



# Reflections

The Newsletter of the Popular Astronomy Club

ESTABLISHED 1936



October 2020

## President's Corner October 2020



Welcome to the Popular Astronomy Club's October Newsletter. October is significant for PAC for a number of reasons. First, this October marks the Eighty-fourth year since the founding of the Popular Astronomy Club. That's a long time for any organization and is certainly worthy of celebration at our club "virtual banquet" on October 24<sup>th</sup>. This year, the banquet will be conducted using Zoom, so it will not be an in-person meeting, and the banquet will feature a feast for the mind rather than the stomach. The featured guest speaker is Lisa Wells, Remote Observer for the Canada-France-Hawaii Telescope located on the summit of Mauna Kea on the big island of Hawaii. Ms. Wells' talk, "An Astronomer's Life", will highlight her career in Astronomy from humble beginnings in the Quad Cities to working at several world class observatories. This talk will be informative about her accomplishments and inspirational for anyone inclined to pursue a career in the science of astronomy. In addition to this talk, there will also be a number of awards given out in recognition for club member accomplishments and contributions (of

(Continued in next column)

which there are many). You won't want to miss this year's virtual banquet. Watch your email for a reminder and link to the Zoom meeting (October 24<sup>th</sup>, 7:00pm Moline Time).

I would also like to point out we already have a number of speakers tentatively signed up to provide talks into the New Year. November will feature a talk entitled "Exploring Pluto after New Horizons: Oceans, Volcanism, and Habitability at the Edge of the Solar System", by Adeene Denton, PhD student from Purdue University. For December, PAC member Roy Gustafson will provide the program "Year in Review". January is tentatively planned to be "Cosmic Horizons" by Chuck Allen, Vice President of the Astronomical League. The rest of 2021 is shaping up too and you can see all of the proposed talks here in this newsletter. While you are perusing this list, please consider signing up to do a newspaper article, a constellation report or a smorgasbord topic. These are great opportunities for you to do some research on a topic, write an article and/or do a talk for one of the club meetings. The next year will be a good one and with your help it will be a great one!

We are also in need of volunteers to be trained to use the newly refurbished Paul Castle Observatory. Rusty Case, Terry Dufek, Dale Hachtel and I are fully trained and qualified to use the ob-

(Continued on next page)

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servatory and the new telescope. This is an impressive facility but very easy to operate. Come out to one of the observing sessions we will have this fall and see one of us to get trained on the operation of the observatory. If you haven't done so already, try doing the NCRAL Fall Messier Mini Marathon. Paul's Observatory is the perfect tool to observe all 28 objects in one evening. There is an award for completion of one of these Mini Marathons. It's a great excuse (if you need one) to get out under the stars and do some observing.

In addition to marking the end of PAC's fiscal year, October is also time to renew your membership. A membership form is included here in this newsletter, so don't delay in filling it out and sending it in to Dale Hachtel, your club Treasurer. Your club has much to offer. Keep looking up! Al.



Photo JPL/ NASA

## ANNOUNCEMENTS / INFO



### NCRAL Seasonal Messier Marathon Program

NCRAL's Seasonal Messier Marathon observing program is NOT designed to qualify observers for the Astro-nomical League's Messier Observing program; the two programs are unrelated and observing requirements are quite different. In the NCRAL program, the main requirement is to quickly observe and essentially check off items from one of four seasonal lists of Messier objects as noted in the section to follow.

NCRAL recognition will consist a suitable printed certificate and a 3/4-inch enameled star pin (a different color for each season). There will be no direct cost to the membership for participating in the award program; the cost of the program (pins, certificates, mailers, postage) will be borne by the Region as a benefit of affiliation. Relevant program documents are linked below

[NCRAL Seasonal Messier Marathon Program Rules](#)

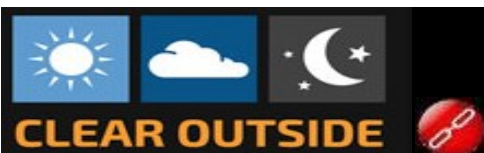
[NCRAL WINTER Seasonal Messier List](#)

[NCRAL SPRING Seasonal Messier List](#)

[NCRAL SUMMER Seasonal Messier List](#)

[NCRAL AUTUMN Seasonal Messier List](#)

meteoblue  
weather ✨ close to you



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# ANNOUNCEMENTS / INFO

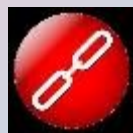
**LOOKING FOR  
OLDER ISSUES OF  
REFLECTIONS  
NEWSLETTER?**



**HISTORY OF PAC?**



**Popular Astronomy Club  
on Facebook?**



## Astronomical League Observing Programs

The Astronomical League provides many different Observing Programs. These Observing Programs are designed to provide a direction for your observations and to provide a goal. The Observing Programs have certificates and pins to recognize the observers' accomplishments and for demonstrating their observing skills with a variety of instruments and objects

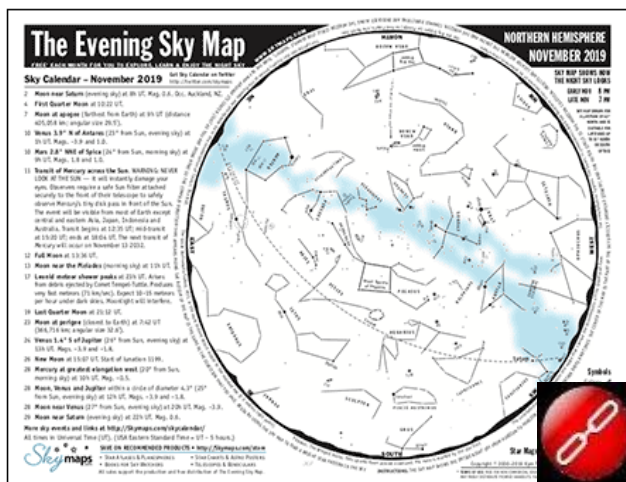


*Thank you for  
Renewing Your  
Membership!*

*Elizabeth Robinson  
Brad Smith  
Mark Pershing*



Check out the Astronomical  
League **ONLINE!**



Check out  
the North  
Central  
Region of the  
Astronomical  
League (NCRAL)  
online



# ANNOUNCEMENTS / INFO



**Kalamazoo Astronomical Society**  
*Looking Up Since 1936*

September 18, 2020

## Invitation to Attend 2020/2021 Season of “Online Viewing Sessions”

Dear Members of the Popular Astronomy Club:

Sharing the night sky with the public through outdoor observing has been a long-standing tradition for both of our organizations. However, persistent cloud cover and frigid temperatures make sharing the sky quite challenging during the winter months. The KAS is pleased to announce that beginning on November 7th we will be introducing “Online Viewing Sessions” that will run through February of 2021. The monthly sessions will be held on the video conferencing service [Zoom](#). We would like to extend an invitation to all of your members to join us during one or more of the sessions. Those interested in attending should [contact us](#) through our website for the Zoom meeting ID and password. We would also be happy to add them to a mailing list, so we can send them the Zoom info before each session. Please see the table below for start times. Admission is free.

If weather conditions necessitate a cancellation there will be a second “cloud date” scheduled the following Saturday. Postponement or cancellation information will be posted on the KAS website and social media platforms.

[Online Viewing Sessions](#) utilize our premiere facility, the KAS Remote Telescope, located under the dark desert skies of Arizona Sky Village in Portal, AZ. The Remote Telescope consists of a 4-inch Takahashi refracting telescope mounted on a 20-inch PlaneWave CDK telescope, both equipped with identical full-frame CCD cameras. Session participants will view images of deep-sky objects captured on the CCD cameras in Arizona, transmitted to participant’s computer, tablet, and smart phone screens. Once the session has concluded, attendees will be provided with a link to download the images captured that night to share with friends and keep as mementos. Participants will also be able to view live streaming video of the telescope in operation through our website.

The Remote Telescope Project involved a 7-year fundraising effort that included contributions from KAS members, corporations and foundations, raising over \$122,000.

Dates and times for the 2020/2021 season are as follows:

<u>Primary Date</u>	<u>Cloud Date</u>	<u>Time (EST)</u>
November 7th	November 14th	8:30 – 10:30 pm
December 5th	December 12th	8:30 – 10:30 pm
January 9th	January 16th	9:00 – 11:00 pm
February 6th	February 13th	9:00 – 11:00 pm

For more details and to view images of the Remote Telescope, please our website at [kasonline.org](http://kasonline.org). You can also follow the KAS on [Twitter](#) and [Facebook](#).

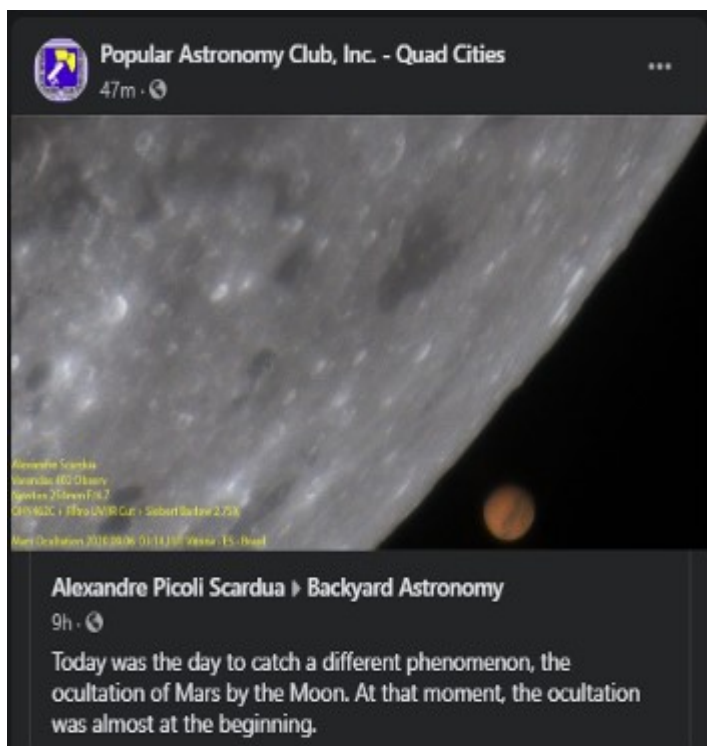
c/o KAMSC ☐ 600 West Vine, Suite 400 ☐ Kalamazoo, MI 49008 ☐ [www.kasonline.org](http://www.kasonline.org)

# CONTRIBUTIONS



Al,  
Thank you so much for showing us around the remodeled observatory! I was thrilled that the observatory has been kept in such good shape! Terrina and Selena were delighted to see it as well!  
Marrietta

(right)  
Marrietta Castle along with her daughters wanted to see Paul's Observatory so we met on Tuesday September 15 for a tour.  
**Al Sheidler**

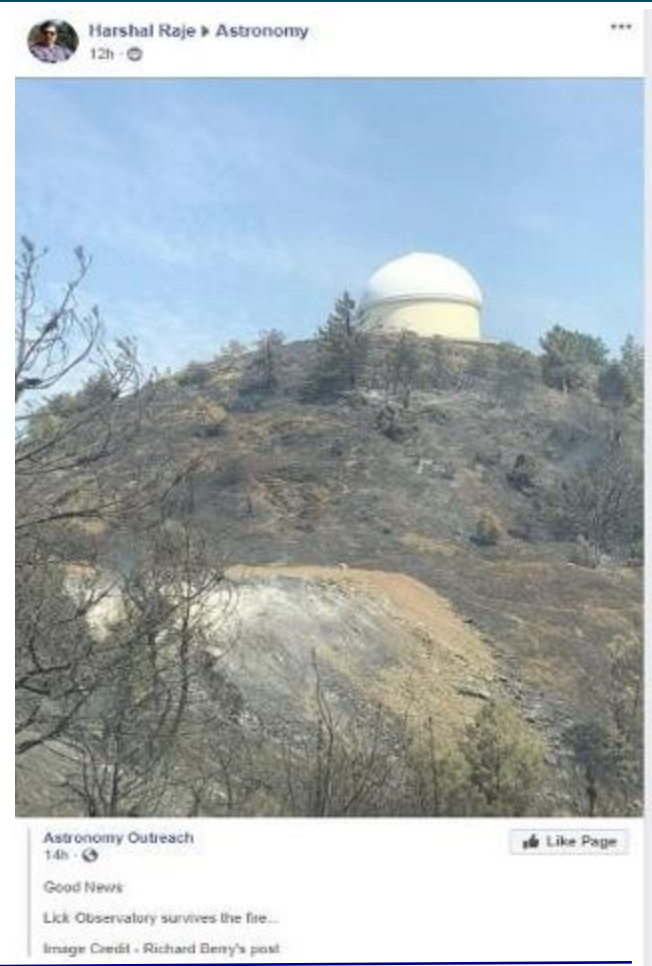


## Eastern Iowa Star Party (EISP) held at Menke Observatory September 18-20th, 2020

The annual QCAS Eastern Iowa Star Party was held at the traditional location this year. Attendance was sparse because of the pandemic. Quite a few guests attended on Saturday night when better overall conditions occurred than Friday night. Friday night clouds did clear out around 9 pm to give much better quality skies than Saturday night., at which the haze from the forest fire smoke did return.



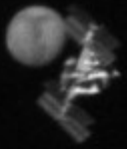
# CONTRIBUTIONS



# CONTRIBUTIONS



**Popular Astronomy Club, Inc. - Quad Cities**  
3m · 🌐



**Astronomía Online**  
3d · 🌐

**THE INTERNATIONAL SPACE STATION AND ITS RED PLANET TRANSIT**

This stunning ISS transit capture ahead of the planet Mars was obtained by amateur astronomer Tom Glenn in the early morning of Monday, September 14, 2020. The space station passage ahead of the red planet was only visible to along a 100 meter wide runner passing northeast San Diego, California.

Despite being a single video frame, with an exhibition of just 0,35 milliseconds, amazing details of both ISS and Mars, including the Syrtis Major Plateau, the most remarkable feature on the planet's surface can be seen. At the time, the ISS was moving at a speed of 7,4 km / second with respect to the observer.

The full video: <https://youtu.be/oHcMvF-nP2s>

**BBC**  
**Sky at Night**  
MAGAZINE

**THE VIRTUAL PLANETARIUM**  
The best things to see in the night sky this month

**What to see in the night sky: October 2020**  
BBC Sky at Night Magazine  
389 views · 4 hours ago

**SUBSCRIBE**  
For the best stargazing every month

23:00

**Tom Harnish** · Budget Astrophotography  
1 hr · 🌐

Not budge astronomy. But excellent budget astronomy image of Milky Way, Andromeda and Saturn.



40 · 2 Comments

**Tomasz Andonewski** · Astrophotography / Amateur Astronomy Enthusiasts  
1h · 🌐

Pisces in a mirror image, Białowieża Forest in Podlase from Poland - August 2020



You and 17 others · 3 Shares



# CONTRIBUTIONS



*Some **You Tube** videos for you to view while being home bound*

Why is Europa so Intriguing to Scientists?



How Far Away Is It ?-  
04 - Comets and the Heliosphere (4K)



Andromeda and the Local Group  
(go to 2020 4K edition)



All the Planets from Inside



The most exciting telescope that  
no-one is talking about



What is Plate Solving? Tips for  
Faster Astrophotography!



Moons Beyond the Solar System



Neil deGrasse Tyson Explains Why You  
Can't Reach Absolute Zero



How Earth Moves through Space





# MARS 2020



**Closest approach** occurs at 1419 UT on October 06, 2020 (291.0° Ls) with an apparent planetary disk diameter of 22.6" at a distance of 0.414909454147 astronomical units (AU) or 38,568,243 mi (62,069,571-km). During closest approach in 2020 the apparent diameter of Mars will be 1.7 arcsec smaller than it was at the same period in 2018; however, it will be 31 degrees higher in the sky – good for observing the Red Planet for observers in the northern and southern hemispheres of Earth. It should also be noted that closest approach between Earth and Mars is not necessarily coincident with the time of opposition but varies by as much as two weeks.

**Opposition occurs** 13 months after conjunction when Mars is on the opposite side of the Earth from the Sun. At that time, the two planets will lie nearly in a straight line with respect to the Sun, or five weeks after retrogression begins. Opposition will occur at 2320 UT on October 13, 2020 (295.2° Ls) with an apparent planetary disk diameter of 22.4 arcsec. Mars will remain visible for more than 12 months after opposition and then become lost in the glare of the Sun around September 01, 2021 as it approaches the next conjunction (October 08, 2021). The cycle is complete in 780 Earth days.

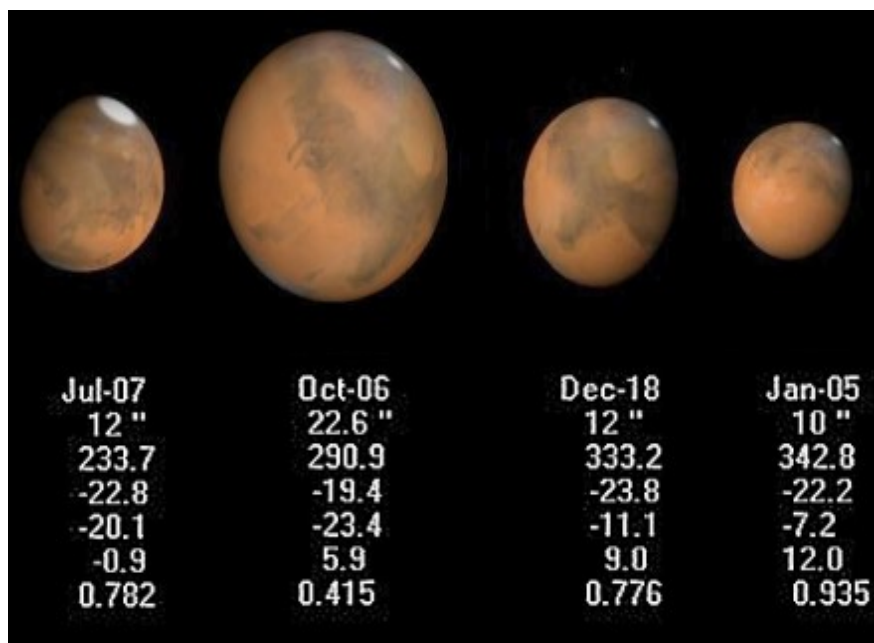
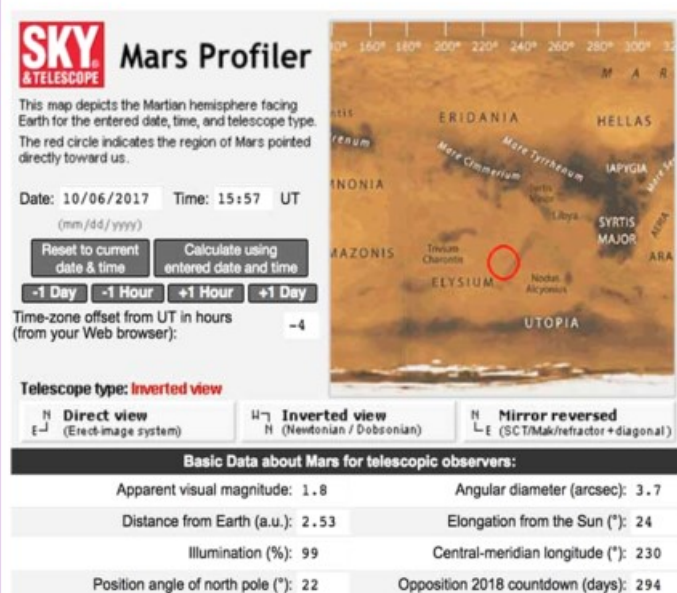
## DUST STORMS

Observations of Mars indicate that major dust storms tend to be more frequent when Mars is closest to the Sun – during southern hemisphere spring and summer. While predicting these events is nearly impossible to make our studies show that the Martian dusty season should begin about the third week in July (241° Ls) throughout the first week in September 2018 (270° Ls). The highest probability of dust storms occurring will be on or about August 10, 2020 (255° Ls) and a sensitive area for the development of dust storms is in northwest Hellas. Massive, planet-encircling storms usually occur in southern hemisphere summer and that will come by the middle of November (315° Ls). Observers should be alert for dust clouds in the northeast Hellas Basin, the Serpentis-Noachis region, and the Solis Lacus region.

## LAUNCH OUR MARS PROFILER TOOL!

To compare what you see on Mars with a map, you need to know which side of the planet you're seeing. *Sky & Telescope's* [Mars Profiler](#) can tell you that and more for any date and time. Best of all, it shows a map of Mars so that you can identify any bright and dark markings you see.







Here's what Mars Profiler looks like:






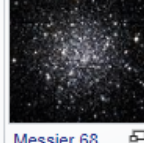


# The 12 different Classifications of Globular Clusters

From 1927–1929, Harlow Shapley and Helen Sawyer Hogg began categorizing clusters according to the degree of concentration the system has toward the core using this scale. This became known as the Shapley–Sawyer Concentration Class. The **Shapley–Sawyer Concentration Class** is a classification system on a scale of

*(Continued in next column)*

Class	Description	Example
I	High concentration toward the center	 Messier 75
II	Dense central concentration	 Messier 2
III	Strong inner core of stars	 Messier 54
IV	Intermediate rich concentrations	 Messier 15
V	Intermediate concentrations	 Messier 30
VI	Intermediate mild concentration	 Messier 3

one to twelve using Roman numerals for globular clusters according to their concentration. The most highly concentrated clusters such as M75 are classified as Class I, with successively diminishing concentrations ranging to Class XII, such as Palomar 12. (The class is sometimes given with numbers [Class 1–12] rather than with Roman numerals.)

Class	Description	Example
VII	Intermediate loose concentration	 Messier 22
VIII	Rather loosely concentrated towards the center	 Messier 14
IX	Loose towards the center	 Messier 12
X	Loose	 Messier 68
XI	Very loose towards the center	 Messier 55
XII	Almost no concentration towards the center	 Palomar 12

# ASTRONOMY IN PRINT

## Taking A Closer Look at Astronomical Distances

By Ian Spangenberg

The Universe is a vast and complex system. Trying to wrap your head around the distances involved can be quite the astronomical task. So, it can be useful to make analogies and scale models to help us imagine it. Once we understand how far away other stars and galaxies are, it becomes easier to appreciate limitations associated with the possible future exploration of the universe.

Earth orbits the Sun, which is one star among about 250 billion in the galaxy we call home, the Milky Way. As your house is one among many in a city, our sun is one star among many in the galaxy. A galaxy is a city of stars, many of which have planets orbiting them. One of our nearest galactic neighbors is called the Andromeda Galaxy, another city, of about a trillion stars, or four times as many as the Milky Way.

These are some pretty mind-boggling numbers. You can say the words “billion” and “trillion”, but how can we imagine what those numbers actually represent? Check out a Wikipedia page called “Orders of magnitude”, which shows real-world examples of different powers of ten. A billion is about the population of Africa in 2009. A trillion is about the number of in the ocean, the number of trees on Earth, and the number of bacteria on the surface of a single human body. Now can you better imagine a trillion stars in the Andromeda?

*(Continued in next column)*

The Andromeda Galaxy, with its ocean-of-fish number of stars, is located about 2.5 million light-years away from us. While a light-year might sound like a unit of time, it is a unit of distance that light travels in one year (365 days). Light moves very fast; 300 million meters per second or about 186,000 miles per second. At light speed, one could, one could travel the Earth’s equator 7.5 times in one second. If light can go around the 7.5 times in one second, it can go pretty far in one year – that distance is a light-year.

The concept of look-back time says you never see anything in real time. You always see things as they were. If you shine a flashlight at a friend, you see your friend not as she looks now but as she looks now but as she looked a few billionths of a second ago. It takes time for the light to bounce off your friend’s face, move across the room, and enter your eye. You see her as she looked when the light bounced off of her face.

The look-back time effect increases the further away you are from an object.

In astronomy, though, this effect can be very pronounced.

Light is fast, but the distance between the Milky Way and Andromeda is large. Search Google Image for the Andromeda Galaxy, Andromeda is 2.5 million light years away, which means the picture you see is how it looked 2.5 million years ago. If aliens lived in the Andromeda Galaxy and looked toward our galaxy, the Milky Way, they wouldn’t see “us”. They would see what we

*(Continued on next page)*



# ASTRONOMY IN PRINT

looked like 2.5 million years ago because that light is just now getting to them.

Imagine a galaxy that was 10 million light-years away, another one that is 100 million light-years away, and another one that is a billion light-years away. When we look at those galaxies, we see them as they looked 10 million, 100 million, and a billion years ago. Astronomers can get a sense of how galaxies looked and how they were arranged at specific times in the past just by looking an equivalent amount of light-time-distance away. We can literally see how the universe evolved by simply taking pictures of galaxies and arranging them by distance. We can get a sense of the development of galactic and universal structure over time.

This effort also produces some issues when we start trying to explore our solar system and beyond. On average, the planet Mars is about 20 light-minutes away. This means that if we send a signal to Mars, the light signal takes about 20 minutes to get there. If Earth said, “hello” to Mars, we wouldn’t get a reply for 40 minutes. You may have seen this effect play out in the movie “The Martian”. It is why scientists don’t drive the Mars rovers. Imagine trying to drive your own car with a 40-minute delay. Instead, scientists send general instructions to the rovers and let the onboard artificial intelligence computer programs drive.

Even worse is the problem of exploring or communicating with other solar systems. The nearest star to us (other than the sun) is

Proxima Centauri. This star does have planets orbiting it, one might even be Earth-like, but the system is 4.2 light-years away from us. Sending and receiving a message would take 8.4 years. We definitely don’t have the technology to go that far now or anytime soon.

Imagine communicating with other star systems in our galaxy, which is about 100,00 light-years across.

If we tried to send a signal to Andromeda- we wouldn’t hear a reply to our “hello” for 5 million years.

If you enjoyed learning about astronomical distances, I include an activity worksheet with the online version of this story. It can definitely be done with kids- all you need is some multiplication and division skills and a calculator. And if you get a chance, try this out. Lay outside with your back on the ground and imagine that you are wearing the earth as a backpack as you hike through the universe at around 100,000 miles per hour, ironically a number equal to about the number of hairs on your imaginative head.

*(Continued in next column)*





October  
2020

## How to see more than half the solar system at once

By David Levy

Have you ever wondered if you could see more than half the solar system at once? An opportunity to do so does not come about often, but it does happen from time to time. A couple of summers ago, Venus, Mars, Jupiter, and Saturn were all in the evening sky and could be spotted at once. Now, during this summer of 2020 a couple of hours before dawn, Mars, Jupiter, and Saturn are all in the sky and can be seen at the same time.

The procession begins in the evening, with Jupiter and Saturn easily visible at about the same time in the east. Jupiter is brighter than all the stars on a summer night, and through a telescope, the rings of Saturn are exquisite. Jupiter and Saturn appear to get close in the sky every twelve years, or about once every Jupiter orbit of the Sun. They were close together in 1960, 1972, 1984, 1996, 2008, and now. They were not far apart when I first looked at Jupiter through a telescope on September 1, 1960. Galileo himself could have felt no greater thrill than I did when I used my first telescope, Echo, and saw the wonderful planet, surrounded by four bright moons and decorated with gas bands in its upper atmosphere. Dad and Mom were with me and they enjoyed that unforgettable view as well. You too can replicate that experience on the next clear night.

Toward the east, Mars is brightening with every night as it gets closer to Earth. Through a good telescope you should be able to see a polar cap, and dark markings on its surface like the prominent Syrtis Major or the very large Mare Acidalium. Mars has two tiny moons, Phobos, and Deimos. I have seen Phobos, one night many years ago, using

*(Continued in next column)*

a large 36-inch diameter reflector. Two spacecraft are now on their way to Mars. One carries a rover and a helicopter intended to search for evidence of past life on this planet.

Towards dawn, Venus rises in the northeast. Although it is the brightest planet (and the brightest object in the sky after the Sun and the Moon), Venus offers virtually nothing to see through its dense clouds, even using a good telescope. However, on rare occasions it gets occulted by the Moon. The attached picture is of one such event I saw.

During about half of the nights this summer, the Moon joins this pantheon of planets. Because the Moon is a real place that we have visited, not just an object in the sky, it is a real treat in any telescope. Walk across the craters, climb its mountains, and skate along its enormous *maria*, or plains. The Moon is always wonderful.

It is not a trick to see so much of the solar system at once. Late on the night of August 12, 2020, while observing the Perseid meteors, I viewed Jupiter low in the west, and Saturn just a bit higher in the sky. Mars was high in the south. Further east shone the waning crescent Moon. Finally, Venus was low in the east.

You do not need a telescope to see all this. Just open your eyes and behold the wonder of our tiny neighborhood in the cosmos.



The picture: the author took this image of the Moon about to occult Venus in the spring of 2006

# UPCOMING EVENTS



**Date:** October 24th, 2020

**Event:** Virtual Banquet 7:00 PM

**Location:** Zoom (*details to follow*)

**Banquet Speaker:** Lisa Wells (*see bio this page*)

**All these dates and times  
are Tentative due to  
conditions! Please check  
your emails for any up-  
dates as to whether the  
Event will Occur!**

- **October 17th, 2020** Niabi Outreach at sunset
- **November 9th, 2020** PAC regular meeting at Butterworth Center at 7:00 PM. Presentation by Adeene Denton "Exploring Pluto after New Horizons: Oceans, Volcanism, and Habitability at the Edge of the Solar System"
- **November 21st, 2020** Niabi Outreach at sunset
- **December 14th, 2020** PAC Business meeting at Butterworth Center at 7:00 PM. Program: Year in Review with Roy Gustafson
- **January 11th, 2021** PAC regular meeting at Butterworth Center at 7:00 PM. Presentation: Cosmic Horizons - Chuck Allen, Vice President, Astronomical League - See bio in December Newsletter
- **February 8th, 2021** PAC regular meeting at Butterworth Center at 7:00 PM. Presentation: "The Year In Space" program by Larry Boyle, Chicago Society for Space Studies, via Zoom.
- **March 8th, 2021** PAC Business Meeting 7:00 PM Presentation: Smorgasbord
- **April 12th, 2021** PAC Regular Meeting 7:00 PM Presentation: "Skies and Skywatchers of Ancient North America" Bill Iseminger, Cahokia Mounds State Historic Site

**Mark your calendars and watch upcoming e-mails for more information!**

## An Astronomer's Life

by Lisa Wells

The talk will highlight Lisa's career in Astronomy from humble beginnings in the Quad Cities to working at several world class observatories including the US National Observatories both Cerro Tololo Inter-American Observatory (CTIO) in La Serena, Chile, and Kitt Peak National Observatory (KPNO) in Tucson, Arizona, to the Canada-France-Hawaii Telescope (CFHT) in Hawaii.

Lisa Wells is currently a Remote Observer for the CFHT located on the summit of Mauna Kea on the big island of Hawaii. She holds a Bachelors degree in Math, Computer Science, and Physics from Augustana College, and a Masters degree in Astronomy from the University of Arizona and has previously worked at CTIO in La Serena, Chile, and KPNO in Tucson, Arizona. She was also previously in charge of the campus observatory at the University of New Mexico in Albuquerque during the approach of Halley's Comet in 1986. The picture to the right was taken at an open house outreach event at CFHT during the Venus Transit of the Sun in 2012.





# SIGN UP REPORT

MONTH	NEWSPAPER ARTICLES	CONSTELLATION REPORT	PROGRAM
AUG 2020	Al Sheidler	PICNIC	PICNIC
SEPT 2020	Ian Spangenberg	none	Mr. Zach Luppen, University of Iowa, Zach will discuss the upcoming JUICE and Europa Clipper Missions )
OCT 2020	Paul Levesque	None Scheduled	Virtual Banquet
NOV 2020		None Scheduled	Presentation by Adeene Denton "Exploring Pluto after New Horizons: Oceans, Volcanism, and Habitability at the Edge of the Solar System" via Zoom (see Nov. Newsletter)
DEC 2020	Terry Dufek		Roy Gustafson (Year n Review)
JAN 2021		None Scheduled	Presentation: Cosmic Horizons - Chuck Allen, Vice President, Astronomical League via Zoom See bio in December Newsletter
FEB 2021		None Scheduled	"The Year In Space" program by Larry Boyle, Chicago Society for Space Studies, via Zoom.
MAR 2021			SMORGASBORD (SEE BELOW)
APR 2021		None Scheduled	Presentation: "Skies and Skywatchers of Ancient North America" Bill Iseminger, Cahokia Mounds State Historic Site via Zoom
MAY 2021		None Scheduled	"NASA Solar Missions", program by Dr. Therese Kucera, NASA Goddard, via Zoom
JUN 2021			
JUL 2021			Green Bank Observatory - Virtual Tour and Current Projects

**Editors Note:** If you are interested in contributing/ participating in the above programs, sign ups are available at the monthly meeting or please let The Vice President and Editor know what you are good to go with.. Any corrections please send to Vice President and Editor. This will be updated every issue.  
**Thank you**

**All these dates and times are Tentative due to conditions! Please check your emails for any updates as to whether the Event will Occur!**

## SMORGASBORD

### MARCH

_____	_____
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### JUNE

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### SEPTEMBER

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# ASTRONOMICAL CALENDAR OF EVENTS



# THE PLANETS October 2020

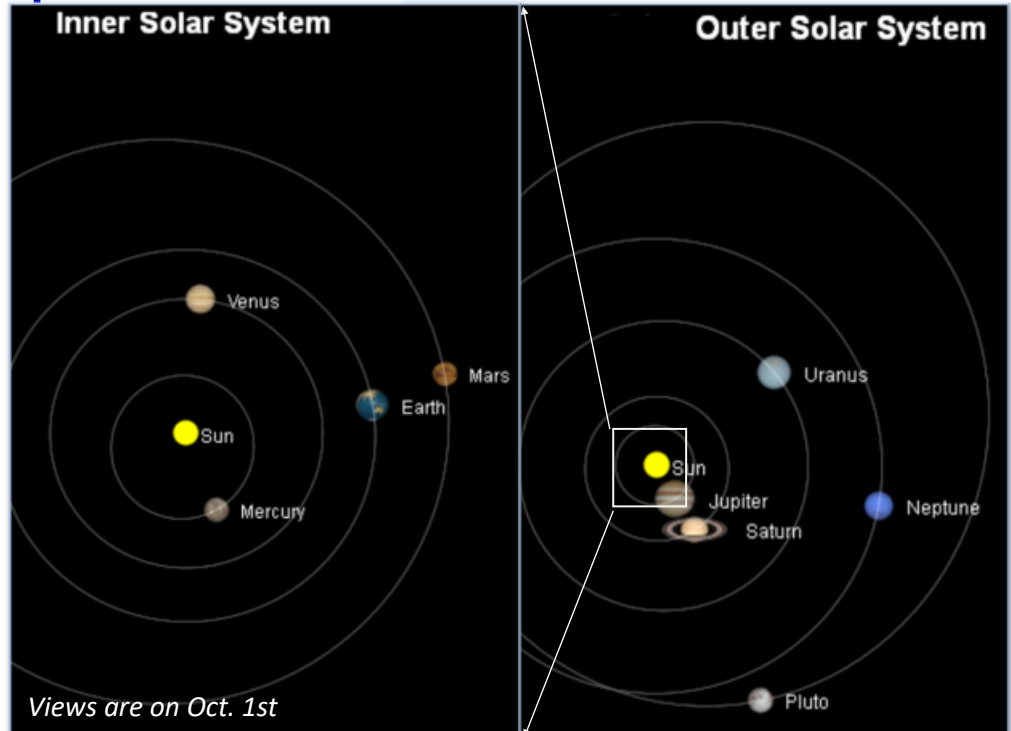


01 11:00 Mercury at Greatest Elongation: 25.8°E  
01 16:05 **FULL MOON**  
02 12:09 Venus 0.1°S of Regulus  
02 22:21 Mars 0.7°N of Moon  
03 12:22 Moon at Apogee: 406321 km  
06 20:02 Aldebaran 4.5°S of Moon  
07 19:29 Moon at Ascending Node  
09 19:39 **LAST QUARTER MOON**  
10 08:18 Pollux 4.1°N of Moon  
11 07:27 Beehive 2.1°S of Moon  
12 20:59 Regulus 4.5°S of Moon  
13 18:00 **Mars at Opposition**  
13 18:57 Venus 4.3°S of Moon  
16 14:31 **NEW MOON**  
16 18:46 Moon at Perigee: 356913 km  
19 14:12 Antares 5.7°S of Moon  
20 10:53 Moon at Descending Node  
21 00:00 **Orionid Meteor Shower**  
22 12:10 Jupiter 2.0°N of Moon  
22 22:49 Saturn 2.6°N of Moon  
23 08:23 **FIRST QUARTER MOON**  
25 13:00 Mercury at Inferior Conjunction  
29 11:13 Mars 3.0°N of Moon  
30 13:46 Moon at Apogee: 406393 km  
30 16:00 Venus at Perihelion  
31 09:49 **FULL MOON (Blue Moon)**  
31 11:00 **Uranus at Opposition**

**The Sun** starts off on October 1<sup>st</sup> in Virgo moving into Libra on the 31<sup>st</sup>.

**Mercury** starts off on the 1<sup>st</sup> in Libra (mag: -.02, dia: 6.8", Illum: 60%). It is at greatest elongation east of the Sun by 26°. Mercury is on the western horizon (7° 33') at sunset and very poorly placed for viewing throughout the month. It slowly diminishes in altitude most of the month until it reaches inferior conjunction on the 25<sup>th</sup>.

**Venus** is in Leo on October 1<sup>st</sup> (mag: -4.09, dia: 15.51", Illum: 71.7%). The planet lies near Regulus in the morning sky (26.5° off the eastern horizon). On the second, Venus is 30' from Regulus at 4 am. By 5 pm (not visible locally), Venus and Regulus are separated by 5'. It dims a little and shrinks in size a little but remains in the same place in the sky relatively. On October 22<sup>nd</sup>, Venus moves into Virgo.



**Mars** is in Pisces on October 1<sup>st</sup>. Mars is the main planet for viewing this month. It rises about 7:30 pm. It is magnitude -2.50 and has a diameter of 22.49". On the 2<sup>nd</sup> at 11:00 pm the Moon passes about 1° from Mars. In the southern hemisphere there is an occultation. On October 6<sup>th</sup>, Mars is closest to Earth at .415 AU. Mars reaches opposition on October 13<sup>th</sup> at 6:20 pm. Then it will be magnitude -2.62, its brightest for this opposition. The Moon passes by again on the 29<sup>th</sup> by 4 3/4° south of Mars.

Jupiter is still in Sagittarius this month, due south at 7:30pm (mag: -2.35, dia: 40.40"). It is 7° west of Saturn. It is still good viewing though, because of its low altitude of 25°, photographing can be tricky because of the thick atmosphere. The nearly ½ Moon passes by on October 22, giving a nice arrangement with Saturn. The view is almost an isosceles triangle. By the 31<sup>st</sup>, the gap between Jupiter and Saturn is under 5°.

**Saturn** remains in Sagittarius in October (mag: .47, dia 17.17", rings 40"). It is 7° east of Jupiter. The gap between them closes as mentioned in the Jupiter sec-

tion above. Be sure to check out the great conjunction with Jupiter and the Moon on the 22<sup>nd</sup>.

**Uranus** is in Aries this month (mag: 5.68, dia: 3.73"). It is about 14 ½ ° east of Mars, low in the eastern sky. The Moon passes south of the planet on October 4<sup>th</sup> at about 2 am. The Moon returns to pass south of Uranus on the 31<sup>st</sup> by about 4°. This is also the date of the planet's opposition and is as close as it gets so take in its nice bluish-green disk when viewed in a telescope.

**Neptune** is in Aquarius on October 1<sup>st</sup> (mag: 7.82, dia: 2.36"). It is in the SE sky at 8pm, about 22° above the horizon. It has a small pale violet disk in telescopes.

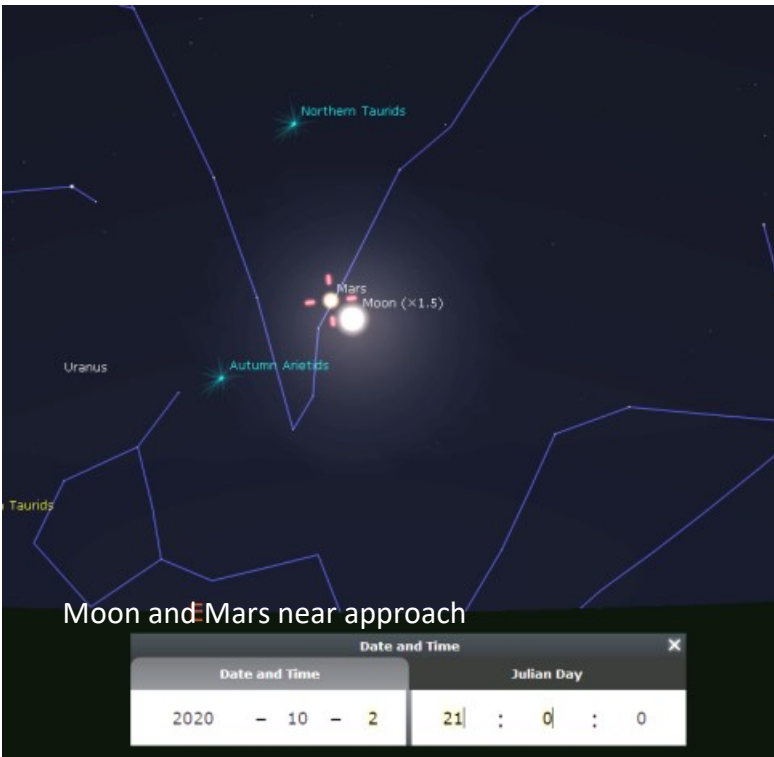
**Pluto** is located between Saturn and Jupiter in Sagittarius. The dwarf planet is 14.31 magnitude.

**Ceres** is in the low SE at 9pm. It is in the constellation Piscis Austrinus and magnitude 8.2

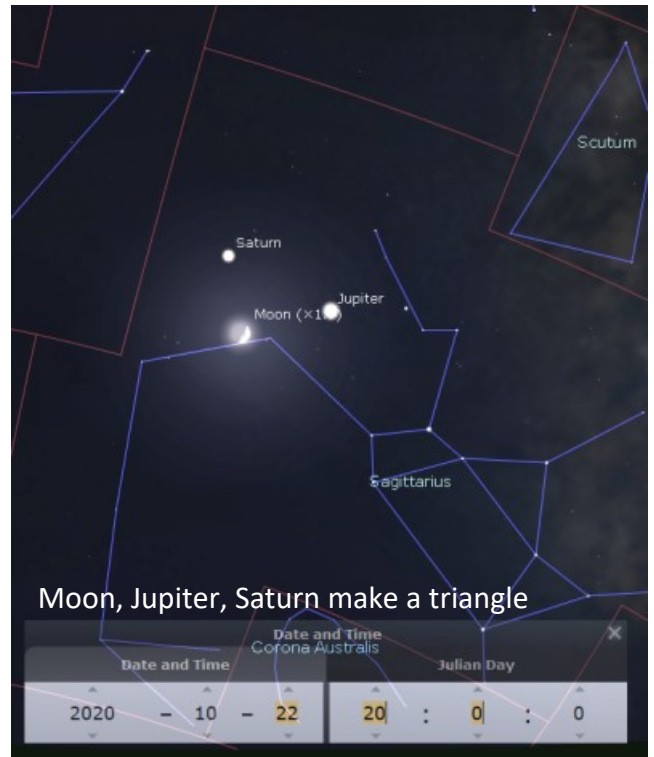
**Vesta** is in the morning sky near Venus. The asteroid is about 6 1/2° northwest of the planet at magnitude 8.3



**Mara at Opposition**



Moon and Mars near approach



Moon, Jupiter, Saturn make a triangle

# The Orionid Meteor Shower

October 21st, 2020—Moon only 5 days old!

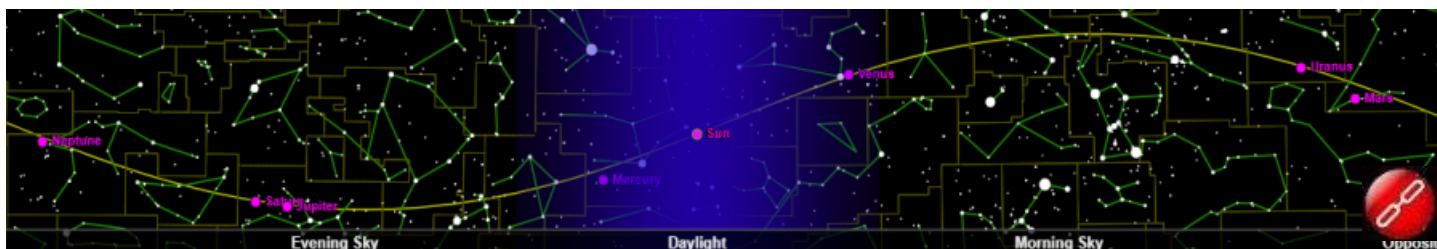




# Planetary Alignments in October 2020

Phenomenon	Date and Time	Object 1	Object 2	Separation
Occultation	2020-10-01 06:56:26	Jupiter	Europa (JII)	—
Conjunction	2020-10-02 23:01:59	Mars	Moon	+1°21'28.7"
Conjunction	2020-10-04 07:47:55	Uranus	Moon	+3°12'41.8"
Conjunction	2020-10-10 11:39:26	Mars	Deimos (MII)	+0°00'23.5"
Conjunction	2020-10-12 18:12:18	Moon	(4) Vesta	+1°17'15.2"
Conjunction	2020-10-13 21:17:55	Venus	Moon	+3°13'52.3"
Transit	2020-10-15 21:47:15	Jupiter	Io (JI)	—
Conjunction	2020-10-16 15:47:27	Moon	Sun	+3°25'45.6"
Transit	2020-10-17 03:56:01	Jupiter	Callisto (JIV)	—
Transit	2020-10-17 06:18:51	Jupiter	Europa (JII)	—
Conjunction	2020-10-20 06:38:33	Mars	81P/Wild	+1°14'44.9"
Conjunction	2020-10-22 10:46:31	Jupiter	Moon	+2°31'01.8"
Conjunction	2020-10-22 11:11:15	Mars	Deimos (MII)	+0°00'24.4"
Conjunction	2020-10-23 01:21:12	Saturn	Moon	+3°02'29.5"
Occultation	2020-10-23 20:51:50	Jupiter	Io (JI)	—
Conjunction	2020-10-25 14:54:01	Mercury	Sun	+0°54'47.1"
Conjunction	2020-10-27 06:01:03	Neptune	Moon	+4°16'19.3"
Conjunction	2020-10-29 13:05:44	Mars	Moon	+3°23'08.6"
Conjunction	2020-10-31 10:42:18	Uranus	Moon	+3°29'09.1"

From stellarium



From in the sky. org

## OCTOBER DOUBLE STARS

Object	RA	Dec	Mag	Sep	PA	Year
40/41 Draconis	18 <sup>h</sup> 00 <sup>m</sup> .2	+80° 00'	5.7, 6.0	18.7"	231°	2013
95 Herculis	18 <sup>h</sup> 01 <sup>m</sup> .5	+21° 36'	4.9, 5.2	6.2"	257°	2013
70 Ophiuchi	18 <sup>h</sup> 05 <sup>m</sup> .5	+02° 30'	4.2, 6.2	5.9"	130°	2013
Epsilon Lyrae	18 <sup>h</sup> 44 <sup>m</sup> .3	+39° 40'	5.2, 6.1, 5.4, 5.4	2.3", 208.7", 2.4"	346°, 172°, 78°	2013
Zeta Lyrae	18 <sup>h</sup> 44 <sup>m</sup> .8	+37° 36'	4.3, 5.6	43.7"	150°	2013
Beta Lyrae	18 <sup>h</sup> 50 <sup>m</sup> .1	+33° 22'	3.6, 6.7	44.8"	147°	2012
Struve 2404	18 <sup>h</sup> 50 <sup>m</sup> .8	+10° 59'	6.9, 7.8	3.4"	181°	2013
Otto Struve 525	18 <sup>h</sup> 54 <sup>m</sup> .9	+33° 58'	6.1, 7.6	45.2"	350°	2012
Theta Serpentis	18 <sup>h</sup> 56 <sup>m</sup> .2	+04° 12'	4.6, 4.9	22.3"	104°	2013
Beta Cygni	19 <sup>h</sup> 30 <sup>m</sup> .7	+27° 58'	3.2, 4.7	34.7"	55°	2012
57 Aquilae	19 <sup>h</sup> 54 <sup>m</sup> .6	-08° 14'	5.7, 6.4	35.6"	171°	2013
31 Cygni	20 <sup>h</sup> 13 <sup>m</sup> .6	+46° 44'	3.9, 7.0, 4.8	111", 333.8"	174°, 325°	2011
Alpha Capricornus	20 <sup>h</sup> 18 <sup>m</sup> .1	-12° 33'	3.7, 4.3	381.2"	290°	2012
Beta Capricornus	20 <sup>h</sup> 21 <sup>m</sup> .0	-14° 47'	3.2, 6.1	205.4"	267°	2012
Gamma Delphinus	20 <sup>h</sup> 46 <sup>m</sup> .7	+16° 07'	4.4, 5.0	9.0"	266°	2013
61 Cygni	21 <sup>h</sup> 06 <sup>m</sup> .9	+38° 45'	5.2, 6.1	31.5"	152°	2013
Beta Cephei	21 <sup>h</sup> 28 <sup>m</sup> .7	+70° 34'	3.2, 8.6	14.1"	248°	2013
Struve 2816	21 <sup>h</sup> 39 <sup>m</sup> .0	+57° 29'	5.7, 7.5, 7.5	11.8", 19.8"	120°, 338°	2012
Epsilon Pegasi	21 <sup>h</sup> 44 <sup>m</sup> .2	+09° 52'	2.5, 8.7	145.4"	318°	2013

From the Astronomical League

# DEEP SKY WONDERS

For October  
Evening Skies

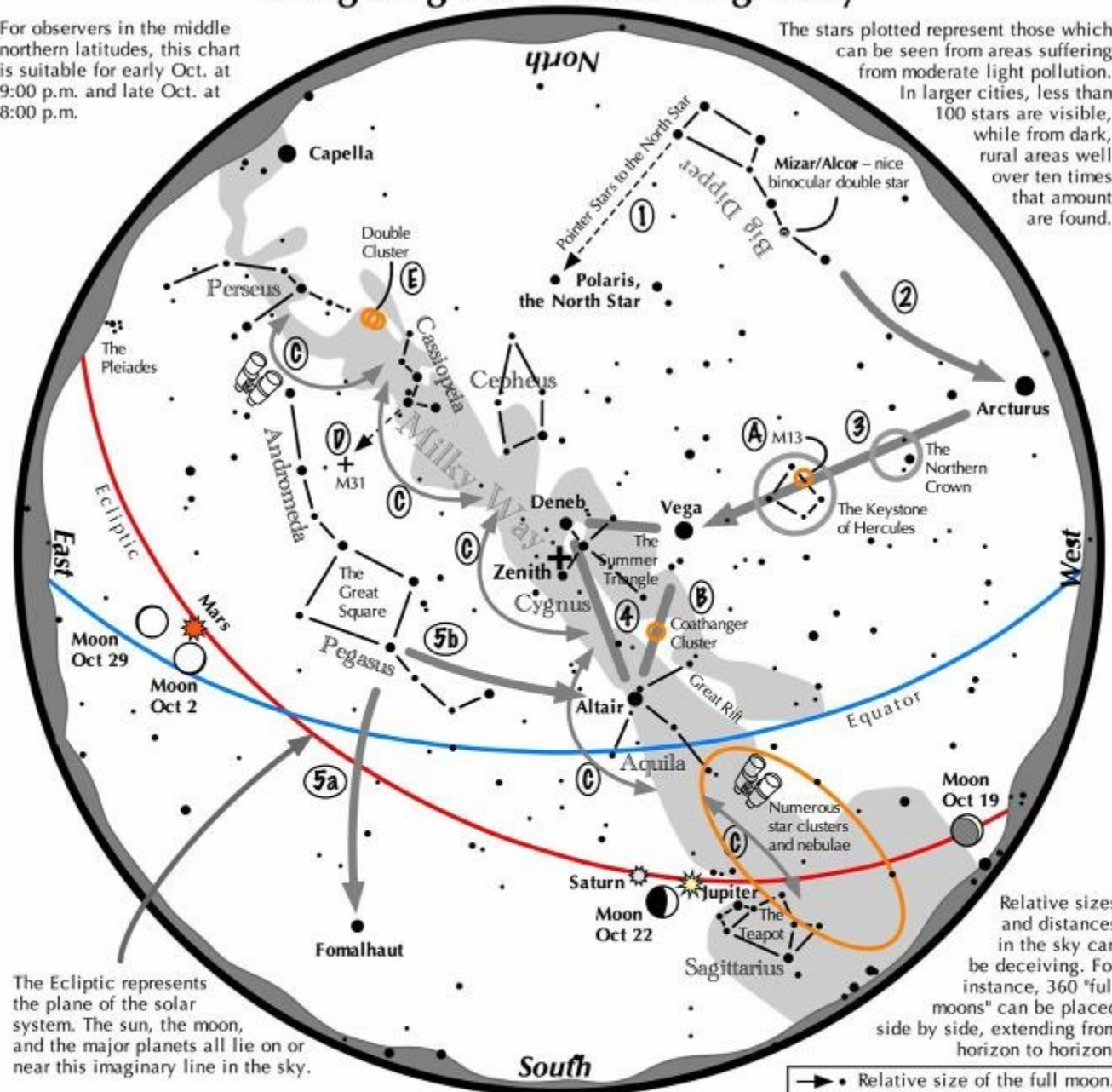
Name	RA (J2000)	Dec (J2000)	Mag.	Transit	Type
NGC 6709 (Flying Unicorn Cluster)	18h51m18.0s	+10°19'04.8"	7.07	19h12m	open star cluster
M 11 (Wild Duck Cluster)	18h51m05.0s	-6°16'12.0"	7.09	19h12m	open star cluster
NGC 6738	19h01m16.8s	+11°37'12.0"	8.63	19h22m	open star cluster
NGC 6755 (Possible Binary Cluster)	19h07m49.0s	+4°16'01.2"	7.89	19h28m	open star cluster
M 56	19h16m35.6s	+30°11'00.5"	8.62	19h37m	globular star cluster
NGC 6811 (Hole in a Cluster)	19h37m17.0s	+46°23'16.8"	6.98	19h57m	open star cluster
NGC 6819 (The Foxhead Cluster)	19h41m18.0s	+40°11'13.2"	7.48	20h02m	open star cluster
					cluster associated with
NGC 6823	19h43m09.1s	+23°18'00.0"	7.31	20h04m	nebula
NGC 6826 (Blinking Planetary Nebula)	19h44m48.2s	+50°31'30.3"	8.97	20h05m	planetary nebula
NGC 6822 (Barnard's Galaxy)	19h44m56.2s	-14°47'51.3"	8.70	20h06m	galaxy
NGC 6830 (Poodle Cluster)	19h50m59.0s	+23°06'00.0"	8.10	20h12m	open star cluster
M 71 (Angelfish Cluster)	19h53m46.5s	+18°46'45.1"	6.31	20h14m	globular star cluster
M 27 (Dumbbell Nebula)	19h59m36.4s	+22°43'15.8"	7.60	20h20m	planetary nebula
NGC 6866 (Kite Cluster)	20h03m55.0s	+44°09'28.8"	7.77	20h24m	open star cluster
NGC 6885 (20 Vulpeculae Cluster)	20h12m01.0s	+26°28'40.8"	8.28	20h33m	open star cluster
IC 4996 (P Cyg Cluster)	20h16m30.0s	+37°37'58.8"	7.47	20h37m	open star cluster
M 29 (Cooling Tower)	20h23m55.9s	+38°31'22.8"	6.76	20h44m	open star cluster
NGC 6910 (The Inchworm Cluster)	20h23m07.9s	+40°46'30.0"	7.56	20h44m	open star cluster
NGC 6939 (Ghost Bush Cluster)	20h31m30.0s	+60°39'43.2"	7.96	20h52m	open star cluster
NGC 6940 (Mothra Cluster)	20h34m25.9s	+28°16'58.8"	6.47	20h55m	open star cluster
IC 5076	20h56m00.0s	+47°24'00.0"	5.84	21h17m	reflection nebula
NGC 7000 (North America Nebula)	20h58m47.1s	+44°19'48.0"	4.15	21h19m	HII region
					cluster associated with
NGC 7023 (Iris Nebula)	21h01m36.9s	+68°09'47.9"	6.96	21h22m	nebula
NGC 7009 (Saturn Nebula)	21h04m10.9s	-11°21'48.3"	8.29	21h25m	planetary nebula
NGC 7039	21h10m48.0s	+45°37'01.2"	7.75	21h31m	open star cluster
IC 1369	21h12m11.5s	+47°45'18.0"	8.95	21h33m	open star cluster
M 15 (Pegasus Cluster)	21h29m58.3s	+12°10'01.2"	6.47	21h51m	globular star cluster
M 39	21h31m48.0s	+48°25'58.8"	4.74	21h52m	open star cluster
M 2	21h33m27.0s	-0°49'23.7"	6.51	21h54m	globular star cluster
					cluster associated with
IC 1396 (Elephant's Trunk Nebula)	21h39m00.0s	+57°29'24.0"	3.64	22h00m	nebula
M 30 (Jellyfish Cluster)	21h40m22.1s	-23°10'47.5"	8.08	22h01m	globular star cluster
					cluster associated with
IC 5146 (Cocoon Nebula)	21h53m24.0s	+47°16'01.2"	7.34	22h14m	nebula
NGC 7160 (Swimming Alligator Cluster)	21h53m40.1s	+62°36'10.8"	6.24	22h14m	open star cluster
NGC 7209 (Star Lizard Cluster)	22h05m07.0s	+46°28'58.8"	7.84	22h26m	open star cluster
NGC 7293 (Helix Nebula)	22h29m38.5s	-20°50'13.6"	7.90	22h51m	planetary nebula
					cluster associated with
NGC 7380 (The Wizard Nebula)	22h47m20.9s	+58°07'55.2"	7.34	23h08m	nebula
NGC 7510 (The Dormouse Cluster)	23h11m00.0s	+60°34'12.0"	8.04	23h32m	open star cluster
M 52 (Cassiopeia Salt-and-Pepper Cluster)	23h24m48.0s	+61°35'34.8"	7.04	23h46m	open star cluster
NGC 7662 (Blue Snowball)	23h25m53.6s	+42°32'06.0"	8.43	23h47m	planetary nebula

\* Data from Stellarium

# Navigating the October Night Sky

For observers in the middle northern latitudes, this chart is suitable for early Oct. at 9:00 p.m. and late Oct. at 8:00 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



## Navigating the October night sky: Simply start with what you know or with what you can easily find.

- 1 Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
- 2 Follow the arc of the Dipper's handle. It intersects Arcturus, the brightest star in the early October evening sky.
- 3 To the northeast of Arcturus shines another star of the same brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
- 4 Nearly overhead lie the summer triangle stars of Vega, Altair, and Deneb.
- 5 High in the east are the four moderately bright stars of the Great Square. Its two southern stars point west to Altair. Its two western stars point south to Fomalhaut.

### Binocular Highlights

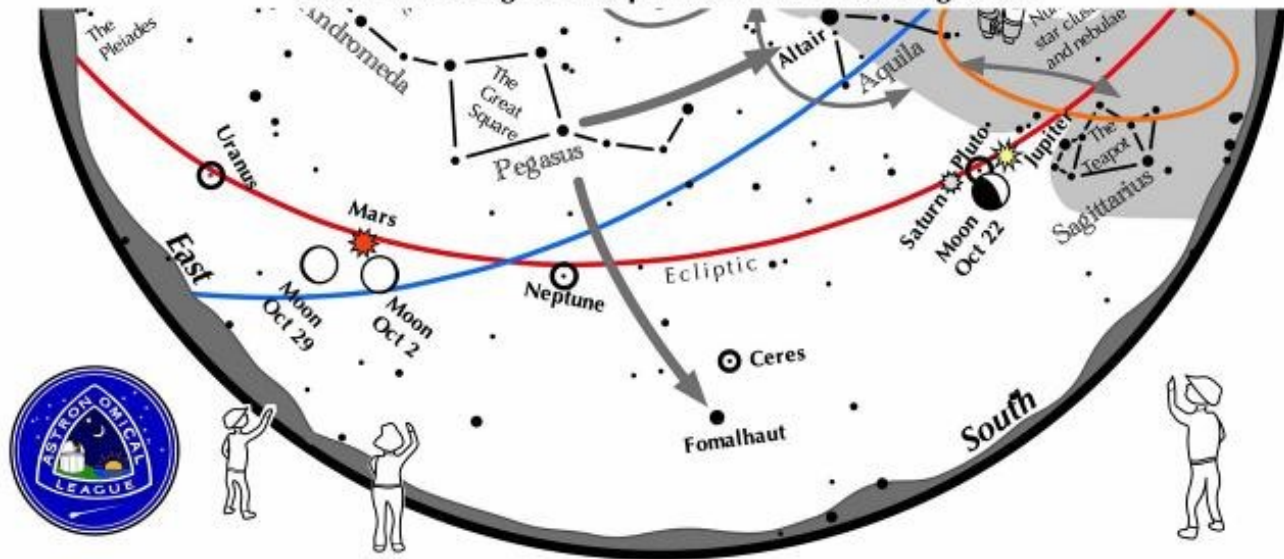
**A:** On the western side of the Keystone glows the Great Hercules Cluster, a ball of 500,000 stars. **B:** 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger. **C:** Sweep along the Milky Way for an astounding number of fuzzy star clusters and nebulae amid many faint glows and dark bays, including the Great Rift. **D:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **E:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster.

Astronomical League [www.astroleague.org/outreach](http://www.astroleague.org/outreach); duplication is allowed and encouraged for all free distribution.



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

**See all three bright outer planets and a not-so-bright one**



**75 minutes after sunset, scan from the southwest to the south, then to the east: the Seen and the Unseen...**

Find bright **Jupiter** and **Saturn** in the south-southwest, then locate **Mars** in the east.

- On the night of October 2, climbing in the east, brightly shines ruddy Mars with the near full moon glowing to its right.
- On the night of October 22, the near-first quarter moon is positioned between bright Jupiter and Saturn. **Unseen Pluto** lies immediately above the moon.
- On the night of October 29, the near-full moon hovers to Mars' lower left.
- **Unseen Neptune** lies one-third of the distance across the sky from Mars to easily seen Saturn.
- **Difficult-to-see Uranus**, which can be spotted by the keen-eye observer under dark skies, is found an equal distance that Mars lies from Neptune but on the other side of Mars. Binoculars will definitely help.
- The dwarf planet **Ceres** lies **unseen** just north of Fomalhaut shining low in the south-southeast.

A curious fact: all these bodies of the solar system currently are placed just below the plane of the ecliptic.

# Why Earth has 4 seasons

*Suggested  
By Roy  
Gustafson*



# Spotlight: Hyades (open star cluster)

- Best seen in Binoculars. Spectacular object.
- is the nearest open cluster and one of the best-studied star clusters.
- Located about 153 light-years from the Sun, it consists of a roughly spherical group of hundreds of stars sharing the same age, place of origin, chemical characteristics, and motion through space.
- Aldebaran (the nearby bright star) is unrelated to the Hyades, as it is located much closer to Earth and merely happens to lie along the same line of sight.
- The five brightest member stars of the Hyades have consumed the hydrogen fuel at their cores and are now evolving into giant stars.
- Four of these stars, Gamma, Delta 1, Epsilon, Theta Tauri, form an asterism that is traditionally identified as the head of Taurus the Bull.
- Epsilon Tauri has a gas giant exoplanet candidate, the first planet to be found in any open cluster.
- The age of the Hyades is estimated to be about 625 million years
- The core of the cluster, where stars are the most densely packed, has a radius of 8.8 light-years (2.7 parsecs).
- The stars of the Hyades are more enriched in heavier elements than our Sun and other ordinary stars in the Solar neighborhood
- The Hyades Cluster is related to other stellar groups in the Sun's vicinity. Its age, metallicity, and proper motion coincide with those of the larger and more distant Praesepe Cluster, and the trajectories of both clusters can be traced back to the same region of space, indicating a common origin.
- The Hyades are unrelated to two other nearby stellar groups, the Pleiades and the Ursa Major Stream, which are easily visible to the naked eye under clear dark skies.
- As a naked-eye object, the Hyades cluster has been known since prehistoric times. It is mentioned by numerous Classical authors from Homer to Ovid.
- In England the cluster was known as the "April Rainers" from an association with April showers.

*(continued in next column)*



- The cluster was probably first catalogued by Giovanni Battista Hodierna in 1654, and it subsequently appeared in many star atlases of the 17th and 18th centuries, however, Charles Messier did not include the Hyades in his 1781 catalog of deep sky objects and it therefore lacks a Messier number.
- All stars form in clusters, but most clusters break up less than 50 million years after star formation concludes. The astronomical term for this process is "evaporation." Only extremely massive clusters, orbiting far from the Galactic Center, can avoid evaporation over extended timescales. As one such survivor, the Hyades Cluster probably contained a much larger star population in its infancy.
- Surveys indicate that 90% of open clusters dissolve less than 1 billion years after formation, while only a tiny fraction survive for the present age of the Solar System (about 4.6 billion years). Over the next few hundred million years, the Hyades will continue to lose both mass and membership as its brightest stars evolve off the main sequence and its dimmest stars evaporate out of the cluster halo. It may eventually be reduced to a remnant containing about a dozen star systems, most of them binary or multiple, which will remain vulnerable to ongoing dissipative forces.



**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 <https://nightsky.jpl.nasa.gov/> to find local clubs, events, and more!

**Observe the Skies Near Mars**

David Prosper

October is a banner month for Mars observers! October 6 marks the day Mars and Earth are at closest approach, a once-every-26-months event. A week later, on October 13, Mars is at opposition and up all night. Mars is very bright this month, and astronomers are eager to image and directly observe details on its disc; however, don't forget to look at the space around the planet, too! By doing so, you can observe the remarkable retrograde motion of Mars and find a few nearby objects that you may otherwise overlook.

Since ancient times, Mars stood out to observers for its dramatic behavior. Usually a noticeable but not overly bright object, its wandering path along the stars showed it to be a planet instead of a fixed star. Every couple of years, this red planet would considerably flare up in brightness, for brief times becoming the brightest planet in the sky before dimming back down. At these times, Mars would also appear to slow down its eastward motion, stop, then reverse and head westward against the stars for a few weeks, before again stopping and resuming its normal eastward movement. This change in the planet's movement is called "apparent retrograde motion." While all of the planets will appear to undergo retrograde motion when observed from Earth, Mars's retrograde appearances may be most dramatic. Mars retrograde motion in 2020 begins on September 10, and ends on November 16. You can observe its motion with your eyes, and it makes for a fun observing project! You can sketch the background stars and plot Mars as you observe it night after

night, or set up a photographic series to track this motion. Does the planet move at the same rate night after night, or is it variable? As you observe its motion, note how Mars's brightness changes over time. When does Mars appear at its most brilliant?

NASA has tons of great Mars-related resources! Want to know more about apparent retrograde motion? NASA has an explainer at: [bit.ly/marsretromotion](https://bit.ly/marsretromotion). Find great observing tips in JPL's "What's Up?" videos: [bit.ly/jplwhatsup](https://bit.ly/jplwhatsup). Check out detailed views with NASA's HiRISE satellite, returning stunning closeups of the Martian surface since 2006: [hirise.jpl.arizona.edu](https://hirise.jpl.arizona.edu). NASA's Curiosity Rover will be joined in a few months by the Perseverance Rover, launched in late July to take advantage of the close approach of Mars and Earth, a launch window that opens two years: [nasa.gov/perseverance](https://nasa.gov/perseverance). Calculate the ideal launch window yourself with this handy guide: [bit.ly/marslaunchwindow](https://bit.ly/marslaunchwindow). The Night Sky Network's Exploring Our Solar System handout invites you to chart the positions of the planets in the Solar System, and NSN coordinator Jerelyn Ramirez recently contributed an update featuring Mars opposition! You can download both versions at [bit.ly/exploresolarsystem](https://bit.ly/exploresolarsystem). Young astronomers can find many Mars resources and activities on NASA's Space Place: [bit.ly/spaceplacemars](https://bit.ly/spaceplacemars). Here's to clear skies and good seeing for Mars's best appearance until 2033!

(continued in next column)

(continued on next page)





## Observe the Skies Near Mars

David Prosper (continued from previous page)

(left) If you are paying this much attention to Mars, you're likely curious about the skies surrounding it! Find Mars in the constellation Pisces, with constellations Aries, Triangulum, and Cetus nearby. Aries may be the only one of these dimmer patterns readily visible from light-polluted areas. The Pleiades rises shortly after



Mars. Dim Uranus is found close by, in Aries. If you are observing Mars up close, use the same eyepiece to check out Uranus's tiny blue-green disc. If you are uncertain whether you spotted Uranus, you didn't see it! Unlike stars, Uranus doesn't resolve to a point at high magnifications.

(right) The path of Mars during the last five months of 2020. Notice the retrograde motion from September 10 to November 16, with prime Mars observing time found in between. October 6 is the day of closest approach of Earth and Mars, "just" 38.6 million miles apart. Images created with help from Stellarium: [stellarium.org](http://stellarium.org)



Deep Sky objects ranked by difficulty of viewing Chart contributed by **Byron Davies**. Link to site below:



DEEP SKY OBJECTS RANKED BY DIFFICULTY OF VIEWING																			
BASED ON THE USE OF A MID-RANGE TELESCOPE (7-INCH)																			
Virgo	Virgo	Carina Major	Andromeda	Coma Berenices	Leo	Ophiuchus	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius	Sagittarius
M104	M57	M41	M31	M94	M79	M62	M24	M87	M78	M69	M21	M8	M107	M101	M100	M74	M58	M20	M68
6.0	6.8	4.1	3.4	8.2	7.2	6.8	3.1	8.8	8.0	7.8	8.0	5	7.8	7.8	9.4	9.4	7.8	8.2	8.2
Pisces	Pisces	Cygnus	Sagittarius	Virgo	Sagittarius	Sagittarius	Sagittarius	Virgo	Sagittarius	Sagittarius	Ophiuchus	Ophiuchus	Ophiuchus	Andromeda	Triangulum	Ursa Major	Ursa Major	Ursa Major	Ursa Major
M45	M93	M53	M39	M86	M71	M70	M19	M86	M71	M70	M19	M10	M110	M33	M101	M100	M74	M58	M20
3.1	6.2	7.8	6.8	8.8	8.0	7.8	8.0	8.8	8.0	7.8	8.0	8.8	8.1	8.1	7.8	9.4	9.4	7.8	8.2
Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major
M42	M92	M52	M34	M85	M75	M64	M54	M85	M75	M64	M54	M12	M90	M4	M100	M74	M58	M20	M68
4.0	6.8	6.8	6.2	8.1	8.0	8.0	8.0	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major	Ursa Major
M39	M82	M50	M37	M85	M75	M64	M54	M85	M75	M64	M54	M12	M90	M4	M100	M74	M58	M20	M68
6.5	6.4	5.2	5.8	8.1	8.0	8.0	8.0	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus
M22	M81	M48	M36	M105	M77	M63	M26	M105	M77	M63	M26	M18	M95	M55	M74	M58	M20	M68	M20
6.5	6.8	6.8	6.8	8.2	8.0	8.0	8.0	8.2	8.0	8.0	8.0	8.0	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus
M5	M80	M47	M38	M96	M84	M60	M56	M96	M84	M60	M56	M14	M109	M83	M97	M59	M59	M59	M59
7.1	7.1	6.4	6.4	8.3	8.1	8.0	8.0	8.3	8.1	8.0	8.0	8.0	8.3	8.3	8.3	8.3	8.3	8.3	8.3
Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus
M13	M67	M46	M43	M88	M72	M65	M51	M88	M72	M65	M51	M9	M99	M73	M58	M58	M58	M58	M58
6.8	6.7	6.1	6.1	8.8	8.3	8.3	8.3	8.8	8.3	8.3	8.3	8.3	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus	Ophiuchus
M11	M66	M44	M40	M89	M76	M58	M49	M89	M76	M58	M49	M1	M108	M59	M91	M91	M91	M91	M91
8.1	8.5	8.1	8.1	8.8	8.7	8.7	8.4	8.8	8.7	8.7	8.4	8.4	10	9.6	10.1	10.1	10.1	10.1	10.1
Virgo	Virgo	Ursa Major	Ursa Major	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo	Virgo
V.Easy	Easy	Easy	Easy	Moderate	Moderate	Moderate	Moderate	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard

DATA SOURCE: TONYFLANDERS.WORDPRESS.COM

DATA VISUALISATION: STARLUST.ORG

## HOW DID PLUTO'S MOONS FORM?

August 27th, 2020



## Did Jupiter Push Venus Into a Runaway Greenhouse?

August 23rd, 2020



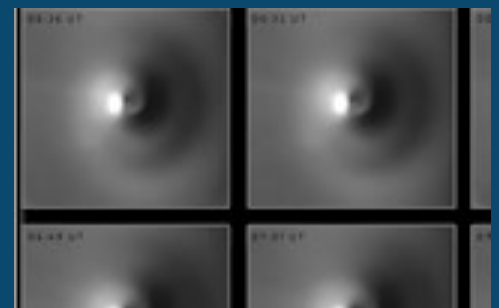
## Did a supernova cause the Devonian mass extinction event?

August 27rd, 2020



## Comet NEOWISE Was Spiraling and Spinning as it Passed by Earth

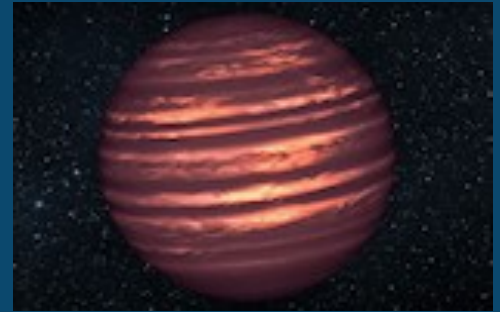
August 27th, 2020



# NEWS & LINKS

Astronomers find 100 brown dwarfs  
in our neighborhood

August 28th, 2020



This solar system has three stars, and that's  
not even the weirdest part

September 4th, 2020



Europa's entire icy shell shifted 70-degrees a  
few million years ago

August 31st, 2020



The Solar System has been Flying Through  
the Debris of a Supernova for 33,000 Years

September 1st, 2020





## STUDY SUGGESTS JUPITER COULD HAVE 600 MOONS

September 8th, 2020



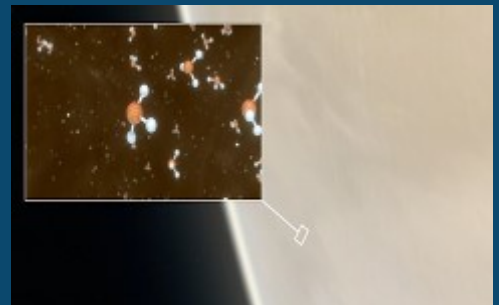
## The weird space that lies outside our Solar System

September 8th, 2020



## Possible Marker of Life Spotted on Venus

September 14th, 2020



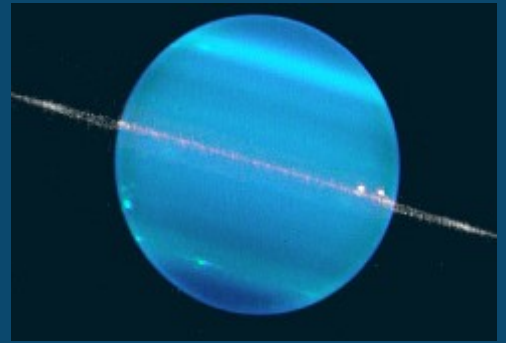
## Hubble Spots Dark Matter-Rich Spiral Galaxy

September 21st, 2020



## Herschel Measures Thermal Properties of Uranian Moon

September 17th, 2020



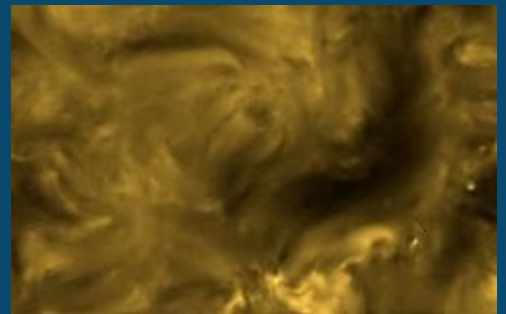
## Astronomers Find Jupiter-Sized Exoplanet Orbiting White Dwarf

September 16th, 2020



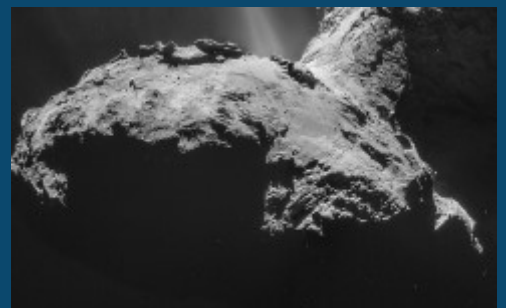
## Solar Cycle 25 has arrived. Here's what to expect from the Sun in the coming months and years

September 23rd, 2020



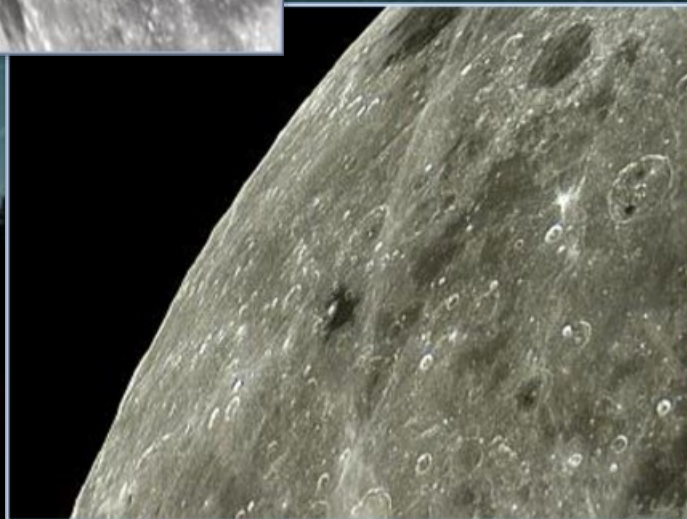
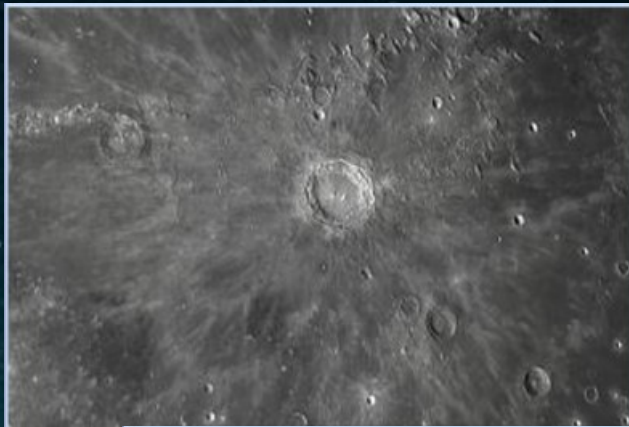
## Even Comets Can Have Auroras. Comet 67P/Churyumov-Gerasimenko Does

September 24th, 2020



# MEMBER OBSERVATIONS

Photos taken on August 30th, 2020. Moon was 90% illuminated. I was lowering the exposures as much as possible. Then I played around with brightness/contrast to bring out maximum detail.  
**Terry Dufek**





# MEMBER OBSERVATIONS

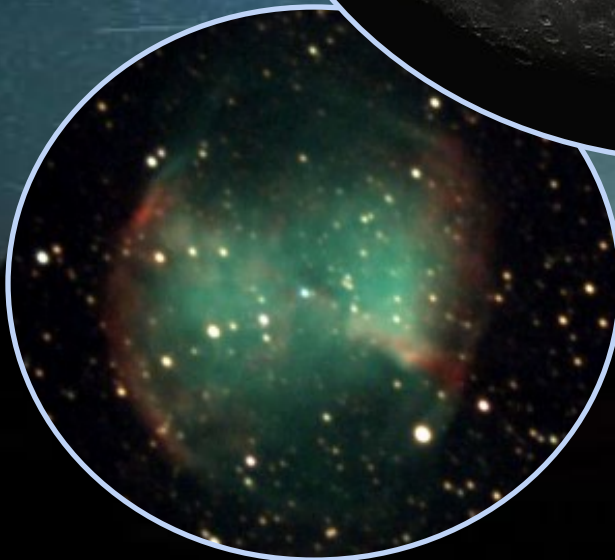
In a side by side comparison, M22 (right) is more robust than M13 (left). It just lacks the altitude in the sky



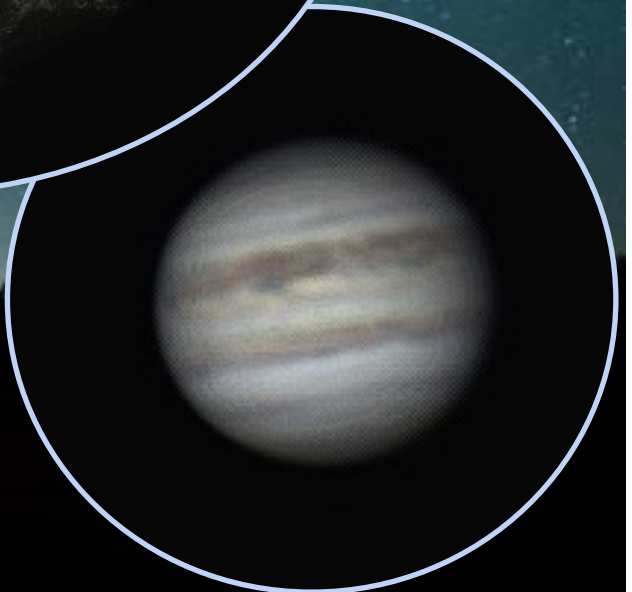
*Photos  
taken on  
On September  
4th, 2020  
by  
Terry Dufek*



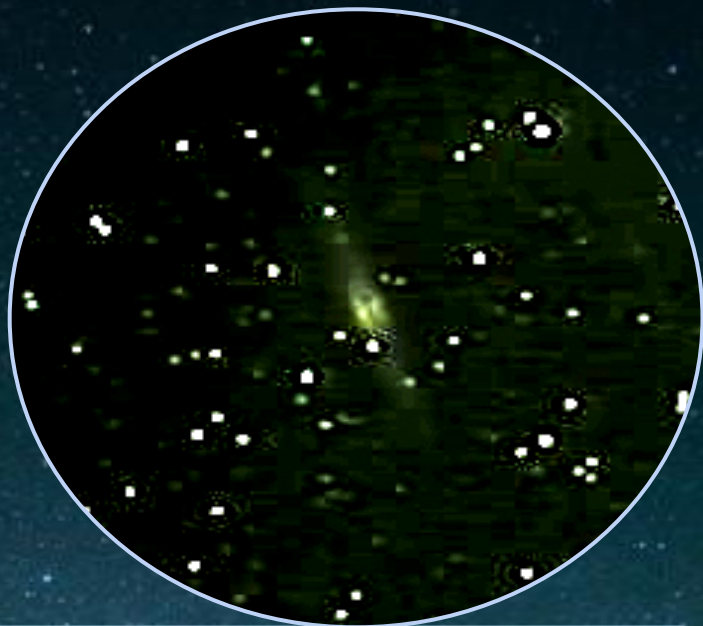
The 92% illuminated Moon, striped of its brightness and increasing the contrast brings out great detail



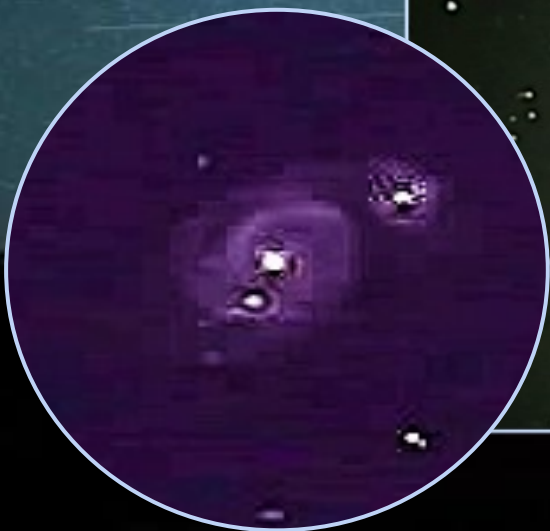
The dumb-bell and a kind of Ho Hum Jupiter with no red spot visible



# MEMBER OBSERVATIONS



Photos taken by Rusty Case  
August 29th at Menke. Gal-  
axy in upper left is NGC 891.  
Upper left and lower right  
are M31, M32, and M110.  
Lower left is M51. He used  
the R2 camera on his  
102mm Explore Scientific  
Refractor.





# MEMBER OBSERVATIONS



Photos taken by Byron  
Davies on September  
15th, 2020 at Paul Castle.

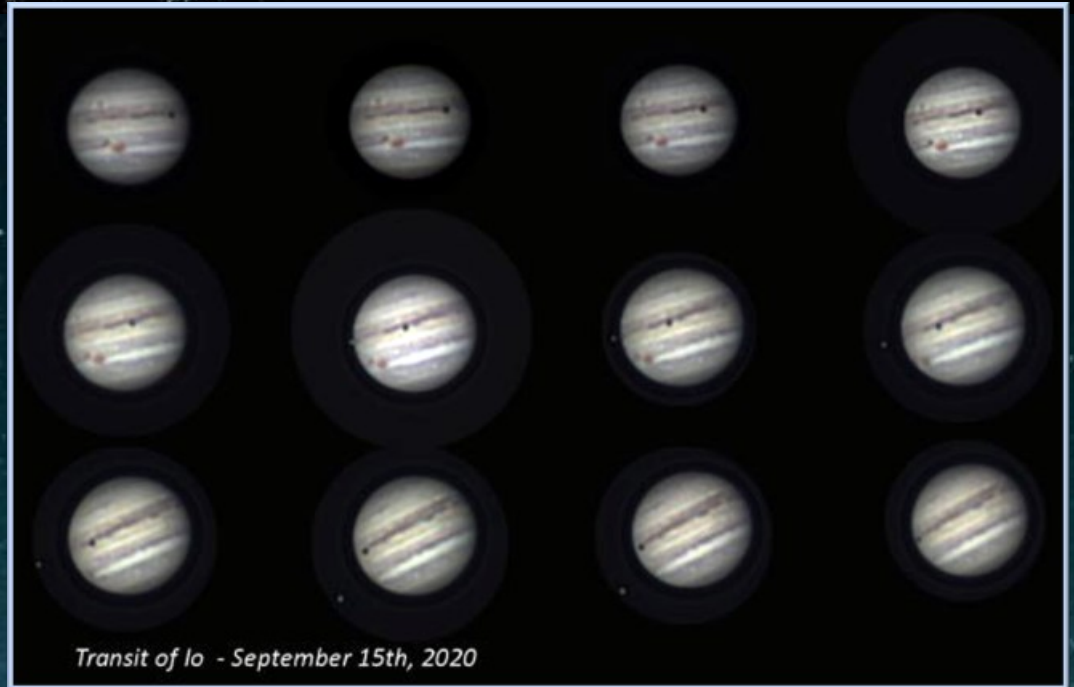




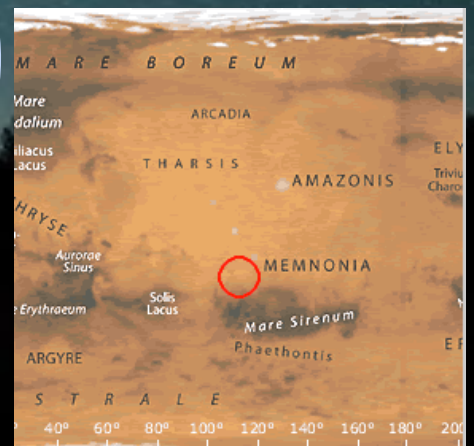
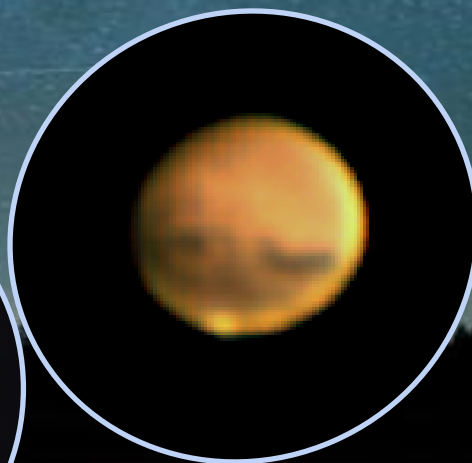
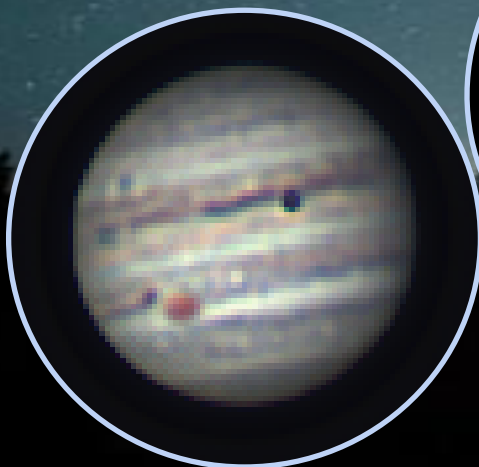
# MEMBER OBSERVATIONS

(right) Photos of the transit of Io on the evening of September 15th, 2020. (left to right, top to bottom) The photos were from about 8 pm to 10:30 pm. You see the planet at different angles as it change position in the sky.

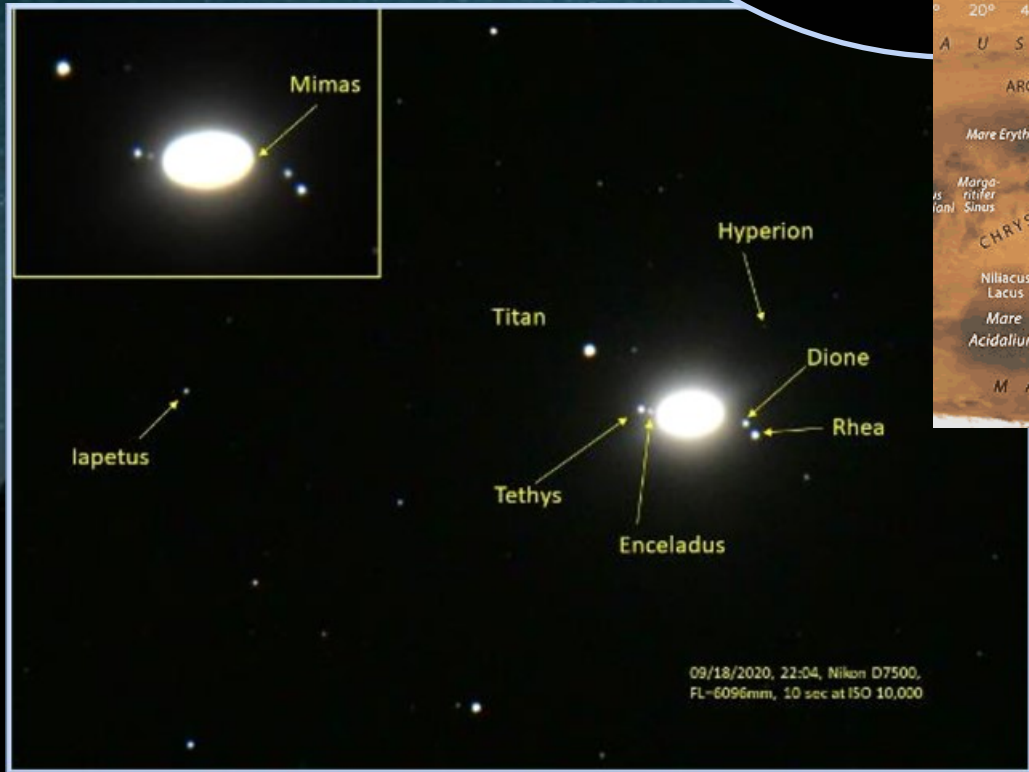
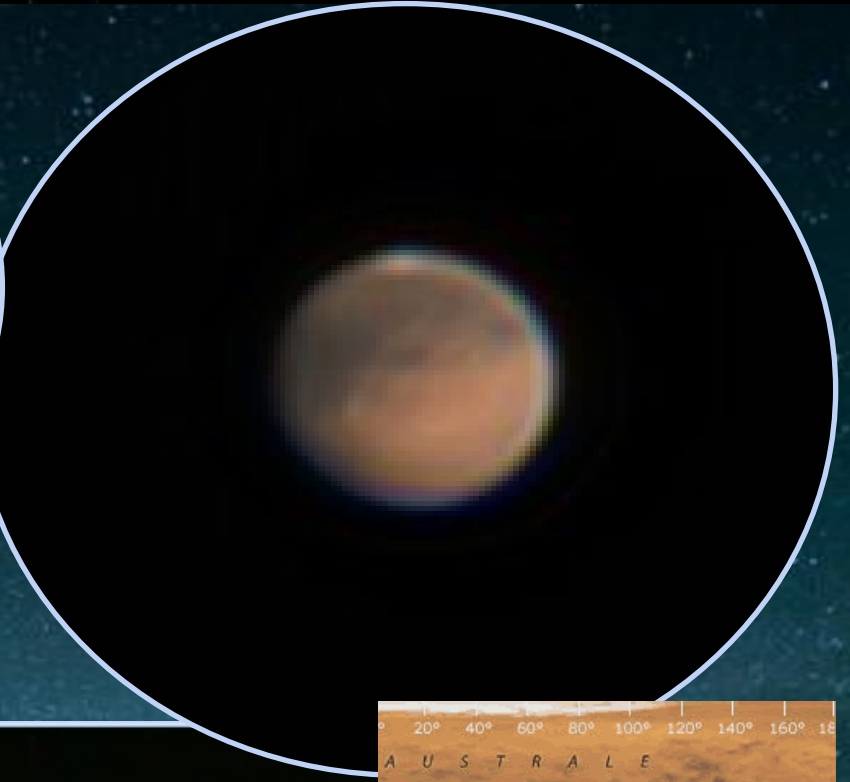
**Terry Dufek**



(below) Jupiter, Saturn and Mars on the evening of September 15th. The dust in the air from the fires are preventing the sharpening of the planets through registax. Barlow lens just magnified the problem. The air was very stable that evening however so I got some fairly decent shots. **Terry Dufek**



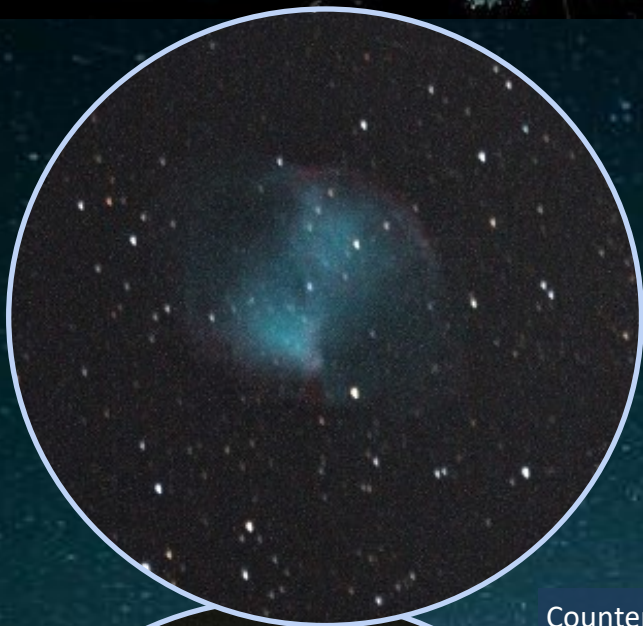
# MEMBER OBSERVATIONS



Photos by Al Sheidler at the EISP.  
The shadow on Jupiter, is from the moon, Europa.



# MEMBER OBSERVATIONS



Counterclockwise from upper left: M27, M2, M13 and M57  
Photos by Byron Davies on September 22nd, 2020





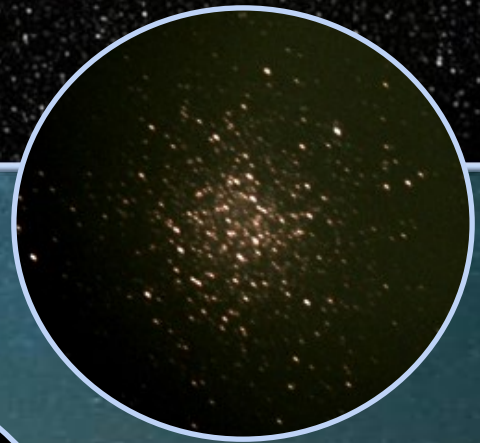
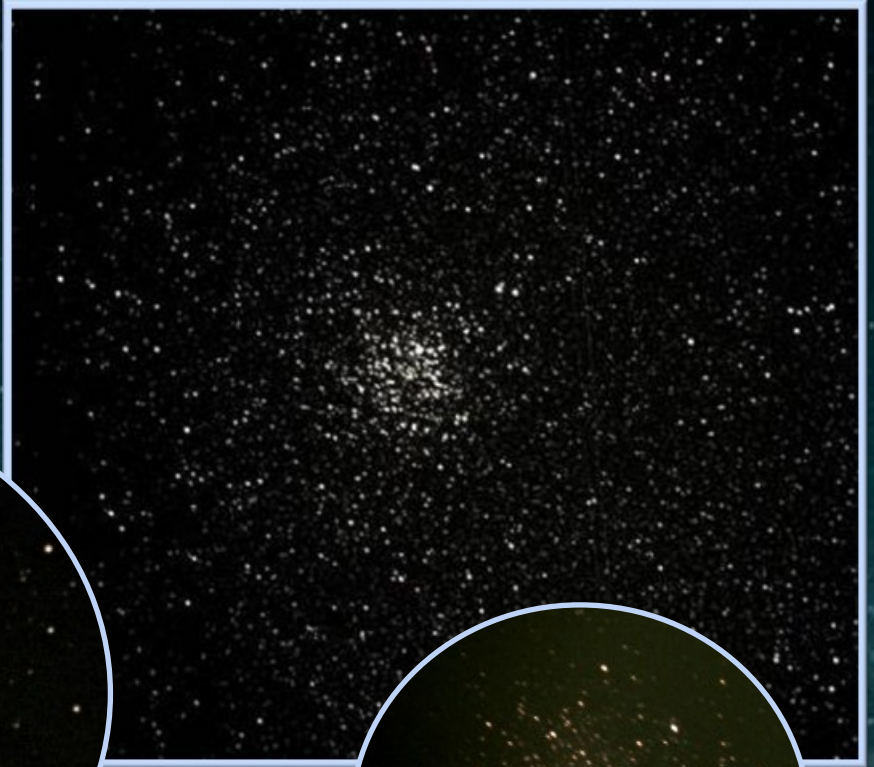
# MEMBER OBSERVATIONS

(left) M11—the Wild Duck Cluster.  
(below-left) -

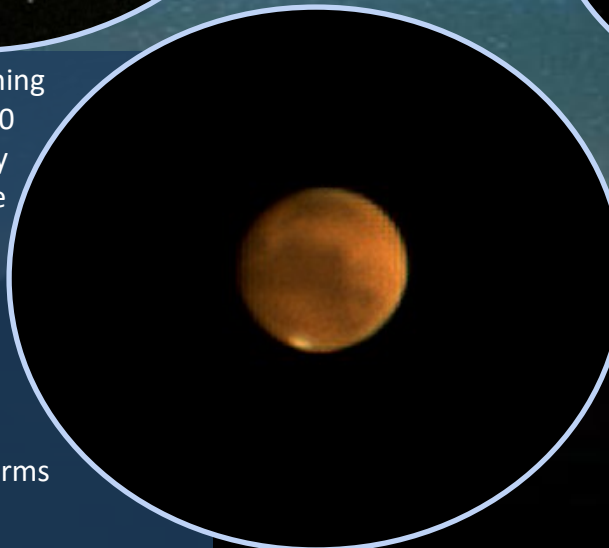
Messier 15 is a globular cluster in the constellation Pegasus

(below-right) - Messier 55 a globular cluster in the constellation Sagittarius.

Photos by Terry Dufek



Mars (right) on the evening of September 24th, 2020 from my backyard. Very short exposure because I only had a one planet alignment and Mars continued to drift. Was shot about 6 inches over my garage. doesn't look like we will be dealing with dust storms this year.



# MEMBER OBSERVATIONS

Photos by  
Byron Davies on  
September 29th,  
2020— early  
morning.  
M42—The Orion  
Nebula, the  
horsehead and  
flame and M1 –  
the Crab Nebula  
with its delicate  
colors.  
Byron said  
“ Skies were  
crystal clear this  
morning and the  
moon was  
setting as I set  
up. Best viewing  
in weeks. “





# Paul Castle Observing Sessions

## Paul Castle Observing Session September 4, 2020

Last evening a group of us met at the Paul R. Castle Observatory to take advantage of the beautiful, clear sky last evening. In the group photo are Terry Dufek, Al Sheidler, guest Gary Knapp, Eric Sheidler, Rusty Case, Wayland Bauer, Ken Boquist, and Dale Hachtel.

We met around 6:30 to grill some brats, partake in a simple picnic dinner and enjoy fellowship as we waited for the sun to set. Terry, Dale, Wayland, Ken and Rusty set up telescopes in the grassy field nearby the observatory. Eric, Dale, Gary and I opened the observatory and prepared the new scope in the observatory while we waited for it to get dark enough to observe.

In the observatory, we spent most of the time learning about the various functions available for aligning the new scope and finding various objects using the hand controller. Dale and I continue to learn more every time we use the CPC1100HD. We spent the majority of the time using the scope for visual observations until we stumbled onto an intriguing object called NGC6751, The Dandelion Puffball Nebula. This is a planetary nebula set in an attractive field of view with many small stars. While the planetary nebula was visible by eye, we decided to mount the Nikon D7500 camera in place of the eyepiece we were using to see what a time exposure photograph would reveal. This image was captured using the scope's 2800mm focal length, and a 15 second exposure at ISO 16000. The planetary nebula appears as a small, bluish, irregular-shaped circle with a diminutive star at its center. To me, the photograph doesn't look much like a dandelion or a puff ball-- personally, I've never seen a blue dandelion, but gazing at it in the eyepiece, NGC6751 does perhaps resemble something akin to its description. An active imagination is a plus for an astronomer! At Terry's suggestion, we then drew a bead on the planet Neptune and took a snapshot using the same settings as for NGC6751. The photo definitely reveals the planet and perhaps one of its moons Triton. We also targeted Jupiter, Saturn and Mars, all of which were splendid solar system objects last night. We all had a great time and are looking forward to the coming weeks as the planet Mars approaches opposition.

**Al Sheidler**



Neptune and Triton



NGC6751 Dandelion Puffball Nebula



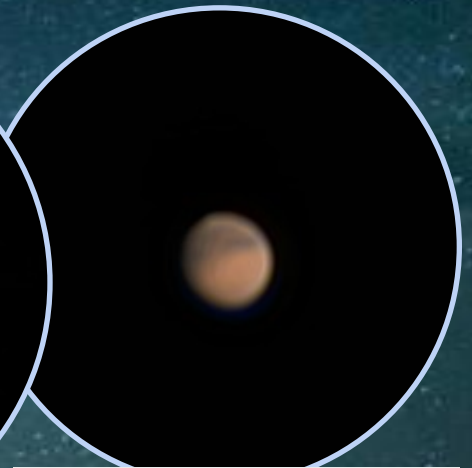
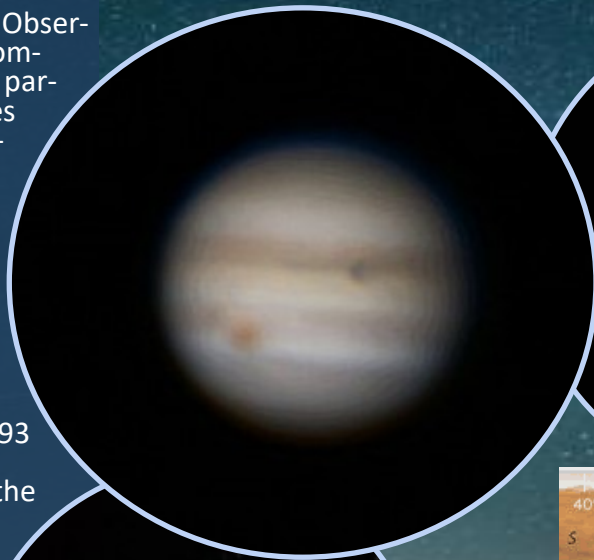
# Paul Castle Observing Sessions

## Paul Castle Observing Session

September 15th, 2020

Last evening a group of us met at the Paul Castle Observatory to take advantage of clear skies and warm, late summer weather. In the group photo are Al Sheidler, Byron Davies, John Baker (guest), Paul Saeger, Jim Rutenbeck, Terry Dufek and Rusty Case. Everyone set up a telescope except me--I used the scope in Paul's Observatory. Someone made the comment that we had a "mini star party" with the array of telescopes deployed there last night. Unfortunately there was significant haze in the upper atmosphere due to smoke from the forest fires out west. Despite the smoke, I was very amazed at the quality of the deep sky images folks were teasing out of their equipment. Paul and Byron were producing some amazing images of the NGC7293 (the Helix Nebula), M27 (the Dumbbell Nebula), and M57 (the Ring Nebula). Last night was the "night of the planetary nebulas and the planets" (Mars, Jupiter & Saturn). Attached are some of the images I took through the observatory's CPC1100 using my Nikon 7500 SLR camera. Mars is really getting good. Make sure to get out with the group for upcoming observing sessions to view Mars.

**Al Sheidler**

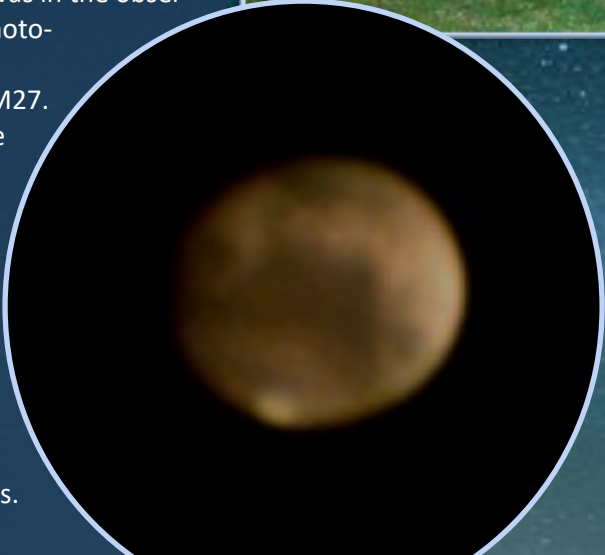


# Paul Castle Observing Sessions

## Paul Castle Observing Session September 22th, 2020

An observing session was held at Paul Castle this evening. The skies were hazy and overcast with high thin clouds. Dale Hachtel, Rusty Case, Byron Davies, Wayland Bauer and Terry Dufek were present. I photographed the Moon and planets last night through the hazy clouds. Dale was in the observatory. Byron photographed M13, M56, M57, and M27. The photos were fairly decent because they were overhead. Rusty helped Wayland with the R2 on his telescope. Broke up around 9:30 pm because of the thickening clouds.

**Terry Dufek**

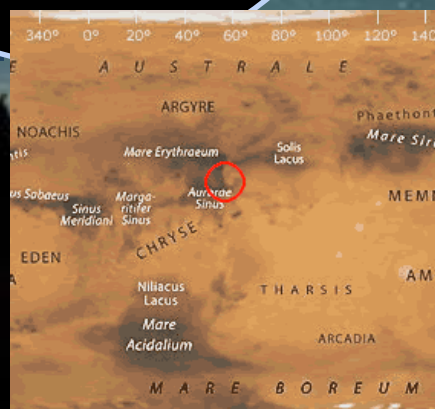
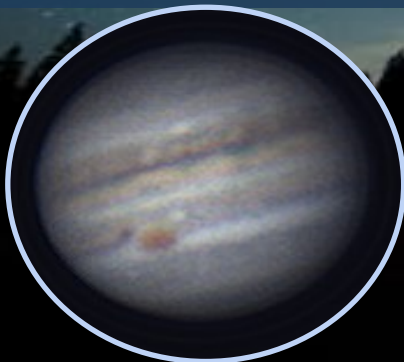


The thin haze prevented some of the best views last night, but the moon and planets provided some interesting views. Using the observatory scope, I was able to see an interesting view of the moon with high contrast at the crescent points. I had a clear view for a while of Saturn, with detail of the rings and Saturn, with Titan and possibly two other moons. I was able to experiment with getting a cell phone image of a cluster, M25.

Mars was unusually clear and detailed, even with the low position and through the haze.

The viewing was getting worse, so the group packed up and went home around 10:00pm.

**Dale Hachtel**





# Paul Castle Observing Sessions

## Paul Castle Observing Session September 25th, 2020

An observing session was held at Paul Castle this evening. It looked like it was going to be clear but ended up very hazy. Could only see a few bright stars. Half Full Moon had an orange tint to it and an orange haze around it (about 2 degrees). Rusty got some deep sky shots but all my photos of planets (except Moon) were not sharp. Only Rusty and I showed up and we only stayed until 10 pm. I don't think the haze was from the forest fires but was just a rather crappy atmosphere. There was a strong breeze from the south. The weird thing is when I got home, the haze around the moon had dissipated and Mars had gotten much brighter and steady. I could even see a few more stars.

**Terry Dufek**

*Ps: I checked the following morning and it was the smoke returning with the breeze from the south.*







# PAC MONTHLY MEETING

President Alan Sheidler arranged (with the help of Dale Hachtel) for the September 2020 meeting of the Popular Astronomy Club to be conducted via (Zoom) at 7:00 p.m. local time, on September 14th, 2020. We had 23 members and 13 guests attending.

Time for membership renewal is approaching. (October) Application is online or at the end of the newsletter.

A talk by Zachery Luppen (from the University of Iowa) was given entitled "The Europa Clipper and JUICE Spacecraft: Our Next Missions to the Jovian System. It was followed up by questions and answers.

## Business Meeting:

### Director of Observatories:

Paul Castle observatory is ready to go and available to all members.

PACMO is being brought to EISP on September 18th

### Secretary:

Member YTD total points are being totaled and will be finalized by September 30th, 2020

### Treasurer Report:

Dale reviewed current figures from the latest treasurer report. Insurance figures are not in yet as we have a new carrier.

### ALCOR:

Web address is now correct with the AL. Web addresses have been corrected with various internet sites as encountered.

### Vice President:

Not present

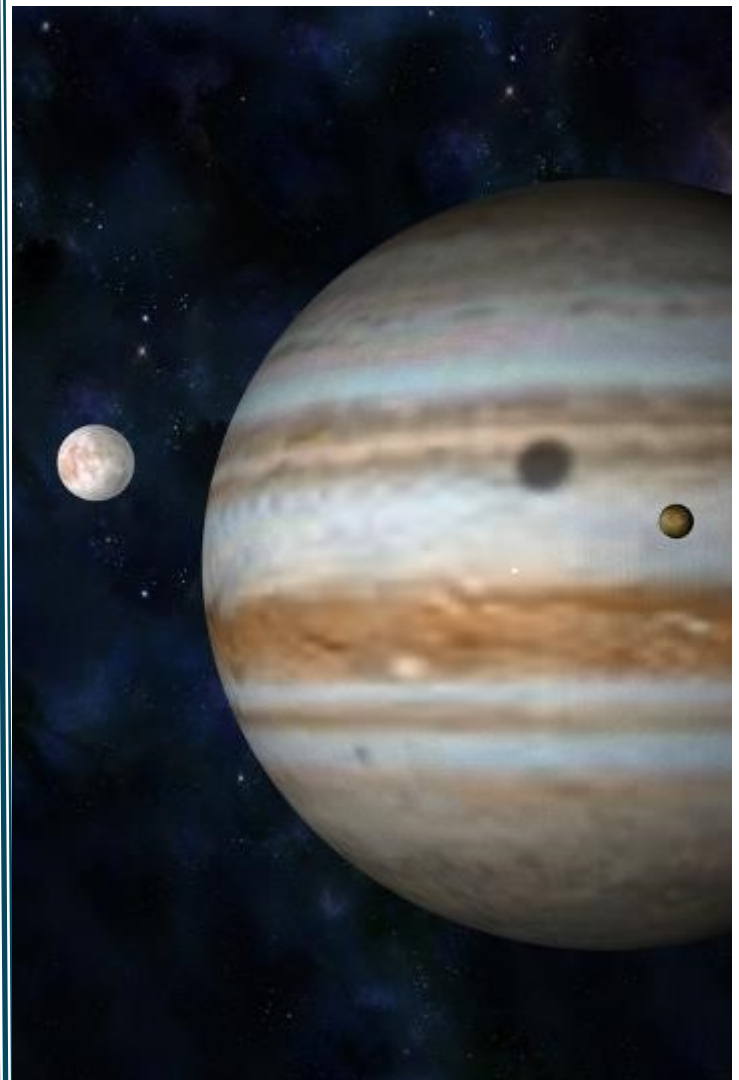
Issues reported

Wayland brought up about winter Messier certificates, They haven't been received yet. Al said they are still coming.

Mike Dannefeldt has a Polemaster for sale at \$70 off the purchase price. Contact him via email.

Al is meeting with Marietta Castle and 2 relatives to view the remodeled observatory.

A motion was made to adjourn the business meeting by Wayland and seconded by Byron. It was approved by the majority.



*(continued in next column)*

9/1/2020

**TREASURERS REPORT**

from 6/1/2020 to 8/31/2020

description	current period detail	current	YTD
<b>Receipts:</b>			
memberships	3 new members	\$42.50	\$162.50
member donations			
program donations			
misc donations			\$1,630.75
interest		\$1.17	\$1.91
banquets			
birdies			
calendars			
special			
sales			\$700.00
other	T- Shirt		\$45.00
Total Receipts		\$57.67	\$2540.16

<b>Expenditures:</b>			
programs			
speakers			
PACMO operation	License renewal	\$158.00	\$398.00
observatory			\$301.00
equipment			
maintenance			
Astronomical League	Annual dues	\$185.00	\$185.00
insurance			
operating supplies			
newsletter			
web page			
banquet	Will carry over to next year		\$100.00
donations			
miscellaneous			\$100.00
Legal	Illinois Annual Report filing fee	\$10.00	\$10.00
PACMO upgrade			
observatory upgrade		\$3866.27	\$8612.29
other			
adjustments			
Total Expenditures		\$4219.27	\$9706.29

<b>Balances</b>	as of 8/31/2020		
previous balance		\$10978.79	\$13983.32
net change		-\$4161.60	-7166.13
ending balance		\$6817.19	\$6817.19

check account			\$1352.01
money market account			\$5414.51
savings account			\$10.23
business special			\$45.44
cash			\$0.00
undeposited checks			\$0.00
Total Cash Assets			\$6827.19





# POPULAR ASTRONOMY CLUB



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 1<sup>st</sup> 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](http://www.popularastronomyclub.org)**

Membership pro-rated (for new members) 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 \$30.00 \$ \_\_\_\_\_

(b) Additional family member (\$7.50 each) x (#) \_\_\_\_\_ \$ \_\_\_\_\_

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 \$ \_\_\_\_\_

(d) Sustaining Member \$60.00 \$ \_\_\_\_\_

(e) Patron Member \$80.00 \$ \_\_\_\_\_

(f) Student Member \$10.00 \$ \_\_\_\_\_

**Grand Total** \$ \_\_\_\_\_

Your Name: \_\_\_\_\_

Address: \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

E-Mail \_\_\_\_\_

Home Phone: \_\_\_\_\_ Cell Phone \_\_\_\_\_

Please enter name (s) of ADDITIONAL FAMILY MEMBERS:

\_\_\_\_\_

Emergency Contact: \_\_\_\_\_ phone # \_\_\_\_\_

**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 (treasurer)  
1617 Elm Shore Drive  
Port Byron, Illinois 61275  
cell # [614-935-5748](tel:614-935-5748)