

# Reflections 

Newsletter of the Popular Astronomy Club,

## President's Corner NOVEMBER 2019



## Alan Sheidler

Welcome to another edition of "Reflections", the universe's best astronomy newsletter. You can read about it here, but November presents an opportunity to see a very rare bit of planetary choreography: a transit of the planet Mercury. On the morning of November $11^{\text {th }}$, Mercury will travel across the bright disk of the sun as seen by observers here on earth. The passage of one celestial object in front of another is called a transit. This is similar to an eclipse, but in this case, Mercury, which is about $1 / 200^{\text {th }}$ the size of the sun, will not be able to blot out much of the sun's brilliance.
However, viewed through a telescope equipped with a solar filter the transit can be an interesting an exciting event to observe. Below are photos from November $8^{\text {th }}, 2006$ showing the transit of Mercury viewed from the Quad Cities area that afternoon. In the group photo are Roy Gustafson, Karl Allemeier and yours truly. In the image of the solar disk, there is a sunspot on the left side. The planet Mercury is the tiny object at the lower left.
You can read about the specifics of the November $11^{\text {th }}$ transit here in this newsletter. The club is plan-

(Continued in next column)

ning to be in the parking lot of Niabi Zoo from sunrise to just after midday (the end of the transit) to provide views of this momentous event to visitors and also to observe this wonderful event themselves. Most people have never seen the planet Mercury, and the opportunity to see it in the daytime is exciting. Because the transit coincides with Veteran's Day, many folks may have the day off, and if the weather is good, come on out to Niabi and witness this rare event. While it is true the next transit will occur on November 13, 2032, we will not be able to see it from North America. The next transit which will be visible from here is May $7^{\text {th }}, 2049$. So get out and see this one!


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## ANNOUNGEMENTS /INFO

## LOOKING FOR OLDER ISSUES OF REFLECTIONS NEWSLETTER? Click HERE <br> HISTORY OF PAC? Click HERE

Popular Astronomy Club on Facebook?

## READY FOR

 MEMBERSHIP OR TO RENEW?Click Here OR SEE LAST PAGE!


## SUBMISSIONS

If you have an article or photos to submit or items of interest, we encourage you to send them in by the 25th of the month. Links to stories are welcome also. Thank you!

## Thank you

 for Renewing your Membership!Don Anderson
Wayland and Anne Bauer
Nancy Boelens John Douglas Mike and Wanda Gacioch
Roy and Jan Gustafson Dale and Joanne Hachtel
Mary, Tim, Alex, and Hugh Holt
Dino Milani, Ellen Tsagaris, Mitchell Milani
Mark Pershing
Elizabeth Robinson and Brad Smith Mark Schroeder Jeff Struve
Roberta and Lanny Wright

## WELCOME!

NEW MEMBER
Stephen Sinksen

$$
\begin{aligned}
& \text { NORTHERN } \\
& \text { LCHTS } \\
& \text { Lawantuntio }
\end{aligned}
$$

Do you subscribe to the Northern Lights newsletter? It is free and full of information on what is going on in the North Central Region (NCRAL) Click on link above to subscribe by email and receive monthly! (Click HERE to see latest issue)

## ANOUNGEMENTS IINFO

## THANK YOU!

I am truly honored to be a recipient of the Carl H. Gamble Memorial Award. I was surprised by the presentation at the last Niabi event.

Since the award was based on the work I did for the NCRAL 2019 Convention, I would like to share the honor with everyone from PAC that contributed to the convention's success. For fear of missing a name, l'll not try to list everybody; but suffice it to say, although I was able to provide guidance on "What we need to do", there were probably 18-20 individuals that provided the "How to do it" and did it!

Planning committee members found the greatest speakers,
 developed graphics, developed and maintained a great website, solicited sponsors, developed and followed budget, compiled registration list, and on and on. Did you see the great NCRAL 2019 write-up in the recent Fall issue of The Reflector (Sara just keeps on working!)?
The weekend of the conference, additional PAC members provided a welcome reception, decorated, brought DIY projects for display, presented, manned the registration table, managed the giveaways, played timekeeper, manned the PACMO, setup/took down, answered questions, and otherwise entertained our guests.

Round of applause and pat on the back. We did it as a team.

## Mike Gacioch



## Congratulations!

## Niabi Outreach/ Carl H. Gamble Award October 20th, 2019

The October Niabi outreach was cancelled this month due to clouds and drizzle. PAC members still showed up and presented the Carl H. Gamble Memorial Award to Mike Gacioch for his superb work at chairing the NCRAL 2019 conference. He is the 6th recipient. Attending the award presentation were Dale Hachtel, Wayland Bauer, Bryan Raser, Al and Eric Sheidler, Rusty Case and Terry Dufek


## Previous Gamble Award Winners!

- 1st Harry Nelson 1981

Astronomy Popularizer

- 2nd Barry Ward 1989

Initiator of Voyager Watch

- 3rd Wayne Jens 1997

Led Mirror Grinding Class

- 4th Paul Castle 2010 posthumously)
PRC Observatory
- 5th Lillian Nelson 2015 Longtime Supporter of PAC


## ANOUNGEMENTIS / INFO

## Congratulations!

## North Central Region of the Astronomical League - NCRAL

## NCRAL SEASONAL

 MESSIER MARATHONAs NCRAL Chair, I am delighted to announce that the first NCRAL Seasonal Messier Marathon award had been earned by Popular Astronomy Club president Alan Sheidler.

On the evening of October 8th, Alan completed
(Continued in next column)
the requisite observations to qualify for Autumn certificate \#1 along with his pin. He turned in his observing record immediately thereafter. His award certificate is shown here.
In addition to a certificate, award winners receive a colored star pin. NCRAL members might want to complete this observing program, details of which can be found in the Autumn 2019 issue of our "Northern Lights" newsletter.

Congratulations to Alan on being the first-ever award recipient for completing an NCRAL seasonal mini-marathon!

Carl Wenning, NCRAL Chair (2017-2021)

## Alan Sheidler

has completed the requisite observations to qualify for the


NCRAL Messier Marathon
award and pin for the season of

## Autumn



NCRAL Chair


Autumn Certificate \#1

Observation
Date

## 2019 Eastern lowa Star Party (EISP)



EISP September 27th-28th, 2019
The Eastern lowa Star Party of the QCAS was still held this year despite overcast rainy weather both days. On Saturday, talks, drawings and exhibits were held indoors at the Wapsi River Environmental Center for over 50 attendees. Talks included: Steve Kawaler , a NASA guest speaker that dealt with data captured by Kepler, K2, and Tess; Grant Harkness from the Wilton Observatory and Jeff Struve about Exo planet detection software. PAC/ QCAS members attending were Dino and Mitchell Milani, Al Sheidler, Terry Dufek, Craig Cox, Mike Dannefeldt, Paul Levesque, Jeff Struve , Mike Ombrello and Rusty Case.

## Jeff's notes on the days events:

Steve and Grant gave incredible presentations, thank you guys!!! My presentation seemed to be well received too... not much snoring!...

We gave away 17 nice door prizes which included a new pair of Celestron binoculars, a Televue Barlow, an Explore Scientific Extender, and a real nice guide scope.

And congrats to Mitch Milani, who with a little help from Rusty, won the new 102 mm f7 Astrotek doublet!

We had our first vendor at Eastern lowa Star Party this year, Jan brought quite a few nice astronomy related items like jewelry, and coasters, and some pictures! Grant had a number of meteorites also for sale, some raw, some polished, and some in jewelry form too!

I think all had chili for lunch or supper, feasted on Rusty's deer sausage, and the many munchies that were available.

Of course the weather did not cooperate for doing any astronomy tonight, but hopefully we'll get a bit of clearing tomorrow. Who knows!

Speaking of bad weather, Tom H won the rubber chicken award for buying the last piece of new gear, which we decided caused all of this bad weather! Thanks to Tom too!

Jeff Struve


## 2019 Eastern lowa Star Party (EISP)

(RIGHT) aerial view of Menke Observatory by Rusty Case



## Girl Scout Outreach- Geneseo

## October 5th, 2019

The Geneseo area Girl Scouts asked PAC to partner with them so that the girls could earn their Space Science Badges. We had all levels of scouting from Daisy to Ambassador and 85 girls plus their troop leaders were registered for the event on October 5 at the Geneseo Community Center. We had hoped to be able to offer some viewing but due to rain and clouds it was an indoor program. Tours of the PACMO were offered so they could see what a mobile observatory looks like.

We did a series of short presentations introducing them to how a telescope works, how to use a planisphere, asteroids, and the Fall night sky. Al, Dale, Rusty, Dino, Terry, Joanne, Eric, and Sara helped support this large event. Between talks the girls did their "badge work" around various tables in the room. We utilized the Night Sky Network kits, Glass and Mirrors and Space Rocks and also brought our Weight Station scales so the girls could see what they would weigh on different planets. Thank you to everyone who

(Continued on next page)
 you!

We got a very nice thank you note
from the Girl Scouts about the October 5th program we did at Geneseo. They also sent us a nice check for \$175 (WOW!). I wanted to thank you all for your help with the event too! Thanks. Al Sheidler


## Outreach Event- LeClaire

 Boy Scouts October 17th, 2019An observing event only was held in conjunction with Boy Scout activities at the Bridgeview Elementary School in LeClaire on Oct.17th. About 80 attended including scouts, parents and siblings. They had a look at Jupiter, Saturn, the Ring Nebula, Messier 2, and Albireo among others. The PACMO was a popular attraction and many were lined up to get a view. PAC members attending were AI Sheidler, Dale Hachtel, Rusty Case, Wayland Bauer and Terry Dufek.

## THANK YOU!

We got this nice thank you note and a nice $\$ 50$ donation from the cub scouts for our observing program we did last Thursday evening at Bridgeview School in LeClaire. Thanks for supporting that program. Al Sheidler
Dear Popular Astronomy Club,
Thank you so much for setting up telescopes and your mobile observatory at our last Pack meeting! The sins had a blast.
Thanks again,
James Hershborjer Eviomaster cub Scoots
Pack 46
THANK YOU

## Outreach Event- Kewanee Wethersfield Grade School

October 22nd, 2019


Today Jan and I presented an astronomy program for the ind grade classes at the Kewanee Wethersfield Grade School in Kewanee, Illinois. Including the teachers and students we had 51 participants for a 1 hour solar system presentation. Always a yearly fun time for us! The kids are great and the teachers always so appreciative. Roy Gustafson

## Transit of Mercury November 11th, 2019

The transit will be visible from any location where the Sun is above the horizon between these times, including from Africa, the Americas, Europe and French Polynesia. This will be the first transit of the planet since May 2016, and the last
PAC will be at Niabi Zoo to view that morning! until November 2032

Editors note: Sunrise on November 11th, 2019 in Davenport is at 6:46 AM

| Event | Davenport Time |
| :--- | :--- |
| First location to see the partial transit begin | Nov 11 at 6:34:43 am (NO VIEW) |
| Geocentric** partial transit begins (ingress, exterior contact) | Nov 11 at 6:35:25 am (NO VIEW) |
| First location to see the full transit begin | Nov 11 at 6:36:24 am (NO VIEW) |
| Geocentric** full transit begins (ingress, interior contact) | Nov 11 at 6:37:06 am (NO VIEW) |
| Mercury is closest to the Sun's center | Nov 11 at 9:19:46 am |
| Geocentric** full transit ends (egress, interior contact) | Nov 11 at 12:02:31 pm |
| Last location to see full transit end | Nov 11 at 12:03:13 pm |
| Geocentric** transit ends (egress, exterior contact) | Nov 11 at 12:04:12 pm |
| Last location to see partial transit end | Nov 11 at 12:04:54 pm |

## Transit of Mercury November 11th, 2019

## Transit of Mercury: 2019 Nov 11



## TRANSIT FACTS

- Mercury transits separated by the interval of 46 years occur on nearly the same calendar date (within 1-2 days depending on the number of intervening leap years) and same orbital node, and the planet has a similar path across the Sun.
- This makes the 46year period an analog to the Saros period for solar eclipses. It's a natural period in which to organize Mercury transits into series.
- The transit of 2019 is a member of series 247. It is the 11th of 19 transits in the series running from the years 1559 to 2387.
- Edmund Halley first realized that transits could be used to measure the Sun's distance, thereby establishing the absolute scale of the solar system from Kepler's third law
- Transits of Mercury occur in May or November
- On June 3, 2014, the Mars rover Curiosity observed the planet Mercury transiting the Sun


# Popular Astronomy Club History 



NOVEMBER MEESTIMG - POPULAR ASTRONONX CLIB SATURDAY, NOVFOBER 23RD, 1946

TINE: 9:00 A.M.
This vill be our firat daytime meeting in the history of the olub, occasion being a partial eclipse of the sun.

Approximete local times of the eclipses (I say 'approximate' because I find no times given for any point anywhere near our locality).

$$
\begin{aligned}
& \text { Eclipse begins }-9: 30 \mathrm{~A} . \mathrm{M} . \\
& \text { Eclipse greatest }-11: 30 \mathrm{~A} . \mathrm{M} . \\
& \text { Eclipse ends }
\end{aligned}
$$

(See page 25 , November "Sky and Telescope" for map of eclipse).
At greatest point of eclipse the sun will be approximately $45 \%$ covered. Telescope will be equipped to project the 1mage of the sun on sicreen. This will onable a considerable number of people to vatch the progress of the oclipse and those interested may bring cameras and take pictures of 1 t .

Bring your lunoh along. Suggest that you bring prepared lunch as it vill probably be too oold to eat outdoors and tables vill be set up in the observatory meeting room. As usual, the Gambles vill furnish ooffec. An outdoor fire will be available in case some of the brave want to prepare a lunch and eat it outdoors.

Postponed Annual Meeting and business session after the eclipse, imediately following lunch. If veather is eloudy or atorny, please arrange to come to the megting anyvay. Vo vill have an interesting indoor program, and by all moans ve can not postpone our annual business meeting to a later date.

Leonld Moteors
Look for the an
look for the annual Leonid meteor shover the nights of November 14 th , 15 th , and 26 th , preferably the early morning hours of the 16 th .

Ve will report on the Nationsl Society Amsteur Astronomers League.
Ve vill report on the Meteor Shover of October 9th.
We vill report on unusual 1947 phenomens.
We vill report on the Telescope Makers class.
Telescope makers class is holding regular meetings. Anyone interested please contact Secretary Young,

There will be an opportunity to observe sunspots. At this writing there are numerous active sunspots and we may expect some aurora.

All in all, this should be a very interesting meeting.
Dress warm. There might be a wood sawing contest after the eclipse.

## TRANSPORTATION COMMITTEEE

John Schieck, Chairman - Tele. M-6661
Members or guests not having transportation, please communicate with Mr. Schieck.

AS USUAL, GUESTS ARE WELCOME.

POPULAR ASTRONOMY CLUB
C. H. GAMBLE, PRESIDENT

## The Morning Democrat July 31st, 1952

## Before Local Astronomers Say 'Saucers' Exist, Must Be Shown

Moline area astronomers Wednesday night agreed that before they would place any faith in the existence of "flying saucers," they would have to be shown.
"It seems that the saucers always seem to elude astronomers," C.H. Gamble, president of the Moline Astronomy Club, commented.
"Maybe that's because the astronomer usually understands what he see in the skies, he added.

None of the interested star fanciers attending the club's monthly meeting at Gamble's Sky Ridge Observatory, 3201 Coaltown Road, Moline, was willing to give any weight to the oft-times mentioned idea that the saucers come from another planet.

Peter Lauritzen, 830 43rd street, Rock Island, a featured speaker during the meeting on "Summer Constellations," disclaimed belief in the exitance of "saucers." He attributed such reports to "normal" heavenly phenomena.

In his talk he pointed out that by knowing your constellations, you can easily locate stars and other objects. He explained that the "other objects" referred to were not "saucers" by any means, but planets.

Another speaker, Paul Smith of Geneseo, discussed "The Universe Reduced to "Common Figures Scale," also had a word on "flying saucers." The word: "unlikely."

However, he added, if the "saucers" aren't secret missiles being tested by our or a foreign government, then there might be a pos-
(Continued on next page)

## Popular Astronomy Club History

(Continued from previous
sibility of some creatures from another world scouting around.

Smith, in his talk, commented that people rarely realize the relative distances between elements in outer space. To use "common figures" he took the hair.
"Say the earth is $1 / 40$ th the diameter of a human hair," he supposed. "Then the Moon is $1 / 150$ th of a a hair and only one hair away."

The Sun is about 30 hairs wide and on inch away from the earth, he continued.
"Our entire solar system would be two yards in diameter," he pointed out.

Using the same hair for the Earth, the closest star would be four miles away and the limit of the known universe would be one billion miles away. That may sound like a long way but actually, combing away the hairs, the farthest known stars are six trillion billion miles away, a figure even larger than the United States budget.

President Gamble spoke on "The Milky Way," showing that it is a galaxy of around 100 billion stars of which our Sun is one.

A picnic on the Gamble lawn preceded the meeting with over 50 attending.


NOT A SINGLE SAUCER - Three members of the Moline Astronomy Club are seen (above) Wednesday night as they scanned the skies at the Sky Ridge observatory - but nary a flying saucer did they see, or have they seen. Peter Lauritzen of Rock Island (center) points out a constellation r two while club President C.H. Gamble of Moline gets a good look through his 5 1/2- inch Zeiss reflector telescope and Paul Smith of Geneseo (left) looks on. (Morning Democrat photo)

Editors note: Thank you to Sara Sheidler for contributing these articles from the Popular Astronomy Clubs past.


## October 2019

## California and the Universe

Since early in the last century, astronomers dreamed of the clear sky over California as a place to unlock our imaginations and study the Universe. In 1917, the 100-inch Hooker telescope was opened to the poetry of Alfred Noyes, who wrote:

We creep to power by inches. ...Even tonight Our own old sixty has its work to do; And now our hundred-inch: I hardly dare To think what this new muzzle of ours may find.

And just think what the big telescope did find; among many other things, it revealed that our Universe was double the size we thought it was. Despite the fact that I have visited Mount Wilson many times, my most recent visit in September gave me an insight I hadn't experienced before. I was a guest of Scott Roberts, whose Explore Scien-

tific telescope company had organized an observing party there. The place literally oozes history through every stone, piece of wood, and gear revealing the progress of our understanding of the Universe as it increased during the 112 years since the observatory's founding in 1907.
During my visit there I felt as though I was standing next to some of these great astronomers, now long gone. I was standing next to George Ellery Hale as he struggled to build the Snow solar telescope, the mighty 60 -inch, and the 100 -inch Hooker telescope. I was standing next to Fritz Zwicky as he used the 100-inch on so many nights. Zwicky had quite the reputation as a curmudgeon. He might have included me among the many colleagues he called "spherical bastards" meaning a bastard no matter which angle or prism you choose to look through.
I was standing next to Walter Baade. There is a story that, at the outbreak of the second world war, he was declared an enemy alien and ordered to stay near his Pasadena home. Since he, or someone, allowed the vicinity of Pasadena to include Mount Wilson, Baade essentially enjoyed three years of uninterrupted observing time on the 100-inch. With Los Ange-
 les under occasional blackout conditions that darkened the Mount Wilson sky still further, Baade made his crucial observations of individual variable stars in the Andromeda Galaxy that he, and Bart Bok, later used to determine the size and shape of our own Milky Way Galaxy.
George Ellery Hale was unsatisfied with the size and abilities of the big 100-inch telescope, and he longed for a much larger one. He hired Russell Porter, the amateur astronomer who had founded the Stellafane telescope makers meeting in 1925, to work on a 300inch telescope. When that was deemed impractical, a 200 -inch telescope was built instead. Porter's drawings of the 200 -inch were stupendous. Realizing that the 100 was unable to reach the north celestial pole due to its English double yoke mount design, he envisaged a beautiful and elegant horseshoe design so that the 200 -inch could point right at the pole if needed. Even the lowly 18 -inch Schmidt camera telescope, the first telescope at Palomar, made history as the instrument Zwicky used to discover 100 supernovae in distant galaxies, and, near the end of its useful life, it was the telescope used in the discovery of Comet Shoe-maker-Levy 9.
I close with a variation of a quotation by Sir Kenneth Clark. What defines the great observatories that look to the stars and revolutionize our understanding of them? I don't know. But I know them when I see them. And the observatories at Mounts Wilson and Palomar are them.

# ASTRONOMY IN PRINT 

# The transit of Mercury, November 10th, 2019 

By Terry Dufek

Mercury, the smallest and fastest moving planet in the solar system is appropriately named for the Greek god of speed and gets our attention during the month of November. A transit (or crossing) of Mercury across the Sun will occur on November 11, 2019 from sunrise, 6:48 am. until 12:07 pm. Transits are relatively rare events. This will be the first one since 2016 and the next one will not occur until 2032. During a transit, Mercury appears as a tiny black dot moving across the large disk of the Sun as viewed through a specially equipped telescope allowing safe viewing of the Sun. This transit will have started just before sunrise in the Quad Cities. The length of time for the transit can vary due to where the planet is crossing across the face of the Sun. As seen from the Earth, only transits of Mercury and Venus are possible.
Transits of Mercury are common, with 13 happening in the 21 st century. Venus transits are very rare at about 2 per century and they have already occurred this century. No more will occur until the 22nd century. The reason transits of Mercury with respect to Earth are much more frequent than transits of Venus is because Mercury is much closer to the Sun and it orbits more rapidly (about 4 times per our year). Transits of Mercury can only occur when the Earth is aligned with a node or point at which Mercury's orbit crosses the path of the sun. Most of the time now that occurs in either May or November. This transit will be widely visible from most of Earth including the Americas, the Atlantic and Pacific Oceans, New Zealand, Europe, Africa and western Asia.

IMPORTANT: Since Mercury is only 1/194 of the Sun's apparent diameter, a telescope with a magnification of 50 x or more is recommended to watch this event. The telescope MUST HAVE an adequate solar filter certified for safe viewing of the Sun, otherwise your eyes will be damaged without it. Don't use any homemade versions as damage can be severe. It is basically the same cautions that must be taken as during a total solar eclipse.

The German astronomer Johannes Kepler (1571-1630), was the first human to successfully predict transits of both Mercury and Venus. His calculations of planetary motions were based largely on observations from Tycho Brahe. Kepler accurately predicted a transit of Mercury on November 7, 1631, and a transit of Venus just a month later, on Decem-
ber 6th. He died before being able to observe either of the events. A priest/astronomer Pierre Gassendi (1592-1665), witnessed the transit of Mercury. He became the first human to view a planetary transit with a clear understanding of exactly what he was seeing. Gassendi did not see the Venus transit because it was not visible in Europe. Jerimiah Horrocks and William Crabtree became the first to witness a transit of Venus.

Edmund Halley, of Halley's Comet fame, first realized that transits could be used to measure the Sun's distance, and thereby establishing the scale of the solar system from Kepler's third law. Nevertheless, the 1761 and 1769 expeditions to observe the transits of Venus gave astronomers their first good value for the Sun's distance from Earth.

During the transit, time measurements such as 1 st and 2 nd contact (right and left side of the planet's touching (ingress) of Sun's limb and 3rd and 4th contact (right and left side of planet last touching (egress) of Sun's limb become important. They help us with investigations of the Earth's rotation, measuring the mass of Mercury, and checking for changes in the Sun's radii.

During the last transit, NASA studied Mercury's thin sodium atmosphere. Sodium in the exosphere absorbs and re-emits a yellow-orange color from sunlight, and by measuring that absorption we can learn about the density of gas there. The atoms in Mercury's exosphere come from the surface of Mercury itself. They are blasted into space by solar radiation, solar wind bombardment and meteoroids. This gives Mercury a comet-like tail stretched out as long as 1.2 million miles.

If you would like to see one of nature's rare events, come out to the Niabi Zoo parking lot on the morning of the $11^{\text {th }}$. The Popular Astronomy Club will set up telescopes and have the PACMO (our mobile observatory) on site. Weather permitting, we will folIow Mercury's journey across the face of the Sun until noon.

You can also, join us, The Popular Astronomy Club, every third Saturday evening at the Niabi Zoo (March thru November- weather permitting). Check out our website at: popularastronomyclub.org and on Facebook under "Popular Astronomy Club, Inc. Quad Cities". You can also join us for our monthly meetings at the Butterworth Center, Moline. It is every second Monday (excluding August and October) at 7:00PM. Everyone with a curiosity about Astronomy is welcome!!

# UPCOMING EVENTS 

## November 11th, 2019

## PAC regular meeting at Butterworth Center at 7:00 PM. Constellation Report by Roberta Wright. Program: lan Spangenberg

LINK to map of Butterworth
Center complex.
We are in
building B

- November 2nd, 2019 -Visit to Bryan Raser's Observatory in Prophetstown. If you are interested in helping with the Castle Observatory upgrades, please try to come. Let's try to do some observing if we can.
- November 5th, 2019 Free Lecture "Reaching for the Stars" on Tuesday, November 5th at 7:00pm in Olin Auditorium , Augustana University, presented by Mr. José Hernández
- November 11th, 2019 Transit of Mercury at Niabi Zoo Sunrise
- November 16th. 2019 Niabi Observing Night.
- December 9th, 2019 PAC Business meeting and election of Officers- Year in Review by Roy Gustafson
- January 13th, 2020 PAC regular meeting at Butterworth Center at 7:00 PM.
- February 10th, 2020 PAC regular meeting at Butterworth Center at 7:00 PM.
- March 9th, 2020 PAC Business meeting at Butterworth Center at 7:00 PM.
- April 13th, 2020 PAC regular meeting at Butterworth Center at 7:00 PM.
- May 11th, 2020 PAC regular meeting at Butterworth Center at 7:00 PM.
Mark your calendars and watch upcoming
e-mails for more information!
Newspaper Articles 2019-2020
Nov Terry Dufek
Dec Jeff Struve
Jan Open
Feb Open
Mar. Ian Spangenberg
Constellation Reports 2019-2020
Nov Roberta Wright
Dec Dale Hachtel
Jan Terry Dufek
Feb. Open
Mar. Open
Apr. Ian Spangenberg
Programs 2019-2020
Nov lan Spangenberg TBD
Dec Year in Review-Roy Gustafson
Jan Wayland Bauer
Feb. Terry Dufek
Mar Open
Apr Open
May Ian Spangenberg
Editors Note: If you are interested in contributing/
participating in the above programs, please let Di-


## ASTRONOMICAL CALENDAR OF EVENTS

adjusted for Daylight Savings Time
when applicable
Nov 01 16:40 Moon at Descending Node
Nov 02 02:31 Saturn $0.6^{\circ} \mathrm{N}$ of Moon
Nov 04 04:23 FIRST QUARTER MOON Nov 05 18:00 S Taurid Meteor Shower Nov 07 02:37 Moon at Apogee: 405060 km
Nov 09 13:18 Venus $3.8^{\circ} \mathrm{N}$ of Antares
Nov 09 17:07 Mars $2.6^{\circ} \mathrm{N}$ of Spica
Nov 11 09:00 Mercury at Inferior Conjunction (TRANSIT)
Nov 12 07:34 FULL MOON
Nov 12 17:00 N Taurid Meteor Shower Nov 13 21:52 Aldebaran $3.0^{\circ}$ S of Moon Nov 16 00:00 Mercury at Perihelion Nov 16 02:48 Moon at Ascending Node Nov 17 05:41 Pollux $5.4^{\circ} \mathrm{N}$ of Moon Nov 17 23:00 Leonid Meteor Shower Nov 18 04:11 Beehive $0.9^{\circ} \mathrm{S}$ of Moon Nov 19 15:11 LAST QUARTER MOON Nov 19 17:24 Regulus $3.7^{\circ} \mathrm{S}$ of Moon Nov 23 01:54 Moon at Perigee: 366721 km
Nov 24 03:02 Mars $4.3^{\circ} \mathrm{S}$ of Moon Nov 24 20:50 Mercury 1.9º of Moon Nov 26 09:06 NEW MOON
Nov 28 04:00 Mercury at Greatest Elongation: $20.1^{\circ} \mathrm{W}$
Nov 28 04:49 Jupiter $0.7^{\circ} \mathrm{S}$ of Moon Nov 28 12:50 Venus 1.9º S of Moon Nov 28 22:13 Moon at Descending Node Nov 29 15:12 Saturn $0.9^{\circ} \mathrm{N}$ of Moon
 the $30^{\text {th }}$. There is a transit of Mercury across its surface on Nov. $11^{\text {th }}$.
Mercury is in Libra on Nov. $1^{\text {st }}$. (mag. .71, 8.7", illuminated $26.7 \%$ ) Mercury lies very low in the W-SW after sunset but too low for viewing. It transits the Sun on Nov. $11^{\text {th }}$. By the $30^{\text {th }}$, Mercury is about $9^{\circ}$ off the SE horizon at 6:15 AM. (see next page)

Venus is in Scorpio on Nov. $1^{\text {st }}$. (mag. -3.84, 10.69", illuminated $93.7 \%$ ) Venus is low in the W-SW after sunset. It is $5^{\circ}$ off the horizon. Using Venus, it can be easy to find Mercury which is just below by $3^{\circ}$. On Nov. $23^{\text {rd }}$, Venus passes just under Jupiter by $11 / 2^{\circ}$ (see next page).
Mars is in Virgo on Nov. $1^{\text {st }}$. (mag. 1.78, 3.69"). Mars is $7^{\circ}$ off the E-SE horizon at 6:30 AM. It stays about the same height, at the same time sliding more toward the SE through out the month. On the $24^{\text {th }}$ a late phase Moon is close by to the left of the planet by about $3^{\circ} 49^{\prime}$.
Jupiter is in Ophiuchus on Nov $1^{\text {st }}$. (mag. -1.90 , dia. $33.3^{\prime \prime}$ ) It is low in the SW, $12^{\circ}$ off the horizon at 7 PM. It moves steadily toward the horizon throughout the month. It has a close encounter with Venus on the $23^{\text {rd }}$. (See Venus)
Saturn Is in Sagittarius on Nov $1^{\text {st }}$. (mag. .57, dia 15.98 ", rings $37.2^{\prime \prime}$ ) It is in the S-SW sky $221 / 2^{\circ}$ off the horizon. The early phase Moon is just to the right of the planet by $41 / 2^{\circ}$ (see next page). The early Moon passes again close to the planet on the $29^{\text {th }}$ by about $2^{\circ}$. (see next page)
Uranus is in Aries on Nov $1^{\text {st }}$. (mag. 5.67, dia 3.74"). It is in East at about $14^{\circ} 22^{\prime}$ above the horizon at 7 PM. It gains height to $36^{\circ}$ above the horizon by the end of the month, at the same time.
Neptune is in Aquarius on Nov. $1^{\text {st }}$ (mag. 7.85, 2.33") It is in SE sky, about $31^{\circ} 14^{\prime}$ above the horizon.
At 7 PM. By month end, the planet has moved a little more to the south and a little higher $\left(10^{\circ}\right)$ in the sky.
Pluto is in Sagittarius on Nov. $1^{\text {st }}$ (mag. 14.34, dia . 10 "). It is about $5^{\circ}$ to the East of Saturn at 7 PM. Vesta is in Taurus on Nov. $1^{\text {st }}$ (mag. 6.6). It is above the eastern horizon by about $19^{\circ}$ at $9 P M$. By month end it has moved into Cetus.



## Navigating the November Night Sky

For observers in the middle northern latitudes, this chart


Navigating the November night sky: Simply start with what you know or with what you can easily find.
1 Face south. Almost overhead lies the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend a line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the south. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second brighest star in the south.
2 Draw a line westward following the southern edge of the Square until it strikes Altair, part of the "Summer Triangle."
3 Locate Vega and Deneb, the other two stars of the Summer Triangle. Vega is its brightest member, while Deneb sits in the middle of the Milky Way.
4 Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, then to Perseus, and finally to Auriga with its bright star Capella.

## Binocular Highlights

A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a 'fuzzy" oval. Di Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas. E. The Double Cluster.

Astronomical League www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.

If you can observe only one celestial event this month, see this one:


## Mercury's transit across the sun on November 11

You must properly use an approved solar filter! Never look at the sun without one, even for a split-second!

## View the Mercury Transit on Nov. 11:

1. Do not use the filters from solar eclipse glasses as a filter for binoculars or a telescope - either in front of the objective or behind the eyepiece. These filters are not designed for this. They are not safe to use in this manner!
2. Binoculars will not give enough magnification for a satistying view.
3. Use a telescope fitted with an approved solar filter mounted in front of the objective lens, as would be done when viewing sunspots.
4. A magnification of 50 x or more is suitable.
5. Mercury will appear as a jet-black round dot taking over five hours to traverse the sun's disk.
6. East coast viewers can see the entire event weather permitting. West coast viewers can only see the second half.

Transits of Mercury aren't rare, but they aren't common, either, with about 13 per century. The next one occurs on November 13, 2032. Sorry, people in North America will not be able to view it because it begins at $1: 30 \mathrm{a} . \mathrm{m}$. EST and ends before sunrise.

Stay tuned for a different, but equally fascinating event that occurs on Nov. 24!


From in the sky.org

## Spotlight: NGC 7331\& The Deer Lick Group

- NGC 7331 is an unbarred spiral galaxy about 40 million lightyears away in the constellation Pegasus
- was discovered by William Herschel in 1784
- NGC 7331 is the brightest member of the NGC 7331 Group of galaxies
- also called the Deer Lick Group, and contains four other members; NGC 7335, NGC 7336, NGC 7337 and NGC 7340, affectionately referred to as the "fleas".
- Although visible in large binoculars, it was missed by Messier.
- NGC7331 is similar in size and structure to the Milky Way, and is often referred to as "the Milky Way's twin" (Recent discoveries about the Milky Way have put that distinction in doubt) The primary difference between our galaxies is that NGC 7331 is an unbarred spiral galaxy
- In spiral galaxies the central bulge typically co-rotates with the disk but the bulge in the galaxy NGC 7331 is rotating in the opposite direction to the rest of the disk



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!

## The Messenger Crosses the Sun: Mercury Transit 2019 By David Prosper

Did you know that there are two other objects in our skies that have phases like the Moon? They're the inner planets, found between Earth and the Sun: Mercury and Venus. You can see their phases if you observe them through a telescope. Like our Moon, you can't see the planets in their "new" phase, unless they are lined up perfectly between us Earthlings and the Sun. In the case of the Moon, this alignment results in a solar eclipse; in the case of Mercury and Venus, this results in a transit, where the small disc of the planet travels across the face of the Sun. Skywatchers are in for a treat this month, as Mercury transits the Sun the morning of November 11!


Photo of the May 9, 2016 transit of Mercury. Mercury is the small dot on the center right. Note how tiny it is, even compared to the small sunspot on the center left. Credit: Dave Huntz

You may have seen the transit of Venus in 2012; you may have even watched it through eclipse glasses! However, this time you'll need a solar telescope to see anything, since eclipse glasses will only reveal the Sun's blank face. Why is that? Mercury is the smallest planet in our solar system, and closer to the Sun (and further away from Earth) during its transit than Venus was in its 2012 transit. This makes Mercury's disc too small to see without the extra power of a telescope. Make absolutely certain that you view the transit via a telescope


This photo from the same 2016 transit event shows Mercury a bit larger, as it should; it was taken at a higher magnification through a large 16 inch telescope! Credit: J. A. Blackwell
equipped with a safe solar filter or projection setup. Do NOT combine binoculars with your eclipse glasses; this will instantly burn a hole through the glasses - and your eyes! While most people don't have solar telescopes handy, many astronomy clubs do! Look for clubs host-
(continued on next page)


## NASA Space Place Partner Article

ing Mercury transit observing events near you at bit.ly/findnsn (USA) or at bit.ly/awbtransit (worldwide). What a fun opportunity to see another planet during the day! This transit is expected to last over five hours. Folks on the East Coast will be able to watch the entre transit, weather permitting, from approximately 7:35 am EST until around approximately 1:04 pm EST. Folks located in the middle of North America to the west coast will see the transit already in progress at sunrise. The transit takes hours, so if your weather is cloudy, don't despair; there will be plenty of time for skies to clear! You can find timing details and charts via eclipse guru Fred Espenak's website: bit.ly/mercurytransit2019 Mercury's orbit is small and swift, and so its position in our skies quickly changes; that's why it was named after the fleet-footed messenger god of Roman mythology. In fact, if you have a clear view of the eastern horizon, you'll be able to catch Mercury again this month! Look for it before dawn during the last week of November, just above the eastern horizon and below red Mars. Wake up early the morning of November $24^{\text {th }}$ to see Mars, the Moon, and Mercury form a loose triangle right before sunrise.


## CONTRIBUTIONS

Popular Astronomy Club, Inc. - Quad Cities
Published by Terry Dufek [?] • $3 \mathrm{hrs} \cdot(\mathbf{c}$


Fantastic things in the world
14 hrs - ©
Moonrise Reflection *) Knights Ferry, California.
mel by: @a_guy_named_eric [IG]


## NGWSLIVRS

Neil Armstrong's Sons Help Open Exhibit of Father's Spacecraft in Cincinnati
October 2nd, 2019
CLICK HERE for link to News Article

Is Our Solar System's Mysterious 'Planet 9' Really a Grapefruit-Size Black Hole?
October 2nd, 2019

CLICK HERE for link to News Article

20 new moons discovered orbiting Saturn

October 7th, 2019

CLICK HERE for link to News Article

Astronomers show how supergiant stars repeatedly cool and heat up

October 10th, 2019

CLICK HERE for link to News Article

## $\triangle$ TM S M M S

# Venus May Not Have Been As Earthlike As Scientists Thought 

October 15th, 2018
CLICK HERE for link to News Article


Interstellar Comet Borisov Looks Pretty Normal, New Observations Suggest

October 15th, 2019

CLICK HERE for
link to News Article

The clumpy and lumpy death of a star
October 17th, 2019

CLICK HERE for
link to News Article

Ancient stars shed light on Earth's similarities to other planets

October 17th, 2019

CLICK HERE for
link to News Article

## NGWSLINKS

Massive Star-Forming Galaxy Spotted in Early Universe

October 23rd, 2019

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CLICK HERE for link to News Article
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Beyond Jupiter, researchers discover a 'cradle of comets'

October 24th, 2019

CLICK HERE for
link to News Article

Astronomers See Strontium in the Kilonova Wreckage, Proof that Neutron Star Collisions Manufacture Heavy Elements in the Universe
October 24th, 2019
CLICK HERE for link to News Article

Telltale signs of a planetary collision in binary star system

October 24th, 2019

# Member Observations 

# Paul Castle Observing Session October 8th, 2019 

Attached is a photo of the group that convened at the Paul Castle Memorial Observatory to take advantage of the rare but beautiful clear fall evening last night. Shown in the (Continued in next column)
photo are Al Sheidler, Chris Nordick, Wayland Bauer, Rusty Case, Dale Hachtel, and Dave Smith. Terry Dufek joined the group later after he arrived. Our intent was to attempt to observe the list of objects in NCRAL's Fall seasonal Messier Observation list. Though we had a bright, gibbous moon, we went ahead and gave it a good college try.
Al Sheidler


Autumn 2019 Seasonal Messier Marathon
Telescope(s) used: 10" Meade LX200 goto
Eyepiece(s) used: $56 \mathrm{~mm}, 40 \mathrm{~mm}, 26 \mathrm{~mm}, 32 \mathrm{~mm}+2 x$ Barlow
Observer: Alan Sheidler
NCRAL Affiliation: Popular Astronomy Club Date(s) of Observations: October 8th, 2019

Location: Paul Castle Memorial Observato-

Magnification(s) used: 45, 62.5, 96, 156X
Field(s) of view: $1.25,0.9,0.58 \& 0.36$ deg
Moon phase: waxing gibbous ( $\sim 11.5$ days)
Seeing: 3/5
Transparency:

Editors Note: Al saw all the objects on the list and achieved the 1st award for the "Autumn 2019 Seasonal Messier Marathon (see page 5)

| Sequence | Messier <br> No. | Object <br> Type | Common <br> Name | Constellation |
| :---: | :---: | :---: | :--- | :--- | | Time |
| :---: |
| Ob- | notes



## MGmber Observations

## Paul Castle Observing Session <br> October 22nd, 2019

Wayland Bauer and Terry Dufek went out to Paul Castle to complete the NCRAL's Fall seasonal Messier Observation list. The sky rapidly cleared at sunset though it was very windy. There was good transparent and average seeing. After a while, the wind began to diminish and they began to complete the list of the 27 items on the list. There was no problem with most of the items though they crossed checked each others views on the really faint objects to be sure. At the end of the evening all objects on the list were viewed by both Wayland and Terry.

Also attending were Tim, Alex and Hugh Holt. They brought their Astroscan telescope and were viewing in the Milky Way area. Alex also did a sketch of M33 which closely matched what we were viewing. A central bulge along with long curving arms. Alex did see a meteor as did Terry. Neither were an Orionid.

We wrapped up around 9 PM as it was getting colder and a wind chill was taking effect.

AUTUMN 2019 SEASONAL MESSIER MARATHON
Observer: Terry Dufek
NCRAL Affiliation: Popular Astronomy Club
Date of Observation: October 22 ${ }^{\text {nd }}, 2019$
Location: Paul Castle Observatory

| Sequence | Messier \# | Object Type | Common Name | Constellation | time Observed |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 55 | GCl |  | Sagittarius | 7:21pm |
| 2 | 69 | GCl |  | Sagittarius | 7:24 pm |
| 3 | 70 | GCl |  | Sagittarius | 7:29 pm |
| 4 | 75 | GCl |  | Sagittarius | 7:30 pm |
| 5 | 11 | OCl | Wild Duck Cluster | Scutum | 7:33 pm |
| 6 | 26 | OCl |  | Scutum | 7:35 pm |
| 7 | 56 | GCl |  | Lyra | 7:39 pm |
| 8 | 57 | PIN | Ring Nebula | Lyra | 7:40 pm |
| 9 | 71 | GCl |  | Sagitta | 7:41 pm |
| 10 | 27 | PIN | Dumbbell Nebula | Vulpecula | 7:46 pm |
| 11 | 29 | OCl |  | Cygnus | 7:50 pm |
| 12 | 39 | OCl |  | Cygnus | 7:53 pm |
| 13 | 2 | GCl |  | Aquarius | 7:56 pm |
| 14 | 72 | GCl |  | Aquarius | 7:58 pm |
| 15 | 73 | OCl | group of 4 stars | Aquarius | 8:01 pm |
| 16 | 15 | GCl |  | Pegasus | 8:04 pm |
| 17 | 30 | GCl |  | Capricorn | 8:06 pm |
| 18 | 52 | OCl |  | Cassiopeia | 8:08 pm |
| 19 | 103 | OCl |  | Cassiopeia | 810 pm |
| 20 | 31 | Gal | Andromeda Galaxy | Andromeda | 8:14 pm |
| 21 | 32 | Gal | comp to Andromeda | Andromeda | 8:16 pm |
| 22 | 110 | Gal | comp to Andromeda | Andromeda | 8:19 pm |
| 23 | 33 | Gal | Triangulum Galaxy | Triangulum | 8:23 pm |
| 24 | 74 | Gal | Phantom Galaxy | Pisces | 8:26 pm |
| 25 | 77 | Gal |  | Cetus | 8:33 pm |
| 26 | 34 | OCl |  | Perseus | 8:43 pm |
| 27 | 76 | PIN | Little Dumbbell | Perseus | 8:47 pm |

The 83rd annual Popular Astronomy Club was held on October 12th, 2019 at the Butterworth Center. 35 members and guests attended the festivities. There was a late start to banquet after a small snafu with the food being delivered by HyVee but eventually everyone was enjoying some good food and company.

The guests moved on to the meeting room area where a talk was given by our own Roy Gustafson about he and Jan's trip to South America in July to view the total solar eclipse. He also talked about some eclipse mechanics and also how you could hear an eclipse if you were blind.

The attendance drawing for the year was then held and the winner was Wayland Bauer of a $\$ 25$ Applebee's gift card.

Al then presented appreciation, outreach and member of the year awards. Alex and Mary Holt, along with Mark Pershing received their Astronomical League Basic Level Outreach awards and pins.

Al then thanked the present board of directors for their contributions during the past year.

A warm thank you went out to the Nordick family for their support of the Popular Astronomy Club the last ten years. Al said a thank you to Anne Bauer who has cheerfully participated to make our outreach efforts a success and bring astronomy knowledge to the public. An acknowledgement went out to the Nelson family and particularly Lillian Nelson for their support of the Popular Astronomy Club through the years.

Al then reviewed all contributions from members this last year through presentations, constellation reports, newspaper articles and contributions to the newsletter.

An acknowledgment went out to Terry Dufek who created the current NCRAL logo, now in use.
A review was done of PAC activities the past year. An acknowledgement went out to the contributions of the NCRAL 2019 committee and all members that supported a great conference. A thank you to Wayland and Anne Bauer for chairing the 2019 picnic committee. A review was made of all members and their years in the Popular Astronomy Club.

The member of the year was then announced to be Dale Hachtel. It was for his attendance of outreach events, participation on PAC committees and
(Continued in next column)


Registration

participation in observing events and activities. An acknowledgement by Dale that a lot of this was done with help from his wife, Joanne.

A thanks was given to Jeff Struve and QCAS for their help .

An acknowledgement was made for our Imagination Station Outreach in March, which was our biggest event of the year.

A photo was shown of the picnic cake representing 2 events, 50 years since the landing on the moon and 52 years for Wayland and Anne having been married.

The banquet then adjourned following with drawing of the prizes. It was a great event and looking forward to next year..

## Terry Dufek




Drawing Prizes on Display


Good Food- Good Company!

(Continued in next column)


Many thanks to Sara Sheidler for rounding up a fine buffet!!

(Continued on next page)

(Continued in next column) 34


Roy Gustafson, keynote speaker, gave a talk on his eclipse trip to South America, eclipse mechanics and how to hear a solar eclipse.


The attendance award for the year was presented to Wayland Bauer. The prize was a \$25 Applebee's Gift Card.
(Continued on next page)



Alex and Mary Holt receiving an outreach achievement award for 2019


Mark Pershing receiving an outreach achievement award for 2019
(Continued in next column)


## CONGRAYULAHONSE

## Member Years of Service

## PAC MEMBER

Mark Schroeder
YEARS

Joel Carter
John Douglas
Roberta Wright
Lanny Wright
Cindy Pippert 39
34Frank Stonestreet
Al Sheidler ..... 31
25-29 years
Don Anderson ..... 29
John Weber ..... 28
Liz Robinson ..... 28
Brad Smith ..... 27
Roy Gustafson ..... 26
Gerry Pearson ..... 26
Lee Farrar ..... 25
20-24 years
Sara Sheidler ..... 24
15-19 years
Jan Gustafson ..... 19
Anne Bauer ..... 18
Wayland Bauer ..... 18
Mel Shroeder ..... 15
Gail Sederquist, ..... 15
10-14 years
Ken Boquist ..... 13
Rusty Case, ..... 10
Eric Sheidler ..... 10
Mike \& Helen Haney ..... 10
5-9 years
Dino Milani ..... 9
Mitchell Milani ..... 9
Ellen Milani (Tsagaris) ..... 9
Gary Nordick ..... 9
Christina Nordick ..... 9

PAC MEMBER
Ben Nordick ..... 9
Ally Nordick ..... 9
Bryan Raser ..... 7
Thom Sederquist ..... 7
Adam Beals ..... 5
Nancy Boelens, ..... 5
Katie Melbourne ..... 5
0-4 years
Mike Ombrello ..... 4
Terry Dufek ..... 4
Jeff Struve ..... 4
Joan Struve ..... 4
lan Spangenberg ..... 4
Mike Mack ..... 3
Mike Gacioch ..... 3
Wanda Gacioch ..... 3
Dale \& Joanne Hachtel ..... 3
Dr. Lee Carkner ..... 2
Craig Cox ..... 2
Holt Family, Tim, Mary, Alex, Hugh ..... 2
Mark Pershing ..... 2
Paul Levesque ..... 2
Mike Dannenfeldt ..... 1

## conymiruironss

## Constellation Reports

Roberta Wright (Nov)
Roy Gustafson (Dec)
Dino Milani (March)
Terry Dufek (May) Alex Holt (June)
Frank Stonestreet (July)
Ali Nordick (Sept)

## Presentation Reports

Mike Dannenfeldt -potpourri presentation (6/2019)
Roberta Wright - Time (3/2019); potpourri presentation (6/ 2019); potpourri presentation (book review: Whoosh (9/2019)
Jeff Struve - historical coins/ astronomy (3/2019); exo planets and spectroscopy (5/ 2019); moon info (7/2019)
lan Spangenberg - Callisto (1/2019); NCRAL 2019 presentation report (5/2019); potpourri presentation (Space Flight Museum) (9/2019)
Gerald Pearson- international dark skies (4/2019)
Dino Milani- NCRAL 2019 presentation (5/2019); potpourri presentation (Foucault pendulum/ Apollo 12) (9/2019)
Katie Melbourne- NCRAL presentation report (5/2019)
Alex Holt- potpourri presentation (poem: A Splash of Color) (9/2019)

Dale Hatchel - tree of life by tiffany (3/2019); potpourri presentation (6/2019)
Roy Gustafson - 2018 year in pictures (12/2018); NCRAL 2019 presentation report (5/2019)
Terry Dufek- Planetary photography (1/2019); NCRAL 2019 presentation (5/2019); potpourri presentation (6/2019); potpourri presentation "Asteroids (9/2019)
Rusty Case- NCRAL 2019 presentation report (5/2019)
Lee Carkner- NCRAL 2019 presentation report (5/2019)
Wayland Bauer- potpourri presentation (6/2019)
Anne Bauer- space exploration /women in the club (3/2019)


## cony:ribuironss

## Contributions to Reflections Newsletter

Wayland Bauer- photos submitted for reflections (8/2019)
Ken Boquist- reflector (12/2018); Mars/ Neptune conjunction (1/2019) reflections; Comet Wirtanen observations and photo (1/2019) ; Comet Wirtanen observations and photo (1/2019) ; Sun report/photo (2/2019); Photos submitted (Feb 8th) (2/2019); Solar Photos submitted (2/2019)
Joel Carter- contribution to the reflector (8/2019)


John Douglas - Videos of NCRAL 2019
Roy Gustafson- outreach write up (12/2018); reflections (1/2019); photos submitted to reflections (2/2019)
Dale Hatchel - write up Putnam outreach (12/2018)
Joanne Hatchel - write up Putnam outreach (12/2018); PAC QCESC Program article reflections (3/2019)
Paul Levesque - My visit to the Museo Galileo (Galileo Museum) (2/2019)
Mike Mack- reflector (12/2018); Moon impact (3/2019)
Dino Milani- photos submitted to reflections (2/2019)
Gerald Pearson- Kitt Peak (4/2019)
Al Sheidler- comet Wirtanen; Early morning Venus/Moon/Jupiter Report (2/2019);
photos submitted to reflections (2/2019)

## Annual PAC Picnic Committee <br> Wayland and Anne Bauer for 2019



NCRAL 2019 Planning Committee
Wayland and Anne Bauer
Al and Sara Sheidler
Roy and Jan Gustafson
Dale and Joanne Hatchel
Dino Milani
Wanda Gacioch
Terry Dufek


Rusty Case
Cindy Pippert (t shirt design)

## NCRAL 2019 Major PAC Sponsor Mike Mack

## NCRAL 2019 Chairman Mike Gacioch

## NCRAL 2019 Support Team

Mary, Alex and Hugh Holt
Gail \& Thom Sederquist
Mitchell Milani
Paul Levesque
Eric Sheidler
John Douglas
Jeff Struve (Menke Observatory)
Lee Carkner (John Deere Planetarium) lan Spangenberg
Mark Pershing Nancy Boelens

Thank you for your interest in the Popular Astronomy Club. To renew your membership or to apply as a new member, Please fill in the information and either mail this form to the address below, or bring it to a PAC event. The membership year runs from October 1st through September 30th. There is a pro-rated amount if you join anytime during the year (see below). Our club newsletter, REFLECTIONS, will be e-mailed to you and it will be posted on the club website.

Submission of this application and payment confirms the applicant's agreement to abide by the policies
and procedures detailed in the PAC Policy \& Procedures Document available at our website: www.popularastronomyclub.org.

Membership pro-rated amount by month:
Oct-\$30.00, Nov-\$27.50, Dec-\$25.00, Jan-\$22.50, Feb-\$20.00, Mar-\$17.50, Apr-\$15.00, May-\$12.50, Jun\$10.00, Jul-\$7.50, Aug-\$5.00, Sep-\$2.50

PAC renew or new member:
(a) Regular Membership
\$ $\qquad$
(b) Additional family member (\$7.50 each) x (\#) $\qquad$ \$ $\qquad$
Or you can elect c, d, or e (this includes the $\$ 30.00$ membership, with the balance a tax deductible gift to PAC):
(c) Supporting Member
$\$ 40.00$
\$ $\qquad$
(d) Sustaining Member
$\$ 60.00$
(e) Patron Member
$\$ 80.00$
\$ $\qquad$
\$ $\qquad$
$\qquad$
$\$ 10.00$
(f) Student Member
(g) Astronomy Magazine (call the club treasurer for rate)
\$

$$
\text { Grand Total }(a+b+c+d+e+f+g)=
$$

\$ $\qquad$

Your Name: $\qquad$
Address: $\qquad$
City $\qquad$ State $\qquad$ Zip $\qquad$
E-Mail $\qquad$
Home Phone: $\qquad$ Cell Phone $\qquad$
Please enter name (s) of ADDITIONAL FAMILY MEMBERS:

## THANK YOU!! Welcome to the Popular Astronomy Club!!

Make your check payable to the Popular Astronomy Club, Inc. Mail or present at a PAC meeting to:
Dale Hachtel (dale_hachtel@msn.com)
1617 Elm Shore Drive
Port Byron Illinois, 61275
614-935-5748

