Celebrating Sixty Years of the Warren Astronomical Society

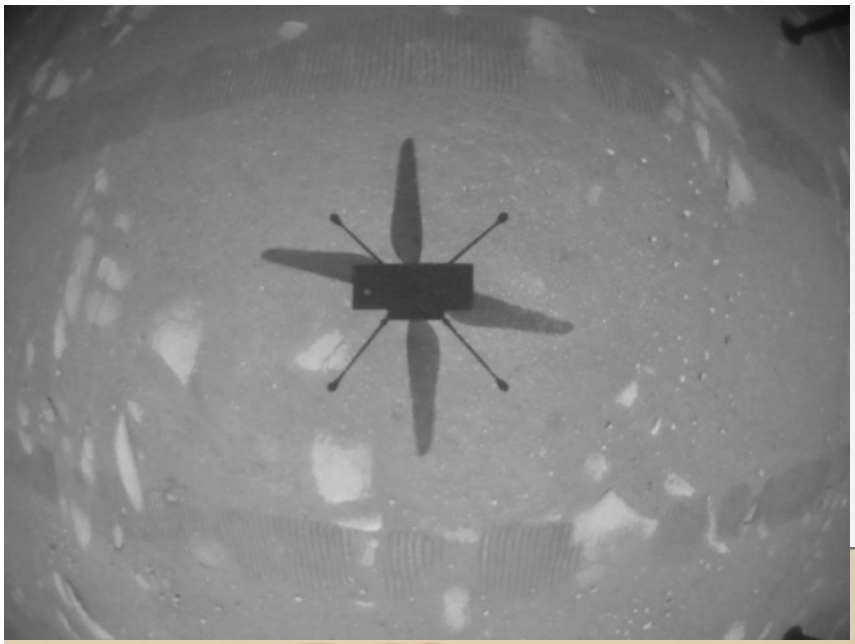
The W.A.S.P.

Vol. 53, no. 5

May 2021

The Warren Astronomical Society Paper

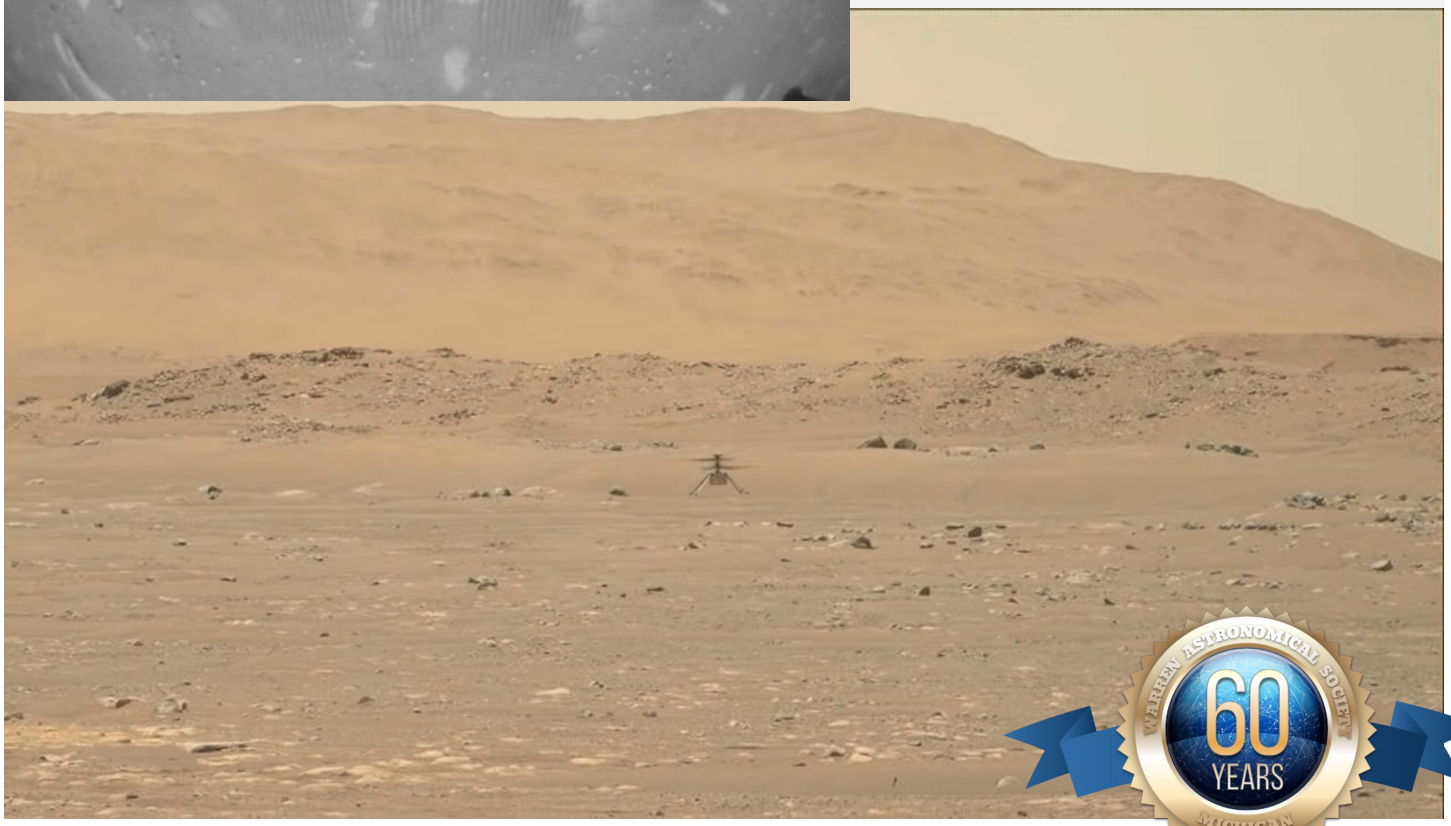
Ingenuity Takes Flight



Monday April 19, 2021, NASA's Ingenuity Mars Helicopter became the first aircraft in history to make a powered, controlled flight on another planet. The solar-powered helicopter first became airborne at 3:34 a.m. EDT.

Altimeter data indicate Ingenuity climbed to its prescribed maximum altitude of 10 feet (3 meters) and maintained a stable hover for 30 seconds. It then descended, touching back down on the surface of Mars after logging a total of 39.1 seconds of flight.

-From NASA



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.

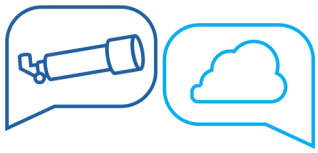
The Warren Astronomical Society Paper (WASP) is the official monthly publication of the Society.
Articles for inclusion in the WASP are strongly encouraged and should be submitted to the editor on or before the end of each month. Any format of submission is accepted. Materials can either be transmitted 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.

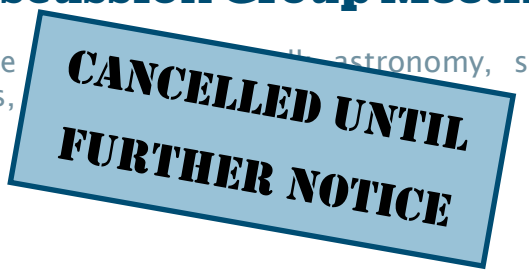
Snack Volunteer Schedule

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 [illegible] astronomy, space news,



In This Issue:

President's Field of View

It's odd, perhaps, to think of the death of a ninety-year-old man I never met as a surprise, or untimely (for family, of course, such a death may never be timely). Still, I couldn't help but say "No!" out loud when I learned of the passing of Michael Collins.

You see, he was my favorite astronaut. I'd come to terms some years back with the reality I'd never get the chance to meet him, the way Jonathan and I once lucked into a situation wherein I talked about Ford Motor Company's CEO with Buzz Aldrin while Jonathan got to ask Scotty Carpenter about his SeaLab experience. But it was comforting to know he was out there, still doing interviews where he spoke of the value of the free press in a civil society, posting lovely and humane things about the value of our Earth on social media, and generally being a gracious example of a human being in these, ah, trying times.

So, I mourn him, but I also want to say a few words about what made Michael Collins so special to me. He was an oddity in the early space program, a military kid who grew up in bases all over the globe and therefore had no hometown to throw him a parade when he first went into space. Although he arrived in the astronaut corps via the Air Force, he didn't make much of his military status in his life, preferring to be called "Mike" rather than "General Collins." He and his wife Pat stayed together all their lives, and when offered a chance to command his own moon mission and leave his footprints on the lunar dust, he declined in part because another mission would be too hard on his family.

Michael Collins
1930—2021

Mike cultivated roses and fretted over the black-spot on their leaves during the Houston summer. He left his mark on America by becoming the first administrator of the National Air and Space Museum in the nation's capital. He sneaked back inside the Columbia command module of Apollo 11 to scribble a tribute to the spacecraft on her wall. And he wrote perhaps the finest astronaut memoir of any American, "Carrying The Fire," which displays the full spectrum of his charm— pilot and poet, voyager and wonderer, a modest man who appreciated every hand dealt in life that allowed him to do incredible things. If you can't get ahold of a copy, the Apollo 11 transcripts are accessible online and they showcase his quick wit and way with words, if not his doodles and sketches.

Astronauts, though heroes, are not always role models, and especially not the hard-charging gang of test pilots who rode rockets during the nineteen-sixties. Collins stands out to me as someone to emulate for reasons beyond his bravery and piloting skills— as a man making his way in the world, as a representative of humankind. As an example of how to carry that fire.

Diane Hall
President

Save the Date

Warren Astronomical Society

Annual Picnic

August 28, 2021

Tentatively scheduled, the board may elect to keep or cancel the event based on COVID-19 State and Federal health mandates and recommendations. This will be determined as we get closer to the date of the picnic.

Even though the event is outdoors, we still recommend social distancing, wearing of face masks when not eating, and not sharing eyepieces for safety.

PO BOX 1505

WARREN, MICHIGAN 48090-1505

April 5, 2021

David H. Levy
PO Box 895
Vail, AZ 85641

Dear David,

At the Regular Monthly Board Meeting of the Warren Astronomical Society, held on April 5, 2021, the following resolution was presented for consideration and adoption:

WHEREAS, in recognition of his contributions to the Warren Astronomical Society Paper, AND, his participation and contributions to the virtual monthly meetings of the Warren Astronomical Society, AND, his contributions to the astronomical community at large, now,

THEREFORE, LET IT BE RESOLVED THAT:

The Board of the Warren Astronomical Society bestows on DAVID H. LEVY,
HONORARY MEMBERSHIP
to the
WARREN ASTRONOMICAL SOCIETY

Motion by: Dale Thieme Supported by: Dale Partin Motion Passed: Unanimously

THE BOARD OF THE WARREN ASTRONOMICAL SOCIETY

Diane Hall – President Dale Partin – 1st Vice President Riyad Matti – 2nd Vice President
Mark Kedzior – Secretary Adrian Bradley – Treasurer
Dale Thieme - Publications Robert Trembley - Outreach

Letters

Response from April Photo Identification

Photo IDs

Frank and Diane McCullough

-Doug Bock

Re: The latest issue of the WASP is online!

Great latest issue! Chock-full of intriguing items.

Especially enjoyed the Dave Levy write-up regarding Rik and Dolores Hill.

I'll even admit to having chuckled at the insights of one "G.M. Ross," an individual so famous he can partially go by initials, like J.K Rowling.

-Mark Kalinowski

Various

To: President, Editor (referring to the April issue)

In that order:

Your experience with Taurus and Mars reminds me of a colourimetry experiment I stumbled in to, years ago in pre-dawn from the drive-way in Royal Oak. (One of the reasons I was the Grand Duke of Urban Astronomy.)

'ZOUNDS! All those solar pictures. Cole Porter wrote a song about you for Anything Goes.

-G. M. Ross

Letter to W.A.S.P. re current number

Penny Wayne Thanks for fulsome obituary because I never knew her, even de minimis. Those intellectually active like Wayne are naturally well come in our Society. Interest in astronomy and ancillary technologies is unimportant. I have a good amigo in Grand Rapids who joined the local society, not from any passion for the subject, but to associate with "intelligent people". He has surely been of great help to me.

The call of "dark skies". As the former Grand Duke of Urban Astronomy, I understand the urge therefor. In my many improving commentaries to the Society, I have taken pains to show the unfavourable -- even wretched -- locations for reports. On the other hand, from what I know about the "Thumb", the region holds the best skies in eastern Michigan. I make no reference to the Bortle Scale, because I am not well informed. My experienced brother might be of analytical help from some what west of Port Austin. Upon application, I will supply means of contact.

The Sun section. No lack of historical perspective or trawling for imagery from our editor, eh?

G. M. ROSS, Grand Duke, Ret.

Looking Back

Photo: Dale Thieme

Photo: Dale Thieme

An open house at Stargate one fine day in May 2009, Top, Bob Berta explains a set-up to some attendees, Middle: Blaine McCullough (back to the camera, wearing W.A.S. jacket) looking on. Right: What the telescopes were all pointed at...

Kalamazoo Astronomical Society

Looking Up Since 1936

Public Service Announcement April 17, 2021

For More Information:
Richard S. Bell, KAS President
(269) 373-8942 or kas@kasonline.org

KAS to Feature Nobel Prize Laureate Dr. John C. Mather at its June 4" Meeting

The Kalamazoo Astronomical Society (KAS) is pleased to announce that Dr. John C. Mather will present *Cosmic Instability: How* a *Smooth Early Universe Grew into Everyone You Know* at its general meeting on **Friday, June 4" at 7:00 pm EDT.** The meeting will be held on Zoom and live streamed on the KAS YouTube Channel. Admission to free, but registration for Zoom is required.

Dr. Mather is a Senior Astrophysicist in the Observational Cosmology Laboratory located at NASA's Goddard Space Flight Center in Greenbelt, Maryland. He is also the Senior Project Scientist on the James Webb Space Telescope, scheduled to launch on October 31, 2021. As Senior Project Scientist (1995-present), Dr. Mather leads the science team and represents scientific interests within the project management.

Dr. Mather's research centers on infrared astronomy, cosmology, and the development of new instruments for exploring the universe. He was the Project Scientist and a Principal Investigator for the Cosmic Background Explorer Satellite (COBE) - with which the left-over radiation from the Big Bang was measured precisely for the first time. He has received numerous awards, including the Nobel Prize in Physics with George Smoot (2006). *Time* magazine named Dr. Mather on its 100 Most Influential People in the World list in 2007 and as one of 25 most influential people in space in a special issue on New Space Discoveries in October 2012.

Below is the abstract for Dr. Mather's June 4 presentation *Cosmic Instability: How* a *Smooth Early Universe Grew into Everyone You Know:*

> Gravity made stars, stars made heavy elements, gravity and chemistry made planets, geology and biology made people, and people made telescopes. What we would like to know is how hard it all was, and could it happen elsewhere. The James Webb Space Telescope, planned for launch in October 2021, will extend the discoveries of the Hubble with a much bigger mirror, cooled to low temperatures so it can observe infrared radiation. It will have detectors capable of observing a bumblebee at the distance of the Moon! Dr. Mather will show the telescope, describe its capabilities, and discuss what it might find. We expect to see the history of the universe laid out before us, from the first luminous objects to our local neighborhood, and to answer questions like:
> How did the galaxies and black holes first form and grow? Are there Earth-like planets out there? How can we tell if they harbor life?

For more details and to register, visit the Kalamazoo Astronomical Society's website at **kasonline.org**.

Freeing Trade Is a Simple Matter of Astronomy

In 1859, construction of the 120-mile-long artificial waterway known as the Suez Canal began. Over the course of ten years, workers carved through the Isthmus of Suez, like a worm through an apple, connecting the Mediterranean and Red seas. Its main purpose was to shorten trade routes that would otherwise have to travel around the southern tip of Africa. As this can cut weeks off a voyage, it is easy to see why ship captains would want to worm their way through the canal. This is also why a stranded container ship blocking the canal was a global issue.

Location of the Ever Given. Source: New York Times and Airbus satellite imaging

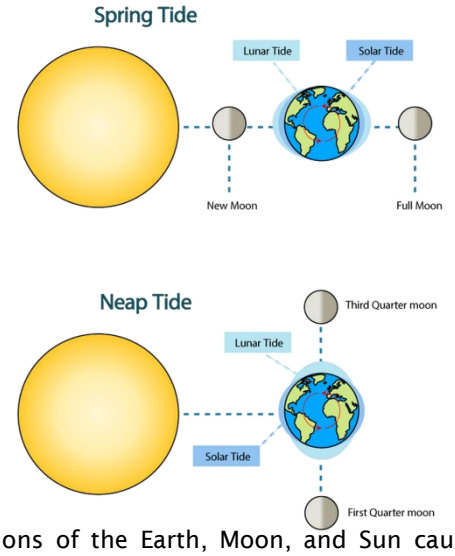
On March 23rd, the ship Ever Given ran aground near the entrance at Suez and held up hundreds of ships, affecting roughly 13% of international trade. As this created a nearly $10 billion per day shipping delay, you can imagine how greatly the stuck crew wanted to worm their way out of that situation!

So, what does this have to do with astronomy and, more importantly, what's with all the talk about worms? Well, the heroine of our story is the greatest worm of all! Her name: The Worm Moon.

After nearly a week trying to dig the ship out and an assortment of other efforts, the solution was simple. Just add water. For mere humans, this is no easy task as the Suez Canal is connected to the world's oceans. The Moon though? She'll do it for free as she's passing by.

Tides are caused by the gravitational effects of the Moon. Earth's oceans will bulge outward when the Moon is directly overhead, as this is where the Moon's gravity is strongest. At the same time, another bulge will occur on the opposite side of Earth, where the Moon's gravity is weakest. This is known as high tide, as the local water levels will generally rise during the event. In between the bulges is low tide, where water levels are lower than average, a result of all the water gravitating to the high tide regions.

By the same token, the Sun gets into the game too. While the effect is not as strong as that of the Moon, the Sun can serve to amplify or weaken the tides, depending on



Orientations of the Earth, Moon, and Sun causing the tides. Source: www.science8sc.weebly.com.

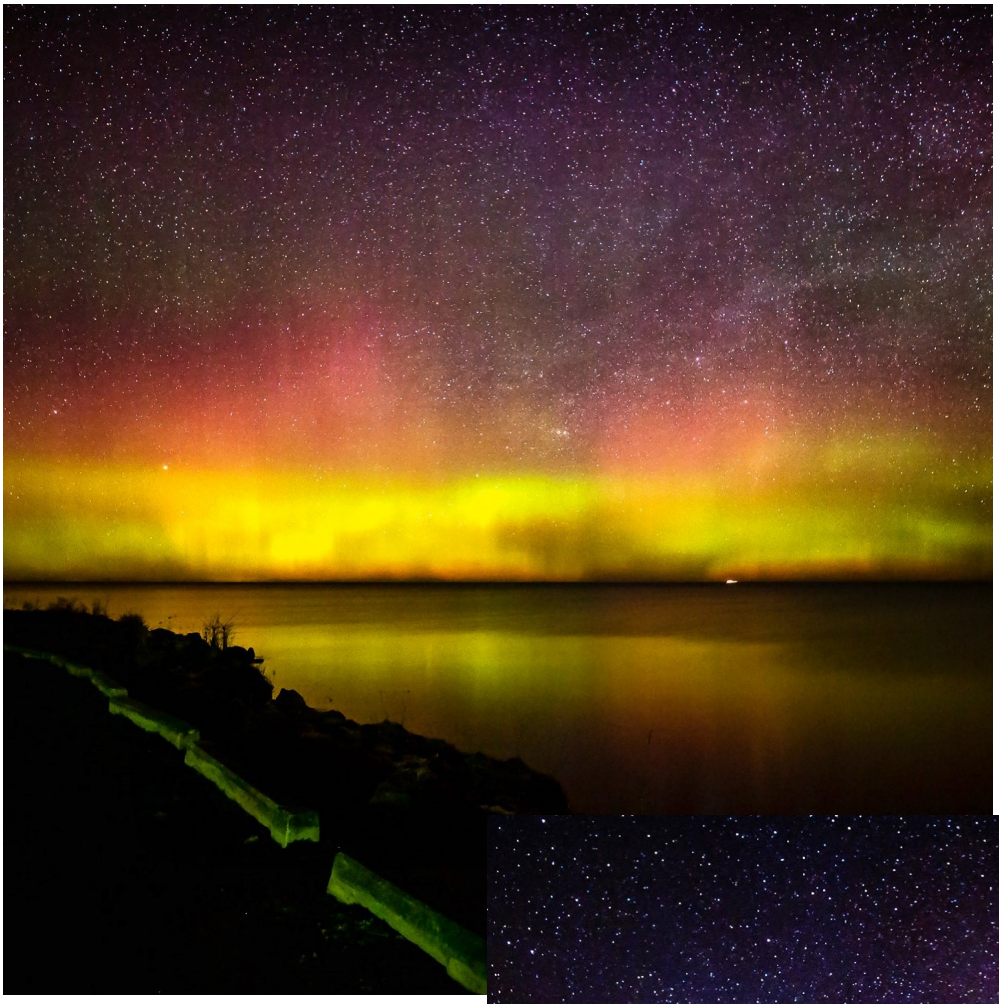
the alignment of the three celestial bodies. In particular, when there is a full or new moon in the sky, the high tides are at their highest. This is exactly the turn of events that occurred during a full moon on March 29th. With water levels a foot-and-a-half higher than during normal high tide, workers freed the Ever Given and tugboats were able to pull it to safety.

So why worms? Well, the full moon that occurs during March is named the Worm Moon. This is likely a reference to the earthworms that emerge from the soil as spring begins or, as they are freed from the earth, as it were. Alternatively, Jonathan Carver, an 18th century sea captain, posited that the name came from beetle larvae that surface around this time. Either way, it is a fitting name to end the story of how, through the combined efforts of the Earth, Moon, and Sun, the Ever Given was freed and global maritime trade was saved.

Zin, C. (2021, April 10). Freeing Trade is a Simple Matter of Physics. *Helium Flash a Macomb Community College Astronomy Newsletter*, Issue 3, 5.

Christopher Zin received a PhD in physics from Wayne State University, with a focus on high energy collisions. His graduate research, primarily related to simulating and studying collisions at particle accelerators like the LHC, was fulfilling, however, he found teaching to be truly rewarding. Thus, he is pursuing a career in teaching and currently acts as adjunct faculty at Macomb Community College.

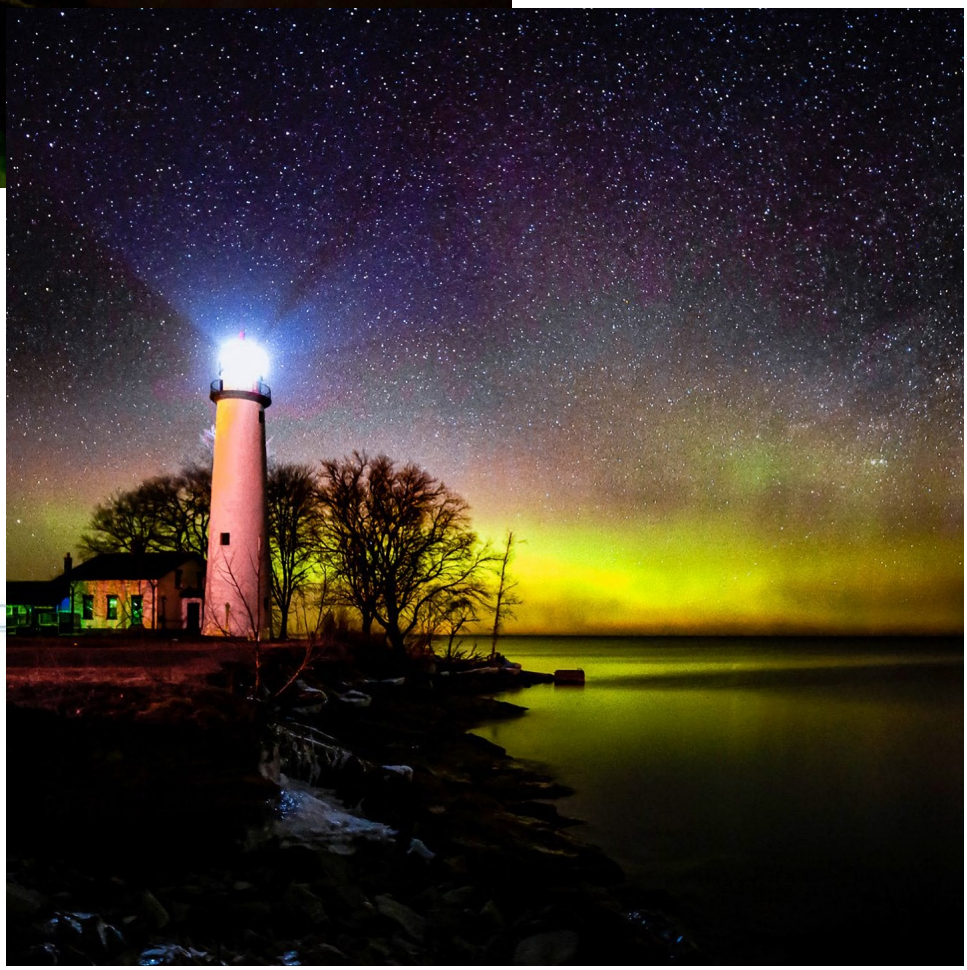
The work of Professors Francette Fey and Timothy Skonieczny in encouraging students and faculty of Macomb Community College to publish in Helium Flash, a Macomb Community College Newsletter, and to republish in the WASP is gratefully acknowledged.



Perseverance pays off

WAS member Adrian Bradley frequently visits the Thumb area of Michigan for nightscapes and spent a long night at Pointe Aux Barques Lighthouse. This was after 2 months of failed tries. His last aurora chase had him watching snow flying past the lighthouse!

On the weekend he got these images, He had gotten a tip about auroras and gambled on them being visible towards morning. It paid off!



The View From C.W. Sirius Observatory

The Sombrero Galaxy

Messier 104, otherwise known as the Sombrero galaxy, is a spiral galaxy located in the constellation Virgo. Located approx 32 million light-years away, M104 is half the size of our Milky Way galaxy.

It has a bright nucleus, an unusually large central bulge, and a prominent dust lane in its outer disk, which is viewed almost edge-on. The dark dust lane and the bulge give this galaxy the appearance of a sombrero hat. Astronomers initially thought that the halo was small and light, indicative of a spiral galaxy, but the Spitzer Space Telescope found that the dust ring around the Sombrero Galaxy is larger and more massive than previously thought, indicative of a giant elliptical galaxy. The galaxy has an apparent magnitude of +8.0, making it easily visible with amateur telescopes, and it is considered by some authors to be the galaxy with the highest absolute magnitude within a radius of 32 thousand light-years of the Milky Way. Its large bulge, its central supermassive black hole, and its dust lane all attract the attention of professional and amateur astronomers.

The Sombrero was discovered by Pierre Méchain in 1781, but was not officially added to the Messier catalog until 1921. In 1921, Camille Flammarion found Messier's personal list of the Messier objects including the handwritten notes about the Sombrero Galaxy.

The galaxy's most striking feature is the dust lane that crosses in front of the bulge of the galaxy. This dust lane is actually a symmetrical ring that encloses the bulge of the galaxy. Most of the cold atomic hydrogen gas and the dust lie within this ring. The dust ring is the primary site of star formation within this galaxy. Some astronomers believe the dust region used to circle the entire central light bulge. And over billions of years formed down into a single dust lane circling the galaxy.

M104 is a wonderful telescope target in spring and early summer months. Using a 4"-10" telescope in fairly dark skies will show a nice shape of the galaxy. But using a much larger scope, 15" and greater will reveal the dark dust lane quite nicely and will take on the resemblance of a sombrero hat. I took this image through my 11" telescope using a one shot color ZWO camera, with a total of 7 hours of integration time. Aside from being a very cool astro-photo object, the Sombrero galaxy should definitely be on your observing list!

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

NGC 2841

From Wikipedia: **NGC 2841** is an unbarred spiral galaxy in the northern circumpolar constellation of Ursa Major. It was discovered on 9 March 1788 by German-born astronomer William Herschel. J. L. E. Dreyer, the author of the *New General Catalogue*, described it as, "very bright, large, very much extended 151°, very suddenly much brighter middle equal to 10th magnitude star". Initially thought to be about 30 million light-years distant, a 2001 Hubble Space Telescope survey of the galaxy's Cepheid variables determined its distance to be approximately 14.1 megaparsecs or 46 million light-years. The optical size of the galaxy is 8.′1 × 3.′5.

This is the prototype for the flocculent spiral galaxy, a type of spiral galaxy whose arms are patchy and discontinuous. The morphological class is SAa, indicating a spiral galaxy with no central bar and very tightly-wound arms. There is no grand design structure visible in the optical band, although some inner spiral arms can be seen in the near infrared. It is inclined by an angle of 68° to the line of sight from the Earth, with the major axis aligned along a position angle of 148°.

The properties of NGC 2841 are similar to those of the Andromeda Galaxy. It is home to a large population of young blue stars, and a few H II regions. The luminosity of the galaxy is 2×10^{10} $M_\odot$ and it has a combined mass of 7×10^{10} $M_\odot$. Its disk of stars can be traced out to a radius of around 228 kly (70 kpc). This disk begins to warp at a radius of around 98 kly (30 kpc), suggesting the perturbing effect of in-falling matter from the surrounding medium.

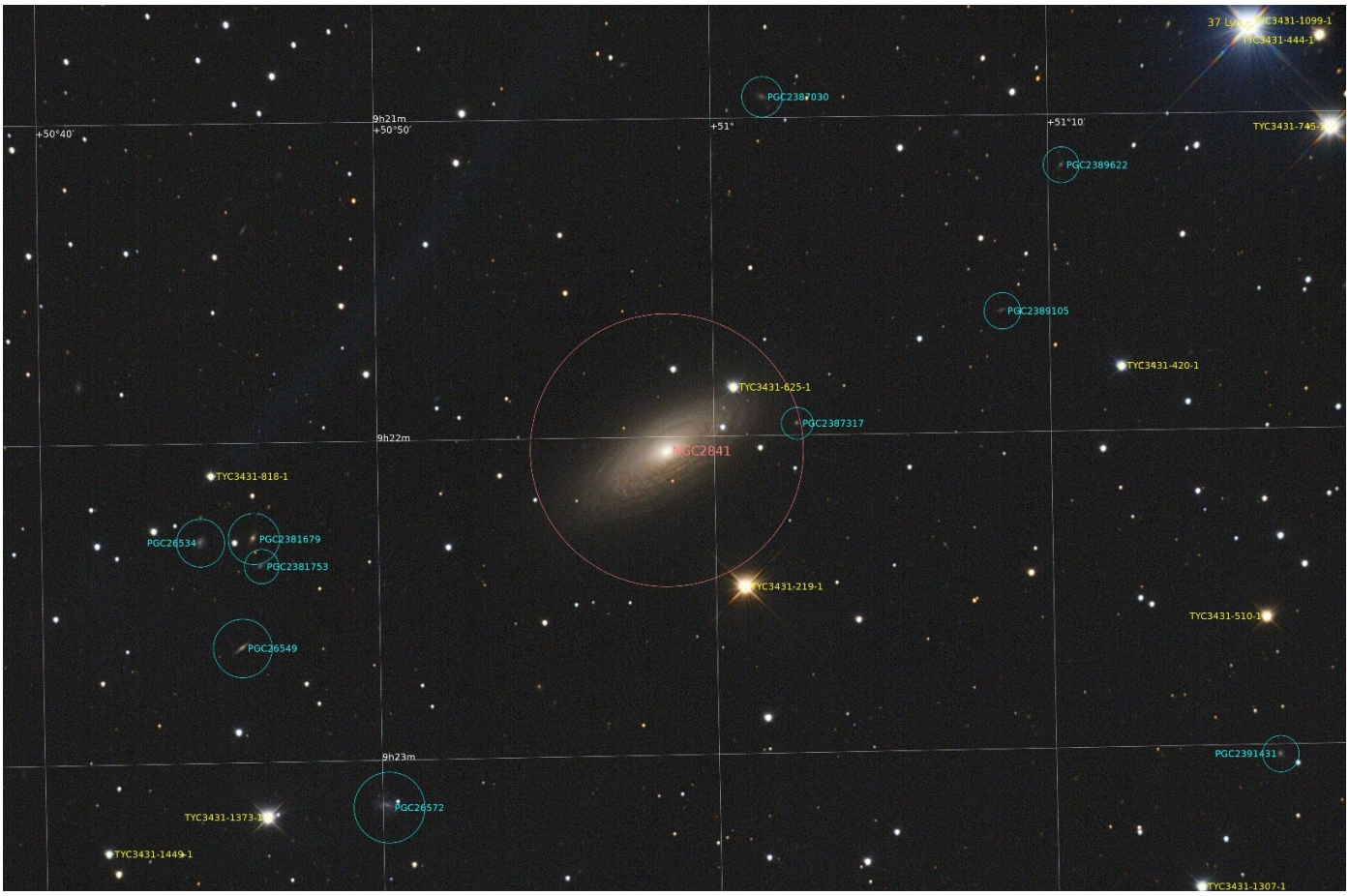
The rotational behavior of the galaxy suggests there is a massive nuclear bulge, with a low-ionization nuclear emission-line region (LINER) at the core; a type of region that is characterized by spectral line emission from weakly ionized atoms. A prominent molecular ring is orbiting at a radius of 7–20 kly (2–6 kpc), which is providing a star-forming region of gas and dust. The nucleus appears decoupled and there is a counter-rotating element of stars and gas in the outer parts of the nucleus, suggesting a recent interaction with a smaller galaxy.

(Continued on page 11)

(Continued from page 10)

Data Acquisition on April 3, 2021
51 x 300 second light frames, 24 darks, 50 flats
10" f/8 RC telescope, Losmandy G11 mount
ZWO asi071mc PRO camera, @ gain 240, temp 0C

Below: Plate Solve



-Doug Bock

We're starting to see more solar flare activity as there was a group of flares from the sun during the week of April 21-27. In the plot below from the Geostationary Operational Environmental Satellite (GOES), you can see from the X-ray flux plot that there were a lot of flares that exceeded the "C" level (fig. 1.) For comparison, the plot at the bottom shows a typical quiet day on the sun (Fig. 2.) Flares at the C level can be detected by the superSID project which is a citizen science project administered by Stanford University and the Society of Amateur Radio Astronomers (SARA). We have an operational SuperSID station at McMath-Hulbert. The SuperSID receiver measures the signal strengths of the very low frequency (VLF) stations used by the world's navies to communicate with ships and submarines. These stations operate in the radio frequency range of 15-40 kHz. These very low frequencies can penetrate seawater to a great depth. When a flare occurs, a SuperSID station sees an increase in the signal strength from an individual VLF station. This increase is caused by the increased ionization of the ionospheric layer that reflects the signal as it traverses long distances from the transmitter to the SuperSID station. There is a very close correspondence between the X-ray flux from a flare and the received signal in the VLF spectrum.

SuperSID Project:
http://solar-center.stanford.edu/SID/sidmonitor/

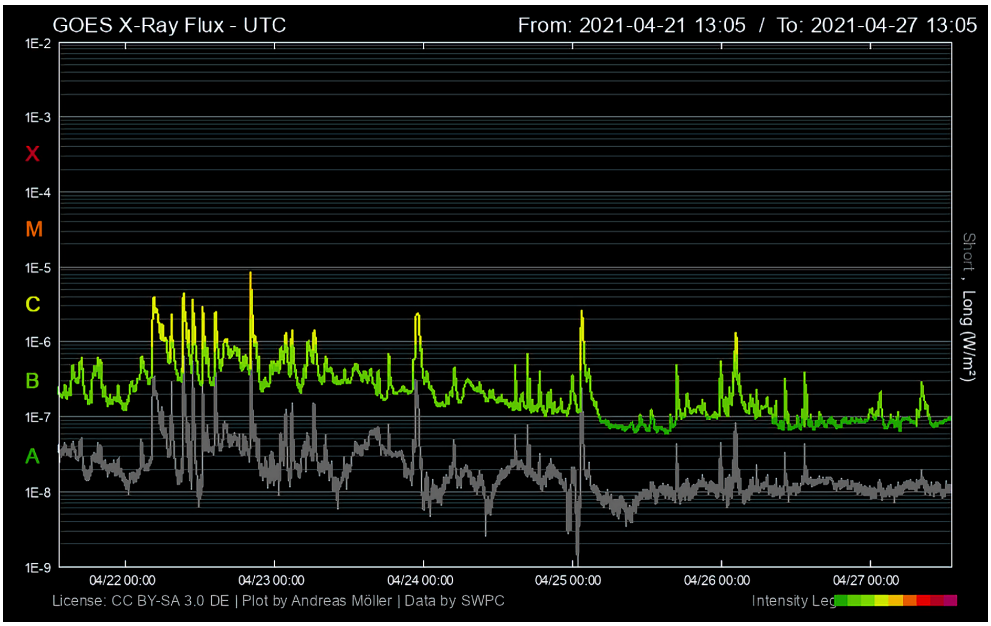


Fig. 1

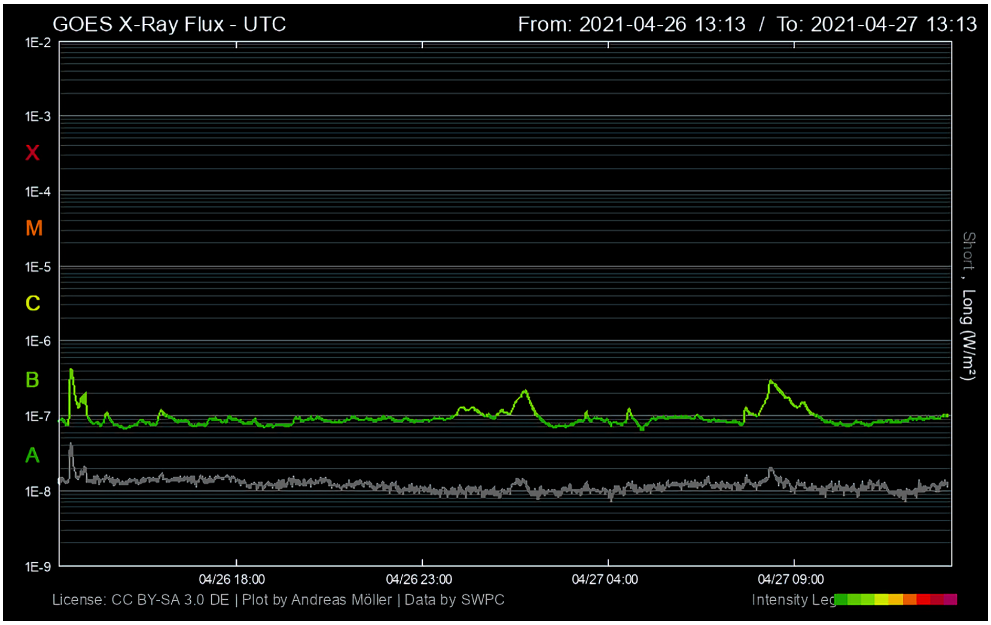


Fig. 2

Observation Reports

29-30 March

CASTOR -- a.k.a Alpha Geminorum A and B. Excellent transparency but poor seeing. Spectacular two pure white companions. Mag. 1.9 and 3.0. A = spec. class A1 b = spec. class A2, with identical colour indices. 5.4" separation in 2019 (OBS. HANDBOOK 2021) Separation min. was in 1965. Like under water search-lights.

MOON -- Search for the "blue lake" very difficult with low Moon and windy seeing. Phase was ideal, however, per communication by others @ 1.5 d. past full. Search for the small elusive feature was in vicinity of Manilius.

Principal references = Alter Plate 48 (Wilson & Palomar) and Kopal Plates 22, 23. Difficult scrutinising Lacus Felicitatis, L. Odii, L. Dolores. Could the object be Archimedes H, G, E, or B?

TU Gem -- Carbon star just N. of M-35. Moderately low in the W. Appeared tan. Colour index 3.4, middle range per the OBS. HAND., supra. Observation of TU on 23-24 Feb. last year with 10.2 cm refractor in the Veen = "pale yellow-cream". Narrow range variable.

16" Borr II Telescope, with "Handsome Joe" McBride.

-G.M. Ross

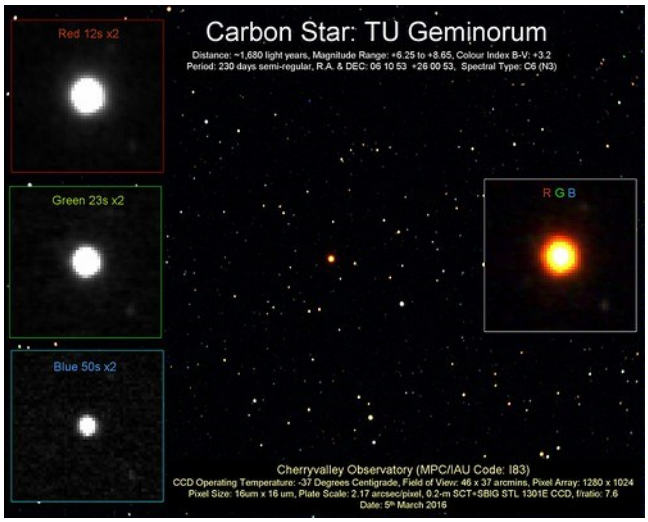


Image by Mike Foylan, Green Valley Observatory, Rathmolyon, County Meath Ireland.

26-27 March (supplemental)

TU Geminorum -- Evolution of the "C" spectral class. Per Ostromecki and Huziak in Observer's Handbook (2021) mag. 7.7 - 8.0, colour index of 3.4. Definitely reddish. In the Atlas Catalogue of A. Becvar, published 1964, TU is 7.4 - 8.3 mag., which for carbon stars seems to be a close fit to the contemporary numbers, given how idiosyncratic such objects can be. The scholarship which went into his book could have been ten years old. Spectral class = N3. The cool stars were consolidated in a new taxon: "C". Now of days TU is C6,4.

1 - 2 April

Cr 135 (reprise) -- Given excellent transparency and no Moon, this magnificent open cl. deserved another examination w/ 7X binoculars. Result was the same: Aside from the invader Pi Puppis, late spectral class K5, and ~ 3 other stars, 135 proper was not visible. OBJECTS IN THE HEAVENS lists it as 2.7 mag., while Becvar's CATALOGUE does not list. At approx. -36 deg. this Collinder object is well situated for S. Mich. observers w/ good horizon.

d-2 PUPPIS -- A test for 7X binoculars, but not rigourous. This "proper motion" triple is easy.

N.G.C. 2451 PUPPIS -- Birren declares this cluster naked eye, and reasonably, if add'l 10 degrees latitude. 45 arc-min. in diameter, mag. 2.8.

Exceptionally fine sight @ 7X, 2451 too is dominated by a yellowish star, "c" Pup: 3.7, class K5 per Becvar. OBS. HANDBOOK (2021), p. 311: photogr.

mag. = 3.7. Mean spectral class, B5.

N.G.C. 2546 PUP -- Not visible in a 5 cm. refractor @ 22X. Birren lists the open cl. as "Bright, scattered", but this Observer differs, doubts mag. 6.3.

Mystery deepens with Becvar: mag. 4.6 with 50 stars. OBS. HANDBOOK (2021), p. 311: photogr. mag. = 5.0, dia. 45 arc-min. Mean spectral class, B0.

UZ PYXIDIS -- Carbon star, easy in 5 cm refr'r @ 22X, 45X. Officially a "double" with S.A.O. 176457 at same R. A., magnitude 7.6. Observer estimates UZ ~ 6.5 by comparison. How ever, OBS. HANDBOOK, p. 295 gives range 7.0-7.6.

"Handsome Joe" McBride and Observer conclude conservatively colour is "warm". On 4-5 Mar. 2020 in 10.2 cm refractor (Veen Obs.) = "light orange" but star "very low".

Not in Becvar CATALOGUE (1964).

-G.M. Ross

(Continued on page 14)

(Continued from page 13)

NON-OBSERVING REPORT

Haumea/ Hi'iaka

15-16 April

Occultation of 12.4 mag. star in S. Bootes by largest satellite of trans-Neptunian planetoid. 136108 Hi'iaka = 320 km. +/- 40 km. Event estimated to last 12.4 sec. (max.) 06.25 - 06.33 U.T. Pacific to Atlantic occ'n path.

Grand Rapids/ Fox Valley societies mobilised, from S. New Mexico (LaPaz) to S.W. Mich. (Veen Obs'y). Weather failure over all (?) sites. Co-ordinator B. Holler reports numerous weather problems but three "chords" out of Maryland as of afternoon of 16th.

-G. M. Ross

OBSERVING REPORT

16 - 17 April

q Velorum -- Amazing sight for a "A" class star, a function of altitude/ atmosphere. The star turned periodically to ruby! One could mistake q for an "M" or carbon star. The 6th mag. "companion" to south was faintly visible.

Principal star = 3.9 mag. Easy to identify by line of three horizontal field stars immediately to N.

Lambda Velorum -- Bright at 2.2 magnitude. Per Hirschfeld and Sinnott's CATALOGUE @ -43 deg. 25' Declination. The "companion" to W. of Lambda (Sinnott's POCKET ATLAS) not vis. Close proximity to Lambda? Star h4191 easy near-by.

Psi Velorum -- 5th mag. "companion" @ Position Angle ~ 110 easy to see, probably vis. in binoculars.

k Velorum -- On Sinnott ATLAS as principal of three object asterism @ 6.1, but a 4th star present ~ 8th mag. The array would be interesting in binoculars.

U Antliae -- Carbon star. Not in OBSERVER'S HAND. annual list. All though U is immediately north of the Milky Way isophote, very easy to see in otherwise sparse area. Reddish orange, probably approx. at peak magnitude. H & S CATALOGUE (1982), supra, lists as 5.4 mag. of "N" class. Carbon designation had not yet been formulated. (?)

Transparency excellent, seeing excellent. From S. E. Kent Co., approx. 42 deg. 54 min. N.

5 cm. f /11 refractor, 22X

-G. M. Ross

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, May 3 , 2021
Virtual Presentations

Main Talk:

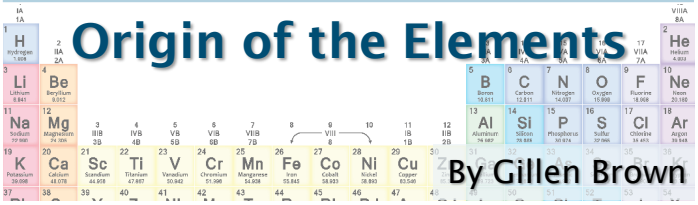
The Warren Astronomical Society boasts a healthy and very active astrophotography group. A newer member to both the club and the group, Dale Hollenbaugh, will regale us with his personal adventure into the hobby of astrophotography. Ranging from backyard imaging to chasing the solar eclipse, Dale covers many aspects of the field. Of course there is the accumulation of gear and occasionally 3-D printing when the part needed simply doesn't exist.

About the Speaker

Dale holds a Bachelor of Science degree in Mechanical Engineering from Bucknell Univ. He is a Sr. Mechanical Engineer at BAE Systems and has one U.S. Patent. Dale is an avid photographer and loves to travel with his wife. He has always had a fascination with space, but haven't always been into astronomy, but will talk about this history and background more in detail in his presentation.

(Continued on page 16)

Thursday, May 20, 2021
Virtual Presentation



In this talk Gillen will discuss how different elements were made in the history of the Universe. Starting with the creation of Hydrogen and Helium in the Big Bang, he will walk us through the main processes that created different elements. Along the way we'll discuss nuclear fusion in stars like our sun, supernovae that mark the end of massive stars, and collisions between the densest stars in the universe. By the end of the talk we'll be able to understand where all the elements on the periodic table came from.

About the Speaker

Gillen is a PhD student studying astronomy at the University of Michigan. He originally grew up in the Kansas City area, and graduated with a BS in Physics from the University of Missouri - Kansas City. While there he got involved in astronomy research, which inspired him to go to graduate school. At the University of Michigan, Gillen studies galaxy formation using computer simulations of galaxy formation, focusing on the star clusters in galaxies and the chemical evolution of galaxies.

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.

(Continued from page 15)

Short Talk:

Temperature Profile of a Protoplanetary Disk

By Jenny Calahan

Protoplanetary disks are the birth-place of planets. We first need to understand some basic characteristics of protoplanetary disks in order to understand how planets like our Earth, or Jupiter, or any exoplanet was formed. Basic characteristics like mass and temperature are difficult to disentangle from observations, the bulk of a protoplanetary disk's mass is in H_2, which is not observable given the cold temperatures of a disk. The temperature structure, both vertically and horizontally throughout a disk is also essential in understanding where certain chemicals reside, and feeds into how we calculate the total mass of the disk. In this talk Jenny will explain how she uses both radio observations and disk simulations to determine the 2D temperature structure of a protoplanetary disk, and how we use that to calculate its mass.

About the Speaker

Jenny Calahan is a third year graduate student in Astronomy and Astrophysics at the University of Michigan. She studies protoplanetary disks by using a combination of radio observations and computer models of protoplanetary disks. She's most interested in the temperature structure of protoplanetary disks, probing the temperatures at which planets form. She is also interested in astrochemistry, and how we can use complex molecules to tell us more about the planet forming potential of disks. Outside of her research, Jenny is a member of the Astrobites organization where she was an author for two years, and now does behind-the-scenes organizational work. She enjoys cooking, hiking, and creative writing.

Jenny, sitting on a telescope dish on Kitt Peak. It's the VLBA (Very Long Baseline Array) dish on the peak; She used the 12m telescope just down the road when she was an undergrad at University of Arizona.

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Skyward with David Levy

A long time ago, while I was writing my biography of Clyde W Tombaugh, discoverer of Pluto, I learned from him that he had discovered other objects during his long search at the Lowell Observatory in Flagstaff, Arizona. He found many asteroids during his time at Lowell Observatory, at least one comet, and, surprisingly enough, one nova. In February 1986, I visited Flagstaff in an effort to locate the nova that he found. It was a painstaking, tedious task but I loved it anyway. Because Clyde had been so careful recording his observations from each photographic plate onto the envelopes surrounding that plate, I had only to read through all the notes from each envelope. On one of the envelopes covering the year 1931, I saw the nova on a plate dated March 23 of that year. He remarked that must be "quite an interesting star to brighten from fainter than fifteenth magnitude in less than a day."

I later found nine other observations of this star while going through old plates at the Harvard College Observatory, and then I reported them all to Brian Marsden, then director of the Central Bureau for Astronomical Telegrams. He said, "I will announce it, but not yet."

"Why not?" I asked.

"Because you are an amateur astronomer."

Them's fighting words. But before I had a chance to use them, he said, "If you were a professional astronomer, you would never look at the field again, and that would be the end of it. But as an amateur astronomer, you have a lovely 40-centimeter (16-inch) telescope with which you can observe the field every night. When the star erupts again, you will catch it, and then I will announce it as a current item!"

Six months later, on March 23, 1990, I saw the star in outburst with that telescope. It was 59 years to the day after Clyde's discovery, and I was thrilled to let the discoverer know of it. The observation and history were announced in a subsequent announcement card. Since then I have seen the star in outburst over and over again, and one of those sightings was on another March 23, which by this time had assumed more than one new significance: it is also the discovery date of our most famous comet, Shoemaker-Levy 9. It is also our wedding anniversary.

TV Corvi is now my favourite variable star. On each clear night I check the field. One time I caught the star so early in its brightening that I was able to create a movie of the event. When there is an always welcome outburst, it is fun to say hello to my old friend, and I really have a feeling that the star answers me, from the depths of space, with a cosmic "hi there!" right back.

This is the civic building in Streator, Illinois. Streator is where Clyde was born in 1906. There is a plaque on the left side for him.
Photo by David Levy during his visit.

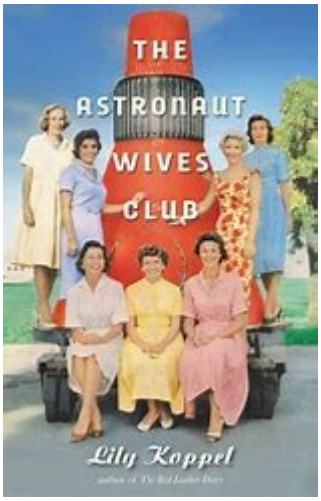
Movie Review with Diane Hall

Astronaut Wives Club

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

Episode Eight: Abort

The Original Seven are down to the Mercury Six; the remaining guys lay Gus Grissom (Joel Johnstone, seen in dream sequences) to rest at Arlington and the Astrowives are of course on-hand for Betty (JoAnna Garcia Swisher). The funeral scene plays out to a cover of "The Times They Are A Changin'" and I'd like to take a time-out to compliment the series for its use of music— instead of the godawful "most on-the-nose hits of the sixties we could get for cheap" that many works set in the moon-shot era use, Astronaut Wives Club employs surprisingly good contemporary interpretations of the classics alongside original tunes. It's one of the reasons I enjoy watching this even when the scripts go sideways.



Anyway, some tall, dark, mystery man passes a note to Betty after the interment. The other Astrowives assume his note is some weird pseudo-scandal and downplay its significance to Betty, but eight episodes into this show we know Betty does not let things go. Especially not if it relates to Gus in any fashion. Mystery man turns out to be a whistleblower from North American Aviation, and Betty runs with his tale of a damning internal memo about problems with the Apollo capsule to Deke Slayton (Kenneth Mitchell) and Al Shepard (Desmond Harrington), who aren't exactly convinced by a hearsay account of a memo from some engineer who wouldn't disclose his name. The composite NASA guy whose name I don't bother to remember (Evan Handler) goes on TV saying that the program's going to roll right on schedule as a tribute to Gus and his crew, sparking fear and discord among the Astro-families… which is bunkum, as NASA's leadership announced before the funerals that they didn't know how long the program would be grounded though they'd make the attempt to get boots on the moon by 1970. But hey, this space race story needed some invented drama, right?

Marilyn See (Nora Zehetner) tries to comfort Betty by proposing they take a trip together to get away from Houston and all of its memories, so Betty insists they go to DC where the hearings on Apollo One are going down on Capitol Hill. Because of course she does. Meanwhile Louise Shepard (Dominique McElligott) does her best to tend to a shattered Pat White (Alexa Havins) even as her own home life is getting increasingly messy— for one, daughter Alice is making eyes at Pat's boy, for another Alice isn't actually… ah, whatever. Louise begins to learn that playing the perfectly serene queen of the Astro scene is hurting a lot of people besides just her. Honestly I thought she learned that several episodes ago but hey, change is hard.

A main conceit of this episode is that, just as the AstroWives banded together to get better treatment from NASA in the previous episode, that pressure from the Wives changed NASA's go-go culture after the Apollo One fire. I admit I haven't yet read the book this series is based on but every single work I have read on the subject indicates the astronauts were devastated enough to not meekly submit to the pressures of "the schedule" after their buddies got roasted and that the real NASA management did a lot more soul-searching on the fly than Composite Guy ever does. But that wouldn't allow for the melodrama of allllllll the dudes being heels again while one of the Wives is right about everything. In real life, Betty Grissom successfully sued North American Aviation for damages, setting a precedent that astronaut families didn't have to accept fiery death as a standard risk of the job. She also lent her name to a book, Starfall, that was, shall we say, uncomplimentary toward Gus's Apollo One subordinates, saying they were too busy side-dealing and playing to work and kind of admitting he had poor control over his own crew. How come that version of Apollo One never makes it to the airwaves?

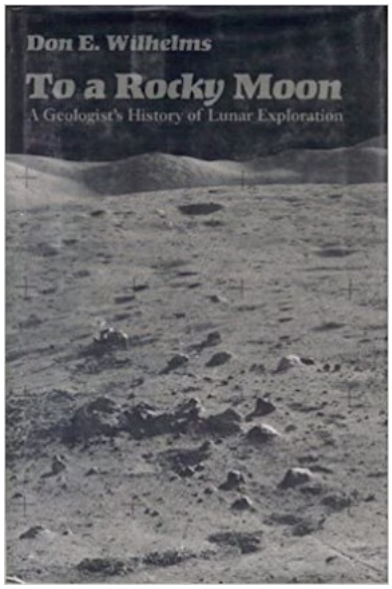
Despite last episode's tossed-off reference to the Grissoms losing a bundle on bad investments, the scene where Deke and Betty go over her finances only serves a red-herring infidelity plotline and doesn't even mention the investments. How do astronauts get scammed out of money? What sort of person or firm scams astronauts— American heroes? What sort of father/husband is an astronaut who is susceptible to being scammed… as opposed to savvy Al Shepard, who has a million negative traits but a functioning BS detector? These untrodden avenues for exploration might've made for fresh, illuminating drama, but Astronaut Wives Club isn't really interested in that.

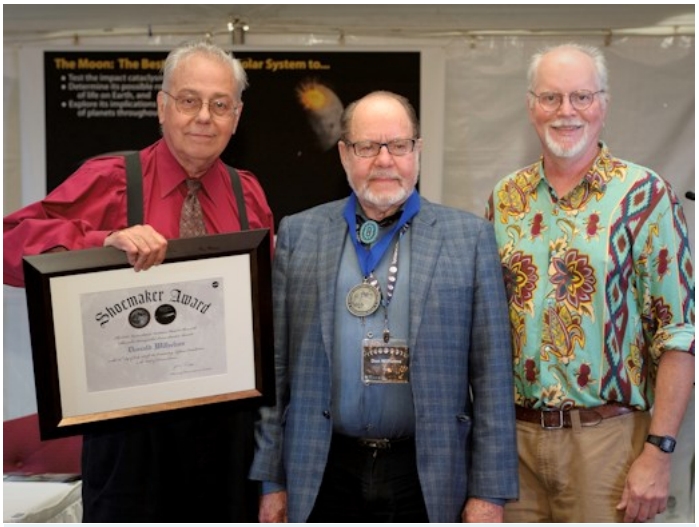
Three moons out of five, and that's with cutting it slack for having good music and a sweet scene with Rene and Scotty Carpenter.

To a Rocky Moon

"The Moon, which has always ruled Earth's nights, was first viewed by telescope in 1609, first touched by machines in 1959, and first visited by human beings in July 1969. It was the object of intense scrutiny for the quarter of a century centered on that incredible visit and its five successors." -from the preface.

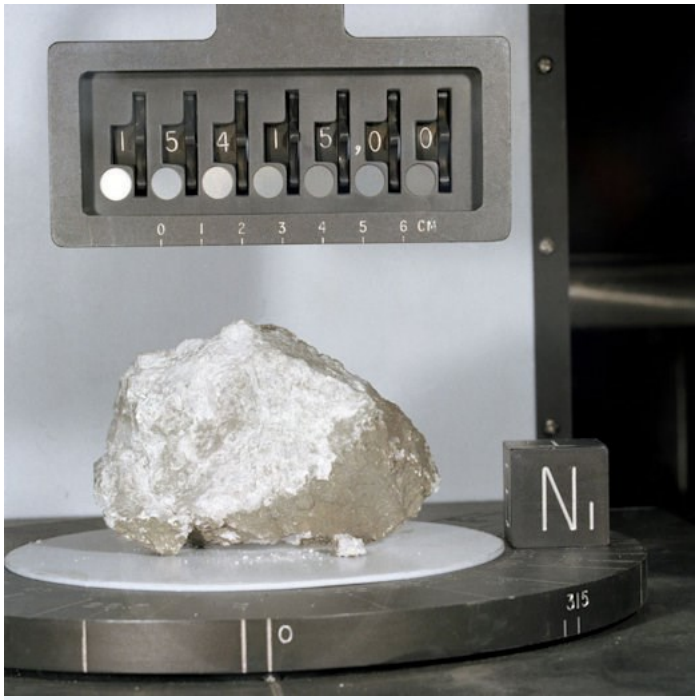
There I was, researching all things lunar (triggered by Gary Ross's Shining Mountain talk), when I came across an interesting phenomenon: a book still in copyright, not public domain, as an online PDF. Said book was *To a Rocky Moon* by Don E. Wilhelms. Of course, I downloaded the file and commenced reading which put a halt to writing anything about armchair astronomy for a bit. The PDF also makes it easy to quote from the book: "Lunar terra volcanism lingered in the minds of the geochemists and petrologists at the January 1972 conference. Some fragments in the Apollo 14 breccias do consist of true volcanic basalts…" (p 258) See? Unfortunately, the PDF was made from scans of the physical pages and sometimes need a bit of a correcting tweak when pasting them.





Left to right: David Morrison, Donald Wilhelms and Jeff Moore. Photo Credit: NASA/Dominic Hart

Now, about the book. Originally intended as a chapter for Wilhelm's other work, *The Geologic History of the Moon*, *To a Rocky Moon* grew to book size on its own and is primarily a chronological account of the history of lunar research from a geologist's point of view, following the probes (and the astronauts) that went there. Wilhelm stated that this was a story that needed telling (and I am pleased he did). During the telescopic history of lunar studies, many ideas about the Moon bubbled up: First, lunar volcanism, a widely held idea for a long time.



From Apollo 15: The Genesis Rock, sample number 15415, was an anorthosite, a piece of the moon's primordial crust. Geologists, hoping to learn more about the moon and its origins, selected the Hadley-Apennines landing site for precisely this reason. Image credit: NASA

Then came Gilbert and Baldwin who espoused the impact theory. This is covered in the chapter, "A Quiet Prelude," which continues with the Cold vs. Hot moon ideas: Cold moon champion, Harold C. Urey, felt that the Moon formed along with the planets and embodied the origins of the solar sys-

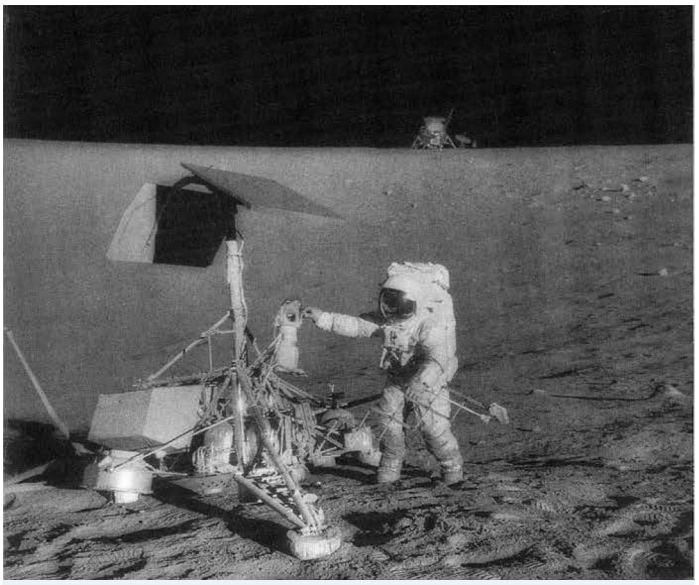
(Continued on page 20)

(Continued from page 19)

tem (he also embraced the impact theory). The "Hot (or molten) Moon" camp, featuring Gerard Kuiper, held that radioactivity heated the early Moon, allowing the deformation to the globe dimensions observed - and volcanic craters. Which was another bone of contention: volcanic craters vs. impact craters. Telescopes and spectrographic measurements were not providing conclusions, and the moon was tantalizingly just out of reach.

It did not help that lunar studies were in the doldrums, eclipsed by sexier astrophysical astronomy. But, starting in the fifties, things began looking better. First, Kuiper managed to get lunar studies on the front burner with the Department of Defense (they had the rockets), and then, the feud with Urey over hot/cold moon garnered more interest from geologists. With all the sounding rockets going up and exploring the space surrounding Earth, aiming for the moon would be a logical next step in proving who was right.

The Space Race, ignited by Sputnik, started providing earth-bound geologists with Moon data as many probes orbited, crashed, and landed on the moon. The geologists got a bonus when we decided to send astronauts there. Wilhelm describes the findings from the probes, how they fit in with our plans and the training the astronauts received at the hands of the geologists. He also deals with the theoretical battles leading up to the manned landings, such as the nature of the surface particles on the moon. The landers would fail or survive depending on who was right. Astronomer Thomas Gold opined that the surface would likely fail to support a craft,



Alan Bean inspecting Surveyor 3, which landed 31 months before his Apollo 12 lunar module (background) did.
NASA photo ASI 2-48-7 133.

(Continued on page 21)

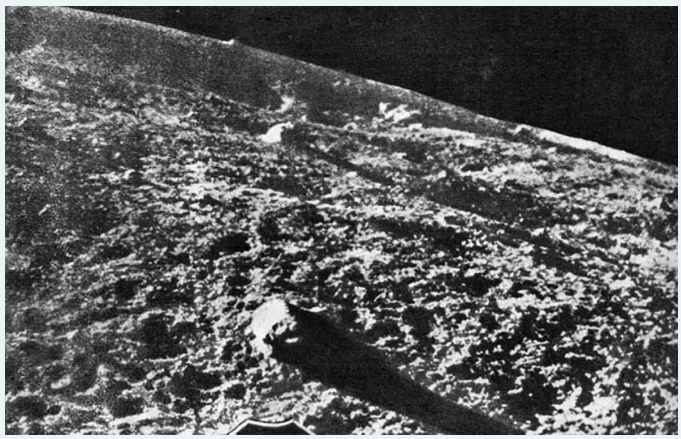
Oops!

In February of 1966, Luna 9 sent back the image data that it recorded on the moon's surface. Since this was before the development of digital cameras, the probe processed the picture and sent the data in FAX format. The Jodrell Bank Radio Telescope caught the signal and printed it out—on a borrowed FAX machine. What they didn't know was the aspect ratio the Soviets used. The result was a somewhat squashed image. Like what you'd get if you took a 16x9 image and brought the sides in to a 4x3 ratio (the actual lateral compression was 2.5.)

The Soviets were understandably upset with this "scoop" but may have had the last laugh when they saw the Brits had got it wrong.

The mistake threw a small spanner in the American program considerations since it portrayed a more hostile (jagged) surface than what was actually there. Took a bit of time to sort out, but eventually we got back on track with our lunar expectations.

Above is the print that hit the newspapers, below, the actual image at the right proportions. Note the shallower angle of the foreground rock compared to the "squashed" image.



(Continued from page 20)

Wilhelm points out that Gold had taken a perfectly logical conclusion regarding impact cratering and went on to a flight of fancy regarding what lunar "erosion" was and would lead to (filling the Mare basins). Naturally, "His mathematics fit his ideas perfectly, of course, as mathematics can always be made to do." Wilhelms states. Others, like Eugene Shoemaker, felt it was more solid than telescopic and orbiter findings indicated.

Wilhelm goes a bit easier on Gold (and the controversial "Gold Dust") than Charles Wood does in *The Modern Moon*, but not by much.

With the Apollo 16 mission, one can sense the demise of volcanism as the primary engine of lunar evolution in favor of impact theory, turning on a dime, you might say. Further away from ground zero, say over in England, the sea change was much slower. Interesting. The Apollo missions' hits and misses are spelled out by Wilhelm, in fair geological detail. Membership in the Michigan Mineralogical Society might help here, I had to look up several geological words (at least now I know how to pronounce breccia.)

I found this book a compelling read. After I read the PDF version, I purchased a physical copy and read through the whole thing again, then, as I referenced various sections for this review, found myself at least finishing the chapter, occasionally going further before remembering what I was supposed to be doing. Following Diane Hall's lead on her movie reviews, I would give it five out of five moons, wishing I could give it six.

-Dale Thieme

The downloadable version can be found here:
https://www.lpi.usra.edu/publications/books/rockyMoon/

Physical copies for purchase:

AbeBooks.com:
https://www.abebooks.com/servlet/SearchResults?sts=t&cm_sp=SearchF-_-home-_-Results&an=Wilhelms&tn=To+a+Rocky+Moon&kn=&isbn=
Amazon:
To a Rocky Moon: A Geologist's History of Lunar Exploration: Don E. Wilhelms: 9780816510658: Amazon.com: Books

Other books by Don E. Wilhelms:

The Geologic History of the Moon
http://ser.sese.asu.edu/GHM/
The Geology of the Terrestrial Planets
https://www.lpi.usra.edu/publications/books/geologyTerraPlanets/

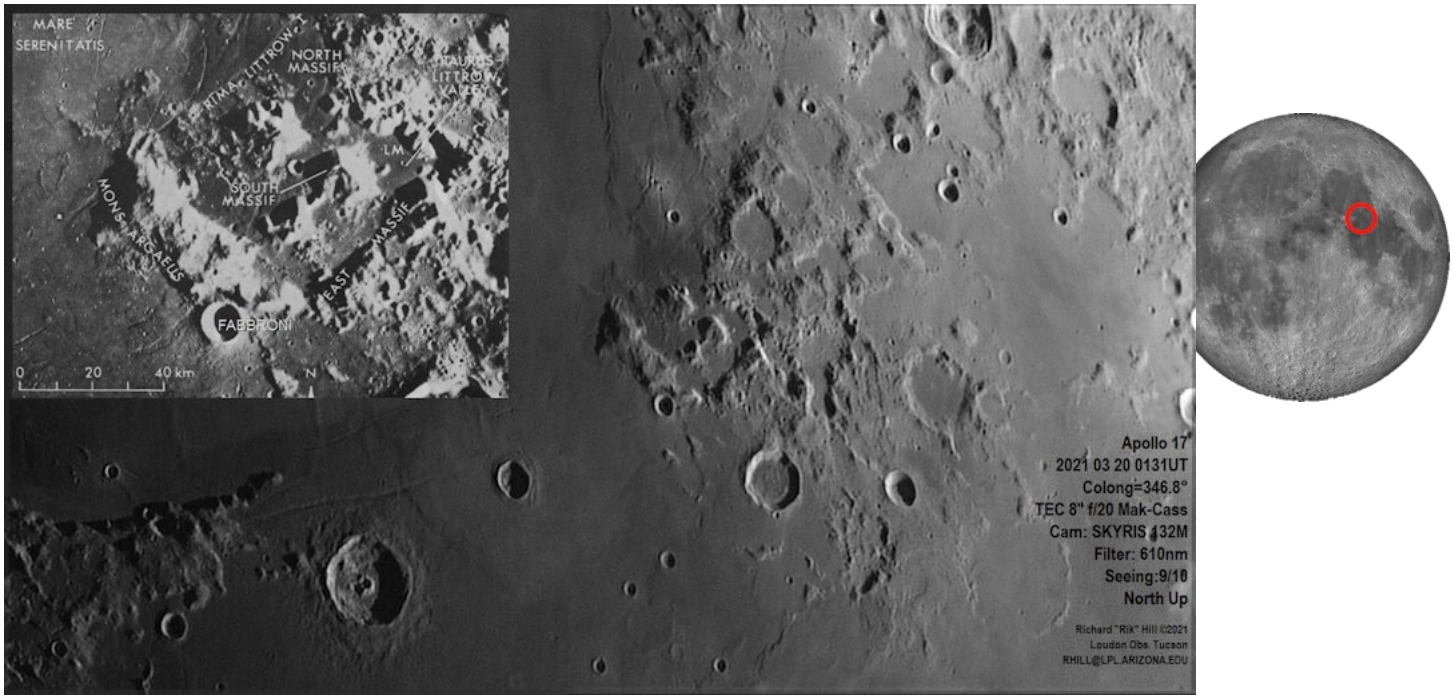
Left to right: Gene Simmons, Harold Urey, John O'Keefe, Thomas Gold, Eugene Shoemaker, and University of Chicago chemist Edward Anders at a 1970 press conference. NASA photo, courtesy of James Arnold.

Over the Moon with Rik Hill

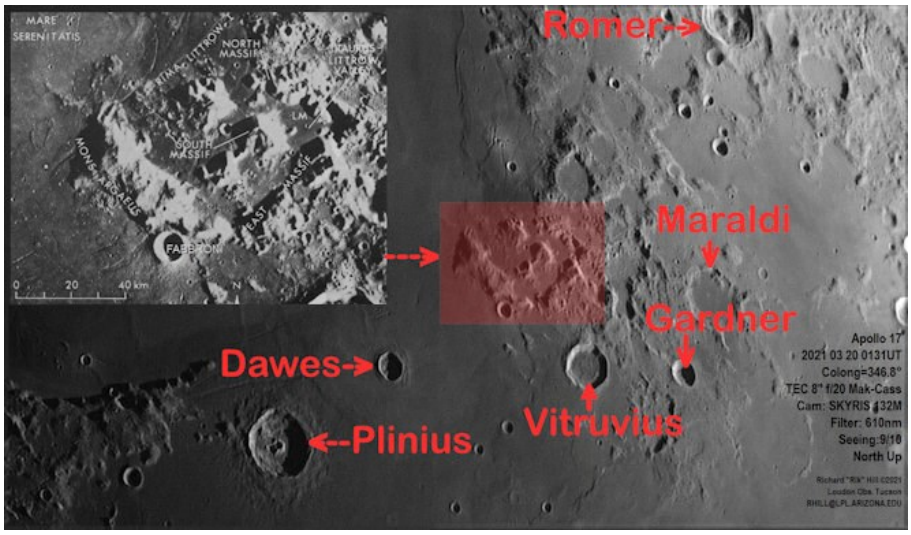
Where Man Last Walked

I've done this region before, numerous times, but this was probably the best seeing I ever had on it. This was a 9/10 night and I was really surprised at what I saw. The large crater at the bottom is Plinius (44km dia.) and to its right is the smaller Dawes (19km). Nearly an equal distance in the same direction is an even smaller crater Fabbroni (12km) and then 4 mountains aligned almost perpendicular to the line through these three craters. Looking at the inset NASA image you can see Mons Argaeus north of Fabbroni and then South Massif. On the other side of South Massif is the Taurus-Littrow valley and the LM is where the the Apollo 17 Lunar Module set down.

Just above the LM is North Massif and to the right are the Sculptured Hills with the Wessex Cleft between them, all names given to these features by Eugene "Gene" Cernan and Harrison Schmidt of the crew of Apollo 17. Below the LM in the inset is a small mountain, approximately 2x2.5 km in size, that was named Bear Mountain. It is clearly visible in my image. All the 22 hours of EVAs of that mission (Extra Vehicular Activity) took place between South Massif and North Massif north of Bear Mountain as they collected a record setting 110.5kg of samples, a record yet today for any single mission. It was quite a thrill to be able to identify all these details on an image taken with my modest telescope!!



This image was created from parts of two 1800 AVIs stacked with AVIStack, merged with MicroSoft ICE and final processed with GIMP and IrfanView.



Location mapping by Ralph DeCew

History S.I.G.

May 1987

Following an upbeat "A Note from the President" by Alan Rothenberg, we get "Two book reviews" from Tom MacLaney: *How to use an Astronomical Telescope* by James Muirden and *The Night Sky* by Ian Ridpath & Wil Tirion. The issue is the taken over by Ken Kelly with, first a program listing: "Calculation of an Ephemeris for a Minor Planet Orbit" then the chart:
Minor Planets for April - May
Ephemeris for (532) Herculina
Ephemeris for (2) Pallas
Ephemeris for (1) Ceres
Ephemeris for (6) Hebe
Source: 1987 emp

May 1997 (printed)

In this issue, we find Larry Kalinowski's long running column, "Computer Chatter". Also in the issue is a reprint of Alan Hale's (of Hale-Bopp fame) where he decries the state of scientific employment. Ther is an announcement of the "14th Annual Summer Solstice Star Party" at Doug Bock's Northern Cross Observatory. Jeff Bondono presents "Masterpieces Messier Missed - NGC 4216 at 12h16m +13d09m", a listing of amusing statements "On the Lighter Side" is submitted by Al Vandermarliere.
The 3rd Huron County Star Party is announced, and Greg Milewski completes the issue with "Astro-Facts" and a puzzle, "Meteor Showers."


WASP
Warren Astronomical Society Paper
Volume 19 Number 3
MAY 1987


WASP
Warren Astronomical Society Paper
Volume 29, Number 5 http://www.eaglequest.com/~bondono/WAS/iwas.html May, 1997

Computer Chatter
by Larry Kalinowski

Hail Hale-Bopp! If you want to call it the comet of the century, you've got my vote! It couldn't be much better placed in the sky for the casual observer. Even perihelion was magnificent. It's going to attract a lot of people to amateur astronomy. I have no doubt that telescope sales will reach a peak because of this comet.

Evidently, Bill Gates and company have realized the importance of capturing that part of the public that still hesitates to get involved with regular computers. Microsoft has purchased WebTV. The acquisition cost Microsoft 425 million dollars. Success in this venture depends on the introduction of digital television and how well it's accepted by the public. Even so, Bill and company are guaranteed some success, as today's TV sets will cease being manufactured by the year 2006.

Europa is making news because of Galileo's latest data acquisition of that moon. Three hundred foot high icebergs are evident in the photos shown by NASA. Where there's water, there could possibly be life, of some form or another. At some depth below the surface there may be enough heat to sustain it.

According to the Detroit Free Press, the Heaven's Gate cultists played amateur astronomer with a brand new LX-200 telescope about two months before heading for la-la land. However, the $3,645 telescope let them down because they could see the comet but not the space ship that was following it. So, they asked for their money back. Mike Fowler, of Oceanside's Photo And Telescope, reluctantly cancelled their charge-card order. "They didn't know much about astronomy" Mike said. They went to another astronomy store called Scope City in San Diego and bought binoculars, telling the clerk that they got a better view, of the comet, using binoculars. It's amazing how strong a belief system can be, even when the evidence against your beliefs is staring you right in the eyeball.

There's been a slight change in Microsoft's plans for Windows 97. The name's been changed to Windows 98. Why? Because it's been delayed. That's nothing
see LARRY on page 3

An Open Letter from Alan Hale
by Alan Hale, dated March 21, 1997
submitted to the WASP by Joe Van Poucker

I am Alan Hale, the co-discoverer of Comet Hale-Bopp which, as I'm sure you're aware, is getting a tremendous amount of media attention at this time. Like I'm sure is true for many of you, I was inspired by the scientific discoveries and events taking place during my childhood to pursue a career in science only to find, after completing the rigors of undergraduate and graduate
see Alan Hale on page 3

14th Annual Summer Solstice Star Party

Where: Northern Cross Observatories
When: June 6-8, 1997
Cost: $3.00 per person or $5.00 per family
Rules: Enter at your own risk
No Alcohol
No Pets
Bring your own food, we only provide the barbeque grill

Camping is allowed, but you must pack in/out everything. There are Motels nearby (5 miles) that you can make reservations at. NCO is located near Fenton, MI. We will also have speakers on Saturday afternoon. There is a call for papers for those who wish to participate. Please send an abstract to the addresses below by May 1, 1997.

Activities that are planned as of now
Observing Friday and Saturday Night
Volleyball Saturday afternoon.
Talk on the building of the roll-off observatory
Comet Hale-Bopp roundup. Bring your pictures and slides of the comet and any events you participated in related to the comet. We will have a slide projector setup. So show your stuff.
Childrens Observing program
Adult Observing Program
Solar Observing

From the Scanning Room

Breaking News-

Another collection of past WASPs has emerged. Cynthia Harrington, daughter of long time former member Dave Harrington, was referred to me by Doug Bock when she found a box full of old issues while helping her dad clean the basement. Many texts and phone calls later, the box was picked up and brought down here to Florida, courtesy of my sister who was on her way back from Michigan.

And there is good news: I've found two more missing issues, November and December of 1973 (which completes 1973.) Once I have these processed and scanned in, the 70s will have only six missing issues; the 80s, three; the 90s, eight and four from 1969, the first year of publication.

Dale Thieme,
Chief scanner
history@warrenastro.org

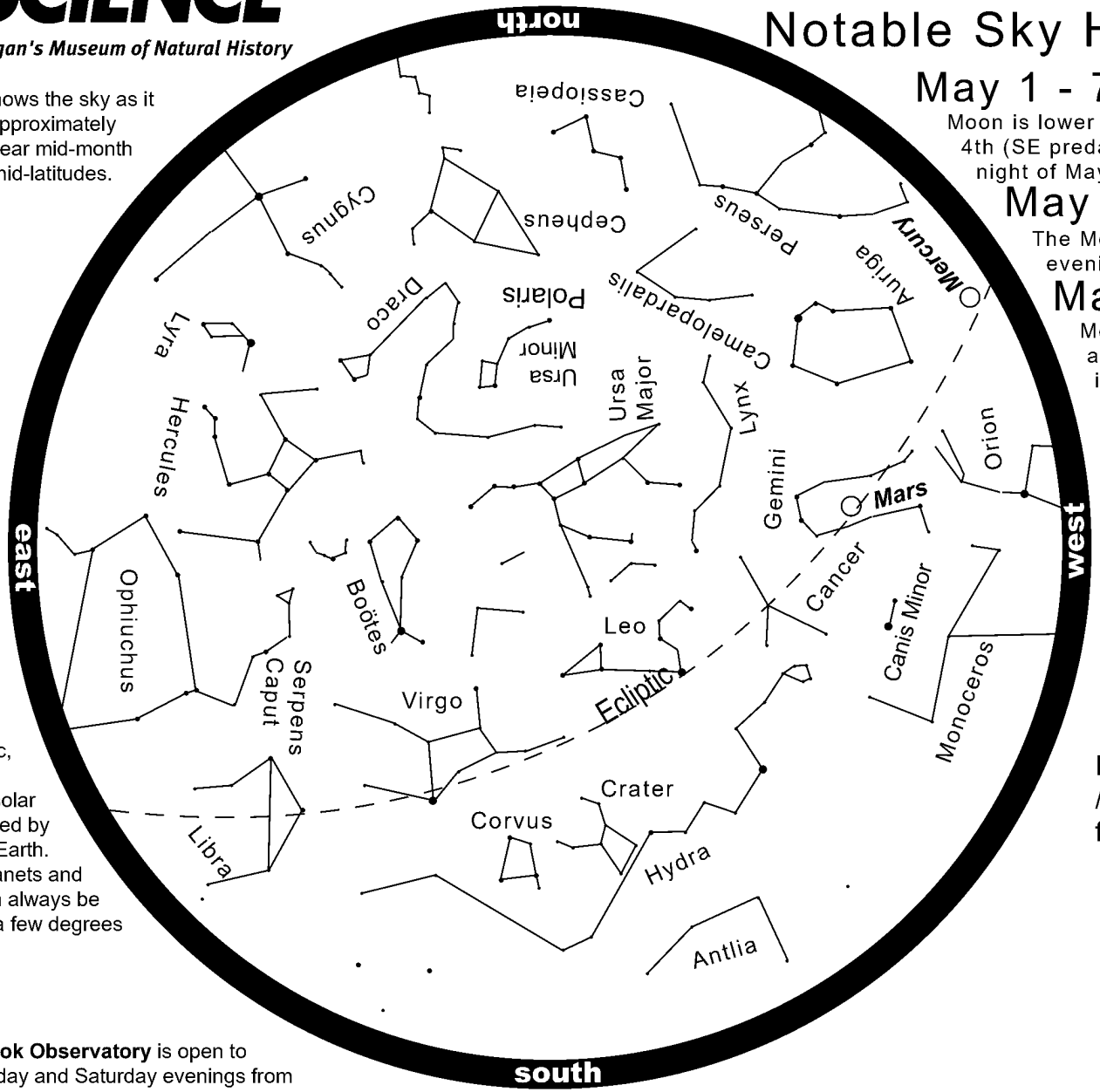
CRANBROOK INSTITUTE OF SCIENCE

Michigan's Museum of Natural History

MAY 2021

Notable Sky Happenings

This chart shows the sky as it appears at approximately 10pm EDT 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 always be found within a few degrees of this plane.

May 1 - 7

Moon is lower left of Saturn and lower right of Jupiter on the 4th (SE predawn). Eta Aquarid meteor shower peaks the night of May 4. It may produce up to 30 meteors/hour.

May 8 - 14

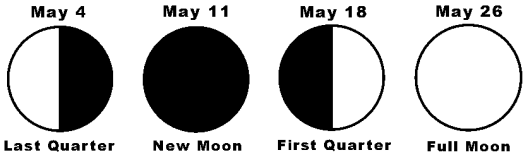
The Moon is at the left of Mercury, very low in the evening twilight on the 13th (WNW). Use binoculars.

May 15 - 21

Mercury is very low in the WNW this week (see above). Moon is lower left of Pollux, Castor is to the right on the 16th (W evening). Moon is above Regulus on the 19th (SW evening).

May 22 - 31

Partial phase of a total lunar eclipse on the 26th is barely visible from Detroit. Moon is lower left of Saturn on the 31st (SSE morn.).



Now Showing

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

The Cranbrook Observatory is open to the public Friday and Saturday 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

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

Doug Bock - Messier 101 Spiral Galaxy

May 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3 Cranbrook Virtual Meeting	4	5 Cinco de Mayo	6 Eta Aquarids	7	8
9 Mothers Day	10	11 New Moon	12	13 Eid al-Fitr	14	15 International Astronomy Day
16	17 Mercury easy to see at dawn	18	19	20 Macomb Virtual Meeting	21	22 Virtual Stargate
23	24	25 Moon at Perigee: 357310km	26 Full Moon Lunar eclipse (W. US)	27	28	29
30	31 Memorial Day					

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 April 2021.

Stargate observatory and the Dob shed along with all equipment are in good condition as of April 30, 2021.

There will be no open house in May as the observatory will remain closed until further notice due to the COVID-19 pandemic.

Virtual observing or discussion may be possible from Northern Cross Observatory (NCO) depending on weather and if Doug Bock is available to host it. Use the same WebEx link from last meeting and join online starting at 8 pm on May 22, 2021.

Riyad I. Matti
2021 WAS 2nd VP,
Observatory Chairperson

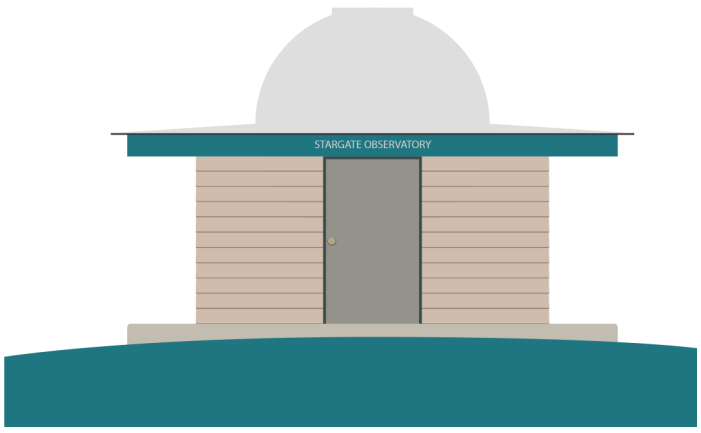
Treasurer's Report

As of April 30, 2021, we have:

174 Paid Memberships
$22,672.40 in the main account
$3,279.84 in the GLAAC account
$1,208.66 in the W.A.S. PayPal account

New Memberships in April:

We welcome:
Michael Wilson III
Jennifer Fleming
Jonas Harrison (sponsored by Scott Schneider)
Dr. David Levy (voted in as an honorary member)



Astronomical Events for May 2021

Add one hour for Daylight Savings Time
Source:
http://astropixels.com/almanac/almanac21/almanac2021est.html

Day	EST (h:m)	Event
03	12:02	Saturn 4.2°N of Moon
03	14:50	LAST QUARTER MOON
03	22:03	Mercury 2.1°S of Pleiades
04	16:00	Jupiter 4.6°N of Moon
04	20:00	Eta-Aquarid Meteor Shower
11	14:00	NEW MOON
11	16:54	Moon at Apogee: 406512 km
13	05:29	Moon at Ascending Node
13	12:59	Mercury 2.1°N of Moon
15	23:47	Mars 1.5°S of Moon
16	19:39	Pollux 3.1°N of Moon
17	01:00	Mercury at Greatest Elong: 22.0°E
17	20:08	Beehive 2.9°S of Moon
19	12:28	Regulus 5.0°S of Moon
19	14:13	FIRST QUARTER MOON
23	08:07	Spica 6.5°S of Moon
25	20:52	Moon at Perigee: 357310 km
26	06:14	FULL MOON
26	06:19	Total Lunar Eclipse; mag=1.009
26	11:55	Antares 4.8°S of Moon
26	14:38	Moon at Descending Node
28	22:00	Mercury 0.4° of Venus
30	20:22	Saturn 4.2°N of Moon

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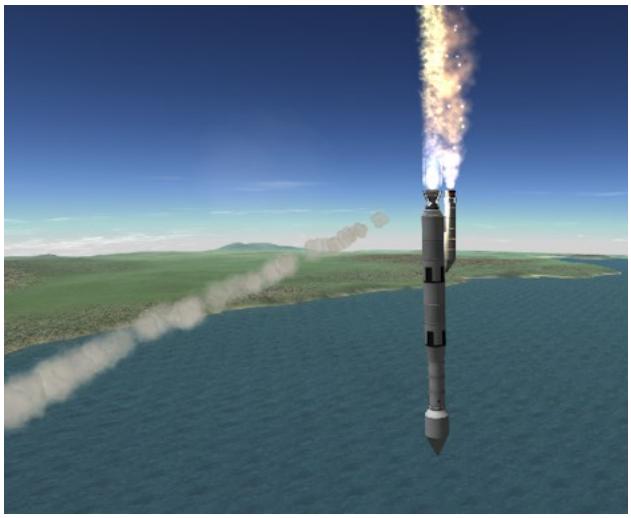
If you're shopping on Amazon, make sure to use Amazon Smile. It costs you nothing, and if you select us as your charity, Amazon will donate 0.5% of every purchase you make to the Warren Astronomical Society.

Outreach Report

Member Spotlight

Adrian Bradley was a guest during a multi-stream live presentation on April 7th hosted by ExploreScientific - he got this cool badge and everything!

Bob Trembley hosted a 2 hour Kerbal Space Program live-session on April 12th for Yuri's night - mistakes were made, hilarity ensued! Bob's young nephew joined the session, and an old college buddy.



The Moon landing was going so well - right up until the unexpected crash...

Library Telescope Loan Program

Mark Kedzior reports: I contacted Pat McClary, Branch Manager of Grosse Pointe Woods Branch Library, and inquired as to the status of the library telescopes being circulated to patrons. She informed me that they have been available for circulation and provided me with some numbers on the amount of circulations (check outs) of the telescopes. I did ask her about the procedure they used regarding when the telescopes were returned from use. The returned telescopes were quarantined for a period of four days before they were available for the next patron - this period of time was a guideline established by the library administrators association (or something to that effect) who set those standards for libraries to follow in regard to checking out items from the library during this pandemic. With that being said, I spent about three hours inspecting and tuning up four telescopes (out of seven) and get them up to checkout standards for the patrons. I will be returning to inspect the other three next week.

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Pat and I also talked about resuming the telescope orientation/monthly night sky presentation in virtual format (Zoom), which I will be getting ready for the month of May. I have a PowerPoint presentation on the Library Telescope and how to use it - just have to add the night sky info of the month presentation to the meeting. I will let everyone know the meeting dates and link invite to join the Grosse Pointe patrons in getting them interested in astronomy and checking out those library telescopes. It will be six years on July 28 that the 1st telescope was checked out in circulation - something must be working!

I will be getting clarification from Pat in regard to the amount of times each telescope went out in circulation, and report that information to you.

If you are giving presentations or doing other astronomy outreach, *please let me know!*

Use this link to send me a quick email report:
Outreach@warrenastro.org

Great Lakes Association of Astronomy Clubs Board Meeting

April - No Meeting, The GLAAC Board took a break!

Next GLAAC Meeting: May 13, 2021 7:00 PM

https://umich.zoom.us/j/584733345

Save the Date!

AATB 2021: September 24/25, 2021

-Bob Trembley

IAA Planetary Defense Conference

This week, I attended the IAA Planetary Defense Conference online - I've been wanting to attend this conference for YEARS, so being able to attend it online was a real treat for me!

An exercise being held during the conference was the "discovery" of a fictitious asteroid, 2021 PDC, with a 5% chance to impact the Earth. Presenters covered how impact percentages are calculated, and how they figure out impact location probabilities – all with *very nice* graphics! Over the course of the week, the impact percentage was refined using "new observations"

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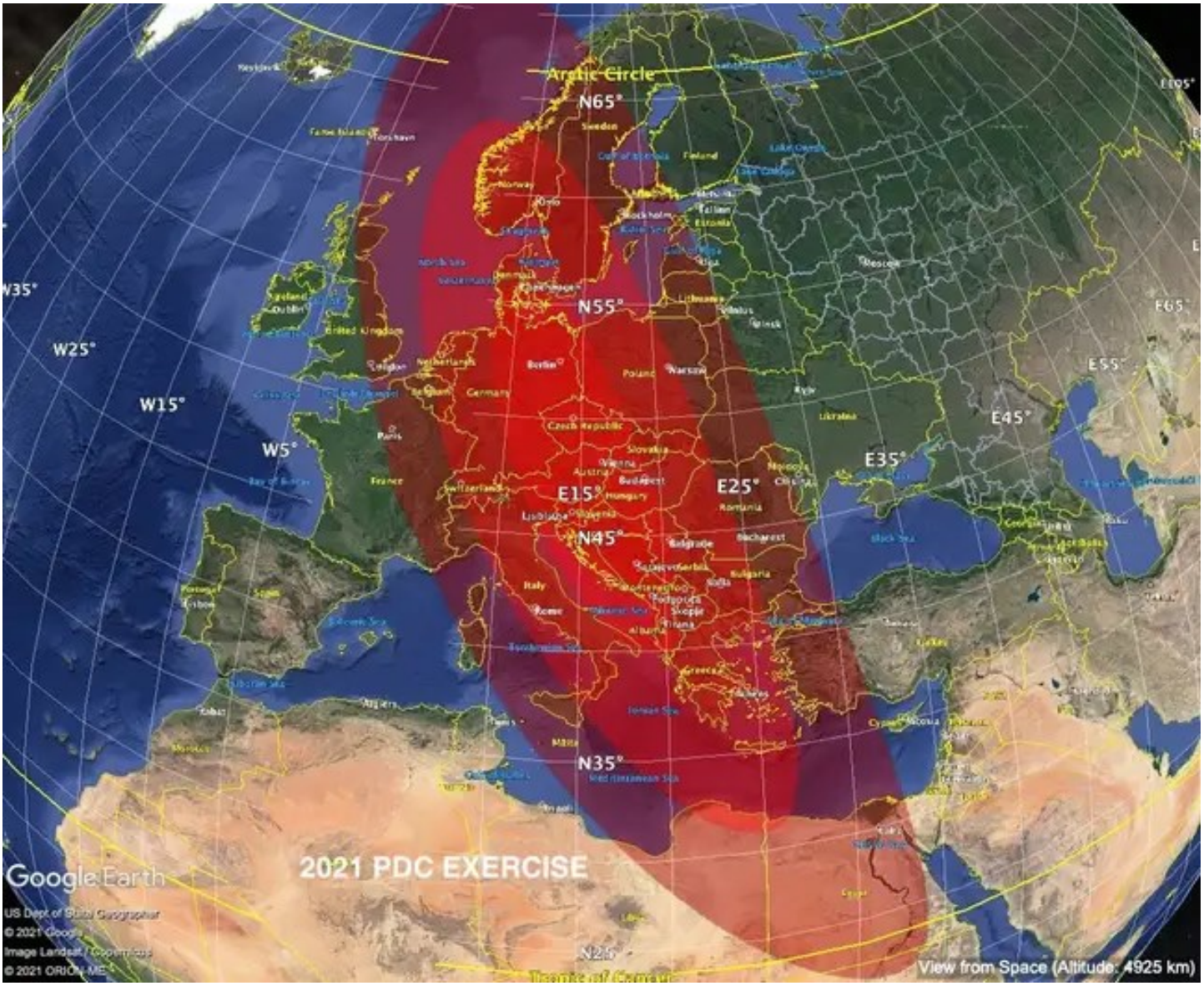

Image: The 2021 PDC Hypothetical Asteroid Impact Scenario, Day 2, showing the possible impact range.Image: NASA/JPL

Polls were given to attendees after each presentation – I groused in chat that the 2nd poll question was "unfair," because (A) a 5% chance might indeed be low (but I'm going to worry about it anyway), and (C) 6 months IS WAY too short of a time to mount a deflection mission to the asteroid from scratch. Option (B) mentioned Bruce Willis… and got the squinty eye from me…

Who makes the Announcement?

An interesting topic that came up was that with social media - the information about a potential asteroid impact will be available online before the International Asteroid Warning Network (IAWN) or any of its signatories have time to even comment. It may be very easy to "lose the narrative" with the widespread propensity for misinformation these days. How do "we" (the scientists) get the narrative back and hold it? Who will be the "Expert Voices" for different countries? (A Global Asteroid Fauci).

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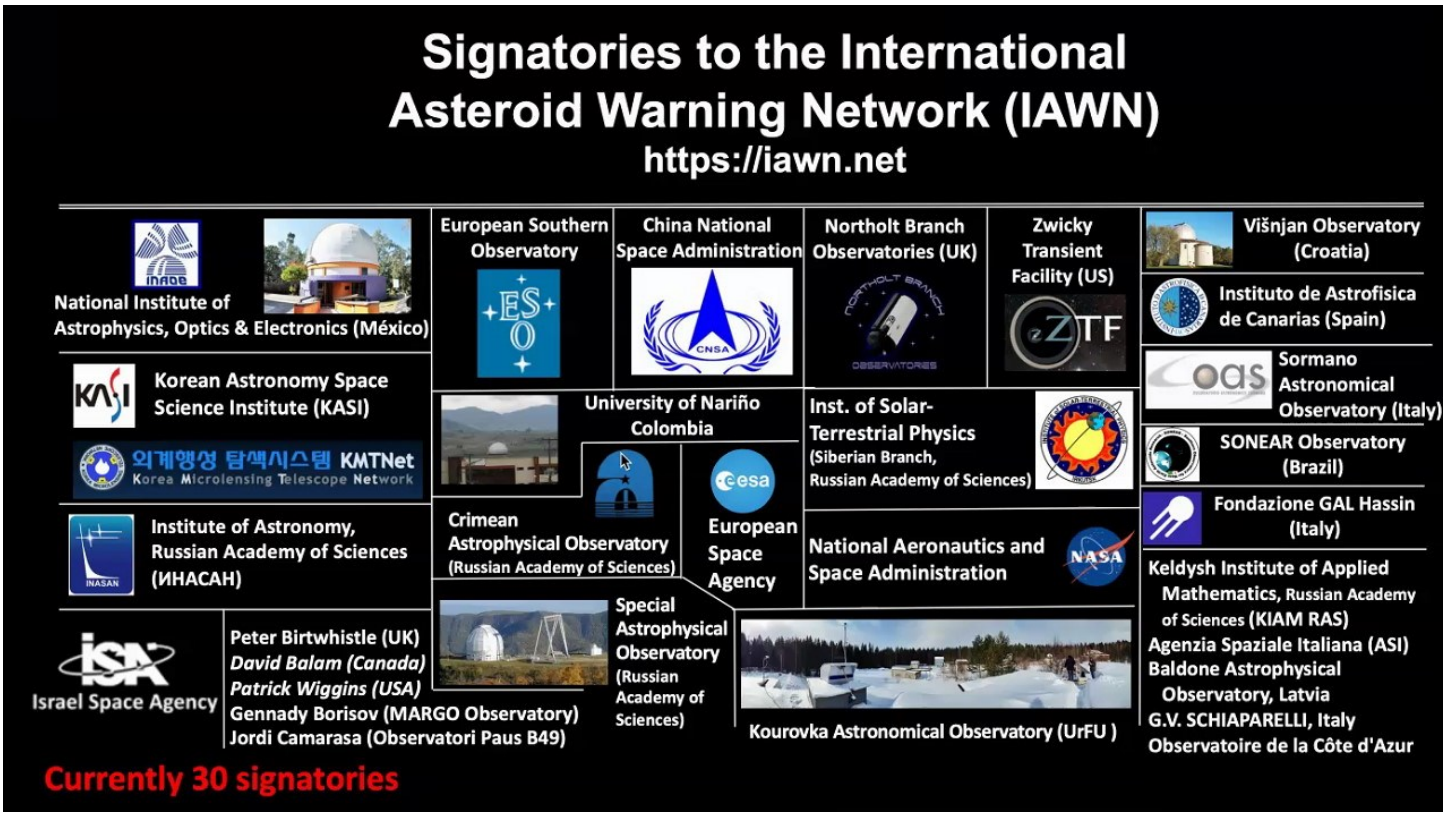

One of the scientists was asked if any of their models took into account the economic impact of the announcement of an imminent impact – she answered NO, their particular task was to refine impact probabilities and calculate populations affected; economic considerations was not their job requirement… I had to think that was a polite way of saying: "Not my circus, not my monkeys!"

How would you avoid panic, with only 6 months notice? A lot of the bits are NOT in place yet. Not knowing how these decisions will be made is frustrating to scientists.

Something that was not brought up was possible (almost certain) politicizing of an imminent impact.

Two asteroid missions were discussed:

DART Mission – what I found interesting was WHY the double asteroid was chosen: because it will be much quicker to see how much the orbit of the impactee has changed after the impact -vs- a Sun-orbiting asteroid, which could take months or years to determine any change.

OSIRIS-Rex mission – where some interesting aspects of cratering resulting from different size and velocity impactors were covered. BOY, was there a LOT of technical talk!

Nukes in *SPACE!*

On Day #2, while I was writing my post for the Vatican Observatory, they are talking about using NUKES! They discussed how much mass could be launched and delivered to an incoming asteroid in a short period of time, and the (oh my gosh!) myriad national and international legal aspects of launching nuclear devices into space.

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Let's just say "Nukes in Space" is a BIG issue, and one that will likely NOT be solved within the 6-month time-frame of the Impact Scenario.

Responsibility -vs- liability

Something I've also not thought about when it comes to asteroid deflection: responsibility and liability. If you send a deflection mission, and it hits the asteroid, and the asteroid does move a little, but it still impacts and injures people - who is responsible for that? Who is liable for that? This is just one of the many MANY legal issues surrounding planetary defense.,,, But at least these kinds of things are being talked about.

I had the conference up from days 3-5, but I was so busy, I was unable to watch very much. Gizmodo had a good article about the hypothetical asteroid impact campaign:
https://gizmodo.com/an-asteroid-impact-simulation-is-currently-underway-and-1846783079

-**Bob Trembley**

Meeting Minutes

BOARD *Virtual* MEETING
April 5, 2021

Officer's reports

Meeting was called to order at 6:36 PM by President Diane Hall via WebEx.

Officers present: Diane Hall, Dale Partin, Riyad Matti, Mark Kedzior, Bob Trembley (quorum present) – Dale Thieme @ 6:46 PM & Adrian Bradley @ 6:55 PM. Two WAS members in attendance.

Officer Reports: 1st VP Dale Partin reported vacancies for month of July presentations. 2nd VP Riyad Matti reported on his regular inspection of Stargate

Observatory and the Dob Shed, and everything looked in good order. The observatory is still closed due to state COVID guidelines. Riyad also reported that former WAS member Dr. Brian Kerman has donated a 12" Meade LX-200 Schmidt Cassegrain telescope with all its extra accessories. Bob Berta assisted Riyad in picking up this donation and securing it in the Dob Shed and accessories secured in safe. Dr. Kerman has asked for a letter itemizing everything included in his donation to the WAS. Secretary Mark Kedzior reported that the minutes of both March meetings are posted in the April edition of the WASP. Outreach Chairperson Bob Trembley reported that Ken Bertin has done some virtual outreach presentations and discussed the ins and outs of "White House Astronomy", along with some final planning of "Yuri's Night" to celebrate Global Astronomy Month. Publication Chairperson Dale Thieme reported that the April edition of the WASP is on the WAS website, with good feedback on the contents of this issue, and was able to obtain information identifying individuals in his WAS Historical Picture Project. Treasurer Adrian Bradley reported that the Treasury Report is listed in the April edition of the WASP, and reports that we have 171 paid memberships to date.

Old Business

Board discussion took place regarding presenting an Honorary Membership to David H. Levy for his contributions to the virtual monthly WAS meetings and articles for the WASP. Motion by Dale Thieme – supported by Dale Partin to bestow upon David H. Levy and Honorary Membership to the Warren Astronomical Society – motion was passed unanimously.

Discussion took place regarding the management of our virtual meeting platform. After discussion, WebEx will be our platform for our virtual monthly meetings.

Bob Trembley discussed April outreach event – "Yuri's Night" on Monday, April 12th. He will be virtually presenting the Kerbal Space Program

(Continued on page 33)

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on that night. He also has started podcasts for the Vatican Observatory.

Discussion continued on contact person(s) on the WAS website.

New Business

WAS Picnic – the 4th Saturday in August (28th) has been selected as the date for our annual picnic - planning will be taking place for the event, with Riyad obtaining the necessary permit and reservation of the pavilion for our event.

Discussion on phasing in outdoor outreach requests – e.g. Northville Library – it was decided to continue to encourage virtual outreach until state COVID guidelines determine when it is safe to gather for astronomical events.

WAS 2021 Banquet – The WAS 2021 Banquet will be held Thursday, December 9th (virtual or in person to be determined as we near that date). Our featured presenter at this event will be WAS Treasurer Adrian Bradley with his presentation "Pictures in the Sky".

Motion to adjourn by Dale Partin - supported by Dale Thieme – motion passed unanimously. Meeting adjourned at 7:20 PM by President Diane Hall.

Respectfully submitted,
Mark Kedzior
Secretary
Warren Astronomical Society

CRANBROOK *Virtual*MEETING
April 5, 2021

The meeting was called to order at 7:30PM and a welcome to all by President Diane Hall. She then reviewed the ground rules, meeting format and etiquette of this virtual meeting and presentation so as to be enjoyed by all in attendance.
(Attendance on WebEx was 32 at 8:30PM).

IN THE NEWS – presented by Diane Hall (of note): Moon and tides work in tandem to free massive ship with containers stuck in the Suez Canal – Marscopter lives!! – survived minus 90 degree temperatures under belly of Perseverance – will know within the next thirty days if it will fly – SpaceX SN 11 – Ka-BOOM – In eastern Antarctica an impact event took place – small metal rocks from carbon chondrites were recovered –

IN THE SKY – Mars near Aldebaran and 1st quarter moon – the "Stellar Crow" – the constellation Corvus can be seen below Virgo near Spica – a prominent variable star UV Corvii (a favorite of David Levy and observed by Clyde Tombaugh in 1932) – NGC 4361 – a nova at 7th magnitude can be seen in the constellation of Cassiopeia –

OFFICER REPORTS

President Diane Hall announced that the WAS Board has presented David Levy with an Honorary At Large Membership to the WAS for his contributions to our monthly virtual meetings and article submissions to the WASP.

1st VP Dale Partin announced our upcoming presentations at our monthly meetings: April 15th Macomb meeting – President Diane Hall with "The Galileo Mission" – at the May 3rd Cranbrook meeting, a short presentation by Jenny Calahan with "Temperature Profiles of a Protoplanetary Disk", followed by WAS member Dale Hollenbaugh with his main presentation "From Beginner to Journeyman: My Journey in Astrophotography". The May 20th Macomb meeting has Gillen Brown with "The Origin of the Elements".

2nd VP Riyad Matti reports that the Stargate Observatory and Dob Shed are in good shape. He reported on a new addition to the WAS observing arsenal: a donation of a 12" Meade LX200 SC with numerous accessories by former WAS member Dr. Brian Kerman. He also reported that Saturday, August 28th, will be the date of the WAS Annual Picnic, and planning will be underway for the event.

Secretary Mark Kedzior reported that the minutes of the March meetings are in the April edition of the WASP.

Treasurer Adrian Bradley reports that there is $22,621.40 in the WAS account, $3279.84 in the GLAAC account, $1,061.40 in the WAS PayPal account – also reports 172 paid WAS memberships.

Outreach Chair Bob Trembley reports that Ken Bertin did a virtual presentation for the Detroit Public Library – also discussed "White House Astronomy" and "Astronomy on the Mall" for 2022.

Publications Chair Dale Thieme reports the April edition of the WASP is online – also reports positive feedback on this edition.

SPECIAL INTEREST GOUPS

Solar – no sunspots - Double Star Group – no report –

History – Historical Photo Project still going strong – Astronomical League – nothing to report, but a reminder that dues for the next year mem-

(Continued on page 34)

(Continued from page 33)

bership renewals is approaching – Virtual Observing/Discussion Group – bad weather for observing but discussion group followed.

OBSERVING REPORTS

Bill Beers shared image of NGC 2359 – "Thor's Helmet" – an emission nebula 12,000 LY away in constellation of Canis Major – total image time was three hours with ZWO one shot color cam with no filters. Adrian Bradley shared image of zodiacal light taken at Port Crescent State Park near Port Huron – also shared image of Bortle 2 skies 45 minutes north of Mackinac Bridge, showing the Milky Way which can be seen with naked eye. Dale Hollenbaugh shared his images of M64 – the Leo Triplet – M78 - M81& M82 – Markarian's Chain – M88-89 group -M101 Pinwheel Galaxy – M96 group – M94 – Cat's Eye nebula – Jonathan Kade reported his visual observations of M64, the M95-96 group and M67 in Cancer.

SHORT PRESENTATION

1st VP Dale Partin introduced David Levy, with his presentation "Of Schmidt Cameras, Comets, and Asteroid Bennu: A Long Friendship with Rik and Dolores Hill" – David recounts the differences of observing when living in Canada (one clear day a month) to moving and observing in Arizona (one cloudy day a month) to the story of how he met Rik and Dolores Hill (Lifetime Members of the WAS – Rik and Dolores were in attendance at tonight's meeting) and their continued friendship through the years.

MAIN PRESENTATION

After the break, 1st VP Dale Partin introduced Anne Blackwell, a graduate student working on her doctoral degree in Astronomy at the University of Michigan, with her presentation of "Supernova Kinematics and Cluster Metallicity: Xray Mysteries". Anne's presentation consisted of three parts:

Xray Spectroscopy – Supernova Remnant Kinematics – Missing Metal Conundrum. She went over each section thoroughly with supporting data and images detailing her research into this subject. Following her presentation, questions and discussion followed.

To see both presentations in their entirety, go to:

https://www.youtube.com/warrenastro

Meeting was adjourned at 9:40 PM.

Respectfully submitted,
Mark Kedzior
Secretary

MACOMB *Virtual* MEETING
APRIL 15, 2021

Meeting was called to order at 7:30 PM by President Diane Hall. Officers present: Dale Partin, Riyad Matti, Mark Kedzior, Adrian Bradley & Dale Thieme. (WebEx attendance was 27 @ 8:30 PM).

President's Report – Diane announced that the 2021 WAS Picnic will be held on Saturday, August 28th. Riyad Matti is securing the permit and reservation for the pavilion – hours of event will be announced at later date. Diane also announced that we are still waiting for confirmation as to when the WAS will be able to meet again in person at both the Cranbrook and Macomb venues.

1st VP Dale Partin announced the upcoming presentation lineup:

May 3rd Cranbrook meeting – Main presentation by Dale Hollenbaugh – "From Beginner to Journeyman: My Journey in Astrophotography" with a short presentation by Jenny Calahan on "Temperature Profiles of a Protoplanetary Disk". At the May 20th Macomb meeting, Gillen Brown will be presenting "The Origin of the Elements". Also, we have a need for presenters, with openings in July.

2nd VP Riyad Matti reported that his regular inspection of Stargate and the Dob Shed found them in good condition. Riyad also reported on the donation of a Meade 12" LX200 S/C with numerous accessories from former WAS member Dr. Brian Kerman. Bob Berta assisted Riyad in picking up the donation from Dr. Kerman and securing it at our Stargate and Dob Shed buildings.

Secretary Mark Kedzior had nothing to report as of this time.

Treasurer Adrian Bradley reported a balance of $22,672.40 in the WAS account, $3279.04 in the GLAAC account, and a current paid membership total of 173. Some discussion took place as to the increase in membership, possibly from the COVID pandemic sending people outdoors and spending more time looking at the night sky, and the ability to attend our meetings virtually.

No Outreach report due to Bob Trembley's absence.

Publications Chair Dale Thieme reported that the April edition of the WASP is online, and encouraged individuals to get their contributions and articles ready for the May edition of our publication.

(Continued on page 35)

(Continued from page 34)

SPECIAL INTEREST GROUPS

Double Star – nothing to report as of this time. Solar - Doug Bock reported sunspot AR 2814 was rotating across the sun this week. History – Dale Thieme reports that he received old WASP issues from former WAS President Dave Herrington, and will peruse though the collection in search of any issues that haven't been scanned into our archives. The 1st publication of the WASP was in March 1969. Astrophotography – Bill Beers shared his 7.5 hour image of M104 – the Sombrero Galaxy – 31 million light years away in the constellation of Virgo. An 8" or larger telescope will reveal the dust lane when viewing in ideal conditions. Astronomical League – renewal date for memberships are coming up in June.

OBSERVING REPORTS

David Levy reports he is trying to once again locate Comet 2020 R/4 ATLAS – in 1984 it was in the same position in the sky when he first saw it – he read a poem from Leslie Peltier about the twelve comets he discovered. Doug Bock is also attempting to image this comet. Adrian Bradley shared his images of the zodiacal light from the Point Aux Barques Lighthouse in the Thumb, and of the M37 cluster in Auriga using only a camera. Jonathan Kade reported his observation of a solar halo –

IN THE NEWS – presented by Ken Bertin (of note): X-rays being emitted from Uranus (as recorded by the Chandra Xray Observatory) – Juno finds auroral feature on Jupiter of rapidly expanding auroral rings - Closest extra galactic fast radio burst yet from near M81- 12 million light years away – Hubble spots double quasars in merging galaxies – Small asteroid 2021 GW4 only 12,313 miles from earth on April 12 in vicinity of constellation of Leo travelling at 18,000 MPH – Raindrop sizes similar on earth and alien worlds – Possible life signs in clouds of Venus – Mars helicopter's first flight postponed for one week – Chemical fingerprint reveals a migrating exoplanet - Martian hill named in honor of Curiosity scientist Rafael Navarro – Earth has another layer in its core – Telescopes unite in unprecedented observations of famous black hole.

IN THE SKY – on April 22nd, the constellation Hercules can be located between the stars Vega and Arcturus in the east – April24 – 26, 25 minutes after sunset, Venus and Mercury can be located in west very close to horizon – April's full moon – the 1st Supermoon of 2021, at 11;30 PM April 26th – in the southeast before sunrise, the moon sweeps by Saturn May 3rd, by Jupiter May 4th, and Neptune May 6th.

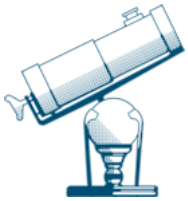
MAIN PRESENTATION – After break, Dale Partin introduced President Diane Hall, with her presentation of "The Galileo Mission". According to Diane, the origins of this presentation began with the gift of a vintage t-shirt from Jonathan Kade, which compelled her to research and provide in detail all of the interesting facts and data on this mission, beginning from its launch in 1989, to its arrival at Jupiter on December 7, 1995, and its ending on September 21, 2003 with its plunge into the atmosphere of Jupiter. Scientists are still studying all of the information acquired on this mission. Diane listed "The Ten Triumphs of the Galileo Mission": 10) The nature of the Jovian Rings 9) The atmosphere of the Galilean moons 8) Things about Io 7) More things about Io 6) Jupiter's atmosphere 5) Jovian Thunderstorms 4) Magnetic Ganymede 3) First moon orbiting asteroid (Dactyl around Ida) 2) Liquid moons Callisto and Ganymede 1) Europa's ocean

There will be two future missions to Jupiter's moons – Europa Mission (NASA) and the Jupiter Icy Moons Mission (ESA).

Questions and discussion followed Diane's presentation, which can be seen in its entirety at: https://www.youtube.com/warrenastro

Meeting was adjourned at 9:30 PM.

Mark Kedzior
Secretary, Warren Astronomical Society



Saw a Fireball?

Report it to the American Meteor Society!

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

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

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!

Virgo's Galactic Harvest

David Prosper

May is a good month for fans of galaxies, since the constellation Virgo is up after sunset and for most of the night, following Leo across the night sky. Featured in some ancient societies as a goddess of agriculture and fertility, Virgo offers a bounty of galaxies as its celestial harvest for curious stargazers and professional astronomers alike.

Virgo is the second-largest constellation and largest in the Zodiac, and easily spotted once you know how to spot Spica, its brightest star. How can you find it? Look to the North and start with the Big Dipper! Follow the general curve of the Dipper's handle away from its "ladle" and towards the bright orange-red star Arcturus, in Boötes – and from there continue straight until you meet the next bright star, Spica! This particular star-hopping trick is summed up by the famous phrase, "arc to Arcturus, and spike to Spica."

This large constellation is home to the Virgo Cluster, a massive group of galaxies. While the individual stars in Virgo are a part of our own galaxy, known as the Milky Way, the Virgo Cluster's members exist far beyond our own galaxy's borders. Teeming with around 2,000 known members, this massive group of galaxies are all gravitationally bound to each other, and are themselves members of the even larger Virgo Supercluster of galaxies, a sort of "super-group" made up of groups of galaxies. Our own Milky Way is a member of the "Local Group" of galaxies, which in turn is also a member of the Virgo Supercluster! In a sense, when we gaze upon the galaxies of the Virgo Cluster, we are looking at some of our most distant cosmic neighbors. At an average distance of over 65 million light years away, the light from these galaxies first started towards our planet when the dinosaurs were enjoying their last moments as Earth's dominant land animals! Dark clear skies and a telescope with a mirror of six inches or more will reveal many of the cluster's brightest and largest members, and it lends itself well to stunning astrophotos.

Virgo is naturally host to numerous studies of galaxies and cosmological research, which have revealed much about the structure of our universe and the evolution of stars and galaxies. The "Universe of Galaxies" activity can help you visualize the scale of the universe, starting with our home in the Milky Way Galaxy before heading out to the Local Group, Virgo Cluster and well beyond! You can find it at bit.ly/universeofgalaxies. You can further explore the science of galaxies across the Universe, along with the latest discoveries and mission news, at nasa.gov.

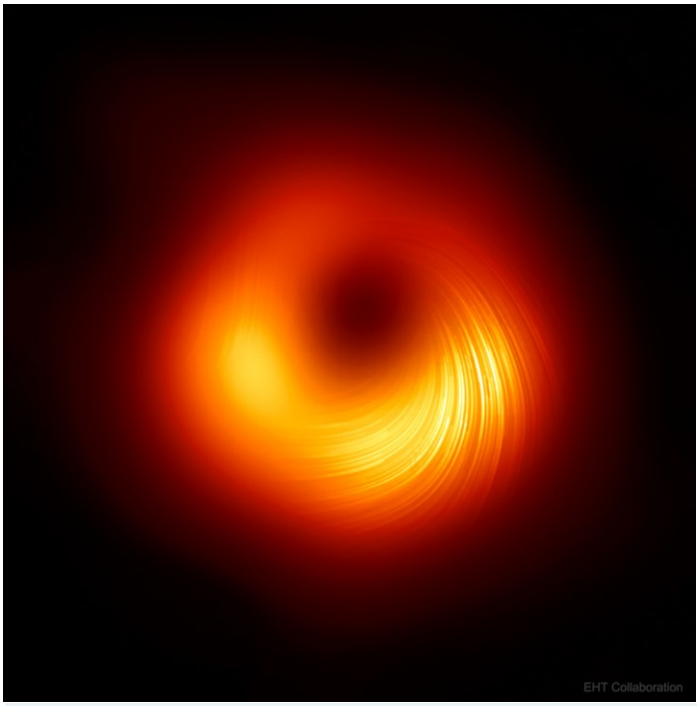


Image 1 Caption (black hole polarization):

The first image of a black hole's event horizon was taken in the center of one of the most prominent galaxies in Virgo, M87! This follow up image, created by further study of the EHT data, reveals polarization in the radiation around the black hole. Mapping the polarization unveils new insights into how matter flows around and into the black hole - and even hints at how some matter escapes! More details: apod.nasa.gov/apod/ap210331.html

Credit: Event Horizon Telescope Collaboration

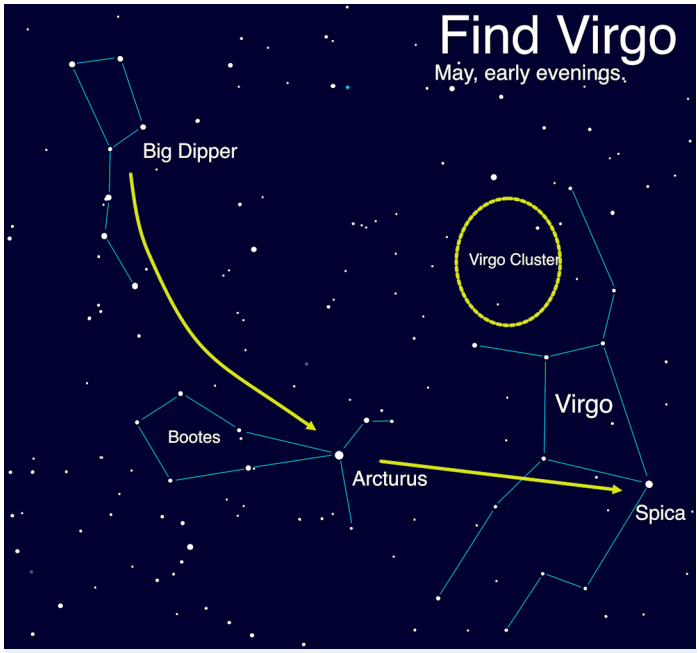


Image 2 Caption (Virgo finder chart)

Find Virgo by "arcing to Arcturus, then spiking on to Spica." Please note that in this illustration, the location of the Virgo Cluster is approximate - the borders are not exact.