



Vol. 52, no. 12

The W.A.S.P.



December 2020

The Warren Astronomical Society Paper

Season's



Greetings

The WASP



Published by
Warren Astronomical Society, Inc.
P.O. Box 1505
Warren, Michigan 48090-1505

Dale Thieme, Editor

2020 Officers

President	Diane Hall	president@warrenastro.org
1st VP	Dale Partin	firstvp@warrenastro.org
2ndVP	Riyad Matti	secondvp@warrenastro.org
Secretary	Glenn Wilkins	secretary@warrenastro.org
Treasurer	Mark Jakubisin	treasurer@warrenastro.org
Outreach	Bob Trembley	outreach@warrenastro.org
Publications	Jonathan Kade	publications@warrenastro.org
	Entire Board	board@warrenastro.org

The Warren Astronomical Society, Inc., is a local, non-profit organization of amateur astronomers. The Society holds meetings on the first Monday and third Thursday of each month, starting at 7:30 p.m.

First Monday meeting:	Third Thursday meeting:
Cranbrook: Institute of Science	Macomb Community College
1221 North Woodward Ave	South campus, Bldg. J, Room J221
Bloomfield Hills, Michigan	14600 Twelve Mile Rd.
	Warren, Michigan

Membership and Annual Dues

Student	Individual	Senior Citizen	for families
\$17.00	\$30.00	\$22.00	add \$7.00

Astronomical League (optional)\$7.50

Send membership applications and dues to the treasurer:
c/o Warren Astronomical Society, Inc.
P.O. Box 1505
Warren, Michigan 48090-1505

Pay at the meetings

Also via PayPal (send funds to treasurer@warrenastro.org)

Among the many benefits of membership are

- Loaner telescopes (with deposit). See 2nd VP.
- Free copy of each WASP newsletter.
- Free use of Stargate Observatory.
- Special interest subgroups. See chairpersons.

The Warren Astronomical Society Paper (WASP) is the official monthly publication of the Society.

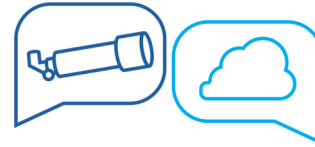
Articles for inclusion in the WASP are strongly encouraged and should be submitted to the editor on or before the end of each month. Any format of submission is accepted. Materials can either be transmitted in person, via US Mail, or by email (publications@warrenastro.org)

Disclaimer: The articles presented herein represent the opinion of their authors and are not necessarily the opinion of the Warren Astronomical Society or this editor. The WASP reserves the right to edit or deny publication of any submission.

Stargate Observatory is owned and operated by the Society. Located on the grounds of Camp Rotary on 29 Mile Road, 1.8 miles east of Romeo Plank Road, Stargate features an 8-inch refractor telescope under a steel dome. The observatory is open according to the open house schedule published by the 2nd VP.

Snack Volunteer Schedule

The Snack Volunteer program is suspended for the duration. When it resumes, volunteers already on the list will be notified by email.



Discussion Group Meeting

Come news, space



In This Issue:

President's Field of View	4
Letters	4
Visit to Arecibo Observatory	5
McMath-Hulbert Report	11
Astro Images	12
C.W. Observatory	13
Northern Cross Observatory.....	14
Throwing Shade	15
Presentations	17
Mars Observations	18
Skyward	19
Movie Review	20
Over the Moon	21
History S.I.G.	22
Armchair Astronomy	23
Cranbrook Monthly Sky Chart	28
Stargate	29
Stargate Officer's Report	30
Treasurer's Report	30
Astronomical events	30
Outreach Report	31
Meeting Minutes	33
GLAAC	36
NASA Night Sky Notes.....	37
Last Word	38



Want to keep track of W.A.S. meetings and exciting astronomical events next year?

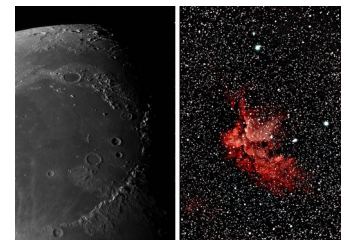
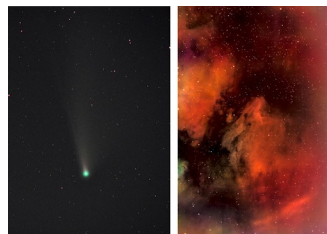
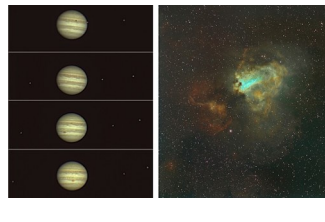
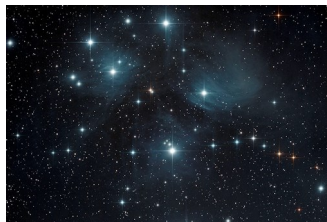
Order your 2021 Warren Astronomical Society calendar now!

These beautiful calendars feature photos from 17 W.A.S. members:

- Joe Tocco - Comet NEOWISE Over Charlevoix
- Adrian Bradley - Milky Way Over the Boat launch
- Bill Beers - NGC7023 Iris Nebula
- Cheryl Kaplan - Milky Way over Longs Peak
- Dale Hollenbaugh - Mars/ Dale Partin - Under the Stars with Comet NEOWISE
- Doug Bock - Messier 101 Spiral Galaxy
- Ed Stucky - M 45 Pleiades (Seven Sisters)
- Zsolt Nagy - Almost a Quarter Moon
- John Dumar - Rotation of Jupiter with its Moons / Bob berta - M17 the Swan Nebula
- Ken Meloche - M27 the Dumbbell Nebula
- Mike Young - Almost a Full Moon
- Ray Bosshard - Comet NEOWISE / Fred Pompei - IC5070 Pelican Nebula
- Thomas Mitchell - Blue Moon on Halloween
- Zsolt Nagy - Sunset on the Moon / Paul Goelz - NGC7380 Wizard Nebula

You can buy calendars for \$15 each (\$5 flat rate shipping) by sending a check to Warren Astronomical Society c/o 22712 Nona St, Dearborn, MI 48124. [You can also order them online.](#) Be sure to include your mailing address so we can get them to you. Email publications@warrenastro.org before sending check or paying online as this will be a limited run.

[Buy Yours Today](#)





President's Field of View

This year was not what I was expecting.

That's not entirely a bad thing; the Warren Astronomical Society actually started things off on a low note with the sudden passing of Pat Brown back in February. Pat's obituary went out in the WASP even as the novel coronavirus escalated into a global crisis, and at the time I thought bitterly on how 'tis the duty of the President to write such obituaries. I wondered how many there would be in upcoming months.

Thankfully, the astronomical community has not been hit as badly as I feared we'd be in March—cold comfort, perhaps, given we've members and officers mourning an empty space at the table this holiday season. But our host institutions—Cranbrook, Macomb Community College South Campus, and the Metropark System—responded to the pandemic with regard to science and the public health, and we made our transition to being an online endeavor. And here we are, in December, with the plague still raging but a hope that sometime in 2021 we can go back to “normal”—normal in the sense of sharing snacks during a meeting break, inviting strangers to look through our telescopes, crowding into the Stargate dome.

There's been a monkey's paw quality to the year; as someone who felt we'd been overwhelmed by outreach requests in 2019 thanks to the Apollo 11 anniversary hoopla, that we experienced a genuinely good comet in NEOWISE and couldn't share it with the public was a stroke of cosmic perversity. And now, with the solar cycle picking up, I take my PST on those rare clear days and set it up next to the house, and peer through it alone as neighbors walk by. And I remember the times I'd haul that PST down to Crosswinds Marsh, and set it up with Pat as my outreach partner for the day, and hope we'd get a clear enough sky to let the kids have a look at the big red ball.

We can't get back all we've lost, but we keep moving forward into the future nonetheless. And around us, sunspots rise in their decade-long cycle, planets move in a silent dance that takes centuries to execute, comets flare for the first time in a millennium. We see the universe one snapshot at a time and invest in it our own meaning, grand and tragic and poetic. And it goes on.

Diane Hall
President



Letters

Approbation for Hollenbaugh, current number.

The satellites of Mars. Yikes! Persha, Hill, and Beers combined could not achieve such a feat. Never seen them my own self, but you got their picture under dodgy conditions. There should be a medal struck in your honour.

G.M. Ross

(refers to November 2020 issue, page 10—Ed.)

(Continued on page 10)



Club Member Name Tags

Email publications@warrenastro.org for
your personalized name tag



Space Pirate Radio

Tune in to Captains Marty Kunz
and Diane Hall for live radio
Wednesday nights at 9:00 pm ET
on
Astronomy.fm

A Visit to Arecibo Observatory

Dale Hollenbaugh



It first learned about the Arecibo Observatory from the climactic fight scene from the 1995 James Bond flick *GoldenEye*, but it didn't really cement itself into my memory until the 1997 film *Contact*. I was fascinated by the setting, with that large iconic dish built right into the landscape of Puerto Rico, and placed it on my "bucket list" of places to visit in my future travels. Last year, my wife, Kriste, and I got our chance to visit the facility. We love to travel and typically take a vacation mid-winter to get away from the snow and ice of Michigan to visit someplace warmer. In 2019, our winter vacation was a Caribbean cruise. It was a fantastic cruise and we visited quite a few new islands and added significantly to our countries-that-we've-visited-so-far list, but the cruise actually departed from and then returned back to San Juan, Puerto Rico. Kriste had visited San Juan many years earlier on another cruise, but it was my first visit to the US territory of Puerto Rico. I wanted to explore the territory while we were there, so we spent an extra three nights in Puerto Rico before we embarked on our cruise. I am very happy that we did, as Puerto Rico was one of the highlights from the vacation.

To visit to observatory, one must actually get there first, and that is easier said than done. Kriste and I are typically rent-a-car-and-explore-ourselves type of travelers, so we opted for this mode of transportation, even though packaged tours were available. We visited on our first full day in Puerto Rico, which was Jan. 27, 2019, a Sunday. Arecibo is a town on the north shore of Puerto Rico about 50 miles west of San Juan and the observatory is located about 10 miles inland up in the hills at an elevation of about 1,600 ft. We left our hotel in Condado, just east of the capital San Juan, and headed for the expressway. It was an easy drive to Arecibo, but both Google Maps and our trusty Garmin GPS led us astray heading up to the observatory and had us going up a series of increasing narrow dirt roads finally culminating in a path only fit for a Jeep. I reversed back quite a distance until I could turn our rental car around and went back down the hill several miles until I reached pavement. We chose another path, and eventually arrived at the observatory. Once we arrived, we inquired at the guardhouse about the road to which they responded, "oh yeah, they never finished that road." (Fig. 1)

(Continued on page 6)

(Continued from page 5)

As we entered the Observatorio de Arecibo facility, we noticed an old rusty sign which reads "PROHIBIDO EL USO DEL CELULAR" with a picture of an old 1980's style cellular flip phone. We put our phones into airplane mode, so the signals don't interfere with the radio telescope, and proceeded to walk up the steep walkway to the top of the hill to arrive at the visitor's center. The entrance fee was only \$12. The visitor center is fairly small but has several interesting exhibits. I didn't spend much time reading the exhibits as I was too anxious to head outside to gaze upon the big dish. There would be plenty of time to read the exhibits later. So, we go outside and walk right up to the rim and look down upon the 1,000 ft. diameter spherical reflector. It is nestled down in a natural sinkhole formed from the decay of limestone from the karst hills which is a common geologic formation in this corner of Puerto Rico. This is one of the largest sinkhole depressions on the island and its dimensions and near-circular plan met the requirements for the huge dish reflector. The location of the NSF-funded project also required it be on US soil and be near the equator. The dish is 167 ft. deep and covers an area of about 20 acres. The reflector surface is made up of 38,778 perforated aluminum panels, which allows rain to drain below onto the shade-tolerant vegetation. It is surrounded by three massive towers with cables (Fig 2) supporting the huge 900-ton aerial instrument platform, which is suspended 492 ft. above the base of the reflector.



Figure 1: The "road" less traveled.

The radio telescope has a focal length of 435 ft. The tallest of the towers is 365 ft. high and the platform is suspended by 18 cables (Fig 3). Each tower is back-guyed to ground anchors with seven 3.25 in. diameter steel bridge cables. In total, there are 39 cables supporting the platform.

(Continued on page 7)



Figure 2: Tower anchor, showing the seven cables.



Figure 3: Platform support Cable

(Continued from page 6)

The radio observatory, which is partly used to search for extraterrestrial intelligence as part of the SETI program, is used primarily for research in radio astronomy, atmospheric (ionosphere) science and radar astronomy. Construction began on the observatory in 1960 and was completed in 1963

orbit one another, they give off gravitational waves causing their orbits to shrink. The measurements taken at the observatory confirmed their theory and won them the Nobel Prize for Physics in 1993. The Nobel Prize medal and plaque are on display in the museum. Other exhibits listed discoveries that the

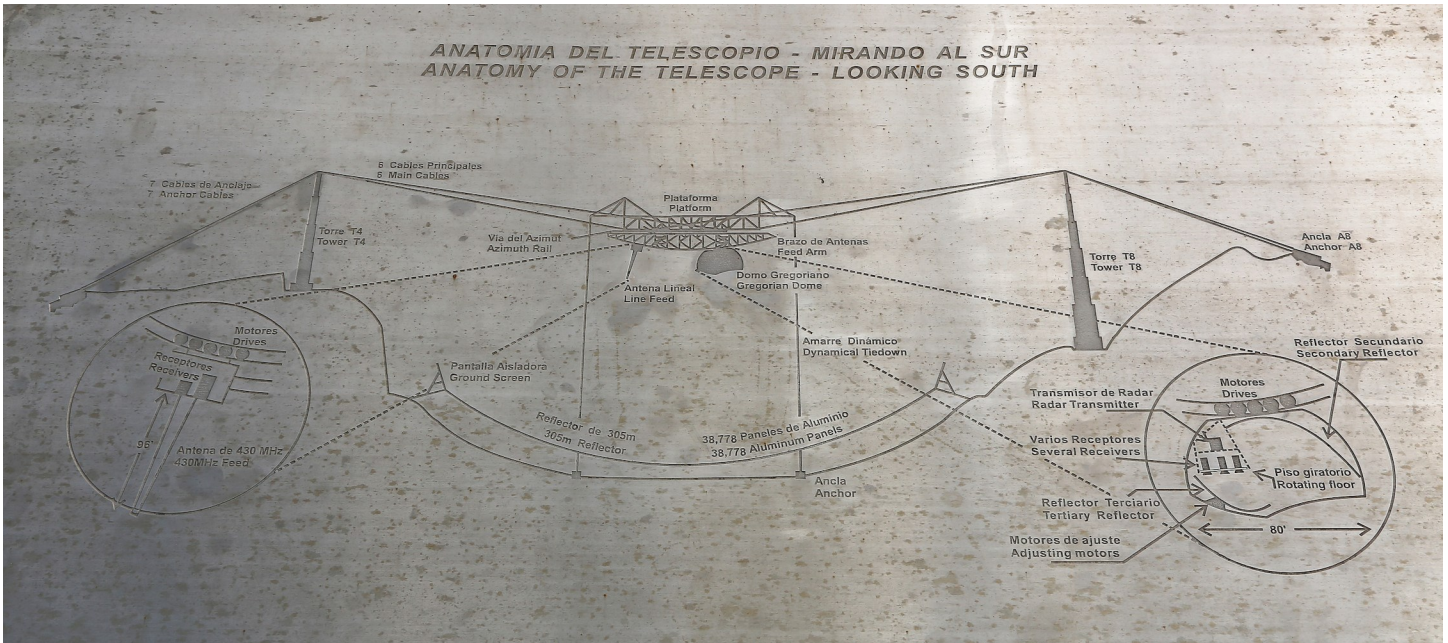


Figure 4: Diagram of the Arecibo Observatory on a plaque.

and the observatory came online Nov. 1, 1963 (fig. 4). For over 52 years, the Arecibo Observatory was the world's largest single-aperture telescope, surpassed in 2016 by the Five-hundred-meter Aperture Spherical Telescope (FAST) in China.

During our visit, we heard a constant drone of an alarm coming from the platform. I asked what the noise is and someone tells me it is the alarm saying that they are actively using the radio telescope - in essence, science was occurring.

The large platform, suspended above the dish, contains various instruments and antennae (Fig. 5). The 96 ft. long, 430MHz line-feed antenna was the first antenna installed. Another major structure on the platform is the large Gregorian Dome, which was added in 1997 and contains two sub-reflectors which can focus radio waves at a single point, greatly expanding the frequency range (Fig. 6). Auxiliary cables were added to the towers to help support the platform which grew in weight as part of the upgrade.

After viewing and photographing the dish for a while, we headed back inside to see more of the exhibits. One exhibit says that in 1974, Joseph Taylor and his student Russell Hulse used the observatory to measure the changing orbits of a pair of neutron stars. They theorized that as these stars

telescope has made over the years including determining the rotational period as well as mapping the distribution of water ice in the polar regions of Mercury, tracking near-Earth asteroids and monitoring for impact risks, mapping the cloud-covered surface of Venus, imaging the rings of Saturn, detection of methane lakes on Titan, the first direct imaging of an asteroid as well as the first direct detection of an asteroid with a moon. It also has been used for significant research of pulsars, which includes the discovery of the first extrasolar planets.

The entire region was still in the process of trying to recover from the devastation of back-to-back category 5 hurricanes to sweep through the Caribbean in Sept. 2017, first Irma and then two weeks later, Maria. Hurricane Irma first hit the Leeward Islands of Anguilla, Barbuda, St. Barts, St. Martin and the USVI, but the eye wall passed just north of Puerto Rico. The storm was so large and fierce that it still battered Puerto Rico causing widespread damage. The rainfall caused widespread flash flooding, high winds left 1.5 million people without power and damaged almost half of the telecommunications towers. Four people in Puerto Rico died from this hurricane. Two weeks later, Hurricane Maria devastated the islands of Dominica and St. Croix before ripping directly across Puerto Rico to disastrous effect. The torrential rains caused numerous land-

(Continued on page 9)



Fig 5: Aerial instrument platform.



Fig 6: Sub-reflectors visible inside the Gregorian Dome.

(Continued from page 7)

slides and the winds completely destroyed the power grid leaving all 3.4 million residents without power. Most were left without clean water for weeks. The initial direct death toll in Puerto Rico was 64, but indirectly, the death toll on the territory would rise to nearly 3,000 people. It was the worst natural disaster in Puerto Rico's history.

Hurricane Maria's winds broke off most of the long, skinny 96 ft. line feed antenna from the platform of the observatory, causing it to plunge down and puncture the reflector below. About 20 ft. of the antenna remains - it still works, but at diminished capacity. Most of the work is done by the Gregorian Dome. A separate 40 ft. dish used as a phase reference for the Very Long Baseline Interferometry (VLBI) was damaged as well.

Our visit to Puerto Rico was 16 months after Maria. During our drive across the island to visit the observatory, and later while visiting El Yunque National Forest, I was surprised at just how much wasn't damaged, or at least how much had recovered. We saw plenty of signs of damage - billboards and towers that were toppled, building and homes that were damaged or destroyed, but out in nature, in the forest, much of the landscape survived and was thriving, due in part to being in a lush tropical zone. The foliage had recovered more quickly than I would have thought. Still, the damage occurred, lives were lost, and the people were devastated and still rebuilding over a year later. Many were without power for almost a year. Many homes along the way had makeshift tin roofs.

Our visit to the observatory was on a quiet Sunday and it was not very busy. I spoke with the young lady running the refreshment stand, who lived in the nearby hills. She said that her grandmother's house was damaged when a tree fell and punctured the roof letting the rain destroy the house, forcing her grandmother to move in with them. It took them almost a year to get power back to their home, and they needed roof repairs as well. She said it was common in that region and most homes were damaged to some degree and most were without power for months. I spoke to other Puerto Ricans later in the trip and heard similar stories of damage and ongoing recovery and how they were dealing with it.

On Jan. 13, 2014, a magnitude 6.4 earthquake damaged one of the platform support cables. It was repaired, but never replaced. In 2018, it was announced that a new antenna called the Advanced Cryogenic L-Band Phased Array Camera for Arecibo (ALPACA) was to be installed in 2022. In December 2019 more earthquakes rocked the region and on Jan. 7, 2020, another magnitude 6.4 earthquake shook the observatory, but no damage was report-

ed. On Aug. 10, 2020, one of the platform auxiliary support cables broke and slipped out of its socket and fell causing a 100 ft. gash in the reflector and also damaged some of the exterior panels of the Gregorian Dome as well as the receivers inside. The cable that broke wasn't the same one that was damaged in 2014. A new cable was ordered to replace the broken one and scheduled to arrive in December, but on Nov. 7, 2020, a second cable broke from the same tower, Tower T4, doing further damage to the reflector. Engineers inspected the remaining cables and found new wire breaks on some of the original main support cables, and evidence of significant slippage at several sockets holding the remaining auxiliary support cables which were added in the 1990s when the Gregorian Dome was added. It was determined that there is no way to safely repair the cables due to the risk of an uncontrolled collapse if one more cable fails on the same tower. On Nov. 19, 2020, the National Science Foundation decided to perform a "controlled decommissioning" the observatory and is currently working on plans for this. On Nov. 24, 2020, using aerial drone surveillance, engineers observed additional breakages on the exterior wires of the remaining cables on the same tower.

On the morning of Dec. 1, 2020, before the full plan for the decommissioning had been revealed, another cable broke sending the 900-ton instrument platform crashing down into the reflector, destroying one of the most powerful telescopes on Earth. Even though there wasn't a huge fireball like in the climactic ending of *GoldenEye*, the observatory still succumbed to the same fate as in the film and is, sadly, no more. After 57 years, the main telescope of the Arecibo Observatory is gone, but its legacy of research and discoveries lives on. The NSF does intend to restore operations at the Arecibo Observatory LIDAR facility as well as continue to operate the visitor center after the decommissioning.

While our visit to the Arecibo Observatory was brief - lasting only a few hours - it was very memorable. The trip there and back was an adventure as well. I am very thankful that we got a chance to see it before it was gone.

-Dale Hollenbaugh



If you're shopping on Amazon, make sure to use Amazon Smile. It costs you nothing, and if you select us as your charity, Amazon will donate 0.5% of every purchase you make to the Warren Astronomical Society.

(Continued from page 4)

From Gerald C. Persha, out in New Mexico. Jerry has become quite the scholar of novae, to boot. -G.M. Ross

Subject: N Per 2020

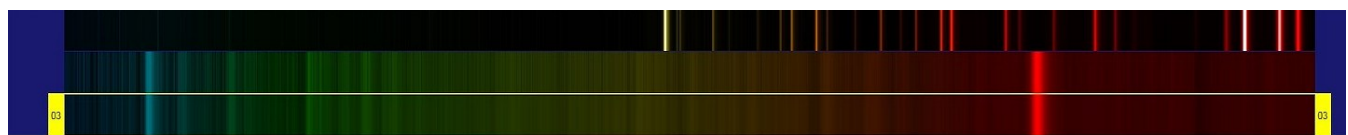
Date: 2020-12-01 11:30

From: Gerald Persha

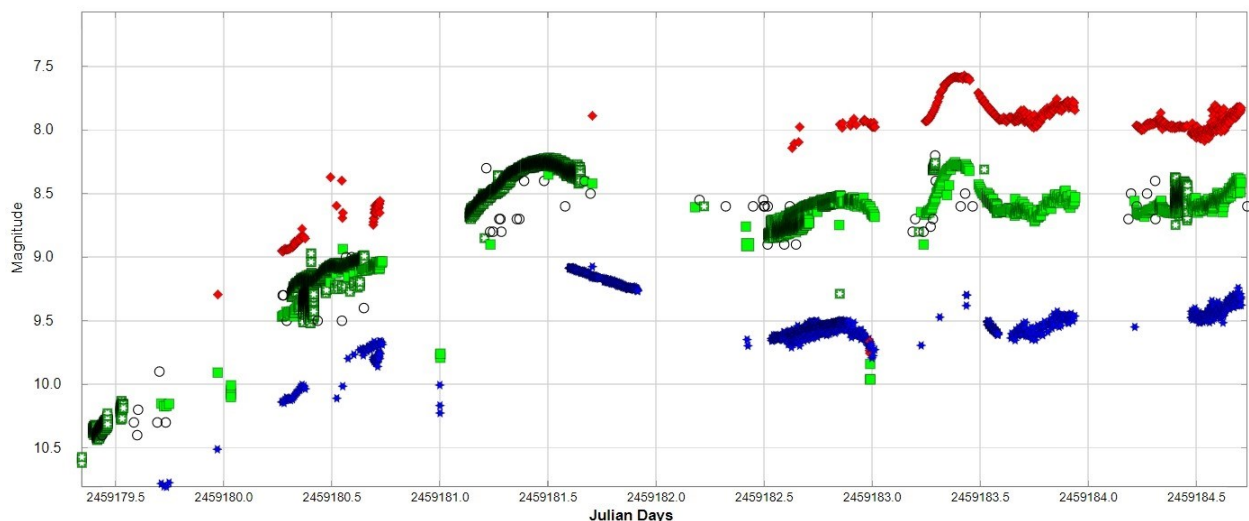
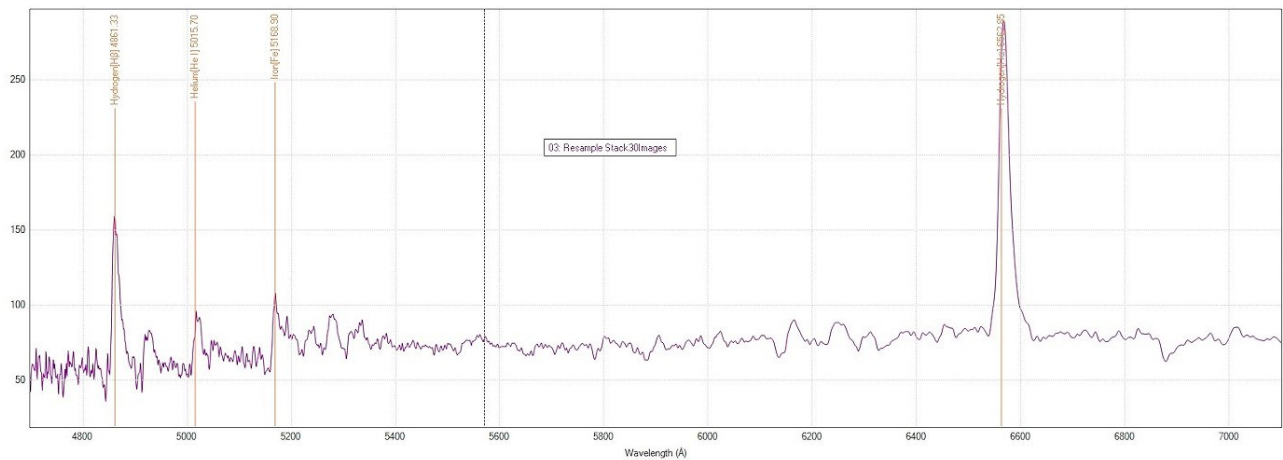
I was able to obtain a spectra of the nova last night under less than ideal conditions - a very thin layer of clouds. I really need a better camera to get the SN ratio I desire for these dim objects or a bigger telescope. Since my observatory can not handle a bigger scope I guess it is the camera. What do y'all think of a QHY294M to replace my QHY9M with a KAF 8300 sensor.

Back to the science and one weird spectra. I guess when things blow up on this scale things are about to get weird. From the P Cyg profile of the H-beta line, I get a velocity of the cloud approaching us at 1091 km/sec. There are not a lot of identifying lines in the spectra. The Helium line at 5016 is prominent but the Helium lines at 5876 and 6678 are no where to be found. It is nice to see iron in the spectra which one day will become part of a new earth and brain sucking aliens. On earlier spectra taken by others, the H-alpha line was shown as two humps separated by about 20 Angstroms with one centered on the H-alpha line and the other on the red side. Now it is one broad hump and the peak pushed to the red side of the H-alpha line. I hope to get better spectra tonight.

I have also included the latest AAVSO light curve which shows the roller coaster reaching the top before a long decline to oblivion.



N Per 2020 12-01-2020





McMath-Hulbert Report

We are noticing increased solar activity, looking like Solar Cycle 25 is finally beginning in earnest. There is a large sunspot visible; this is the largest in several years and there was an M-Class solar flare from this spot last week too. See the GOES satellite X-ray data plot below.

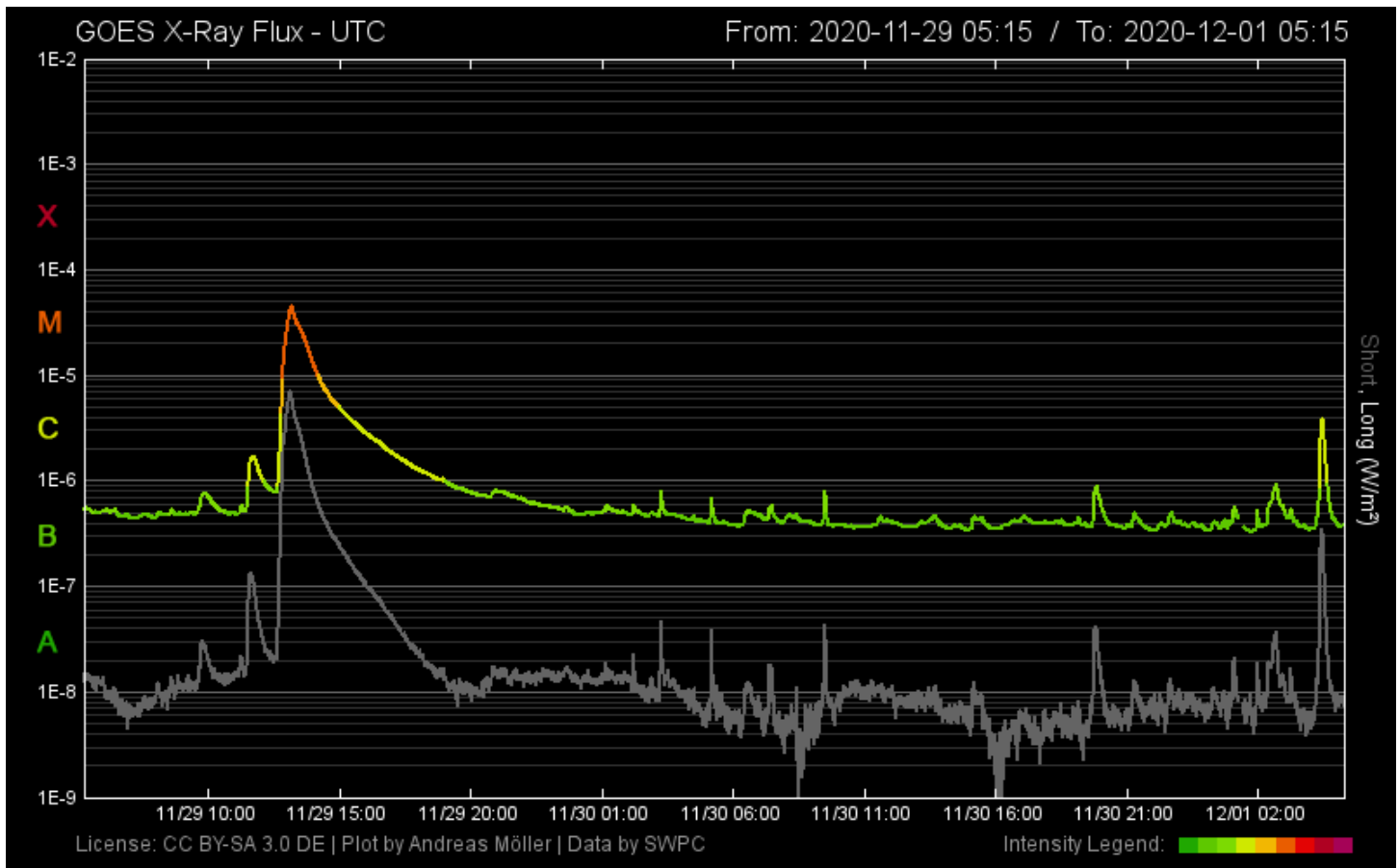
While most of our projects will be worked on indoors this year, some outdoor public observing is schedule for Feb 6, 2021 at The Hawk Wood Nature Center In Auburn Hills Mi.

We are working on a way to see planets and the Moon through a telescope and having its image viewed on a monitor.

Work on the spectroheliograph in Tower 2 is pretty much on hold for the season, as the sun does not

now rise above the treetops that surround the building. Not to fear! There are a number of winter projects we will be continuing with. We can align the grating and collimation lens down in the well beneath the operations pedestal using an artificial projected test image that will be shone on the input slit. This “artificial test image” will let us divide up the alignment tasks of this large instrument into smaller manageable pieces.

To sum up activity so far this year, we have installed and aligned a new diffraction grating donated by MHAS member Dave Groski and were able to see hundreds of absorption lines in the solar spectrum. This is an important first step. Next, we need to deal with stray light that’s getting into the optical path and we’ll be working on this over the winter too.





W.A.S. Astro-Images



A night on Boon Hill—photo by Doug Bock

Balancing Act—photo by Adrian Bradley



The View From C.W. Sirius Observatory

Messier 51 - The Whirlpool Galaxy

The Whirlpool Galaxy, also known as Messier 51, or M51, is an interacting spiral galaxy with a Seyfert 2 active galactic nucleus. Located in the constellation Canes Venatici, it was the first galaxy to be classified as a spiral galaxy. Its distance is estimated to be 23 million light-years away from Earth.

The galaxy and its companion, NGC 5195, are easily observed by amateur astronomers, and have been extensively observed by professional astronomers, who study it to understand galaxy structure (particularly structure associated with the spiral arms) and galaxy interactions. The Whirlpool Galaxy has an estimated diameter of 76,000 light-years, and is home to approximately 100 billion stars. Overall the galaxy is about 43% the size of the Milky Way, and its mass is estimated to be 160 billion solar masses, or around 10.3% of the mass of our Milky Way Galaxy.

The pronounced spiral structure of the Whirlpool Galaxy is believed to be the result of the close interaction between it and its companion galaxy NGC 5195, which may have passed through the main disk of M51 about 500 to 600 million years ago. In this proposed scenario, NGC 5195 came from behind M51 through the disk towards the observer and made another disk crossing as recently as 50 to 100 million years ago until it is where we observe it to be now, slightly behind M51.

What later became known as the Whirlpool Galaxy was discovered on October 13, 1773, by Charles Messier while hunting for objects that could confuse comet hunters, and was designated in Messier's catalogue as M51. Its companion galaxy, NGC 5195, was discovered in 1781 by Pierre Méchain, although it was not known whether it was interacting or merely another galaxy passing at a distance.

Located within the constellation Canes Venatici, M51 is found by following the easternmost star of the Big Dipper, and going 3.5° southwest. Its declination is +47°, making it a circumpolar for observers located above 43°N latitude; it reaches high altitudes throughout the northern hemisphere making it an accessible object from the early hours in winter through the end of spring season, after which observation is hindered in lower latitudes.



NGC 5195, M51's companion, (also known as Messier 51b or M51b) is a dwarf galaxy that is interacting with the Whirlpool Galaxy. Together, the two galaxies are one of the most widely studied interacting galaxy pairs.

Since M51, at our latitude, is circumpolar (never sets below the horizon), it can best be seen in the spring months in dark skies. You can view M51 in binoculars, but a small telescope will reveal the galaxy much better. Using a 12" or larger telescope will show much more spiral arm detail. M51 also makes for an easy imaging target, one that would make a great photo to hang on your wall. Happy hunting!



About CW Sirius Observatory:

C.W. (Cadillac West) Sirius Observatory is located 15 west of Cadillac Michigan. Owned and operated by WAS member Bill Beers. The dome is an 8' Clear Skies Inc dome which houses an 11" f/10 SCT telescope, a 102mm f/7 refractor telescope, Celestron CGEM DX mount, and uses an ASI ZWO 071 color CMOS camera, as well as a QHY8L color CCD camera. The telescope can be remotely operated from inside Bills house.

Anyone interested in learning about astrophotography, or any questions regarding equipment, or how to take astrophotos using your iPhones, or any related questions, can contact Bill at: BEEZOLL@AOL.COM





This month there are a couple of comets that are within small to medium telescope range, at 7th and 8th magnitude.

Comet C/2020 S3 Erasmus is in Virgo in the morning sky currently at 7.1 magnitude.

Comet C/2020 M3 ATLAS is in Taurus as well at 8+ magnitude, heading north.

You can find information about these comets at either

[Comets | TheSkyLive.com](https://www.theskylive.com) or [Comets \(heavens-above.com\)](https://www.heavens-above.com)

You'll find that the estimated magnitude from JPL and the latest observed magnitude differ by 5 magnitudes in some cases. This is why real observations are important.

Below is Comet C/2020 M3 (ATLAS)

In addition, a short video of it at [Comet C/2020 M3 ATLAS November 8, 2020 - YouTube](https://www.youtube.com/watch?v=...)

Data: November 8, 2020

SGPro, PHD2, FocusLock

10" f/8 RC Telescope, Losmandy G11 mount

ZWO asi071mc PRO camera @ 0C, gain 400,

45 x 30 second subs, 24 darks, 50 flats

Stacked on the core and processed in PixInsight



-Doug Bock

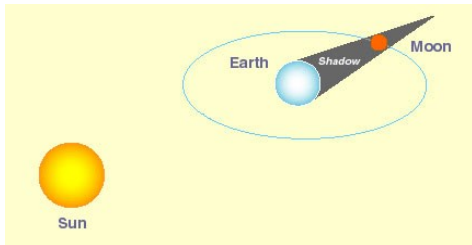
Throwing Shade

Brad Young

Tulsa Astronomy Club

The Earth is a large object. That's probably not news to you, but it might surprise you how large its shadow is. Using a little bit of math, you will find that on average the shadow thrown by the Earth is about 1.4 million km (870,000 miles) long, and encompasses a volume of almost 6×10^{13} cubic km (1.43×10^{13} cubic miles). The shadow of the Earth as shown below is called the umbra. This shadow is so long is because we are so far from the sun.

NOT TO SCALE:



TO SCALE (Earth in blue, Moon in yellow):



Notice that even 400,000 miles out (the end of the diagram), the umbra is just starting to shrink in width. It would take another diagram, a little longer, to follow the shadow to its end.

It would be great to observe an object so large. The fact is, at sunset* you can see the Earth's shadow plainly, using just your eyes.

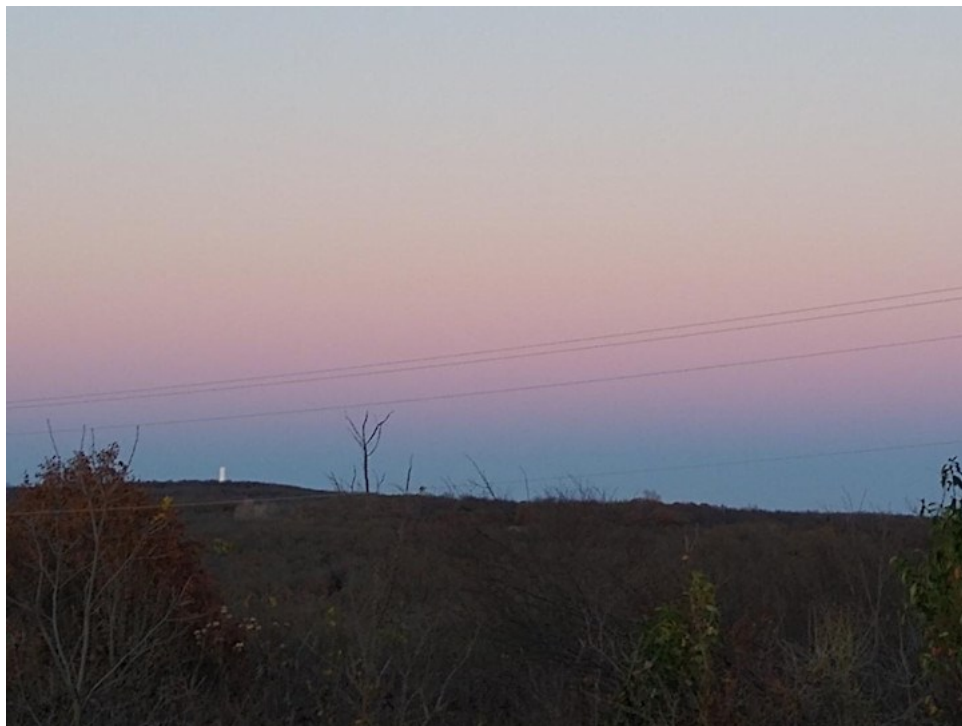
**NOTE: all phenomena in this article also occur, in reverse, from break of day until sunrise.*

At the moment of sunset, our sky would go completely dark if we did not have an atmosphere. If that were true, we would never be able to see the Earth's shadow on a consistent basis like we can now. (We also wouldn't be alive but that's a story for another venue).

As the sun goes down the next clear night with no bright moon, look directly opposite of it in the east. From near the horizon to low (about 20 degrees or less) above it, you may see a beautiful band of pinkish glow that will begin to get a little darker in hue and rise up off the horizon over the first 10 minutes after sunset or so. Underneath it, you

might see a dark blue band that extends down to the horizon and begins to get larger as twilight deepens into night. Somewhere between 15 and 25

(Continued on page 16)



Belt of Venus (Image by Brad Young)

(Continued from page 15)

minutes after sunset, the pinkish glow will give way completely to the dark blue or deep violet glow, and then even that band will disappear as the sky becomes completely dark.

The pinkish glow is called the Belt of Venus, as in the Roman goddess of love. This portion of the Earth's shadow is made more beautiful and easily visible, by refraction of the last bit of sunlight in the Earth's atmosphere. This is the reason that the pinkish glow is much more prevalent and easier to see directly opposite of the sun. Backscattering (aka Rayleigh scatter) of sunlight by particles in the upper atmosphere preferentially reflect longer, redder light waves.

Meanwhile, the blue to dark violet portion (the lower band) is our view of the umbra (complete shadow) cast by the Earth. It is also known as the "shadow wedge" although it may appear more oval than sharply edged in definition.

Another way to see the Earth's shadow is a lunar eclipse. Occasionally there are partial or total eclipses of the moon. During these eclipses, we are seeing the umbra projected onto part or all of the Moon's surface. We have a partial lunar eclipse coming up November 18-19, 2021. At that time, you can see the shadow of the earth extended about 384,000 km (240,000 miles) and showing

very obviously on the surface of the moon.

NOTE: We have a penumbral lunar eclipse coming up on November 29-30. The penumbra is the effect of the Earth partially blocking sunlight. So, during penumbral eclipses, the Moon is not actually passing through the fully dark umbral shadow cone. Therefore, it is difficult to see the slight shading on the Full Moon.

So, during the course of each night, there is a huge dark cone of shadow, cast by the Earth, that extends more than three times the Moon's distance into space. You can visualize it as you watch twilight descend, or once a year or so, watch a lunar eclipse. But even when you can't see it, it's there. It extends out and up into the sky, rotating from east to west just like the stars every night. It's fascinating to see it in action, each night presenting a new chance to watch the Earth throw shade.

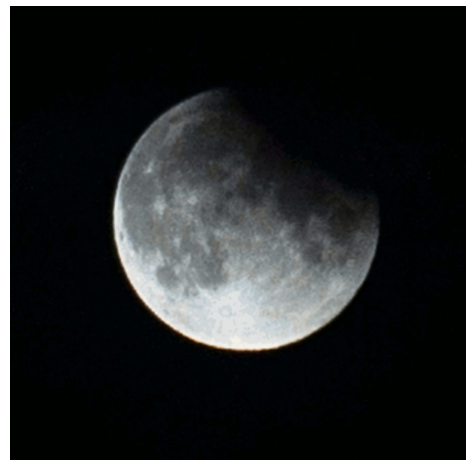
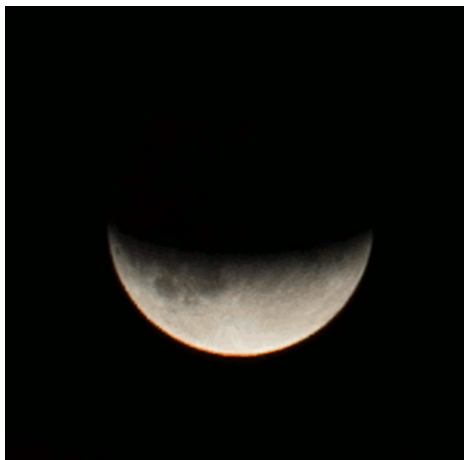
-Brad Young

RESOURCES:

A really cool panoramic view of the Belt of Venus is at:

https://lunaproductions.com/wp-content/uploads/2016/04/757_CloudsRest_dusk_v6j_q8.jpg

All images, unless noted, from Wikipedia



View of the partial phases of a lunar eclipse

Full animation: https://upload.wikimedia.org/wikipedia/commons/a/a0/Eclipse_lunar_2019.gif

W.A.S.P. Photo and Article Submissions

We'd like to see your photos and articles in the W.A.S.P. Your contribution is ESSENTIAL!
This is YOUR publication!

Send items to: publications@warrenastro.org

Documents can be submitted in Microsoft Word (.doc or .docx), Open Office (.ods), or Text (.txt) formats, or put into the body of an email. Photos can be embedded in the document or attached to the email and should be under 2MB in size. Please include a caption for your photos, along with dates taken, and the way you'd like your name to appear.

Presentations

Monday, December 7, 2020

Virtual Presentations



Main Talk:

“Mathematics of the Planetarium”

By Jeff MacLeod

A planetarium can show you the sky of any night at any location on the Earth, but how does it do this? And better yet, can we make our own?

Jeff MacLeod is currently a physics and astronomy major at Wayne State University (~5 months to go!). He is also a former President of the Warren Astronomical Society. He is a presenter at the Wayne State Planetarium as well as a Solar System Ambassador for NASA. He has been obsessed with space and spaceflight nearly his entire life. He is currently ignoring homework to build spaceflight trajectory calculators. If you need help navigating to the Moon, Jeff can help.



(Continued on page 18)

Thursday, December 10, 2020

Virtual Banquet

What the Star of Bethlehem Wasn't

By Guy Consolmagno

Every year, astronomers (and astronomy clubs) get asked about the Star of Bethlehem. If you think you're tired of it, imagine if you were the director of the Vatican Observatory! In this talk, Br. Guy Consolmagno (director of the Vatican Observatory and Detroit native) will talk about what the star isn't, what the star might be, and how we can use the public's interest in the topic as a way to educate people about astronomy (and more!).

Brother Guy Consolmagno SJ is Director of the the Vatican Observatory and President of the Vatican Observatory Foundation. A native of Detroit, Michigan, he earned undergraduate and masters' degrees from MIT, and a Ph. D. in Planetary Science from the University of Arizona; he was a postdoctoral research fellow at Harvard and MIT, served in the US Peace Corps (Kenya), and taught university physics at Lafayette College before entering the Jesuits in 1989.

Along with more than 200 scientific publications, he is the author of a number of popular books including Turn Left at Orion (with Dan Davis), and most recently Would You Baptize an Extraterrestrial? (with Father Paul Mueller, SJ).



WAS PRESENTATIONS

If you would like to present either a short talk (10-15 minutes) or a full-length talk (45-60 minutes) at a future meeting, please email Dale Partin at:

firstvp@warrenastro.org.

Short Talk:



By Mark O'Malley

Mark O'Malley will finish the journey we began in June with Von Braun's biography from a child of the nobility in the Kingdom of Prussia to the end of his life as an American citizen in Virginia. We will take up the narrative with his involvement with the United States Army, and NASA, the historical significance, and a bit of background to the history of Europe and America that resulted in all of these activities being so well-funded.



Mark works as a Buyer in the automotive industry. His current employer is the ZF Group. Prior to working in Michigan, he lived in Minnesota, Texas, Indiana, Missouri, and Germany. he has been a member of the WAS since 2016. His activities include but are not limited to stargazing, hockey, organizing German language clubs, studying history, and volunteering as a mentor at Warren Mott High School.

Mars Observations

Mars Reports:

4-5 NOVEMBER -- Veen Observatory
(Warm windy day) 5" Newtonian. Poor seeing on Mars. Wind. One of worst views this apparitions.

5-6 NOVEMBER --Veen Observatory
Less wind in early evening. Sky turbid.
5" Newtonian. Very disappointing on Mars even with filter. "Band" of dark features. Polar cap not visible.

Best days behind us . . .

6-7 NOVEMBER -- (same)
5" reflector ~ 165X. Seeing better on Mars. Syrtis Major on W. limb. Deucalionis Regio obvious in orange-red filter but polar cap is not vis.

7-8 NOVEMBER -- (same)thereof.
Seeing good on Mars, ~165X + filter. Polar cap visible. For 1st time this year clearly obs'd Hellas.

8-9 NOVEMBER -- (same)
Mars in 5" Newtonian, orange filter. Seeing good.

Diameter of planet much reduced. Syrtis Major well left of central meridian. Very dark N. tip thereon. Iapigia shades in to Hellas. (A frost in H. now?)

North margin of Sabaeus is dark and sharply defined. The Aria-Arabia region is totally blank.

9-10 NOVEMBER -- (same)
5" Newtonian ~165X, 25A filter on Mars.

Good seeing despite light wind. Syrtis Major is on meridian. Polar cap barely visible. Again: S. Major north prominary very dark. The interface of Mare Cimmerium against Aeolis is very well defined & dark. No Hesperia cleft was observed between Syrtis Minor and Mare Cimmerium (in keeping with earlier obs'ns). Hint of detail seen in Hellas. North polar hood never seen this opposition.

G.M. Ross

Join the Astronomical League!



The mission of the Astronomical League is to promote the science of Astronomy. The major benefit of belonging to this organization is receiving the quarterly newsletter, The Reflector, which keeps you in touch with amateur activities all over the country.

Also:

- Participate in the Observing Program
- Avail yourself of the League Store
- Astronomy Books at a discount
- Attend Astronomical League Conventions



Only \$7.50 annually,
(Membership starts July 1)

alcor@warrenastro.org



December 17.

The night of December 17, 1965 changed my life. That was the night I began a search for comets that this goes on to this day. It represents the second most important decision I have ever made, to begin a visual search for comets and exploding stars that are called novae. The first most important decision, of course, was to marry Wendee. Both decisions made my life what it is today.

Usually in Montreal, November, December, and April are the cloudiest months. Therefore I wasn't counting on a clear sky that evening. After a Friday evening dinner with my family, I walked over to my friend Tom Meyer's home and we visited for a while. Afterwards, around 11 pm. I took Clipper, our little beagle, for a walk towards the summit of the hill on which we lived.

It was during this little stroll with Clipper that things began to change. Towards the west there appeared to be some lightening of cloud cover, and soon after, clearing. Within about 15 minutes large swaths of sky were showing some stars. I couldn't believe it. I turned toward home, and for a few seconds Clipper and I enjoyed a tug-of-war until he gave up and walked back home with me. Just before midnight on



I have owned and used Pegasus, an 8-inch diameter Cave reflector, for more than half a century. In this picture, camper Andy Bauman and I are pointing Pegasus to project the Sun, at the Adirondack Science Camp, in 1966. I used this telescope on my first night of comet hunting in 1965. Photograph by Joe Howard.

the 17th, I began my first comet hunting and I scanned the sky between Pollux and Castor, in the constellation of Gemini. The clouds returned after that.

As the famous ABC news reporter Jules Bergman said on the launch of Telstar, the world's first active telecommunications satellite in 1962, "And it all began today." For me, it surely did. In December 2020, fifty-five years will have passed, and I still am searching almost every clear night. There are 22 comets roaming about the solar system with the Levy name on them, plus one named Jarnac. Jarnac Observatory is the name of our observing site here in Vail, Arizona and is named in turn after my grandfather's cottage, Jarnac, near Ripon, Quebec. An object was found and automatically reported by

Tom Glinos, who once had an automated telescope here. Because he incorrectly identified the object as an asteroid, when it turned out that it sported a tail and was reclassified as a comet, it was named, following the rules, for the observatory, not for the discoverer. Thus, my total is now 23 comets. If my grandfather knew that his beloved cottage (and later observatory) now had a comet with its name on it, he would be dancing all over heaven. It is a happy story that still goes on today.



Astronaut Wives Club

<https://abc.com/shows/the-astronaut-wives-club>

Episode Four: Liftoff

Now that the election is over and we're between jobs, let's get back to the candy floss of *The Astronaut Wives Club*. We've reached the episode about Wally Schirra's Sigma 7 mission, but really it's not about that, it's about... what the hell is this episode even about?

The Wives have relocated to Houston, and Jo Schirra (Zoe Boyle) has her heart set on being accepted into Houston high society. This is a bizarre concept to most of the other Wives, especially the likes of Betty Grissom (JoAnne Garcia Swisher), who doesn't know the difference between designer dresses and the discount rack at the local department store (Lady Louise Shepard schools Betty on this point because of course she does). But they support Jo in her quest to climb the Houston social ladder, because there's a new threat on the horizon: the Cuban Missile Crisis!

Except the threat of the Missile Crisis is overshadowed by an even worse menace: The *Gemini Bikini Girls!* (Or "G-g-gemini B-b-bikini Girls," because even sweet Annie Glenn has her hackles raised over them.) Yes, the wives of the New Nine have arrived in Houston, eyes wide with cruel innocence whilst brandishing trays of meatloaf cupcakes as their deadly weapons.



Liftoff shines in the small moments of chemistry between the Wives we've come to know over the last three episodes; my laugh-out-loud moment was the part where Rene and Betty lifted flower arrangements from the Junior League party. So #relatable. But the dreadful after-school-special A-plot of this episode demonstrates that this show doesn't entirely know what it wants to be about. If it's about sisterhood formed via crisis, why use the Gemini Bikini Girls as paper-thin antagonists, and why delight on putting them in their place? Why spend an entire episode putting Jo in her place for daring to want something as retrograde as Junior League membership in a period piece?

The show wants to have its perfectly frosted girl-power Bundt cake and gorge on it too... just as it tries to coyly acknowledge Max the Life Magazine Guy is Jewish (Luke Kirby) without saying it. Are we, the enlightened viewers of the 21st century who view the Junior League as silly and meatloaf cupcakes as revolting, supposed to find his budding relationship with Louise doubly taboo for it? As for the menfolk, we get some uplifting moments of teamwork and brotherhood even though by now it's clear that Gordo Cooper isn't the only one of the Seven who ought to be sleeping in the tub every night, so the whole thing feels off. Who are we rooting for?

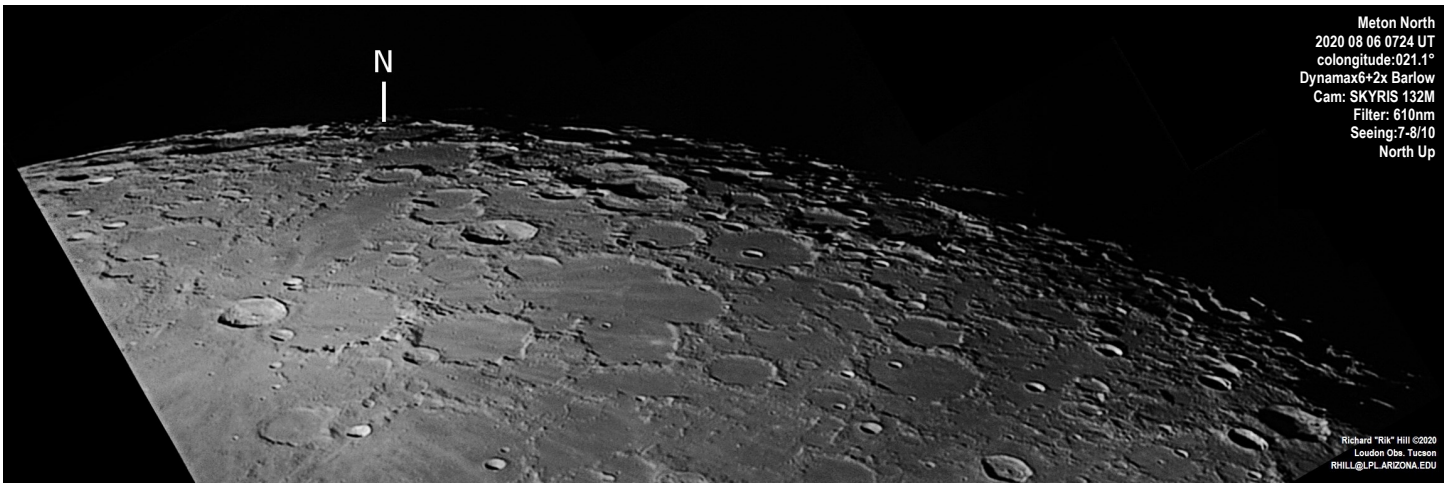
After watching this, Wally Schirra as played by Aaron McCusker makes sense on a meta level: he's a prank-pulling agent of chaos not out of joy but out of resignation to a script neither fair nor just. When the guy with the Whoopie Cushion is starting to look like a moral center to a show... Houston, we may have a problem. While the episode ends with Betty and Rene helping Jo chainsaw a hole through their fence so they can all hang together without tourist buses gawking at them, cutting one's way out of bad writing is a feat on another level.

Three and a half moons out of five because I've come to enjoy these characters but the plot of this episode should've been left in 1962.





Over the Moon with Rik Hill



Meton North
2020 08 06 0724 UT
colongitude:021.1°
Dynamax6+2x Barlow
Cam: SKYRIS 132M
Filter: 610nm
Seeing:7-8/10
North Up

Richard "Rik" Hill ©2020
Louisa Obs. Tucson
RHILL@UPL.ARIZONA.EDU

Northland

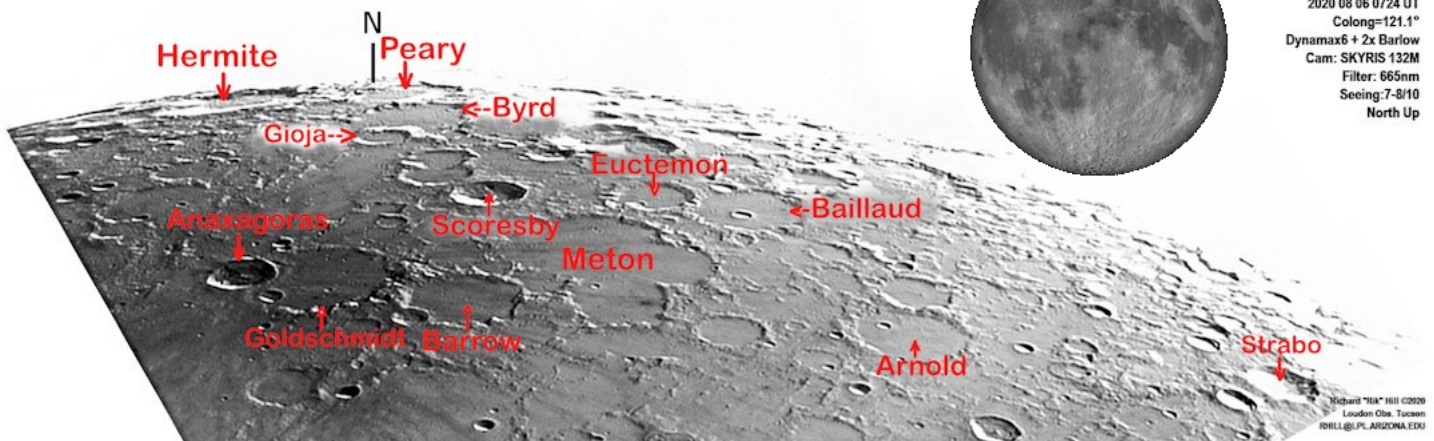
What we are getting here is a pretty good look at the north polar regions of the Moon during a relatively favorable libration. The location of the pole itself is denoted by the "N" marker so we can begin our exploration with that. There is a large foreshortened crater just to the left of the marker. This is Hermite (114km diameter). To the immediate lower right of the marker is Peary (77km) and just a little further to the lower left is Byrd (97km) both north pole explorers on Earth. On the near edge of Byrd is a very nicely defined crater Gioja (43km) on the edge of that crater directly under the marker. Farther down and slightly left, we see a well defined fairly recent crater (within the last billion years) with a faint but well defined ray system, Anaxagoras (53km).



ther right is a large cloverleaf shaped feature, Meton that is the merge of four craters with the central plain listed as 126km with each of the side lobes having their own satellite designations and diameters. Meton is listed as 3.9-4.5 billion years old (b.y.o.) and is one of the more distinctive features on the north end of the moon. Just above this is the much younger crater Scoresby (58km) and less than 3.2 b.y.o. To the upper right of this is a large crater with a distinctive small fresh crater on its floor, Baillaud (94km) sort of a double crater with Euctemon (68km) adjacent to the upper left. Both of these craters may also be as old as 4.5 billion years! To the lower left is another similar crater with a small satellite crater on it's floor, Arnold (99km). Then down in the lower right corner, above the name tag, is our last crater, Strabo (56km). You can see some of the terracing as the sun sets on this *impact* crater named for the man who was known for his commentary on *volcanism*!

Over to the right Anaxagoras overlaps an old crater, Goldschmidt (124km) and farther right is Barrow (95km), a crater that should be watched for interesting shadow play at sunrise. Edging a little fur-

This image was made from 3 1800 frame AVIs stacked with AviStack2 (IDL) and further processed with GIMP and IrfanView.



Meton north
2020 08 06 0724 UT
Colong=121.1°
Dynamax6 + 2x Barlow
Cam: SKYRIS 132M
Filter: 665nm
Seeing:7-8/10
North Up

Richard "Rik" Hill ©2020
Louisa Obs. Tucson
RHILL@UPL.ARIZONA.EDU

History S.I.G.

December 1983

The holiday cover of this issue shows labels on the presents under the tree, interesting how little the astronomer's wish list has changed over the years- we might substitute SD cards for film, but that is about it. Wonder what we would wish for these days instead of drive correctors. "The Constellation Corner" features Perseus this month. Rick Davidson writes about "Opportunities to use Large Telescopes" noting that the scopes at Kitt Peak were occasionally idle. Wrapping up the newsletter we have "The Sun's Gates" by Ken Kelly.



December 1993

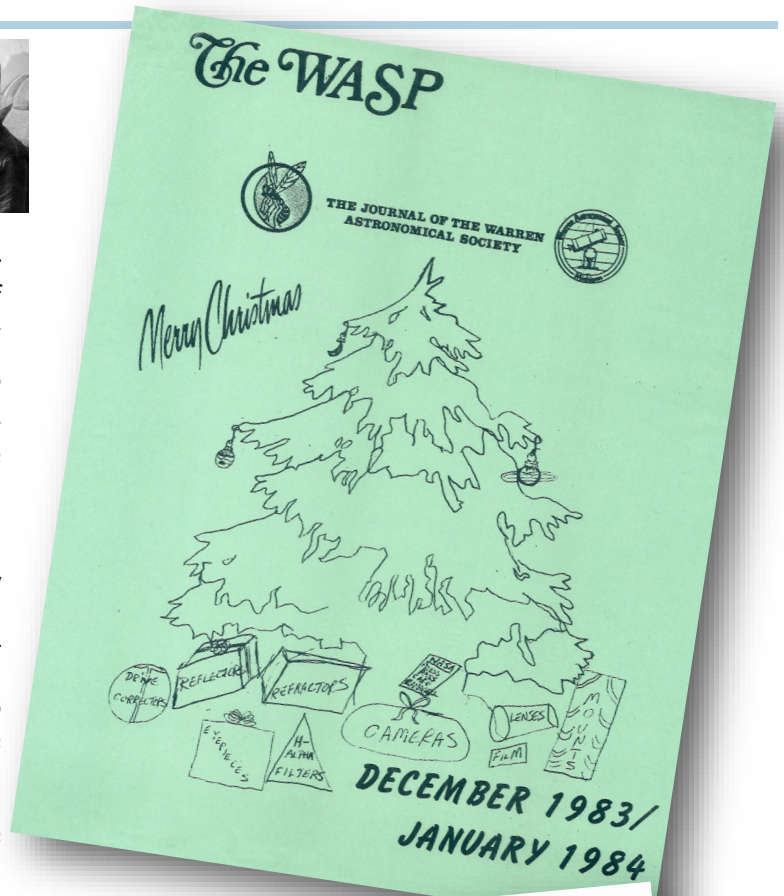
The main article of this issue is "Hubble vs. New Ground-Based Optics" where the Hubble Space Telescope is compared with the newest earth-bound telescopes to come online. No author is listed, but its continuation page leads directly into a NASA news release. But, between these two, we have "Computer Chatter" by Larry F. Kalinowski. The NASA news item might interest David Levy: "Hubble Investigates Comet on a Collision Course with Jupiter."

From the Scanning Room

I've written the last article (for now) in Adventures in Armchair Astronomy and can devote more time to sorting through the remainder of the Kim Dyer collection I have here. That is the plan, at least. In other developments, the faithful HP all-in-one has suddenly decided to stop printing. I've replaced it with an Epson Workforce number, and it appears it will fit the bill for my scanning purposes.

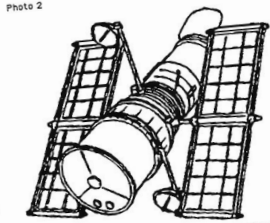
In other news, I regained my chair as Publications Director. I look forward to working with myself on the publication of the WASP and other projects.

Dale Thieme,
Chief scanner



Hubble vs. New Ground-Based Optics

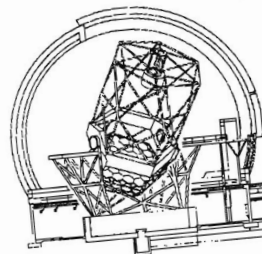
The Hubble Space Telescope (HST) represents a historic leap forward for optical and ultraviolet astronomy. However, the aberration in the HST's primary mirror has led many to claim that powerful new ground-based telescopes will equal or surpass HST's performance. On the other hand, when the optically corrected after the Servicing Mission in late 1993, the sensitivity of HST to very faint objects will increase by about 10 times. Each type of telescope offers astronomers unique strengths. Astronomy will make its mark on history with a combination of advanced ground-based systems and the restored Hubble Space Telescope.



Telescope (Photo 2) will have its chance to capture faint objects far out and back in time when the universe was in infancy.

How are new technologies improving the performance of ground-based telescopes? What science can only Hubble do? Two features of telescope design are crucial in comparing the capability of ground-based telescopes: resolving power and light gathering power. Location also is a key factor which in many cases outweighs the differences in resolving power and light gathering power of telescopes.

Keck is 10-meter surface is an array composed of a mosaic of 36 hexagonal segments, which are operated in unison (Photo 1). (Cutaway drawing by Steven Simpson courtesy of Sky and Telescope.) After servicing late in 1993, the Hubble Space Telescope.



Light Gathering Power
One measure of a telescope's capability is light gathering power. The bigger the area of a lens or mirror, the more light from an object that can be captured and focused to make a brighter image. For cameras, it's the f-stop which controls how much area of the lens is available. The more area (lower f-numbers), the shorter the exposure needs to be to form an image. Because astronomers study very faint objects in the sky, they need telescopes with as big an area as possible to collect and concentrate light into an image.

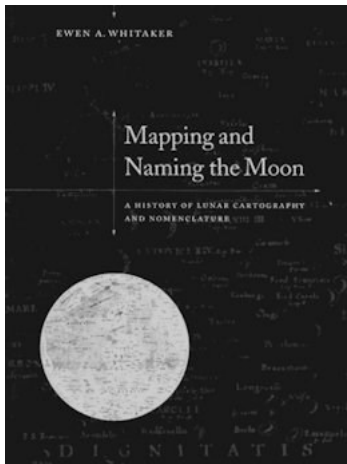
The most light-hungry instruments are the spectroscopes which take the incoming light and split it into an array, like colors of the rainbow, called a spectrum. With these spectra scientists can tell what kinds of atoms and molecules are found at very great distances or far back in time and how hot and how fast they are moving.

The world's largest telescope, the W. M. Keck telescope in Mauna Kea, Hawaii, instead of one mirror, is made of many individually controlled, hexagonal mirror segments. Keck's multi-mirror array has a 10-meter (33-foot) aperture. (Continued on page 4.)



Adventures in Armchair Astronomy

Mapping the Moon



While researching the maria for last month's article, I came across an abbreviated history of lunar mapping in *Luna Cognita*. One footnote recommended that, if I wanted to dive deeper in that topic, I should get a hold of a copy of *Mapping and Naming the Moon* by Ewen A. Whitaker. Yes, please.

In his book, Whitaker divides the history of mapping the Moon in four eras, which I'll follow.

First Era: From Prehistoric Images to Archetype Map

Galileo Galilei (1564-1642) was the first to publish sketches made with a telescope in 1610 (*Sidereus Nuncius - Sidereal Message*), "publish" being the keyword. A Thomas Harriot (1560-1621), after sketching the moon in 1609, had produced what could be described as a map of the moon, possibly for his own studies, didn't publish and the map remained unknown until 1965. These sketches of the moon, done through the limitations of the telescopes of the time also lacked any labeling of features. Pierre Gassendi (1592-1655) and Nicholas de Peiresc (1580-1637), who hit upon the idea of using the progression of the earth's shadow during a lunar eclipse to aid in longitude determination of earthly locations, realized that naming the features



J. Hevelius



G. Riccioli

could help (rather than using letters and numbers, easily forgotten or confused). They hired an engraver, Claud Mellan, to make plates of the drawings for printing. Unfortunately, this plan never reached fruition. With the death of Peiresc, the project ceased. Which is a pity since the engravings were quite realistic.

Actual publication of lunar maps (detailed depictions with noted features) probably began with Michael van Langren (Langrenus) (1598-1675). He, with the blessing (and funding) of King Felipe IV of Spain and Princess Isabella (the King's aunt) embarked on a lunar atlas. The project was put on fast forward when rumors circulated that Johannes Hevelius (1611-1687) and Giovanni Battista Riccioli (1598-1671) were also developing maps of the moon. Langrenus had the foresight to patent (copyright) the names of the features: "By Royal Decree changes in the names of this map are forbidden under pain of indignation, and copies and other forgeries are forbidden under pain of confiscation and a fine of three florins" (in case the indignation didn't work.) A quick word on the names used:

In his map, Langrenus used the names of European royalty and nobility, philosophers, scientists, mathematicians, patrons, etc., as well as the names of explorers, religious leaders, the 14 saints, and possibly other unidentified names.

The Van Langren map didn't gain much traction and was superseded, in succession, by Hevelius' map (*Selenographia*) and then Riccioli's (*Almagestum Novum*.) Hevelius disregarded Van Langren's nomenclature and applied his own naming scheme (it is also possible he never received the map Van Langren sent him). At first Hevelius considered applying names of recent

(Continued on page 24)

Table 1

Caput	headland, cape	Mons	mount
Catena	chain	Montana	mountainous area
Chersonnesus	peninsula	Montes	mountain range
Collis	hill	Palus	marsh
Continens	continent	Petra	rock
Desertum	desert	Planitia	plain
Eruptio	outbreak	Promontorium	promontory
Fluvius	river	Regio	region
Fons, Fontes	source, sources	Scopulus	sea crag
Fretum	strait	Sinus	bay
Insula	island	Stagnum	swamp
Lacus	lake	Tumulus	mound
Mare	sea	Vallis	valley

(Continued from page 23)

and contemporary “famous and most learned men in mathematics.” But decided against that scheme because it might induce jealousy and strife (Why is my crater smaller than that pompous jerk’s?) and went with naming the lunar features after terrestrial seas, islands, mountain ranges, countries, etc. He also employed an extensive glossary in his nomenclature (see Table 1). The resulting names were rather lengthy. For example: Montes Coibacarani, Celenorum Tumulus, Chersonnesus Taurica, Lacus Corocondamitis and Lacus Hyperboreus Inferior.

Following the Hevelius map, Riccioli produced his version of the lunar map, using Francesco Grimaldi’s drawings. He abandoned Hevelius’ naming scheme, pointing out the precedent of Van

Langren’s work. He adopted much of the naming scheme of Van Langren...but dropped the names of current religious and other dignitaries. He chose, instead to go with ancient and contemporary contributors to astronomy. When the dust settled, he did use 63 of Van Langren’s names (relocating all but three: Pythagoras, Endymion, and Langrenus) and added 147 new names. In Van Langren’s letter to Gassendi, where he complained of Hevelius’s disregard of his map, he also went on to gripe, “Again, here is Father Riccioli, professor of Bologna, who has changed everything even though he had nothing but praise when I sent him my selenography.” And thus, Van Langren became the Rodney Dangerfield of Selenography. Hevelius and Riccioli became the go to source for the universities and general usage while Van Langren’s work faded from sight.



Hevelius’ Map of the Moon

(Continued on page 25)

(Continued from page 24)

Second Era: From Archetype to Maturity

For more than 150 years, the maps of Hevelius and Riccioli held sway, with many instances of both being used in a single publication. But, as observing instruments kept improving, inaccuracies in their maps were getting attention. Robert Hooke (1635-1703) compared his drawing of Hipparchus (Mons Olympus in Hevelius's map) with the simplistic renderings of Hevelius and Riccioli. He also speculated on the cause of the crater formation, by experimenting with dropping bullets in pipeclay slurry (Impact theory) and rising bubbles of water vapor breaking through heated alabaster powder (volcanic

theory.) Hooke didn't go so far as to come up with a complete map, but others took their shot at it:

- Christopher Wren (1631-1723), who constructed the first known globe of the moon.
- the French Capuchin friar Chérubin d'Orléans (1613-97, real name Michel Lasséré) claimed to draw a map of the moon using his invention, a rhombic pantograph, which looked suspiciously like Hevelius's map, who charged him with plagiarism (plus, it needed an incredibly sturdy equatorial mount, capable of supporting the pantograph mechanism, which didn't exist).

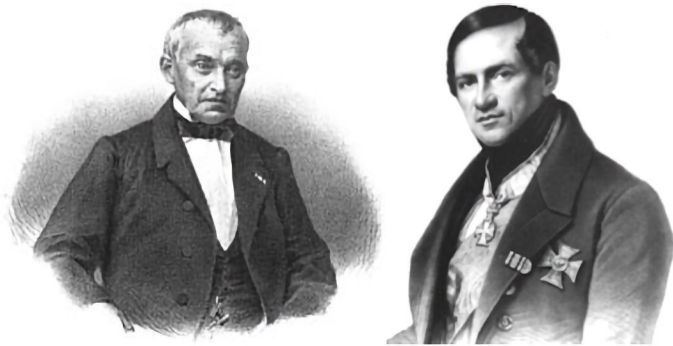


Riccioli's map of the Moon

(Continued on page 26)

(Continued from page 25)

- J. D. Cassini (1625-1712) , featuring some illusory details.
- Tobias Mayer (1723-62) and separately, Johan H. Lambert (1728-77), concluded the only way to achieve an accurate lunar map was to measure the positions of many of the moon's features, which could then be plotted on maps.
- John Russell (1745-1806) felt the maps of the time were inadequate for what he was seeing in his lens and set about adding his new and improved map, the result being a lunar globe, later publishing it in map form as well.
- Johann Hieronymus Schröter (1745-1816), who used a projection technique to gain further accuracy.



Mädler

Beer

All this mapping activity came to a head with the collaboration of Johann Heinrich von Mädler (1794-1874) and Wilhelm Beer (1797-1850) when they came up with a highly detailed map and book, *Der Mond* (The Moon).

During all this time, with the proliferation of astronomical textbooks, encyclopedias, ephemerides, atlases etc., moon maps were published with varying degrees of accuracy. In addition, the names of the features were constantly usurped, migrated, added to, and became a veritable soup sandwich of selenography. But everything stagnated after *Der Mond* came out. No one thought it could be surpassed. It took the development of photography to shake everyone out of their doldrums and take lunar cartography to a new level.

Third Era: From Proliferation to Standardization

At the Paris observatory, M. Loewy (1833-1907) and P. Puiseux (1855-1928), designed a telescope to take some 6000 plates of the Moon. Using the best images, they enlarged them (to the point of revealing the individual negative grains!) and published

Atlas Photographique de la Lune. In a more modest effort, Julius Franz (1847-1913) acquired plates from Lick Observatory and used them to create a more accurate map than the eyeball cartographers did, but he followed their lead and added more names.

Samuel A. Saunder (1852-1912), working on yet another mapping scheme, looked around at all the confusion and decided something simply must be done. He went to Royal Astronomical Society in 1905 and brought the situation to their attention. The matter, after a couple years, went before the General Assembly of the International Association of Academies which promptly set up an eight-member committee resulting in several elaborate and cumbersome labeling conventions that were shown to be unsatisfactory. Saunder, instead, proposed the original Mädler names.

Getting the go-ahead, Saunder enlisted the services of Mary A. Blagg (1858-1944) to catalogue a comparison of the maps of Mädler, Schmidt, and Neison plus a few others. She completed the task in 1913 as the *Collated List of Lunar Formations*, complete with 4,789 entries (entailing over 14,000 comparisons between the three maps, not to mention uncounted references to available texts and photographs). With this as a source, a new map could be generated, but the onset of World War I and the deaths of Saunder, Franz and other members of the committee brought the project to a halt.



Mary Blagg

Following the War, the International Astronomical Union was founded to coordinate astronomical research and observation. Commission 17, the lunar nomenclature committee, with H. Turner, M. Blagg, G. Bigourdan, W. Pickering and P. Puiseux as members took on the unfinished work in 1922. Any thoughts that discrepancies would be cleared up quickly were soon dispelled by the 1925 and 1928 meetings as Mary brought new listings of errors and additions. It took years to come up with a final listing called, *Named Lunar Formations*. The committee, in a hurry to get the job done, completed the lunar charts with Mary Blagg's rough drafts on graph paper (much to her chagrin). The NLF catalogue was deemed an acceptable compromise between the various nomenclature schemes and adopted internationally as the official IAU lunar list. But this was not a done deal.

(Continued on page 27)

(Continued from page 26)

Fourth Era: The Space Age Demands Changes

Fast forward to the sixties and, with the success of the Soviet Luna 3 mission (photographing the Moon's far side), the IAU was faced with some decision making among which map orientation was one. Traditionally, east was on the left side of the moon as observed in the sky, but now there was a globe to deal with and that orientation would not work. The IAU decided that west would be left (corresponding with terrestrial mapping convention) and north up for printing purposes. They also ruled that the names of craters would be for people deceased. With the increase in lunar attention and studies, the IAU formed committee 16a for Lunar Nomenclature and Cartography consisting of A. Dolphus, Z. Kopal, K. Koziel, G. Kuiper, D. Martynov, A.A. Mikhailov, and M. Minnaert. They got busy and produced a complete revision of the NLF (now called the *System of Lunar Craters—SLC*) the *Lunar Aeronautical Chart (LAC)* series of 1:1 million scale maps, and the *Rectified Lunar Atlas (RLA)*. At the 1967 IAU General Assembly, G. Kuiper and D. W. G. Arthur reported completion of the scheme of lunar nomenclature for the Moon's visible hemisphere. The result was that SLC and LDP became the official reference for lunar nomenclature and since the LAC series maps adhered to the SLC nomenclature, they became "official", too.

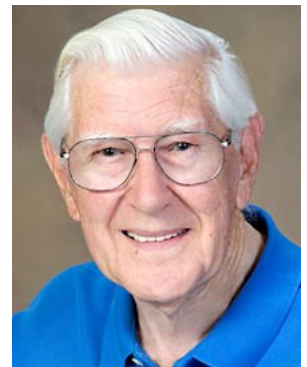
Then the other shoe fell. The Soviets showed up at the 1967 Assembly with their new lunar book, *Atlas Obratnoi Storony Lunny, Chast 2* [*Atlas of the Far Side of the Moon, Part 2*]. A far side lunar atlas based on the Luna 3 and Zond 3 probes. But they didn't follow the previous precedents! Suddenly, there was a lunar map half-populated with Russian names, living and dead. A compromise was reached where, among other things, nine cosmonauts and nine astronauts received named craters, quite a few of which were still living. I suspect the IAU felt the passage of time would eventually fix that "little issue", bringing all names under the official rule.

Of course, the IAU couldn't make progress without taking a step back. With the far side nomenclature in flux, they postponed assignment of names until the 1970 General Assembly, creating a sub-group of the Nomenclature and Cartography Committee, the WGLN consisting of D. Menzel (chair), Mikhailov, Minnaert, and Dollfus, "...none of whom is personally and directly engaged in the work of Lunar topography." You can almost sense disaster looming. Predictably, the WGLN came up with proposals that ignored accepted topographical practice turning a deaf ear to the howls of protest from actual cartographers. It didn't help that NASA used the WGLN as prime advisors. As the WGLN stumbled

along, spreading chaos, the IAU formed a new working group to deal with the planetary exploration and the newly revealed surfaces to be mapped, the Working Group for Planetary System Nomenclature (WGSPN) and renamed the WGLN, the Task Group for Lunar Nomenclature (TGLN). The name change didn't stop the wayward policies of the TGLN, who were busily renaming lunar features, moving the names, and adding the names of composers, poets and writers.

Eventually, the WGSPN flexed its muscles and came up with an all-encompassing system of nomenclature that cancelled the exceptions of the TGLN: no more composers, poets and writers on the moon, for starters. The TGLN protested but was overruled. Finally, the lunar cartographers started getting heard and in 1974, NASA formed a users' group (Lunar Photography and Cartography Committee). With the death shortly after the 1976 IAU Congress of the TGLN chair, D. Menzel and his replacement being the chair of the WGSPN, co-operation between the two groups was ensured.

Ewen Whitaker (1922-2016), involved in the lunar projects for many years, was assigned the task of assigning letters to far side sub-craters and came up with a clockface rule to give consistency not readily found on the nearside. The IAU adopted it and proceeded with yet another listing, the *Gazetteer of Planetary Nomenclature 1994*, which contained all names officially recognized by the IAU. Whitaker notes that there are errors in the listing which were cleared up in the galleys but managed to make it into the final printed version (example: the crater Ramsden supposedly being located in the exact center of the Moon's disk.)



Ewen Whitaker

Whitaker concluded his book with the admonition that it is important to know where things are on the moon, especially for those planning to go there, but, after reading his book, I'm left with the odd feeling, do we really know...yet?

-Dale Thieme

Sources:

Mapping and Naming the Moon, Ewen A. Whitaker, 1999, ISBN 0521622484

Luna Cognita, Robert A. Garfinkle, 2020
ISBN-10: 1493916637

Notable Sky Happenings

Dec. 1 - 7

Moon is to the left of Pollux on the 4th (SW morning) and the upper right of Regulus on the 6th (SSW morning).

Dec. 8 - 14

Moon is upper left of Spica on the 10th (SE morn.) and upper right of Venus on the 12th (ESE morn.).
Geminid Meteor Shower peaks the evening of the 14th and morning of the 15th. It's one of the year's best (averages 60 per hour).

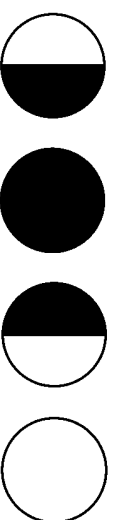
Dec. 15 - 21

Moon is below Jupiter AND Saturn on the 16th (SW evening twilight). Winter begins at 5:02 am EST on the 21st. Use binoculars and don't miss the rare conjunction of Jupiter and Saturn in the SW on the 21st (6:30 pm). The last closest conjunction between the two was in 1960. The next one as close won't be for another 60 years..

Dec. 22 - 31

Jupiter is to the left of Saturn on the 22nd (SW evening, use binoculars). The Moon is below Mars on the 23rd (SE evening).

Dec. 7 Dec. 14 Dec. 21 Dec. 29

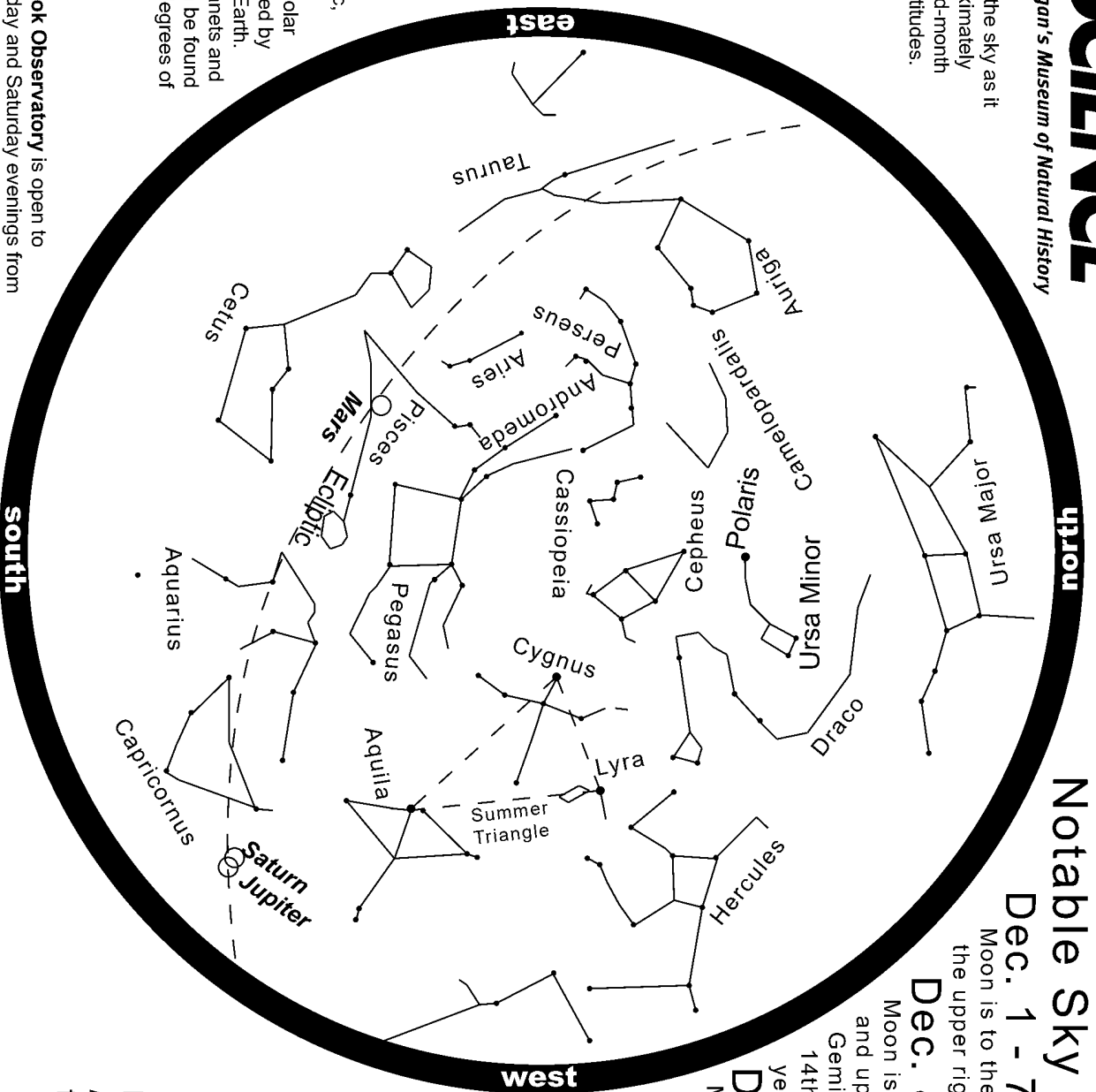


Now Showing

Please visit science.cranbrook.edu/explorer/acheson-planetarium for program updates.



This chart shows the sky as it appears at approximately 6pm EST near mid-month at northern mid-latitudes.



What is that dashed line?
It's the ecliptic, the reference plane of the solar system, defined by the Sun and Earth. The major planets and the Moon can be found within a few degrees of this plane.

The Cranbrook Observatory is open to the public Friday and Saturday evenings from 7:30 - 10:00pm EST, and the first Sunday of the month from 1:00 - 4:00pm for solar viewing. Come have a look through our 6" telescope! For observatory information visit <http://science.cranbrook.edu/explorer/observatory>

For astronomy information visit <http://science.cranbrook.edu>



Stargate Observatory

Special Notice

Due to the measures taken during the Covid-19 pandemic On-site Star Parties and group events are cancelled.

During this time, you are encouraged, when the skies co-operate, to join the livestream with Northern Cross Observatory on the open house schedule (4th Saturday of the month)

Past livestream are available on the Warren Astronomical Society's YouTube channel:

<https://www.youtube.com/channel/UC12jUX4Gmweg6fTtUuqa8CQ>

Observatory Rules:

1. Closing time depends on weather, etc.
2. May be closed one hour after opening time if no members arrive within the first hour.
3. Contact the 2nd VP for other arrangements, such as late arrival time. Call 586-909-2052.
4. An alternate person may be appointed to open.
5. Members may arrive before or stay after the scheduled open house time.
6. Dates are subject to change or cancellation depending on weather or staff availability.
7. Postings to the Yahoo Group and/or email no later than 2 hours before starting time in case of date change or cancellation.
8. It is best to call or email the 2nd VP at least 2 hours before the posted opening with any questions. Later emails may not be receivable (secondvp@warrenastro.org).
9. Generally, only strong rain or snow will prevent the open house... the plan is to be there even if it is clouded over. Often, the weather is cloudy, but it clears up as the evening progresses.

Advisory: Concerns are circulating in the amateur astronomy community about COVID-19 being passed from one person to another via contact of different persons' eyes with a telescope eyepiece. While we are not medical experts, we thought we should pass on this concern. Sharing telescopes may be considered by some to be high-risk due to the possibility of eyes touching eyepieces.

Stargate Report

Observatory report for December.

Stargate observatory and the Dob shed along with all equipment are in good condition as of November 5, 2020.

Maintenance on the observatory has been performed to seal the gaps between the outer walls and the roof soffit, as well as between the concrete floor and the deck by the doors, to block wasps from getting in a nesting. In addition, the building has been cleaned and floors vacuumed.

The observatory will remain closed until further notice due to the COVID-19 pandemic.

Riyad I. Matti
2020 WAS 2nd VP, Observatory Chairperson

Treasurer's Report

Treasurer's Report for 11/30/2020 MEMBERSHIP

We have 94 current members

INCOME AND EXPENDITURES (SUMMARY)

We took in \$2036 and spent/transferred \$1769 We have \$21274 in the bank \$30 in checks and \$585 in cash, totaling \$21889 as of 11/30/2020

INCOME

AL 2020	\$67.50
calendar 2020	\$150.00
Donation	\$348.88
Membership	\$582.00
Merch	\$84.00
Renewal	\$831.00

EXPENSES

Calendar Shipping Cost	30.35
PO Box 2020	92.00
Snack Reimbursement	70.00
Snack Supplies	2.12
Speaker Expense, Dinner	54.23
Speaker Expense, Driving	261.00
Env. & Stamps for Beg Letters	19.32
Batteries for AP Hand Controller	33.07
Meetup Fees	89.94
Club Insurance Premium	1117.00

Astronomical Events for December 2020

Add one hour for Daylight Savings Time

Source:

<http://www.astropixels.com/ephemeris/astrocal/astrocal2020est.html>

Day	EST (h:m)	Event
01	02:46	Moon at Ascending Node
03	20:24	Pollux 3.8°N of Moon
04	20:10	Beehive 2.4°S of Moon
06	11:28	Regulus 4.8°S of Moon
07	19:37	LAST QUARTER MOON
12	15:40	Venus 0.8°S of Moon: Occn.
12	15:42	Moon at Perigee: 361777 km
13	20:00	Geminid Meteor Shower
14	06:03	Moon at Descending Node
14	11:13	Total Solar Eclipse; mag=1.025
14	11:17	NEW MOON
16	23:28	Jupiter 2.9°N of Moon
17	00:25	Saturn 3.1°N of Moon
19	22:00	Mercury at Superior Conjunction
21	05:03	Winter Solstice
21	18:41	FIRST QUARTER MOON
22	04:00	Ursid Meteor Shower
23	09:48	Venus 5.5°N of Antares
23	13:30	Mars 5.6°N of Moon
24	11:32	Moon at Apogee: 405010 km
27	15:20	Aldebaran 4.6°S of Moon
28	10:03	Moon at Ascending Node
29	22:28	FULL MOON
31	02:41	Pollux 3.8°N of Moon

GLAAC REPORT 11/30/2020

Beginning Balance: \$3,025

INCOME

Donation for AATB 2020, Ottums \$50

EXPENSES

No activity

Ending Balance: \$3,075

Mark Jakubisin
Treasurer

Outreach Report

This has been a challenging year for those of us that have been active doing astronomy outreach - events across the planet have been cancelled, libraries and observatories have been closed, and having members of the public look through your telescope is a potentially risky proposition. I *really miss* going over to my buddy's house and playing computer games, and attending science fiction conventions... MAN do I miss going to those!

I recently received a 50 pound box of NASA 2021 calendars - these were supposed to be handed out at NASA events - which got cancelled. The NASA/JPL Solar System Ambassador program enlisted the help of their ambassadors to distribute them. Connie took enough to give to all her students in her middle-school astronomy class - she said her students "went crazy" when they found out they could keep them! Connie overheard a couple parents try to lay claim to them.

The Vatican Observatory Foundation (my employer) has cancelled workshops, summer school programs, and attending various outreach events - the same thing that's happened to the W.A.S. With the online-surge after the start of the pandemic, the VOF began hosting monthly Zoom meetups for their Sacred Space Astronomy (blog) subscribers - getting to interact with Vatican Observatory staff has been pretty cool. The W.A.S'. transition to online meetings has been a great success, and virtual Astronomy at the Beach feels like a dream to me now.

This week, Connie is teaching virtually from home (which makes me happy) - she has transitioned to an online format much better than I thought she would; last trimester, I gave my "Tour of the Solar System" to her students online. Recently, a science fiction convention I've presented at in the past invited Br. Guy and I to give presentations online in February - we've submitted several ideas for solo and panel presentations. Online looks like it's here to stay for the foreseeable future - I'd like to see W.A.S. and GLAAC do a couple online events, and help support teachers - *which brings me to:*

Member Spotlight

Ken Bertin volunteered to do multiple "Size and Distance" presentations for Renee Grenier's (Rochester Community Schools) online classes.

If you are giving presentations or doing other astronomy outreach, *please let me know!* [Use this link to send me a quick email report.](#)



Michigan Dark Sky Update

(edited from email from Sally Oey)

Eberwhite School, A2: The school's outdoor lights are now back on their schedule of turning off at an appropriate hour! Many thanks to Sophie Grillet for pursuing the issue, and to Emile Lauzzana of the Ann Arbor Public Schools for resolving this. ***If anyone else has issues with AAPS lighting, Mr. Lauzzana has been very helpful and responsive.***

Burton Tower, UM: The Astronomy Department has obtained approval to have the Burton Tower lights turned off during observing activities at Angell Hall! Huge thanks to Shannon Murphy, Ted Bergin, and Tiffany Ng for moving this forward, and to Ben Thauland, Facilities Manager at the School of Music, Theater, and Dance; and the Office of the VP for Communications. This will also help the Angell Hall Open Houses.

Ann Arbor Lighting Ordinance: Gillen Brown reports that the Ann Arbor Student Advisory Council has passed a resolution in support of the draft Lighting Ordinance. Thanks, Gillen, for initiating that! The latest word from the Planning Manager is that the Lighting Ordinance will be presented to City Council in December or January.

Library Lot park project, A2: Rita Mitchell (Sierra Club) has been appointed to the "Council of Commons" advising the city on the development of the Library Lot park. She'll help ensure that the plans are dark-sky compliant. Rita is also a city Environmental Commissioner. Thank you, Rita!

Headlands International Dark Sky Park: You may have heard about the Enbridge Line 5 suspension -- unfortunately, this does not affect the tunnel project threatening the dark skies at Headlands.

(Continued on page 32)

(Continued from page 31)

Petoskey: Mary Adams is doing a series of star lore presentations in January at North Central Michigan College.

Scenic Michigan's annual photo contest winners include two, terrific night-sky photos featuring comet NEOWISE. Thanks to Executive Director Erica Briggs for also raising the issue of light pollution in the related MLive article (requires login).

John Mirsky shares an article on Houzz promoting bird-friendly, dark-sky landscape lighting; and Heidi Trudell shares a feature in Architect magazine on dark-sky lighting design.

Nicholas Poggioli shares a Nature article on the aggregate biological effects of artificial light at night (requires UM login or subscription).

Reminder: Please review our Wish List of Action Items. If you can help move forward any items, please add your name and let us know, including adding new items. There's tons to do!

New people: Welcome! Please enter your name and info on the private Google page Dark Sky Group Members so we can see who we are and how best to leverage what we bring to the effort. Please browse and feel free to use the info in our Google docs, and to add to them.

More Info on Michigan Dark Skies: <https://sites.lsa.umich.edu/darkskies/>

Night Light Image from NASA's Black Marble Site: <https://worldview.earthdata.nasa.gov/>

Video Suggestions

Since Br. Guy Consolmagno will be our guest at the banquet, I have a couple suggestions for videos where he discusses the Vatican Observatory and Vatican Observatory Museum - I showed these to my in-laws, and they were *amazed* that they'd never heard anything about this!

The Popes Telescopes

<https://youtu.be/ccOGKAL6Qas> - A fascinating tour of the Vatican Telescopes with Br. Guy as a docent.

Papal Space Rocks

<https://youtu.be/5OI4wb2XIZc> - An informative and entertaining tour of the Vatican Observatory Museum.

The Pope's Astronomer

<https://youtu.be/ZODAKaR16cY> - An interview with Br. Guy.

Fr. Angelo Secchi - Jesuit Astrophysicist

<https://youtu.be/iBDED7tAq4s> - A discussion about the "Father of Spectroscopy." This video has several "why didn't I ever hear about this in my Catholic upbringing?" moments.

Bob Trembley



1935 Zeiss Double Astrograph Reflector - one of only 4 in the world. From "The Popes Telescopes."

Meeting Minutes

BOARD MEETING

November 2, 2020

Board Members - All present. Diane Hall called this business meeting to order at 6:30.

Old Business

Riyad Matti noted that wasps continue to be a concern in the walls of the observatory. He plans to have the openings caulked early in the spring before they become active. Arrangements can be made for observatory use for trained individuals or very small groups.

Glenn Wilkins reported that all the October minutes were approved and submitted for publication in advance of deadlines.

New Business

Calendar Committee – Bill Beers urgently needs images to complete a timely proposal for 2021

CRANBROOK GENERAL MEETING

November 2, 2020

Diane called this meeting to order at 7:30. 27 members continued to participate on WebEx and an additional 10 joined on You Tube.

In the News/Sky was presented by Adrian Bradley. All of these reports can be found in full at Space.com.

Water on the Moon has now been confirmed as common, even in the shadows of craters exposed to the sun. The first indication was found in 2009 and confirmed in 2018. This discovery is important when planning for a possible Moon base for missions to Mars and beyond.

The European Philae lander was launched in 2014 and recently soft landed on the “skull face” on comet 67P. This historic lander was part of the Rosetta program.

The Perseverance Mars rover has now travelled 146 million miles and is now half way to the Jezero crater and is expected to arrive next February to begin its search for life. One planned test is to fly a helicopter prototype called Ingenuity in the thin atmosphere.

Kepler planet discoveries from 2009 thru 2018 indicate that more than half of sunlike stars (G class) have rocky planets in habitable zones. This is also true of red (M) dwarfs; however, due to closer distances from the sun, any “habitable” planets would likely be tidally locked and thus poorly suited to the development of life. Dale P.

noted that he has posted his updated version of the Drake equation on U Tube.

The Saturn/Jupiter close conjunction will happen on December 21. Unfortunately, the pair will be very close to the western horizon and difficult to view from Michigan. A week or two earlier would most likely offer the best opportunities for viewing or photography. Also, the winter circle of constellations will be rising again soon providing a return of many of our favorite objects.

Officer reports

Diane thanked everyone who has contributed so much through an “interesting” year. She noted that the Sun continues to be boring although there are indications that interesting viewing may be coming soon based on increasing coronal activity. The Board is hopeful that regular **discussion group** meetings will be resumed using virtual technology.

Dale reported that we have a comfortable number of scheduled reports well into the winter but would welcome further volunteers or suggestions.

Jonathan reported that the complete Treasurer’s report, and minutes for all the meetings can be found in the current WASP. Mark reported that we currently have \$21,274 in the bank and \$585 in cash. Membership remains at 93.

Bob reported that he is looking forward to assisting with the GLAAC plan to promote individual local astronomy clubs in their upcoming publications. He also noted that he is an official NASA ambassador for the Osiris-Rex sample recovery mission to asteroid Bennu. Bob will provide timely updates for us. He also viewed the Pelican Nebula with a hydrogen-alpha filter with interesting results.

Ken Bertin reported he gave an outreach report on Fritz Zwicky at the Wyandotte Station.

Old Business

2019 Year in Review – Jonathan is still seeking additional reports

Banquet prizes – None have been received so far in this strange year

Annual service awards – Diane is still looking for recommendations from WAS members (offline)

(Continued on page 34)

(Continued from page 33)

New Business

Banquet duties – Diane confirmed that the banquet will indeed be remote and Brother Guy will be our speaker. However, we still need to finalize details related to selecting/distributing service awards, and distributing any door prizes that may become available.

Pro Forma communications with our host organizations – Dale agreed to compose letters to Cranbrook & Macomb. Bob agreed to contact the Metro Park Administration to affirm our ongoing relationship.

Officer Election Results

moderated by Ken Bertin

Diane Hall ran again for **President** unopposed and won by affirmation

Dr. Dale Partin ran again for **1st Vice President** unopposed and won by affirmation

Riyad Matti ran again for **2nd Vice President** unopposed and won by affirmation

Mark Kedzior ran for **Secretary** unopposed and won by affirmation

Adrian Bradley ran for **Treasurer** unopposed and won by affirmation

Bob Trembley ran again for **Outreach Programs** unopposed and won by affirmation

Dale Thieme ran for **Publications Director** unopposed and won by affirmation.

Congratulations and appreciation to all!

Break – 8:30 to 8:50

Main Presentation

Dr. Dale Partin introduced Farmington Community Stargazers member Jenny Pon and her talk Space Ghosts. Comets were often referred to as such in the early days due to their wispy appearance and uncertain source. Very nice images were shown of Hale-Bopp in 1997 through Newwise on July 18. Then she took us through a deep dive of objects listed by Charles Messier in his pursuit of comets.

Jenny then transitioned into early and then modern images of galaxies such as M51 and the Sombrero. Next, she explored comparisons of early/modern images of various common nebulae reflecting how the true nature of ghosts have been revealed through science. Next, star cycles were reviewed showing the expected life cycles for massive stars as well common stars like our sun.

Finally, we were taken through a very interesting element formation chart reflecting our current understanding of how the natural elements were formed in suns through normal life cycles

as well as novae and super novae such as the Crab.

The meeting was closed at 9:49

MACOMB MEETING

November 19, 2020

Diane Hall called this meeting to order at 7:29 PM for 13 viewers on You Tube and 28 participants on WebEx

IN-THE-NEWS/IN-THE-SKY presented by Bob Trembley

News highlights –

Space Ex launched a crew to the ISS on 11-15 and they are currently on the space station.

The Perseverance Mars rover is on schedule to land on 2-15-2021.

The Chinese Lunar sample recovery mission is expected to be launched next week.

Nobel prizes have been announced for Roger Penrose and Reinhard Gretzel.

A dramatic composite video was shown detailing the collection of asteroid material by Osiris-Rex.

The oldest known planetarium projector was found in a barn.

The Arecibo radio telescope in Puerto Rico has suffered another damaging failure, this time with a support cable. After multiple engineering assessments of the damage, the National Science Foundation has sadly decided to decommission the historic scope and gradually tear it down. The 1,000 foot diameter scope began operation 57 years ago.

Sky attractions include lots of prominences displayed on the Sun which currently make it an interesting target despite only one sunspot. A recent image of Uranus was shown with 3 clearly identifiable moons through an amateur scope.

OFFICER REPORTS

Following the officer election, Diane thanked the current Board members for past services and welcomed new officers as well as those re-enlisting for another year! She noted that nominations for distinguished service awards are still needed, along with additional photos for the 2021 calendar.

The virtual banquet will be on December 10 with Brother Guy as our guest speaker, thanks to Bob Trembley.

Dale reported the short talk for the December 7 meeting will be by Mark O'Malley who will complete his report about the life of Werner Von Braun. A long talk is also expected; however, there will be a different speaker to be announced in advance.

(Continued on page 35)

(Continued from page 34)

Glenn reported that the "Cranbrook" minutes have been reviewed and are now available for publication. Election results are included.

Mark reported we currently have 93 members with \$21,274 in bank deposits and \$585 in cash. As usual, a complete financial report will be found in the WASP.

Bob reported that the Metro Park is comfortable with our relationship and has no current need for support. Doug Bock reported that he was able to do a live presentation to scouts and leaders at Boone Hill. No issues were encountered related to COVID restrictions. Ken Bertin held a weekly virtual event as reported in Facebook.

Jonathan reported that the November WASP was published as scheduled.

OBSERVING REPORTS

Diane reported that Gary Ross provided a detailed summary of his Mars observing sessions at the Veen Observatory. His report was sent to Announcements and covered evenings from 11-4 thru 11-10 through both a 5 in. refractor and a 5 in. reflector.

Ken Bertin enjoyed unexpectedly colorful views of Mars through an 80 mm Vixen scope. The transparent night also allowed viewing of two of the moons of Saturn.

Mark showed us a sketch of Mars he made recently at 300 power about midnight with excellent viewing in S/E Michigan. Diane suggested he submit it for consideration for our calendar.

Jonathan reported observing NGC 253 from the dark site near the tip of the mitt through his 10" Schmidt-Cass scope. He remarked that this object is underappreciated!

Adrian shared some of his recent photos taken at Alcona Lake Park near Glennie. Members were impressed and asked for further information about the site. Adrian then shared an impressive photo of a Red-Tailed hawk at takeoff. We learned he is an avid birder, a hobby that several WAS members also enjoy.

David Levy contributed a relevant poem in memory of the Arecibo telescope.

BREAK – 8:22 to 8:37

MAIN PRESENTATION

Dr. Dale Partin introduced Diane Hall while highlighting some of her most notable contributions to the WAS. These included 10 years as an officer and 15 presentations! The subject of this talk was *Unsung Historical Observatories*.

Although most of them usually do not come to mind when thinking about N. American observa-

tories, many prominent astronomers got started at these places making numerous important contributions. The talk was both informational and entertaining. The following observatories were covered, some built pre-1900:

Fritz Randolph Observatory (Halstead) 1954 thru 2020 at Princeton, N.J. housing the 4th largest refractor when opened.

Knightridge in Bloomington, IN closed in 2020

Daniel Kirkwood also in Bloomington containing a 12" refractor

Warner & Swasey in Cleveland, OH Opening in 1891 with a high-quality 9.5" refractor. Impressive discoveries were made here, and later public observing was offered.

Perkins in Delaware, OH opened with the 3rd largest refractor and was later opened to the public. The Big Ear radio dish was later added. Sky & Telescope magazine evolved from reports originating here.

Oak Ridge, MA opened circa 1930 and was used to discover many minor planets. A radio dish was added later.

Allegheny in Pittsburg opened in 1857 with a 13" refractor.

Fritz-Clark opened in 1861 at Pittsburg with the 3rd largest refractor at the time. The site later expanded to a total of 3 domes.

Chabot at Oakland, CA with a 30" refractor that was open for public renting.

Chamberlin at Denver opened in 1894 with a 20" refractor

The Humphrey aka Clark-Seigmuller was mentioned
The David Dunlap at Richmond Hill, Ontario opened with a 75" reflector

McMath-Hulbert at Lake Angelus, MI opened in 1930

Site 515 radio dishes (2) at Stanford, CA. An array of dishes was added in Phase 2. The site was shut down in 2006.

Many of these sites experienced multiple re-configurations and relocations due to funding changes and light pollution. The growing popularity of large reflectors in high, dark sites also contributed. Diane suggested that this list could form the basis for an interesting road trip of discovery. At least one member noted that this subject could turn into a great-reading book for anyone interested in astronomy.

Diane closed the meeting at 9:39

Glenn Wilkins
Secretary

The Warren Astronomical Society is a Proud Member of the Great Lakes Association of Astronomy Clubs (GLAAC)

GLAAC is an association of amateur astronomy clubs in Southeastern Michigan who have banded together to provide enjoyable, family-oriented activities that focus on astronomy and space sciences.

GLAAC Club and Society Meeting Times

Club Name & Website	City	Meeting Times
Astronomy Club at Eastern Michigan University	Ypsilanti/EMU	Every Thursday at 7:30PM in 402 Sherzer
Capital Area Astronomy Club	MSU/Abrams Planetarium	First Wednesday of each month 7:30 PM
Farmington Community Stargazers	Farmington Hills	Members: Last Tuesday of the month Public observing: 2nd Tuesday of the month
Ford Amateur Astronomy Club	Dearborn	Fourth Thursday of every month (except November and December) at 7:00 PM
McMath-Hulbert Astronomy Society	Lake Angelus	Board and paid members-First Sunday of the month Public open house—first Saturday at 11 am
Oakland Astronomy Club	Rochester	Second Sunday of every month (except May)
Seven Ponds Astronomy Club	Dryden	Monthly: generally the Saturday closest to new Moon
Sunset Astronomical Society	Bay City/Delta College Planetarium	Second Friday of every month
University Lowbrow Astronomers	Ann Arbor	Third Friday of every month
Warren Astronomical Society	Bloomfield Hills/ Cranbrook & Warren/ MCC	First Monday & third Thursday of every month 7:30 PM

GLAAC Club and Society Newsletters

Warren Astronomical Society:	http://www.warrenastro.org/was/newsletter/
Oakland Astronomy Club:	http://oaklandastronomy.net/
McMath-Hulbert Astronomy Club	http://www.mcmathhulbert.org/solar/newsletter/
Ford Amateur Astronomy Club:	http://www.fordastronomyclub.com/starstuff/index.html
Sunset Astronomical Society:	http://www.sunsetastronomicalsociety.com/
University Lowbrow Astronomers:	http://www.umich.edu/~lowbrows/reflections/

WAS Member Websites

Jon Blum: [Astronomy at JonRosie](#)
 Bill Beers: [Sirius Astro Products](#)
 Jeff MacLeod: [A Life Of Entropy](#)

Bob Trembley: [Balrog's Lair](#)
 Bob Trembley: [Vatican Observatory Foundation Blog](#)

Doug Bock: <https://boonhill.org>
 Facebook: Northern Cross Observatory <https://www.facebook.com/NorthernCrossObservatory>
 Boon Hill and NCO Discussion <https://www.facebook.com/groups/369811479741758>
 YouTube channel: <https://www.youtube.com/channel/UC-gG8v41t39oc-bL0tGpS6w>



NASA Night Sky Notes

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Visitors to Both Jupiter and Saturn

David Prosper

Have you observed Jupiter and Saturn moving closer to each other over the past few months? On December 21, the two worlds will be at their closest, around 1/5 of a full Moon apart! While the two gas giants may *appear* close, in reality they are hundreds of millions of miles apart. Despite this vast distance, a select few missions have visited both worlds by using a gravity assist from giant Jupiter to slingshot them towards Saturn, saving time and fuel.

Pioneer 11 was the first mission to visit both worlds! Launched in 1973, the probe flew past Jupiter in late 1974, passing just 26,4000 miles above its stormy clouds. In 1979, it became the first spacecraft to encounter Saturn. Pioneer 11 took the first up-close photos of Saturn and its satellites, and made many exciting discoveries, including the detections of its magnetic field and a faint “F” ring, before departing Saturn and eventually, the solar system.

The Voyager missions quickly followed up, taking a “Grand Tour” of the four largest and most distant planets in our solar system. Both probes were launched within two weeks of each other in 1977. Voyager 1 flew past Jupiter in March 1979, discovering Jupiter’s faint ring and two new moons, along with active volcanoes on Io’s surface! The probe then flew past Saturn in November 1980, discovering five new moons, a new “G” ring, mysterious ring

“spokes,” and “shepherd moons” shaping the rings. After a brief encounter with Titan revealed evidence of complex organic chemistry and liquid on the moon’s frigid surface, Voyager 1 was flung out of the plane of the solar system. Following close behind, Voyager 2 took detailed photos of Jupiter’s moons and cloud tops in July 1979. Flying past Saturn in August 1981, Voyager 2 measured the thickness of Saturn’s rings and took detailed photos of many of its moons. This second explorer then captured images of Uranus and Neptune before leaving our solar system.

Cassini-Huygens was the last mission to visit both worlds. Launched in 1997, the mission flew past Jupiter in late 2000 and took incredibly detailed photos of its stormy atmosphere and faint rings. Cassini entered into Saturn’s orbit on July 1, 2004. The Huygens probe separated from Cassini, landing on Titan to become the first probe in the outer solar system. Cassini discovered geysers on Enceladus, fine details in Saturn’s rings, many more moons and “moonlets,” the changing oceans of Titan, and seasonal changes on Saturn itself. After revolutionizing our understanding of the Saturnian system, Cassini’s mission ended with a fiery plunge into its atmosphere on September 15, 2017.

What’s next for the exploration of the outer worlds of our solar system? While Juno is currently in orbit around Jupiter, there are more missions in development to study the moons of Jupiter and Saturn. Discover more about future NASA missions to the outer worlds of our solar system at nasa.gov.



The difference in technology between generations of space probes can be stunning! The top two photos of Jupiter and Saturn were taken by Pioneer 11 in 1974 (Jupiter) and 1979 (Saturn); the bottom two were taken by Cassini in 2000 (Jupiter) and 2016 (Saturn). What kinds of photos await us from future generations of deep space explorers?



“Final” Word

-Jonathan Kade, Publisher

My Final Say

Fellow W.A.S. members, it's with a little wistfulness and a fair amount of relief that I write the final column of my term as Publications Director. As many of my previous columns observed, 2020 has been one of the strangest years any of us has ever seen. We've very successfully transitioned to online meetings, but as the primary host of the online meetings for most of the year, that effort has meant a lot of hours put into setting up Webex meetings, helping presenters do sound/video checks, running the Webex meetings, streaming to YouTube, and (sometimes) cleaning up the YouTube videos afterwards. It's been pretty grueling.

Thankfully, I haven't had to do any real work as Publications Director, as my friend Dale Thieme has done all the work in his role as W.A.S.P. editor. Not only has he continually raised the bar on what the WASP can be, he's also expanded his repertoire of skills to send out not just W.A.S.P. announcements but also many of the meeting invitations this year when work was making it difficult for me to do so in a timely manner. He's also worked to keep our Meetup events up to date and accurate when I dropped the ball on those. Beyond those general publications-related efforts, he has also served as a volunteer ombudsman, making sure the board remembered to do things we needed to do when we needed to do them. He worked with Bill Beers to create a wonderful 2021 calendar, the most inclusive calendar we've ever published, and done all the work on the 2021 membership mailer you should receive in January. Without Dale, the club might not have survived this year.

I never thought I would take the job of Publications Director. Putting together the WASP requires a lot of time, discipline, and focus, and whatever my strong suits are, those three are not among them. The only reason I took the job was because Dale was there as W.A.S.P. editor. Little did I know I was going to end up foisting on him a lot of the other club work I had done for a long time, like meetup updates and email notices, too! Hopefully, I will be able to take those reins back in a civilian capacity when I'm off the board, so Dale can focus "just" on the WASP and on the History subgroup.

My main goal in becoming Publications Director, as you might remember from before the pandemic, was to finally move the club to a new website with a little bit more modern appearance and set of functionality. As you can tell if you've visited the website recently, that hasn't happened. I'm hopeful

that, in the new year, I will be able to spend more of my time on that. We deserve a website that looks like it's from at least 2015, instead of 1995. I still want to know what people want the most from the new website. So far, my ideas mostly center on more information about Stargate and how people can start volunteering and using the equipment there, as well as a more welcoming and informative front-end for our massive library of W.A.S.P. issues.

As we wind down the year with a virtual banquet, I am reminded how much I miss seeing everyone in person. The members of the Warren Astronomical Society are my friends and almost family, and have been for a solid 1/3rd of my life at this point. Not being able to banquet with all of you, to visit and jam with Dale T in Florida or Warren, to stay up too late at Stargate with Riyadh and company, to join the Blums for the November discussion group, to hear the theatrical stylings of G.M. Ross, to hear members talk to each other in twos and threes and fours on breaks - it has really impoverished my life. I am really looking forward to a vaccine and an end to the isolation. I hope we can find a way to keep remote participants involved when we resume in-person meetings.

One final thought for 2020: by reducing the number of things the club does and the channels through which we do them, the pandemic has also concentrated the work of the club on a smaller number of people. This was probably unavoidable, but it does increase the risks of burning people out. Speaking as somebody who was pretty close to the verge from my various responsibilities for the last couple-three months, I hope we can find a way to get more members involved in keeping the gears turning as we get through the end of the pandemic and get back to in-person events. I'm really excited to have Adrian Bradley joining the board and Mark Kedzior rejoining, and I wish the new board all the best. Even if you aren't on the board, though, the club really needs your help in 2021 and beyond!

-Jonathan Kade

