



Vol. 54, no. 8

The W.A.S.P.



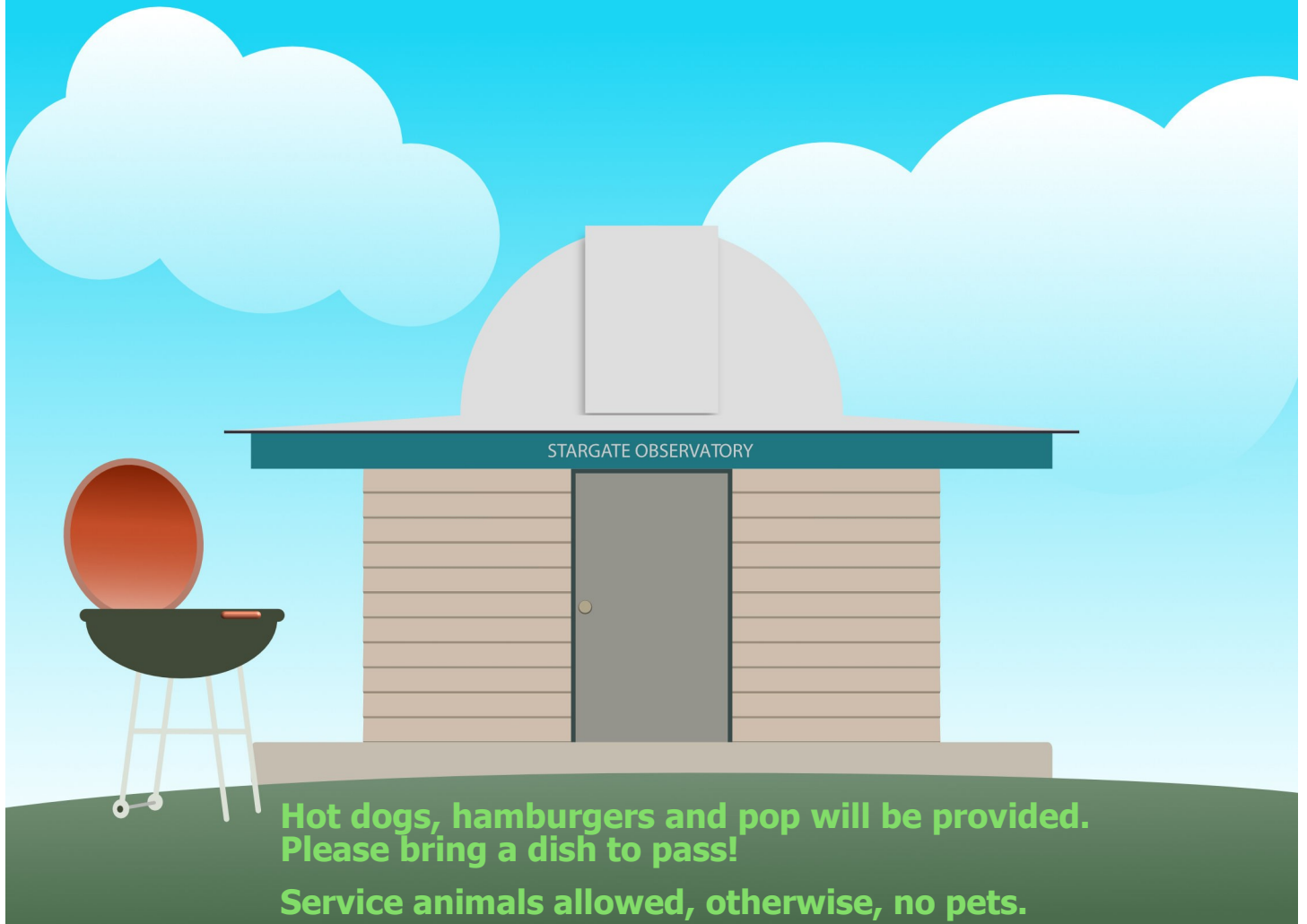
Winner of the Astronomical League's 2021 Mabel Sterns Award

August 2022

The Warren Astronomical Society Publication

W.A.S. Annual Picnic & Stargate Open House

5:30 pm August 27th at Camp Rotary Pavilion



The WASP



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

Dale Thieme, Editor

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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:

Cranbrook: Institute of Science
1221 North Woodward Ave
Bloomfield Hills, Michigan

Third Thursday meeting:

Macomb Community College
South campus, Bldg. J, Room J221
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

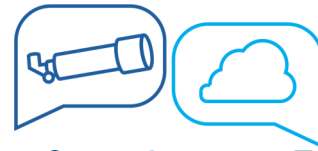
- Loaner telescopes (with deposit). See 2nd VP.
- Free copy of each WASP newsletter.
- Free use of Stargate Observatory.
- Special interest subgroups. See chairpersons.

The Warren Astronomical Society Publication (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.



Discussion Group Meeting

Come on over, and talk astronomy, space news, and more!



If you would like to host a discussion group, please contact Jeff MacLeod: discussion@warrenastro.org

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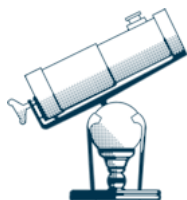
President's Field of View

There are few experiences more effective for rejuvenating one's love for amateur astronomy than going to one of the hobby's most hallowed spaces and experiencing it to the fullest. To sit on knob of granite beside one's observing partner, 1200 feet above sea level in the mountainous darkness of Vermont as the Porter Turret Telescope shifts position from Saturn to Jupiter is, I think, as thorough a pick-me-up as is possible for a visual observer. If you've never made the trek to Stellafane, I do have to say it's absolutely worth it. Jonathan and I did some of the most intense visual astronomy we've attempted using binoculars in a long, long time in order to conquer the Observing Olympics list compiled by none other than Phil Harrington, and we managed it using modest 8X42 birdwatching binocs.

That said, when one is in charge of an astronomy club no such trek is ever purely for pleasure, as good as it is to sit back and let other people put on the show. We saw talks that pinged our radar as "good for W.A.S." and collected contact information, noted a fine amateur publication and wondered if its editor might want to circulate her work via our WASP, and heard some great advice from Stellafane's organizers about making clubs accessible and sustainable.

Above all, we received a reminder that fun and companionship keep this hobby alive from generation to generation. A cheer from bystanders when someone completes the Observing Olympics, a round of applause when someone's grandchild wins a Saturn V LEGO set at the raffle, stories swapped in the dark between faceless strangers from different time zones now under the same stars. We have some great events coming up in the next few weeks: Cranbrook's "Treasure" premiere, the W.A.S. picnic/swap meet/hullabaloo, and of course Astronomy at the Beach. Let's get out there and have some fun, elicit those "Wow!" responses at the eyepiece, and ignite some fires of wonder in kids and adults alike.

Diane Hall,
President



Letters

Gauss & c.

Nice vertical shot!

" reproduction of a reproduction of the aerial telescope from 1987 non-award winning W.A.S.P.

Rik Hill's article interesting but slightly painful re [Alpine Valley]. During the Eisenhower-Kennedy era, I was a wunderkind (oh yeah). In "outreach" lectures, such as they were, I called that "gouge" an impact feature. YIKES! No one contradicted me, because the audience knew far less than did I . . . good thing.

Adrian Bradley's Grand Alignment picture over seascape is mighty fine, but given this bright room and white screen margin, I can barely see Mars, even with contortions to shade the computer. He did much better than did I, as cited in "Reports".

- G.M. Ross

Alert reader Ray Bosshard sends in this:

Misc.

While perusing a collection of vague, misleading or humorous headlines, I got a good laugh out of the item below. Hopefully some of your readers may be similarly amused.

-Ray Bosshard

Dr. Tackett Gives Talk On Moon

Indiana Evening Gazette 3/13/76



Observing Reports

1-2 July

Cygnus var. stars. Difficult, probably aggravated by seeing. Certain U Gem star essentially hopeless to see because of very dim resting state.

Reconsidering observing it.

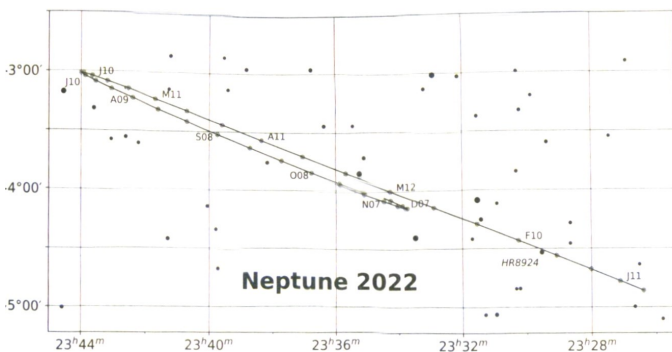
Jupiter. North Aequatorial Belt very thin but hard. Traditional reddish brown. S. Aequatorial Belt for all practical purposes gone! Subdued to extinction. Aequatorial Zone blue-grey, possibly in contrast to creamy surroundings. No Temperate Belts.

Transparency good, seeing fair.

16-in. Schm.-Cass. @ 250X

Addendum

Neptune. P.225 finder map in OBSERVER'S HANDBOOK is grossly inadequate. One can not explain why the text, expending space for discovery of the planet and characteristics of Triton, could not clarify use of the small sky map. Was work to reconcile the HANDBOOK with Tirion's ATLAS 2000 using his excellent clear over-lay of coordinates. Could have been noted: very close proximity of 20 Piscium to the 27 June stationary point in Neptune's sky movement. 20 is just off the L. margin, but point remains. More over, depiction of the year's star field is inexplicably bad.



Neptune is shown as a mag. 8 object among stars ranging from mag. 6 to mag. 11 (chart limit). The star HR8924 is a mag. 6 red-giant variable star in Aquarius.

Neptune chart from 2022 Observers' Handbook

2 July

The Sun. One group of one spot.

Transparency fair with clouds.

5-cm. refractor @ 45X with mylar aperture filter.

COMMENTARY: Per K. Tapping, OBS. HAND. p.185. ". . . Cycle 25 is at last underway. Predictions for this cycle range from another small cycle, maybe even smaller than Cycle 24, to a somewhat larger one. . . . [Obs'ns] hinted that solar behaviour is trending toward either another Maunder or Dalton minimum event". Given photospheric showing,

Observer concurs, but pro forma awaits more data.

2-3 July

Var. stars in Aquila and Sagitta. All "far range" whether U Gem eruptive or Long Period Var. Obs'n of RW Sge ruined by unexpected alto-cumulus.

Transparency fair, seeing good.

16" f /10 Borr II, Veen Obs'y @ various mags.

COMMENTARY: Saw none of 4 targets. "Negative" data of value but only under good field conditions.

7 - 8 July

44 Virginis (Zodiacal Catalogue 1866): Failed occultation attempt. Erroneous reading of prediction.

The Moon. Gibbous just past 1st Q. Terminator perfect for detail on Tycho: internal scales reminiscent of agricultural terraces. Crater relatively new, so impact remains not fully smoothed or "settled"? Position of internal shadow + detail very much like picture on p. 81 of Lunar Orbiter book by N.A.S.A. (1971). Vertical shot, and inner features like decorative plaster work. Pitatus: Central peak above seemingly featureless floor, product of flooding from adjacent Mare Nubium. Crater seems canted toward direction of the mare, possibly from Nubium impact depressing entire region. Observer deemed Pitatus open completely to M. Nubium, but Kopal Plate 57 shows otherwise: floor not featureless (several tiny crater pits and emergents), plus the intersection of Pitatus with the "sea" contains an arc "reef"-- remnant of its N. wall. Copernicus. A perfect black hole! No trace of floor nor inner wall, as new sun-shine touched very top of the annulus. Rukl deems Copernicus a "ringed mountain" 3,760 metres deep. Even though the central peaks attain 1,200 m., not enough to catch Sun at obs'n.

Transparency fair, seeing good (despite low elev.)

5-cm. f /11 refractor @ 86X

COMMENTARY: 44 Vir a triple star, so obs'ns desired.

Kopal = *NEW PHOTOGRAPHIC ATLAS* [], photograph with 43" reflector, Pic du-Midi, 1966. Immediately next to central peak are three very small protrusions, either original sub-peaks or large pieces which fell from Nubium impact?

18 July

The Sun. 4 small groups, two containing single spots having modest penumbrae. Total of 14-15 spots. Features widely scattered.

Transparency excellent, seeing good.

(Continued on page 5)

(Continued from page 4)

5-cm. refractor @ 45X, mylar filter.

8-9 July.

Variable stars. Long Period and other species. AX Mic(roscopii) is too far down in S. for new horizon.

Transparency good, Seeing fair, cold front passage.

16" Borr II, Veen Obs'y @ 120X, 290X.

9 July

The Sun. Three longitude extensive groups. Central group, 14-15 spots incl. one w/ penumbra, possibly largest this Cycle depending on magnetic polarities.

Transparency excellent. Seeing excellent

5-cm. refractor @ 45X, mylar filter.

21 July

The Sun. Five groups distributed evenly across photosphere. Spots: 2, 1, 1, 6, ~ 8-9 (most just pores). Three groups had spots with penumbrae. All though not many spots, A number of groups not experienced for years.

Transparency good.

5-cm. refractor, 45X

-GM Ross



OBSERVING NOTES FOR AUGUST 2022

-Brad Young, Astronomy Club of Tulsa



I'd love to give you some advice about observing in this hot weather, but unless you are willing to wait until 12:00 a.m., it is rough. However, by then, Saturn is up, and soon Jupiter and Mars follow. Venus is getting a bit low in the dawn. Here are some other things to look for this month:

- On August 1st, Mars and Uranus have a conjunction, appearing $1^{\circ}22'$ apart at their closest. This would be a good opportunity to see Uranus using binoculars
- C/2017 K2 (PANSTARRS) is still visible and may be seen moving from SW Ophiuchus to Scorpius through the month
- The Perseid meteor shower peaks 12 Aug, but under a full moon
- Mercury has a mediocre showing in the evening twilight, but should be visible, low in the west, in mid-month
- Saturn and the bright asteroid Vesta are both at opposition this month. Vesta is near the Helix Nebula in Aquarius and should be easy in binoculars at mag 6.

I went to the Astronomy Club of Tulsa observatory on 23 July and, using only binoculars, was worn out by midnight. However, those of us there did see the 46 Starlinks that had been launched earlier that day (!) A young lady said, "What's that line?" and it was them, much to our surprise. We could see them individually in the binoculars.

The NEO (Near Earth Object) search team I'm on has recovered one of the three provisional new minor planets we've discovered. 2021 FU23, which I mentioned in the [Astronomy Club of Tulsa November 2021 news-letter](#). We are reporting it to the MPC (Minor Planet Center) and will await its confirmation and perhaps will even get to name it. The other two, 2021 QQ60 and 2021 RX175 were just announced, and it will be much harder to recover those, but we'll try.

For Sale

Downsizing and selling my 11' Celestron SCT with its CGE German equatorial mount. Asking \$2600.

Details:

- 24" long carbon fiber 11" Schmidt-Cassegrain optical tube, 27.5 lbs.
- 11" aperture, 2800mm focal length, f/10, Starbright XLT optical multicoating
- 9 x 50mm straight-through achromatic finderscope
- 1.25" visual back - [Celestron](#)
- 1.25" prism type star diagonal - Celestron
- 1.25" 40mm Plössl eyepiece - Celestron
- 2x Barlow - Celestron
- Reducer/corrector F6.3 - Celestron
- Slide bar with a standard 75mm (3") wide dovetail
- CGE German equatorial mount with counterweight and tripod
- Hand controller, GPS Module
- Flexible dew cover, Dust covers
- Storage case with wheels and handle

Contact information: rcdegraeve@comcast.net





W.A.S. Astro-Images

Milky Way over Lake Superior

Split Rock Lighthouse State Park, Minnesota



Photo: Dale Hollenbaugh

Fire in the Sky

July 8, 2022

Sometimes, parts of the sky appear to be on fire during sunsets.



Photo: Raymond Bosshard

The View From C.W. Sirius Observatory

NGC 6888 – The Crescent Nebula

The Crescent Nebula, or NGC 6888, is a distinctive emission nebula that stretches about 25 light-years across and is located about 5,000 light-years away from Earth in the constellation Cygnus. Discovered by William Herschel in 1792, the Crescent Nebula is the result of a type of star known as a Wolf-Rayet, which are massive stellar objects that are ageing and losing mass at an incredibly high rate. Within the Crescent, this Wolf Rayet star, known as WR 136, is shedding its outer layers into space at a rate equivalent to the mass of the Sun about every 10,000 years. This violent and rapid ejection has produced a dense shell of scorching hot material that gives the nebula its shape, while the complex structures seen within the bubble are likely the result of stellar winds colliding and interacting with older material ejected by the star long ago. This star is 3.3 times larger than the Sun, 15 times more massive and 260,000 times more luminous. It is thought that WR 136, will eventually end its life in a dramatic stellar explosion known as a supernova.

The Crescent nebula is a relatively faint object that requires exceptionally dark skies and a UHC or OIII filter on the eyepiece to be seen. This nebula has a low surface brightness and can only be seen in a telescope of at least 8" aperture or larger. In small-



Image: Bill Beers

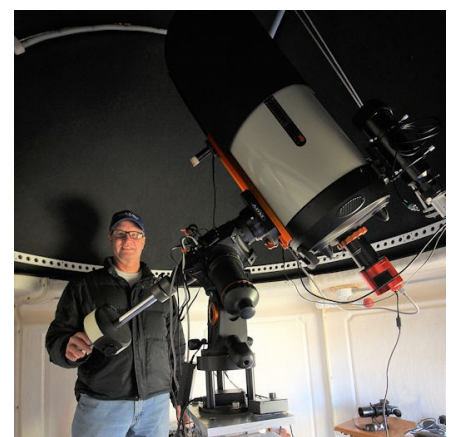
er telescopes, it appears as a nebulous fuzzy patch, while larger telescopes reveal the crescent shape. I found that NGC 6888 was a very difficult object to image. It wasn't until I used a special narrow band filter over my camera lens that I was able to capture the great detail within the Crescent. This image is 5 ½ hours of integration time using my 11" SCT f/7 telescope and a ZWO 071 one-shot color camera. If you get the chance, go out to one of the Stargate open house observing nights, and ask to view this object through our clubs big 22" Dob telescope, with the OIII filter screwed onto the eyepiece. You should be able to see quite a bit of detail within the nebula.



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





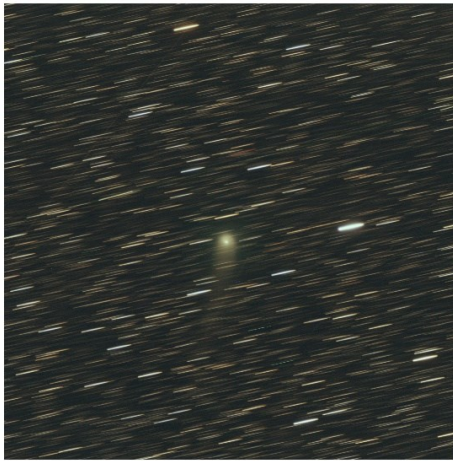
This past month I've been collecting data on Comet C/2017 K2 (Panstarrs) as it approached Earth at about 170 million miles. It is on it's way to perihelion on December 19, 2022, but "whizzed" by us on July 14th, 2022. I took this sequence with the William Optics 105mm f/7 APO refractor and the ZWO asi2600mc pro camera. Each frame contains multiple light frames stacked on the comet core, thus the star trails.

This comet is an Oort cloud comet that was discovered in May of 2017 when it was beyond Saturn at

about 16 AU. The coma developed to about 81,000 miles wide according to EarthSky.org, as it heated up coming into the inner solar system. It's distance from us however never gave it a chance to achieve naked eye magnitudes. It is still a telescopic comet as it heads south through Ophiuchus, towards Scorpius.

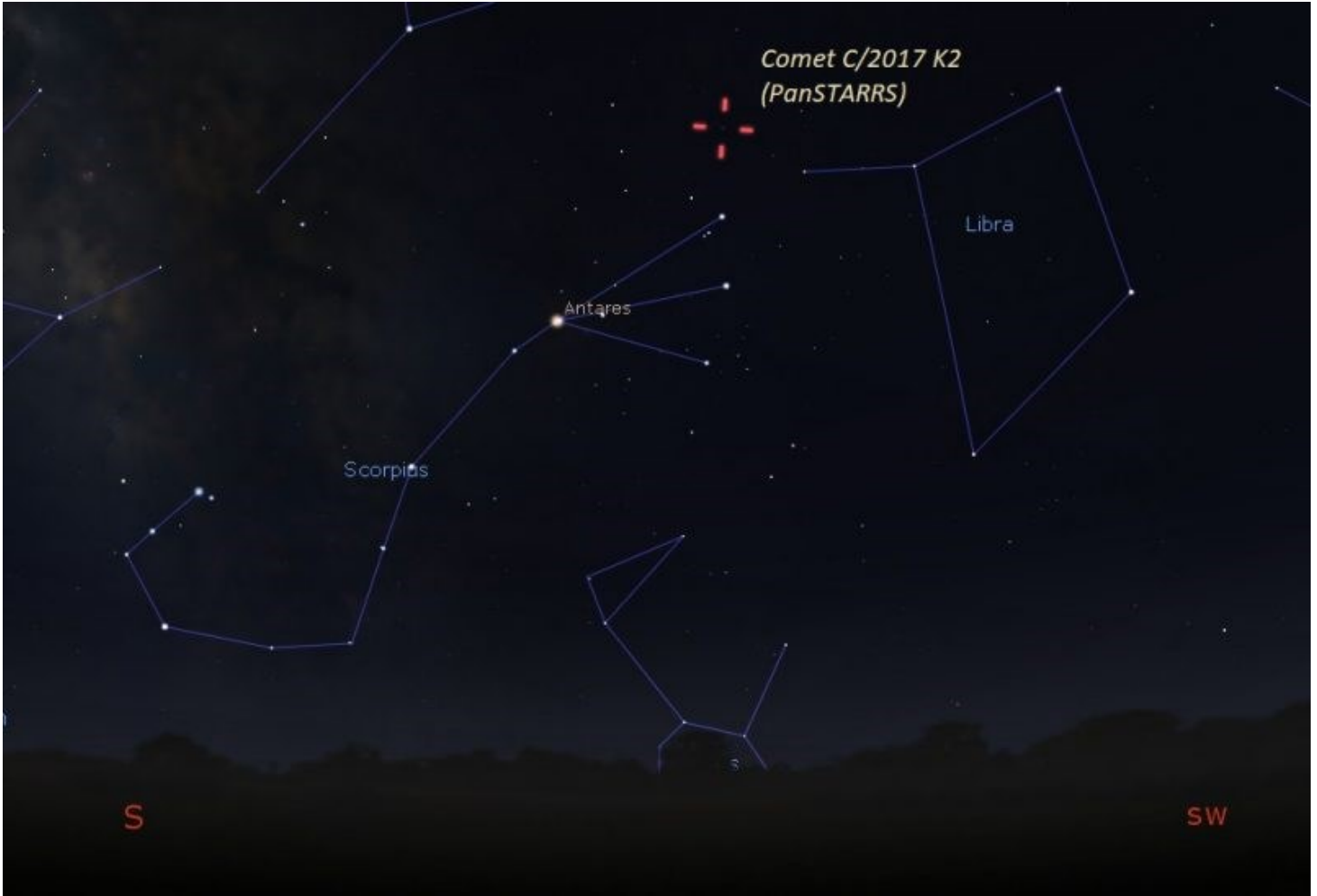
The images were taken on June 16th, June 22nd, June 23rd, June 27th, and July 10th of this year.

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(Continued from page 9)

This chart shows where it will be on August 13th, 2022, for those who wish to go out and take it in. You can also check out Comets | TheSkyLive.com for further information.



-Doug Bock

Call for Calendar Images

We are getting ready to assemble our WAS 2023 Calendar. We need your astro-images, artwork, and sketches for the calendar. Please send a high resolution JPG or TIFF to publications@warrenastro.org for consideration by the calendar committee. Deadline is **August 31st**.



Sample images from prior years

Notes from the Apache-Sitgreaves Observatory

Last year I was set up for visual observation, as well as, Forward Scatter Meteor Detection, of the Perseid meteor shower. For FSMD, the radio system used 91.7 MHz, KOTO in Telluride, CO which is at an azimuth of 15-degrees for me. As it turns out there is 91.7 MHz, KGLP in Gallop, NM at 45 degrees azimuth that I could move the antenna towards, be-



Forward-Scatter Meteor Detection Radio Rig on VHF;
Photo credit: Apache-Sitgreaves Observatory



August 2022

cause the shower radiant will move through the night. With a typical 30-degree wide front lobe of sensitivity I will get Colorado and still pick up New Mexico in the side lobes of the VHF Yagi/ Log-Periodic Dipole hybrid array antenna. I did not record the VHF transmissions on the laptop but I did, along with visual sightings, kept a paper log for both.

For Visual, the following sightings from 3:00 UT to 4:30 UT (Radiant Alt/Az at 0/0 to 20/20);

4; Perseid's
1; Alpha Capricornid
1; Kappa Cygnid
1; Sporadic

For VHF, the following detections from 2:30 UT to 4:30 UT;

16; total
10; 1-second or less
3; 2-second
1; 4-second
1; 8-second
1; 14-second

The difference in counts is that any meteor ionizes the atmosphere into a mirror for VHF, no matter how small. Hearing a 'blip' counts. Notable observations; At 4:09 UT a 2-second visual Perseid meteor in the northeast had a simultaneous VHF. transmission of the same duration. The visual train was unusual as well with its entire length composed of at least 20 dots, unlike the smooth train seen in two other Perseid's.

Stay tuned Space Fans, another Persied Meteor Shower is mid-month in August. A meteor shower is a fun adventure for the whole family, even if you rest in a recliner and take it all in.

About the Apache-Sitgreaves Observatory

The Apache-Sitgreaves Observatory is located on the eastern edge of Overgaard, Arizona, a small town at just under 7000-foot elevation bordering the Apache-Sitgreaves National Forest in northern Arizona. The main telescope at ASO is a 36" f/4.5 Newtonian on a computer-controlled Alt-Az mount. Viewing through the 36" telescope is available to the public by appointment, as are the DSLR Workshop and Solar programs. Current astronomical research projects include the Supernovae Search Patrol of Abell Galaxy Clusters using short integrations reaching 18+ magnitude. ASO is operated by the Apache-Sitgreaves Research Center Inc. which is owned by WAS member, and former WAS president, Steven Aggas.

Presentations

Monday, August 1, 2022

Presentations

Main Talk:

Interstellar Travel: Is It Possible?

"Are We There Yet? Are We There Yet?"

By Jack Howard

NASA is returning to the Moon and planning to go to Mars. Elon Musk wants to build cities on Mars. The outer solar system beckons us, and we are regularly discovering more and more planets out there, including Earthlike planets. Could we actually travel to them? We'll look at what the requirements are and consider the question of whether we could actually do it.

About the Speaker:

Jack Howard first became interested in astronomy and space exploration when Sputnik was launched, Echo I crossed the night sky, and the race to the Moon began. He earned a BS in physics and math at King College and a master's degree in astronomy from James Cook University. He was a 2018 ambassador to Chile under the Astronomy In Chile Educator Ambassador Program (ACEAP). In 2000, he started the astronomy program at Rowan-Cabarrus Community College in North Carolina, where he teaches physics and astronomy. Since then, he has shared the wonders



(Continued on page 13)

Thursday, August 18, 2022

Virtual Presentation

Feature:

The engineering of the JWST

Space Age Origami

By Tony Rice

It took some mind bending engineering to fold the James Webb Space Telescope into the fairing of the launch vehicle. No less amazing was the process of unfolding and deployment—the focus of this talk.

About the Speaker:

Tony Rice is an information security engineer and Virginia Tech alumni working at a telecommunications company in Research Triangle Park, NC. His career has spanned various areas of research and development in software engineering, analytics, and information security. Tony speaks in area classrooms, museums and libraries. He also helps broadcast meteorologists across the country share the night sky with their viewers. He is also frequent guest on local television news in Raleigh, North Carolina discussing current NASA missions and astronomical phenomenon and been known to hold impromptu sidewalk astronomy sessions with passers-by. His proudest moment so far is leading an event with the National Park Service at the Wright Brothers Memorial in Kitty Hawk, NC for over 800 visitors on the Space Shuttle program leading up to the launch of the final mission.



WAS PRESENTATIONS

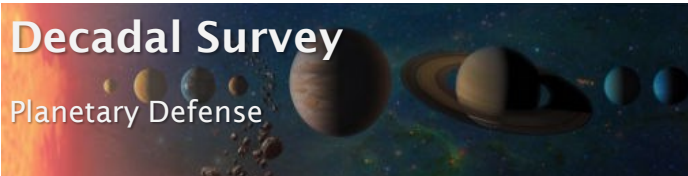
If you would like to present either a short talk (10-15 minutes) or a full-length talk (45-60 minutes) at a future meeting, please email Bob Trembley at:

firstvp@warrenastro.org.

(Continued from page 12)

of space and the excitement of discovery with diverse groups in the Charlotte (NC) area. Jack is a member of the Charlotte astronomy club. His main interests are solar system exploration, exoplanet research, human space flight, and cosmology.

Short Talk:



The dinosaurs didn't have a space program... that we know of...

By Bob Trembley

Planetary defense is part of an international cooperative effort to detect and track objects that could pose a threat to life on Earth and an element of NASA's planetary science endeavors concerned with human health and safety. In this talk, Bob focuses on the proposals from the Decadal Survey.

About the Speaker:

Bob Trembley, currently first VP of WAS, Outreach Director for a total of 5 terms, is fantastically interested in asteroids, Near Earth objects (NEOs), and meteorites. Bob is a HUGE fan of educational space-related PC software such as: NASA's Eyes on the Solar System, Universe Sandbox, SpaceEngine and Kerbal Space Program. Bob and his wife Constance, a middle-school science teacher and also a Solar System Ambassador, run an after-school astronomy and space science club at Connie's school called the "Endeavour Space Academy."



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

Saw a Fireball?

Report it to the American Meteor Society!



www.amsmeteors.org/members/fireball/report-a-fireball

Join the Astronomical League!
Only \$7.50 (membership starts July 1)
Get the Reflector
Participate in the Observing Program
Avail yourself of the League Store
Astronomy Books at a discount
alcor@warrenastro.org

August 1-7, 2022
Milky Way Star Festival
Astronomers Without Borders
ONE PEOPLE + ONE SKY



The sky reborn

Ever since I read Bart J. Bok's foreword to Rose Wilder's and Gerald Ames' *The Golden Book of Astronomy*, I have marveled at what the night sky had to offer and how much of that has changed. "Such wonders," Bok wrote, "fill this book." I have never forgotten those beauties, in particular Bart's favourite: The Eta Carinae nebula, deep in the southern sky.



On Tuesday, July 12, 2022, NASA released the first light pictures from the Webb telescope. One of them is the Eta Carinae nebula. If Bart Bok could come back to us for one minute, he would be thrilled and elated beyond expression. The image is unadulterated joy. It shows so much more than anyone has ever seen before. It tells how this faint star suddenly became the second brightest star in the sky in 1843, the year of a great comet, and it had a second eruption near the end of the 19th century. If Eta Carinae should one day become a supernova it may become as bright as, or even much brighter than, Venus.

The other picture that really got to me was Stephan's Quintet. It was the first compact group of interacting galaxies ever discovered. First observed from France by Édouard Stephan, it consists of four galaxies interacting with one another; plus a fifth, NGC 7320, which is much closer to us. I have seen this cluster many times. Seeing these images from the new telescope pierced my eyes and warmed my heart. But my mind kept returning to the image of Eta Carinae, and to

Bart and Priscilla Bok and their lives together.

Bart loved to tell the story of how he and Priscilla attended the opening of the Flandrau planetarium in November 1975. They arrived early that morning, and they walked toward an exhibit in the back, in the galaxy room. Suddenly Priscilla stopped. "Bart," she said softly as she gazed upon a picture of Eta Carinae, "When I am gone, I will be in this nebula. Whenever you look at the nebula, you will see me there."

Priscilla passed away just four days later. In her memory Bart funded a beautiful concrete bench in the aviary at the Desert Museum. Bart often visited the museum and always enjoyed her bench. "Another audience with the roadrunner soon took place," I wrote later. "As he watched this roadrunner, Bart's thoughts wandered off to a far-off place and time. A memory of Priscilla, happy and alert as she fed a group of magpies, filled his mind. Slowly the image faded, and he imagined once again the exquisite swirls of the nebula in Carinae."

The James Webb space telescope belongs to the world. In January 1610, Galileo pointed his telescope at Jupiter. Over the course of a few nights, he discovered four moons orbiting the solar system's biggest planet, and the night sky has not been the same ever since.

In July of 1994, the Hubble space telescope also pointed at Jupiter. It recorded the crash of a comet on the solar system's biggest planet, and the night sky changed again.

On Tuesday, July 12, the world saw the James Webb Space telescope's first view of the Eta Carinae nebula. The night sky will never be the same.



. The two pictures are both courtesies of NASA, the European Space Agency and the Canadian Space Agency and show the first light images from JWST of the Stephan Quintet and Eta Carolina regions.



Rupes Recta domes

Southwest of the great crater Arzachel (100km dia.), seen here in the top middle of this image, is the feature called the Straight Wall, or Rupes Recta, a fault running some 114km. In truth, it is neither straight nor a wall. It is an escarpment some 2-3 km wide with a height of 240-300 m (possibly even 450m according to Wood) so it is far from the vertical cliff it at first appears. Neither is it straight as can be seen here! At the south end of the Rupes is an interesting set of mountains nicknamed the Stag's Horn Mountains because of their shape.

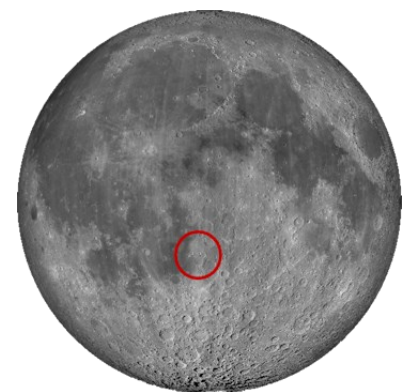
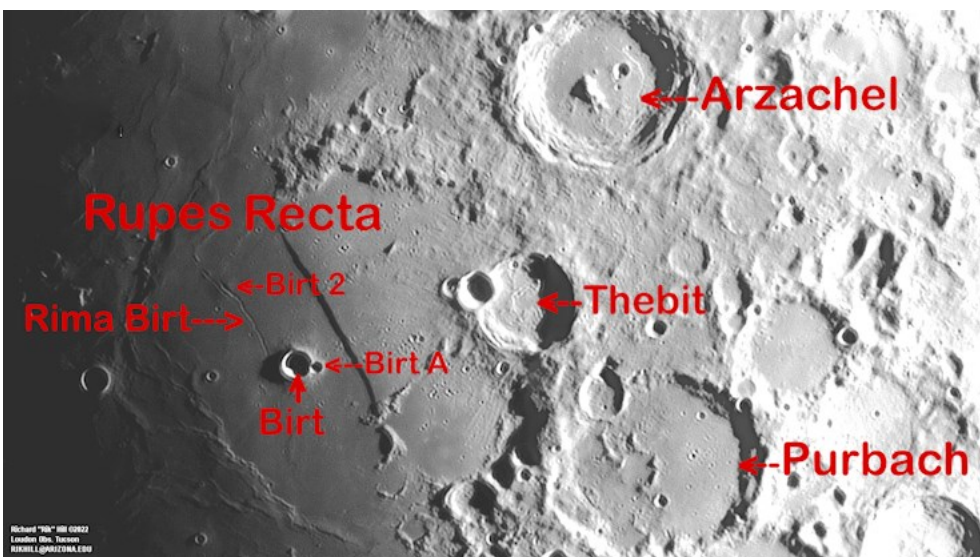
It's not an official name but many lunar observers from the 1950s and 60s are well familiar with them by that name. About 40 km further west is Rima Birt that parallels the Rupes and between the two is the recently formed crater Birt (17km) overlapped by the even more recent Birt A on the east side. At its north end is another shorter unnamed rima. All this seems to sit in the ruins of an ancient flooded crater some 300 km in diameter. On the east side of this larger structure is the crater Thebit (60km) and below right the larger crater Purbach (121km).

Notice the shadow cast by Birt. There's a mild swelling just beyond and below it. If this is a dome, there



is no listing for it. Moving further up the Rupes you get to a point where it widens at the top showing another swelling. This is a recognized dome Birt 1 or B1. Over on the parallel small rima, a little north of this spot is another widening and swelling that is Birt 2. These are among the most difficult domes I have recorded yet but what about the southernmost one? Time will tell.

This montage is made from two stacked 1800 frame AVIs stacked with AVIStack2 (IDL) and merged with Microsoft ICE. Final processing was done with GIMP and IrfanView.



Location maps by Ralph DeCew



August 1989

On the cover: Once the Apollo astronauts were safely back on Terra Firma, the WASP ran a photo of the intrepid crew, NASA's standard portrait of the mission members.

Inside the issue, Minutes of the Macomb Meeting-June 15, 1989, reveals our first go at gaining tax-exempt status. The "Minutes of the Cranbrook Meeting-July 6, 1989" was more astronomically leaning.

As to articles, we get "Excess Redshift in Nearby Galaxy Groups" by Jeff Bondono, "Getting Started in Astrophotography (Part viii - Negative and Positive Projection)" by Larry F. Kalinowski, and the club's library getting promoted in "From the Library Shelf" by Tom MacLaney.

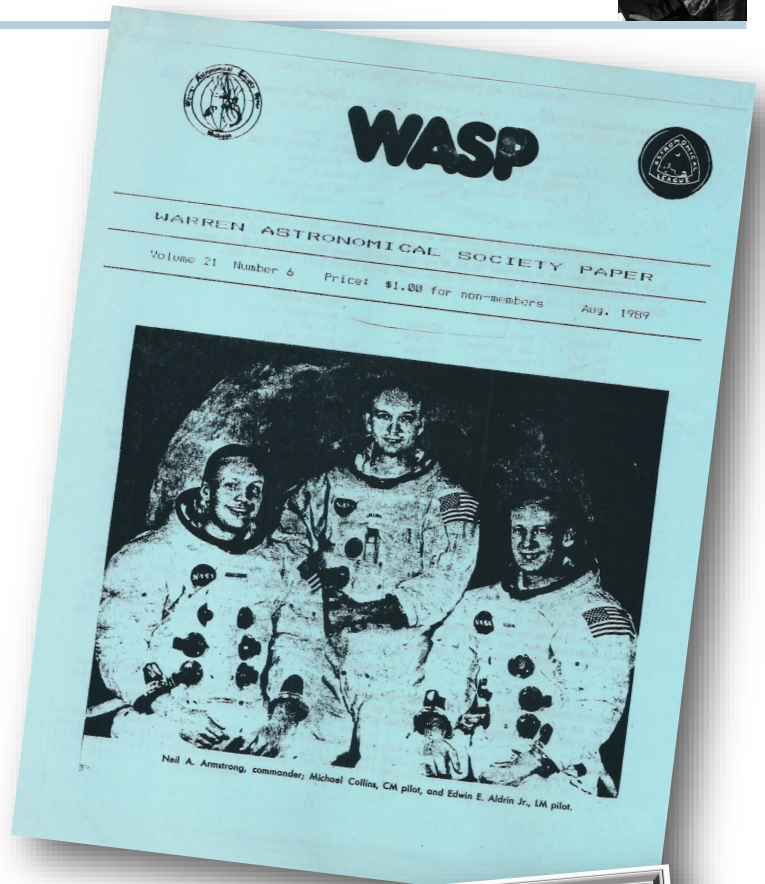
August 1999

The 1999 issues are both printed and in HTML format...except for August. I expect that is because I haven't found it yet in the Dyer collection. On the slight chance that someone out there has a copy, I'd sure like to get it scanned.

In the article, "My 2 Cents" by Joe Van Poucker, we are exhorted to consider gifting a membership as a gift idea. Might not be a good idea to pick up again, I've done it and I know of at least one other instance in recent years.

Astro Chatter by Larry Kalinowski also included a dose of computer talk. And, similar to my efforts in this column, we have "The W.A.S. 25 Years Ago" by LoriAnn Skonieczny. The online version is rounded out by the "Minutes of Meetings" by LoriAnn Skonieczny and the recognition of "New members" by Joe Van Poucker: James Leinhos & Family, Troy.

Dale Thieme,
Chief scanner



AUGUST 2022

Notable Sky Happenings

Aug. 1 - 7

The Moon is above Spica on the 3rd (WSW evening), and at the upper right of Antares on the 6th (SSW evening).

Aug. 8 - 14

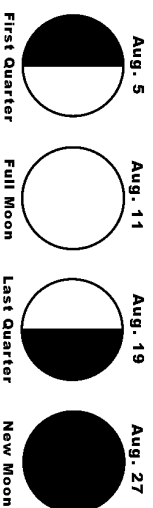
The Moon is at the lower right of Saturn on the 11th (SE evening), and to the left on the 12th (SW pre-dawn). The Perseid meteor shower peaks between midnight and dawn on the 12th & 13th. The Moon, one day past Full, will interfere this year.

Aug. 15 - 21

The Moon is below Jupiter on the 15th (S pre-dawn) and above Mars on the 19th (SE pre-dawn).

Aug. 22 - 31

Moon is above Venus on the 25th (ENE morning twilight).



Now Showing

"Treasures of the Night Sky"

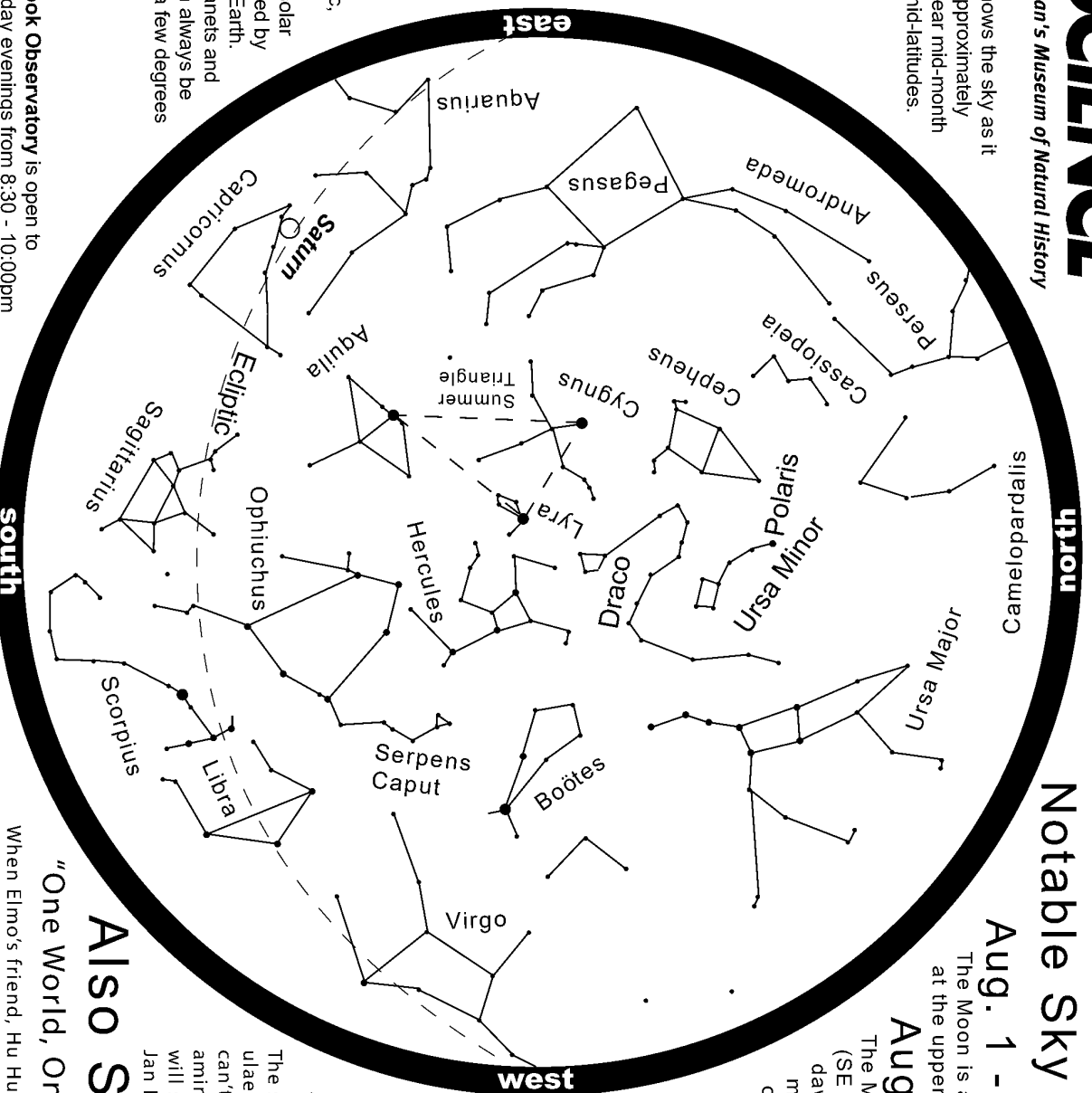
The sky covered with spectacular galaxies, hazy nebulae and sparkling star clusters. Most of these treasures can't be seen without a telescope. This program examines a variety of these riches. Many of the images we will see were rendered by our staff Program Presenter, Jan Fiolka, using telescopes in our observatory.

Also Showing

"One World, One Sky: Big Bird's Adventure"

When Elmo's friend, Hu Hu Zhu, visits from China. Big Bird, Elmo and Hu Hu Zhu take viewers on an exciting discovery of the Sun, Moon, and stars. They learn about the Big Dipper and the North Star and take an imaginary trip to the Moon where they learn that the Moon is a very different place.

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



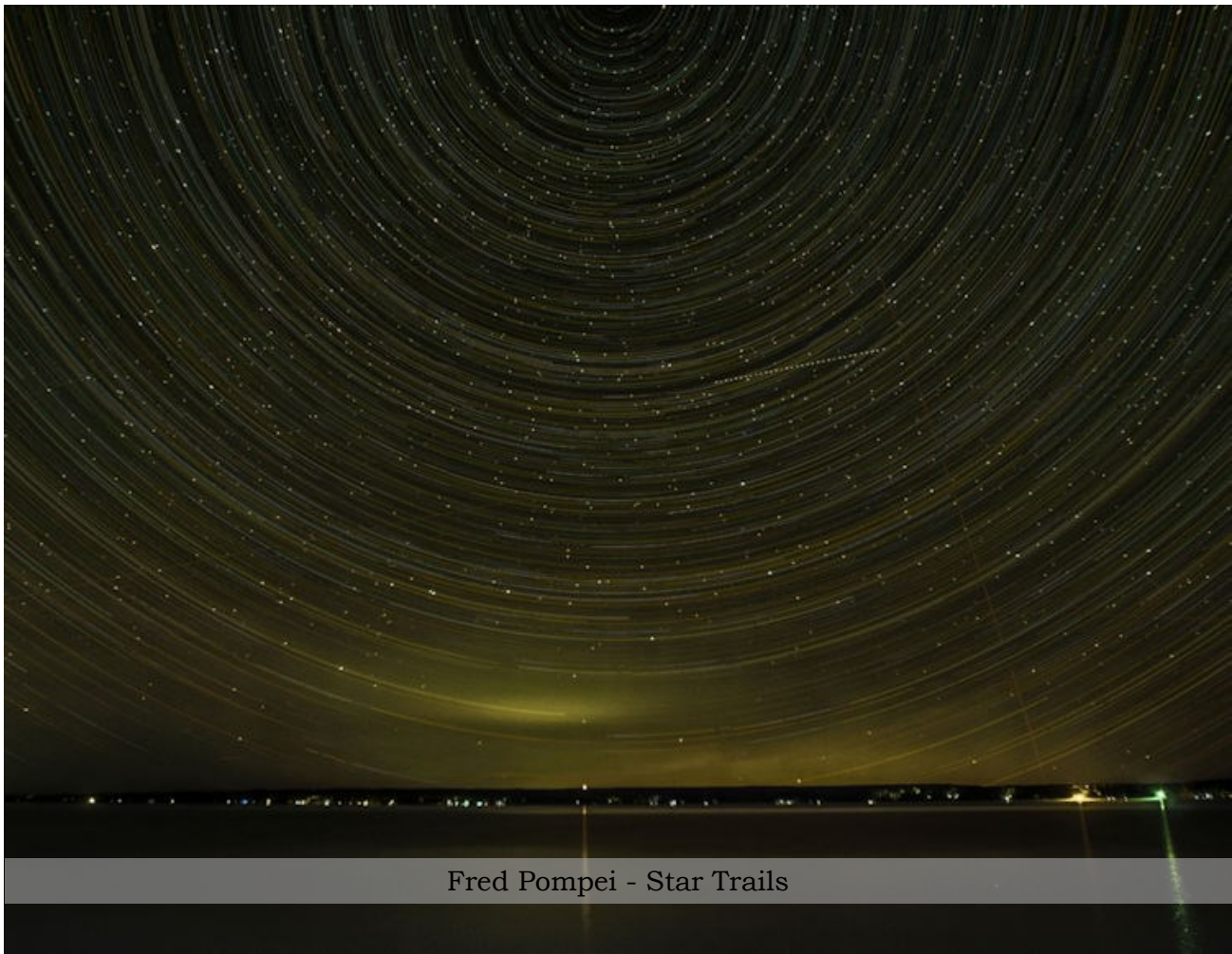
What is that dashed line? It's the ecliptic, the reference plane of the solar system, defined by the Sun and Earth. The major planets and the Moon can always be found within a few degrees of this plane.

This chart shows the sky as it appears at approximately 10pm EDT near mid-month at northern mid-latitudes.

The Cranbrook Observatory is open to the public Friday evenings from 8:30 - 10:00pm EDT, 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/explore/observatory>





Fred Pompei - Star Trails

August 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 <small>Cranbrook</small>	2	3	4	5	6
7	8	9	10 <small>Moon at Perigee: 359830km</small>	11 <small>FULL MOON</small>	12 <small>Perseid Meteor Shower</small>	13
14 <small>Saturn at Opposition</small>	15	16	17	18 <small>Macomb</small>	19	20
21	22 <small>Moon at Apogee: 405419km</small>	23	24	25	26	27 <small>Mercury at Greatest Elong: 27.3°E NEW MOON Stargate Open House</small>
28	29	30	31			



Stargate Observatory

Monthly Free Astronomy Open House and Star Party

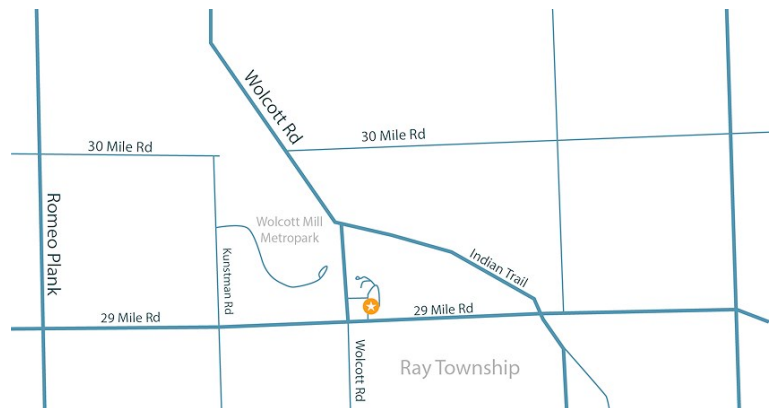
#:30 PM, 4th Saturday of the month!
Wolcott Mill Metropark - Camp Rotary entrance

Advisory: Concerns are circulating in the amateur astronomy community about a possibility of COVID-19 being passed from one person to another via contact of different persons' eyes with a telescope eyepiece. Sharing telescopes may be considered by some to be high-risk due to the possibility of eyes touching eyepieces. Masks are encouraged, mandatory for children.

- Sky tours.
- See different telescope types in operation.
- Get help with your telescope.
- We can schedule special presentations and outings for scouts, student or community groups.

Contact: outreach@warrenastro.org

Find us on [MeetUp.com](https://www.meetup.com)



20505 29 Mile Rd (1.8 miles east of Romeo Plank Rd) Ray, MI 48096
82° 55'04" West Longitude, 42° 45'29" North Latitude

Observatory Rules:

- Closing time depends on weather, etc.
- May be closed one hour after opening time if no members arrive within the first hour.
- Contact the 2nd VP for other arrangements, such as late arrival time. Call 586-909-2052.
- An alternate person may be appointed to open.
- Members may arrive before or stay after the scheduled open house time.
- Dates are subject to change or cancellation depending on weather or staff availability.
- Postings to the Yahoo Group and/or email no later than 2 hours before starting time in case of date change or cancellation.
- 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).
- 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.

Stargate Report

Stargate observatory open house report for July 23, 2022

The observatory was opened at 6:53 pm. The sky was mostly clear with some clouds and haze.

Roughly 14 people attended including WAS members and general public. The 8" refractor dome was opened and a number of double stars and deep sky objects were observed as well as Saturn. There were a couple of scopes set up outside the observatory for imaging and observing.

The observatory committee discussed ways to clean the 22" dob optics during the picnic at the next open house.

The observatory was closed about 2:30 am after the sky became completely cloudy.

Next open house and WAS picnic is scheduled for August 27.

Riyad I. Matti

2022 WAS 2nd VP,
Observatory Chairperson

Treasurer's Report

Treasurer's Report for July 31, 2022

BOA account:

Balance:.....\$31,101.86
Deposits:\$66.00
Withdrawals: \$760.00

PayPal Account:

Balance:..... \$1,254.98
Paid (Astronomical League memberships):.....260.00
Received:.....\$43.12

Total Paid Memberships116

We welcome new member John Delphia.

News from the Treasury:

We have 32 AL memberships recorded. Thank you to all who rejoined the Astronomical League, or joined for the first time.

The process for ordering a physical copy of Sky & Telescope has changed, and prices have gone up above \$40 per year for a member of an astrono-

Astronomical Events for August 2022		
Add one hour for Daylight Savings Time		
Source: http://astropixels.com/almanac/almanac21/almanac2022est.html		
Day	EST (h:m)	Event
03	16:26	Spica 4.6°S of Moon
03	23:58	Mercury 0.6°N of Regulus
05	06:06	FIRST QUARTER MOON
05	15:30	Moon at Descending Node
07	03:29	Antares 2.8°S of Moon
10	12:14	Moon at Perigee: 359830 km
11	20:36	FULL MOON
11	22:55	Saturn 3.9°N of Moon
12	20:00	Perseid Meteor Shower
14	12:00	Saturn at Opposition
15	04:37	Jupiter 1.9°N of Moon
18	05:59	Moon at Ascending Node
18	23:36	LAST QUARTER MOON
19	05:32	Pleiades 3.1°N of Moon
19	07:16	Mars 2.7°S of Moon
22	16:53	Moon at Apogee: 405419 km
23	16:00	Mercury at Aphelion
23	19:17	Pollux 2.1°N of Moon
25	15:58	Venus 4.3°S of Moon
27	03:17	NEW MOON
27	11:00	Mercury at Greatest Elong: 27.3°E
30	21:59	Spica 4.4°S of Moon

my club. Please let me know via email at treasurer@warrenastro.org if you would like more information.

Adrian Bradley,
Treasurer



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.

Outreach Report

Two big outreach events for the are happening and we desperately need volunteers.

Cranbrook is having a member event in the evening of 11 August. They are requesting support from WAS for anyone with telescopes or anyone who can assist with the viewing party. August 11th is also the night of the Perseid Meteor Shower. The event will also allow members access to Cranbrook's new Treasure exhibit

Cranbrook provides the WAS free use of their facility and, in return, Cranbrook assumes we will support their events. Since this is one of the first events Cranbrook/WAS since the initial Covid outbreak, it would be great to show Cranbrook how much we appreciate their support.

The second event is the Astronomy at the Beach Activities at Island Lake on September 16th and 17th (Friday and Saturday). If you have a telescope you can bring, please tell me. Volunteers without telescopes are also needed.

If you can support, please drop an email to Kevin McLaughlin (kevinmclaughlin.dynamics@gmail.com) or write me via the web site.. I will provide more details as the event gets nearer.

Kevin McLaughlin,
Outreach Chair

Meeting Minutes

WARREN ASTRONOMICAL SOCIETY

MINUTES OF BOARD MEETING

JULY 11, 2022 @ 6:30PM

Meeting called to order @ 6:35PM. Officers in attendance: Diane Hall, Mark Kedzior, Adrian Bradley, Kevin McLaughlin - Bob Trembley, Riyad Matti & Dale Thieme (Virtual) - quorum present.

OFFICER REPORTS:

President Diane Hall stated the board has a lengthy agenda for tonight's meeting and proceeded to Officer Reports.

1st VP Bob Trembley gave the information on the upcoming presentations at our next meetings.

2nd VP Riyad Matti reported on the June 25th Open House, with about 50 persons in attendance. The skies were cloudy but answered many questions to those in attendance regarding the WAS and observatory - was able to get out 10" Dob to observe some double stars through the thick haze. The observatory is in good shape - next Open House is July 23rd.

Secretary Mark Kedzior reported the June meeting minutes are in the July edition of the WASP.

Treasurer Adrian Bradley gave the account balances (found in July WASP) and reported the Astronomical League subscriptions are paid to June 2023.

Outreach Chair Kevin McLaughlin reported volunteers are needed for the AATB event September 16-17 at Island Lake, either providing telescopes, donation of cash or manning our club table. He

also reported that Cranbrook is seeking help for the August 11th Perseid Meteor Shower event, with the WAS providing telescopes and members to support the event for our host institution. He will send out email to the outreach mail list as well as all members in regard to both events. President Diane Hall reported that we are in need of a person to transport the 22" Big Dob and trailer to the AATB event (Jeff MacLeod was not available that weekend to transport). Mark Kedzior reported that upon closer inspection the 22" primary mirror of the Big Dob is in need of some serious cleaning and suggested that it be done before transporting scope to the AATB event. Riyad and Mark will coordinate this task before the AATB event.

Publications Chair Dale Thieme reports the July WASP is posted on line.

OLD BUSINESS:

Website Overhaul - Dale Thieme reported doing a makeover in HTML - found issues with resizing - looking at WordPress format.

Wolcott Mill New Building Plans/Construction - Riyad Matti is in process of locating an individual for the designs and plans for a new observing facility to present to the Metroparks for review and approval, and to assemble the Stargate Committee to discuss the construction and site location of the new building.

Calendar Committee - submissions have been requested though our regular email blasts and in

(Continued on page 22)

(Continued from page 21)

the WASP in order to have calendars ready for distribution and purchase at the November meetings. The WAS Picnic (August 27th @4 PM) plans were reviewed and will be finalized at the upcoming August meetings.

NEW BUSINESS:

Cranbrook Treasure exhibit will be August 11th coinciding with the Perseid Meteor Shower event, and volunteers are requested to assist Cranbrook in this event.

WAS December Banquet - a survey will be sent out to membership on this event and results will be announced at July Macomb meeting.

Discussion Group meetings - will be contacting the Blum's to see if they will be hosting the November meeting as they have in past.

Paul Strong Scholarship - a contact info error occurred prohibiting the award this past academic year. Adrian Bradley reported a request from the Macomb Student Fund, which provides financial relief to a Macomb student. After discussion, motion by Adrian Bradley, second by Kevin McLaughlin to donate \$250 to the fund. Motion passed - Mark Kedzior asked for an amendment to the motion stating this amount would be for the 2022 academic year only. Motion by Adrian Bradley to amend previous motion, second by Kevin McLaughlin - motion passed.

The WAS Corporation Annual Report is due in October 2022.

AATB - Adrian Bradley reports the GLAAC is asking for donations from member clubs of \$300 or more to help defray costs associated with the event (tent, speaker cost, etc.). Discussion followed. Motion by Adrian Bradley for the WAS to donate \$500 to the AATB event, second by Kevin McLaughlin. Motion passed.

Motion to adjourn by Mark Kedzior, second by Adrian Bradley. Motion passed.

Meeting adjourned at 7:30PM by President Diane Hall.

Respectfully submitted,
Mark Kedzior, Secretary

WARREN ASTRONOMICAL SOCIETY CRANBROOK MEETING (w/Live Streaming)

JULY 11, 2022 7:30PM

Meeting called to order for in person Cranbrook meeting with live streaming at 7:40PM by President Diane Hall. Number of persons in attendance - 20 (WebEx attendance - 15 & YouTube attendance - 12@ 8:30PM). Meeting began with introduction of attendees and new members.

OFFICERS REPORTS:

President Diane Hall reviewed the WAS August 27th Picnic details. She announced that Mark Kedzior donated an assortment of astronomy books that are available for free to anyone who would like them, and has them placed in front of the auditorium to review and obtain during break. A survey will be sent out in regard to the WAS Annual December Awards Banquet, with results being announced at upcoming meeting. Laura Wade will be hosting the July Discussion Group at her home outdoors on Thursday, July 28, and ask that attendees are vaccinated to be able to attend. She reported on the upcoming retirement of our Cranbrook liaison Don Klaser and wished him well on behalf of the WAS.

1st VP Bob Trembley reported on the upcoming presentations for our future meetings.

2nd VP Riyad Matti gave the observatory report (which can be found in July WASP).

Secretary Mark Kedzior reported the June meeting minutes are in the July WASP.

Outreach Chair Kevin McLaughlin reported that volunteers are needed for the August 11th Cranbrook Perseid Meteor Shower event and also the AATB event on September 16-17 at Island Lake by Kensington.

Publications Chair Dale Thieme reports that the July WASP is posted on line, and kudos to Adrian Bradley on his RASC Photo Submission Awards.

President Diane Hall reports that an able volunteer is needed to haul and assemble the club's 22" Big Dob to the AATB event on September 16-17.

SPECIAL INTEREST GROUPS:

Solar - Marty Kunz reports on lots of solar activity on the sun with many sunspot groups. Double Stars - Riyad Matti reports that targeted double stars will be observed at July 23rd Open House. Astronomical League - Adrian Bradley reports all paid subscriptions are up to date until June 2023. Astrophotography - Doug Bock reports active imaging of Comet PANSTARRS.

OBSERVING REPORTS:

David Levy reports the sun is active with numerous sunspots, large filament and several flares, and read a passage from the Psalms. Kevin McLaughlin reports observing at a dark sky site. Diane Hall and Jonathan Kade were observing in northern Lower Peninsula.

SHORT PRESENTATION:

Bob Trembley presented "Decadal Survey: Missions on Planetary Science 2023-2032", with all the details from this mission, the Uranus Mission, and a preview about next month's presentation on Planetary Defense.

Questions and discussion followed his informative

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(Continued from page 22)

presentation. To see his presentation in its entirety, go to:

<https://www.youtube.com/warrenastro>

MAIN PRESENTATION:

1st VP Bob Trembley introduced (with bio) Tim Thompson and his presentation "Mt. Wilson Observatory". Tim is the lead instructor for docents at the observatory. Tim gave a biographical history on Andrew Carnegie and George Ellery Hale, the Snow Solar Telescope, and determining the temperature of sunspots, and the 1st successful images of the sun in H Alpha on 30 April 1908. Questions and discussion followed his very informative presentation. To see his presentation in its entirety, go to:

<https://www.youtube.com/warrenastro>

Meeting ended at 9:40 PM.

Respectfully submitted,
Mark Kedzior
Secretary

WARREN ASTRONOMICAL SOCIETY

MACOMB (VIRTUAL) MEETING

JULY 21, 2022 7:30PM

Meeting called to order at 7:35 PM by President Diane Hall. Officers in attendance: Bob Trembley, Riyad Matti, Adrian Bradley, Mark Kedzior, Kevin McLaughlin (WebEx attendance - 21 & YouTube - ? @ 8:15 PM).

OFFICER REPORTS:

President Diane Hall reviewed WAS Picnic news and updates. She stated the need for a WAS presence with volunteers with scopes and in person help for future outreach events since folks are starting to emerge to do observing after the COVID restrictions. The July Discussion Group will be at Laura Wade's home outdoors on Thursday, July 28th, and she asks that attendees are vaccinated to attend.

1st VP Bob Trembley reported on the upcoming presentations and is in need of future presenters.

Outreach Chair Kevin McLaughlin reported on the need for volunteers for the August 11th Cranbrook event and the AATB September 16-17 event at Island Lake near Kensington. An email blast will be sent to all members to sign up for the event(s).

2nd VP Riyad Matti gave the observatory report and the Open House details of June 25th and the upcoming Open House on July 23rd.

Secretary Mark Kedzior had nothing to report.

Treasurer Adrian Bradley gave the account balances and reported on the AATB planning that is in progress.

SPECIAL INTEREST GROUPS:

Solar - Sunspots are being observed by many. Astrophotography - Bob Berta reports on h alpha imaging he has been conducting. Discussion - anyone wishing to host a Discussion Group meeting are to contact Jeff MacLeod to schedule.

OBSERVING REPORTS:

David Levy reports observing 26 sunspots and an h alpha flare from Arizona. He also demonstrated the "Jacob's Staff" - an instrument used 300 years before the telescope was invented to measure celestial objects. He read a poem 'His Eyes on the Sky' with his variation on it.

MAIN PRESENTATION:

Bob Trembley led this round table discussion regarding the launching of the Sputnik satellite by the USSR in 1957, and the subsequent "Space Race" between the United States and the USSR. Members shared their memories and recollections of how they remembered it in real time, with background on the dates and details from 1957 to manned launches with the Gemini and Apollo programs, culminating with the Lunar landing in 1969. Jim Shedlowsky, Bob Berta, Ken Bertin, David Levy, Therese Oldani, Adrian Bradley, Ken Heilig and Mark Kedzior gave some recollections of what they remember during those years. Questions and discussion followed this interesting program.

To see this presentation in its entirety, go to:

<https://www.youtube.com/warrenastro>

The meeting ended at 9:30 PM.

Respectfully submitted,
Mark Kedzior
Secretary

Sometimes the Michigan Nebula is actually pretty nice:



Photo: Mike O'Dowd

Cloud Angel

Here is an iPhone picture Mike O'Dowd took from work on June 27. He looked out the window at work and saw this in the sky, 15-20 minutes later it was gone.

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
University Lowbrow Astronomers:	http://www.umich.edu/~lowbrows/reflections/

WAS Member Websites

Jon Blum: Astronomy at JonRosie	Bob Trembley: Balrog's Lair
Bill Beers: Sirius Astro Products	Bob Trembley: Vatican Observatory Foundation Blog
Jeff MacLeod: A Life Of Entropy	
Doug Bock:	
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	



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!

Artemis 1: A Trip Around the Moon – and Back!

David Prosper

We are returning to the Moon - and beyond! Later this summer, NASA's Artemis 1 mission will launch the first uncrewed flight test of both the Space Launch System (SLS) and Orion spacecraft on a multi-week mission. Orion will journey thousands of miles beyond the Moon, briefly entering a retrograde lunar orbit before heading back to a splashdown on Earth.

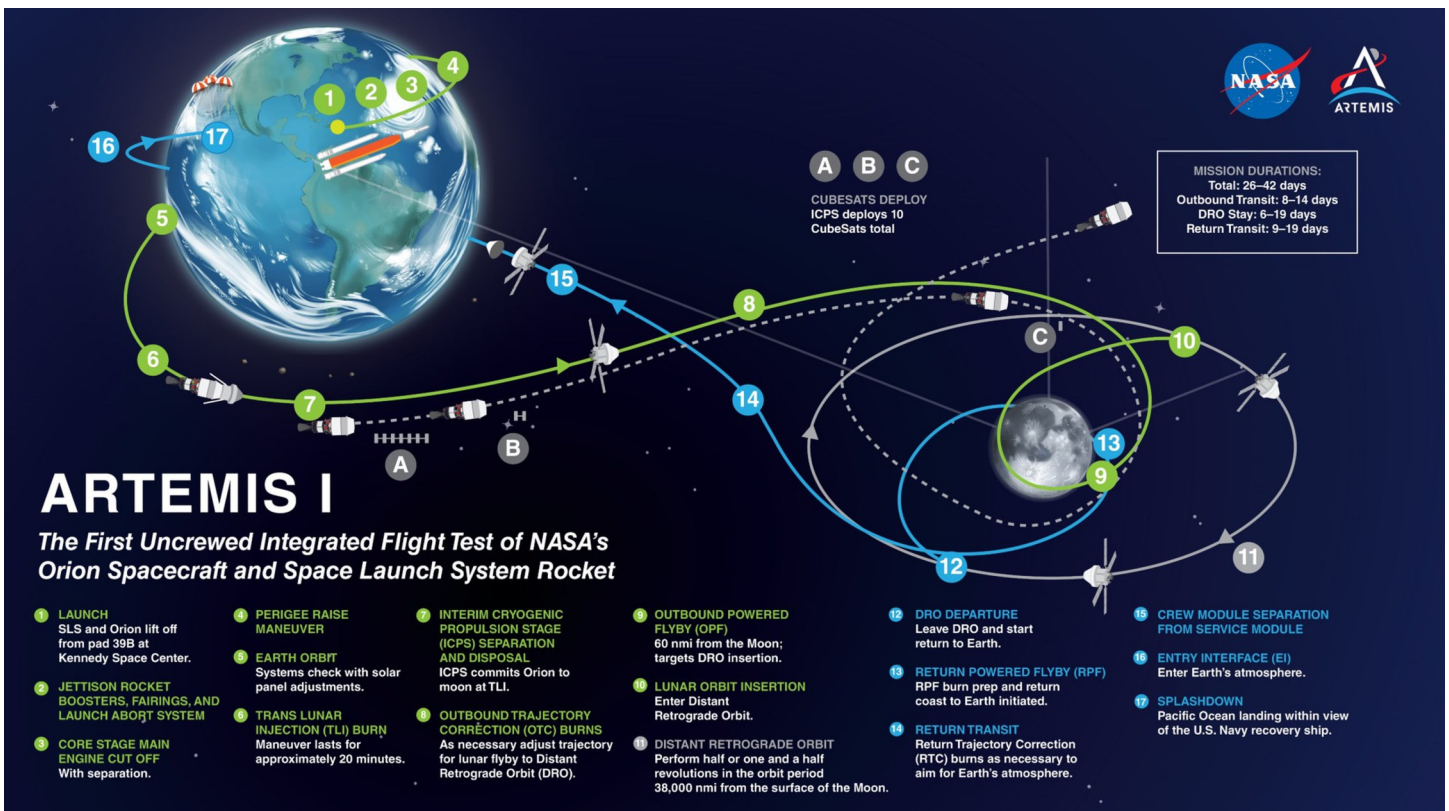
The massive rocket will launch from Launch Complex 39B at the Kennedy Space Center in Florida. The location's technical capabilities, along with its storied history, mark it as a perfect spot to launch our return to the Moon. The complex's first mission was Apollo 10 in 1968, which appropriately also served as a test for a heavy-lift launch vehicle (the Saturn V rocket) and lunar spacecraft: the Apollo Command and Service Modules joined with the Lunar Module. The Apollo 10 mission profile included testing the Lunar Module while in orbit around the Moon before returning to the Earth. In its "Block-1" configuration, Artemis 1's SLS rocket will take off with 8.8 million pounds of maximum thrust, even greater than the 7.6 million pounds of thrust generated by the leg-

endary Saturn V, making it the most powerful rocket in the world!

Artemis 1 will serve not only as a test of the SLS and the Orion hardware, but also as a test of the integration of ground systems and support personnel that will ensure the success of this and future Artemis missions. While uncrewed, Artemis-1 will still have passengers of a sort: two human torso models designed to test radiation levels during the mission, and "Commander Moonikin Campos," a mannequin named by the public. The specialized mannequin will also monitor radiation levels, along with vibration and acceleration data from inside its mission uniform: the Orion Crew Survival Suit, the spacesuit that future Artemis astronauts will wear. The "Moonikin" is named after Arturo Campos, a NASA electrical engineer who played an essential role in bringing Apollo 13's crew back to Earth after a near-fatal disaster in space.

The mission also contains other valuable cargo for its journey around the Moon and back, including CubeSats, several space science badges from the Girl Scouts, and microchips etched with 30,000 names of

(Continued on page 26)



Follow along as Artemis 1 journeys to the Moon and back! A larger version of this infographic is available from NASA at: nasa.gov/image-feature/artemis-i-map

(Continued from page 25)

workers who made the Artemis-1 mission possible. A total of 10 CubeSats will be deployed from the Orion Stage Adapter, the ring that connects the Orion spacecraft to the SLS, at several segments along the mission's path to the Moon. The power of SLS allows engineers to attach many secondary "ride-along" mission hardware like these CubeSats, whose various missions will study plasma propulsion, radiation effects on microorganisms, solar sails, Earth's radiation environment, space weather, and of course, missions to study the Moon and even the Orion spacecraft and its Interim Cryogenic Propulsion Stage (ICPS)!

If you want to explore more of the science and stories behind both our Moon and our history of lunar exploration, the Night Sky Network's **Apollo 11 at 50 Toolkit** covers a ton of regolith: bit.ly/nsnmoon! NASA also works with people and organizations around the world coordinating **International Observe the Moon Night**, with 2022's edition scheduled for Saturday, October 1: moon.nasa.gov/observe. Of course, you can follow the latest news and updates on Artemis 1 and our return to the Moon at nasa.gov/artemis-1



Full Moon over Artemis-1 on July 14, 2022, as the integrated Space Launch System and Orion spacecraft await testing. Photo credit: NASA/Cory Huston Source: <https://www.nasa.gov/image-feature/a-full-moon-over-artemis/>