Highlights of the October Sky. . .

- - - 3rd - - -
AM: A waning crescent Moon and Regulus, in Leo, are 4° apart.

- - - 6th - - -
New Moon
7:05 am EDT

- - - 9th - - -
DUSK: A waxing crescent Moon is 2⅓° to the upper left of Venus, with Antares 6½° to the Moon's left.

- - - 12th - - -
First Quarter Moon
11:27 pm EDT

- - - 14th - - -
DUSK: A waxing gibbous Moon, Jupiter and Saturn form a triangle.

- - - 15th - - -
DUSK: Venus is 1½° to the upper right of Antares.

- - - 20th - - -
DAWN: Mercury moves to within 1½° of Porrima, Gamma (γ) Virginis.

Full Moon
10:57 am EDT

- - - 21st - - -
AM: Orionid meteor shower peaks, but spoiled by the Moon.

- - - 23rd - - -
AM: A waning gibbous Moon is near the Pleiades.

- - - 27th - - -
DAWN: The Moon is about 5½° below Pollux in Gemini.

- - - 28th - - -
Last Quarter Moon
4:06 pm EDT

- - - 31st - - -
DAWN: Less than 5° of sky separate Mercury and Spica in Virgo.

Prime Focus

A Publication of the Kalamazoo Astronomical Society

★ ★ ★ October 2021 ★ ★ ★

This Months KAS Events

General Meeting: Friday, October 1 @ 7:00 pm
Held on Zoom • Click to Register • See Page 14 for Details

Observing Session: Saturday, October 9 @ 7:00 pm
Galaxies of Autumn • Kalamazoo Nature Center

Astrophoto SIG Meeting: Friday, October 15 @ 8:00 pm
Held on Zoom • Click to Register • See Page 4 for Details

Observing Session: Saturday, October 23 @ 7:00 pm
Jupiter, Saturn & the Moon • Kalamazoo Nature Center

Observing SIG Session: Thursday, October 28 @ 7:30 pm
Richland Township Park • See Page 13 for Details

Inside the Newsletter. . .

The general meeting of the Kalamazoo Astronomical Society was brought to order by President Richard Bell, using the 1945 KAAA gavel, on Friday, September 10, 2021 at 7:06 pm EDT. Approximately 32 members and guests joined us virtually on Zoom.

Richard was also the speaker for the evening and presented *85 Years of Looking Up: A Brief History of the KAS*. For a summary of Richard's presentation, please visit the KAS history page on our website. Pretty much everything covered can be read there. Jack Price kept track during the talk and Richard mentioned over 90 past and present KAAA/KAC/KAAS/KAS members. You can also view the entire meeting on our YouTube channel.

The President's Report was mostly fun. The KAS has a new Zazzle clothing page. David Parks has already purchased a hoody, and showed it off to other members, saying that he was very happy with the quality. Right now we only have KAS logo items, but members are welcome to submit any astronomically-themed T-shirt ideas to the Board for sale on the website.

Richard is asking for 2022 general meeting speaker ideas. Please, if you have any recommendations or would like to give a presentation, contact him. Next, we would like to encourage any individuals looking to join KAS, to do it now while the membership is still prorated through the end of next year. The *Owl Observatory User's Guide* is now available for review. Additionally, if you would like be trained on how to access and use Owl Observatory, please contact Richard. To close, he thanked everyone who showed up for the Leonard James Ashby Telescope dedication. It was an intimate occasion that marked an important milestone in KAS's history.

Joe Comiskey shared a double star observing report, including the observation of 8 Lacertae. He was also excited to show off his new (and extremely) wide-field binoculars. Jack Price shared a dark-sky morning view he had of the Pleiades while camping. Richard shared a crescent Moon and Venus image he took near the entrance to the Kalamazoo Nature Center. Astrophotography will be shared at the SIG meetings from now on. Under News & Events, NASA's Perseverance rover has collected its first core sample on Mars. The James Webb Space Telescope is now schedule to launch on December 18th. Pete Mumbower expressed an interest in having a launch party. Richard then shared an image of the Sun from Spaceweather.com with 6 sunspot groups! This shows that the Sun is finally leaving its low activity phase in its cycle.

In other news, Aaron Roman gave a brief Observing SIG update. Don Stilwell asked for volunteers for Crane Fest, held on October 9th and 10th at the Kiwanis Conservation Area in Calhoun County. The meeting adjourned 8:54 pm.

Officers and at-large members gathered on Zoom for a board meeting on Sunday, September 12th. President Richard Bell brought the meeting to order at 5:05 pm EDT. Others present included Jack Price, Don Stilwell, Aaron Roman, Joe Comiskey, Scott Macfarlane and Pete Mumbower.

Don Stilwell presented the Treasurer's Report, including Account Balances and Cash Flow Reports through the end of August. Don received a packet of mail from KAMSC that was accidentally placed in the wrong faculty member's mailbox late last year and not discovered until in-person classes recently resumed. Included were two memberships (one renewal, one new member). Richard planned to contact the people and offer each a free 1-year membership. Another letter was an offer to donate a 12-inch mirror with a grinding tool and 4 eyepieces to KAS. Joe Comiskey said he would follow up with the donor. Finally, Don concluded the Treasurer's Report noting that the reports are balanced.

In follow-up items from previous meetings, we discussed the Remote Telescope. Maintenance to the all-sky camera was performed by Jim Kurtz in June. The Takahashi may need collimation. Additionally, we hope adjust the shutdown script so the observatory closes without user assistance. One continued issue is that the guide camera is not wide enough to locate guide stars reliably. Owl Observatory has upgraded its exhaust fan power. Dave Garten installed a new solar panel and Pete Mumbower wired it with the existing panel.

Aaron Roman made a motion to authorize Richard to purchase a Baader Polarizing Filter for $137 and a Baader Solar Continuum Filter $186. Motion seconded by Jack Price and it was voted on and passed unanimously. A 2" color filter set from Baader was also suggested, but the Board decided against purchasing at this time, citing that it was unclear whether it would be used enough to justify the expense.

The Board agreed, due to rising COVID-19 cases, that meetings would be held virtually until the end of the year. The planned *Luminous* documentary will need to be paid for to virtually watch during the November General Meeting. After some discussion we decided to move forward with the 75-minute version. Unfortunately, this decision to remain virtual also meant that the Winter Solstice Dinner Party will be put on hold until next year.

In other topics, Richard announced that he plans to offer the *Introduction to Amateur Astronomy* series again. And finally, Pete suggested we purchase an 8-inch Dobsonian to keep in Owl Observatory for use during public sessions. The Board decided to take up this issue at a later meeting.

The next board meeting was agreed for Sunday, October 17th at 5pm on Zoom. The meeting concluded at 6:23 pm.

Astrophotography SIG Meeting Minutes

The premiere meeting of the inaugural season for the KAS's new Astrophotography Special Interest Group (AP-SIG) was held on Friday, September 17th. Over 60 members and guests were present via Zoom. President Richard Bell brought the meeting to order at about 8:05 pm EDT and immediately introduced our special guest speaker.

Adam Block is one of the leading astrophotographers in the world today and as won several awards for his work. In 2012, he was the recipient of the Hubble Award, one of the highest awards for excellence in astrophotography, from the Advanced Imaging Conference. The title of his presentation was *To the Ends of the World with Astrophotography*. Adam stated that this would be a talk about sharing astronomical images and what makes them so compelling.

The first image shared featured NGC 4921, a spiral galaxy on the outskirts of the Coma Cluster. The next image showed the heart of the Coma Cluster, which contains few spiral galaxies but many ellipticals. This illustrates how strongly gravity affects galaxies near the cluster's center, disrupting their spiral patterns through interactions and direct collisions. The Milky Way is located on the remote outskirts of the Virgo Cluster of Galaxies, so it should come as no surprise that we live in a spiral galaxy. M87 is a supergiant elliptical galaxy at the heart of the Virgo Cluster. It is the result of many galaxies merging together. M87 has a well-known supermassive black hole at its center with a high-energy jet of gas ejected from this region.

Adam next gave a background in his imaging career. It started, fortunately enough, at the start of the digital revolution for amateur astronomers in the early 1990s. His first digital pictures were made with an SBIG ST-4 guider camera (256×256 pixels). His first real taste of public outreach was sharing live images of Comet Hyakutake before it became visible to the unaided eye in 1996. That same year, Adam started the public stargazing program at the Kitt Peak National Observatory's Visitor Center. The first telescope was a Meade 16-inch LX200, which he described as "anti-designed" for astrophotography.

One major capability for astrophotographers today is High-Dynamic-Range (HDR) imaging, which allows you to reveal the maximum amount of detail in a target without over exposure. HDR photography has its roots with atomic bomb explosion tests. Special film needed to be developed to bring out the range of brightnesses starting with the initial flash. Ansel Adams manipulated tonal values in images to bring out information that would otherwise be hidden. David Malin developed techniques like unsharp masking to bring out greater details in astronomical subjects. In 2008, CCDStack was one of the first image processing programs to display images in a non-linear fashion. Adam shared an image of NGC 5866 that was processed with PixInsight using HDR techniques.

Adam Block was the first guest speaker during the first regular meeting of the KAS AP-SIG on Sept. 17, 2021.

Today, Adam works at the Mount Lemmon SkyCenter Observatory for the University of Arizona, which he founded in 2008. They use the Schulman Telescope, a 32-inch Ritchey-Chrétien, for public outreach. He also does research for the university using a Takahashi Epsilon 180ED astrograph and buys time on a PlaneWave 24-inch CDK in Chile, allowing him to image Southern Hemisphere targets.

A common question Adam is asked is are the colors in his images real. Using IC 2118 as an example, the answer is yes since the camera's white balance is the same as one used for standard daytime imaging. This is not the case for images taken with narrowband filters where colors can be assigned. Adam concluded his presentation by sharing many of his greatest hits. Members are encouraged to view the entire presentation on our YouTube channel.

At the start of the open forum portion of the meeting, KAS members will always have the opportunity to share their latest images. Pete Mumbower began by bringing up his recent image of IC 5146, the Cocoon Nebula. It was taken with his new SharpStar Optics 61mm triplet refractor. He combined over 14-hours of LRGB subframes with an Atik 383L+ camera. It was processed with PixInsight. Richard then shared a simpler image of a conjunction between a waxing crescent Moon and Venus on Sept. 9th. He used a Canon 6D and Sigma 70-300mm lens at 100mm (f/4). It is a 4-second exposure at ISO 100 and processed with Adobe Lightroom. Rick Gustafson, a KAS member living in California, shared images of the Milky Way with Mt. Shasta in the foreground. Another Milky Way image was shot from Kneeland Airport in Humboldt County, CA. Dave Parks then showed an image of the Sadr region taken on July 4th. Condensation formed on his lens, but created an interesting, natural fogging affect around the bright stars. Dave Garten shared an image of NGC 1499, the California Nebula. It was the first image he processed with PixInsight.

Richard reported that the Remote Telescope is back online after an early end to the monsoon season. He encouraged members to use the RT and combine their imaging time for group projects. He also gave an overview of imaging equipment in Owl Observatory. Jonathan Young wrapped things up with a preview of his talk for the October AP-SIG meeting (see page 4). We concluded at 10:05 pm.

Observations

by Richard S. Bell

October is the last great month for stargazing of the year. After this month, the Great Michigan Blanket of Clouds will drape themselves over the night sky until March! October has many advantages over the summer months. First, the sky grows darker at a more convenient time. Observers and imagers alike can sneak in a couple of hours at the telescope before heading to bed and rushing to work the next morning. While dew can still be a problem, the night air is crisper than the humid summer nights. We also get the best of both worlds. Many of the deep sky highlights of summer are still within reach, while showpiece targets of Fall come into prime time viewing. Some of the more notable sights include the Andromeda Galaxy (M31), Double Cluster (NGC 869 &884), and the Pleiades (M45) - just to name a few!

Public Observing Sessions during October haven't fared too well during recent years though. Cloudy weather totally shut us out in 2019 and the pandemic canceled the entire season in 2020. How will 2021 fare? Attendance for recent sessions has been far from spectacular, but I hope that changes for the better this month if skies are clear. As mentioned, it's your last, best chance to gather under the stars with your fellow members until the spring. Mark your calendars for October 9th and 23rd, and don't forget the Observing SIG session on October 28th. I'm quite anxious to present some new A.L. Observing Award certificates to members!

The topic of this month's *Night Sky Notes* is International Observe the Moon Night, which falls on October 15th this year. We have nothing scheduled this time around (it's been hard enough getting members to participate during public sessions), but there's nothing stopping you from setting up your telescope in the front yard or even doing some sidewalk astronomy in a high-traffic area. To that end, I decided to include all six pages of NASA's IOMN Moon maps here in *Prime Focus*. If anything, it'll help you explore our nearest celestial neighbor on your own.

The rest of October is all about astrophotography. The long-traditional "Astrophotography Night" continues at the general meeting on October 1st. All KAS sky shooters are encouraged to share their best images from the past year. Please email me before October 1st if you plan to show off your work. The total number of members presenting will let me know how much time each person will have. That way the meeting won't last for 3 hours!

The next meeting of the new Astrophotography SIG is on Friday, October 15th at 8pm. Details on the main topic appear in the column to your right. I promised a presentation for a general audience during the September meeting and Adam Block delivered. This time, not so much. This meeting will indeed be for those with a more serious interest in imaging. Speaking of the September AP-SIG meeting, I can't promise a summary of each meeting (like the one on page 3), but will try to post each one on our YouTube channel.

Astrophotography SIG Meeting Preview

All KAS members interested in astrophotography are encouraged to attend and participate during SIG meetings. Each meeting will feature a main topic presented by members or special guests. Members are encouraged to share their latest images during each meeting. We will also discuss and review the latest imaging equipment and software.

Main Topic for October Meeting:

Narrowband Imaging Considerations & Lessons Learned from Southern Michigan

presented by **Jonathan Young**

During this talk Jonathan will share several examples of the lessons learned from his narrowband-imaging and processing experience. First, an example of how to balance sensor and equipment limitations using a few test images in order to maximize practical SNR. Then, strategies to improve acquisition efficiency and image quality under changing local sky conditions including examples on managing the impact of smoke, moon, low altitude haze, and light pollution gradients. Next, how to determine practical calibration limits including the power of dithering. Then a quick tutorial using Siril including a powerful tool for gradient correction prior to stacking. Result comparisons of several stretching techniques such as boosted tone mapping, Ha-SHO combinations and weighted luminescence using Startools. Examples of color balancing results including Hubble pallet, artistic weightings and CEILab. Finally, the importance of proper monitor calibration and adjustments needed for different publication mediums including online, metal, canvass and acrylic.

About the Speaker:
Jonathan is an amateur astronomer and automotive engineer residing in Saline, MI. After completing his graduate and undergraduate work at the University of Michigan, he has held several engineering, management and senior management positions at Toyota Motor North America and is currently dual capped as the Vehicle Performance Integration Lead for NA developed battery electric vehicles and as the Senior Engineering Manager for the Advanced Vehicle Structures and CAE Methods Group. He has authored several papers and holds over 30 patents. He began his astronomical interests as a student at KAMSC and has focused his efforts on imaging the night sky for the past seven years. Many of his images are published on his Astrobin page. In addition to astronomy he enjoys traveling and spending time with his wife and four kids.

Friday, October 15th @ 8:00 pm

Held Online via Zoom • *Click Here to Register*

NASA Night Sky Notes...

Weird Ways to Observe the Moon

by David Prosper

International Observe the Moon Night is on October 16th this year – but you can observe the Moon whenever it's up, day or night! While binoculars and telescopes certainly reveal incredible details of our neighbor's surface, bringing out dark seas, bright craters, and numerous odd fissures and cracks, these tools are not the only way to observe details about our Moon. There are more ways to observe the Moon than you might expect, just using common household materials.

Sun Funnels in action! Starting clockwise from the bottom left, a standalone Sun Funnel; attached to a small refractor to observe the transit of Mercury in 2019; attached to a large telescope in preparation for evening lunar observing; projection of the Moon onto a funnel from a medium-size scope (5 inches).

Safety Tip: NEVER use a large telescope with a Sun Funnel to observe the Sun, as they are designed to project the Sun using small telescopes only. Some eager astronomers have melted their Sun Funnels, and parts of their own telescopes, by pointing them at the Sun - large telescopes create far too much heat, sometimes within seconds! However, large instruments are safe and ideal for projecting the much dimmer Moon. Small telescopes can't gather enough light to decently project the Moon, but larger scopes will work.

Put on a pair of sunglasses, especially **polarized sunglasses**! You may think this is a joke, but the point of polarized sunglasses is to dramatically reduce glare, and so they allow your eyes to pick out some lunar details! Surprisingly, wearing sunglasses even helps during daytime observations of the Moon.

One unlikely tool is the humble **plastic bottle cap**! John Goss from the Roanoke Valley Astronomical Society shared these directions on how to make your own bottle cap lunar viewer, which was also suggested to him by Fred Schaaf many years ago as a way to also view the thin crescent of Venus when close to the Sun:

"The full Moon is very bright, so much that details are overwhelmed by the glare. Here is an easy way to see more! Start by drilling a 1/16-inch (1.5 mm) diameter hole in a plastic soft drink bottle cap. Make sure it is an unobstructed, round hole. Now look through the hole at the bright Moon. The image brightness will be much dimmer than normal – over 90% dimmer – reducing or eliminating any lunar glare. The image should also be much sharper because the bottle cap blocks light from entering the outer portion of your pupil, where imperfections of the eye's curving optical path likely lie." Many report seeing a startling amount of lunar detail!

You can **project the Moon!** Have you heard of a "Sun Funnel?" It's a way to safely view the Sun by projecting the image from an eyepiece to fabric stretched across a funnel mounted on top. It's easy to make at home, too – directions are on Chuck Bueter's website. Depending on your equipment, a Sun Funnel can view the Moon as well as the Sun - a full Moon gives off more than enough light to project from even relatively small telescopes. Large telescopes will project the full Moon and its phases, with varying levels of detail; while not as crisp as direct eyepiece viewing, it's still an impressive sight! You can also mount your smartphone or tablet to your eyepiece for a similar Moon-viewing experience, but the funnel doesn't need batteries.

Of course, you can join folks in person or online for a celebration of our Moon on October 16th, with International Observe the Moon Night – find details at NASA's IOMN website. NASA has big plans for a return to the Moon with the Artemis program, and you can find the latest news on their upcoming lunar explorations at nasa.gov.

OBSERVE the MOON

International OBSERVE THE MOON NIGHT 2021

SATURDAY 16TH OCTOBER

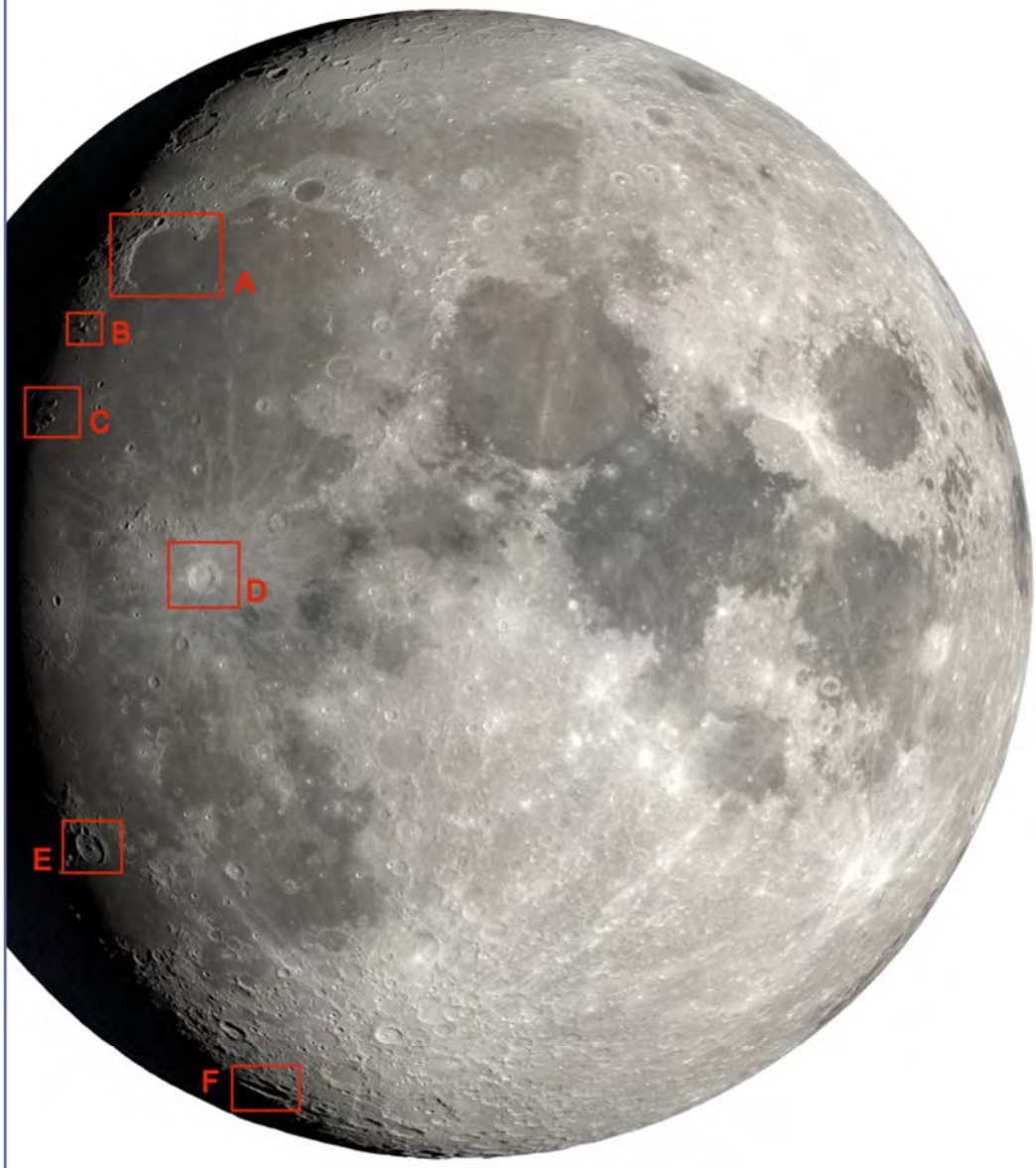
NORTHERN HEMISPHERE MOON MAP FOR TELESCOPE VIEWING

Moon Map

This map was created for International Observe the Moon Night 2021. It depicts the Moon as it will appear from the northern hemisphere at approximately 11:00 PM EDT on October 16, 2021 (3:00 AM UTC on October 17). Many of the best views will occur along the terminator (the line between the day and night side of the Moon).

Selected Features

Some of the more interesting lunar landforms that have favorable lighting for viewing tonight are identified here. Details for each are on the reverse side of this map.



A. Sinus Iridum
B. Gruithuisen Domes
C. Harbinger Mountains
D. Copernicus Crater
E. Gassendi Crater
F. Schiller Crater

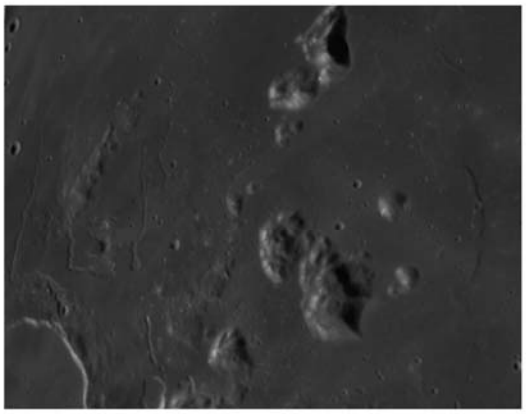
Map generated with NASA's Dial-A-Moon (https://svs.gsfc.nasa.gov/4874)

International OBSERVE THE MOON NIGHT 2021

Selected Features for Telescope Viewing

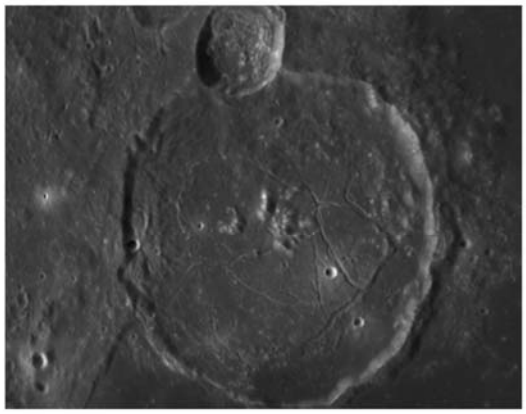
A. Sinus Iridum, the "Bay of Rainbows," is a bay along the northwest edge of Mare Imbrium. This 161-mile-wide (260 km) crater's floor was once flooded with lava. Its north and west rim forms the Jura Mountains.

B. Gruithuisen Domes: These lunar volcanoes, reaching about a mile (1,600 m) high, are unusually tall and steep for volcanoes on the Moon. They seemed to be formed by lava that was particularly thick and pasty.



C. Tonight we see the Harbinger Mountains just after they have experienced sunrise. This small range measures about 59 miles (95 km) long and reaches heights of about 1.2 miles (2 km). Larger telescopes show volcanic vents and channels on the range's western edge.

D. Copernicus is a magnificent 57-mile-diameter (93 km) crater with terraced walls, a flat floor, and a group of central peaks towering almost a mile (1,200 m) above the floor. The crater is over 2.2 miles (3,700 m) deep.



E. Gassendi: This 68-mile-diameter (110 km) floor-fractured crater lies on the northern rim of Mare Humorum. It had its floor pushed up by magma rising from below. Larger telescopes will reveal a network of fractures across the crater floor.

F. Near the Moon's edge, all craters appear oval and foreshortened. However, Schiller is actually very elongated, measuring 111 x 43 miles (180 x 70 km). It was likely formed by the impact of an asteroid striking the ground nearly horizontally.

Detailed images are from **NASA's Lunar Reconnaissance Orbiter** with north up and lunar west to the left. Find more high-resolution images of the Moon at:

lroc.sese.asu.edu
trek.nasa.gov/moon

OBSERVE the MOON

International OBSERVE THE MOON NIGHT 2021

SATURDAY 16TH OCTOBER

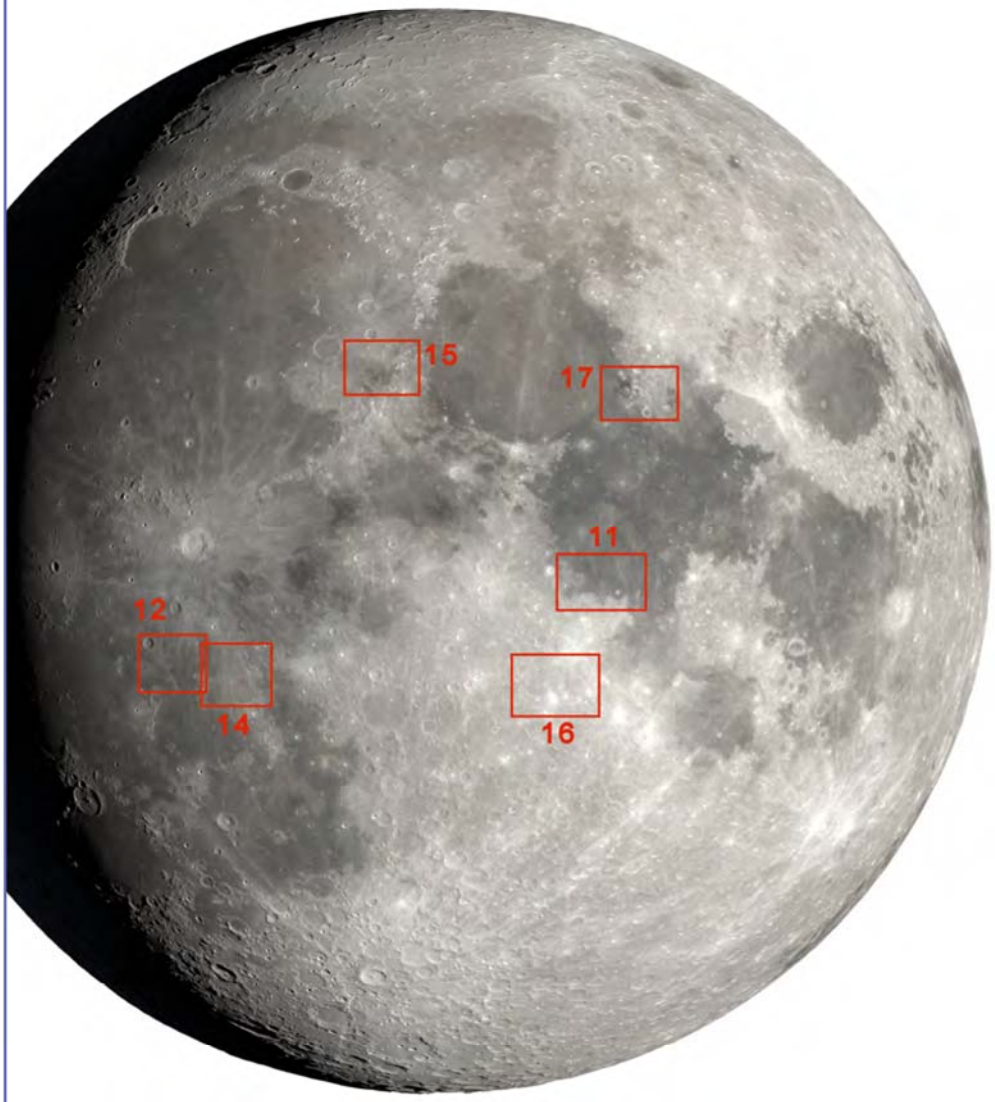
NORTHERN HEMISPHERE MOON MAP with HUMAN LANDING SITES

Moon Map

This map was created for International Observe the Moon Night 2021. It depicts the Moon as it will appear from the northern hemisphere at approximately 11:00 PM EDT on October 16, 2021 (3:00 AM UTC on October 17).

Human Lunar Landing Sites

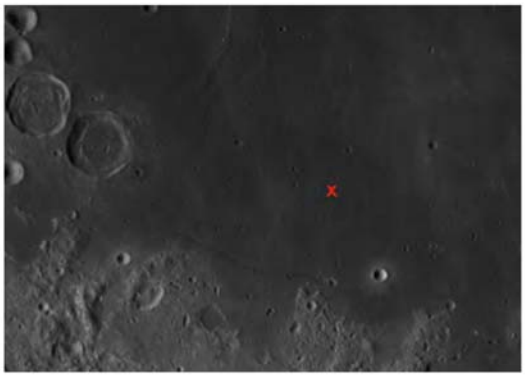
Between July 1969 and December 1972, a total of 12 astronauts landed on the surface of the Moon as part of six of the Apollo missions. Apollo missions 11, 12, 14, 15, 16, and 17 each landed in different locations on the lunar surface. These locations, each fascinating for their own particular reasons, sampled a wide range of lunar geology and terrain, from smooth mare plains to rugged ancient highlands. All six landing sites are visible tonight. Use this map and the magnified charts on the other side of this sheet to find and observe all six historic sites.



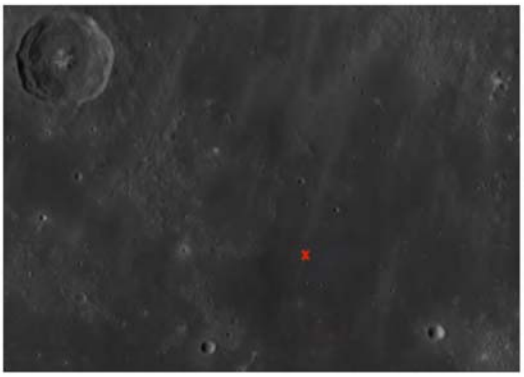
Map generated with NASA's Dial-A-Moon (https://svs.gsfc.nasa.gov/4874)

International OBSERVE THE MOON NIGHT 2021

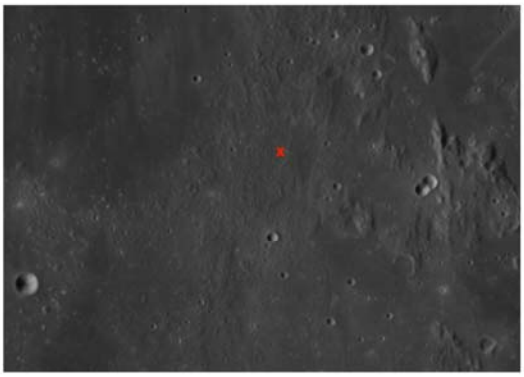
Selected Objects for Telescopic Viewing



Apollo 11: The first human landing site on the Moon was on the smooth, flat plains of the Sea of Tranquility. Despite how flat the area looks from Earth and from lunar orbit, astronauts Armstrong and Aldrin had to maneuver their lander in the last minutes of their descent in order to avoid a field of giant boulders.

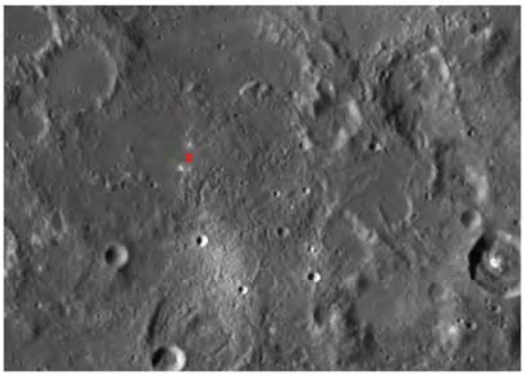


Apollo 12: In November 1969, a pinpoint landing brought astronauts Conrad and Bean down right next to the robotic Surveyor 3 spacecraft, which had landed there in April 1967. The astronauts collected samples of material blasted from the formation of Copernicus Crater over 217 miles (350 km) away and 800 million years ago.

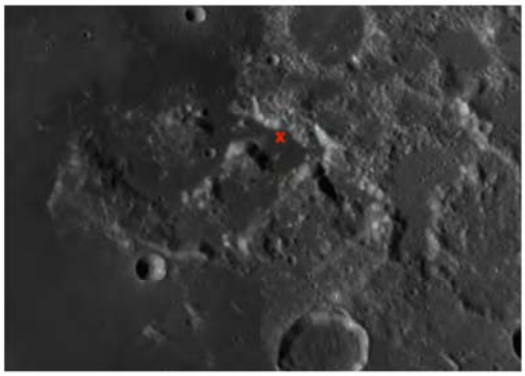


Apollo 14: Astronauts Shepard and Mitchell landed in a broad expanse of low, rolling hills in February 1971. The rock samples collected by Apollo 14 revealed that the topography within Mare Imbrium was formed nearly four billion years ago by debris blasts from the basin's formation.

Apollo 15: In July 1971, astronauts Scott and Irwin landed at the edge of Mare Imbrium at the base of the towering Apennine Mountains. Driving their rover across the mare and up the lower mountain slope, they gathered samples from the dark mare plains and the surrounding, light lunar highlands.



Apollo 16: This was the first and only mission to land in the rugged lunar highlands. In April 1972, astronauts Young and Duke collected rock samples more than four billion years old. These showed that the ancient lunar crust formed from rock that crystalized and floated to the top of a global lunar magma ocean.



Apollo 17: The final Apollo mission to land on the Moon visited the spectacular Taurus-Littrow Valley, deeper than Earth's Grand Canyon. In December 1972, astronauts Cernan and Schmitt (the first professional geologist on the Moon) explored an active fault, a gigantic landslide deposit, and brought back samples that included beads of volcanic glass from an ancient lunar fire fountain.

Detailed images are from **NASA's Lunar Reconnaissance Orbiter** with north up and lunar west to the left. Find more high-resolution images of the Moon at:

lroc.sese.asu.edu
trek.nasa.gov/moon

OBSERVE the MOON

International OBSERVE THE MOON NIGHT 2021

SATURDAY 16TH OCTOBER

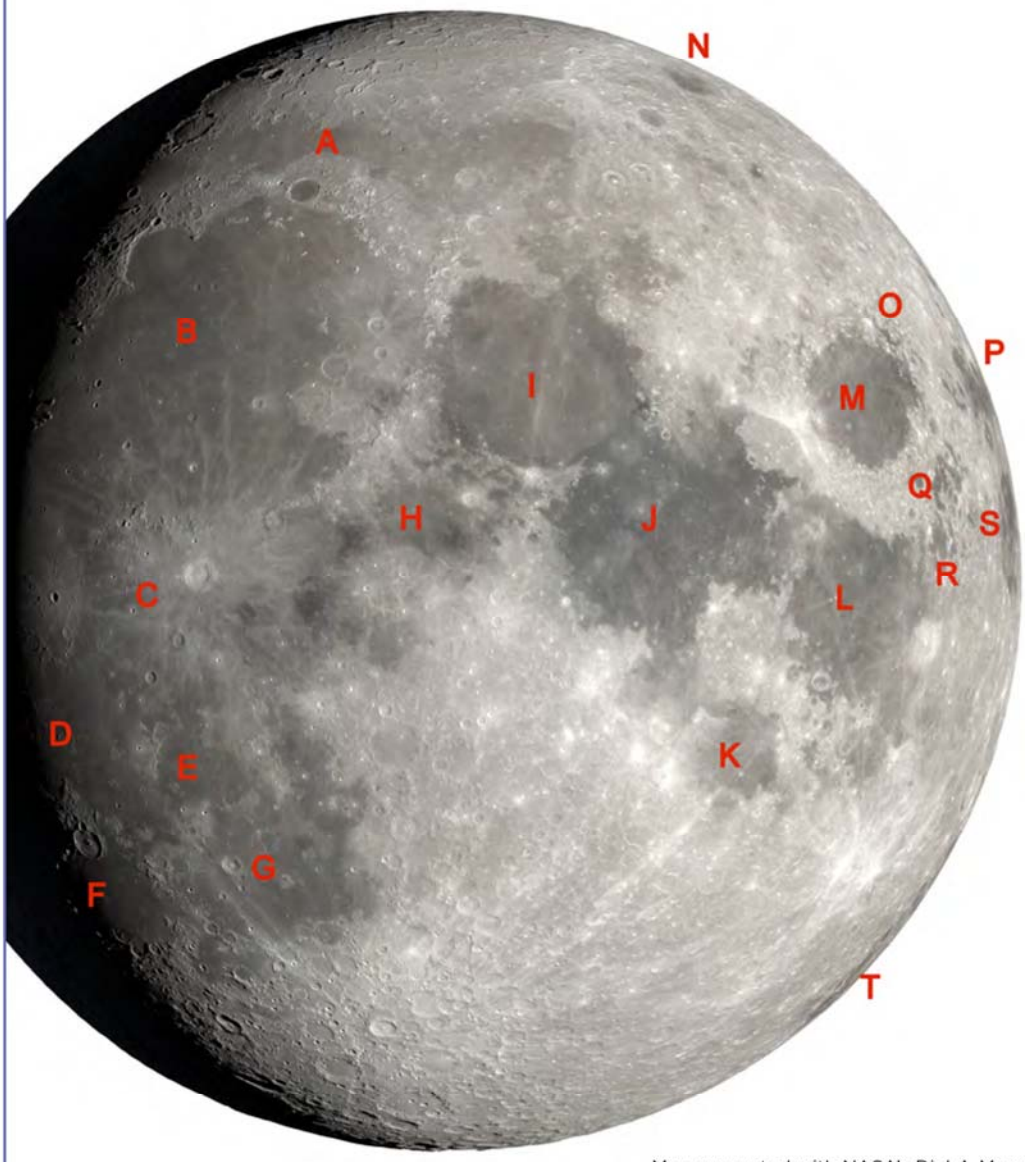
NORTHERN HEMISPHERE MOON MAP WITH LUNAR MARIA (SEAS OF BASALT)

Moon Map

This map was created for International Observe the Moon Night 2021. It depicts the Moon as it will appear from the northern hemisphere at approximately 11:00 PM EDT on October 16, 2021 (3:00 AM UTC on October 17).

Lunar Maria (Seas of Basalt)

You can see a number of maria tonight. Once thought to be seas of water, these are actually large, flat plains of solidified basaltic lava. They can be viewed in binoculars or even with the unaided eye. Tonight, you may be able to identify 18 maria on the Moon. This includes four seas along the eastern edge that are often hard to see. Because of libration, a slight apparent wobble by the Moon in its orbit around Earth, tonight we get to peek slightly around the northeast edge of the Moon, glimpsing a sliver of terrain normally on the Moon's far side.



Map generated with NASA's Dial-A-Moon (https://svs.gsfc.nasa.gov/4874)

A. Mare Frigoris (Sea of Cold)
B. Mare Imbrium (Sea of Rains)
C. Mare Insularum (Sea of Isles)
D. Oceanus Procellarum (Ocean of Storms)
E. Mare Cognitum (Known Sea)
F. Mare Humorum (Sea of Moisture)
G. Mare Nubium (Sea of Clouds)
H. Mare Vaporum (Sea of Vapors)
I. Mare Serenitatis (Sea of Serenity)
J. Mare Tranquillitatis (Sea of Tranquility)
K. Mare Nectartis (Sea of Nectar)
L. Mare Fecunditatis (Sea of Fertility)
M. Mare Crisium (Sea of Crises)
N. Mare Humboldtianum (Humboldt's Sea)
O. Mare Anguis (Serpent Sea)
P. Mare Marginis (Border Sea)
Q. Mare Undarum (Sea of Waves)
R. Mare Spumans (Sea of Foam)
S. Mare Smythii (Smyth's Sea)
T. Mare Australe (Southern Sea)

INTERNATIONAL OBSERVE THE MOON NIGHT 2021–The Lunar Maria (Seas of Basalt)

A. Mare Frigoris (Sea of Cold)

B. Mare Imbrium (Sea of Rains)

C. Mare Insularum (Sea of Isles)

D. Oceanus Procellarum (Ocean of Storms)

E. Mare Cognitum (Known Sea)

F. Mare Humorum (Sea of Moisture)

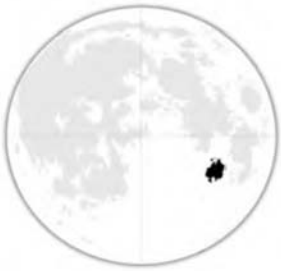
G. Mare Nubium (Sea of Clouds)

H. Mare Vaporum (Sea of Vapors)

I. Mare Serenitatis (Sea of Serenity)

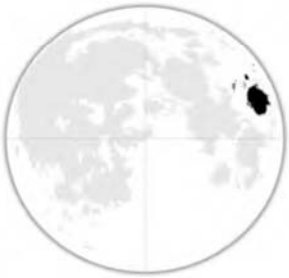
J. Mare Tranquillitatis (Sea of Tranquility)

K. Mare Nectartis (Sea of Nectar)



L. Mare Fecunditatis (Sea of Fertility)

M. Mare Crisium (Sea of Crises)



N. Mare Humboldtianum (Humboldt's Sea)

O. Mare Anguis (Serpent Sea)

P. Mare Marginis (Border Sea)

Q. Mare Undarum (Sea of Waves)

R. Mare Spumans (Sea of Foam)

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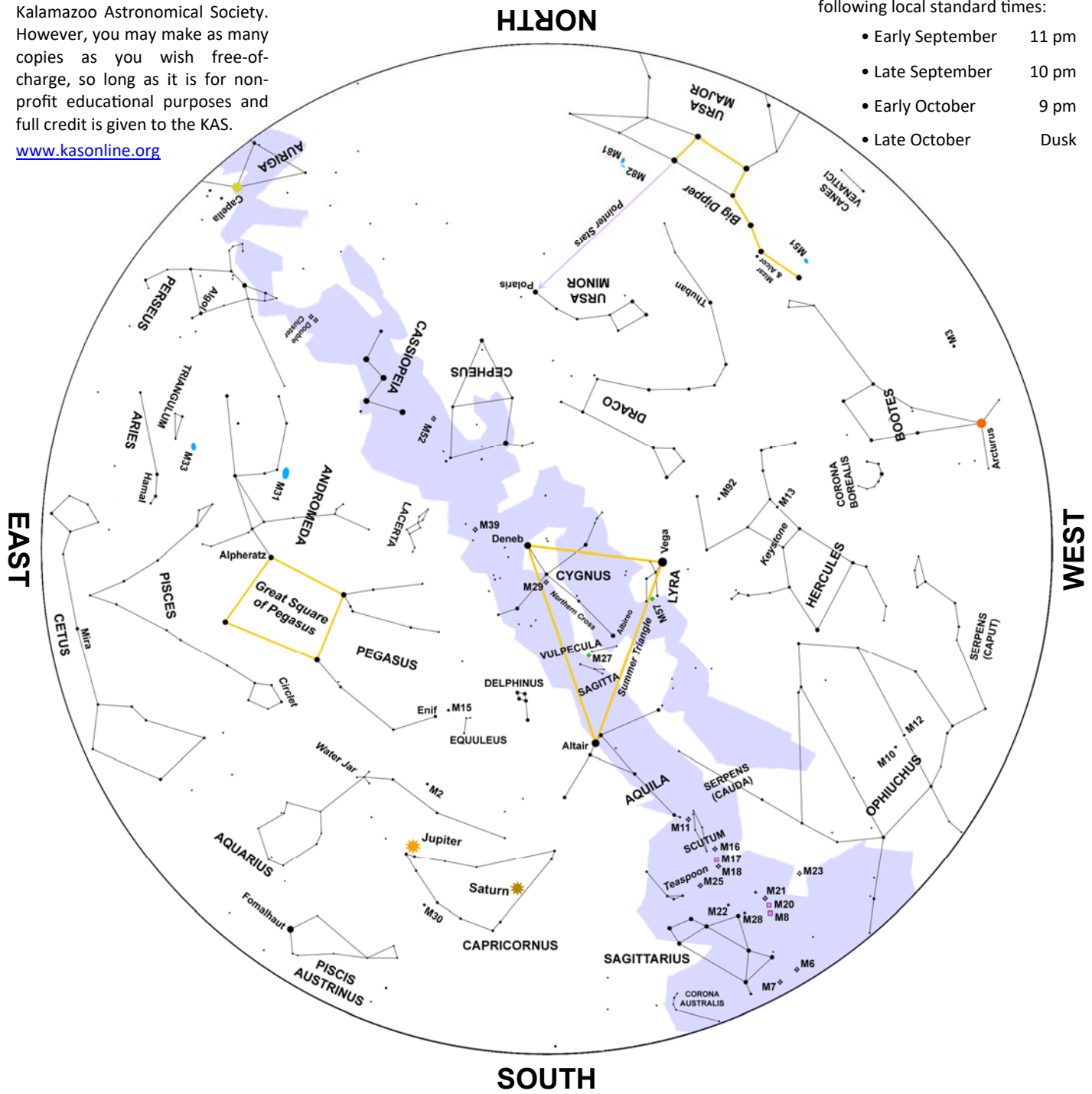
T. Mare Australe (Southern Sea)

These are the 20 lunar seas visible tonight, with north up and lunar west to the left. You may be able to see some of the larger seas with your unaided eyes. Smaller seas may provide challenges even through binoculars. Combine these charts with the accompanying map (on the front page) and see how many of the Moon's maria you can track down tonight!
Note: Mare Orientale is not included here, because it is obscured in the dark western portion of the Moon as seen tonight.

— October Night Sky —

This map represents the sky at the following local standard times:

- Early September 11 pm
- Late September 10 pm
- Early October 9 pm
- Late October Dusk



Venus, still reigning as the Evening Star, has another close encounter with a thin waxing crescent Moon on the evening of October 9th. This time around, Venus will be a mere 2⅓° to the Moon's lower right. The pairing can be found about 13° above the southwestern horizon 15 minutes after sunset. They'll make a marvelous sight in any pair of binoculars or even a widefield telescope, as both will easily reveal earthshine on our nearest celestial neighbor.

Venus has another encounter on October 15th. This time with Antares, the heart of Scorpius the Scorpion. The brilliant white planet and red-orange star will only be 1½° apart. The Evening Star will be less than 2° apart from the supergiant star for the next two days.

Early morning risers can spot Mercury about 5° to the upper left of Spica, in Virgo, shortly before dawn on October 31st. You'll need a clear, unobstructed view of the east-southeastern horizon. Grab binoculars, you'll need them.

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Observing
Special Interest Group

The primary goal of the Observing SIG is to help foster an observing culture in the KAS by helping and encouraging its members to complete Astronomical League Observing Programs. One way to maintain enthusiasm for getting out under the stars is to have a long-range viewing plan or goal. Observing Programs do that by motivating and directing your viewing. Programs are available for unaided eye, binocular, and telescopic observers of all skill levels. This gathering will be canceled in the case of inclement weather.

Thursday, October 28th @ 7:30 pm

Richland Township Park • 6996 N. 32nd St.

8" SCT Available for Loan

Our Celestron 8" Schmidt-Cassegrain telescope is quick and easy to setup. A dew cap, 3 eyepieces, Tel-Rad finder, and more are included.

This is a serious amateur telescope that will provide dazzling views of the Moon and planets, and is capable of showing you thousands of deep sky objects.

Visit the Telescopes for Loan webpage for more information and contact KAS Equipment Manager Arya Jayatilaka today if you'd like borrow it.

Public Observing Sessions

Saturday, October 9th
Highlights: Galaxies of Autumn

Saturday, October 22nd
Highlights: Jupiter, Saturn & The Moon

Gates Open: 7:00 pm Observing Begins: 7:30 pm

Kalamazoo Nature Center
— 7000 N. Westnedge Ave. —

General Meeting Preview

Astrophotography Night

KAS shutterbugs show off their wares.

The tradition continues! Every October the general meeting of the Kalamazoo Astronomical Society is devoted to astrophotography, the art of photographing the night sky. Over the years, KAS shutterbugs have traveled to exotic places, ascended to dizzying heights, or just hung out at the Kalamazoo Nature Center and other locales, working the graveyard shift with their impressive array of camera gear. Now they are ready to show their artistic wares. So come on out for what always proves to be one of our best meetings of the year!

Friday, October 1st @ 7:00 pm

Held on Zoom • Click Here to Register