nothing is and it's VASTLY closer than I could have come on my own (and they continue to improve with each new kit). Did I have suggestions for improvement? Yep. And just about every one of them was minor at best. Would I recommend it to others? Absolutely. Do you need a complete woodworking shop to complete a TeleKit? No. Not at all. A couple of work surfaces, router, sander,

clamps and a few other standard tools will pretty much take care of it.

If you have the time to spare and like to work with your hands, go for it. You'll be glad you did - Go forth and assemble.

The Buying and Selling of Stars

Rod Mollise

What *do* you do when somebody walks up to you enthusing over the fact that they've just "bought" (or received) a star? As most amateur astronomers are aware, there are a number of companies making money on the Internet and elsewhere by "selling" stars. You send them 50 bucks; they send you a certificate, a simple star map showing the location of the star, and vague promises that the new name you've given your star will be enshrined in a catalog somewhere. That's right, that's *not* Gamma Virginis any more, it's *Tammy*.

In the amateur astronomy community, this business--it is that, and a profitable one--of selling stars is a subject that, not surprisingly, causes considerable emotional tumult. What do you do when the proud star owner asks you to find Tammy for her? Point your scope at Gamma Virginis and leave her happy and satisfied? Or tell her the truth? *That the selling of stars and the renaming of them is wholly unscientific and unrecognized, to say the least.* Most amateurs, it seems, come down on the side that labels star selling outfits as the worst sort of con-artists imaginable, and believes in telling hapless buyers this "truth." But *is* that the thing to do, the wise and kind thing?

A recent thread on the sci.astro.amateur Internet newsgroup on this subject, which ran to nearly 200 posts, made me stop and consider my ideas about the now entrenched practice of buying and selling stars and what our reactions to it should be. This is my take on it, and I doubt you'll change my mind, since I've done considerable thinking and cracker-barrel philosophizing, but I would be interested to hear *your* thoughts and opinions. Thanks, especially, to Greg Crinklaw, whose brave posts made me think about this again and seriously.

What do *I* do when confronted by a star buyer? When I'm told someone has just bought a star, I smile and say, "how *wonderful*." Naturally, if I am asked directly and seriously about the scientific validity of the purchase, I'll be honest and say that, no, it (the star's new name and ownership) is not recognized by the IAU, the International Astronomical Union, the "naming" authority for astronomy. But I'll *also* say that that does *not* make the purchase any less meaningful for the star buyer or recipient.

I haven't always felt that way. Like most of the posters on s.a.a., I *used* to be one of those guys who would stamp his feet and howl about the "crooks" selling stars. I'd tell new owners they should have just scrawled out a deed to the star on a scrap of paper with crayons, and that that would have been just as valid as that pretty, new 50-dollar parchment certificate. *Not any more*.

I still consider star selling a bit of humbug, but I've come to believe that, no, it doesn't do any harm to anybody if it makes purchasers *happy.* I can tell you for sure that the star buyers I've encountered don't feel the least bit ripped-off—far from it. In addition, these purchases often carry considerable emotional baggage. Stars are frequently bought as memorials to deceased loved ones. Do you really want to be the person to tell that little old lady that buying her late husband a star was a meaningless act? Was it?

What really encouraged me to hold my peace on the evils of star selling? The Christmas my 7-year-old (at the time) daughter bought *me* a star. I was all set to go into my standard speech, "Well, you see, sugar, we don't *really* own this star, and it isn't *really* named "Rod" now, blah, blah, woof-woof." And then I looked into her face and saw the love and happiness there and just…SHUT UP.

These days, when somebody at a star party tells me they've bought wife or husband a star, I don't just shut up, I say, "You must love her/him very, very much." I'll then send my good old SCT over to that star and hope they are not too disappointed in the appearance of an 8th magnitude sparkler (probably 10th magnitude by now, the way stars are selling).

And you know what? They never are.

Yes, as I said, the selling of stars *is* a bit of humbug, but the BUYING of them is an act of love, and this poor old planet sure could do with a little more of that.

Moon Filters

Stu Forster

Since becoming enamored of CCD imaging, I've found that I resent the Moon once it is fuller than first quarter, as its bright glow effectively washes out the sky and allows only narrow field imaging to in order to avoid major light pollution gradients in my images. Or in other words, I consider the Moon a source of *light pollution*. Rather than fight it or surrender to it, one should observe it. The Moon is an easy target. Its brightness allows any size instrument from binoculars and small 60mm refractors to big light buckets to give stunning views. In addition, it is easy to acquire in the

eyepiece, even with marginal or no finder scope. Also, its brightness allows for high power viewing as long as one has fine slow motion controls or a motor drive. Constantly changing shadows as the terminator advances lead to varying observations and different details from night to night and even during the same observing session.

The Moon's brightness makes it a great target, but also is the biggest problem when observing it. The overwhelming brightness, especially in large scopes, causes our pupils to contract to the point that we waste the exit pupil of eyepieces at moderate powers. To combat the moon's brightness astronomers use moon filters.

The most common and least expensive of the Moon filters are the simple neutral density filters. They sell for $10-15 and block out approximately 90% of the light. There are two negatives with these types of filters. The first is the fact that one needs to move the filter from eyepiece to eyepiece when changing magnification. This can be avoided by using a filter slide in a Newtonian scope or by screwing it into your diagonal rather than the eyepiece in a refractor, so it's always in the optical path. The other negative is that the amount of light transmission is not variable. At low power, too much light may get through. At high power, not enough.

A step up is the variable polarizing filter from Orion Telescope and Binocular Center that sells for $29.95 in 1 ¼ size and $49.95 for the 2" version. These filters screw into an eyepiece and have two elements that can be rotated to adjust from 1-40% transmission. Their main negative is the fact that the eyepiece needs to be removed from the focuser to adjust the brightness levels, which makes fine adjustment cumbersome. Once again the filter needs to be moved from eyepiece to eyepiece unless it's installed in a diagonal. This filter is too thick to fit in a filter slide. The 2" version is probably not needed, since most lunar observing is done with higher power eyepieces, which are usually 1.25" in size.

A better choice may be the Meade Variable Polarizer for $49.95. This is a 1.25" accessory that fits into the focuser and accepts 1.25" eyepieces. The unit can be rotated to adjust transmission while observing. No need to remove the eyepiece. The only possible negative is the need for additional back focus of the scope.

The authors of the *Backyard Astronomer's Guide* mention some loss of resolution with the dual element filters compared to single element units, but I think the convenience outweighs a minimal loss of resolution. You can always use a single element filter at the highest powers when the Moon's brightness will already be attenuated, and resolution is critical.

Yes, the Moon is a source of "light pollution," but while it's up, take some time to observe it. You may even find that good, old Luna can be more than a mere annoyance.

Getting Maximum Zenith Clearance with the NexStar 11 GPS

Matthias Bopp

I have received some questions on how I get maximum clearance between telescope and drive base when using an electrical Crayford focuser with the Celestron Nexstar11GPS. Here is what I am using:

- 3" adapter ADPT3SCT from JMI

- NGF-S electrical Crayford focuser from JMI

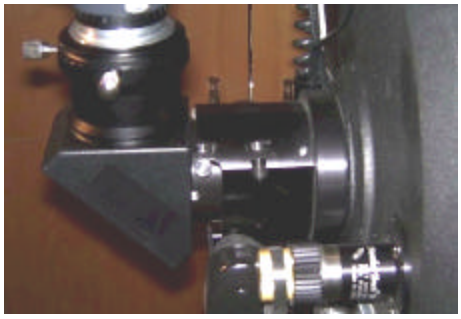
- 2" Maxbright Star Diagonal from Baader-Planetarium

I began with a 3" Adapter for the NGF-S that ensures minimum vignetting and minimum mechanical length. This is threaded directly on the 3" back of the NS11GPS OTA. The NGF-S focuser is then attached to this adapter and clamped. Order this adapter from JMI (part number ADPT3SCT) The picture below shows the motorized NGF-S Crayford focuser. It is attached with this orientation to the ADPT3SCT, and the diagonal is inserted into the 2" opening.

The Baader 2” Maxbright Star Diagonal is an excellent 2” mirror diagonal that provides a minimum of vignetting and an excellent reflectivity of 98.5%. It is all-dielectrically coated with a planarity of 1/10 wave. The coatings are highly durable and last lifetimes without losing reflectivity. They may be cleaned with normal care, without fear of scratches. The 2” eyepiece holder uses dual nickel-plated clamp-screws for maximum convenience and security, and incorporates a captive spring bronze lock-ring to prevent any possibility of damage to your eyepieces.

Those of you who have attached heavy equipment like a filter wheel, a binoviewer, or big 2” eye-pieces to your diagonal have certainly noticed the strong torque such equipment causes once it gets slightly out of balance. To avoid any damage from a loosened attachment of the Star diagonal to the NGF-S and thus a twisting diagonal/filter wheel/ binoviewer combination, I decided to drill two small holes in the nickel-plated brass nosepiece. Thus, the screws of the NGF-S, which are supposed to clamp the Star diagonal, are actually threaded partially into the nosepiece and unless the screws brake twisting of the diagonal cannot take place. To define the right spots at the nosepiece to drill the holes, I simply inserted it into the NGF-S, tightened the 2 screws with a bit of power, and, after removing the nosepiece, had marks ready available. Please make sure to remove any residual metal filings to avoid them scratching the optical surfaces.

Finally here is my setup mounted at the N11GPS:



With NGF-S fully moved in, OTA moved to zenith. The clearance is more than 2” in this setup. This picture shows the minimum clearance with the NGF-S focuser fully moved out. It is still approx. 1.5” when the OTA is pointing to zenith. I hope this description of my setup helps others when choosing their optimum setup.

Apogee Astro-Vue 12x60 Binoculars

Michael Portuesi

Recently, I spotted an ad in *Sky and Telescope* magazine for binoculars with built-in nebula filters from Apogee, Inc. They are available in several sizes, from 7x50 through to giant 20x100 sizes. I wanted something a little bigger than the 7x50 Celestron binos I've had for years, so I talked myself into purchasing the 12x60 pair. The cost was $89.95 plus $11 shipping, an incredibly good deal compared with the $180 I spent on my 7x50's several years ago. I figured they cost so little, compared to other astronomy equipment at least, I couldn't go wrong by taking a chance.

First Impressions

The binoculars are what you expect of Chinese-built astronomy equipment: good but not exceptional quality, but a great bang for the buck. The mechanism works well, but overall fit and finish is not what you expect from, say, a nice piece of Japanese equipment. Black paint covers the outside rather than the rubberized covering many binos sport nowadays. They still look attractive, but the metal tube means they can be cold to the touch. A view through the objective lens shows metal parts that aren't fully blackened, as well as surfaces covered with some substance (adhesive? lubricant?), and the little cover for the tripod mounting bracket hole won't screw on tightly.

They also literally stank — stank as in *smelled* — when I pulled them from the box. It was a combination of the rubber, lubricants and adhesives they use in the manufacture of the binoculars. Most of the smell wore off a day later, but even after two weeks a smelly residue remains.

You get a fairly nice nylon carry case with a Velcro closure, a cleaning cloth, and a tripod-mounting bracket that fits my Vanguard photo tripod nicely. They also include a rather cheesy carry strap that I don't trust. You get lens caps for the objective lenses, as well as the ocular lenses, but the ocular lens caps fit loosely, and fall off quite frequently.

The binoculars are quite light for their size, and not too tiring to hold,

though I have been using them almost exclusively on the tripod.

Nebula Filters

The real attraction of these binoculars is the built-in nebula filters to increase contrast when viewing emission nebulae, planetary nebulae, and supernova remnants. Several notable nebulae, such as the Veil Nebula in Cygnus, the North America Nebula in Cygnus, and the Rosette Nebula in Monoceros, are larger than the typical field of view offered by a telescope. Binoculars allow you to take-in the entire nebula in one go, and the lower magnification compacts the nebula into a smaller view. This can make an easier view through binos than through a telescope.

<photo>
The thumbwheel for the left-side nebula filter is down and to the left of the left ocular.

Two thumbwheels, one underneath each ocular, slide the filters into view. They work very smoothly, and are reminiscent of the optical instruments your optometrist uses during an eye exam. They even make a similar noise when you click them in and out of view.

The daylight view through the filters is a medium-green. I compared the built-in filters with my telescopic nebula filters, an Orion Skyglow broadband, and a Lumicon UHC and an O-III. My nebula filters all pass more blue than the filter built-in to the binoculars. Actually, the view through the filter in the binocular looks closest to the #58 green planetary filter I have. That led me to believe it may not be a true nebula filter at all. But after looking through the objective end of the binoculars, I've caught red-purple reflections off the filter, indicating the presence of dielectric coatings and a true nebula filter.

I tried the filters with the Moon, to cut down on its glare. But I found the Moon's light caused several internal reflections when the filters are in place. This should not be a problem when using the filters for deep-sky nebula observing.

My first real test of the filters came at an observing session June 5, 2004 at Montebello Open Space Preserve in the San Francisco Bay area. This site is close to suburban Silicon Valley, with a good amount of light pollution to the north and east. We first viewed the Veil Nebula in Cygnus, through a great deal of sky glow. The light pollution made the nebula difficult to observe with or without the filter; it was subtle and very difficult at best to detect. But I and other observers agreed the nebula filter did make the Veil a smidgen more noticeable.

We had much better results with the Lagoon Nebula in Sagittarius, in a darker region of sky. Here, the filters definitely exposed more of the nebula when used. With no filter, the cluster contained within the Lagoon dominates, and nebulosity is present, but not extensive. With filters, the extent of the nebula surrounding the star cluster is extended and easier to view. Stars become fuzzier and harder to see with the nebula filters in place, but that's true of nebula filters in general.

Optics

The pair arrived in good collimation, and they have collimation screws at the front and back of the prism section. The collimation screws seem covered with a dab of wax or some other substance to keep you from getting at them.

A center focus knob adjusts both oculars, with an independent focus on the right ocular. Eye relief on the oculars is very good; you don't have to press your eyes up against the lenses in order to take in the full view.

The optics have blue-green coatings. The claimed field of view for these 12x60's is 5.7 degrees, but in reality, I think it may be a little smaller, comparing the bino field versus charts generated with SkyTools software.

The optics are good, but not great; but they are great for the price. They give very nice views of daytime

objects. I have been using them the past several nights for the binocular portion of the Astronomical League Lunar Club observing program. My view of the Moon shows a little false color (red/blue fringing) around the edges, with more color visible with objects placed at the edge of the field of view. This is very comparable to a ShortTube-80 or other Chinese-made achromatic telescopes. Still, the view of the Moon I have been enjoying the past few nights is very crisp. Craters show nice, delineated rim edges and are easy to pick out against the Moon's surface.

There is some amount of fuzziness in objects at the extreme edges of the field, and some flaring is noticeable when viewing bright stars. It is important that you adjust the focus properly on both eyepieces. I saw a good amount of false color on bright objects like Jupiter, before I got the right-side eyepiece focused properly. With a proper focus, the color is much reduced, and while still noticeable, not annoying. Jupiter's moons were nice dots, easy to pick out, and easy to tell relative brightness.

I have observed Comets C/2001 Q4 (NEAT) and C/2002 Q7 (LINEAR) with these binoculars, as well as some of the brighter Messier objects --open and globular clusters, nebulae, and galaxies. Views are bright and contrasty, and compare well with telescopic views through refractors. Overall, views have been very pleasing and well worth the price. On the other hand, I was not seeking optical perfection when I ordered these binoculars, and those demanding high performance should look elsewhere.

Summary

I'm pleased with my purchase. I was looking for a good deal on a pair of cheap but useful binoculars, and I'm having a blast observing with them for not a lot of money. I would recommend these binoculars as a good second pair, or as an inexpensive starter for a beginning astronomer. Other observers and I agreed the built-in filter concept is worthwhile, and that some manufacturer should run with the idea and build a high-end pair of binos with filters.

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Limits are Meant to be Broken

Jack Kramer

Newcomers to observing sometimes puzzle over lists of celestial objects, wondering which ones they'll be able to see with their telescopes. However, old hands at observing normally use an object's given magnitude as a very general guideline. Factors such as transparency of the sky, the object's size, and local light pollution all dictate what you can see on any given night. Other factors include the design of the telescope and quality of the optics, as well as the experience of the observer. On top of that, not all sources agree on each object's exact magnitude. Typically, magnitudes are determined based on photographic plates that have low sensitivity to the blue end of the spectrum – a range at which many deep sky objects radiate strongly and at which the human eye is more sensitive. Thus the magnitude may be shown fainter than at visual wavelengths. In other cases, the photographic magnitude might be brighter than at visual wavelengths. Even magnitudes referred-to as "visual" actually may be based on readings from instruments.

(Un)limiting Magnitude

The table below lists how faint a star is visible in instruments of given sizes.

Aperture		Magnitude Limit
inches	*mm*	
2	51	10.3
3	76	11.2
4	102	11.8
6	152	12.7
8	203	13.3
10	254	13.8
12½	318	14.3
14	356	14.5
16	406	14.8
18	457	15.1
20	508	15.3
24	610	15.7
30	762	16.2

This is just one such list; checking other sources will usually show some disagreement. For example, a different source that I checked gives a magnitude a few tenths fainter for each telescope size. So don't take this as gospel. It's also worth noting that this list is based on stars – point sources – but extended objects of the same magnitude, such as galaxies and nebulae, would normally prove slightly harder to see.

Your 8-inch scope probably is not going to pick up a 15th magnitude galaxy. But depending on circumstances, it's possible to better the previous estimates by a half magnitude or even more. It's often possible to detect a faint and small object, especially if it's adjacent to a brighter object. This happens frequently in the case of galaxy clusters where very faint galaxies lie near brighter ones that serve as "beacons". If the faint ones were out by themselves, you'd probably never notice them at all. The NGC galaxies 4820, 4990, 5046, and 5373 in Virgo lie near brighter galaxies. All four have magnitudes listed from 15 to 15.3, yet I saw them in my 10-inch scope – something the rulebook says I shouldn't have been able to do. In

addition to their position relative to other objects, I had the advantage of observing in a very dark sky and employed averted vision in order to see them. On the other end of the scale, higher magnitude objects sometimes don't appear nearly as bright as you'd expect. The huge spiral galaxy M101 in Ursa Major is a classic example. At 9th magnitude, you'd think it would be easy to see. Yet it's a difficult object because its light is spread across roughly 25 arc minutes of sky. Published magnitudes are integrated; that is, treated as though the objects were point sources, when in fact some are quite extended.

Dawes' So-Called Limit

Hand-in-hand with limiting magnitude is the *Dawes Limit*. This stipulates how much separation in arc seconds between stars can be detected by each size telescope. This is referred-to as "resolution" or "resolving power". The larger the telescope, the closer the stars can lie with respect to each other and still be detected as discrete objects. The classic formula for resolution is 5.0" (arc seconds) divided by the aperture of the telescope in inches. Thus, a 4-inch scope should resolve a double star whose components are separated by no less than about 1.25". This formula also is applied as a guideline to indicate a telescope's ability to show minute details on extended objects like planets.

As with other rules, it's a generalization that doesn't always apply. Dawes based his formula on actual observations of stars of equal brightness. But double stars are rarely of equal brightness, and the less equal they are the harder they become to split. Objects like the Moon and planets also don't follow the formula. High contrast features are much easier to spot below the theoretical limit than the Dawes criterion supposes. This is the case with rilles on the moon under a low angle of illumination. And the shadows of Jupiter's moons when they transit the face of Jupiter are clearly visible, even though their diameters are well below the Dawes limit. On the other hand, the Dawes limit is based on refracting telescopes; obstructed systems (reflectors) have a harder time clearly resolving minute features, unless the optics are of exceptional quality.

Magnification

Using higher magnification increases your ability to see fainter magnitudes by providing a darker background. According to Bradley Schaefer of the University of Texas, going from 100x to 300x on an 8-inch telescope will increase your "light grasp" by about a quarter magnitude. The increases are even more dramatic on larger scopes. Of course, atmospheric conditions and overall optical quality must be good enough to sustain the higher magnification. Given the right conditions and equipment, the 50x-per-inch-of-aperture limit can often be exceeded on some objects.

Eyepiece Designs

Those with un-driven Dobsonian scopes eventually gravitate toward wide field (and expensive) eyepieces. One reason is that an eyepiece with a fairly narrow field of view makes it harder to locate a faint object. But just as important is the fact that the longer you can keep a field in view, the better chance you will have of catching whatever objects are there and seeing details in an object once it's acquired. Each time you have to nudge the telescope along to follow an object, you break off your concentration on the object, plus you have to re-acquire it in your view. So while Orthoscopic and Plossl eyepieces pass the maximum amount of light and provide extremely good contrast, I feel you'll get a better view of faint objects with wider field designs such as Naglers, Panoptics, and Pentax XLs.

The comfort factor also comes into play. Wide field eyepieces have the advantage of being easier to use because of the larger size of the eye lens and longer eye relief. (Eye relief is the distance to the point behind the eyepiece where you must position your eye so you can see the entire field of view.) This is particularly important when using high magnification in planetary observing. If you have to squint through a tiny peephole lens and position your eye right on top of the eyepiece so your lashes are brushing it, you won't feel like lingering there very long. This is true even if your scope has a motor drive. But if the eyepiece is easy to view through, you'll tend to observe the object longer and probably see a lot more detail in it. Experienced planetary observers usually agree that the simpler designs such as the Plossl and Orthoscopic are just about the best eyepieces in terms of image quality. But as a practical matter you'll probably see more detail in something like a Radian or Pentax XL because you're enjoying the experience more.

Other Observing Tricks

There are a few other ways to coax a faint object into view. One of the most common is averted vision – looking slightly to one side of where an object lies. How this works is that the faint light falls on rods around the periphery of your inner eye, rather than on the cones in the center, which are less sensitive. If you stare straight at an object, the light is focused on the cones, which have higher resolution but less sensitivity to faint light.

Motion is another trick. Many observers have found that slightly jiggling the telescope makes very faint objects just discernible. I've found this most useful with faint nebulosity where you catch the edge of a large nebula as you cruise by it. Then when you stop moving the telescope and stare directly at

the area, the nebulosity is nowhere to be seen. Experienced deep sky observers frequently jiggle the scope or move it slowly back and forth across the field where the faint object lies in order to catch that fleeting glimpse.

Getting back to the comfort issue, if you're less tense, you have a better chance of improving your visual acuity. So in addition to using a wider field eyepiece, one way to be more relaxed is to remain seated while observing. For that reason, the adjustable "observer's chairs" are a popular item.

You, the Observer

Despite the title of this article, limits can't *always* be broken. In fact, it's worth repeating that quite often we come up empty-handed on objects that we expect to be well within the range of our telescopes. But conditions vary, so keep on trying.

There's no substitute for knowing what to look for and how to look for it. Guests at a public star party will frequently have a difficult time seeing a deep sky object in your scope that is perfectly obvious to you. Just so, a skilled, experienced observer will generally see objects better than will a newcomer to the hobby. And the experienced observer will have a pretty good idea whether he or she has a shot at seeing a certain faint object or detail. This is not a skill learned in one evening's observing, but something that's mastered over time ... as you break some of the so-called limits.

NEAF 2 Years Later:

Another Experience

By Tom Duggan

Might as well get this down now while its still fresh in my memory. Being old at 41 is a terrible thing. I again had the distinct pleasure of being able to volunteer for NEAF. I brought two more years of experience with me to the show as well as a friend from Alaska. The two years didn't help much as I'm still a screaming newbie.

Things were a little different for me this year from 2002, as vendors were allowed to drive into the gymnasium and drop their equipment off. This saved a lot of time and my lower back sincerely thanks whoever suggested it!

I can't speak for the other Rockland Astronomy Club members who volunteered for vendor setup, but I'm sure many of them felt as I did; a kid waiting for Christmas morning to arrive so you can check out all the new toys coming to the show! Muahahahahahaha!

As in 2002, the vendors were extremely grateful for the assistance Rockland Astronomy gave them helping to setup. All of them were friendly and polite, but you could tell on some occasions some edginess and tiredness; hell, I'd be a bit cranky too if I had to drive from where some of these people came from.

The "drool stop" of Friday night's setup was definitely the Celestron booth which displayed a 20" (some are saying 18") Dall-Kirkham astrograph. Not knowing much about compound telescope design, all I can say is that it looked incredibly well made and sturdy as a rock.

What made me feel right at home was many of the vendors remembered my ugly mug from 2002. Why? I have no clue...

It was also good to see fellow club members from 2002 and some new faces as well. Al Traino, NEAF chairman, made it a point to remember the hell he put me through when he and his fellow chair member, Don Urban, went off for the Sky & Telescope reception dinner Friday night in 2002. The familiar cry of "Hey Tom! You're in charge! We'll be back soon!" rang through the Rockland County

Community College field house like a dirt rake on a blackboard. Please sir, can I have another! It brought back fond memories watching Al run around like a rabbit on Viagra and ephedrine.

Then, the news flash of the day came in; Bill Burgess, of Burgess Optical, didn't leave Knoxville until 1:30 p.m.! (Its a 12+ hour drive). Hmmm....we were wondering, "Who could we sucker…um, *ask* to wait at the gate?" All fingers pointed to Barlow Bob...a collection was made for firewood post haste. Needless to say, Bob was off the hook and Burgess would have to make do with Saturday morning.

I need to thank Dr. Jack Rosen, Volunteer Coordinator, and Bill Thys, Membership Services, of the Rockland Astronomy Club for allowing my guest from Alaska, Chris Erickson, the chance of a lifetime. There was a STAFF badge made out in Chris' name and the NEAF committee had no trouble putting the displaced snowman to work. From comments from Chris and the club members, they hit it off immediately. Chris expressed to me how thankful he was for having the opportunity to work behind the scenes at one of amateur astronomy's premier events. Chris wasn't able to thank each RAC'er he came in contact with, so I am forwarding his thanks.

By the way, Chris wasn't the farthest travelled; I believe he was third farthest. Obviously, Markus Ludes, of APM Telescopes, was first, but Chris got a surprise when he ran into a fellow Alaskan at the Burgess booth on Saturday. "Deshka Dave" lives about 40 miles northwest of Chris near Anchorage. The *bastid!*

Besides the excitement of working NEAF with RAC and the vendors again, the most interesting aspect of this year was the chance to meet quite a few members of the Yahoo astronomy lists I joined shortly after NEAF 2002. Some were exactly as I pictured, others were a pleasant surprise. All were friendly and I enjoyed my brief time with them tremendously.

I'm exhausted beyond belief between working the show and playing host to an amateur astronomer who only gets 4 nights a year to observe. I'd do it again in a minute.

I've posted some images from the show and my visit with Chris:

Check:

http://www.tomduggan.com/astro/NEAF_2004/

I enjoyed seeing old friends and making new ones. I unfortunately had to miss NEAF 2003, but I'm hoping that's the only one. Here's to a long NEAF relationship! Time for a very hot shower, an adult beverage and a quick peek at Jupiter, mi amigos.

The Art of Low Tech Imaging

Rod Mollise

Art by Anthony Sanchez and

Sol Robbins

Before the advent of digital CCD cameras, amateurs recorded the way the Moon and planets looked with pencil and sketchpad. Frankly, before the coming of interplanetary space probes like the Voyagers and Mariners, sketches done by amateur astronomers provided the most accurate record of what was going on with the worlds of the Solar System.

Surely *nobody* bothers to sketch the Moon, Jupiter and the other worlds of the Sun's little family anymore, right? Webcams are so much better.

Those high tech wonders may be

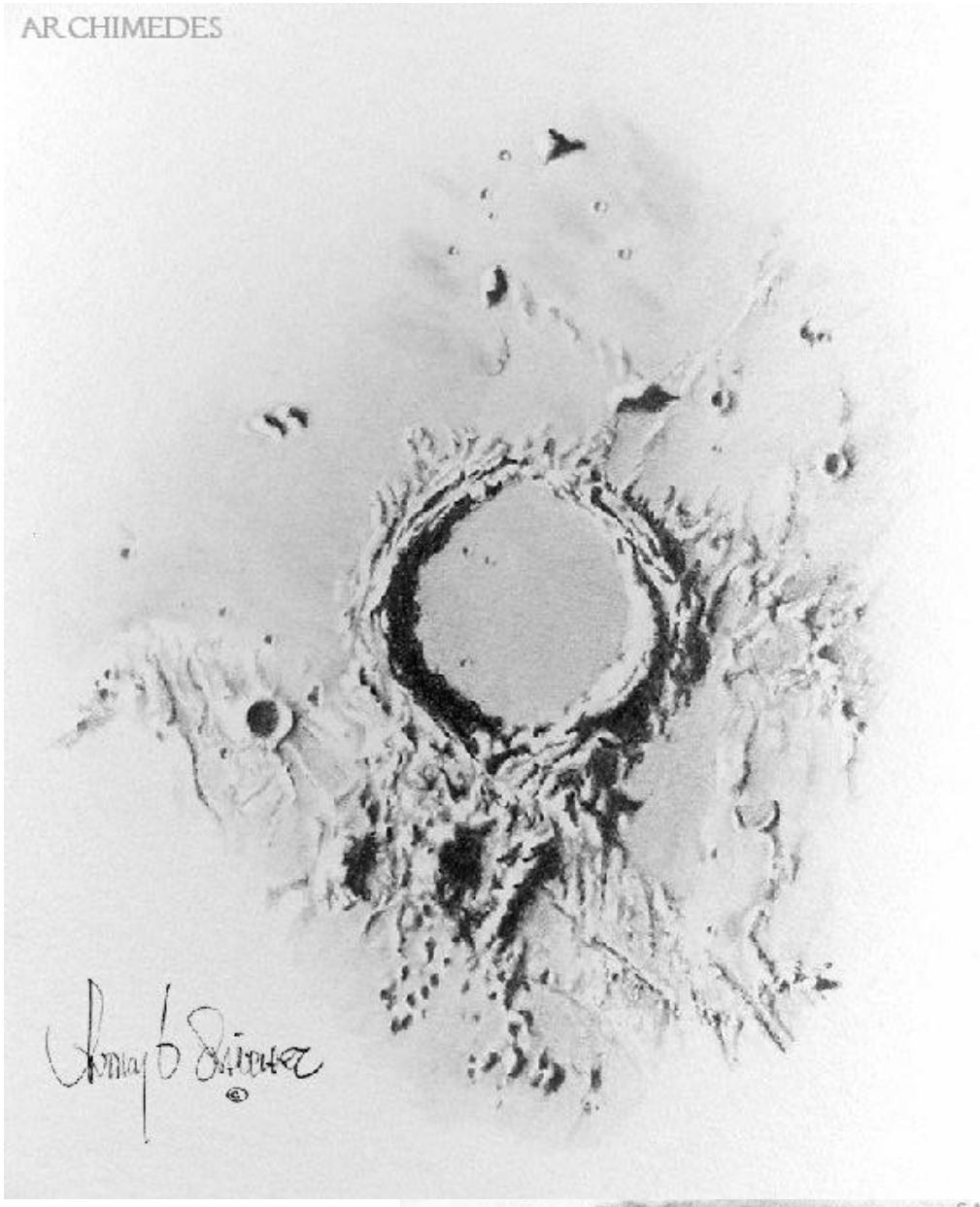
better in *some* ways, but in other ways, including aesthetics, nothing beats a drawing by a talented observer. Luckily, some amateurs

are still turning out beautiful drawings—art, really.

I was minding my own business one day when I received an email from Anthony Sanchez, asking whether I'd be interested in printing some of his Moon sketches. I replied in the affirmative, but really didn't expect much. When I opened the file that Anthony later sent me, though, I was amazed. His drawings are wonderful in every way; from the detail they record, to their overall look and artistic balance. You'll enjoy 'em as much as I did, I'm sure, and from now on his name will be heard frequently when it comes to excellence in amateur Lunar work, I'm guessing.

The planetary sketches are by Sol Robbins, whose work Skywatch readers have enjoyed before. They, too, represent an excellent and informed eye and a remarkably steady hand.

In addition to just being beautiful, I hope these works encourage you to attempt your own planetary portraits. As you can see, the art of Solar System sketching is not dead, and can still contribute to the *science* of the planets.



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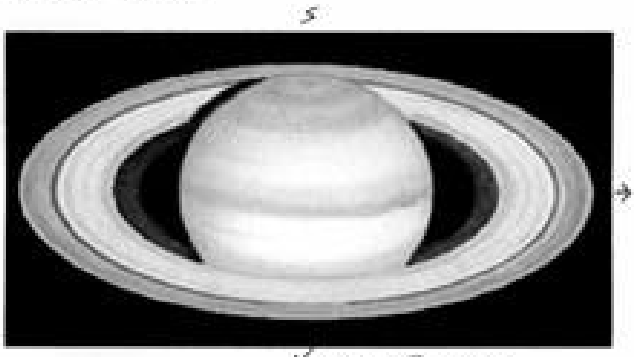
SEEING 7 (8) P



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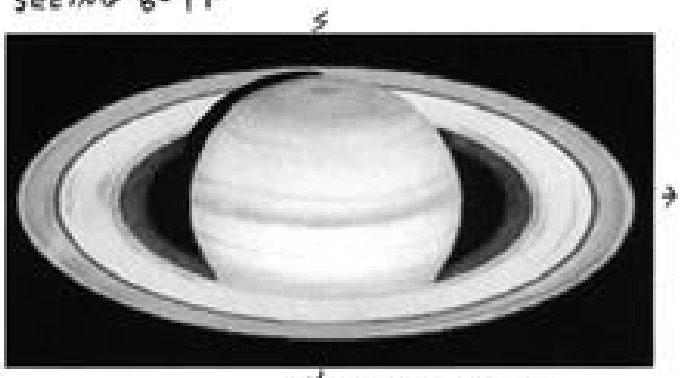
6" SKYWATCHER REFRACTOR
CHROMACOR II
SIRIUS OPTICS MK-1 (RINGS) RBETA (DISK)
400X

FEB. 27, 2004 8:20 - 8:37 PM ET
SEEING 8-9 P



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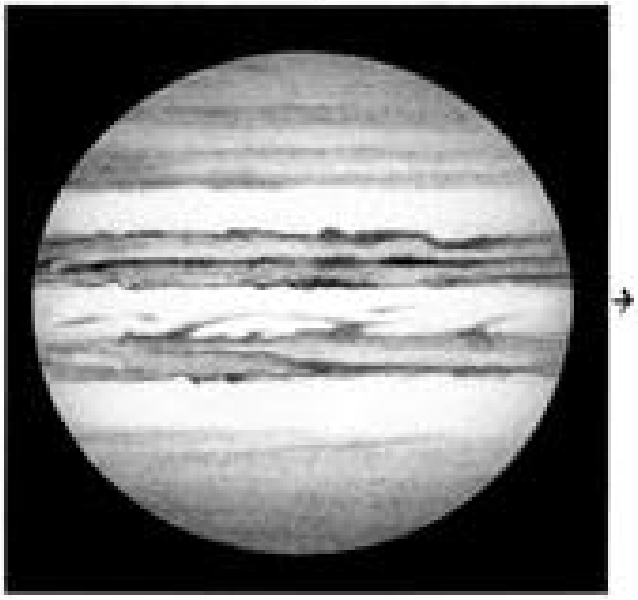
6" SKYWATCHER REFRACTOR
CHROMACOR II
SIRIUS OPTICS NPC FILTER - DISK
UNFILTERED RINGS
400 X

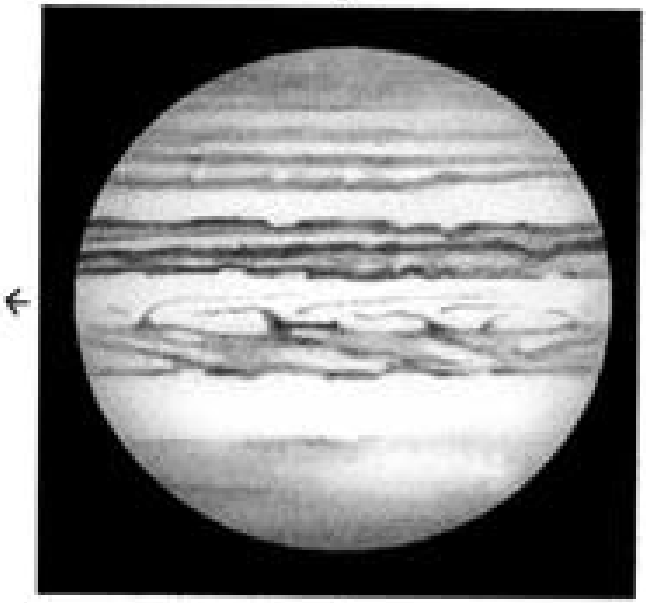
APRIL , 2004 9:05 - 9:13 PM ET DST
SEEING 6-7P



N © Sol Robbins

6" SKYWATCHER REFRACTOR
CHROMACOR II
SIRIUS OPTICS BETA "3" FILTER
234X

APRIL 16, 2004 10:10 - 10:29 PM ET
SEEING 7-8P



N © Sol Robbins

9.6" GUANGHENG NEWTONIAN
SIRIUS OPTICS VFS @ 285-300
AND BETA "3" FILTER
285 X

Space Weather

Patrick Barry and Tony Phillips

Radiation storms, 250 mile-per-second winds, charged particles raining down from magnetic tempests overhead ... it sounds like the extreme weather of some alien world. But this bizarre weather happens right here at Earth.

Scientists call it "space weather." It occurs mostly within the gradual boundary between our atmosphere and interplanetary space, where the blast of particles and radiation streaming from the Sun plows into the protective bubble of Earth's magnetic field. But space weather can also descend to Earth's surface. Because the Earth's magnetic field envelops all of us, vibrations in this springy field caused by space weather reverberate in the room around you and within your body as much as at the edge of space far overhead.

In fact, one way to see these "geomagnetic storms" is to suspend a magnetized needle from a thin thread inside of a bottle. When solar storms buffet Earth's magnetic field, you'll see the needle move and swing. If you live at higher latitudes, you can see a more spectacular effect: the aurora borealis and the aurora australis. These colorful light shows happen when charged particles trapped in the outer bands of Earth's magnetic field get "shaken loose" and rain down on Earth's atmosphere.

And because a vibrating magnetic field will induce an electric current in a conductor, geomagnetic storms can have a less enjoyable effect: widespread power blackouts. Such a blackout happened in 1989 in Quebec, Canada, during a particularly strong geomagnetic storm. These storms can also induce currents in the metallic bodies of orbiting satellites, knocking the satellite out temporarily, and sometimes permanently.

Partly because of these adverse effects, scientists keep close tabs on the space weather forecast. The best way to do this is to watch the Sun. The NASA/ESA SOHO satellite and NOAA's fleet of GOES satellites keep a constant watch on the Sun's activity. If a "coronal hole"—where high-speed solar wind streams out from the Sun's surface—comes into view, it could mean that a strong gust of solar wind is on its way, along with the geomagnetic storms it will trigger. And an explosive ejection of hot plasma toward the Earth—called a "coronal mass ejection"—could mean danger for astronauts in orbit. The advancing front of ejected matter, moving much faster than the solar wind, will accelerate particles in its path to near the speed of light, spawning a radiation storm that can threaten astronauts' health.

Look for coming articles for more about space weather and about NOAA's efforts to forecast these celestial storms. Meanwhile, read today's space weather forecast at http://www.sec.noaa.gov/. Kids can learn about the geostationary and orbits of the GOES satellites at http://spaceplace.nasa.gov/en/kids/goes/goes_poes_orbits.shtml .

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

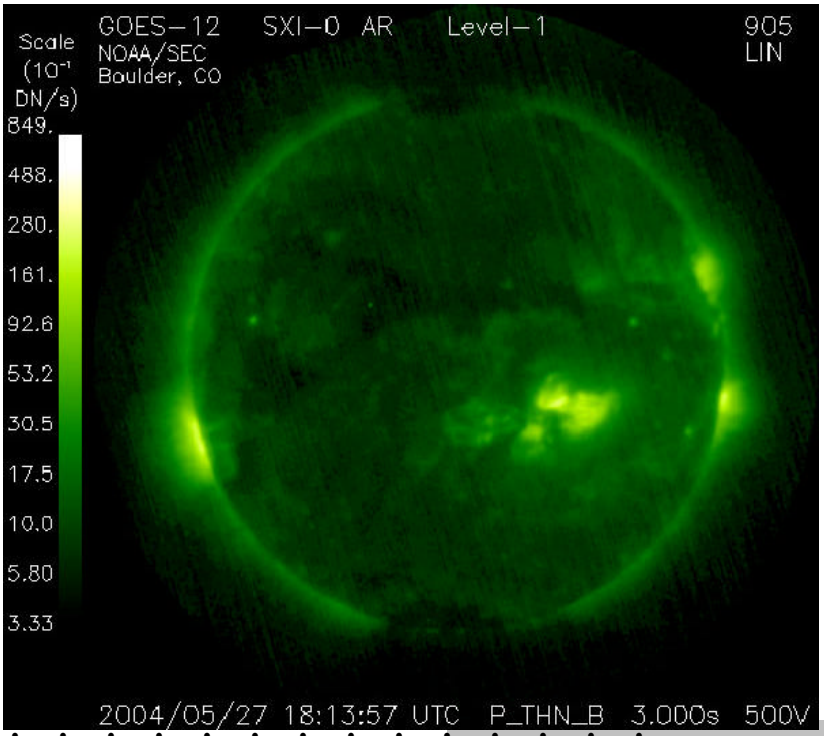


Image caption: This image shows the outer solar atmosphere, or corona, as viewed by the GOES 12 Solar X-ray Imager (SXI). It shows the plasma at 4.0 MK (million degrees Kelvin). Bright areas are associated with sunspots seen in white light images and may produce explosive events known as flares. Dark regions are coronal holes where the fastest solar wind originates. Image courtesy of the Space Environment Center/NOAA.

My Back Pages

"Crimson flames tied through my ears
Rollin' high and mighty traps
Pounced with fire on flaming roads
Using ideas as my maps
"We'll meet on edges, soon," said I
Proud 'neath heated brow.
Ah, but I was so much older then,
I'm younger than that now."

"BONG, AH-OOOGAH,"

The door chimes of stately Chaos Manor South sounded like a sick foghorn. Opening the massive portal presented me with the spectacle of Clancy, the local beat cop, holding two urchins (you know who) aloft. "Faith, Uncle Rod, do these miscreants belong to you? Why, I caught the lads tormenting the squirrels down in Washington Square."

Sigh. "I guess they do officer. Drop 'em right here; I'll settle their hash—but good. I'll put 'em to work straightening up the stacks of "Astronomy Now" down in the dungeons. That oughta be punishment enough for anybody. And I'll be sure they hunt up the mayo jar they owe me, the hermetically sealed one kept on Funk and Wagnal's front porch for a fortnight. The one full of…"

Rumours

It's the battle of the astro web-sites! Things started out innocuously enough. Astromart owner Herb York recently completed a massive revamp of his beloved website. In addition to the features previously there, he added some new ones, including an astronomy articles and reviews section. Doesn't seem like that would cause much heartburn, does it? But things are *never* as simple as they seem in the weird and wonderful world of amateur astronomy.

Some of the supporters of the astro-product review site, Cloudy Nights, took offense. They, some of them, seemed to resent reviews going up at Astromart, though you'd think there'd be enough room for two equipment opinion sources on the web. After all, the two most prominent astro-gear critics, Todd Gross and Ed Ting have been notably inactive lately.

Another objection was the "defection" of Cloudy Nights authors. Some of the writers who had articles posted on CN "migrated" them to Astromart, or duplicated them there. Why? Herb is offering the powerful inducement of a 50 dollar Anacortes gift certificate for articles chosen by the editor at Astromart as "the best," and quite a few of these gift certificates have already been distributed.

Since Cloudy Nights did not pay for nor receive the rights to the articles in question, most of the authors did not believe there was any question of ethics involved.

Another reason some equipment reviewers switched to Astromart was that they felt unappreciated at Cloudy Nights. The site owner, Allister St. Claire, had recently changed CN to a subscription-based service, with most new gear-reviews being reserved for paying customers only. A cadre of writers chosen for the task was doing these new articles, and they were being *paid* for their efforts. Naturally, the authors who Allister did not include in this enterprise felt a little miffed. Despite having supported the site with content for quite a few years, they were being left out in the cold when Cloudy Nights went "commercial" and money was being dished-out.

Then, it all became *a moot point* with the announcement that Cloudy Nights had been *sold* to popular and respected Astronomy dealer, Astronomics of Norman, Oklahoma. The

"for pay" articles were suddenly thrown open for everybody's perusal, and it now appears the site will operate more like the "old" Cloudy Nights did.

The **Anonymous One** thinks there's *plenty* of room in the equipment/article game for *both* CN and Astromart, and is pleased to see Cloudy Nights continuing as a good source of buying advice.

Telescope News? It looks like we're in the scope doldrums now, with the only major *action* being the apparent release by Meade of its upgraded LXD 55 scopes, the "LXD 75" series. Most of us had *assumed* that it would take Meade at least as long to get the 75s out the door as it did the 55s—months and months and months, that is. Apparently not. According to Meade personnel, the new scopes are now shipping. Some will believe *that* when they see a brand-spanking new SNT!

Psst…hey mister…wanna a Super Monocentric? It almost got that bad. I was *afraid* to mention the new TMB "super planetary" eyepieces on the 'net for a while. Seems as the *Sky and Telescope* review by Gary Seronik of these oculars caused one big *goat rodeo*.

Gary gave an overall favorable rating to these top-of-the-heap-pricewise eyepieces, but did note that there was some astigmatism evident at the field edge. That's when *the fur started flying*. TMB supporters screamed that Gary used the "wrong" scopes to test the eyepieces; that he was a dunderhead for using medium focal length instruments with these specialized oculars, which are more appropriate for high focal ratio scopes.

Doubters replied that the scopes Gary used were quite sufficient, and that, at any rate, a worthwhile review of such expensive eyepieces should test them under a variety of conditions.

At this time, TMB is indicating that at least *some* of the eyepieces sent to *Sky and Telescope* were *defective*, and it looks like the S&T gang *may* do some reevaluation. We shall see.

Dang! This astronomy stuff is juicier than *Days of Our Lives*!

--The Anonymous Astronomer

The Wrap-up…

What do I want from y'all next time? I want articles on astronomy software, as it's time for our yearly astroware roundup. I'll be reviewing the latest releases of Deepsky and RTGUI, but how about you guys taking some of the load off me and giving me your evaluations of the new The Sky, Lunar Phase Pro, and some of the other newuns?

As ***always***, though, I'm looking for articles on ***any*** aspect of **amateur astronomy**: Observing, equipment/book/software reviews, poems, personal experiences, star party reports, fiction, cartoons, you name it!

If you have something for me, well, send it on to yer ol' Uncle Rod at RMOLLISE@aol.com

See you all in October!

--Uncle Rod