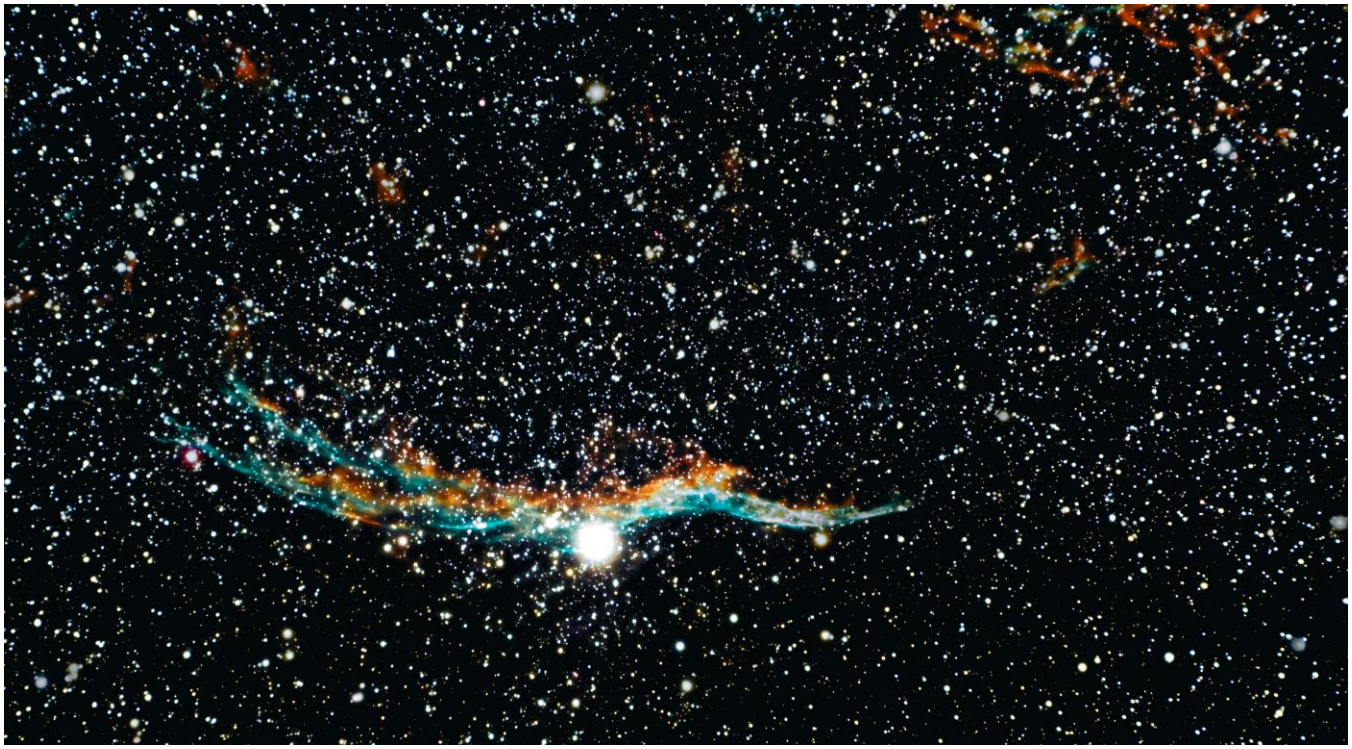
SkyWAAtch

The Newsletter of Westchester Amateur Astronomers

November 2020



NGC 6960, Western Veil Nebula, "The Witch's Broom" by Tony Bonaviso

The Veil Nebula, a supernova remnant in Cygnus, is visible as two distinct parts spanning three degrees of sky. The western segment has many nicknames, "Witch's Broom" being the most common moniker but it's sometimes called the "Finger of God," perhaps by those astronomers put off by the idea of witchcraft but still willing to reference the supernatural. It's a frequent target for astrophotographers, who like to bring out the contrast between red hydrogen and blue oxygen and sulfur. The other visible part of the "Cygnus Loop" is the Eastern Veil, NGC 6992.

The Veil is the ejecta of a 20 solar-mass star that exploded between 10,000 and 20,000 years ago. It is about 2,400 light-years from Earth. It shines at magnitude 7.0, but has very low surface brightness, making it a difficult visual object unless the sky is dark or the telescope has a substantial aperture. Nebula filters also help. The Western Veil was discovered by William Herschel on Sept. 5, 1784. The bright star in its midst is 52 Cygni.

Astro-tech AT92 triplet, Skywatcher EQ6r-Pro Mount, ZWO ASI294 MC Pro camera. Captured with Astrophotography Tool V3.86, guided with PHD2, processed in Pixinsight with star reduction. 40x300 sec @ -10C, 21 dark frames @300 sec@ -10C. 50 bias frames, 21 flat frames. Made at Ward Pound Ridge Reservation.

WAA November Meeting

Friday, November 6th at 7:30 pm

On-line via Zoom

Check your email or WAA web site for the link

BLACK HOLES: Not so black?

Willie Yee

Recent years have seen major breakthroughs in the study of black holes, including the first image of a black hole from the Event Horizon Telescope and the detection of black hole collisions with the Laser Interferometer Gravitational-Wave Observatory. Dr. Yee, a NASA Solar System Ambassador and Past President of the Mid-Hudson Astronomical Association, will review the basic science of black holes and the myths surrounding them, and present the recent findings of these projects.

Pre-lecture on line socializing with fellow WAA members and guests begins at about 7:15 pm.

Also In This Issue

WAA December Meeting

Friday, December 4th at 7:30 pm

On-line via Zoom

Intensity Mapping of the Large Scale Structure of Matter

Paul O'Connor, Ph.D.
Brookhaven National Laboratory

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

Starway to Heaven

Ward Pound Ridge Reservation, Cross River, NY

Saturday, November 7th (sunset is at 4:42 p.m. EST). Rain/cloud date Saturday, November 14th (sunset is at 4:35 p.m. EST). Pandemic restrictions are still in effect. Bring your scope and your mask!

New Members

Rick Faery	Rye
Wayne Forrest	Briarcliff Manor
Michael Kula	Cross River
Matthew Pass	Scarsdale
Robert Sour	Bedford

Renewing Members

Satchi Anderson	Tuckahoe
Michael Lomsky	Wilton
Kevin Mathisson	Millwood

WAA Members: Contribute to the Newsletter!
Send articles, photos, or observations to waa-newsletter@westchesterastronomers.org

Editor: Larry Faltz
Assistant Editor: Scott Levine
Almanac Editor: Bob Kelly
Editor Emeritus: Tom Boustead

ALMANAC For November 2020

Bob Kelly, WAA VP for Field Events


3Q
11/8

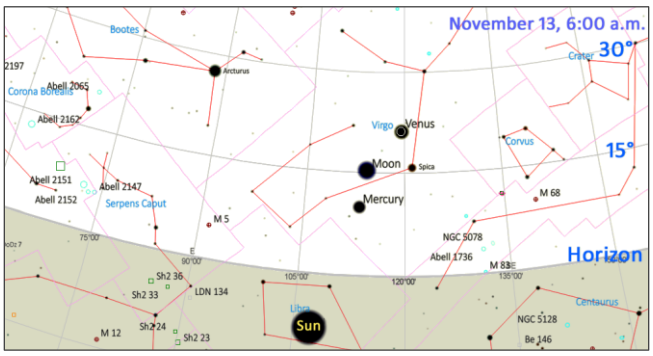

New
11/15


1Q
11/21


Full
11/30

Mercury has popped out into the morning sky. It will be out there all month, above and slightly to the right of where the Sun rises. We get the best morning view of Mercury in 2020 in early November as it ranges 19 degrees from the Sun at its greatest distance on the 10th. At magnitude -0.6 at mid-month, it will get brighter but be closer to the Sun in the last part of November. **Venus**, fading but still crazy bright at magnitude -3.9, is getting lower, seemingly wants to follow Mercury into the twilight's glow. From the 12th through the 14th, the **Moon** seems to skip through the scene with Mercury and Venus, near them in the western hemisphere's morning sky. It should be nice for some wide-angle photographs.

Mars is that ruddy dot up in the southeast at sunset. No need to have to try to find it in the ground clutter, like **Jupiter** and **Saturn** this year. It's fading and shrinking like a shirt washed in hot water, as we zip away from the desert planet in our faster inside track. This month is the last good look at surface features on Mars for many years to come. Look for a night with steady seeing and use high magnification.



Speaking of the giant planets, **Jupiter** is sliding over nearer to **Saturn**, passing about a degree from **Pluto** on its way around the 10th. The distance between Jupiter and Saturn shrinks to four Moon-widths by the end of November. Jupiter is still bright, but Saturn looks dingy by comparison, at magnitudes -2.1 and +0.6, respectively. Our gas giants start the evening low in the southwest, setting just after 9 p.m. at the start of the month, by 8 p.m. at month's end. The Moon poses nearby on the 19th, but not between them in our evening sky.

Look for Saturn's two-sided moon **Iapetus** at around magnitude +10 in the first part of the month. **Titan**, **Rhea**, **Tethys** and **Dione** are as bright or brighter, but, except for Titan, they are closer to the planet than Iapetus and harder to see.

The **Moon** is at perigee 17 hours before new moon near midnight on the 15th. Perigee so near to a Sun/Earth/Moon lineup can have enhanced effects on tides, especially if a nor'easter comes up the coast in the days following perigee.

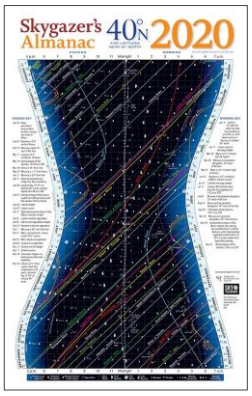
A question for observers will be whether it is worth getting up early for the penumbral lunar eclipse before dawn on the 30th. About 80 percent of the Moon will have a partial eclipse of the Sun, producing a slight shading on the northern part of the Moon. None of the Moon gets into the Earth's darker umbra. It's most noticeable from 4:10 to 5:10 a.m. Since most of the darker maria are in the northern part of the Moon, the contrast may be more noticeable than usual for a penumbral eclipse.

Guy Ottewell says the Moon has its largest apparent tilt toward us in 2020 on the 24th, when the northeastern limb, with a little dark spot called **Mare Humboldtianum**, is more visible to us than usual. Hey, it's a nice just-past-first-quarter view of the Moon in the evening sky anyway. The next night, Thanksgiving Eve, the Moon joins the feast just below Mars. **Uranus** and **Neptune** flank Mars, properly distanced, in the same part of the sky. In a telescope, Uranus looks one-quarter the size of Mars' disk. Take a peek, since it rises up with Aries after dark at magnitude +5.7, which is about as bright as it gets just past opposition on October 31st. Neptune leads the way in Aquarius, and is pretty nice, too, at magnitude +7.9 and 25 percent smaller than Uranus.

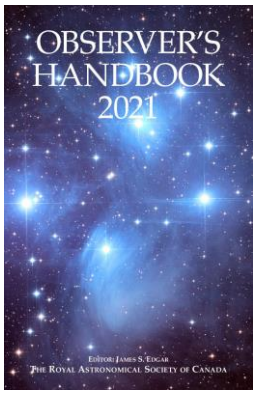
The **Leonid** meteors peak with no moonlight on the morning of the 17th. You might see 10 meteors per hour. They are fast, but bright.

The **International Space Station** is visible in the morning sky through the 12th; in the evening starting on the 17th. ■

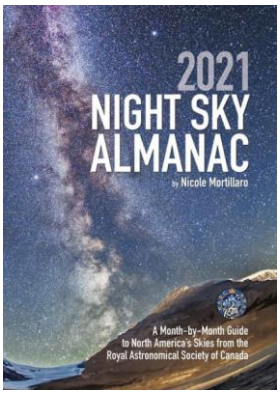
Preview of Annual Astronomy Observer's Guides



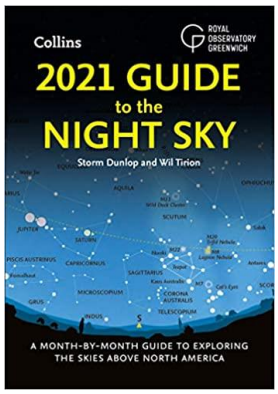
Sky & Telescope's annual *Skygazer's Almanac* (the graphical almanac) and *Sky Watch 2021* will be out soon. https://www.shopatsky.com/resource-materials



Observer's Handbook 2021 – The Royal Astronomical Society of Canada is taking orders. They project it'll be delivered in November. https://tinyurl.com/RASC2021

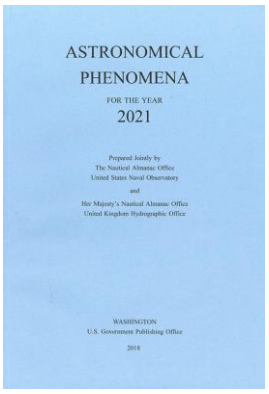


2021 Night Sky Almanac: A Month-by-Month Guide to North America's Skies also from the Royal Astronomical Society of Canada. This is more of a basic guide than the *Handbook*, and is sold in bookstores.

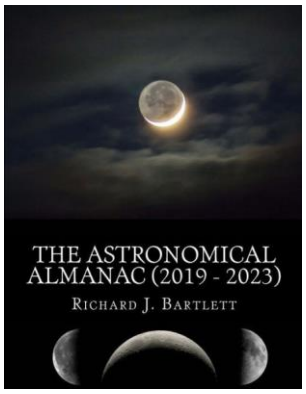


2021 Guide to the Night Sky by Dunlop and Tirion. Available December 1st from bookstores. 2019's edition had some errors and omissions, so read the reviews before ordering.

Guy Ottewell's *Astronomical Calendar for 2021* is in the form of a 27-page chronological listing of sky events in pdf format. Available at https://tinyurl.com/Ottewell2021



USNO Astronomical Phenomena for 2021 from the US Naval Observatory is listed on the US Government Bookstore site, https://bookstore.gpo.gov/products/astronomical-phenomena-year-2021. Will be available January 1, 2021.



The Astronomical Almanac (2021-2025): A Comprehensive Guide to Night Sky Events Paperback by Richard J. Bartlett. Highly detailed. This is an update to the previous versions. The previous edition, shown above, is still good for 2021. Sold in bookstores.

Astronomy Magazine, in past years, had an annual preview in their December issue and a larger, month-by-month analysis of the upcoming year in their January issue.

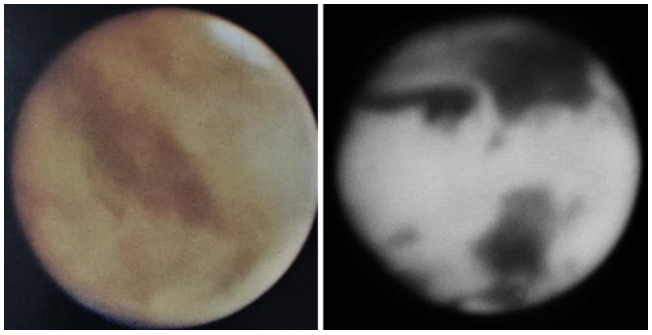
Complied by Bob Kelly

From the Editor: Mars in our Eyes and Imagination — Larry Faltz

Many WAAers spent time at the eyepiece looking at the red planet around the time of its close approach on October 6th. A rare week of consistent good weather and a few good nights the following weeks made for some really rewarding viewing. I was intensely drawn to this event, perhaps because my chances of being around for the next very close approach in 2035 are a bit iffy, considering I'll be a late octogenarian, if I'm anything at all. I also spent time imaging and exchanged tips with some other club members whose pictures are also in this issue.

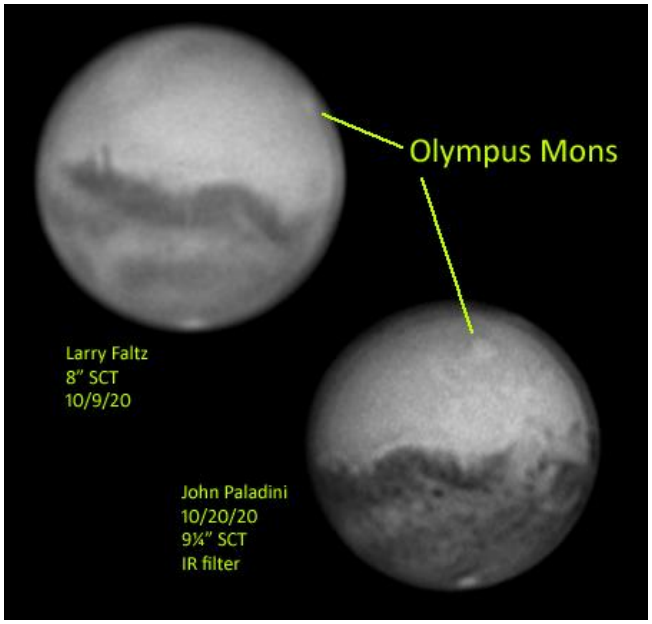
John Paladini and I exchanged emails about our equipment, techniques and experiences throughout this year's apparition. Right after closest approach he sent me this note:

We can now as amateur imagers beat film photos of the great observatories, but what can they do now by stacking CCD images? Here is a Pic du Midi shot of Mars showing Olympus Mons on the right and Gale Crater on the left. Yes, a 36-inch telescope can pick up craters on Mars from Earth! Good thing they did not have this back in 1890's, or no *War of the Worlds* or those canal paintings!



John also sent me a color film image of Mars taken with the 200-inch telescope on Mt. Palomar, and I found another Hale image, this one b/w through a red filter, on the internet. It's dated 1956. We put those images to shame now with a small telescope and a $250 camera.

As we traded more images, we realized that we had both managed to capture Olympus Mons with our SCT's and inexpensive planetary cameras.



John wrote

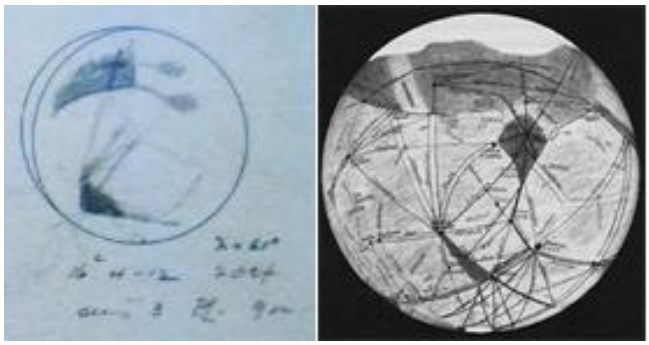
> I never thought the day would come when you can resolve that (Olympus Mons) with modest backyard equipment.

We are the beneficiaries of technology that Percival Lowell (not to mention Galileo, Huygens, Messier, Herschel, Hubble and thousands other observers of our great astronomy heritage) could not have possibly dreamed of.

Percival Lowell was convinced that he saw canals on Mars and made drawings and some sophisticated maps, but what did he actually see? He viewed with a superb 24-inch f/16 refractor,[1] and usually viewed at 400-500 power. He was also known frequently to stop the objective down to 12-16 inches to reduce chromatic aberration from the bright planet. That would also reduce the resolution slightly, although wave front error due to less-than-perfect seeing would be reduced, a reasonable compromise. De-

[1] The Alvan Clark refractor at Lowell is used for public outreach. I viewed Saturn through it in April 2011 at about 250X, and the view was indeed spectacular.

pending on the distance to Mars, the planet's disc at high magnification would have appeared to him to be one or maybe two fingerbreadths held at arm's length, reasonably large to see some detail, but perhaps not much more than in our small-scope images these days. The transcription from what he saw at the eyepiece to what he set down in his notebooks had to suffer from various optical phenomena as well as what we might call the "psychology of vision," typically illustrated by the well-known vase/faces drawing and other illusions. Our images suffer somewhat from some similar technical anomalies due to the compromises inherent in "lucky imaging" and in processing algorithms. Robin Stuart explains more about this on page 15.



(L) From Lowell's observing notebook; (R) one of Lowell's maps

In spite of the obvious advantages and amazing results of planetary imaging with modest equipment, there is still the allure of seeing the actual photons that bounce off Mars. The eyepiece view requires patience. You clear your mind for those brief moments of clarity when the outline of a surface feature fleetingly comes into view. One needs Zen-like focus (and actual telescope focus) in order to catch those tiny features. An 8-inch SCT has a focal length of 2032 mm. A sharp 5-mm eyepiece will give 406X, but our sea-level, suburban atmosphere will rarely allow us to see clearly at that magnification. My best views were with the 8" Celestron SCT, Denkmeier binoviewer, a pair of 13-mm Televue Nagler T6's and the bino's 2X PowerSwitch, giving 313X. Using both eyes eliminates the tension involved in keeping one eye closed, and it averages out the impact of floaters and small lens opacities common to older eyes. I tried to hold the sharp image in my head and reconstruct its surroundings even as the view blurred until the next moment of clarity came along. I wondered if my exhilaration was similar to Lowell's

Christiaan Huygens scratched the saying *Admovere oculisdistantia sidera nostris* onto the edge of the small singlet lens he used for the discovery of Saturn's moon Titan in 1655. Yes, the telescope brings the distant stars (and planets) closer to our eyes, not close enough to show what we know is on the surface courtesy of Viking, Mars Reconnaissance Orbiter and all our landers and rovers, but close enough to feed our imagination in a way that is more animate, more emotional than the other planets.

Jupiter's bands, and even the Red Spot, are just so many smoke rings. When I see Saturn's rings, I think of ice cubes. We never visualize ourselves on the surface of these planets because they have no surface. Venus is just haze. It has a surface but we reflexively dismiss it: we can't picture ourselves at 864° F, breathing CO_2 at 96 atmospheres, pelted by sulfuric acid rain. But Mars is a *place*. Let's try looking at it with the same innocence and even hopeful ignorance as Lowell. Not only are we observing, but we are also channeling Lowell's imagination. We can never get the idea of the canals and their desperate Martian builders out of our minds. They became H.G. Wells's invading cephalopods in their tripods, the "Old Ones" of Robert A. Heinlein's *Stranger in a Strange Land*, the caricatures of Tim Burton's *Mars Attacks!*, the four-armed Green Martians of Edgar Rice Burroughs's *Barsoom* novels, the elegant, refined, doomed beings of Ray Bradbury's *Martian Chronicles*, and countless others, some profound, others banal, to entertain and even educate us.

Would our drive to search for life on Mars be quite as intense, or as compelling to the public, without all of that imagining? Yes, Mars is a cold, arid, empty place, as we know from the 56 years of space exploration that have passed since Mariner 4 destroyed the hope of finding life on the surface of Mars. But at the same time let's reflect that it was once very likely a dwelling place for living organisms that might have left some remnant of their existence. Can we look at its surface, even if only with our small, amateur telescopes, without wanting to see, hoping to see, a Martian? Lowell's confabulations enrich our viewing experience 120 years later. It would have been sadder for us if he had seen the real Mars. ■

Member Profile: John Higbee

Home town: St. Louis, MO, now living in in Arlington, VA.

Family: Married for 39 years (Carol); four children (Kate, Jeanne, Jake and Trish); six grandchildren.

How did you get interested in astronomy? I took Earth Science in 7th grade from the best teacher I ever had, and fell in love with astronomy. I wore out the "520" (Dewey Decimal System for Astronomy) section of every library within reach. My first telescope was a Tasco 60-mm refractor; in high school, I got a used Edmund 4¼-inch reflector.

What did you see? I got the 60-mm for Christmas, so I saw the Pleiades, M42, the Moon, M41, and open clusters in Auriga and Perseus. There were lots of "oohs and aahs" from me and my family!

What's your favorite object(s) to view? Planets: I can't get enough of Jupiter and Saturn; Double Stars: Albireo and Epsilon Lyrae (the "double double"); Deep Sky Objects: globular and open clusters (starting with the Messiers, and branching outwards).

What kind of equipment do you have? I bought my first big telescope, a Celestron C8 Orange Tube, in 1976 and still use it today! I also use a C14 Orange Tube and a Meade ETX125PE for "grab and go," along with a set of Zhumell 25X100mm large binoculars on a binocular mount. My eyepieces center on a set of three University Optics Konigs, along with a set of four Explore Scientific 82-degree eyepieces, and three early TeleVue Naglers.

What kind of equipment would you like to get that you don't have? None. I'm an "analog" kind of astronomer – not all that passionate about go-to technology or astrophotography – and am quite comfortable with "star-hopping" and not being at the mercy of finicky electronics. Also, I have found that the older, "classic" telescopes from the '40s, '50s and '60s are generally built better and are more durable than their modern counterparts. I have what I need.

Have you taken any trips or vacations dedicated to astronomy? Went to my old home grounds (Missouri) for the 2017 total eclipse…and beautiful weather, with a family reunion to boot! (For more details, see my report in the October 2017 SkyWAAtch). Also went to the 2015 Almost Heaven Star Party at Spruce Knob WV, four glorious nights at 4300 feet altitude and Bortle "black sky" conditions!

Are there areas of current astronomical research that particularly interest you? I'm really interested in the huge amount of new research on Ceres, Mars and the moons of the gas giants, as well as Pluto. It looks like the Solar System may not be as inhospitable to us as we used to believe!

Do you have any favorite personal astronomical experiences you'd like to relate? First, the November 2019 transit of Mercury, which I viewed through the U.S. Naval Academy's 7.75-inch Alvan Clark refractor, built in 1857. We did outreach for USNA personnel. Certainly the 2017 solar eclipse and the 2015 AHSP (best skies I ever observed under) are also personal favorites. I hope to see another "brilliantly visible comet" sometime soon!

What do you do in "real life"? I'm a Naval Academy graduate and was a career naval officer, retired in 2002. I served on submarines and commanded a ballistic missile submarine in the early 1990s. Since leaving the Navy, I have worked as a program manager in both the Department of Defense and the Department of Homeland Security. I also volunteer at the Naval Academy as a mentor in the USNA Physics Department, and as the Manager of the Naval Academy Observatory, housing that historic Clark refractor. I plan to retire from "day jobs" in 2021 and relocate to the dark skies in Virginia's Northern Neck.

How did you get involved in WAA? I bought a former WAA president's C14 from the club and restored it. I met Larry Faltz and John Paladini, we became friends and I joined the club.

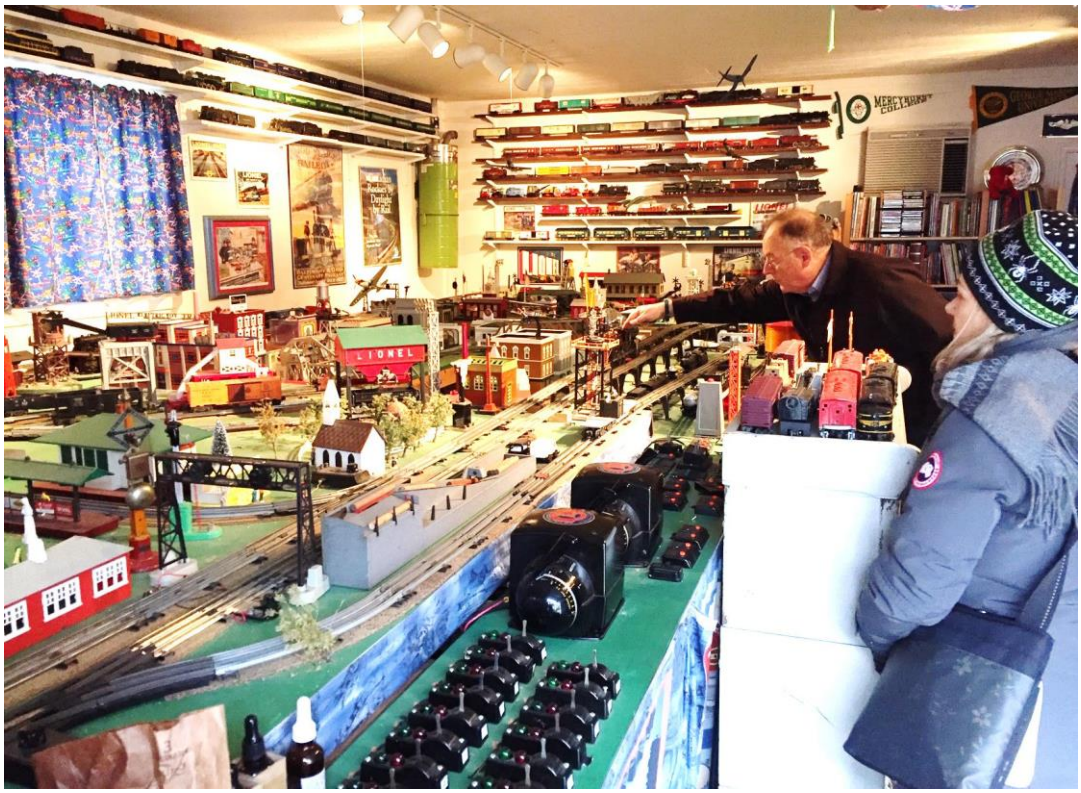
What WAA activities do you participate in? Due to being the most-distant active member of WAA, I mainly help by manning the WAA booth at the annual NEAF at Rockland Community College!

John Higbee and the 7.75-inch Alvan Clark refractor, on the US Naval Academy campus.■

John at NEAF in 2018

John is being modest. In addition to what he's written, he's also a skilled restorer of classic telescopes and is currently working on bringing WAA's 1948 Saturn 6 back to life. It's one of the very few (possibly just 3) Tinsley 6-inch f/15 refractors ever made. John has restored a number of other telescopes and mounts and often staffs the Classic Telescope booth at NEAF.

I couldn't resist showing John's astonishing collection of Lionel model trains. It's set up in his garage in Arlington, Virginia, not far from George Washington's estate, Mount Vernon. He also plays the tuba, which I thought was an interesting instrument for someone who worked on a submarine. (The Editor)



John Higbee showing his Lionel train collection to Elyse Faltz, January 2020

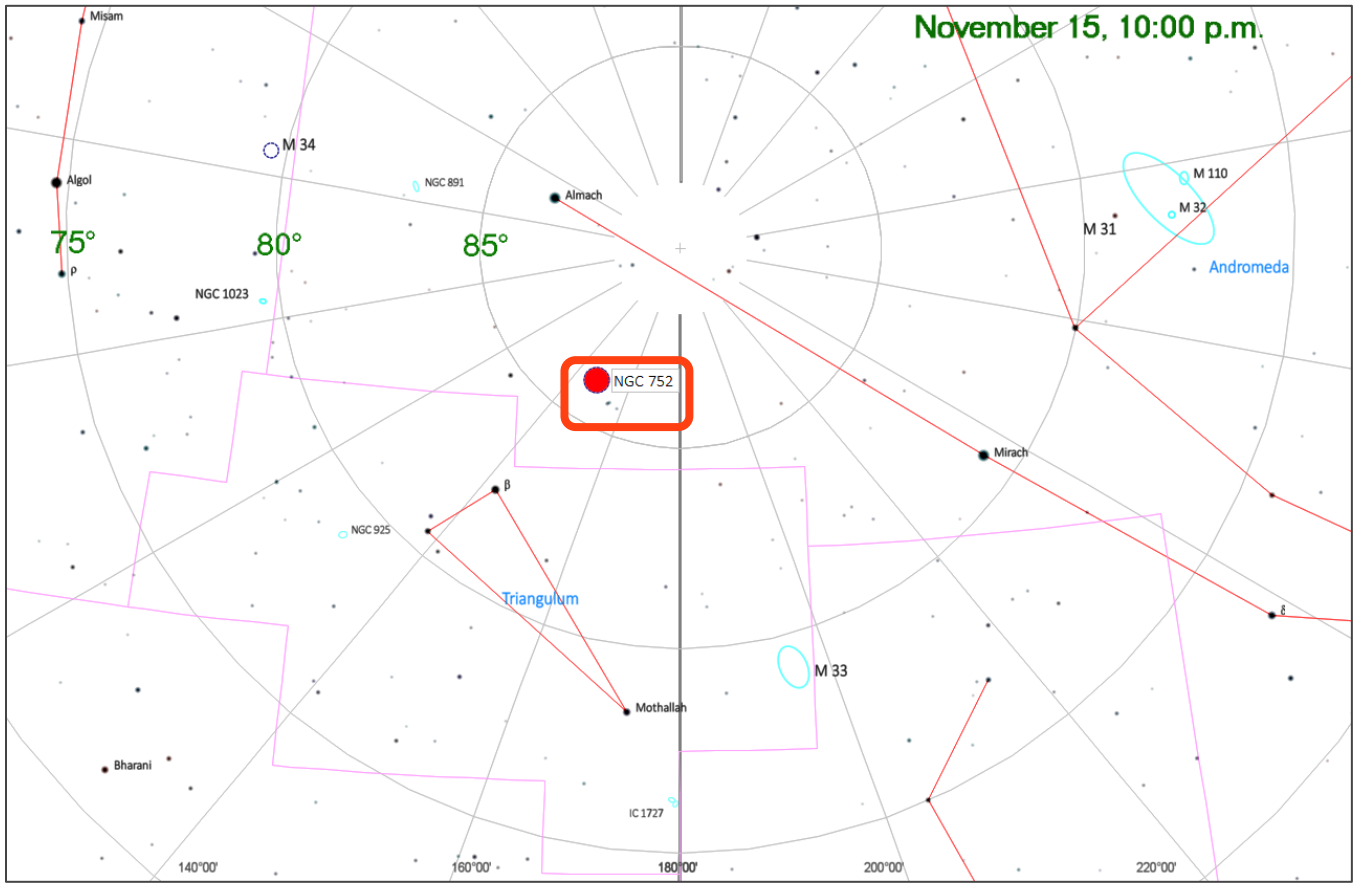
November Deep Sky Object of the Month: NGC 752

NGC 752	
Constellation	Andromeda
Object type	Open Cluster
Right Ascension J2000	01h 57m 41s
Declination J2000	+37° 47.1’
Magnitude	5.7
Size	75 arc-minutes
Distance	1,300 LY
Other ID	Caldwell 28 Collinder 23

This large and diffuse cluster, high overhead in November , was discovered by Caroline Herschel in 1783 although it might have been glimpsed by Giovanni Battista Hodierna before 1654. It’s bright enough to be a naked-eye object in very dark skies, and is a fine sight in binoculars. It is said to consist of 258 stars, of which 15 are red giants. It may be two billion years old, among the oldest of the open clusters. It will be seen best in a wide-field telescope at low power.

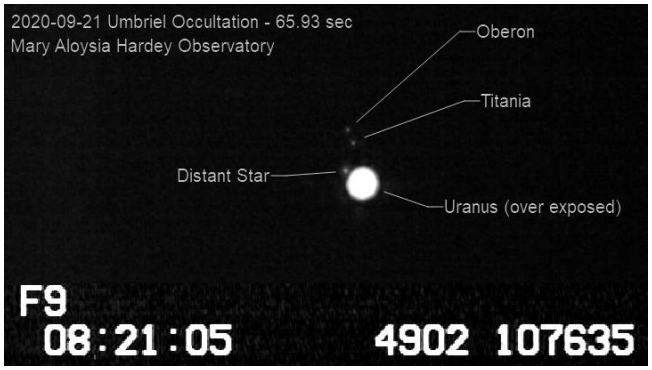
NGC 752: Visibility for November

10:00 pm EST	11/1/20	11/15/20	11/31/20
Altitude	76° 55’	86° 05’	80° 05’
Azimuth	99° 19’	147° 31’	254° 22’



Occultation of a Distant Star by Uranus' Moon Umbriel — Rick Bria

On September 21, 2020 at 08:23:12UT, Umbriel, a moon of Uranus, occulted (blocked the light of) star UCAC4 552-004081 ("Distant Star" for short), a magnitude 13.7 K star in Aries. The occultation was very difficult to record due to poor sky conditions and other related factors, including smoke from fires in the western U.S.



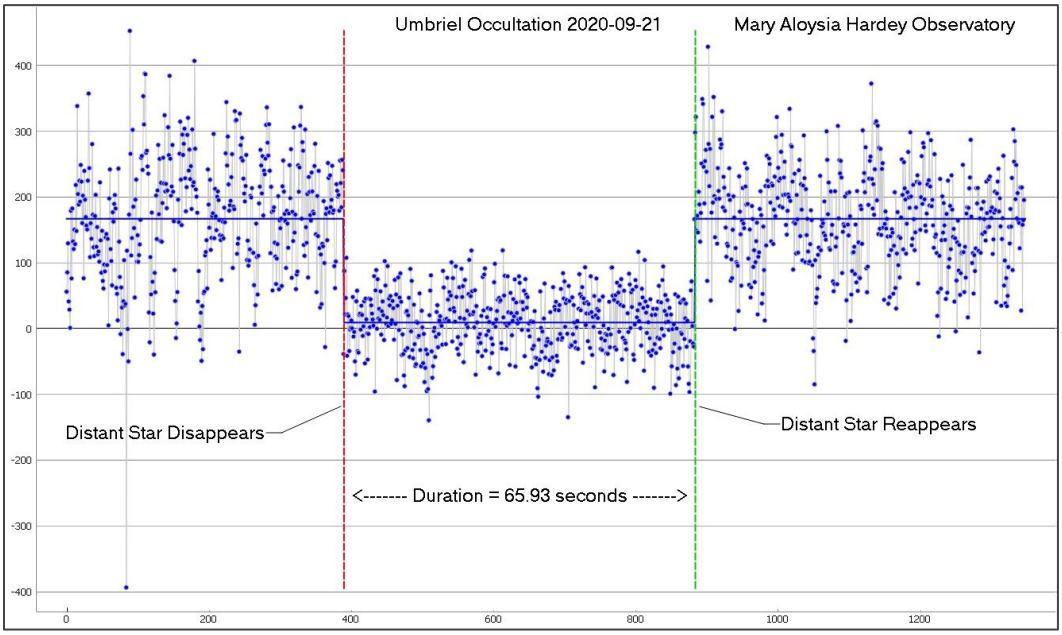
The image is a stack of 50 video frames to better show objects involved in this event. The individual video frames were extremely noisy, but stacking provided a clearer image. Distant Star is visible, as well as the moons, Oberon and Titania, but Umbriel is invisible since it is at least 1 magnitude fainter than the star. Uranus was extremely bright at magnitude 5.7. In order to record the star, Uranus had to be overexposed in the video. Overexposure bloated and enlarged the planet enough that it almost encompassed the star. In the end, we reached a compromise between under-exposing the star and overexposing Uranus. The picture represents the view about 2 minutes before the occultation.

Although it was our most difficult occultation to date, the Mary Aloysia Hardey Observatory successfully recorded Umbriel occulting UCAC4 552-004081 for a duration of 65.93 seconds. The predicted maximum was 68 seconds, indicating we were very near the center of Umbriel's shadow as it swept across planet Earth.

The brightness graph below clearly shows the star was blocked when occulted by Umbriel. Each dot represents a brightness measurement and a time stamp of the star from each video frame.

Professional astronomers have already requested and received our data. Dr. Altair R. Gomes, an astronomer at São Paulo State University, told us: "We hope to publish these data in a future publication comparing them with Voyager observations." Our data from the Mary Aloysia Hardey Observatory will be combined with several other observers across America. Dr. Gomes plans to compare data from this event with the Voyager spacecraft data from 1986 as it flew by Uranus.

It's amazing how much information can be extracted from occultations. For example, rings around Uranus were discovered with this technique. When the combined data is analyzed, perhaps something new will come to light.



From the Junkyard Astronomer: The Apodizing Mask — John Paladini

Excerpt from a 1974 discussion:

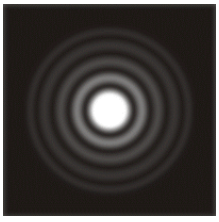
> Me: Ok, so let me get this straight, you want me to take some window screen, the kind you find on any common window, the stuff that is used to keep flies out of the house, cut it up and place in the front of my telescope. That's going to improve the image?
>
> Friend: Basically yes with certain restrictions and caveats.
>
> Me: Did you smoke something lately?
>
> Friend: No. It's called an apodization mask. Let me explain....

So that was how I found out about apodizing.

I sent a few images of Mars taken with an 8-inch SCT to SkyWAAtch editor Larry Faltz (see the Images section of the October newsletter). I noted that a few images were taken with "apodization." Larry sent me an email wanting to know what software I used to perform the apodization function.

My reply was that it was not software, but *hardware*. I attached a picture of the device I had made. I quickly received a reply stating "you MUST write an article about this!" I laughed because it feels like Larry had a similar "you must be kidding me" moment like I had 46 years ago.

So what apodization and what is an apodizing mask?


Airy Disk

Apodization is a filtering process to remove the "feet" of an Airy disk ("pod" in Greek is "foot," so "apod" is "no foot").The Airy disk is the best focused point of light that a circular telescope can make. It is what you see when looking at a star on a steady night. The intensity (y-axis height) of an Airy disk is actually a Fourier transform (a mathematical function) of the wave front, similar in overall shape to the "normal distribution" curve many a student struggled with in statistics class. The main difference is that the airy disk function has smaller "bumps" on either side of the maximum of the function. You can go to the Wikipedia article on "Airy disk" if you want more math torture and more definitions.

The apodization process (sometimes called "anti-diffraction" or "selective shading") pushes those outer rings (feet) towards the center (main core) of the Airy disk. H. R. Suiter said it best when he described it as "the same as taking a broom and traveling around the image, sweeping all the remaining intensity towards the center."

So what is the practical everyday use of this filtering process?

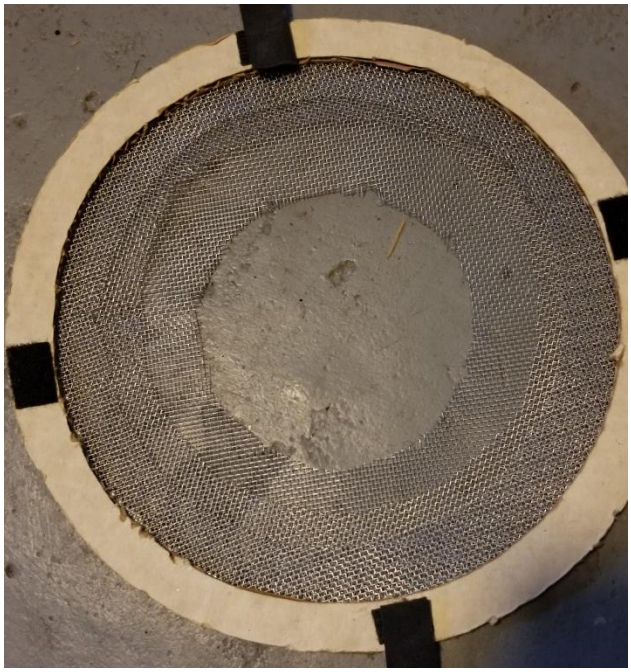
It will help to increase contrast features of low spatial resolution features. It also helps resolve closely split double stars just inside a telescope's resolution limit. It also helps in smoothing out the effects of bad "seeing." This is the reason cited most by ATMers who use this filter. Using an APD filter to improve seeing works better than an aperture diaphragm. Stopping down the aperture makes an image appear steadier by reducing the area that sees atmospheric turbulence, but at the cost of reduced resolution.

The ideal apodization (APD) filter is a selective neutral density filter on a piece of optical glass which fits over the objective of the telescope. It is clear in the center and slowly gets darker towards the outer edge. However it seems this must be a difficult thing to make. Except for some very small versions that are in camera lenses (and that cost a lot!), no one seems to make these filters. I contacted Baader Planetarium, maker of many unique astronomy products. They make the Mylar film used in solar filters and glasses. I thought that this high quality film might be modified to make an APD filter. But I got this response: "Unfortunately we do not offer such a film. We are specialized in AstroSolar film and have unfortunately not the possibility to produce any other film. Very sorry and thank you for your understanding."

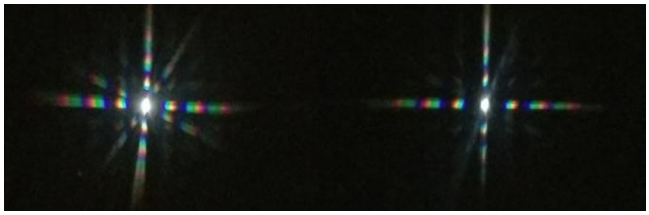
So what is an ATMer to do? Luck would have it that back in June 1954 an article appeared in *Scientific American* magazine by A.S. Leonard, describing how to make an anti-diffraction (a.k.a. APD) screen using actual window screen material. Here's how he did it:

- Cut 3 round screens (metal screens preferred) to fit diameter of the telescope tube. Then cut a hole in each screen as follows 55% of objective diameter, 78% of the diameter, and 90% of the diameter(another formula, by Keene, suggests for refractors to use 52%, 76% and 88%).

- Orient each screen 30 degrees from each other.
- Glue on some sort of ring to hold the screens in place and provide some way to hold it on the front of the scope.



The APD screen acts like a weak grating. You will see a central black region that is about 100 arc seconds across surrounded by a spectral pattern that you ignore.



Vega out of focus (L) and in focus (R) through APOD mask

The screen works well to improve the view of small targets: planets, double stars, small comets. There are some important limitations, however:

- It will reduce brightness a bit.
- An APOD screen cannot be used on targets like the Moon or Sun or any target that is larger than central area.
- It reduces overall resolution in favor of clarity at the center.
- There is color fringing on the outer half of the field.
- There's no real gain for a well-made scope in great seeing conditions.
- It's more effective on scopes 6 inches or larger.
- Since it's made of screen material, you get a free Bahtinov-type of focusing mask.

This filter will not help errors such as spherical aberration turned down or turned up edges, astigmatism, pinched optics, zone errors or misaligned optics. However, it can help a little (but not provide a cure) for a rough surface by averaging the effects all the lumps and valleys. Back in late 1980's I picked up a Dynamax 8 SCT, made by Criterion, after success with their famous Dynascope RV-6 reflector. They wanted to compete with Celestron and Meade for the SCT market, which was displacing the RV-6. The Dynamax quickly got a very bad reputation because of its poor optics. Criterion never recouped its investment and went out of business. The scope's principal problem is that the corrector plate is very rough, so rough that it has what are called "dog biscuits." This problem causes softness in the final image. On the other hand the lines are pretty straight which means the underlying optical curves are pretty good.

Ronchi test image of my Dynamax-8

Rough optics mimic turbulence. Think of roughness as a turbulent wave front that is frozen into the optical glass. Indeed, according to Suiter, "roughness errors are difficult to distinguish from turbulence."

So I used my APD screen on my DX-8 and I felt I got some improvement. To be real strict about this claim I would have to do a whole series of images and do some statistic al work. Maybe later.

After this article was completed, I found a commercially-made apodizer, got one, and will test it out for a future article.

References:

- George T. Keene, *Star Gazing with Telescope and Camera* (1963) p 60-63
- Harold R Suiter, *Star Testing Astronomical Telescopes A manual for Optical Evaluation and Adjustment* (2009) pp 160-166 235-249
- An article on the Lake County Astronomical Society web site: https://tinyurl.com/Apodizer ■

The Westchester Amateur Astronomers Official Cookie — Eva Andersen

You can bet that WAA is the only astronomy club this side of the Oort Cloud (and probably on the other side too) that has its own official Club Cookie. For the past few years, Vice President for Membership (and honorary Chief Confections Officer) Eva Andersen, a nurse practitioner by trade but an astronomy and baking enthusiast by avocation, has brought a tub of these freshly-made cookies to our monthly club meetings, where they are enthusiastically gobbled up during the pre-lecture socializing.

Eva made a scientifically accurate version for the solar eclipse in 2017 that was the cover image of our October 2017 containing member reports on their eclipse experiences.

Since we can't have live meetings for the time being, Eva wanted everyone to bake their own and enjoy them while participating in our Zoom meetings.

Eva's Solar Eclipse cookies, 2017

The Cosmically Delicious Official Westchester Amateur Astronomers Cookie
By WAA Chief Confections Officer Eva Andersen

Ingredients:

- ¾ cup white sugar
- ¾ cup light brown sugar
- 2 sticks unsalted softened butter
- 2 eggs
- 1 teaspoon baking soda
- 1 teaspoon salt
- 1 teaspoon coconut extract
- 2½ cups flour
- 1 cup shredded coconut
- 2 cups total mixed baking chips divided between semisweet chocolate + butterscotch + white

Instructions:

This is easiest done in a stand mixer or with electric mixer.

- Mix sugars and softened butter. Add eggs and mix well.
- Add baking soda, salt, coconut extract and flour and mix well.
- Add shredded coconut and mix. Add 3 kinds of chips and mix well.
- Make teaspoon-sized balls of dough and drop onto slightly greased cookie sheet.
- Bake at 340° until just almost starting to brown. Take out and cool for 3-5 minutes before moving to cooling rack.
- Eat and enjoy.

My Spitz Junior Planetarium — Mike Cefola

Being a chemist, my dad always encouraged my interest in science and loved astronomy in particular. When I was eleven or twelve years old he bought me one of those Japanese white tube refracting telescopes that were sold in department stores, an Atco 60 mm f/15.[2] As it turned out the scope was very high quality and I still have it. The other item he got me was the Spitz Junior Planetarium. The views of the stars on my ceiling fascinated me and it really fueled my love of the night sky.

The Spitz Junior was developed by two Pennsylvania entrepreneurs. One was Armand Spitz, who had previously developed a projection planetarium for public use. The other was Thomas Liversidge, proprietor of the Harmonic Reed Corporation, a firm that produced musical instruments and toys.

The Spitz Junior is in the collection of the National Museum of American History on the Mall in Washington, D.C. The professional-grade model was the first projector used at Andrus Planetarium at the Hudson River Museum.

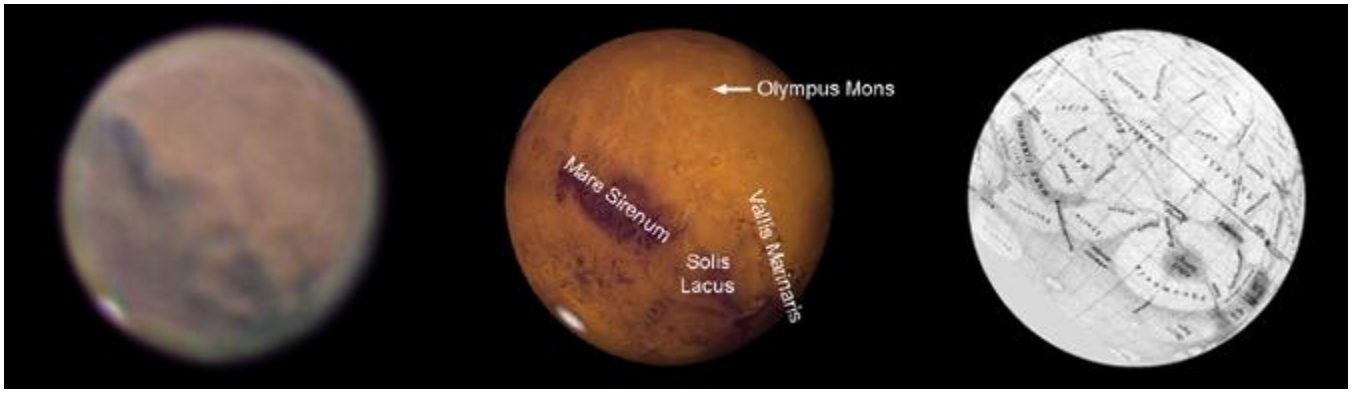
Ann and I have been clearing out our house which contains way to much "stuff," mainly thanks to me. This gem was found lying in the attic, where it had been for five decades. Finding it made me think that there might be many astronomy science toys or games that other WAA members, especially those who grew up during the 1950's space race, may have tucked away in their house. Let's see your cool vintage Astro toys and games. Send a photo and brief description and Larry will post it in the newsletter.

"Some toys are worth keeping for all times. I know I found one in my attic."

[2] Editor's note: The identical telescope is currently being advertised by a club member. See the Classifieds on the last page of this issue. I encouraged Mike to start an Atco collection. He quipped, "If I had two, I could make the Small Binocular Observatory."

Three Views of Mars

Robin Stuart



The three images above show the planet Mars as seen from Valhalla, New York on the morning of September 21, 2020 at 2:54 a.m. EDT, when the longitude of the central meridian was 136° W. The south polar cap is visible at lower left. The prominent bullseye at lower right is the *Thaumasia* region with *Solis Lacus* (Lake of the Sun) at its center. For obvious reasons it is sometimes called the *Eye of Mars*. The mighty chasm of *Vallis Marinaris* borders Solis Lacus to the west. *Mare Sirenum* (Sea of Sirens) is the elongated dark feature. The white arrow in the middle image indicates an area originally called *Nix Olympica* or Snow of Olympus. Now it is known to be the location of *Olympus Mons*, the largest volcano in the solar system.

The left-hand image was made with a Canon 60Da DSLR camera through a Televue NP127 telescope equipped with a 5× Powermate. BackyardEOS was used acquire 1000 frames which were graded and stacked by Autostakkaert!3; 280 frames were used for the final image, which was sharpened by Registax. Olympus Mons can be seen in the image![3]

The middle image is a computer-generated simulation using WinJUPOS, free software that can stack frames while compensating for a planet's rotation. It also contains quite a number of other useful features.

The right-hand image was constructed from Italian astronomer Giovanni Schiaparelli's 1881 Mercator projection map of Mars and transforming it into an orthographic projection representing the visible hemisphere using *Mathematica* code. Schiaparelli is well known for his observation and description of the Martian *canali* or "channels" in Italian. Perhaps unfortunately for him, *canali* naïvely translates into English as "canals," which carries with it an implication of artificial origins. The view that they were actually colossal engineering projects was adopted and promoted by wealthy Bostonian astronomer Percival Lowell who observed and sketched them from his observatory in Flagstaff, Arizona. The observations and existence of the canals remained controversial for many years with many observers failing to see them. The matter was conclusively settled by data returned from the Mariner 4 spacecraft flyby of Mars in 1965.

The canals on Mars are now understood to be optical illusions caused by a combination of poor optics and contrast effects at the boundaries between surface features of differing brightness.

Quite a number of years ago *Sky & Telescope* published a Letter to The Editor in which the correspondent showed a print made from a stack of photographic negatives of Mars. This was a technique employed to reduce photographic grain. Vague linear features could be discerned. The letter raised the question with words to the effect of "If they're not there…how come they're there?" A 2004 article[4] noted the appearance of canals similar to those sketched by Lowell in webcam images made by amateurs during the 2003 historically close opposition. In both cases however the canals were considerably broader than the fine gossamer lines drawn by Lowell and Schiaparelli. Sharpening by wavelets or an unsharp mask tends to emphasize the boundaries between differing surface

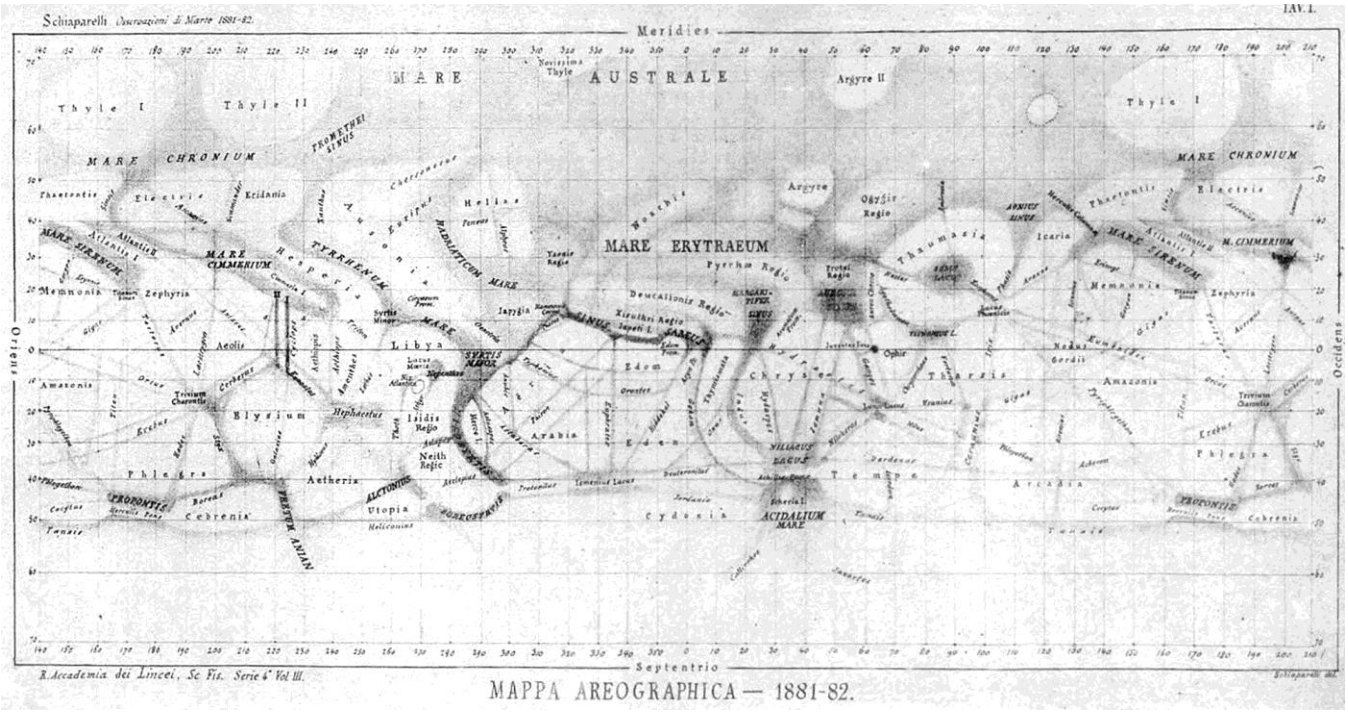
[3] You'll have to look closely, but it's really there. [Ed.]

[4] T. A. Dobbins, T. A. and W. Sheehan, The Canals of Mars Revisited, *Sky & Telescope*, March 2004, p.114–117

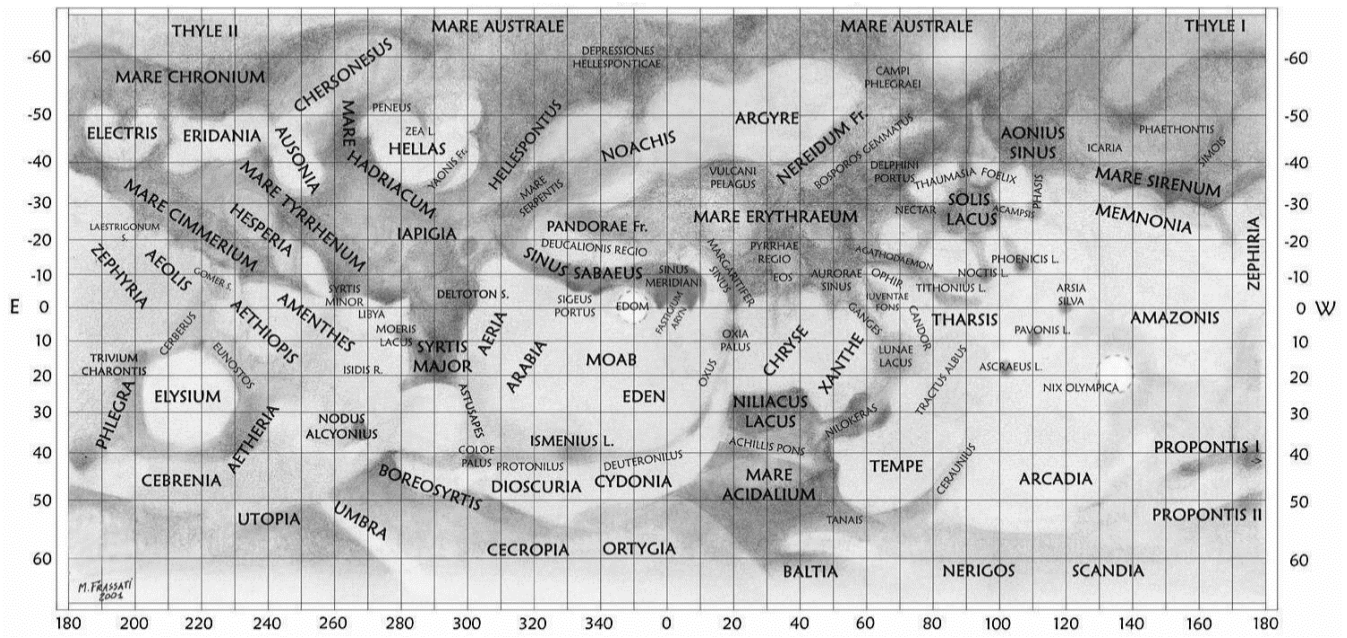
regions and may to some extent be mimicking what these early observers' visual cortexes were doing.

Look carefully at the light-colored surface area at upper right of the left-hand telescopic image above.

Does its subtly mottled appearance bear any resemblance to the network of canals drawn by Schiaparelli in the image at far right? I will leave that for the reader to decide. ■



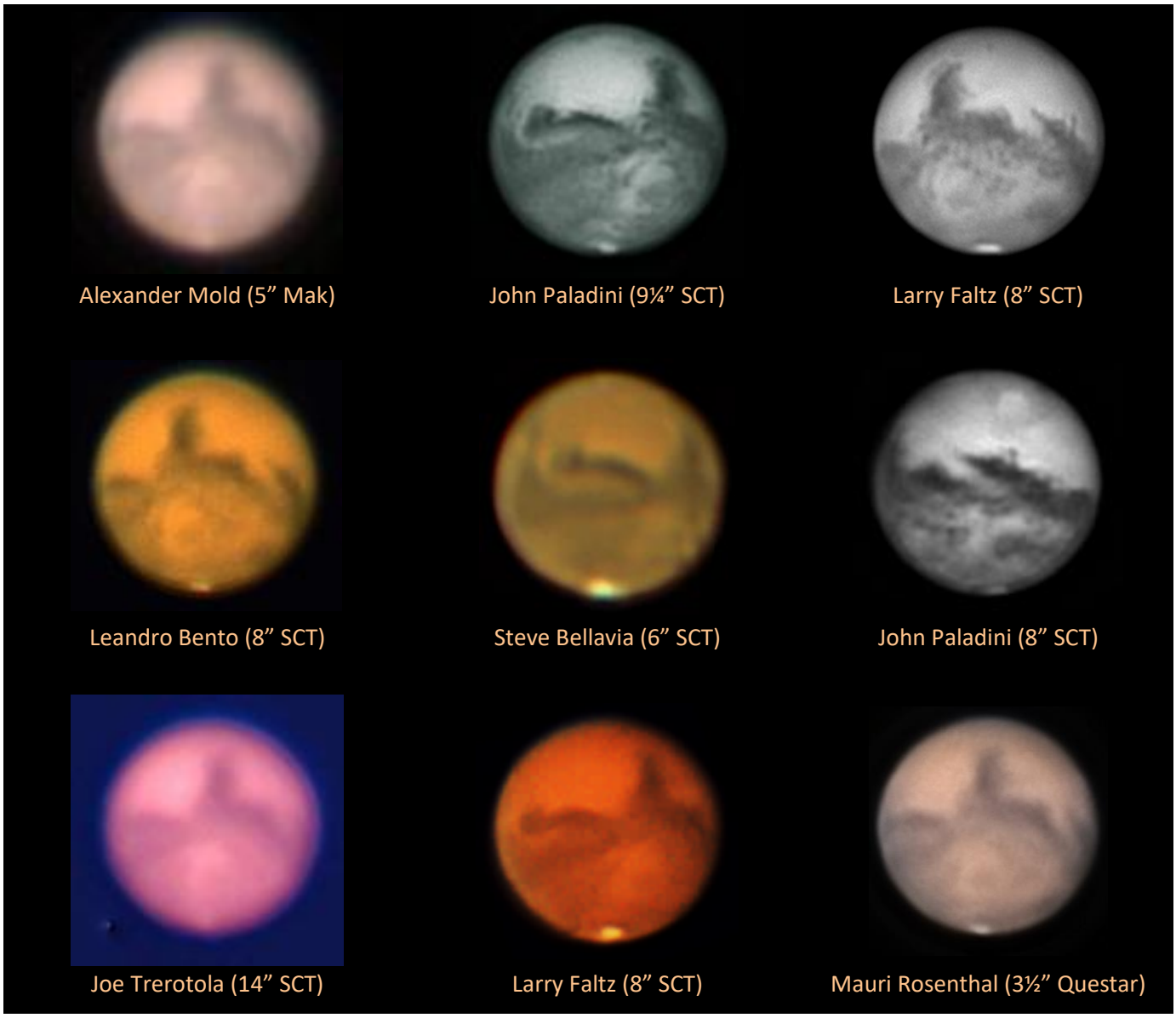
Map by Schiaparelli, 1881



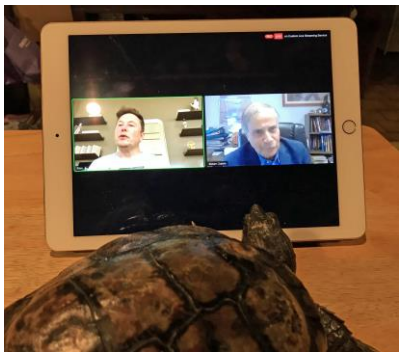
Map by M. Frassati, 2001

Images by Members

Mars images taken during the first and second weeks of October



All images were resized and rotated for this display to show correct orientation with the south pole down.



Although she’s not ot an astrophotographer, WAA Treasurer Karen Seiter was still swept up by the moment and sent these two Mars-related photos. On the left is her BMW with “Mars 2033” license plate (in an International Darksky Association frame) and on the right is her pet turtle Mozart watching SpaceX’s Elon Musk and Mars Society President Robert Zubrin at the Mars Society Convention, held on-line from October 15-18.

Conjunction of Mars and the Moon October 2-3

Left to right: Steve Bellavia 7:59 pm; John Paladini midnight; Greg Borrelly 12:57 a.m. You have to look closely for the tiny dot of Mars, just 1.26% of the Moon's diameter.

Steve got up before dawn on October 3rd to catch Mars and the Moon setting in the gloaming (a word your editor tries to use whenever possible). This image was taken at 6:49 a.m.

Sh2-171 in Cepheus by Leandro Bento

Leandro took this photo of SH2-171 and open cluster NGC 7762 on September 18th, with his usual setup: WO Redcat 51, ZWOASI533MC Pro camera, iOptron Skyguider, Optolong L-enhance filter. 174 min. total exposure at -10° C, 100 gain, offset 70. Flats, bias and darks also taken.

The mag 10.3 open cluster NGC 7762 (near right edge, just above the mag 5.0 foreground star HD223274) is 15 arc-minutes in diameter. It is located near several patches of glowing hydrogen gas that make up Sharpless 2-171. The components of this nebula are sometimes referred to by their designations in another catalog of HII regions, the Cederblad catalog. The brightest component is Cederblad 214, in the lower left. Mag 5.6 HD225216 is a foreground object. The arc of glowing hydrogen at the top is Cederblad 215. NGC 7762 is 2,400 light years away, and is about 270 million years old. The Cederblad catalog was compiled in 1946, the Sharpless in 1959.

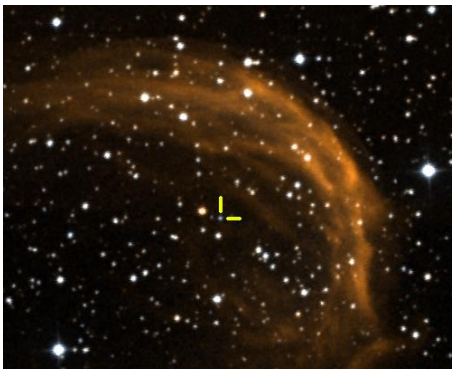
Sharpless 2-188 by Steve Bellavia

This rarely photographed object is a planetary nebula in Cassiopeia, although it hardly looks like it. In very deep images it is circular, but one side is much brighter because the expanding nebular gas is interacting with the interstellar medium and is perturbed by strong galactic magnetic fields. Sh2-188 is at a galactic latitude of only 4.1 degrees. Steve captured a hint of the blue oxygen line that characterizes planetaries.

The nebula is about 9 arc-minutes across and is at an estimated distance of 2,800 light years, with a great deal of uncertainty in that value. This object, also known as PK 128-4.1 and Semeis 22, is not listed in any of Stephen James O'Meara's books, Phil Harrington's *Cosmic Challenge*, or in Sue French's *Deep-Sky Wonders*. I couldn't find a magnitude for it. Its energizing white dwarf "central star" has a magnitude of 17.4. It's definitely visible on Steve's image.

The image was obtained on Sep 23-24 2020, in Mattituck, NY (on Long Island's North Fork). TS-Optics 115 mm f/7 triplet refractor with TS-Flat 2.5 field flattener, ZWO ASI 533MC Pro, ZWO Duo-Band Filter. Guidescope: "Bellavia Basic" 50 mm, 373 mm focal length, guide camera: ZWO ASI290MC color, mount: SkyWatcher EQ6-R Pro.

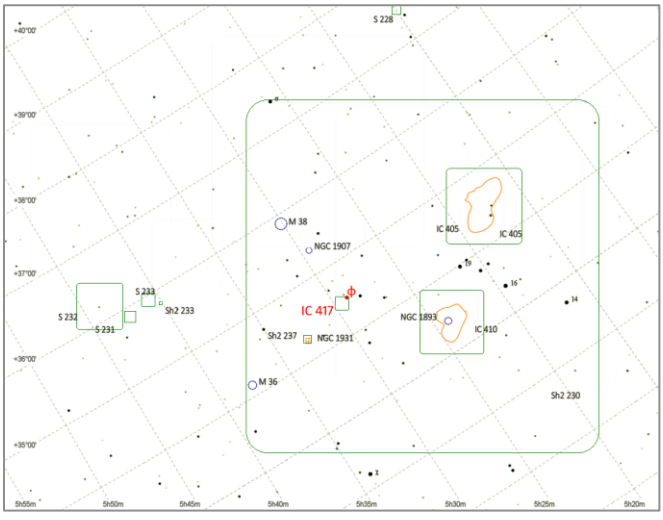
Light frames: 60x240 seconds, Gain 100 (unity) (4 hours total integration); dark frames: 30x240 seconds; flat frames: 30 x 1.20 sec, dark-flat frames: 30 x 1.20 sec.



The central star is shown between the tick marks in this Sloane DSS image (2.5 meter telescope). It's decidedly blue, and therefore very hot.

IC 417 and Stock 8 in Auriga by Scott Nammacher

Auriga is rich in HII regions and open clusters. The faint Stock 8 sits between the more well-known open clusters M36 and M38. It's associated with the emission nebula IC 417. The nebula is considered to be slightly smaller than the cluster, which has a diameter of about 15 arc-minutes. IC 417 also has Sharpless and Cederblad designations, Sh2-234 and Ced 46. These objects sit within an enormous HII region catalogued as Sh2-230.



Scott made this image in the spring of 2020 at his observatory in Athens, NY. PlaneWave 12.5" and SBIG 10XME camera using MaximDL to capture, ACP software to control the photography runs and Photoshop to finish. He used R,G,B, luminance and Hα filters.

The magnitude 5 golden-colored K star Phi Aurigae sits just outside the edge of the HII region, with the fainter 9th magnitude stars of Stock 8 sandwiched between Phi and the brighter part of the nebula. Stephen James O'Meara suggests that Caroline Herschel may have glimpsed the cluster on October 13, 1782, but it wasn't formally identified until 1954 when Jürgen Stock published a list of 21 new clusters found on blue-sensitive plates made at the Warner and Swazey Observatory (Case Western Reserve University). It is 8,150 light years distant. IC 417 was discovered by Max Wolf, a pioneer of deep-sky astrophotography, in 1892 at the observatory of the University of Heidelberg.

Research Highlight of the Month

Kusano, K., Iju, T, Bamba, Y, Inoue, S, A physics-based method that can predict imminent large solar flares, *Science* 2020: 368: 587-591 (20 July)

You think coronavirus is creating havoc? Just wait until the next Carrington Event. The only electrical technology in place when a huge coronal mass ejection impacted the Earth on September 1, 1859 was the telegraph system. Operators got shocks and some had to disconnect their equipment, but there was no real damage. Today, a Carrington Event would bring down electrical systems all over the world, destroying transformers, computers, microwave equipment and communications systems. The world would be blacked out. Commerce would stop. It is likely that world-wide chaos would ensue. A zombie apocalypse would be easier to manage. If we could predict flares enough in advance, it might be possible to shield the most sensitive and important equipment, or take it off-line for only a short period.

Solar flares result from magnetic reconnections on the Sun's surface, associated with active regions (sunspots). The topology of the magnetic field suddenly changes, and magnetic energy is converted into kinetic energy, thermal energy and acceleration of high-energy particles. Coronal magnetic fields play an important role but are very difficult to detect and measure. Current flare prediction methods, based on measurements of the surface magnetic field, have low accuracy.

Kusano *et. al.* from Nagoya University in Japan were able to detect and track smaller, "double-arc" magnetic loops that can grow and create a positive feedback loop that ultimately results in a flare. They determined the critical length-scale for the trigger-reconnection, using data from an instrument on the Solar Dynamics Observatory spacecraft. They studied 200 active regions during cycle 24 (2008-2019) that had large sunspots but didn't produce large flares, comparing those to seven active regions that produced flares above class X2, large flares capable of causing damage if headed our way. They could predict the flares with lead times of 1 to 24 hours (rather than the 8 minutes we get from visual observations). Although not all the large flares were identified by their model, this strategy represents a potential method for an early warning system for solar flares.

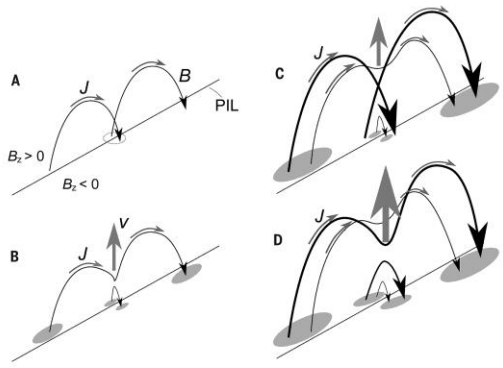


Fig. 1 Schematic illustration of the scenario for the magnetic energy release in a solar flare. (A to D) The proposed sequence of events in the initial stage of a solar flare, in which the connectivity of magnetic field lines changes through magnetic reconnection while magnetic flux on the solar surface is conserved. The curved black lines represent the magnetic field (B), and the curved gray arrows are the electric current (J). The vertical arrows show the ascending motion (V) caused by the magnetohydrodynamic instability. The straight line represents the magnetic PIL—the boundary between positive and negative values of the vertical magnetic field Bz on the solar surface. Ellipses illustrate the bright flare ribbons on the foot points of reconnected magnetic field lines.

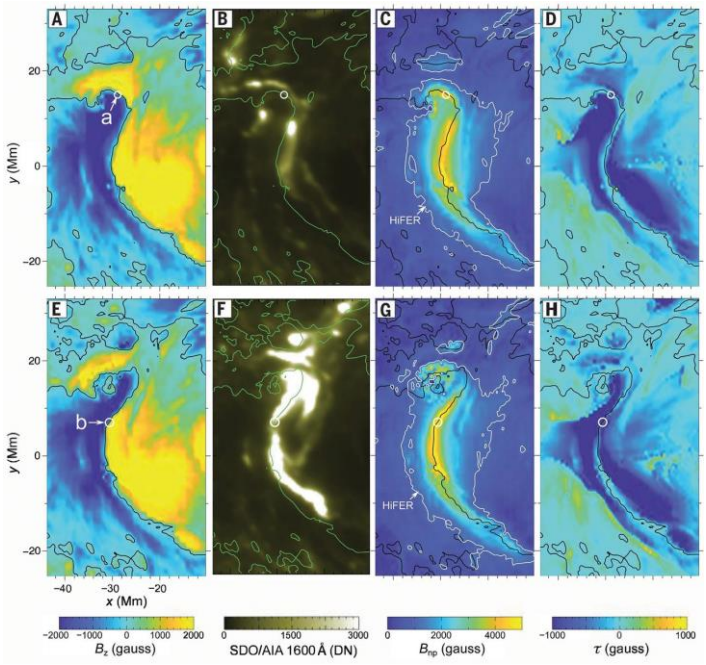


Fig. 3 Maps of the observed parameters for AR 12673 on 6 September 2017.

Member & Club Equipment for Sale

Item	Description	Asking price	Name/Email
Meade LX-70 Equatorial Mount	Dual Axis Drive and Polar Scope - Brand New. Bought during the closeout sale of these mounts. Owner thought he might like to have a light GEM, but decided to stick with alt-az mounts. Set up once in the garage to be sure it all works, and it does, but never saw first light in the field. Price paid: $365.	$170	Eugene Lewis genelew1@gmail.com
Celestron Evolution single arm go-to mount for 6, 8 inch or 9.25 inch SCT or Maksutov	Celestron doesn't sell these separately from the optical tube. Built-in wifi for connection to tablet or phone with SkySafari or Celestron SkyPortal. High-performance worm gears and motors for excellent tracking accuracy and reduced gear backlash. Includes rechargeable lithium-ion battery for 10 hours of continuous observing.	$400	Eugene Lewis genelew1@gmail.com
Celestron Orange Tube C8	A gem from the 1970's! WAA has had this scope in storage for a long time. Serial #25778-6. OTA, fork mount, 6x30 finder, 110v power cable. See the complete description in the August 2020 SkyWAAtch.	$300	WAA ads@westchesterastronomers.org
GSO 6'' reflector OTA	f/5 Newtonian. Tube rings and dovetail. 6x30 straight-through finder.	$200	Anthony Maida lvam1521@yahoo.com
Explore Scientific 102 Refractor OTA	Tube rings and dovetail. Finderscope.	$250	Anthony Maida lvam1521@yahoo.com
Vixen f/11 80mm Refractor OTA	Dual speed focuser. Tube rings and dovetail, no finderscope.	$75	Anthony Maida lvam1521@yahoo.com
Atco 60-mm f/15.1 refractor	A classic Japanese refractor from the early 1970s. Obtained from the original owner about five years ago. It was used only a few times, then stored for 40+ years. Current owner used it maybe seven times. Very good condition. Comes with three eyepieces and a 1.25" eyepiece adaptor star diagonal. Straight-through finder. Equatorial mount with slow-motion adjustment knobs (screws). Wooden tripod, metal tube. Everything is original.	$150	Robert Lewis lewis@bway.net
WANTED	One of our members, a retired professional frustrated by the ever-increasing light pollution in Westchester, wants to know whether there are any other WAA'ers who might be interested to participate in a group purchase of property somewhere in upstate New York to build a small observatory with warm room and living facilities.		Contact Bill Caspe wbcaspe@mindspring.com
Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to ads@westchesterastronomers.org. Member submissions only. Please submit only serious and useful astronomy equipment. WAA reserves the right not to list items we think are not of value to members.			
Buying and selling items is at your own risk. WAA is not responsible for the satisfaction of the buyer or seller. Commercial listings are not accepted. Items must be the property of the member or WAA. WAA takes no responsibility for the condition or value of the item, or for the accuracy of any description. We expect, but cannot guarantee, that descriptions are accurate. Items are subject to prior sale. WAA is not a party to any sale unless the equipment belongs to WAA (and will be so identified). Sales of WAA equipment are final. *Caveat emptor!*			