



The W.A.S.P.



Vol. 52, no. 2

February 2020

The Warren Astronomical Society Paper

WHERE ARE YOU ON THE AMATEUR ASTRONOMY SPECTRUM?

← LESS ENERGY
← SOCIOPATHIC

MORE ENERGY →
PSYCHOPATHIC →

THE IMAGER

Far above it all. Sleeps dusk 'til dawn while automated system slaves away. May be a trashman, yacks about binning and stacking. Sold kidney for mount and CCD



Bourne A. Leader President, secretary, and membership chairman of Local Club for 70 years. Introduced motion to outlaw clouds.	Edna Outreach Performs 1000 hours per month outreach in Zanzibar, Tasmania, and Far Tortuga. Can't find sun in sky.	Scotch and Sodie D'Rink Put the party in Star Party. Favorite optical aid is the bottom of a highball glass. Amazing talents at seeing double.	Noseitall Bigtalker Voice heard on Mars. Recommends best eyepiece, filter, any and all info you don't want or need.	Rather Reed Has every guidebook on astronomy ever published, from Rev. Webb to O'Meara. Has never been outside.	Mindif I. Look Has 30". Never brings anything to star parties; scope hops all night.	"Radar" O'Reilly Checks satellite image and forecast every 5 minutes. Lifetime subscriber to weather.com. Never looks up at sky.	Allen Goodwrench Collimates scope every hour to 1/1000th wave. Aligns to Polaris B. Finally, ready to observe at sunrise.	H.O. Arder Owns: 2 refractors, 6 pairs of binoculars, 3 Dobs, 4 astrographs. Uses none of these.	DeKlew Less Looks for M81 in Australia. Attempts exoplanet observations with 3"	Elias "Eagle" Lies Applies averted imagination. Sees all 27 components of Trapezium. Maps features of Jovian satellites.	Moe Lister Astronomical League Palladium level observer. Has seen all NGC / IC / Messier / Caldwell / Abell / Herschel / D / vdB objects.
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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:	Third Thursday meeting:
Cranbrook: Institute of Science	Macomb Community College
1221 North Woodward Ave	South campus, Bldg. J, Room J221
Bloomfield Hills, Michigan	14600 Twelve Mile Rd.
	Warren, Michigan

Membership and Annual Dues

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

Astronomical League (optional)\$7.50

Send membership applications and dues to the treasurer:
c/o Warren Astronomical Society, Inc.
P.O. Box 1505
Warren, Michigan 48090-1505
Pay at the meetings
Also via PayPal (send funds to treasurer@warrenastro.org)

Among the many benefits of membership are

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

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

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

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

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

Snack Volunteer Schedule

Feb 3	Cranbrook	Ken Bertin
Feb 20	Macomb	Jerry Voorheis
Mar 2	Cranbrook	
Mar 19	Macomb	John Dumar

If you are unable to bring the snacks on your scheduled day, or if you need to reschedule, please notify us at snacks@warrenastro.org as soon as you are able so that other arrangements can be made.



Discussion Group Meeting

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

When: Thursday, February 27, at 6:30pm.

Where: 3219 Woodside Ct. Bloomfield Hills, MI

Amenities and Refreshments:

Laura Wade will provide chili and wine. People attending can bring drinks or other snacks of their choice.

Volunteers Needed:

For presenting In the News and In the Sky at Cranbrook and Macomb meetings.

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President's Field of View

On the night of Wednesday, January 22 of this year, I felt like the luckiest amateur astronomer in the world. The sun had gone down into a bank of thick fog suspended above the blue Pacific, casting a unique “double sunset” before it disappeared. To the southwest, Venus sparkled so brightly it cast shadows and the zodiacal light stretched in a pale pyramid almost to the zenith. To the southeast, Canopus and Achernar—brilliant stars always hidden from Michigan skies—blazed as a foretaste of other southern-sky treasures. I stood at the summit of Haleakala, ten thousand feet above sea level, in the midst of Science City’s collection of pale domes, and for one night I could observe among them.

My observing partner Jonathan and I didn’t exactly buy a ticket for this experience. A plane ticket to Hawaii, yes, but that didn’t get us access to Science City. One of our own Warren Astronomical Society members, who also happens to be part of the Haleakala Amateur Astronomers, had extended the invitation (thanks, Jon!) and escorted us up the mountain for an evening of astronomy that culminated in a glimpse of the ragged edge of the Large Magellanic Cloud above the island of Hawai’i. It’s a memory made possible by the deep, meaningful bonds that this august society can create, bonds that make fellow astronomers into friends, friends into a surrogate family. Those bonds are what truly created many of my best astronomical memories, from seeing Venus take a bite from the sun’s disc in the blazing California sunshine to watching the shark-fin of a partial eclipse descend behind the mountains of Utah to teetering at the top of a ten-foot ladder in hope of seeing Einstein’s Cross.

This is the core of the Warren Astronomical Society, an organization that I have the honor of leading for the upcoming year. For the last thirteen years it has been for me not merely an astronomy club, but a service organization, a social support network, and even, effectively, a family. Such a thing doesn’t just come about; it’s created by the veterans who welcome newcomers, extending their access, their contacts, their trade secrets, and ultimately their friendship. Jonathan and I knew but a single W.A.S. member apiece when we walked in the door of the Cranbrook auditorium in autumn 2006; within a decade, we’d each had the privilege of leading the society.

And so, as the W.A.S. closes out its sixth decade of existence, I call upon all of you to make 2020 a year in which we renew old bonds and establish new ones, doing our best to help newcomers to the society become our dear friends and future leaders. Invite a newcomer to a star party, host a discussion group and make sure

new faces appear there, ask a first-time visitor to come to “gastronomy” after a meeting. Establish the human connections that turn newcomers into long-term members, the foundations that will make both lasting astronomical memories and lasting friendships. Make someone feel like the luckiest amateur astronomer in the world.

Diane Hall
President



Photo: Jon Blum



Space Pirate Radio

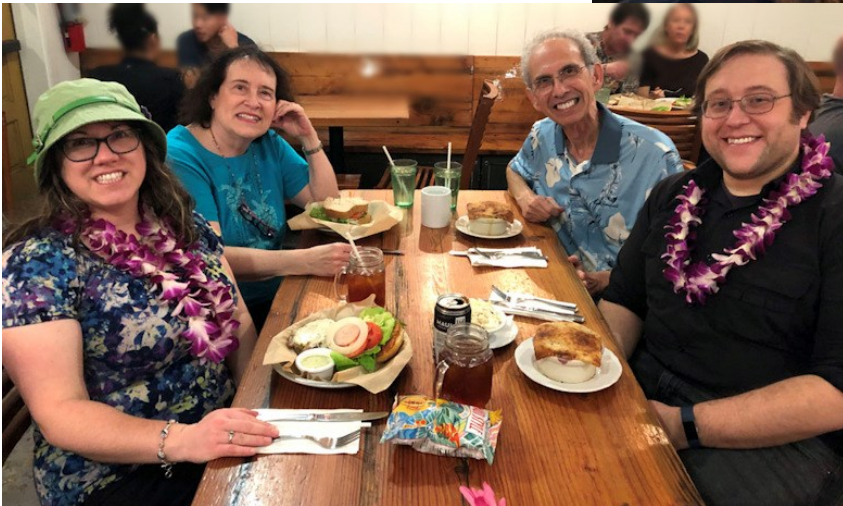
Tune in to Captains Marty Kunz and
Diane Hall for live radio
Wednesday nights at 9:00 pm ET
on
Astronomy.fm

More of Jonathan and Diane in Maui

Right: Science City. The collection of professional domes not far from the Haleakala Amateur Astronomer's facilities.

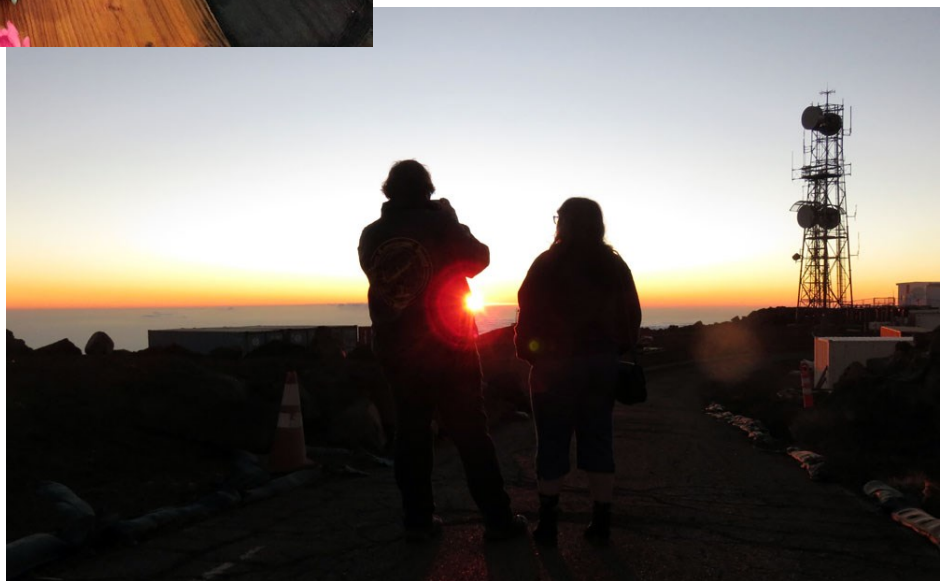
Left to right: Jonathan Kade, Diane Hall, Jon Blum

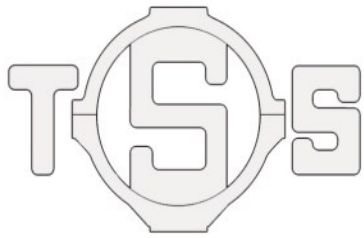
Photos from Jon Blum



Left: Can't have a WAS Astronomical meeting without a Gastronomical meeting, can we? Left to right Diane Hall, Rosie Blum, Jon Blum, and Jonathan Kade

Right: The promise of great viewing tonight.





Telescope Support Systems



FAAC Astronomy Conference & Swap Meet

Saturday, March 21, 2020 9:00 am - 3:00 pm

General Astronomy

- 9:30 am: **Imaging A Rocket Launch** – John McGill
- 10:45 am: **3D Printing for Astronomy** – Liam Finn
- 12 N **Cosmic Harmony & Eccentricity** – Michael LoPresto
- 1:30 pm: **Interstellar Comets & Asteroids** - Jonathan Kade

Technical Talks

- 9:30 am: **Starlink Internet +** - Jeff Thrush
- 10:45 am: **Backyard Narrowband** – Dr Axel Mellinger
- 12 N **Portable Power** – Sean Pickard
- 1:30 pm: **Maximizing CMOS Imaging** - Jason Guenzel

Planetarium Shows

10:00am, 11:30am & 1:00pm FAAC Members

Swap Meet

All Day...Earn Cash by Selling Those Items Sitting Around Collecting Dust! Telescopes, Eye-pieces, Cameras, Binoculars, Mounts, Software, Books, and Accessories, etc.

Participating Vendors

Telescope Support Systems, Sirius Astro Products, and LX200 Electronics Exchange

Admission: \$5.00 (children 15 and younger – Free / must be accompanied by an adult)

Sales Table: \$15 in advance, or \$20 at the door as available, (one admission ticket included).

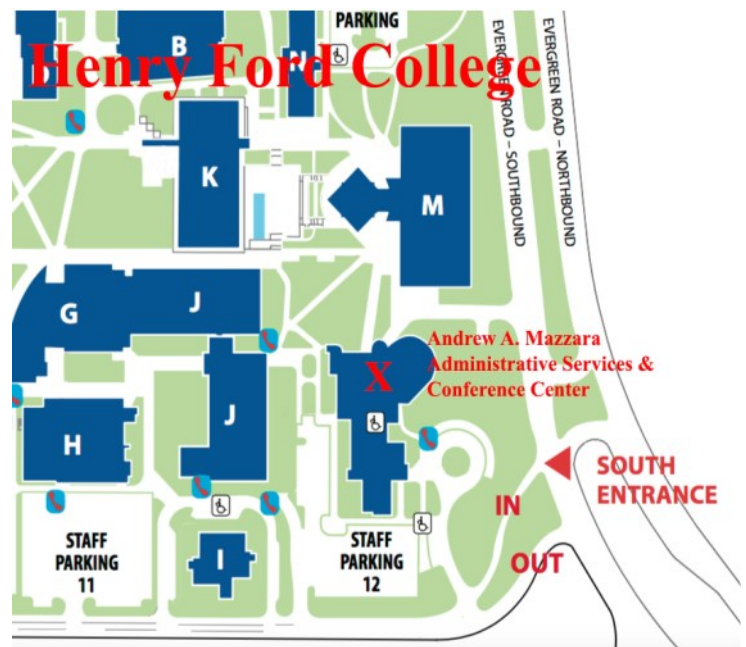
Advanced Table Registration ends Mar 1, 2020

Doors Open: 8:00am for setup.

Make Checks Payable: to **FAAC** for advance table registration.

Send payment to: Ford Amateur Astronomy Club, P.O. Box 7527, Dearborn, MI 48121-7527

Location: Henry Ford College, 5101 Evergreen Rd, Dearborn, MI 48128 (Andrew A. Mazzara Admin. & Conference Center... See **X** on map, Staff Parking Lots 11 & 12 will be open)



For More Information: Contact Jim via email: w8tu@comcast.net or call (734) 751-6280

Errata...sort of

About the Cover



In his presentation, "The Shining Mountain" at Cranbrook in January, Gary made an error and contacted Publications about it. In his email, he states:

"In the sterling lecture on lunar librations, January meeting, *instant*, I made a transparency which stated the Moon's orbit was inclined 5

degrees to the Plane of the Ecliptic. That much is fine. But also, "reversible error", as they say in court decisions. In bold red letters I declared that the nodes of said orbit with the Ecliptic moved around the sky (Metonic Cycle) in NINETEEN + years. Nah: eighteen and change."

He went on to declare this was totally unacceptable and stated he would give up astronomy after the January discussion group.

But wherein lies the truth in the matter?

Well, it turns out Gary had simply mixed up terms while applying the right idea. In the next email, he refers to a correspondence he had with another astronomer.

"Joseph P. McBride nailed it again! The Metonic Cycle is just barely over nineteen years.

From the **Observer's Handbook** (not Wikipaedia) 2019 p. 125: discovered by Babylonians and re-discovered by Meton.

19 years = 6939 or '40 days depending on Leap Year. Metonic Cycle is 6939.116 d.

BUT THE ERROR WAS MINE -- because I mixed up term/s.

1. Joe's detective work was about the Metonic Cycle, a calculus concerning eclipses.
2. What I made the slide for at Cranbrook -- calling it the Metonic Cycle -- was "retrograde progression of the nodes of the lunar orbit", a **different phenomenon**. In this case 18.61 years. The movement of the nodes and the eclipse Cycle are related by some pretty complex mathematics, but are **different**."

We trust the 5cm telescope will find itself under the stars once again and not consigned to the corner of a closet as Gary reconsiders quitting astronomy.

Now that the new year is underway and we hope you are making good on your resolution to do more astronomical observing...or at least buy a new eyepiece, this may be a good time to take stock of where you stand in the Astronomy Spectrum. This item is the brainchild of Brad Young and brought to our attention by Gary Ross (he does get around.) The idea came about on a cloudy night...well, let Brad explain in his email which he sent per our request for a short biography:

My career has been as a Registered Chemical Engineer, but ever since I was 14 my primary hobby has been astronomy. I am an Astronomical League Platinum Level Observer, having completed over 70 of their Observing Programs. I am very active in Citizen Science, including my current role as Advisory Consultant to ConsenSys Space, an open source, blockchain structured app recently released to provide crowd sourced trustworthy satellite tracking.

I don't go to bed at sunset, as I only do remote imaging (hence all the listings in my tagline below). That in support of NEO tracking and surveying, AAVSO variable photometry and spectroscopy, and supernova / comet hunting. But most of all, I enjoy a warm summer night with my scope, my friends, my wife and 2 grown kids, my dog, and the universe to behold.

Wrote this spectrum on one of the very few cloudy nights my last trip to Australia, at the OzSky Spring Star Party (aka best star party on Earth). A few of my companions at that get together inspired the characters; others were ones we all know and, well, you know.

The WASP is no stranger to humor in this vein, looking back in the archives, the chief scanner came up with three examples:

1. Haven't I Seen You Somewhere Before? - Larry F. Kalinowski ([July 1973](#))
2. Can You Spot One? by Kenneth Wilson ([January 1975](#))
3. Amateur Briefs: Annual Astronomy Awards for 1978 Robert Cox Harrington ([July 1978](#))

Well worth a visit to these WASP issues.



Letters

SKEPTICAL INQUIRER

Republication from the scan room.

I may recall the original article in Inquirer which appeared in the W.A.S.P. in 1992: seeing stars during day through a tall smoke stack or similar portal. The celebrated Jerry Persha was a long time subscriber, so the journal was prominent in his living room.

When very young I was exposed to this myth, but by whom time forbids, probably more than once. It is certain none of the informants had ever tried to see mid-day stars! But I believed it from some crude logic, like eliminating side glare . . . or some thing. In point of fact the *opposite* would be true unless that stack were extremely long, to poke into the upper atmosphere. The great Inco-Nickle pile at Sudbury would not suffice by an order of magnitude plus.

Here is one I tried to start for ten minutes of fame (FitzGerald?). I even discussed the idea with my brother who reported his own experiences: Years ago, both of us had peripheral side flashes with eyes shut in the dark, in my case always in bed. First I opined cosmic rays striking the visual cortex or the optic nerve. My brother expressed concern the effect might be detaching retina or the like, but with all of thirty seconds consideration, I proffered my thesis. Possibly I simply wanted to blunt his baleful diagnosis.

Then Reason ruled as she some times does. Nah. How many times in the hours of dark are cosmic rays *likely* to strike such large targets? One could not drift asleep in evening or quit slumber in the morning with out seeing eye flashes *every time*. This effect would have been recorded for centuries!

At least I tried. Coming to think of it, I did not even try.

G. M. ROSS,

host of the final Lafayette Discussion Group, not for the weak.

Fwd: HANDS ON SPECIAL REPORT

A trip down memory lane in the formerly deep spiritual relationship with Riyadh (my [former] god).

----- Original Message -----

Subject: HANDS ON SPECIAL REPORT

Date: 2014-02-13 19:26

From: Gary M. Ross

To: Riyadh Matti

- 1) SN 2014J. Martin Nathan Mill and I observed the object in M-82 on the night of 5 February from within San Diego under turbid and cloudy sky, easy to locate in a 6" Newtonian. Both galaxies were visible. The object appeared slightly yellow but we assumed the colour was from poor transparency. However, a concurrent picture taken by Mark John Christensen in Illinois showed the new star indeed to be more yellow than two TYCHO field stars close by M-82. By comparison to those tenth magnitude stars, SN 2014J was probably ~11th mag.
- 2) We saw Beta Pictoris in 6X binoculars whilst looking over the city. Beta's Declination is 51 deg. S. slightly farther north than Canopus), but was easily observed well before its upper culmination. The Clairemont Mesa section of San Diego is ~ 32 deg. 50 min., therefore at transit the star would be six degrees up. Approximately 4th magnitude. Although Canopus had not yet cleared the local horizon, it would be an ideal way to locate Beta Pic to the west.



Club Member Name Tags

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Only \$7.50 (membership starts July 1)



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

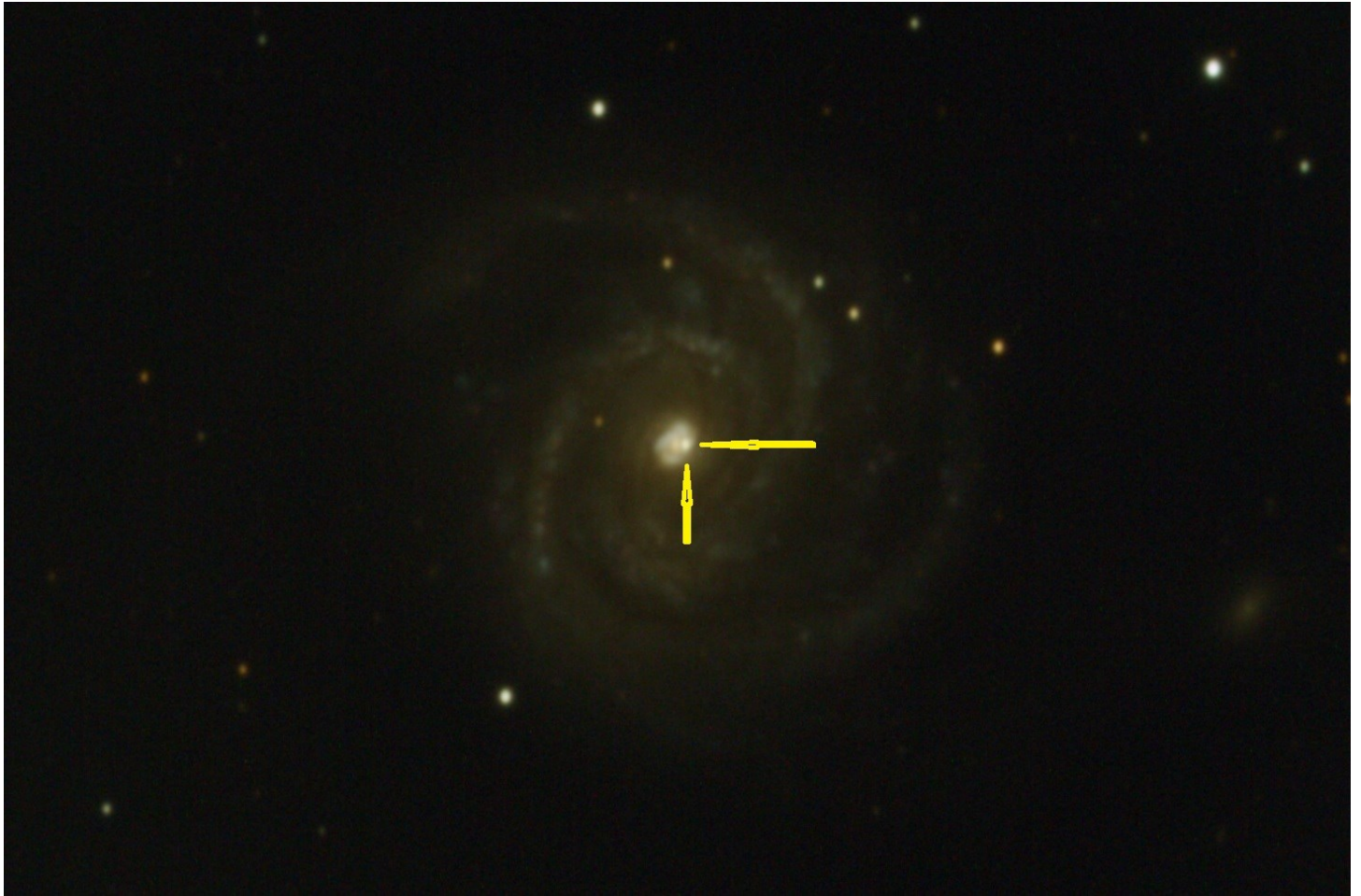
alcor@warrenastro.org



W.A.S. Astro-Images

M100 has a new super nova in it (SN2020oi) which is very close to the core of the galaxy. It is estimated to be about magnitude 13.5 right now.

I imaged this on January 22, 2020 with the 10" f/8 RC and the ZWO asi071mc PRO camera. This is 41 x 300 second sub frames stacked.



Doug Bock

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.

The View From C.W. Sirius Observatory

Jupiter, along with 2 of its moons - Europa and Io

Jupiter is the fifth planet from the Sun and the largest in the Solar System. It is a gas giant with a mass one-thousandth that of the Sun, but two-and-a-half times that of all the other planets in the Solar System combined. Jupiter is one of the brightest objects visible to the naked eye in the night sky, and has been known to ancient civilizations since before recorded history. It is named after the Roman god Jupiter. When viewed from Earth, Jupiter can be bright enough for its reflected light to cast shadows from dark sky

locations, and is on average the fourth-brightest natural object in the night sky after the Sun, Moon and Venus. Since it is the fourth brightest object in the sky, Jupiter was observed since ancient times and thus no one can be credited for its discovery. However, the first telescopic observations were conducted by Galileo Galilei in 1609 and in 1610 Galileo also discovered the 4 major moons of Jupiter, but of course not the smaller ones. Jupiter is primarily composed of hydrogen with a quarter of its mass being helium, though helium comprises only about a tenth of the number of molecules. It may also have a rocky core of heavier elements, but like the other giant planets, Jupiter lacks a well-defined solid surface. Because of its rapid rotation, the planet's shape is that of an oblate spheroid (it has a slight but noticeable bulge around the equator). The outer atmosphere is visibly segregated into several bands at different lati-



tudes, resulting in turbulence and storms along their interacting boundaries. A prominent result is the Great Red Spot, a giant storm that is known to have existed since at least the 17th century when it was first seen by telescope. Jupiter has 79 identified moons, two of which are shown in the photo, Europa and Io. On average Jupiter is 400 million miles from earth, depending on its orbital period with earth. Our largest planet can easily be viewed naked eye in the sky during certain times in the season. Using any size telescope will allow you to see its 4 largest moons, Io, Europa, Ganymede, and Callisto, as well as the planets two major dark bands. And the Great Red Spot, as seen in the photo, can be visible using a 6" or larger telescope at certain times of Jupiter's rotation.



February 2020

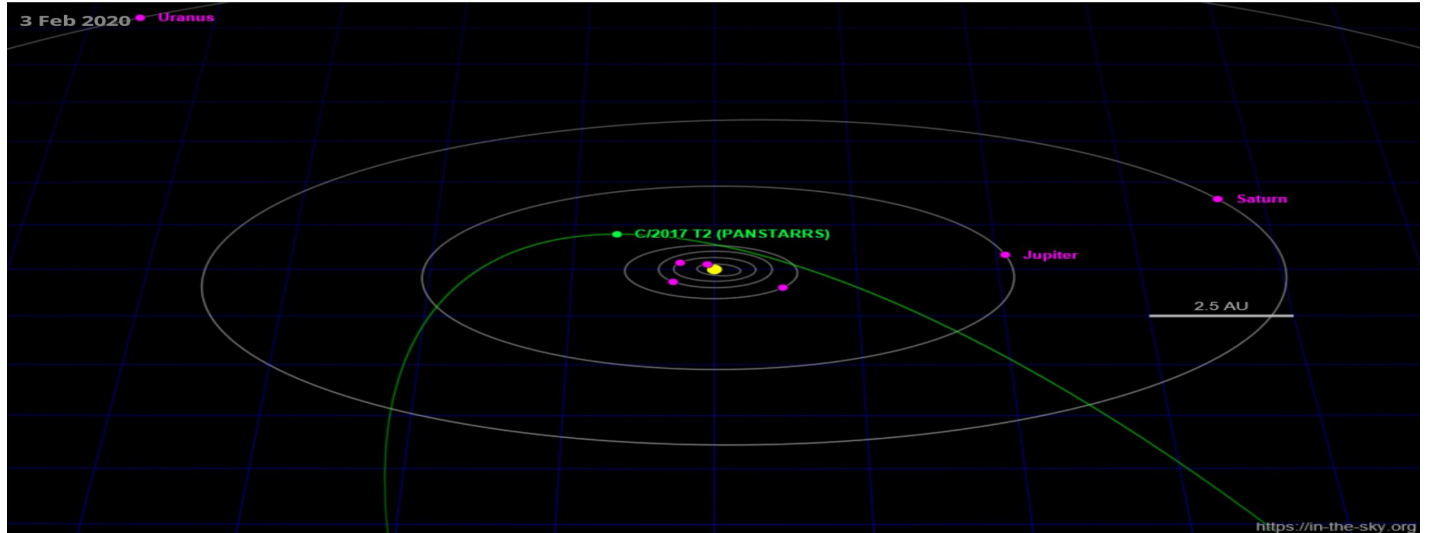
About CW Sirius Observatory:

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.

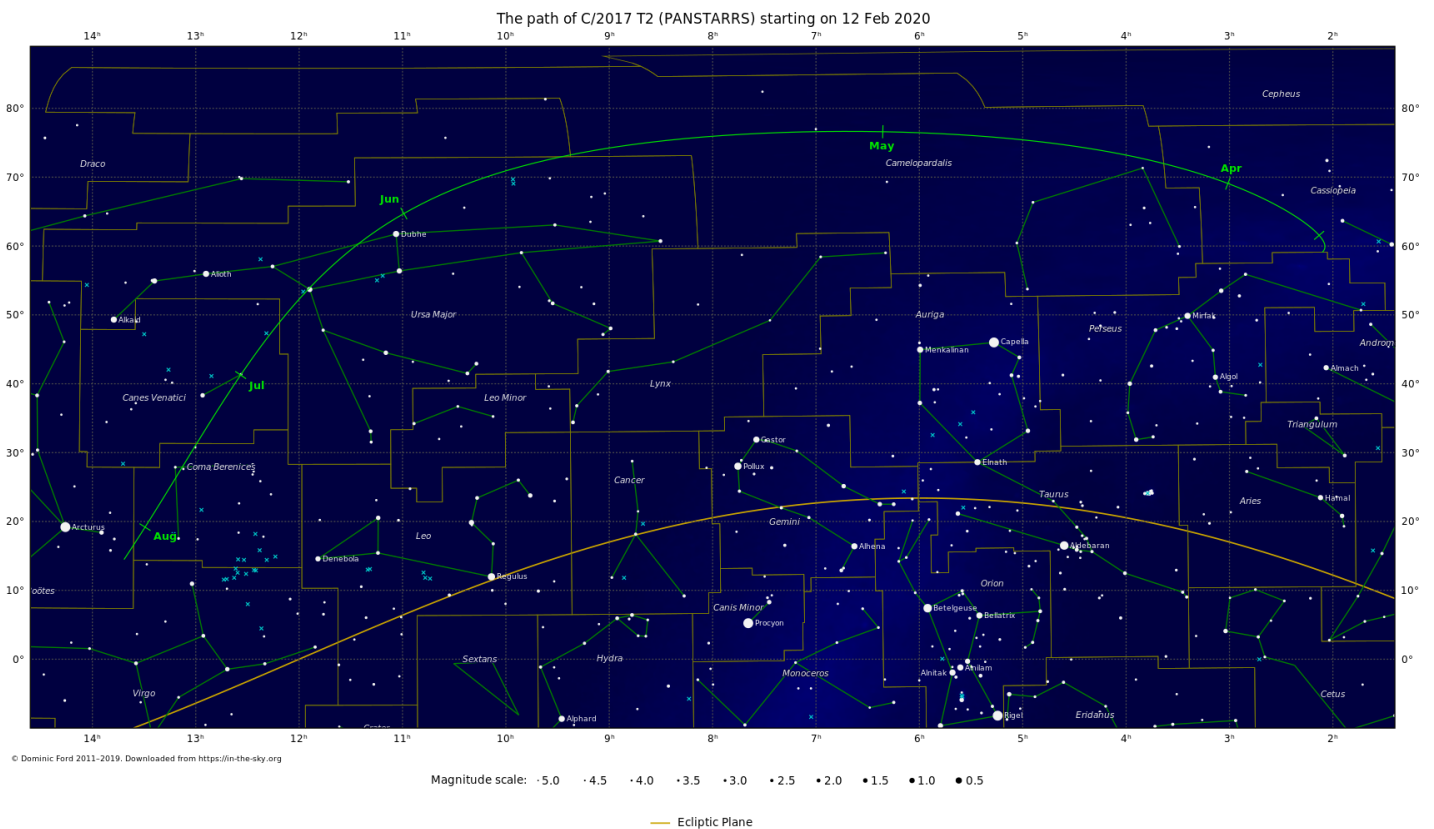


From the Desk of the Northern Cross Observatory

Comet C/2017 T2 has been in our neck of the woods for several months and is getting brighter as it heads for perihelion on May 4th, 2020. Currently it is passing by the Perseus double cluster, and makes for a nice view at ~9th magnitude with a small tail through a telescope. This comet will not get naked eye, but will be reachable for a couple of months via binoculars and telescopes, so give it a try. Below are some graphics of its orbit from "In-The-Sky.org", and "theskylive.com"

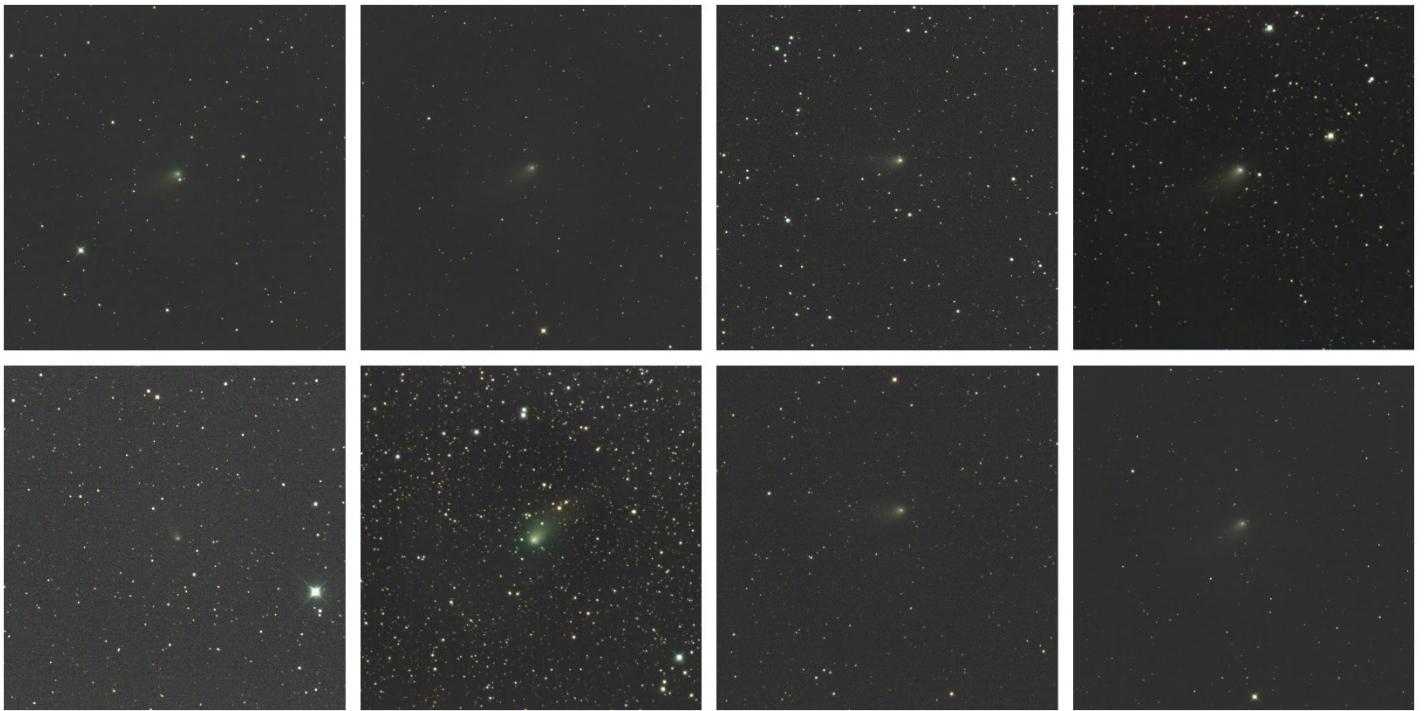


The path through our northern sky over the next few months is shown here.



(Continued on page 11)

(Continued from page 10)



I've been imaging it since October of 2019, and here are a few of those along the way.

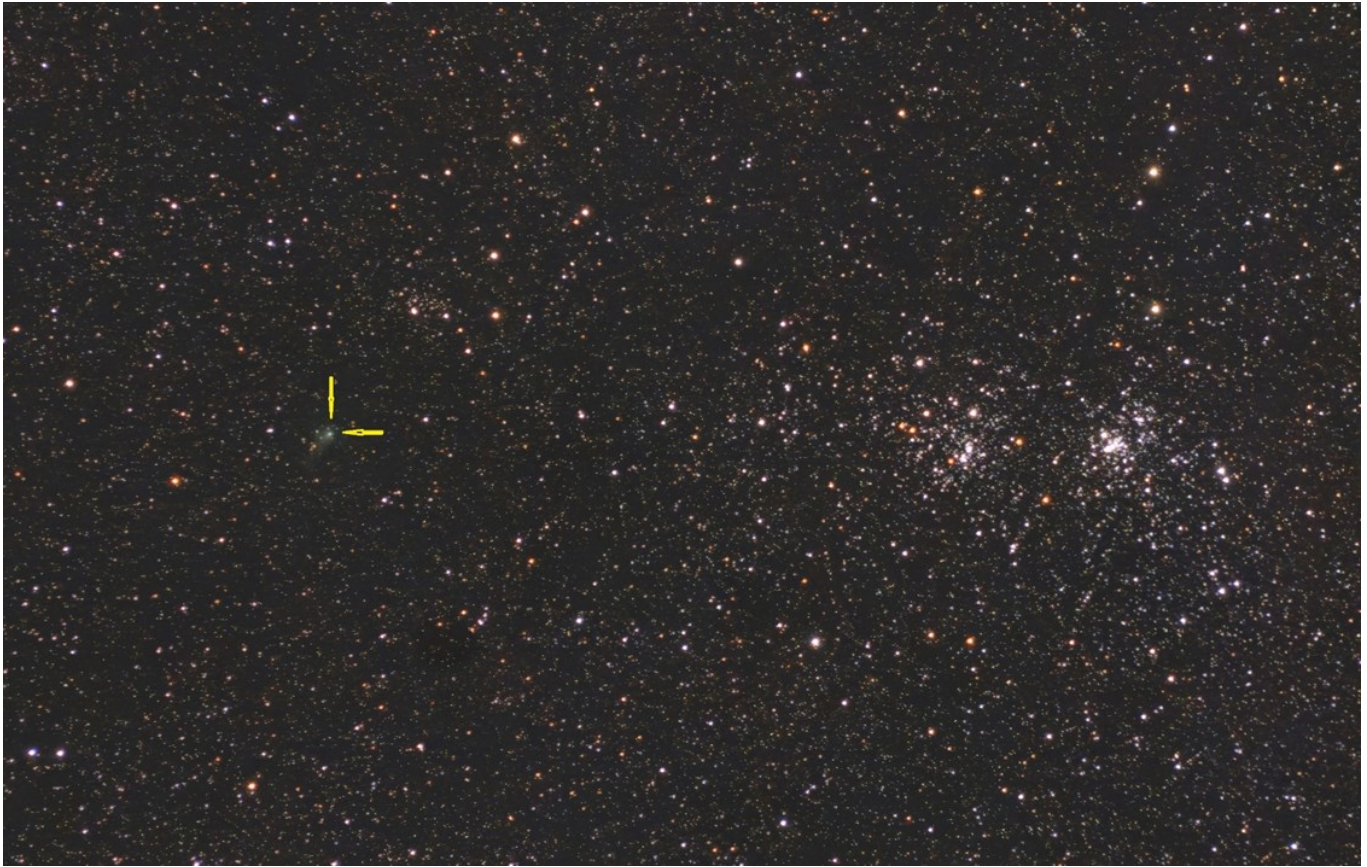
From January 19, 2020 through the 10" f/8 RC using the ZWO asi071MC PRO camera.



(Continued on page 12)

(Continued from page 11)

This was the position on January 19, 2020 relative to the Perseus double cluster (Canon T3i w/200mm lens - cropped)



C/2017 T2 information page

- <https://theskylive.com/c2017t2-info>



Presentations

Monday, February 3, 2020 Cranbrook Presentations



Main Talk:

“A Celebration of Globular Clusters ”

By Diane Hall

Though not as fabled as great open clusters like the Pleiades or Praesepe, paying deeper attention to globular clusters will richly reward both the eye and the imagination. Diane Hall will cover the human experience with globular clusters from the discovery of M22 in 1655 to the current wave of scientific thought on their formation and also provide observing tips for "globs" both dazzling and obscure.

Diane Hall is the current President of the Warren Astronomical Society. Her favorite "globs" are M22, M4, and M5 and she is presently trying to work her way through the Palomar list of the faintest of these faint fuzzies adorning the Milky Way.



Short Talk:

“Chasing Comets”

Comet C/2017 T2 (PANSTARRS)

By Doug Bock

A brief overview of a recent comet C/2017 T2 (Panstarrs), as observed from the Northern Cross Observatory.

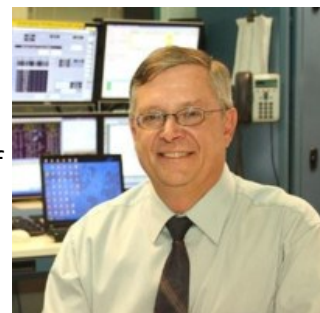
About Doug Bock:
Past President, VP and Editor for the Warren Astronomical Society

Member since the Spring of 1973. Awarded Lifetime membership in 2002.

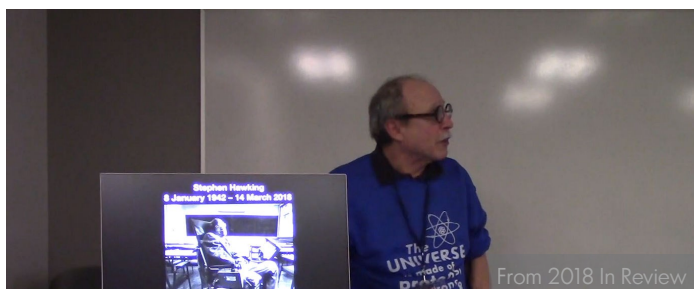
Member of ½ dozen other clubs over the years.

Chairman and Vice-Chairman of the Great Lakes Region of the Astronomical league in the early '80's.

Retired from Ford Motor Company at the end of 2018.



Thursday, February 20, 2020 Macomb Presentation



2019 in Review

Top Astronomical Stories from Last Year

Ken Bertin and Friends

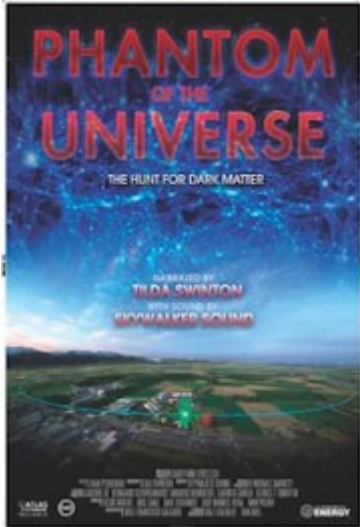
Former W.A.S. President Ken Bertin (and snack volunteer scheduler extraordinaire), along with Mark O'Malley, Diane Hall, Bob Trembley, Dale Partin, and Marty Kunz, will recap the biggest astronomical stories of 2019.

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.



Phantom of the Universe: The Hunt for Dark Matter

Now showing at the WSU Planetarium

This semester the WSU Planetarium is highlighting the search for Dark Matter in our public planetarium shows. In addition to an overview of the current night sky, we are pleased to present the film ***Phantom of the Universe: The Hunt for Dark Matter***. Based on our observations of the Universe, it is believed that 27% of what makes up the Universe is Dark Matter. While observations point to Dark Matter's existence, it is still a mystery as to what it is, with no direct detection of the physical particles. This film was created by scientists researching Dark Matter, in an effort to share their complex, large-scale experiments with the public. Please join us at a Friday night show to learn more about why Dark Matter matters.

Our free public planetarium shows are held at 7pm and 8:30pm every Friday during the semester, and a limited number of reserved seats are available via [Eventbrite](#) at noon the Sunday before each show. We always have at least 20 walk-in seats available for each show, just be sure to arrive about 30 minutes early to get in line for those.

Knowledge on Tap Presents:



Black Holes, Nebulae and Supernovae, Oh My! Exploring Other Worlds with the Zowada Observatory

February 27, 2020 | 5:00 p.m. - 8:00 p.m.
Location: HopCat Detroit
4265 Woodward Ave
Detroit, MI 48201

Cost: Free (but R.S.V.P.-link below)

Pull up a stool, grab a drink and learn something new.

Located in a remote area of southwest New Mexico — near a town with a population of 101 — a robotic telescope constantly watches the night sky. At the same time in Detroit, a Wayne State astronomy professor or student is using the [Dan Zowada Memorial Observatory](#) to peer toward a spot in the universe billions of light years away.

In its first operational year, the Zowada Observatory has captured breathtaking celestial images and given researchers a better glimpse into the mysteries of the universe. The Zowada Observatory has already played a critical role in several important research projects involving NASA's Swift satellite.

Join Ed Cackett, associate professor in Wayne State's Department of Physics and Astronomy, for the latest Knowledge on Tap on Thursday, Feb. 27, at HopCat Detroit's Huma Room. Cackett will discuss why Wayne State has a telescope in the middle of nowhere, the advantages (and challenges) of the fully automated telescope, and using the observatory to discover what happens as material falls into a supermassive black hole at the center of a galaxy. Seating begins at 5 p.m. and the presentation will begin at 6 p.m.

Knowledge on Tap consists of live — and lively — discussions with some of Detroit's greatest minds. The events are held every other month and feature an informal presentation by one of Wayne State's renowned faculty members on a topic of their choice, followed by dynamic conversation. All Knowledge on Tap events are free, open to the public and require no educational background. All ages are welcome.

[R.S.V.P.](#)



Over the Moon

With Rik Hill

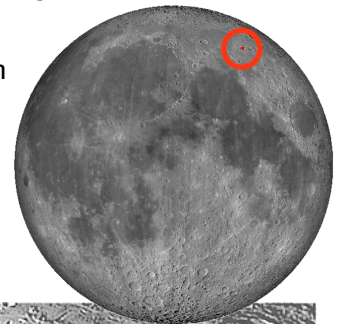
Wonderful things to see

There are just some scenes on the lunar landscape that just never fail to thrill the observer and this is one of them. So much is available to see from Aristoteles to Hercules that one can spend hours here in pure delight. First we have the dominant Aristoteles (90km dia.) on the left side of the image with its beautiful hummocky terrain surrounding and Mitchell (31km) on it's east (right) wall. Note the wonderful detail on the inner west wall of Aristoteles. Above this pair is the crater Galle (22km) isolated in the eastern Mare Frigoris. Further to the west of Aristoteles, deep in the shadows you can see the tops of the walls of Egede (37km) as a ring just coming into the light. Below Aristoteles is the equally impressive though smaller Eudoxus (70km) with the ejecta field to the east softening the details like those seen to the south.

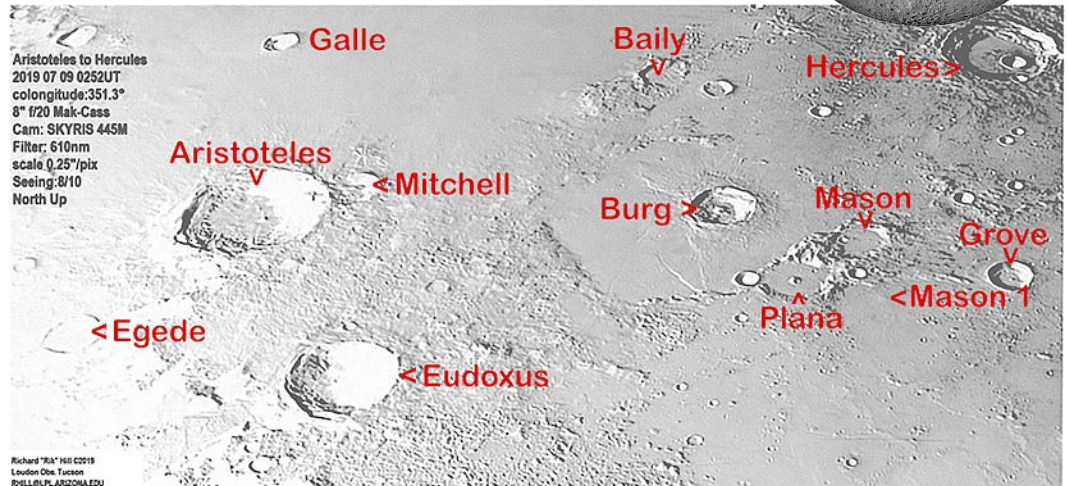


To my eye they don't look so dissimilar in size but I like the little central peak in Plana, the last remnant of the buried mountain. Below Mason you can see the dome Mason-1 in the flat northern portion of Lacus Somniorum that extends to the bottom of this image. Over near the left edge is the rather isolated crater Grove (29km). Above Grove in the upper right (northeast) corner of this image is another great crater Hercules (71km) with nice terraced walls. This is a difficult scene to leave on a good clear and calm night!

This montage was made from 3 images stacked from 3 1800 frame AVIs using AVIS-tack2 (IDL). Further processing was done with GIMP and IrfanView.



Just east of the center of this image is the polygonal Lacus Mortus with the various rimae contained within it and the more or less central crater Burg (41km). Above Burg is another fairly polygonal crater, Bailly (27km). Then below Burg are two interesting craters Plana (46km) on the left and Mason (44km) on the right.



History S.I.G.

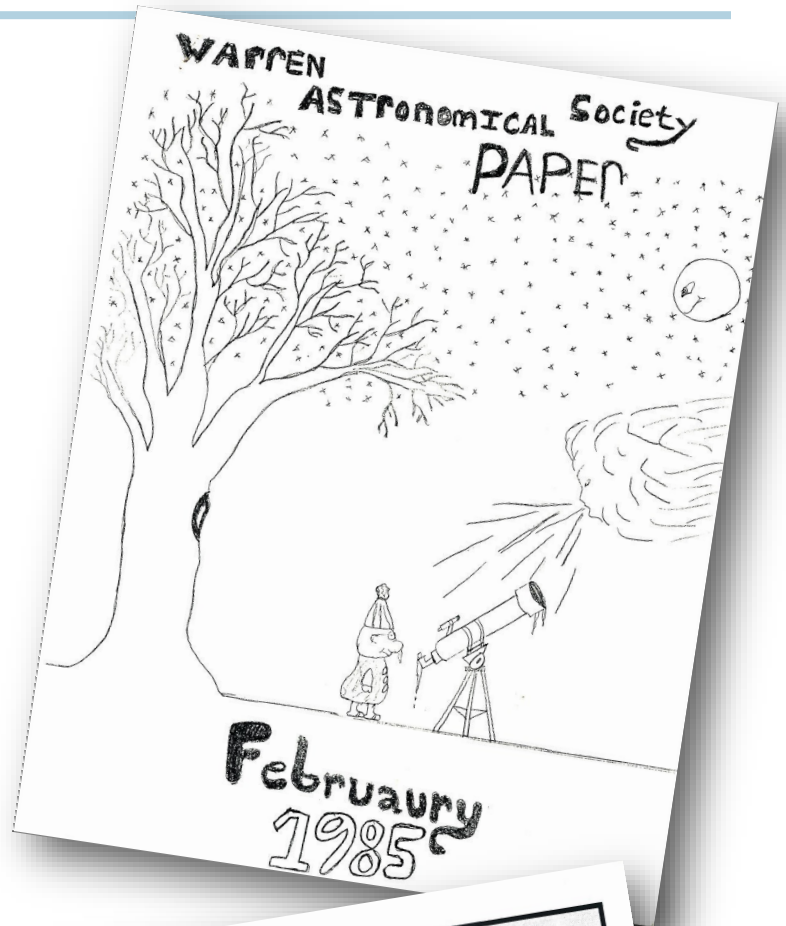
February 1985

Another cartoon cover about the plight of wintertime astronomy. No comment on the spelling of the month, hand-drawn covers don't have the advantage of spell-check.



During the eighties, the January issue was part of a two month publication, December-January, resulting in any reporting of the annual banquet to the February issue where we find Kent Patterson getting the Amateur of the Year Award, Paul Strong the (coveted) Armchair Astronomer Award, And Judy Butcher the Service Award. Also posted in this issue, the current elected officers: Ken Strom, Steve Franks, Jon Root, Alan Rothenberg and Alice Strom.

Steve Franks provides the astronomical article, "Comets", accompanied by a chart of "Positions for Comet Levy-Rudenko (1984T)" by Ken Kelly.



February 1995

Again, we have an Awards Banquet report. Jeff Bondono recognizes the contributions of Society members and notes these awards:

John Herrgott received the John E. Searles Award

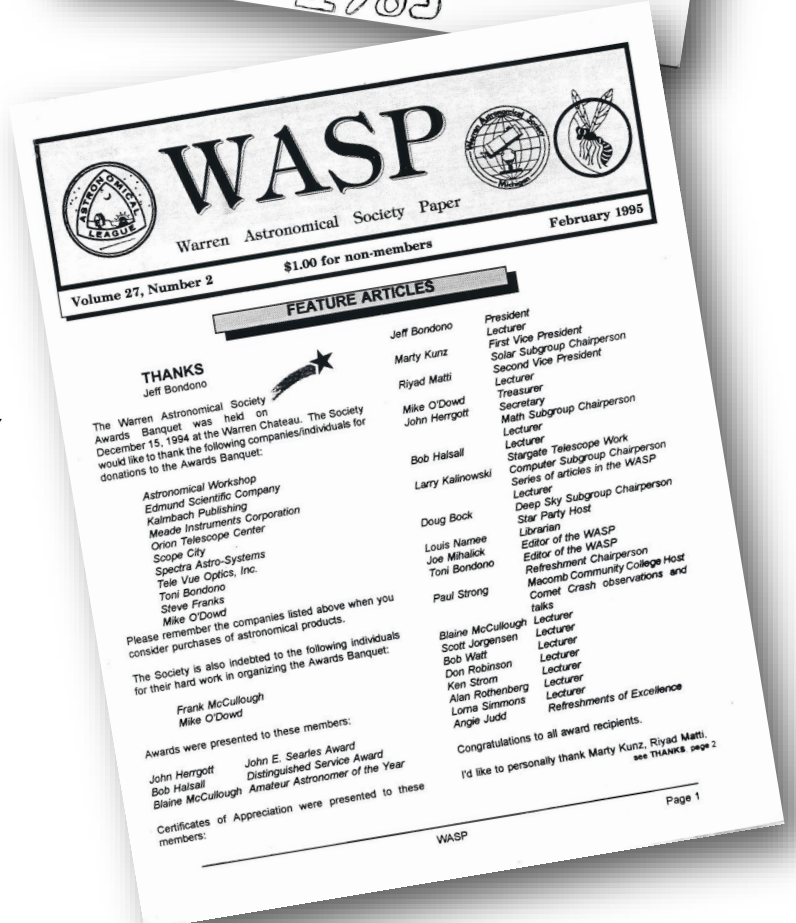
Bob Halsall gets the Distinguished Service Award

Blaine McCullough collars the Amateur Astronomer of the Year

Lorna Simmons follows up a prior article with "Weird World, Continued", Larry F. Kalinowski covers a computer virus occurrence in "Computer Chatter" (remember the 'Michelangelo' virus?). Louie the Librarian critiques two books, *The Night Sky* by Ian Ridpath and *Star Hopping* by Robert Garfinkle.

"Thanks for the Memories" completes the issue with more references to the banquet and recognition of member contributions overall, unsigned but I suspect either the previous president or the editor.

Dale Thieme,
Chief scanner

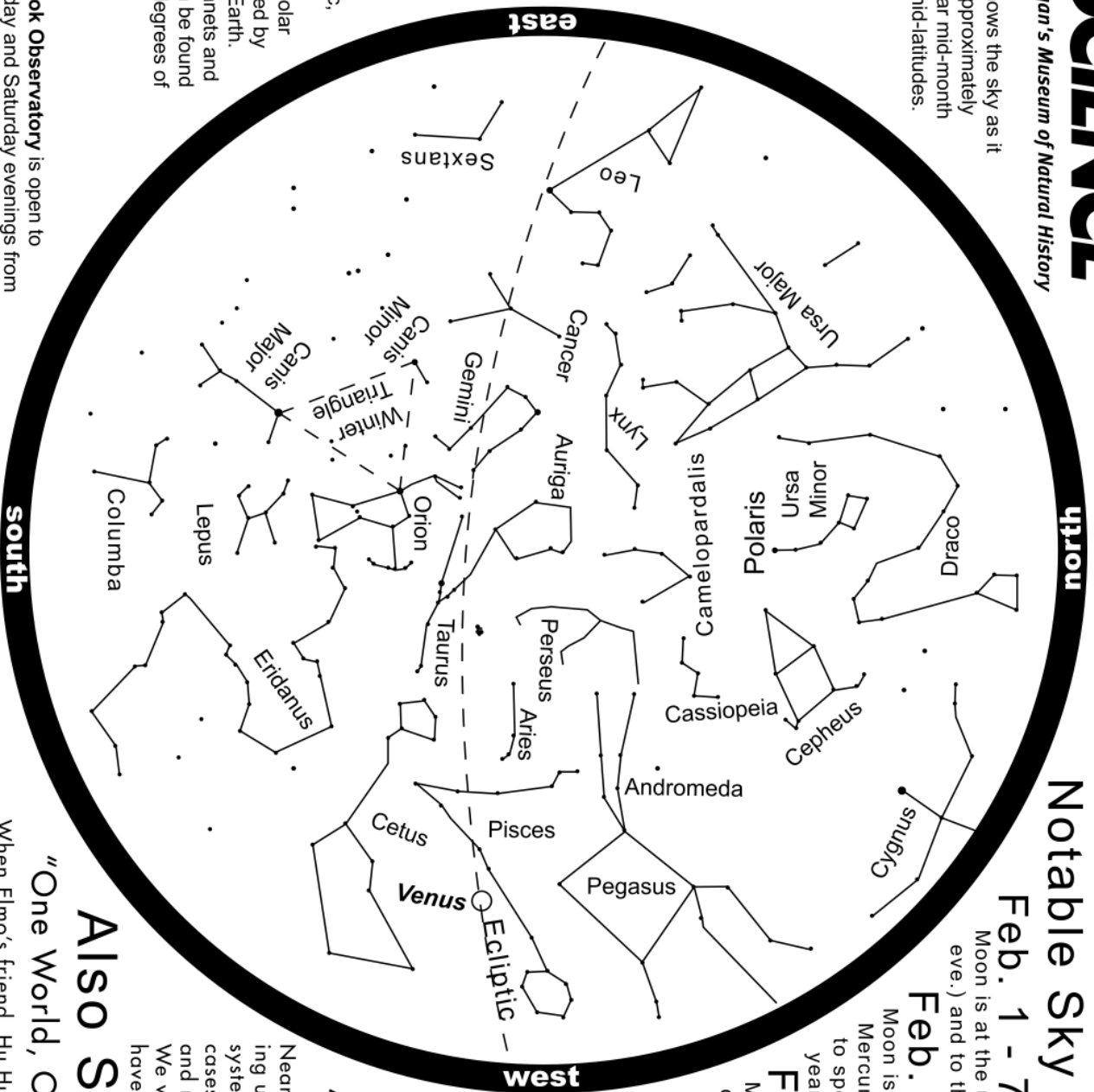


FEBRUARY 2020

Notable Sky Happenings



This chart shows the sky as it appears at approximately 8pm EST near mid-month at northern mid-latitudes.



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

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

Feb. 1 - 7

Moon is at the upper right of Aldebaran in Taurus on the 3rd (S eve.) and to the right of Pollux in Gemini on the 6th (E eve.).

Feb. 8 - 14

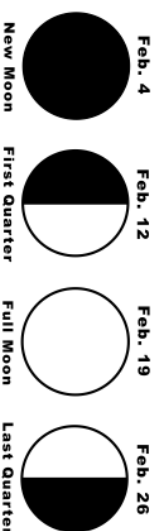
Moon is to the left of Regulus on the 9th (E evening). Mercury's at Greatest Elongation on the 10th. Best time to spot Mercury in the WSW evening twilight for the year. Moon is above Spica on the 13th (SSW morn.).

Feb. 15 - 21

Moon is at the upper right of Mars on the 18th. An occultation of Mars is not visible from Michigan. The Moon is to the right of Jupiter on the 19th and to the lower right of Saturn on the 20th (all are visible in the SE just before sunrise).

Feb. 22 - 29

The Moon is to the left of Venus on the 27th (WSW evening).



Now Showing

"Robot Explorers"

Near the end of the twentieth century, we began launching unmanned probes into the far reaches of the solar system. What they discovered was amazing and in some cases unexpected. New space missions are underway, and many of these robust spacecraft are still operational. We will pay tribute to these robots and learn what they have taught us about our solar system.

Also Showing

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

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

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



Stargate Observatory

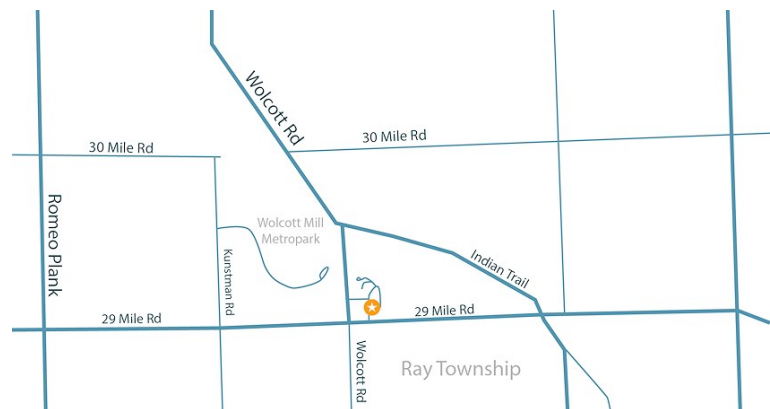
Monthly Free Astronomy Open House and Star Party

4th Saturday of the month!
Wolcott Mill Metropark - Camp Rotary entrance

- Sky tours.
- Look through several different telescopes.
- Get help with your telescope.
- We can schedule special presentations and outings for scouts, student or community groups

Contact: outreach@warrenastro.org

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



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

Observatory Rules:

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) 634-6240 .
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.
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.

Stargate Report

Stargate Observatory Open House January 25, 2020

The observatory was opened at 6:12 and closed by 7:30 pm. No members or visitors attended. The weather was cloudy and it was snowing. The observatory and Dob shed were in good condition. While waiting, the eyepiece safe was organized and cleaned.

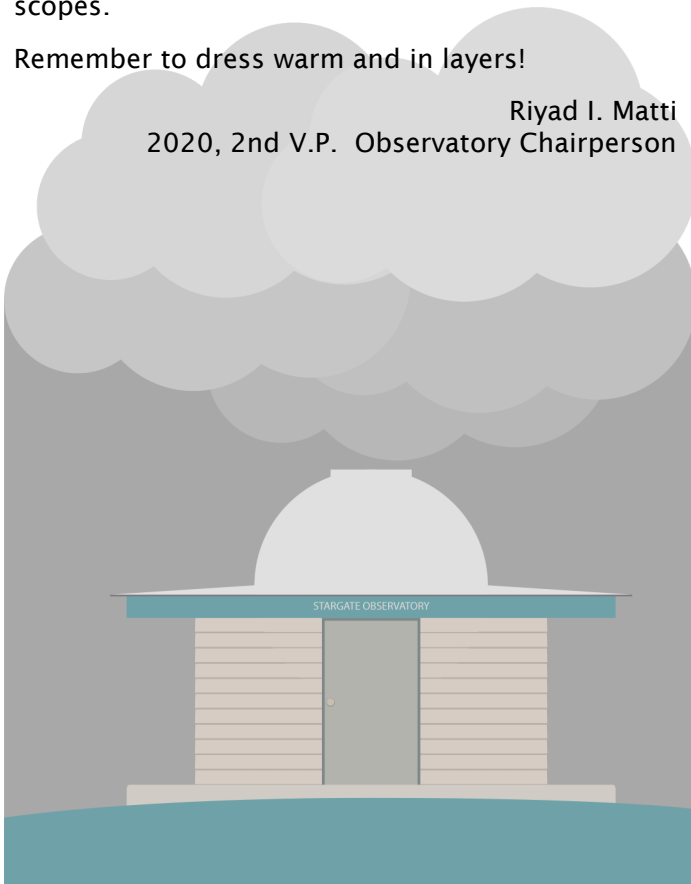
Next Open House Saturday, February 22 at 6 PM.

Sunset: 6:13pm
Astronomical Twilight ends: 7:46pm
Moonrise: 7:11am
Moonset: 5:16pm

Please arrive just after sunset (or sooner if you plan to set up a scope or do solar observing). A friendly reminder to be courteous if you arrive after dark, dim your headlights upon entry to the park, and no white light flashlights please. If you are setting up a large scope or have a lot of equipment to set up then you are permitted to park on the observing field, with your vehicle lights pointed away from the observatory and other telescopes.

Remember to dress warm and in layers!

Riyad I. Matti
2020, 2nd V.P. Observatory Chairperson



Astronomical Events for February 2020

Add one hour for Daylight Savings Time

Source:

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

Day	EST (h:m)	Event
01	20:42	FIRST QUARTER MOON
04	01:53	Aldebaran 3.1°S of Moon
06	03:59	Moon at Ascending Node
07	07:58	Pollux 5.3°N of Moon
08	05:16	Beehive 1.0°S of Moon
09	02:33	FULL MOON
09	16:15	Regulus 3.8°S of Moon
10	09:00	Mercury at Greatest Elong: 18.2°E
10	15:31	Moon at Perigee: 360464 km
12	00:00	Mercury at Perihelion
15	17:17	LAST QUARTER MOON
18	08:18	Mars 0.8°S of Moon: Occn.
18	19:12	Moon at Descending Node
19	14:36	Jupiter 0.9°N of Moon: Occn.
20	08:47	Saturn 1.7°N of Moon
23	10:32	NEW MOON
25	21:00	Mercury at Inferior Conjunction
26	06:35	Moon at Apogee: 406277 km

Saw a Fireball?

Report it to the American Meteor Society!



[www.amsmeteors.org/
members/fireball/
report-a-fireball](http://www.amsmeteors.org/members/fireball/report-a-fireball)

Outreach Report

Outreach Report - February 2020 Cranbrook and WASP

Astronomy at the Beach has a board!

Elections were held during the meeting on Jan. 9th - present at the meeting were members from the DNR, W.A.S., Lowbrows, Ford and GM clubs.

President: Adrian Bradley

Vice President: John Wallbank

Secretary: Jeff Kopmanis has volunteered - until a permanent position is elected.

Treasurer: Since the Warren Astronomy Society currently manages the account and can perform financial duties, they will continue on until a permanent Treasurer is elected or designated.

Communications: Brian Ottum, Bob Trembley will act as his assistant.

AATB Planning Meeting: February 13, 2020, at 7:30PM - Everyone Welcome!

Island Lake Headquarters Building
12950 Grand River Ave, Brighton, MI 48116
- *or online* -

bluejeans.com/864376269

- *or by phone* -
888-240-2560

W.A.S. Calendar Entry: [\[LINK\]](#)

Draft Meeting Agenda

1. Guests expected:

Bridget Harwood (HarwoodB@michigan.gov), Park Supervisor

Old Business

Status of tent rental

Non-Lowbrow club participation

Treasurer and bank account transfer

What needs to be done to transfer account from WAS

Bank choices

Acting treasurer?

New Business

Should scope of event remain unchanged, broaden, or more focused?

Speakers, if any?

one tent or two?

Proposal: monthly to-do/project lists (the Checklist isn't structured that great)

Review demos/presentations from 2019 with an eye for 2020

501c3 status

Pro/Con issues

Current status?

Telescope field planning and management

(including line manager concept)

Considerations for big scope logistics and power

JW: Sponsors and Sponsor letters

Information table

Taking possession of all signs

Even if you can't make it to the January planning meeting, you can join the groups.io site to get emails and updates from the planning committee.

<https://glaac.groups.io/g/main>.

Outreach Volunteers Needed

Speaker Needed at the Detroit Public Library

Sunday, February 16, 2020 2:00pm - Need replacement speaker

AND: Sundays in 2020 2:00pm

The Library would like to have speakers on Sundays - open dates are:

Contact: Jennifer Dye

<jdye@detroitpubliclibrary.org>

Girl Scout Mall Frenzy, Mission:

Space at Lakeside Mall (Sterling Heights)

Saturday, March 21-22, 2020 10pm-3am.

The Girl Scouts have released new Space badges and will be working on them throughout the night. They would like the W.A.S. to help us out again. I've emailed the organizer asking that our table be located in or around a storefront with power. I also asked if they wished me to contact other astronomy clubs via the Great Lakes Association of Astronomy Clubs, and see if they can set up too.

Contact: Caroline Feathers <Cfeathers@gsem.org>
(313) 870-2511

Astronomy Day at Stargate Observatory

Saturday, May 2, 2020

Planning Stage: I've emailed our Metropark contacts about organizing this event.

Astronomy Day at Cranbrook Institute of Science

Saturday, May 2, 2020 1 - 4pm

Planning stage: Cranbrook has asked what we have an unspecified number of volunteers available for

Astronomy Day.

Event on the W.A.S. Outreach Calendar: [LINK](#)

Dark Sky Update

*Edited from an email from Dr. Sally Oey
(MiDarkSkies@umich.edu)*

- T K Lawless Park in Cass County is [Michigan's second International Dark Sky Park!](#)
- The A2 Student Advisory Council (SAC) has voted to support the draft A2 Lighting Ordinance! Many thanks to Gillen Brown, Ryan Farber, et al. for all their work with the SAC. Even better news is that members are interested in bringing it to UM Central Student Government (CSG). A resolution from CSG would be fantastic, and would also help raise student awareness. **UM undergrads:** Please let Gillen (gillenb@umich.edu) and I know if you want to help work with CSG.
- The Detroit Sign Ordinance revision has been deferred for a bit. Erica Briggs (Scenic Michigan, erica@scenicmichigan.org) is leading an effort to contact Detroit City Council members in hopes of stopping the digital sign explosion. Thanks to all who signed the petition!
- The city Working Group (John Mirsky, Erica Briggs, Sally Oey) met with the Downtown Development Authority on Jan 14 and got good feedback on the draft policy for publicly owned lighting. This is separate from the draft Lighting Ordinance.
- **Dexter residents:** Michael Sawula (torynado2@aol.com) is experiencing terrible light trespass from new acorn streetlights on Ann Arbor St in Dexter. Would others be interested in joining him in reaching out to Dexter City Council?

Meeting Minutes

BOARD MEETING – January 6, 2020

Members present: Diane Hall, Dr. Dale Partin, Riyad Matti, Glenn Wilkins, Jonathan Kade and Bob Trembley. Diane called the meeting to order at 6:40 P.M.

Officer's reports

Dale reported that the winter speaker schedule is mostly filled except for the March Macomb meeting. The WASP is up!

Riyad reported that the last open house went OK but was lightly attended.

Diane reported that a Clean Up Day needs to be integrated into the April Open House. It was noted, for instance, that rocks need re-aligning.

Mark Jakubisin was not able to attend due to illness. Jonathan offered to be acting treasurer for the evening. It was proposed that we consider the feasibility of establishing backup volunteers for key board positions. It would be especially helpful if the volunteer already had experience at the particular position. Comments or actual volunteers would be welcomed!

Bob reported team support (GLAAC) is needed from us for Astronomy at the Beach. This can be done through a video conference to avoid travel time.

Jonathan reported software updates are currently in progress to improve our web site.

Old Business

Diane recommended, based on the general survey, that consideration be given to a future dark sky event. She mentioned Rockport and Riyad mentioned Port Austin although the adequacy of facilities there was questioned. Suggestions would be welcomed.

Diane inquired if now might be the time to consider a new GLAAC type of venue in the area sponsored by the WAS (and others?) Belle Isle was mentioned. Comments/suggestions by members would be welcomed.

New Business

Diane asked for submissions for the Year in Review section of the renewal mailer.

Diane noted the need to address compensation for out-state speakers for food & travel. The team suggested a cap of about \$40 for dinner and a total of \$100. The proposal was voted on and approved by all board members present since this amount was within petty cash limits currently in place. WAS members joining the speaker would cover their own expenses.

Diane noted that action is needed to appoint a reg-

(Continued on page 22)

(Continued from page 21)

ular presenter for In the News/In the Sky, or someone to solicit presenters for each meeting well in advance.

Diane noted that a volunteer is needed to handle dry goods for snacks, and procure replacement supplies as required. Please contact Diane or Jonathan if you would be willing to help.

Bob proposed a WAS promotion sign be contracted for erection along the road south of the observatory. Apparently, the concept would be acceptable to the park management, although they would likely want to approve the proposal first.

CRANBROOK MEETING – January 6, 2020

Diane called the meeting to order at 7:30 P.M. 34 members signed in at the front desk.

Key news items were presented as In the News and followed by interesting current objects In the Sky by Ken Bertin.

OFFICERS' REPORTS

Riyad – last open house closed at 9:30 due to cloud cover. The next open house is January 25.

Bob – Noted the serious lack of support for GLAAC planning. A permanent WAS representative is needed. The board would like to know the extent of interest in a Messier Marathon sponsored by WAS. Please contact a board member to help determine if this proposal should be pursued.

Jonathan mentioned that the WASP is **always** interested in any contributions!

Gary Ross will host his “last” discussion group later this month and also noted, importantly, that it will be sans furniture since he is in the ongoing process of moving! Gary also talked briefly about the frequency of Pluto occultations in 2019, and their value to amateurs.

Marty Kunz noted that, although sunspots have not been very impressive lately, there have been some every week.

Snack break – a key event

PRESENTATIONS

Dr. Partin introduced Gary Ross for his feature presentation entitled, “In Search for the Shining Mountain.” This covered his experiences observing the moon with small telescopes and binoculars since 1958. The shining mountain is an elusive bright spot which can only be seen under ideal conditions when normally concealed portions of the moon are exposed due to variations in the moon’s elliptical orbit. Gary read from the logbook of the James C. Veen Observatory, a source some consider almost sacred.

The short presentation was given by Jeff Macleod about his accidental discovery of the John Glenn Astronomy Park in the Hocking Hills area in Ohio. Jeff had photos of the site which were impressive especially considering that it is relatively new and unknown by most amateur astronomers. In addition to interesting things for families to look at, facilities are in place allowing telescope viewing in the open air for those bringing their own equipment. The skies are relatively dark and available most nights in warmer weather months. A large shed is on site and contains several nice scopes under a roll-off roof. However, it is not clear if any of these might be available to amateurs. Jeff mentioned another nearby point of interest that might be included on the way down if time permits. About 4 ½ hours of driving time should be allowed from Detroit with minimal stops.

The meeting was adjourned at 10:02

MACOMB MEETING – January 16, 2020

This meeting was held in Room J221 and was convened by President Diane Hall at 7:30 P.M. It was attended by 29 members and 2 guests.

Diane reported that Bob Trembley would like to arrange a Messier Marathon this year. Suggestions for a date would be appreciated.

Diane reported that an event has been set up for February 1 at the McMath solar observatory in Auburn Hills. Contact Marty Kunz for details.

Bob Trembley reported that a new GLAAC board was established January 9. However, they still need a regular treasurer.

Bob also reported that Astronomy Day will feature events at Stargate and Cranbrook on May 2. Planning is in progress.

Diane reported that speakers are still needed by the Main Detroit Public Library on Woodward for a series of TBD dates. Please contact Jennifer Dye for more information.

In the News was presented this time by Dr. Dale Parton. He continued the practice of fewer topics covered but in greater depth. Topics discussed were lensing quasars, the dating of a meteorite at 5 to 7 billion years of age, the discovery of an asteroid between Mercury & Venus, the discovery of 2 new relatively close super earths, and evidence of a “collision” of the Milky Way approximately 11.5 billion years ago.

In the Sky was presented by Diane. She reported a new super nova near the bright heart of M100. It is designated as SN2020 and should be a somewhat challenging object of interest for W.A.S. observers. It was also noted that Betelgeuse has now faded on this cycle to the 21st

(Continued on page 23)

(Continued from page 22)

brightest star from its rank of 10 or so at peak brightness levels.

The feature presentation was provided by Jim Foerch of the Grand Rapids Amateur Astronomy Association. The unusual, but fun, format was called Astronomy Slam where volunteer members of our society were selected randomly and given astronomy-related questions to field ranging from rather easy to very difficult. Participation certificates were given out to those willing to risk embarrassment!

The meeting ended at 9:30

Glenn Wilkins
Secretary



Treasurer's Report

Treasurer's Report for 1/31/2020 MEMBERSHIP

We have 65 current members

INCOME AND EXPENDITURES (SUMMARY)

We took in \$1,097 and spent/transferred \$229 We have \$22,104 in the bank \$0 in checks and \$647 in cash, totaling \$22,751 as of 01/31/2020..

INCOME

Income Category	Sum of Credit
AL 2020	22.
calendar 2020	150
donations	233
membership	126
merch	45
renewal	520

EXPENSES

Expense Category	Sum of Debit
Calendar Shipping Cost	30.35
snack reimbursement	20
Snack Supplies	2.12
Speaker expense	16
Speaker Expense, Driving	161

GLAAC REPORT 1/31/2020

Beginning Balance: \$2,237

INCOME

No activity

EXPENSES

\$12 BOA charge

Ending Balance: \$2,237

Mark Jakubisin
Treasurer



The historic McMath Hulbert Solar Observatory is a solar observatory in Lake Angelus, Michigan, USA. It was established in 1929 as a private observatory by father and son Francis Charles McMath and Robert Reynolds McMath and their friend, Judge Henry Hulbert. In 1932 the observatory was

deeded to the University of Michigan which operated it until 1979, at which time it was sold into private ownership again.

The McMath-Hulbert Solar Observatory is currently under private ownership but is run by a small non-for-profit organization of amateur astronomers.

(Excerpts from the website home page)

McMath-Hulbert Observatory Facebook Page:

<https://www.facebook.com/MHObservatory/>

McMath-Hulbert Observatory website:

<http://www.mcmathhulbert.org/solar/>

Check the Facebook page and website for open house announcements.



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.

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
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/newsletters/oacnews.html>
 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: MauiHawaii.org Jon Blum: [Astronomy at JonRosie](#)
 Bob Trembley: [Balrog's Lair](#) Bob Trembley: [Vatican Observatory Foundation Blog](#)
 Bill Beers: [Sirius Astro Products](#) Jeff MacLeod: [A Life Of Entropy](#)

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.org to find local clubs, events, and more!

Betelgeuse and the Crab Nebula: Stellar Death and Rebirth

David Prosper

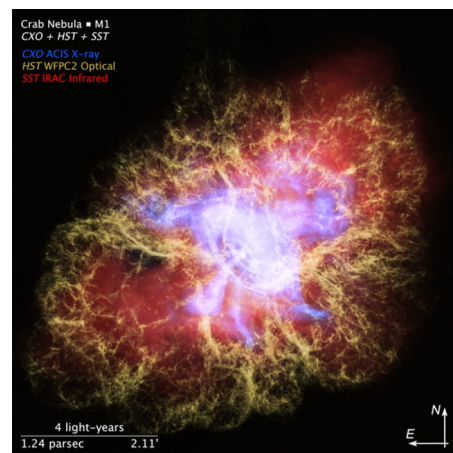
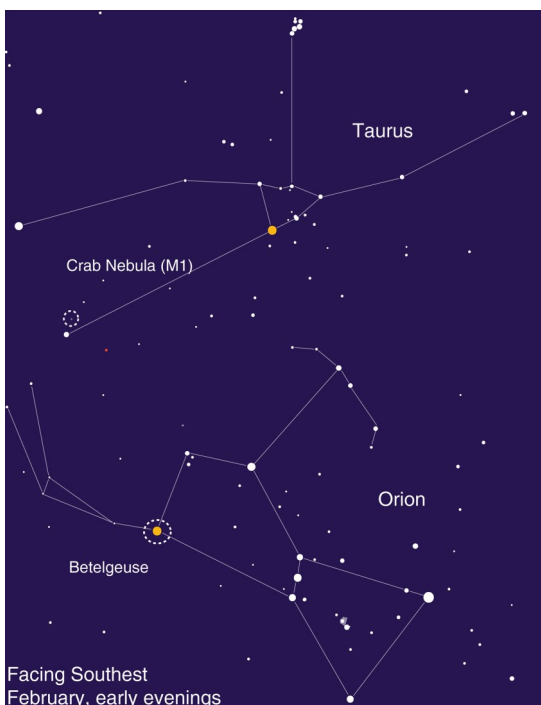
What happens when a star dies? Stargazers are paying close attention to the red giant star **Betelgeuse** since it recently dimmed in brightness, causing speculation that it may soon end in a brilliant supernova. While it likely won't explode quite yet, we can preview its fate by observing the nearby **Crab Nebula**.

Betelgeuse, despite its recent dimming, is still easy to find as the red-hued shoulder star of Orion. A known variable star, Betelgeuse usually competes for the position of the brightest star in Orion with brilliant blue-white Rigel, but recently its brightness has faded to below that of nearby Aldebaran, in Taurus. Betelgeuse is a young star, estimated to be a few million years old, but due to its giant size it leads a fast and furious life. This massive star, known as a supergiant, exhausted the hydrogen fuel in its core and began to fuse helium instead, which caused the outer layers of the star to cool and swell dramatically in size. Betelgeuse is one of the only stars for which we have any kind of detailed surface observations due to its huge size – somewhere between the diameter of the orbits of Mars and Jupiter - and relatively close distance of about 642 light-years. Betelgeuse is also a “runaway star,” with its remarkable speed possibly triggered by merging with a smaller companion star. If that is the case, Betelgeuse may actually have millions of years left! So, Betelgeuse may not explode soon after all; or it might explode tomorrow! We have much more to learn about this intriguing star.

The **Crab Nebula** (M1) is relatively close to Betelgeuse in the sky, in the nearby constellation of Taurus. Its ghostly, spidery gas clouds result from a massive explosion; a supernova observed by astronomers in 1054! A backyard telescope allows you to see some details, but only advanced telescopes reveal the rapidly spinning neutron star found in its center: the last stellar remnant from that cataclysmic event. These gas clouds were created during the giant star's violent demise and expand ever outward to enrich the universe with heavy elements like silicon, iron, and nickel. These element-rich clouds are like a cosmic fertilizer, making rocky planets like our own Earth possible. Supernova also send out powerful shock waves that help trigger star formation. In fact, if it wasn't for a long-ago supernova, our solar system - along with all of us - wouldn't exist! You can learn much more about the Crab Nebula and its neutron star in a new video from NASA's Universe of Learning, created from observations by the Great Observatories of Hubble, Chandra, and Spitzer: bit.ly/CrabNebulaVisual

Our last three articles covered the life cycle of stars from observing two neighboring constellations: Orion and Taurus! Our stargazing took us to the “baby stars” found in the stellar nursery of the Orion Nebula, onwards to the teenage stars of the Pleiades and young adult stars of the Hyades, and ended with dying Betelgeuse and the stellar corpse of the Crab Nebula. Want to know more about the life cycle of stars? Explore stellar evolution with “The Lives of Stars” activity and handout: bit.ly/starlifeanddeath.

Check out NASA's most up to date observations of supernova and their remains at nasa.gov



Above: This image of the Crab Nebula combines X-ray observations from Chandra, optical observations from Hubble, and infrared observations from Spitzer to reveal intricate detail. Notice how the violent energy radiates out from the rapidly spinning neutron star in the center of the nebula (also known as a pulsar) and heats up the surrounding gas. More about this incredible “pulsar wind nebula” can be found at bit.ly/Crab3D. Credit: NASA, ESA, F. Summers, J. Olmsted, L. Hustak, J. DePasquale and G. Bacon (STScI), N. Wolk (CfA), and R. Hurt (Caltech/IPAC)
Left: Spot Betelgeuse and the Crab Nebula after sunset! A telescope is needed to spot the ghostly Crab.

Last Word

From Our Publications Director

Some thoughts on doing things imperfectly

As you may have seen elsewhere in this publication, Diane and I recently got to observe with Jon Blum on top of Haleakalā on Maui. Before we went up, we asked Jon if it was possible to see the Large Magellanic Cloud, which we had never seen before. The LMC is the biggest galaxy, in angular size, in the skies of our part of the galaxy, and well below the celestial equator. It's theoretically possible to see part of it from Hawaii, but we had never heard of anybody doing it. In 2008 we tried to see it from the Onizuka Center for International Astronomy visitor center on Maunakea, at 9300 ft of elevation, but to my recollection we forgot one critical thing: there's another 14000 foot mountain, Maunaloa, south and southwest of Maunakea. Whatever part of the galaxy got over the horizon, we didn't see any of it.

Jon put our question to his colleagues in the astronomy club there, who seemed a bit puzzled by the question. They said it was almost entirely below the horizon, and didn't seem to think it was much worth the effort. We're not 100% sure if anybody actually had seen it. But I kept checking the map, SkySafari, and the weather, and I liked our chances. As it got nearer to transit time, I started looking for a gap in the mountain ridge where we might have a chance. First I climbed the big entrance drive ridge near the flashy new Inouye Solar Telescope - more than a decent hike, there at 10000 feet - and pointed our 15x70s south. I checked the sky map, checked my binoculars again... got it! A faint patch of brightness had cleared the marine layer, and there was nothing nearby it could be except a blob of LMC light. Coming back down the hill, I found a bigger notch closer to the HAA clubhouse, and was able to have Diane and Jon confirm my observation. I can't say for certain we saw the mighty Tarantula Nebula, but at least we saw quite a few patches of nebulosity. It wasn't quite as exciting as I imagine seeing it overhead would be, but it was plenty exciting nonetheless!

To draw a parallel to this volunteer enterprise of amateur astronomy, we often wish that things were different. If only the skies were darker; if only the budget were bigger; if only the crowds were bigger, or more willing to spend time at the eyepiece; if only I had more time to work on the club. But, like



[ESO's VISTA](#) image of the LMC

northern astronomers who find ourselves near the equator, doing what we can with what we have can be awfully rewarding - not just to us, but to the general public. Can't stay out all night at Stargate? An hour helps us a lot! Can't write the astronomy novel you've always dreamed of? The WASP would love to host your short stories. Not ready to give an hour long presentation? Well, a short presentation or a turn on In the News / In the Sky might be just enough. Nobody's grading your work, and your fellow members should make you feel good about doing your best. When you volunteer with the club, in any capacity, you'll feel good about contributing, and others will be very glad that you did.

Jonathan Kade,
Publications