

# Morning Star

## Summer 2022

Newsletter of the Vermont Astronomical Society



### \*\*\* Club Info \*\*\*

#### Announcements

Check out our Member [Forum](#) on our web site ([vtastro.org](http://vtastro.org)), under Discussions.

Several [past meeting presentations and newsletter articles](#) on imaging, observing and equipment are posted on our web site, check them out.

[Past newsletters](#) are posted on our web-site under What We Do.

**Associate Members interested in becoming full members** make your interest known to one of the board members. To become a Full Member one has to actively participate in club functions and events and be active in some other aspects of astronomy (more details are in our by-laws).

#### Moving or Changing Email?

Please send changes to Paul Walker, 53 Valley View, Middlebury, VT 05753, [paulwaav@together.net](mailto:paulwaav@together.net) ([info@vtastro.org](mailto:info@vtastro.org) will also work)

#### Hinesburg Observing Site

We have an observing site in Hinesburg, VT. (Located on town property). A locked gate (required by the town) limits access to the site.

Associate Members can request access to the gate lock. They have to be a member for 3 months. This provides access to the Warming Hut, 115v AC power and port-a-potty and the Teaching Dome.

Full Members can request access to the gate lock, Green Mountain Observatory (18" Obsession) and the

Chmela Observatory (5" folded optics planetary scope) locks.

Board approval is required for Associates. Some training is required in all cases. There is a training checklist and an access agreement that need to be filled out.

Contact the Secretary, Paul Walker or Jack St. Louis for more information at [info@vtastro.org](mailto:info@vtastro.org)

#### Observing List for HOS

We have an email list for members interested in getting a heads-up when someone will be at the Hinesburg Observing Site (HOS).

If interested in getting on the list contact [info@vtastro.org](mailto:info@vtastro.org)

#### Observing Certificates

Several certificates (beginner to advanced) are available to members as encouragement to get out under the stars and hone their observing skills. Follow the link on our web site.

#### Outreach

#### Acknowledgment Letter

To help record our broad community involvement with public star gazing events, projects and classes, we have developed an Outreach Acknowledgment Letter with a Sample Form. It is posted on the website and can be found under **Members, VAS Club Materials for Members, Outreach Acknowledgement Letter**.

**Direct Link:** [http://vtastro.org/wp-content/uploads/2018/03/VAS\\_Outreach\\_Ack\\_Letter\\_V3.pdf](http://vtastro.org/wp-content/uploads/2018/03/VAS_Outreach_Ack_Letter_V3.pdf)

#### Dues

Are due the first of each year.

**Associate Members \$15**

**Full Members \$25**

Send dues and any address or email updates to VAS, PO Box 782, Williston, VT 05495. Or bring to any monthly meeting or Contact Paul Walker, 802-388-4220, [paulwaav@together.net](mailto:paulwaav@together.net).

#### Connect On-line

[www.vtastro.org](http://www.vtastro.org)  
[Twitter@VTAstroSociety](https://twitter.com/VTAstroSociety)  
[Facebook.com/Vermont-Astronomical-Society-113053818706458/](https://facebook.com/Vermont-Astronomical-Society-113053818706458/)  
Email: [info@vtastro.org](mailto:info@vtastro.org) (Goes to the President and Secretary)  
[webmaster@vtastro.org](mailto:webmaster@vtastro.org) (Goes to Secretary and Webmaster)

#### Board Members

Jack St. Louis	Pres	857-5049
Joe Comeau	VP	238-1664
Terri Zittritsch	Treas	598-7226
Paul Walker	Sec'y	388-4220
Bob Horton		238-7290
Keith Lawrence		453-5496
Jim Bosek		879-1697
Scott Turnbull	Webmaster	
Leah Christopher	PR	919-285-6628

Editor & Publisher: Paul Walker  
Maura Kelley assistant editor

Contributors: Rick Daniel, Peter Gillette, David Legrow, Gary Nowak, David Prosper (NASA Night Sky Network), Scott Turnbull, Lou Varricchio, Paul Walker, Richard Whitehead, Terri Zittritsch.

(My apologies if I missed anyone)

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**Stargazing and other Events**

All observing events are weather permitting unless otherwise stated.

Bring extra clothes. Even a summer evening can be chilly after standing still for a couple hours in damp air. We have an email list for members interested in getting a heads up on impromptu events at the Hinesburg Observing Site (HOS).

If interested in being on this list contact [info@vtastro.org](mailto:info@vtastro.org)

Events are listed on our website ([vtastro.org](http://vtastro.org)) and Google Calendar (<https://calendar.google.com/calendar?cid=Nzc5dnQ1bnZrN2ljcDA2NG9vbXFnczI1M2NAZ3JvdXAuY2FsZW5kYXluZ29vZ2xlLmNvbQ>)

**Member & Invited Guest Star Gazing at HOS & other events**

**Keep watch for emails announcing impromptu observing at the Hinesburg site.**

**Note:** If you would like to be a host, greeter/orienteer or want some training on operating the scopes let Paul Walker know.

**Corona Virus Note:**

We will follow the current State COVID restrictions recommendations.

Contact [info@vtastro.org](mailto:info@vtastro.org)

**New Members**

VAS welcomes the following members who joined us since the last newsletter:

Charlene Jonelis

**Meetings/Presentations**

**Meetings can be attended in-person or remotely. We are back to holding meetings in-person at Brownell Library. They can also be attended via Zoom. The Zoom link will be emailed to members with the meeting reminders. Non-members can request the link via [info@vtastor.org](mailto:info@vtastor.org).**

Meetings are held the first (non-holiday) Monday of the month, at 7:30 P.M. in the Kolvoord Community Room of the **Brownell Library**, 6 Lincoln St., Essex Jct (2nd building north of Essex 5 corners on the left on Rt. 2A). Extra parking is available in the Bank North parking lot across from the library. For inclement weather call Jack St. Louis (802-658-0184) or Paul Walker (802-388-4220) to confirm.

**July 11**

**2 Mini-Talks**

**Advanced Imaging Conference, San Jose, May 2022  
Highlights and Insights  
By Richard Whitehead**

Good conference! Some good presentations and all the well known astro-imaging experts were there.

**Jack on the Radio**

Listen to Jack's astronomy update on radio station WJOY AM (AM 1230) on Ginny McGehee's 'Breakfast Table' morning show. Airst the first Wednesday of the month at 8:40 AM.

**Gary's Astronomical Events for the Month**

can be viewed via WCAX at <https://www.wcax.com/weather/astronomy>

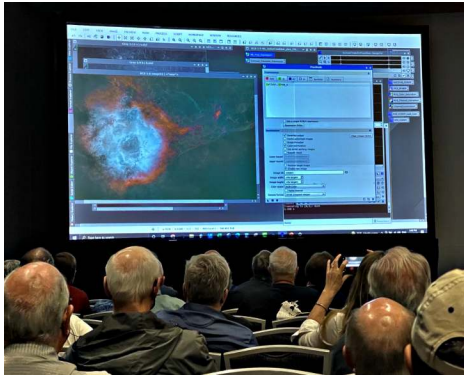
**Green Mountain Astronomers (GMA)**

All events start about sunset. Check before going as some events are not cast in stone or written in the stars yet.

Contact Ron Lewis for info  
802-779-5913 (cell)  
802-247-5913 (home)  
[vtpoet@gmail.com](mailto:vtpoet@gmail.com)

Stay tuned for email notices.

Richard will do a PowerPoint presentation of some of the highlights and cover some downloadable content that was available prior to the conference.



**2nd talk:**  
**Observatory Deck**  
**By Paul Walker**



Paul built a deck last year and placed 3 sheds on it that house 4 telescopes. 2 of the sheds were pre-existing with telescopes in them. It is modeled after the observatory setup that the club (VAS) built a few years ago. The club's deck is bigger with bigger sheds and 2 telescopes.

This is short version of what may be a longer presentation down the road. He will give an overview of the setup and show some pictures of the construction steps, providing descriptions of each step.

**August 1**

**2022 Texas Star Party – The First Since Covid Arrived**  
**By Steve Grimsley**

The first official Texas Star Party, after a two year hiatus, was held at the Prude Ranch in the Davis Mountains of west Texas. Because of the threat of Covid, attendees were required to sign a

five page legal release of liability for the star party organizers and the host ranch. Attendance was around 350, good but significantly less than typical pre-Covid numbers. Nevertheless, it was very gratifying to see many friends again after three years.

A thirty object observing list had numerous small planetary nebula and faint galaxies, some of which were a visual challenge in my 155mm refractor. These star party observer lists are fun to do and can provide useful ideas on objects for imaging. Three of my six images captured this year were objects from the observer list. Another welcome benefit is getting an official 2022 observing pin after completing the list and turning in your notes.

Highlights for me this year were capturing fair to good images of colliding galaxies, a supernova, a structural analog galaxy to our own Milky Way, a super thin edge on galaxy, and the M64 Blackeye galaxy. My image, from last year, of Markarian's chain of galaxies won the Peoples Choice award. An unwelcome problem this year were the several strong dust devils that crossed the main upper field toppling over some scopes.

This presentation will show images of equipment, local observatories, weather phenomenon, and my night sky images from this year.



**M64 (The Blackeye Galaxy)**  
**Taken by Steve at the Texas Star Party**  
(Cropped 40%)

**September 12**

**Introduction to Observing Jupiter**  
**"The Amateurs' Planet" in Autumn 2022**

(The best opportunity to observe it in 70 years)

**By Gary T. Nowak**

Jupiter is the King of the Planets; being the largest planet in the Solar System. This makes Jupiter an easy target for visual telescopic observations. Jupiter is the most rewarding planet in the Solar System for the Amateur Astronomers. Its disk presents more detail, color, and variations than any other planet in the Solar System. Those features that are visible through the amateur telescope eyepiece are the top layers of Jupiter's clouds.

Galileo first discovered Jupiter's four largest and brightest moons with a "crude telescope" on 7 Jan 1610. These 4 bright moons are one of the best known planetary moons in the Solar System. Amateur telescopes give a great view of these 4 moons. Their positions changing hourly as they revolve around Jupiter.

This presentation will be divided into 4 sections:

The first section will briefly go over Jupiter's orbit, atmospheric make up and its observational window time frame.

The second section will briefly go over the amateur telescopes for observing Jupiter, planetary colored filters and seeing conditions.

The third section will look at Jupiter's main cloud belts and cloud zones. This includes an overview of the main cloud belt features and Great Red Spot.

The fourth or last section will deal with the 4 Galilean Moons and their orbital activities which produce transits, eclipses, and occultations. Each of the 4 moons will be looked at individually for their disk details.

After this presentation, the audience should have an understanding of why Jupiter is known as "The Amateurs' Planet" and a very popular amateur telescopic showpiece.



**Io, Jupiter, RedSpot (upper right side), Ganymede. image 2011, Paul Waler**

## Articles

### Conclusion: A look at the Adirondack Sky Center By Lou Varricchio

The Adirondack Sky Center & Observatory in Tupper Lake, N.Y., welcomes stargazers from around our region. While a new science center is planned, the current, compact facility has several superb telescopes that are deployed for public star parties. Included in the Sky Center's array is the famous Newtonian "Pump" telescope, designed and built by New England engineer Wally Everest in 1928.

Everest, a General Electric engineer, is best remembered for helping test Corning glass samples for the 200-inch Mt. Palomar telescope. And there's a Vermont connection with Everest's "Pump": Everest first unveiled the scope at Stellafane in Vermont in 1928. Since that time, Everest went on to grind over 100 mirrors for a variety of telescopes through the 1960s.

"The name of the Pump telescope derived from a bit of personal humor," the Sky Center reports. "Everest thought the balancing arm had the angle and proportions of the old town

pumps you can still find preserved in public spaces in villages and towns throughout New England and the Northeast."

Another notable 20th-century telescope maker, Albert Ingalls (author of the classic 1930s book, *Amateur Telescope Making*), said Everest was "the premier amateur mirror maker of his day." Everest's mirror-making instructions are included in Ingalls' book with photographs and technical sketches that still instruct telescope builders today.

According to the Sky Center, "Everest designed and built the 12-inch equatorial-mounted old town pump Newtonian telescope with clock drive for his personal use. It remained in his Marblehead, Mass., garage for many decades... It was his favorite astronomical instrument..."

Fast forward to 2006: Wally Everest, II, generously donated his father's telescope to the Adirondack Sky Center. But restoration work was needed before the scope could be used. Clarkson University engineering students got involved in the effort which included cleaning the mirror and manufacturing all-new brass fittings.

"Restoring the finder scope was the hardest task," according to the Sky Center. "Nothing commercially available

that looked like the original could be found. An appropriately sized brass tube was ordered from McMaster-Carr. Someone found a heavy brass plug in the Clarkson Physics Lab storeroom. A skilled machinist milled it into a tapered eyepiece holder. The telescope had come with a wooden boxed set of brass eyepieces, one of which was requisitioned for the finder scope."

You can plan a visit to the Sky Center to see Wally Everest's "Pump" by first checking out the facility's web page at [www.adirondackskycenter.org](http://www.adirondackskycenter.org).

## Board & Committee Meetings

### April Board Meeting

Jack- Asked what do we have for historical club records, what records do we want to keep and which are we OK with getting rid of. Jack has some records, Paul has others. Terri has the financial records which Doug passed on to her. We are required to keep financial records for 7 years. Most other records we don't need to keep so it's a matter of what we think may be of interest to the club down the road. Jack has the minutes from the first meeting of the club, the first or an early newsletter. Paul has some old financial/member info from the 1980's, some hard copies of the Morning Star newsletter from the 80's and early 90's, electronic copies of all and some hard copies of the newsletter from 1996 to present.

While at the Hinesburg site the other day Jack ran into Henry walking his dog. Henry is a guy who lives near the site that Keith approached last year about mowing the grass. Henry will mow the area and trim around the buildings and let us know what he would charge each time. The board will then decide about hiring him to keep the grass at bay. Different club members have been doing the mowing over the years. The board has discussed paying for this service a few times over the years. The last time we received an estimate of ~\$400 for the season.

Jack suggested we go from 8 board members back to 7. We are currently



Wally Everest checks out his Old Town Pump Telescope on Breezy Hill, Stellafane, in Vermont, in 1928. (Photo courtesy of Adirondack Sky Center)



running with only 7 members. We decided to leave it at 8 for now as our by-laws do not require all positions be filled.

Joe plans to have his "Spontaneous Night Under the Stars" again this year in late Summer. He said we should plan on having a Stargazing event at Wake Robin this year, something we have done in the past.

Paul did some training of some personnel at Ilsley Library in Middlebury in the use of their Library Loaner Scope as part of their plan to increase use of the scope by their patrons.

Paul did a slide show presentation at Carpenter-Carse Library (Hinesburg) that showed approximately what some sky objects will look like through the loaner scope and hands-on training for some of the library's patrons and personnel.

Paul and Eben Gay were able to move all of the brush from the observing area that we had cut down last Fall. Paul noticed that the south-facing wall of the Warming Hut is in need of a fresh coat of paint. Jack will see about taking care of that.

Eben Gay sent Paul a request for site (gate) access. The board approved Eben for access. Terri offered to train him. FYI- Training is required before access is given. Paul, Terri and Jack are trained to provide this training.

Terri gave the Treasurer's report. She is working with the Library in Morrisville to organize a stargazing event for late summer or early fall.

Keith will be providing re-training to Enosburg Library and a few other libraries for their Loaner Scopes.

Jim scheduled an Eclipse Committee meeting for next Thursday (April 29).

## May Annual Meeting

Jack opened the meeting.

The Vermont Astronomical Society will celebrate its 58th Anniversary Friday, May 6th, committed to our Statement of Purpose "To Promote Astronomy In Vermont". 2021 was another tough year with no events, all monthly meetings, board and committee meetings conducted via Zoom on the Internet. The meetings were well attended, and we have recently received several Outreach event requests

planned out to September - the VAS is alive and well.

The Solar Array Farm Installation  
I asked Nils Behn, CEO of AEGIS, about their expected start date for the Solar Array Farm construction, his reply: We are still waiting on the Agency of Natural Resources to complete their environmental assessment for the town because there was some groundwater contamination detected. So it is likely that this project will start construction in the Fall of this year.

The first work of clearing the array area West of our site has been completed, now the tree stumps and other debris needs to be removed.

Associate's Observatory: The domed observatory is ready for use, I will start training sessions for those interested soon. To date I have 3 names on my list to contact.

This will be specifically for Associate Member's use, has the Site Access combination on the lock, houses an 8" Meade SCT with a tracking drive, and GoTo controller. Eyepieces and other accessories are in the Dome. The Observatory was named The Teaching Dome and will be labeled as such in the near future.

New Treasurer: Doug Williamson stepped down as the VAS Treasurer with Full Member Terri Zittritsch assuming that role, and will finish out the current term until May 2023. Again, many thanks to Doug for all his efforts over the 10 years he served as VAS Treasurer, and thanks to Terri for stepping up to assume the duties of Treasurer.

VAS Website Upgrade: The Board approved to spend money to have the VAS website upgraded for improved security, applying a new template for a new look and better site navigation. Work will continue under the direction of the Board.

VAS Library:

I [Jack] am maintaining a Library for the VAS, books and other items available to club members upon request. Books or other items may be on loan or purchased-by-donation. I sent out the Library list to the VAS News list and will send it out periodically.

2024 Total Solar Eclipse: Jim Bosek is heading up the 2024 Solar Eclipse Committee and is already working on a notice to send to Vt. State agencies. Please think about how you would like to spend your time when the eclipse comes, and if you are willing to help to support those organizations who will eventually ask the VAS for help - that can be in the form of pre-eclipse presentations or on-site assistance during the eclipse. Please contact Jim Bosek if you are willing to help with eclipse support.

Brownell Library: I was contacted by Alison Pierce, Circulation Librarian & Volunteer Coordinator, she says: How would you folks like to meet in our community room in June? We are doing some programming in the community room and since your programs are affiliated with the library we wanted to offer the room up to you. We aren't letting outside groups use the room. At this point in time we are requiring everyone in the building to wear a mask.

I replied that we would be happy to be back at the Library and would comply with masking, so please plan to wear a mask if you attend the June meeting at the Brownell.

Need a Coordinator: I am currently handling all external requests for Star Parties and other events, but am looking for a volunteer to take over this task. I am busy outside the VAS and do not want to miss responding to requests for our help, or drop the ball on planning events. This could be a cooperative effort between 2-3 members, you do not have to be a Full member.

Terri gave the Treasurer's report: The report is available to members on request.

Jack gave the Secretary's Report in Paul's absence:

103 Paid up as of 12/31/21  
87 Paid up member previous year  
New members in 2021 - 20  
New members YTD - 4

We have plans to do the following:

- Scheduling more observing events at the site.

- Have training sessions at the site for people to get help using their scopes (much of this will likely be done as part of the scheduled observing events).

#### Election Results:

There are 31 Full Members. A quorum for voting is greater than 50%.

Received 20 Ballot which met the quorum requirement of 16.

The President, Vice and 3 board members at large up for re-election. There was also one open board member at large position which had no candidates.

All officers and board members at large up for election were unanimously re-elected.

There were no write-ins.

One member abstained.

Joe gave the VP's report: Last year was once again a challenge due to the pandemic. In between outbreaks, I was able to host a "Spontaneous Evening Under the Stars" event in late August. This event was a joint venture between Island Arts and the Vermont Astronomical Society. The evening was partly cloudy but the 60+ guests were treated to many celestial showpieces. Much of this was made possible by the super skilled members of VAS who kept a good lookout for clear spots and set up their scopes to maximize any available viewing opportunities on very short notice. I am very thankful for their support. This year, I also plan to host the event in late August and look forward to a perfect night in the Champlain Islands.

My interest in viewing has been centered on Astrophotography. Many VAS members have taken this up. During the pandemic, I have seen fantastic wide field images along with RGB and narrowband shots that are among the best in the world. Paul Walker and Larry Garrett have been very diligent informing us of events in the sky worth going after with our cameras. Richard Whitehouse and Terri Zitritsch are narrowband masters and have posted extremely high quality images of deep sky targets. Steve Grimsley's images always feature perfect stars. Paul Walker in inadvertent collaboration with Ron Lew-

is took a trophy image of Comet Neowise above a red barn in Brandon. Maura Kelly's widefield of the Pleiades and California nebula revealed a perspective that I had not seen before. Peter Gillette took a very nice series of shots of the solar eclipse with a mix of clouds that made a very interesting composition. Greg Warrington captured beautiful widefields of Comet Neowise. Jack has brought astroimaging to the general public with his iPhone camera adapter. Finally, Dave Legrow's supernova is a recent excellent shot.

All the club's astrophotographers have really added to the enjoyment of the night sky.

I worked with a young person named Aiden DePollo who has expressed an extreme interest in astronomy. I brought him to Stellafane last year and he was overwhelmed with joy at the opportunity to talk to club members. Aiden met Steve Grimsley at last year's "Spontaneous Evening" event and offered a really good mount. Steve met with Aiden and helped him set up his scopes. Aiden now lives in Wisconsin but plans to join me at Stellafane this year. He had a good experience last year and said that no matter where his parents live, he wants to get back to Stellafane every year.

As the pandemic slowly fades away, I hope to initiate more outreach sessions this summer.

Keith's reported

#### ACTION ITEMS

none

#### MOTIONS:

none

### June Board Meeting

Jack opened the meeting.

An old 5" Carl Ziess refracting telescope on an alt-az mount was donated to the club. The scope has a permanently mounted turret with eyepieces and gives an erect image. We discussed options for what to do with it, ranging from donating it to the Leahy Center, Shelburne Museum or Springfield Telescope Makers or finding a collector interested in buying it.

The Hinesburg Development Committee is happy to have input from us regarding the planned housing development next to our Hinesburg Observing Site.

Jack has finished his mentoring of a student on astronomy.

Joe will hold his "Spontaneous Night Under the Stars", a joint VAS/Island Arts event, around the end of August.

Terri- VAS Member Mary Lou West from New Jersey has asked Terri if she would do the talk she did for us at the June meeting for Mary Lou's New Jersey astronomy club, on her experience using remote commercial telescopes for astrophotography.

Keith- The telescopes used for the Library Loaner Scope Program are no longer available. There are people looking into the possibility of using a similar telescope from another manufacturer. We have 1 telescope available for modification for the program. We also have the demo scope for the program that could go to a library.

Keith suggested that we use some of the recent monetary donation from the estate of Russell Chmela's father to buy several thousand solar viewing glasses to be distributed around the state for the upcoming April 2024 total solar eclipse. Jim noted that the Eclipse Committee recommends spending \$1650 for 3,000 solar glasses (\$0.55 ea). It was suggested we consider buying enough to provide about 100 to each library in the state. With ~350 libraries we decided that was not feasible. The solar glasses will include the club's name and other info that we choose.

The next Eclipse Meeting will be July 14 via zoom.

#### ACTION ITEMS:

None

#### MOTIONS:

Terri made the motion that we authorize Jim to purchase 3,000 solar glasses for \$1650. Joe seconded the motion.

After some additional discussion this motion was amended to authorize the purchase of 5,000 solar glasses for \$2250 using some of the Chmela donation for the additional 2,000 glasses.

The vote was unanimous in the affirmative.

The Board voted to give the IDA (International Darksky Association) \$100 in dues again this year.

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**VAS Membership Committee**  
 Membership Committee Annual Report  
 May 3, 2021

This committee did not meet in 2022. Members are as follows:  
 Keith Lawrence, Chair  
 Mark Moyer  
 Paul Walker  
 Dennis Woos  
 Steve Quigley  
 Terri Zittritsch  
 Angele Mott Nickerson  
 Jack St. Louis, ex officio

We had a busy year with ten library telescopes delivered as listed below:  
 1) In June to Quechee / Wilder library's in Quechee.  
 2) Winooski Memorial Library.  
 3) Charlotte Public Library.  
 4) South Burlington Public Library.  
 5) Greensboro Free Library - local support is Brad Vietje.  
 6) Cobleigh Public Library in Lyndonville - local support Brad Vietji.  
 7) Stowe Free Library.  
 8) Westford Public Library.  
 9) Bixby Memorial Library in Vergennes.  
 10) Morrisville Centennial Library.

It is noteworthy that Orion has, at least temporally, stopped selling the Starblast 4.5" telescope as they are unable to procure them from their supplier. We have 1 in stock plus our demo that could be delivered to libraries in our area at this time. I will be working with Cornerstones Of Science in Maine to determine where to go from here.

I have been visiting our libraries that have telescopes to complete a tune up. So far this past year I have visited 7 sites. All these telescopes are in good condition.

With Great respect,  
 Keith Lawrence

-----  
**Observatory Site Committee**  
 No meetings were held last year nor, to date, this year. No report was prepared for the annual meeting.

Committee Members:  
 Paul Walker - Chair  
 Doug Williamson  
 Jim Bosek  
 Keith Lawrence  
 Jack St. Louis  
 Maura Kelley

The brush that grows around the perimeter of the Hinesburg Observing Site (HOS) was cut and removed last Spring and last Fall, with some piles of brush from last Fall's cutting removed this Spring.

The club has hired a Hinesburg resident who lives just down the road from the HOS to mow the grass at the site. Keith Lawrence suggested looking into this. Keith and Jack St. Louis spearheaded making this happen. The Board approved this arrangement. This committee was not directly involved.

Paul Walker

## Under the Stars & Planets

### OBSERVER'S CORNER

#### Observing Tips

► (repeat) When searching for an object start with your lowest power eyepiece. As you gain experience with your telescope and the location of your favorite objects you will find this is not always necessary.

If you have tips to share whether for beginners or experienced observers send them our way at [info@vtastro.org](mailto:info@vtastro.org)

#### Equipment Suggestions

If you have equipment suggestions to share whether for beginners or experienced observers send them our way at [info@vtastro.org](mailto:info@vtastro.org)

#### On-line Resources

► Here's a really nice, printable Star Atlas. It shows how to go about printing, laminating and binding the atlas. And, even more, with supplements!  
<http://www.deepskywatch.com/deep-sky-hunter-atlas.html>

## Member's Observations

### Lunar Eclipse 5/15/2022

A handful of members managed to get a glimpse of this eclipse.

I chased around to find clear spots.  
 Joe Comeau

Much the same experience here in Town of Essex.

Got a peek at a bite out of the moon-pie at about 10:30. The skies looked promisingly clear enough for the main event. When it came time to view totality I was fogged in and just the barest smudge of light from the eclipsed Moon was in evidence.

Had to do a drop off at the airport and was on the road at 4AM. Of course the sky was crystal clear with a glaring full Moon by then. As I dropped down the hill on my drive I encountered the fog again along the Winooski.  
 Scott Turnbull

Nice at first, then fog blocked it all, then cleared up until after totality, then fog returned before the end of second partial phase. Including phone photos from my apartment, need to check the camera photos and will send out a few,  
 Jack

Got to see most of totality from my porch in Ira, through hazy high cloud at times and thickening fog towards the end. It cleared up nicely for the disappearance of double star S672 in Libra. At 40x in my ST 80 it did disappear "stepwise" as predicted in Sky & Telescope. Nice. Even factoring in the cloud and low altitude it seemed like a pretty dark eclipse. Lunar surface features in the darker parts of the umbra were difficult to make out. Color-wise the Moon looked dark gray, with the brighter parts of the limb a neutral yellowish gray. It seemed redder to me naked eye than in the scope. A 1.5 on the Danjon scale?

Pete Favreau

Glad you got to see it, Brian and Jack! Tonga volcano was the contributing factor.

-P-

Can't believe skies cleared for the eclipse after 4h UT, dark event!

Watched the partial phases in deep fog here, till the last sliver of light was no more. But one last look at the hopeless skies just 35 minutes later had clear skies.

Spaceweather.com states longer exposures needed even in large telescope for good results.

What a stunning visual sight near the head of Scorpius. Had excellent views in 20x80mm and 6" f/8. I did see a surface flash, or thought so, just before total phase. While I will submit to ALPO, I doubt confirming video will be submitted. My conditions scraped video with fog so no setup for that.

Lawrence Garrett

Did anyone else note how dark the eclipse was? I attributed it to the thin haze I was seeing.

Turns out it may have been volcanic ash... SpaceWeather.com -- News and information about meteor showers, solar flares, auroras, and near-Earth asteroids

Brian S. Johnson

Not much from my house. Got a small 10 minute break in the clouds around 10:50 to see the partial, but the sky went totally black from then on. Had to watch it online.

Pat Porch

I was texting with Jack, while watching and photographing from my balcony. The sky was dramatic, is one way to put it. This was the pre-eclipse view.



As the eclipse developed, the skies kept dancing with me. This was the last shot I got before things looked totally socked in, with lightning flashing in the southwest, where the clouds were coming from...



All images taken with a Canon Powershot SX50HS at various shutter speeds and focal lengths. At this point, it looked to me like there was little hope for a totality appearance, but I know Jack and Sharon were going to wait a little longer, to see if there was a break. I'd been up and at it since 5 AM, and from that perspective, it looked like it was over.

Anyone else have better luck, or perhaps, stamina???

-P-

Glad to see despite the poor weather forecast that some of you managed to see the eclipse.

We're down in Tennessee but I did bring my iOptron SkyTracker just in case. The evening started out with clouds but they slowly disappeared before the total part started. I used my Canon T7i with a 75-300mm zoom to take a bunch of images. I'm in Bristol, TN in the brightly lit parking lot at a motel so it was a bit tricky finding Polaris to polar align the SkyTracker. I pointed the eclipse out to a number of people at the motel who happened to wonder out or drive in. A couple of them had heard about the eclipse but had forgotten about it.

Paul Walker

### First Member and Invited Guest Stargazing Event of the Year

By Paul Walker

(Jan, his wife, suggested he write something about this)

The first Member Stargazing event was on 6/24/22 (at least I think it was the first club wide event). This was one of those impromptu events.

10 people including myself and the newest member of the club showed up. It was a long wait until dark but I think everyone enjoyed being out under the stars.

Richard and Maura were setting up for imaging session and many checked out their equipment and asked questions while waiting for the darkness.

I gave some members a tour of the Teaching Dome. Explained the purpose, which is to be a focal point (or should I call it a focal plane? - some astro-imaging humor - I guess in this case it's focal point) for teaching members anything from how to find their way around the sky to how to get faint fuzzies into a scope to astro-imaging. A number of members indicated an interest.

As promised, I brought my bioviewers (not to be confused with binoculars). Several folks got to see M13 (the Great Globular Cluster in Hercules) and M57 (the Ring Nebula) through the 18". The views had the *impression* of being 3-D.

Good view of Saturn about 2:30 AM! About 1:30 I noticed a bright light on the Eastern horizon. My first response was, what's that, an airplane with its landing light on? No, as I watched it moving very slowly higher I realized that it was Jupiter. What can I say, it was rather late at that time. Once I realized it was Jupiter I also realized a moderately bright star in a small group of stars to the southwest, that had caught eye earlier, was Saturn.

### How Small of a Lunar Craterlet can be Seen Through a Telescope?

By Gary T. Nowak

13 May, 2022

#### Introduction:

The Moon is our closest celestial body. The Moon appears to us as a big, bright object in the night sky. A pair of binoculars will start to reveal some of the Moon's largest features. A good telescope will allow an observer to see the wonders of lunar surface details. Some amateur astronomers especially beginners are under the impression that some lunar surface details as small as an automobile can be seen. If only our amateur astronomer telescopes could do that. However, the true reality of lunar observations is often not what we can imagine it is. So, this leads into the subject of this report. How small of a lunar craterlet can be seen or resolved



visually in a telescope? This report will try to answer that question for our local (Vermont) observing conditions. The author will use his observational data and experience to come up with an answer to that question.

### ***Factors Effecting Lunar Observations:***

There are a few factors to consider when one observes Lunar surface detail:

- i. Telescope Optics
- ii. Telescope Mount
- iii. Seeing Conditions

In order to see fine details on the Moon such as craterlets, one must have a telescope with high quality optics and a good steady mount. These two factors will not be discussed in this report. I will concentrate on the 3rd factor; Seeing Conditions.

### ***Dynamics of Seeing Conditions:***

Seeing is an astronomical term for the steadiness of the air. Our atmosphere is made up of air cells or seeing cells that vary in size and density. (Smith, p18). These seeing cells move about and the light from celestial objects is bent or refracted by them. The rapid movement of these seeing cells causes the light from celestial objects to blur and move around. This movement causes the twinkling or scintillation of stars. The twinkling of the stars may be considered pretty by some but this is not what you want for great lunar observations. This scintillation is controlled by dynamic factors. These factors affect the movement of the seeing cells and this will determine the steadiness of the atmosphere and the steadiness of your view of the Moon in a telescope. (Grego, Moon Observe p243)

### ***Dynamic Factors Controlling Seeing:***

1. Jet Stream
2. Man Made Features
3. Geographic Features
4. Altitude of Celestial Object

**1. Jet Stream:** The Jet Stream is a band of high-speed winds that travels around the world at a high altitude. The

Jet Stream movement causes the rapid movement and mixing of the seeing cells. This high-altitude mixing causes poor seeing conditions. Any time the Jet Stream is within 300 miles of your observing location; your local seeing conditions are often degraded. The Jet Stream is a major contributing factor to poor seeing conditions. (Reeves, Digital p346) Weather fronts can copy the effect of the Jet Stream. Any time a front is within 300 miles of your area; it will probably create poor seeing conditions. (Reeves, Digital p346)

**2. Man Made Features:** Buildings, chimneys, roofs, and asphalt streets or parking lots play a role in creating turbulence. Heated by the Sun, these items give off heat which produce rising columns of warm air creating local, low altitude seeing cells creating bad seeing conditions. (Dobbins, p19; Grego Moon Observe p243)

**3. Geographic Features:** Certain geographic features are often superior to others features in effecting seeing. Plateaus are often producers of good seeing while mountains are not. Winds blowing over mountains often create turbulence which causes bad seeing. The effects of local topography play an important role in seeing conditions at your observing site. (Dobbins, p19)

**4. Altitude of Celestial Object:** The atmosphere which we observe through is not uniform. The lower atmosphere near the horizon is a much thicker slice of air than the zenith region. The thicker air will have a better chance of distorting the light from a celestial object. Celestial objects viewed near the Zenith be affected much less by bad seeing. (Grego, Moon Observe p243)

To determine one's local seeing conditions with accuracy and reliability a special seeing scale is used. We will take a look at this special seeing scale.

### ***The Seeing Scale of (0-10): A Scientific Seeing Scale***

To determine Seeing or steadiness of the atmosphere for Lunar and Planetary observations, a scientific seeing scale was made by William H. Pickering, a Harvard Astronomer (1858-1938). This Seeing scale was based on visible

details and extent of the Airy Disk and Airy Rings of a star. The display of the Airy Disk and Rings was based on observations made with a 10" refractor. As the images of the Airy Disk and Rings deteriorated; this would provide a lower rating on the scale. The original scale ratings were approximate since the Airy Disk is complex and changing: Here's the seeing scale based on the Airy Disk image. (Texereau, p310)

- 8-10 Excellent: Perfect images, no noticeable defects and rings are stable,  $\theta = 0$
- 7-8 Very Good: Complete Airy Rings but some rings are not uniform,  $\theta < 0.25 \rho$
- 6-7 Good: Complete Airy Rings but some ring sections agitated,  $\theta = 0.25 \rho$
- 5 Moderate: Broken diffraction rings, Airy Disk has wavy edges,  $\theta = 0.5 \rho$
- 3-4 Poor: Distorted Airy Disk, some rings absent or faded,  $\theta = 1.0 \rho$
- 1-2 Very Poor: Airy Disk very agitated and strongly distorted, no rings,  $\theta = 1.5 \rho$
- 0 Terrible. Airy Disk appears bloated and broken into several sections,  $\theta > 1.5 \rho$

$\theta$  = Wave inclination angles (distortion).  
 $\rho$  = Angular radius of diffraction spot (Airy Disk).

(Jean Texereau, p309, goes into a mathematical formula on how to determine the seeing rating based on observations of certain Airy Disk parts.) (Also, Grego, Solar System p24)

However, most lunar and planetary observers rarely go to the lengths of actually assessing the visual diffraction patterns of stars so the scale was adjusted based splitting double stars using a 10" aperture. Use of splitting double stars visually is quicker and a much easier way to determine seeing.

Here's the Seeing Scale based on the Dawes Limit of 0.457 sec of arc (0.5", rounded off). for a 10 inch aperture. (Grego, Solar System p24, Also North, p25)

**10" Telescope Seeing Scale**

Scale Rating	Double Star Separation
10 .....	0.5"
8 .....	0.7"
6 .....	1.0"
4 .....	1.5"
2 .....	3.0"
0 .....	5.0"

It should be noted that various individuals have adjusted the scale criteria for different sizes of telescopes. As noted the above scale is for a 10" telescope or one close to 10", say 8" or 12". This scale criteria can't be used with smaller apertures.

Here's the modified seeing scale for a 5" telescope by different authors. (Van Venrooij, p218). (Dawes Limit aperture, 0.914" ~1.0") And a 4" telescope.

**5" Telescope Seeing Scale**

Scale Rating	Double Star Separation
10 .....	1.0"
8 .....	1.4"
6 .....	2.0"
4 .....	3.0"
2 .....	4.0"
0 .....	5.0"

**4" Telescope Seeing Scale**

Scale Rating	Double Star Separation
10 .....	1.2"
8 .....	1.8"
6 .....	2.4"
4 .....	3.0"
2 .....	4.0"
0 .....	5.0"

The 5" seeing scale is very close to my 4.7" refractor size so I use this to determine my Seeing. My average backyard Seeing is based on splitting double stars with my 4.7" (120 mm) f/7.5 APO refractor. My average double star smallest separation is 2.2" which puts my average Seeing about 5.0-5.5 on the scale. Authors such as Robert Reeves, Webcams p287F, Digital p345F and Richard Berry p19 cover factors that ruin your local seeing conditions including the major role that the Jet Stream plays in controlling seeing conditions. I now have 7 years of data on my Seeing conditions from my back yard observing so I know what my average seeing (5.0 -5.5) will allow me to view.

Once you start doing observations of double star separation to determine your Seeing Scale Rating, you will find that it is fairly objective. Using this system takes the a lot of the subjectiveness out of your seeing rating. You need to make many observations over a period of time to build up a data base of your seeing conditions. You can then use the minimum double star separation to help estimate how small a lunar craterlet or Mars surface feature you should be able to see.

*Moon:* 1" Resolution  $\approx$  1.9 km (1.2 mi) when the Moon has an angular diameter of 31" (Grego, Moon Observe, p243)

*Mars:* 1" Resolution  $\approx$  280 km (175 mi) when Mars has an angular diameter of 25" (Grego, Mars p214)

I know an extended object size is not exactly the same as the separation of two double stars but this conversion will give you an approximate estimation for what you should be able to see on the Moon or Mars based on your local seeing.

Only a few amateurs know about this method. Some who do note atmospheric seeing do so use a 0-10 scale using a method that is quite subjective. This results in an unreliable record of local seeing conditions.

**Lunar Observing Multipliers:**

The Moon is probably the most observed astronomical object in the night sky. To help improve your ability to see fine lunar details; these Lunar Observing Multipliers may help you get the best view of lunar details regardless of your local seeing conditions.

- A. Perigee Moon
- B. Location of Moon on the Ecliptic
- C. Moon's Orbital Tilt
- D. Terminator
- E. Colored Filters

**A) Perigee Moon:** The Moon orbits around the Earth in an elliptical orbit. This orbit is not equal but off center. So, one end of the Moon's elliptical orbit is closer to the Earth than the other end. At apogee, the Moon is further from the Earth and the Moon's apparent diameter is at it's smallest, 29' 23". At perigee, the Moon is closest to

the Earth and the Moon's apparent diameter is at it's largest, 33' 29". At perigee the Moon is about 14% larger than at apogee. Viewing the Moon when it's near perigee will help the lunar observer see small lunar details. One should strive (if possible) to observe the Moon when it's near its perigee position. (Grego, Moon Guide p35)

**B) Location of Moon on the**

**Ecliptic:** The Moon takes 29.5 days to go through a complete set of phases. This 29.5 day period is called the Synodic Month or Lunation. (Grego, Moon Guide p39) The Moon's orbital plane lies close to the Ecliptic; therefore it follows a path through the Zodiacal constellations. Since the Earth's axis of rotation is tilted 23.5 degrees relative to it's orbital plane around the Sun (Ecliptic), the Ecliptic is tilted the same relative to Earth's axis (and equator) and to the Celestial Equator. Therefore, each month as the Moon orbits the Earth, part of the time the Moon is well above ecliptic and for us northern observers high above the horizon. The Moon's highest position is obtained when the Moon is in or near the constellations Gemini and Taurus (near 6 hours of Right Ascension). The lowest lunar position is when the Moon is on or near 18 hours of Right Ascension (the Scorpio and Sagittarius Constellations). (Edgar, p159) For the 1st Quarter Moon this means the time around the Vernal Equinox, the months of February, March, and April. For the Last Quarter Moon this means the time around the Autumn Equinox, the months of August, September and October. Observing the Moon near perihelion (closest approach) and when highest in the sky, will help you to get better Seeing conditions. (Grego, Moon Guide P39)

**C) Moon's Orbital Tilt:** The Moon's orbit is not quite parallel with the plane of the Ecliptic. It is tilted some 5° 9' to the Ecliptic. This will add or subtract altitude to the Moon's position relative to the Ecliptic. The combination of the Moon's orbital tilt plus the Moon's position in or near the 6th Hour of Right Ascension while on the Meridian Line can give the Moon extra altitude above our horizon for our local observation sites. (Edgar, p159)

**D) Terminator:** The terminator is the line that divides the Moon's sunlit side from its unlit side. The Moon has no atmosphere, so it offers a well-defined dividing line between sunlight and darkness. Most lunar details can be best seen on or near the terminator because the Sun's low angle of illumination produces dark shadows and better contrast on even low lunar topographic features. The rims of craters are clearly defined due to the long dark shadows they cast. The First and Last Quarter Moon offers some of the best views of lunar surface details in and near the terminator. (Grego, Moon Guide p53)

**F) Color Filters:** The Moon reflects on average about 12% of sunlight it receives. Despite this low reflectivity; looking at the Moon in a telescope, it can appear to be exceeding bright and have lots of glare. Color filters are a good way to reduce lunar glare and irradiation. (Dobbins, p45). Yellow and green colored filters are the most common colored filters used.

Here's a list of commonly used filters for viewing the Moon:

W56 Light Green, W58 Green  
also W57 Green  
W11 Yellow Green  
W15 Dark Yellow  
W12 Yellow  
W8 Light Yellow  
Baader 500 nm Green . W58  
Baader 495 nm Yellow . W12

I have found for my lunar observations, the Baader 495 nm (Yellow) filter works best. The 495 nm filter sharpens the image a bit, seems to darken lunar shadows to a degree and cuts down glare. However, it should be mentioned that using color filters is not a panacea. If seeing is bad, a color filter will not make the view in the eyepiece as steady as a photograph. Nor will a color filter help you see fine lunar details like the Lunar Orbiter Reconnaissance satellite produced.

#### Lunar Observational Data:

The goal of this report is to determine how small of a lunar craterlet can be resolved visually in telescopes of various sizes. The author learned from years of observations that the theoretic

cal limits of a telescope cannot be reached due to local seeing conditions. So, what is the smallest size lunar craterlet that can one can expect to see in a given telescope based on local seeing conditions? The results may be a surprise to some folks.

#### Lunar Sites Used for Observation:

The sites of lunar features used in this report were chosen from the Lunar 100 card. To ensure proper identification of craterlets next to lunar features, the primary criteria was for the features to be relatively isolated and have nearby a handful of craterlets of a range of sizes.

- **Messier / Messier A:** Oblique ricochet impact pair. #25 Feature on the Lunar 100 Card. This area is usually well seen around a 4-day old Crescent Moon.
- **Cauchy Region:** Fault, rilles and domes. #48 Feature on the Lunar 100 Card. This area is usually well seen around a 4-day old Crescent Moon
- **Apollo 11 Landing Site (Statio Tranquillitatis):** #90 Feature on the Lunar 100 Card. This site is usually well seen around a 5-day old thick Crescent Moon
- **Apollo 15 Landing Site (Mons Hadley and Rima Hadley Regio):** #66 Feature on the Lunar 100 Card. This area is usually well seen around a 7-day old Moon (1st Quarter Moon)
- **Rupes Recta:** Best example of a Straight Fault on the Moon. #15 Feature on the Lunar 100 Card. When I started out as an amateur astronomer way back in 1968, this was one of the 1st lunar features I identified and viewed. This area is usually well seen around an 8 -day old Moon.
- **Plato:** Best example of a Lunar Flat Floored Walled Plain. #83 Feature on the Lunar 100 Card. This area is usually well seen around an 8-day old Moon.

#### Participants in the Lunar Observations:

All of the lunar observing data was gathered by myself in the back yard of my home in Williston, Vermont. I used

my 4.7" (120 mm) f/7.5 APO refractor to gather most of the data. I also used a 4" (100 mm) f/ 9 APO refractor on occasion as well. The lunar observation data was gathered from 20 June 2015 to 6 April 2022.

Supplement lunar observing data was supplied by the following observers.

Larry Garrett of Fairfax, Vermont: Larry used a 6" (150mm) f/8 Newtonian and a 12.5" (317 mm) f/6 Newtonian for his observations. Both Larry and myself are members of ALPO. (Association of Lunar and Planetary Observers)

Paul Walker of Middlebury, Vermont. Paul used a 10" (250 mm) f/5.6 Newtonian and a 12.5" (317 mm) f/4.8 Newtonian. Paul had made some observations using a binoviewer. Since the author and Larry did not have binoviewers, only observations made using a monoviewer (single eyepiece) were used in this report. Perhaps in the future another report could be produced comparing the resolution gain of the binoviewer to single eyepieces on lunar features. All three observers are members of the VAS (Vermont Astronomical Society). The author extends his thanks and gratitude to both Larry and Paul for sharing their lunar observation data for this report.

#### Author's Lunar Observational Results:

4" (100 mm) f/9 APO Refractor 150X with Baader 495 nm (Yellow) filter.

Seeing Excellent  $\geq 7.0$  (min. double star separation 1.9"), smallest crater 6 km (3.7 mi)

Seeing Average  $\approx 5.0$  (min. double star separation 2.7"), smallest crater 8 km (4.9 mi)

These were my first set of observations and started me on my quest to find out what the local seeing conditions were doing to the resolution capability of my 4" (100 mm) refractor. Craterlets used were Plato G (8 km), Plato M (8 km), Plato S (6 km) and Plato U (6 km).

4.7" (120mm) f/7.5 APO refractor 180X with Baader 495 nm (Yellow) filter

Seeing Excellent 8.0 (min. double star separation 1.5"), smallest crater 3.7 km (2.2 mi)

This observation was only made once. The craterlet observed was Messier J, 3.7 km. This observation was greatly aided by a Perigee Moon, high lunar altitude, and very favorable position near the terminator. The only way I saw this craterlet is by its shadow. Most of the craterlet rim was ill defined. If it wasn't for the dark shadow, I wouldn't have seen the craterlet.

Seeing Excellent  $\geq 7.0$  (min double star separation 1.7"), smallest crater 4.0 km (2.4 mi)

This size craterlet I was able to see 4 different times. These craterlets were Plato W (4.0 km), Cauchy E (4.0 km), . These craters were seen as a fully defined circular rim with nice sharp dark shadow. I'm very positive about these observations since I was able to repeat these observation 4 different times. These observations make this resolution a good hard data point for a Seeing rating of 7.0.

4.7" (120mm) f/7.5 APO refractor 150X with Baader 495 nm (Yellow) filter

Seeing Average  $\approx 5.0$  (min double star separation 2.2"), smallest craters 8 km (4.9 mi), 7 km (4.3 mi), 6 km (3.7 mi)

These observations of the crater sizes were made many times with the 4.7" refractor. With the average Seeing (5.0-5.5) 8 km craters were fairly easy. The 7 km craters were a bit tougher. The 6 km craters were sketchy and ill defined, their shadow helped a lot in seeing them. The number of repeatable observations makes this a reliable data point for a Seeing rating of 5.0. The craterlets seen are Plato G, J and Q (8 km), Rupes Recta (Birt A) (7 km), Plato U (6 km) and Cauchy B (6 km).

Despite my many attempts, I could not reach the Theoretical Resolution of my 4.7" (120 mm) telescope. The Theoretical Resolution of a 4.7" (120 mm) telescope is: Resolution smallest Double Star separation 0.97" and smallest

crater 1.9 km. I will round off these values to 1.0" and 2.0 km (1.2 mi). My smallest craterlet observation was 3.7 km (2.2 mi). I'm not going to place too much emphasis on it because I only saw it once and the craterlet was ill defined. I will use my 4 observations of the 4.0 km (2.4 mi) craterlets. The 4 km crater observations corresponds to the "Working Limit Concept" of authors like Sam Brown, p18 and Terrence Dickerson, p50. The Working Limit Concept effect is due to the local seeing conditions.

The Local Seeing Working Limit is often 2X the theoretical limit. My excellent seeing conditions crater resolution of 4 km is 2X the theoretical limit (2.0 km). Unless my local seeing conditions change dramatically, it is unlikely that I will ever reach the theoretical limit of my telescope from my backyard observing site. There will be more about the chances of excellent seeing later in this report. Let's compare my observational results to a Theoretical Telescope Resolution Chart.

Aper.	Res.	Crater size
2.4" (60 mm)	1.9"	3.6 km (2.2 mi)
3" (75 mm)	1.5"	2.8 km (1.7 mi)
4" (100 mm)	1.2"	2.3 km (1.4 mi)
4.7" (120 mm)	1.0"	1.9 km (1.1 mi)
6" (150 mm)	0.8"	1.5 km (0.9 mi)
8" (200 mm)	0.6"	1.1 km (0.6 mi)
10" (250 mm)	0.5"	1.0 km (0.5 mi)
12" (300 mm)	0.4"	0.8 km (0.4 mi)

Note: A mean Moon size of 31" was used (Table from Grego, Moon Observe p243)

If I do a comparison to the chart and use my best result for resolution, 1.5", then my 4.7" (120 mm) f/7.5 APO refractor is acting like a 3" (75 mm) telescope. If I do a comparison to my best lunar craterlet resolution of 3.7 km (2.2 mi) to the chart then my telescope is acting like a 2.4" (60 mm) refractor. This result is considerably worst that I had expected. Seeing plays a very important role in affecting the limit of telescopic resolution. This supports the Working Limit Concept in observing and needs to be taken into account to adjust one's expectations.

## Other's Lunar Observational Results:

Paul Walker of Middlebury, Vermont observes in his backyard with a 10" (250 mm) f/5.6 Newtonian at 174X and a 12.5" (317 mm) f/4.8 Newtonian at 188X. Paul also uses a binoviewer and takes images of the Moon. Only his observations with a monoviewer (single eyepiece) will be considered. Paul also used English Units in his size data so I did the conversion equivalent to Metric.

Here's a summary of Paul's results:

Seeing	Res.	Crater Size
Excellent	0.83"	2 Miles (3.2 km)
Good	?	2.5 Miles (4.0 km) and 2.8 Miles (4.5 km)
Average	?	4.0 Miles (6.4 km)

Neither of Paul's Telescopes, the 10" (250 mm) f/5.6 and 12.5" (317 mm) f/4.8, reached the theoretical limit. Paul's smallest crater resolution of 2.0 miles (3.2 km) was not too far off from my best observation of the 2.2 mile (3.7 km) craterlet. My other 4 observations of the 2.4 Miles (4.0 km) are similar to Paul's observations under good seeing of craters 2.5 miles (4.0 km) and 2.8 Miles (4.5 km). Clearly the local seeing conditions are playing the Major role in limiting the resolution of Paul's two telescopes. Paul's best resolution of 0.83" is right on the limit of resolution for a 6" (150 mm) telescope (0.8").

Larry Garrett of Fairfax, Vermont observes in his backyard with a 6" (150 mm) f/8 Newtonian at 171X, 230X and a 12.5" (317 mm) f/6 at 217X and 261X. Larry uses the Baader 495 nm (Yellow) filter. Larry came up with similar results. Using his 6" (150 mm) f/8 Newtonian at 171X with the Baader 495 nm filter; he observed Cauchy E and Cauchy C both at 4.0 km (2.4 mi). Most of the time Larry notes that the 12.5" (317 mm) will only show what the 6" (150 mm) can resolve. Its only when there's really excellent seeing that the 12.5" will out perform the 6".

Using the data from the 3 observing sites we can deduce that Seeing is the major controlling factor preventing telescopes from reaching their theoretical limits, either in splitting close double



stars or for observing the smallest lunar craters. It seems that Vermont's atmospheric conditions are not conducive to producing nights of excellent seeing.

This then raises the question of what are the chances of having excellent seeing at your local observing site? I have data on the conditions for my backyard observing site in Williston, Vermont. The data spans the dates of 20 June 2015 through 6 April 2022. The data comes from 166 observing sessions. The data presented here does not contain observations made at other sites. Note that some data values are rounded off.

Seeing	# of Session	% of Total
Excellent $\geq 7.0$	18	11%
Average $\approx 5.0$	118	71%
Poor $\leq 3.0$	30	18%
Total	166	100%

Transparency Data was included for completeness; however, this data will have no influence on the resolution results.

Trans.	# of Session	% of Total
Excellent $\geq 5.7$	7	4%
Average $\approx 5.3$	123	74%
Poor $\approx 4.5$	36	22%
Total	166	100 %

### Summary:

Each observation site will have its own local observing conditions. For my backyard, there's only a 11% chance on a given night that I will have excellent seeing conditions. On the other end of the data there's an 18% chance of experiencing poor seeing. The majority of nights, 71%, will have average seeing. So, an observer should set their expectations accordingly. Vermont skies are not known for producing excellent seeing conditions. This is something a lunar observer should take consideration, especially if one is thinking of a larger telescope in the hopes of seeing smaller lunar features. From the data, 4 km (2.4 mi) lunar craterlets seems to be the typical lower limit for Vermont skies. This indicates that for most observing conditions a 6" (150 mm) telescope will be the largest aperture needed to deliver

maximum lunar detail in the most commonly occurring seeing conditions in many if not most areas of Vermont. Both Sky & Telescope authors, Gary Seronik and Dennis di Cicco support this statement. Lunar observers in Vermont may just have to live with the Working Limit Concept. Perhaps author Peter Grego sums up the restriction of seeing conditions best with, "For most of us, viewing rarely allows us to resolve lunar detail finer than 1 arc second, regardless of the size of the telescope used, and more often than not a 150 mm (6") telescope will show as much detail as a 300 mm (12") telescope, which has a light-gathering area 4 times as great. It is only on the nights of really good visibility that the benefits of the resolving powers of larger telescopes can be experienced." (Grego, Moon Observe p243-244)

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- Van Venrooij, Martin and Rutten, Harry. Telescope Optics, Evaluation and Design, Willmann-Bell, Inc. Richmond, Virginia, 1998

### Objects to Observe

The other day I decided to observe some objects in and around the Summer Triangle (formed by the bright summer stars Deneb, Vega and Altair, all in the Milkyway).

Then I thought, this would be a good region in include in this newsletter and that I could make a list for people to observe and report my observations at the same time.

I observed the area over 2 consecutive nights using a 12.5" f/4.8 Dob and 8" f/6 Dob. Objects are listed in the order that I observed them. Atmospheric seeing was average. Observing site was my backyard in Middlebury, VT which has moderate light pollution (SQL reading of 20.7-20.9 compared to 20.1-20.2 for the Hinesburg site. Limiting magnitude was  $\sim 5.6$  near Polaris. The Milkyway was easily visible.

The first observations. Epsilon though M27 were made on 6/2/22 using 32mm eyepieces in my binoviews. The rest were made on 6/3/22 using 21mm eyepieces in the binoviews. You will see this reflected in the stated magnifications.

### Epsilon Lyrae (the Double Double).

- Wide double (3.5' of arc separation) of nearly equal brightness, each is a tight double (Epsilon  $\epsilon^1$ , 4.7 & 6.2 mag., 2.6" separation and Epsilon  $\epsilon^2$ , 5.2 & 5.5 mag., 2.3" separation). 12.5"scope- Both pairs readily split at 123x & 199x.
- 8" scope- Only Epsilon  $\epsilon^1$  split at 99x. Both split at 160x. Cleaner looking split than with 12.5"

8"- Viewed at 92x, 151x and 244x, best at 244x. Same results as with the 12.5". Interestingly, I found out it is supposed to be the nebula not the star that disappears. This may

have been due to the poor seeing (3-4 out of 10)

**NGC 6888** (The Crescent Nebula), emission nebula. Being very faint it is a must to “star hop” and positively identify this object’s by the field stars. The few times I have looked up this object I have found it difficult to locate. It requires a detailed star chart such as Uranometria.

8”- 92x, not visible. At 60x with Orion Broadband filter, can’t say as I could see it.

12.5”- 75x, I think I could detect it using the Orion filter.

**NGC 6960** (Western Veil), **NGC 6995 & 6992** (often referred to as the Eastern Veil)

12.5”- First tried it using the binoviewer at 75x with Orion Broadband filter. Visible but none of the above parts of the Veil fit in the whole field of view. Switched out the binoviewer for a 38mm 2” eyepiece (40x) with Orion filter. Better view. Doesn’t compare to the view through the club’s 18” scope in the HOS’s darker sky.

8”- 32x (38mm e.p.) Without the Orion filter I could maybe detect a little of the Western Veil. It helps that it is easy to locate with 4.2 mag. 52 Cgyni sitting in the middle of it. Without the nebula filter I was not able to see the Eastern Veil well enough to locate it. With the filter I was able to locate it and then could see it without the filter.

**B142 & B143** (The Cave Nebula, also known as the “E” nebula)

20x90mm binoculars, Hard to see. Would not have noticed them if I was just sweeping the area with binos.

**NGC 7000** (North America Nebula) Emission nebula. This is a very faint, large patch of H-alpha emission.

20x90 Binoculars- Detectable but barely. The “Mexico” part of the nebula was a little more visible than the rest. I tried the Orion Broadband filter behind one of the eyepieces but it didn’t seem to help. This is one of those objects that really benefits from a dark sky. This is the first time I can say that I detect-

ed it from my backyard. With its large size binoculars or low power with a “wide field” telescope is a must. Some have reported being able to see it with the unaided eye in a dark sky.

## ASTRO-IMAGER'S CORNER

*All things astrophotography, for the beginner to the expert.*

### Imaging Tips

If you have tips to share whether for beginners or experienced imagers send them our way at [info@vtastro.org](mailto:info@vtastro.org)

### Software/Online Info

#### *Astrophotography How-to*

<https://www.allaboutastro.com/how-to-learn-astrophotography.html>

If you have imaging software or a site with imaging info to share whether for beginners or experienced imagers send them our way at [info@vtastro.org](mailto:info@vtastro.org)

### Imaging Articles

If you have an imaging article (long or short) you would like to share, drop us a line at [info@vtastro.org](mailto:info@vtastro.org).

### Imaging Projects--

Making your own projects can add another dimension to your imaging experience.

If you have an imaging project you would like to share, drop us a line at [info@vtastro.org](mailto:info@vtastro.org).

## MEMBER'S IMAGES

### The Sun is Back!

What, you didn’t know it was missing? Well actually it hasn’t been.



Lunar Eclipse Mosaic 5/15/22  
By Joe Comeau



Lunar Eclipse Mosaic Showing Outline of Earth's Shadow 5/15/22  
By Paul Walker  
300mm f/5.6, 2 sec., ISO 200, cropped 50%



Just hasn't gotten much attention from us amateur astronomers for the last few years due to it being rather quiet, with few sunspots or big prominences to look at.

**On this page are images Terri Zittrisch took from home on July 2nd.**

They were taken in the deep red wavelength of the H-alpha (hydrogen-alpha) emission line (656.3nm). This is the same wavelength of the red emission nebula you see in deepsky images.

Each is a stack of several video frames. "I typically stack by percentage of frames. They are 30 sec videos at 20 frames/sec, 600 frames total. I usually use somewhere between 25% and 50% of the frames."

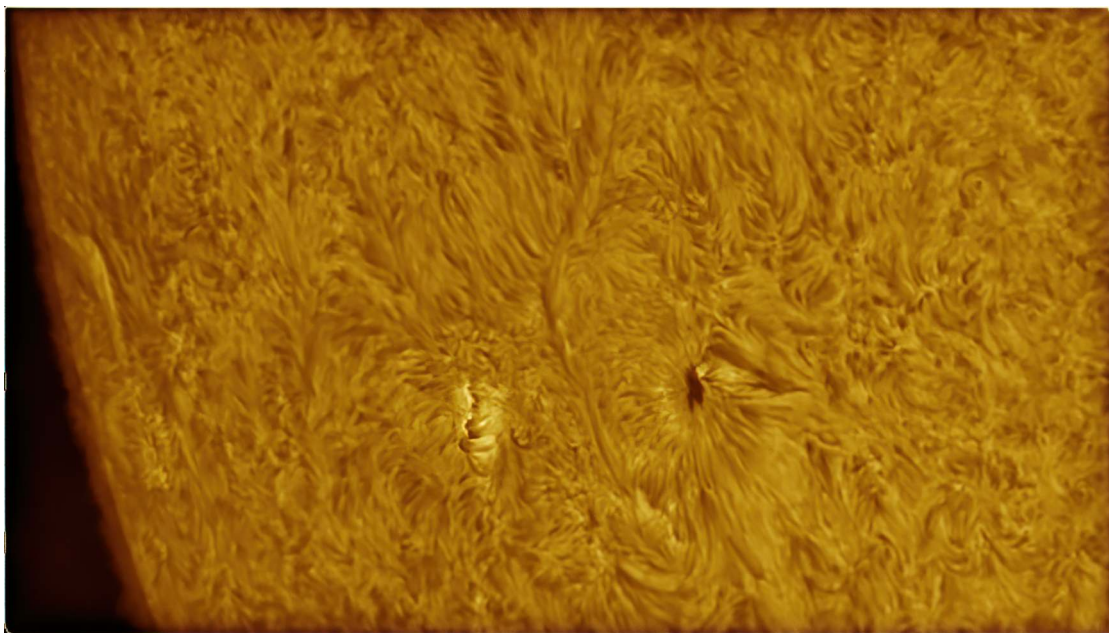
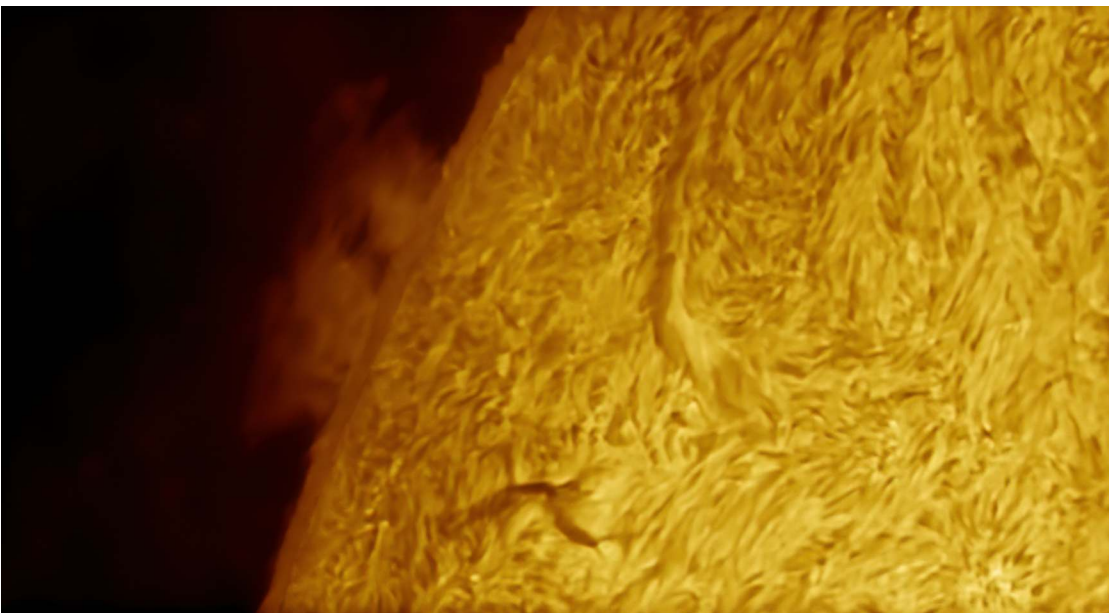
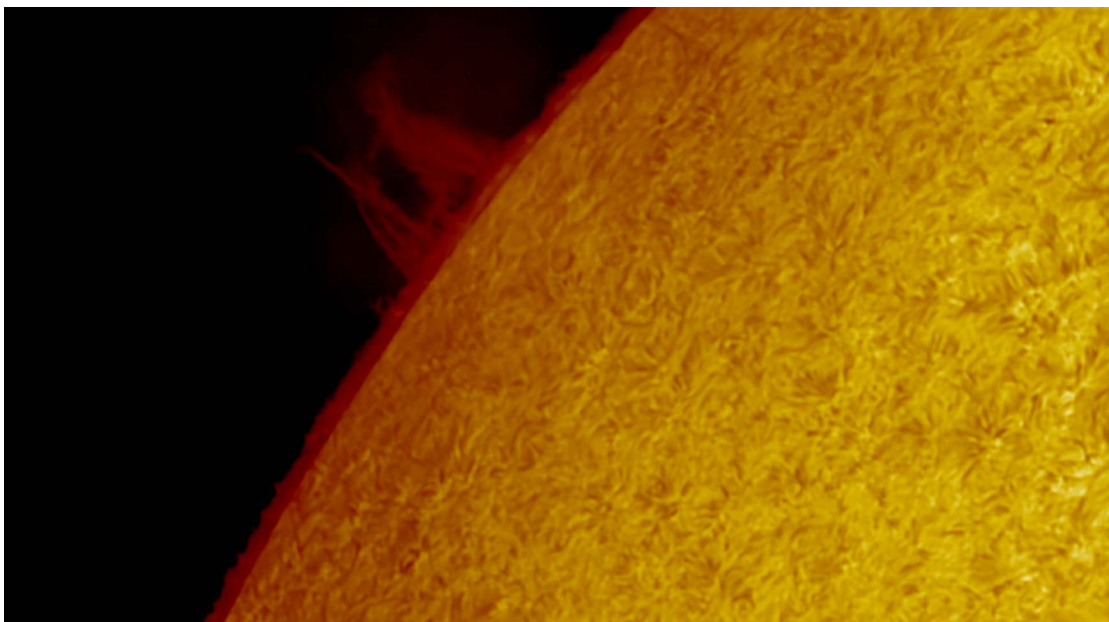
Some of these features have a 3-D look and in reality of course, they are 3-dimensional.

#### **Equipment:**

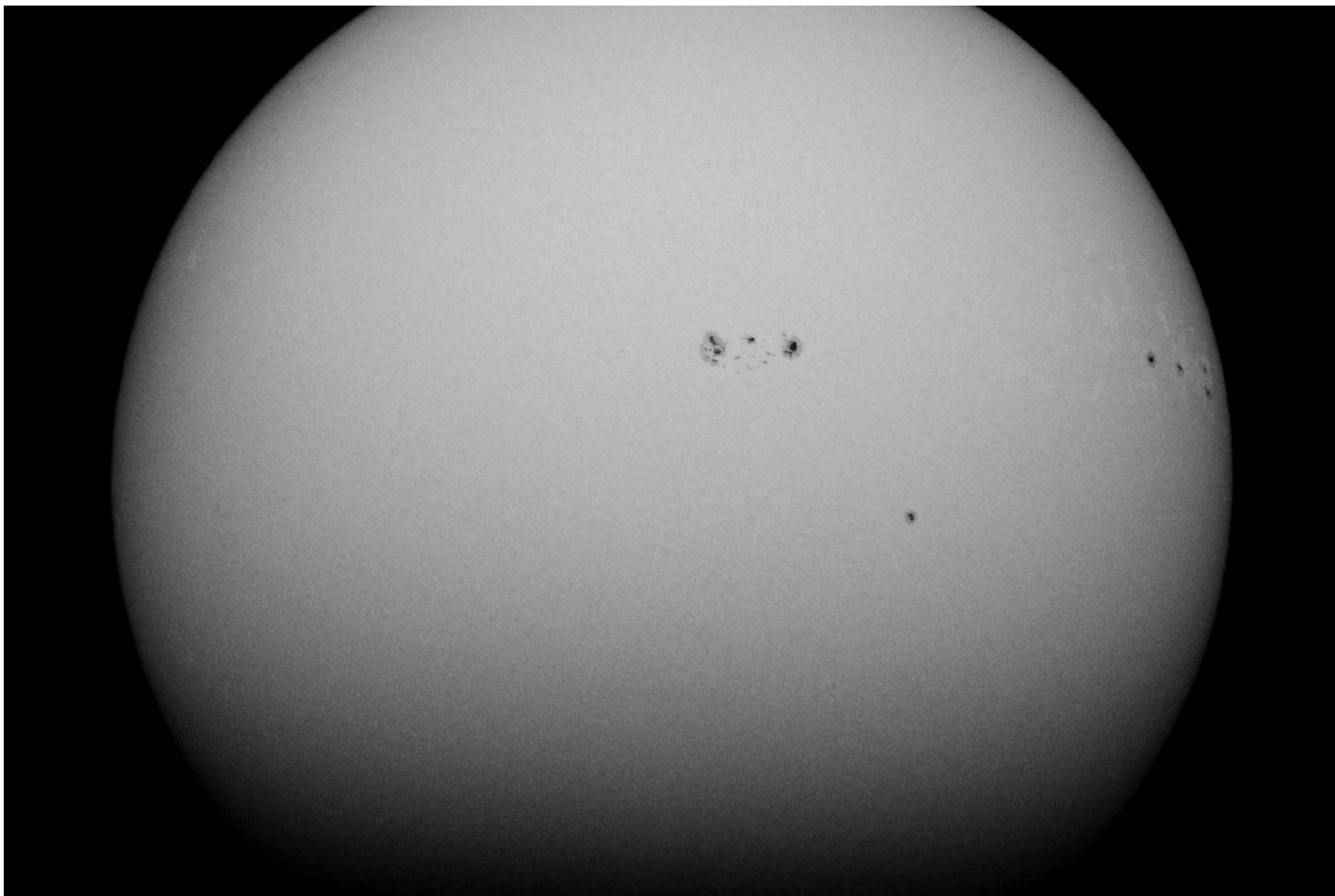
Quark H-alpha active filter on my explore scientific 100mm f/7 scope. The quark has a built in 4x Barlow, giving an effective f/ratio of f/28. The camera is a monochrome ASI290. This has a small sensor of only 6mm across diagonally and with 2.9um pixels. This gives a very small field of view but good resolution as can be seen in these images (the color was added at the end of processing).

#### **The Sun Taken in White Light (2022-06-20) By Paul Walker**

Two fairly large sunspot groups are visible along with







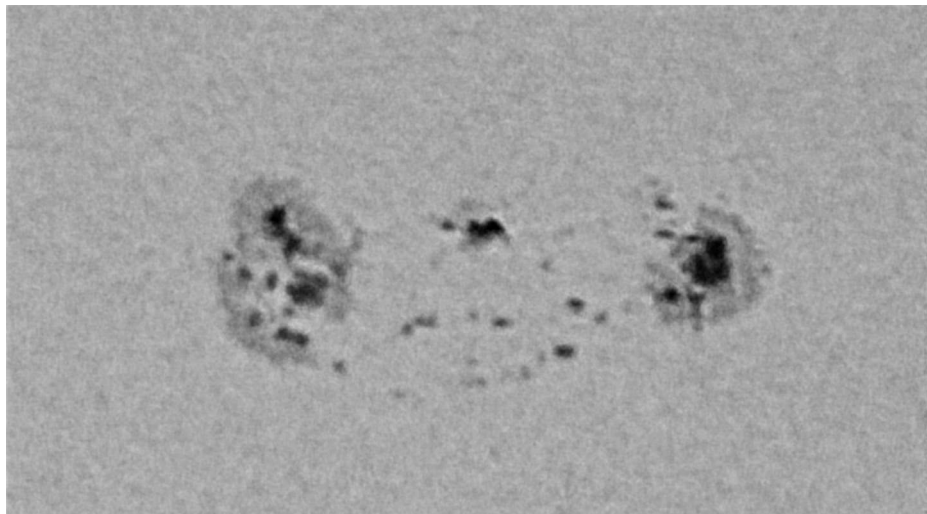
1 isolated sunspot. The group on the right is slowly disappearing around the edge of the Sun. Below is a blow-up of the group near the middle. It appears to be very complex with sub groups at either end and strings of tiny spots in between following the magnetic field lines. This group produced a number of solar flares.

The smallest features are about 2 arc sec across (5-6 pixel in the original image. This translates to about 1000 miles. A lot of sharpening was applied to bring out the details.

This was taken with a Canon T7i DSLR (APS-C size sensor)(1.6x form factor) on a 10" f/4 (1000mm f.l.) stopped down to 8" f/5 using an 8" full aperture white light solar filter (Baader ASTF 200, solar film filter, ND 5.0). This filter is intended for both visual and photographic uses. It produces a very bright white image (no color tint visually, slightly bluish in images). Visually it's bright enough that there is little or no need to shade your eyes to see the details.

I was also using a 1.5x Wollensak Barlow from Surplus Shed. With the camera, it gives 2 times the magnification of prime focus. It is a single image taken at 1/1250 sec @ iso100. This gives you an idea of how bright the image is.

To the right is a crop of the large sunspot group. It shows how complex the magnetic field is within this region. Every dark spot is the places where the hot plasma of the surface being held in place by strong magnetic field lines allowing those spots to cool off and therefore appear darker than the rest of the surface.



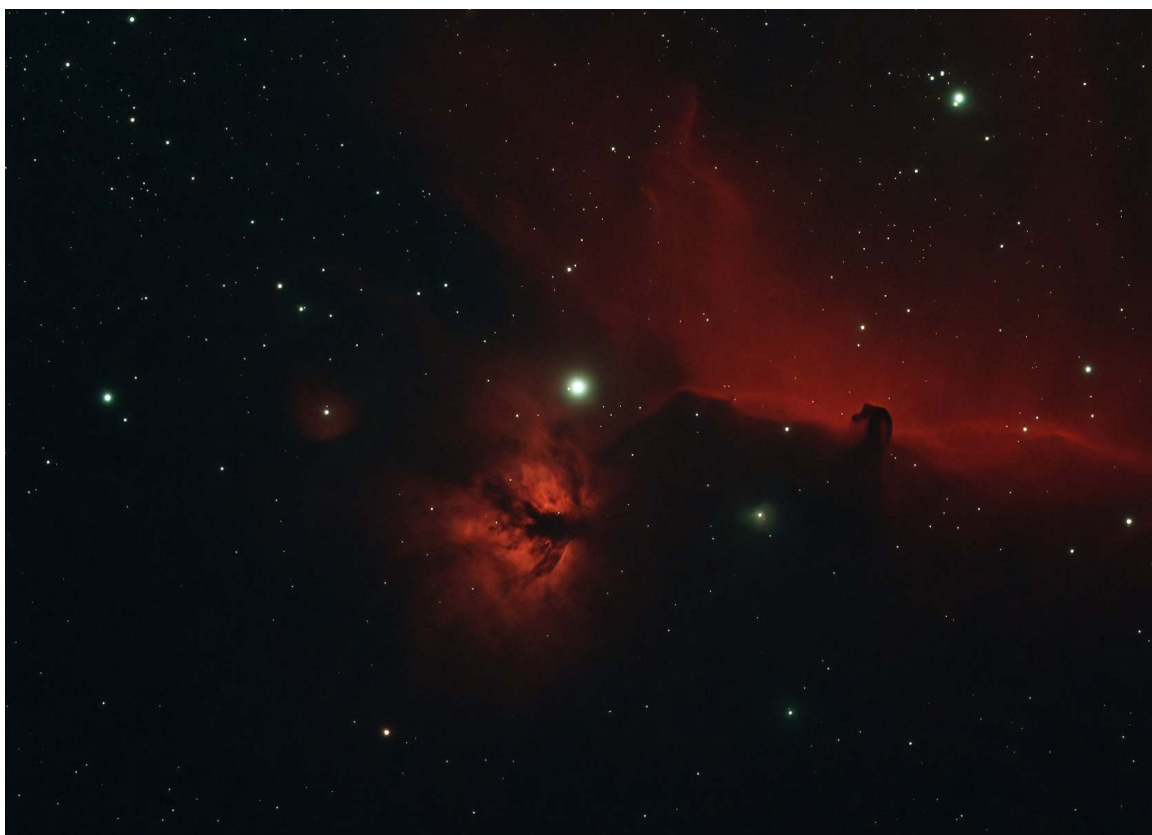


**By Dave Legrow**

M60, the larger fuzzy ball in the middle, is an elliptical galaxy. SN2022hrs was discovered on 4/16/2022.

Celestron EdgeHD 9.25 with flattener on CEM 40 mount. ZWO ASI 533MC camera ZWO ASI Plus, 20 120 sec exposures stacked and stretched.

### **Horsehead Nebula**

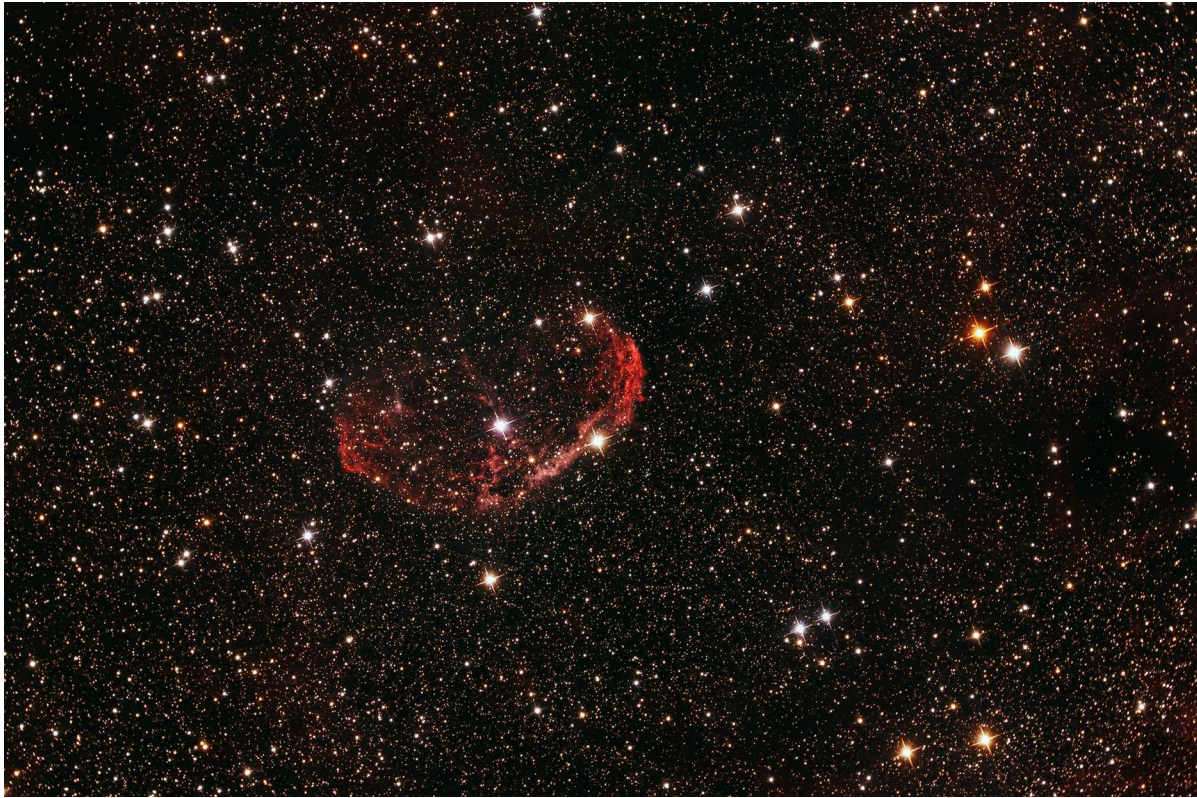


**By Dave Legrow**

After reading the news letter and looking at Steve Grimsley's photos from Texas, I thought of another subject, astrophotography filters. Here is an image I took last week with my latest filter acquisition. It was taken in my backyard - a horrible place to shoot from. Telescope: ZW81 with reducer, Filter: Antlia Alp-T, Camera: ZWO ASI 2600 MC, 18 exposures @180 sec, Stretched, but I didn't rebalance the color. Halos are much lower than with the Optolong L-eXtreme. OIII is muted, so color needs to be rebalanced. I wonder how the Antlia would compare to the OPT Triad Radian, Baader, and IDAS filters.

**NGC 6888 (Crescent Nebula)**





**By Rick Daniel**

22 subs 300 sec (1 hr 50 min total), Orion RC8 with focal reducer for 1250mm fl @ f/6, Orion Atlas Pro mount, QHY 268c OSC cam, ZWO IR/V cut filter, ZWO 290 mini guide cam, Altair 60mm guide scope, APT for capture software, PHD2 for guiding, Pixinsight and Photoshop for processing

**SH2-101**



**By Rick Daniel**

10 subs at 300 sec (60 min total) Same equipment as above.



**M104 (The Sombrero Galaxy) →  
By Richard Whitehead**

It's such a small object but so perfectly formed - 28 mill LY away.

Taken with his remote setup in New Mexico.

Scope : Planewave CDK14

Mount : Planewave L-350

Camera : ZWO ASI 6200 MM Pro

ZWO filter wheel Astronomik filters



**←M20 (The Trifid Nebula)  
By Richard Whitehead**

I originally did this image as a very deep image and it showed the Sagittarius star field very well, and I liked it , but of course the fashion these days is minimize the stars to the point of disappearance. So I combined both images here to hopefully show the rich star field and the extent of the faint reflection nebulosity.

Same equipment as above.







**By Richard Whitehead**

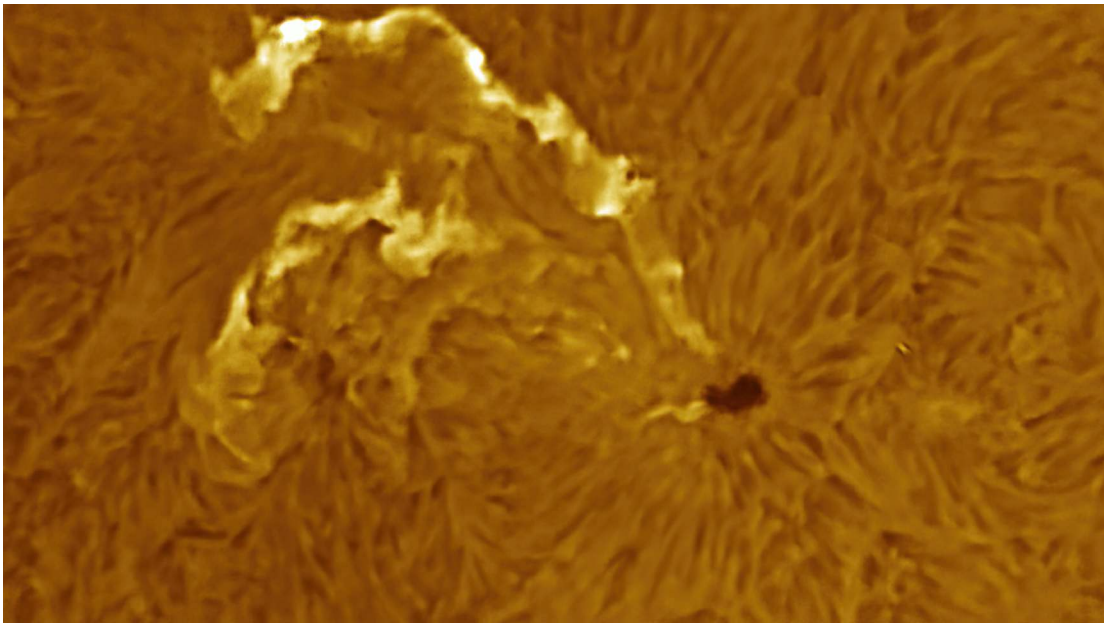
Taken with his remote setup in New Mexico

Scope : Planewave CDK14

Mount : Planewave L-350

Camera : ZWO ASI 6200 MM Pro

**Solar Flare taken in H-alpha Light - 2022-07-08**



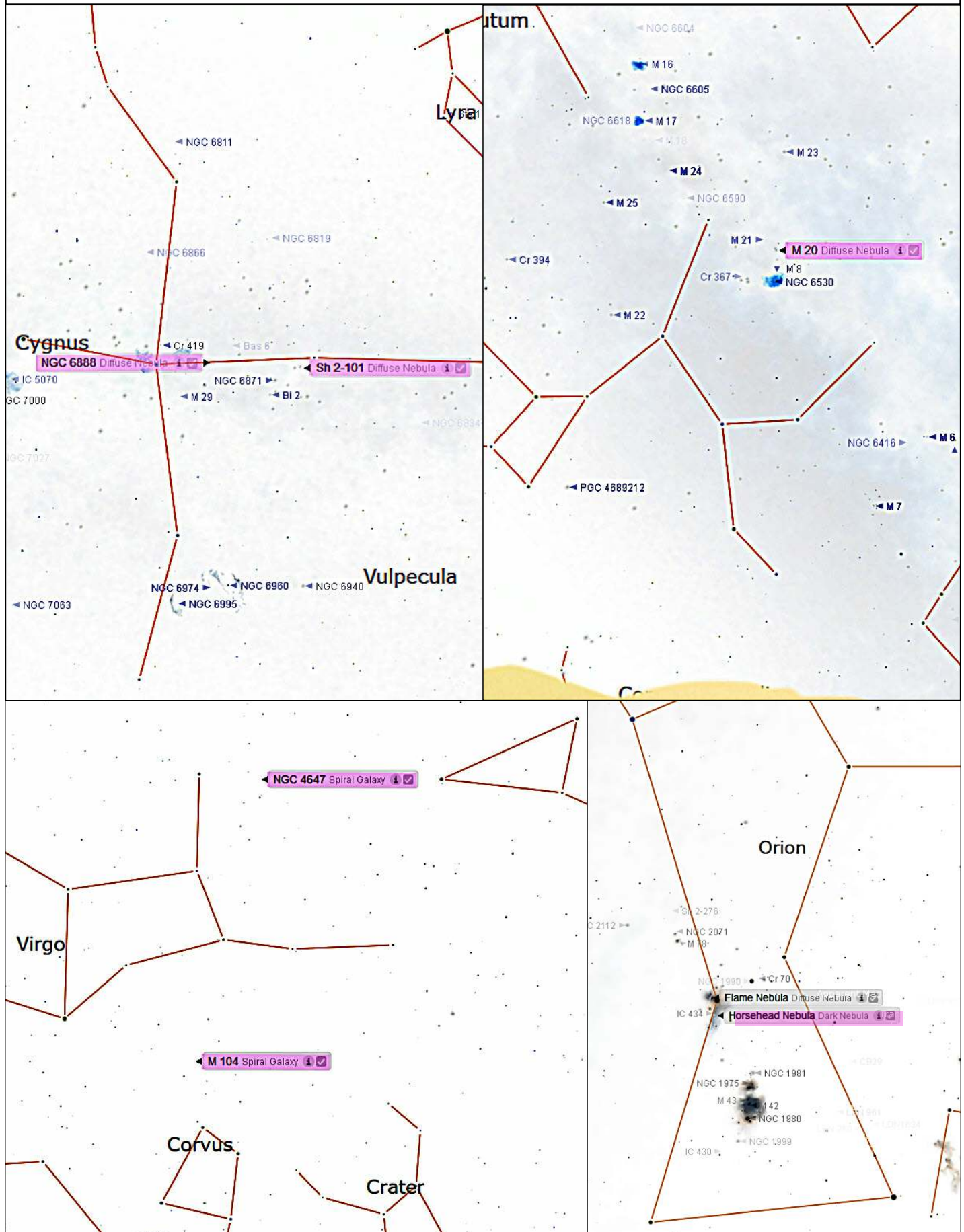
**By Terri Zittritsch**

Terri's camera was overwhelmed with the brightness of the flare itself so she had to significantly reduce the exposure, to the point that the background was barely visible. It wasn't until it was almost over she could expose the rest of the surface normally. The flare was classified as a '2.5 long duration' flare. It took out some short wave communications over the earth via the radiation burst. See this and other solar images on the VAS Forum under AstroPhotography, Images.

**Space Science Roundup**

**Location Charts for the deep sky object images in this issue.**

Created using Starry Night Pro 8 & Picture Window Pro 7.





## NASA News

--by Scott Turnbull, VAS Member and Solar System Ambassador volunteering for JPL/NASA



### Voyager Probes : Tales of Reduced Power and Anomalous Telemetry

The twin Voyager space probes have been traveling through space for nearly 45 years. Age and distance is catching up with them.

Both spacecraft are powered by three radioisotope thermoelectric generators (RTGs) and have a host of instruments collecting and sending scientific data back to Earth.

Over time the power output of the

RTGs reduces as the amount of Plutonium decays. At this time the generators are producing about 40 percent less electricity than when their missions started. NASA has been making decisions to conserve power so as to keep the probes operational as long as possible. Over the last three years, this has involved turning off the heaters to five of the probes' scientific instruments. The Voyager Science Steering Group will make further decisions on maintaining the power budget for the Voyager mission this August. With aggressive management by the engineering team the plans could stretch the Voyager missions into the 2030s — half a century longer than the probes were originally expected to last.

Meanwhile, the Voyager 1 probe has been returning seemingly anomalous telemetry data that has baffled the engineering team on Earth. The interstellar explorer is operating normally, receiving and executing commands from Earth, along with gathering and returning science data. But readouts from the probe's attitude articulation and control system (AACS) don't reflect what's actually happening onboard.

The AACS controls the 45-year-old spacecraft's orientation. All signs suggest the AACS is still working, but the telemetry data it's returning is invalid. For instance, the data may appear to be randomly generated, or does not reflect any possible state the AACS could be in.

The issue hasn't triggered any onboard fault protection systems. Voyager 1's signal hasn't weakened, either, which suggests the high-gain antenna remains in its prescribed orientation with Earth. Until the nature of the issue is better understood, the team cannot anticipate whether this might affect how long the spacecraft can collect and transmit science data.

Voyager 1 is currently 14.5 billion miles (23.3 billion kilometers) from Earth, and it takes 20 hours and 33 minutes for communication signals to travel that distance. That means it takes roughly two days to send a message to Voyager 1 and get a response.

It's possible the team may not find the source of the anomaly and will instead adapt to it, Dodd said. If they do find the source, they may be able to solve the issue through software changes or potentially by using one of the spacecraft's redundant hardware systems.



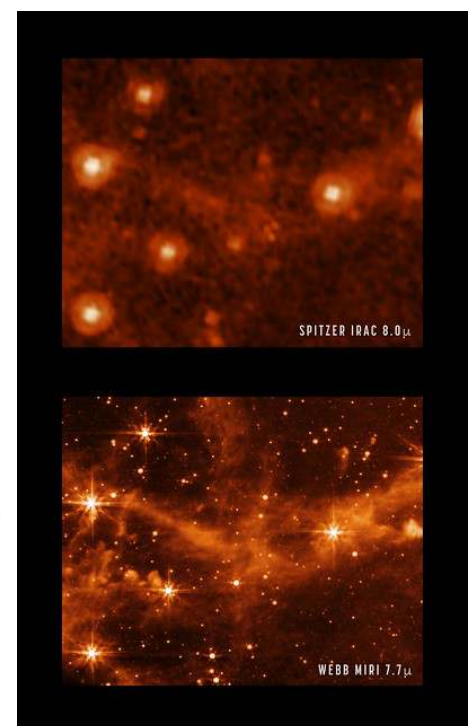
### Webb Telescope Prepares to Begin Science Mission

The James Webb Space Telescope has completed its alignment and calibration activities and is being prepped to begin its planned scientific observations.

One of the James Webb Space Telescope's four primary scientific instruments, known as the Near-Infrared Imager and Slitless Spectrograph instrument ([NIRISS](#)), has concluded its post launch preparations and is now ready for science.

The "First Images" are scheduled for release to the public on July 12<sup>th</sup>. Deciding what Webb should look at first has been a project more than five years in the making, undertaken by an international partnership between NASA, ESA, CSA, and the Space Telescope Science Institute (STScI) in Baltimore, home to Webb's science and mission operations.

"Our goals for Webb's first images and data are both to showcase the telescope's powerful instruments and to preview the science mission to come," said astronomer Klaus Pontoppidan, Webb project scientist at STScI. "They are sure to deliver a long-awaited 'wow' for astronomers and the public."



In addition to imagery, Webb will be capturing spectroscopic data – detailed information astronomers can read in light. The first images package of materials will highlight the science themes that inspired the mission and will be the focus of its work: the early universe, the evolution of galaxies through time, the life cycle of stars, and other worlds. All of Webb's commissioning will also be made publicly available.

## Resources

Information presented in this article was provided by the NASA/JPL mission web sites.

For more information, please refer to <https://www.jpl.nasa.gov/news/en-gineers-investigating-nasas-voyager-1-telemetry-data>  
<https://blogs.nasa.gov/webb/>

## For Sale

**1. Denkmeier Binoviewer Package:** Standard binoviewer with Powerswitch (integrated 2.5x barlow) and OCS (for use in any telescope), includes two 32mm Plossls: \$450

**2. Farpoint 2-inch autocollimator:** \$80

**3. 50mm RACI finderscope** (excellent optics, 1.25" helical focuser): \$35

Contact Siddhesh Mukerji,  
[siddmukerji@gmail.com](mailto:siddmukerji@gmail.com)

**Copies of "Mirror Mirror" - A History of the Human Love Affair with Reflection** by Mark Pendergrast of Colchester, Vt. available for \$25. Mark will split the profits with VAS.

Contact Mark at  
[markp508@gmail.com](mailto:markp508@gmail.com) or see Jack St. Louis at any monthly meeting.

**Orion StarMax 90mm EQ F/13.9 Maksutov-Cassegrain Telescope & equatorial mount**

90 degree diagonal, correct image diagonal, finder scope, Sirius Plossl 25mm eyepiece, Sirius Plossl 12.5mm eyepiece, Moon filter, Optics Cleaning Kit  
**Make an offer.**

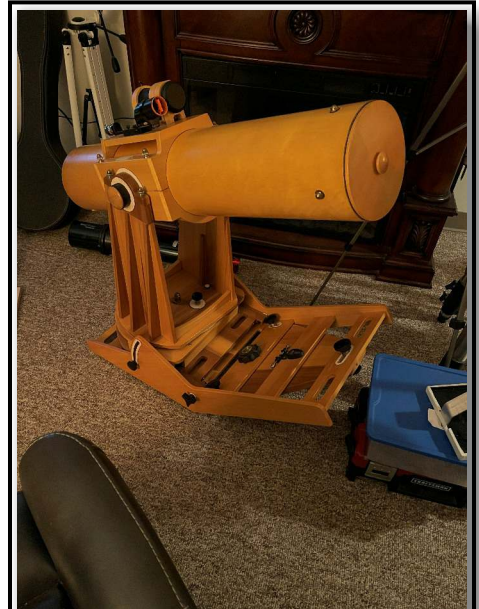
For sale by the VAS.  
Jack St. Lois 802-857-5049 or  
[jack.st.louis@comcast.net](mailto:jack.st.louis@comcast.net)



## Wanted

**Wanted** - First telescope program - I am working to recycle old 4.5" reflectors to construct starter Dobsonian telescopes for first time users. I am looking for donations of old telescopes, 1 1/4" rack and pinion focusers, Plossl eyepieces and other parts..

Contact Keith Lawrence, 802-453-5496, [sleepingbearwoodworking@yahoo.com](mailto:sleepingbearwoodworking@yahoo.com)



**6" F/8 Newtonian**, homemade by C.J. Park, won Stellafane award in 2006, gold-coated primary mirror, alt-az & equatorial mount.  
**\$200.00 minimum**

For sale by the VAS.  
Jack St. Lois 802-857-5049 or  
[jack.st.louis@comcast.net](mailto:jack.st.louis@comcast.net)

**Meade model 390 refractor with alt-az mount**, 90mm f/11  
**\$100 or best offer**

For sale by the VAS.  
Jack St. Lois 802-857-5049 or  
[jack.st.louis@comcast.net](mailto:jack.st.louis@comcast.net)





**Light duty machining for custom brackets/adapters and modifications to existing hardware for astronomy purposes.**

Nominal fee (~\$10 - \$50 depending on size and complexity).

I have a mini milling machine and a mini lathe.

Paul Walker 802-388-4220 or paulwaav@together.net

### Celestron NexGuide Autoguider

I purchased used at the Stellafane Swap Tables as a backup to the one I am using, however, I forgot had already purchased a backup at the Swap Tables the previous year. I don't really need 2 spares.

**\$140 OBO.** (\$300 new)

It is a stand alone autoguider, does not use a computer, connects directly to your mount's autoguider port. Has an screen for displaying stars and menu.

**Note:** to use this you will likely need a an 80-90mm guide scope to find a star to guide on (I use a 90mm and get down to mag 7). You will also likely need a way to aim the guide scope at a suitable star. There is now a commercially available guide scope aligner, Google Lftscop.

Paul Walker 802-388-4220 or paulwaav@together.net

**Celestron alt-az tripod** for sale by the VAS. **Make an offer.**



Jack St. Lois 802-857-5049 or jack.st.louis@comcast.net

### First Telescope Program

With the support of the VAS Board, I am developing a First Telescope Program for new members of the club. For now I am seeking a few of the old 4 1/2" f/8 Newtonian telescopes that I can renovate, fit with 1 1/4" rack and pinions and eyepieces then outfit with Dobsonian mounts. **My target is to sell these to club members for \$100 or non-members for \$125.** For the first year the new owners can return it for full refund in case of non-use or to upgrade, etc. After a year the refund will depend on condition. Sales will depend on availability of telescopes and components, so if you have old telescopes, eyepieces or parts you want to sell or donate or if you know of someone who would like an inexpensive telescope that really works, please contact me.

Contact Keith Lawrence, 802-453-5496, sleepingbearwoodworking



### Observing Aids for sale

**Observing chairs** - Enjoy longer observing sessions. Adjustable seat height for comfort and better viewing. **Starting at \$90.**

**Binocular parallelogram mounts** - Raise and lower your binoculars while maintaining an object in the field of view. Work well for use with lounge chair for observing at higher elevation or for multiple observers of different height. I will fit your binoculars to the mount for optimum performance. **Starting at \$195.**

**Binocular mount for your tripod** - replace the bracket with a system that keeps the binoculars in balance. Find an object, release the binoculars and they stay where their pointed. **\$50**

**Clip on red book lights** with variable brightness - I am working on modifying these for use on clip boards etc. If you have an interest please email or call me to discuss your need.

Contact Keith Lawrence, 802-453-5496, sleepingbearwoodworking@yahoo.com

### Telescope mirrors and a couple mounting cells

**3.5" f/10** with 3/4" diagonal.

**6", probably f/8.**

**8", probably f/8**, in nice cast aluminum cell.

**10" f/9, 1/10 wave** (measured by Bob several years ago), Beral coating that is in good condition though the edge has several chips (edge not beveled) and a note from the coater says there are a few scratches and it is not fully polished (may be saying that because of the scratches). From St. Michael's College.

Other than the 10" f/9 I cannot vouch for the figure of the mirrors.

The only one that may be Pyrex is the 8" mirror, I'd have to pull it out of the cell and look again. The rest have the slight greenish-yellow tint of plate glass.

**Make an offer on any of the items.**

Paul Walker 802-388-4220 or paulwaav@together.net