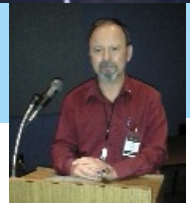
Event Horizon

Volume 29, Number 9
September 2022

From The Editor



Chair's Report by Bernie Venasse

It's back to school, and also, back with the EH with the arrival of the September edition!

We're back in-person! And, so too are the shows at the McCallion Planeterium!

Thanks to all who contributed!

Bob Christmas,
Editor

editor 'AT' amateurastronomy.org

Welcome back !!!

Summer Recap of Inreach and Outreach Events

July 8, Bayfront Park. A dozen members set up scopes for the public event. Robert Smoke put together a very nice visual presentation. 75 members of the public enjoyed views of the crescent moon. After years of COVID restrictions it was nice to hear exclamations of "Oh WOW!" once again. Sadly, the city has replaced the parking lot lights and the view of the sky is limited to only the sun, moon, the ISS, and the brighter planets.

July 9, Binbrook. A great turnout! Many new members having their first night out. A good number of seasoned observers on hand to assist the newbies from the Astro 101 program. *(Continued on page 2)*

IN THIS ISSUE:

Chair's Report (continued)

July 29, Binbrook. Meteor shower event. 16 members and guests attended and viewed about 15 Southern Delta Aquariid Meteors. Some very nice views of Saturn and Jupiter.

July 30, Binbrook. Only 6 members in attendance for this last-minute opening. Had a decent view of Comet C/2017 K2 PanStarrs.

Aug 6 Solar, Lakeview Park. Setups demonstrating white-light viewing and Ha viewing were offered to the passing public. Several club members dropped by to lend support. Dinner at Hutch's. Of Course!

Aug 13 Solar, Lakeview Park. Even more members attended with their scopes. Dinner at Hutch's, again. Of Course!

Aug 20, Binbrook. Another very good turnout, this time hosted by Denise and Chris White. A good time had by all. View of the night… A bright sky-train of satellites crossing the northern twilight shortly after the ISS had crossed the southern skies.

Aug 26, Binbrook. A dozen members shared the park including several youth members.

Aug 27, Binbrook. This evening gave 20 members clear skies for the second night of the weekend. Most interesting sighting may have been the bright red meteor observed around midnight.

What's happening around the club?

Registrations continue for the September 23-25, 2022 Star Party. Contact Sue McLachlan for details.

The Loaner Scope program has a new custodian. Paula Owen has assumed the responsibilities of this program as well as continuing to be our Membership Director. The program is very active. If you would like to partake in this program, please contact Paula via loanerscope@amateurastronomy.org

A big thanks to Paul Delaney, our speaker in June, for his inspiring and entertaining views about Solar Observing. Kudos as well to Brian Whitman for his video presentation about solar observing.

Our next meeting is scheduled for September 9, 2022 at McMaster Innovation Park. MIP is located at *175 Longwood Rd. S. in Hamilton*. This will be a hybrid meeting combining a live audience with a Facebook presence. Doors open at 7:00pm and the meeting begins promptly at 7:30pm. GOOGLE MAPS LINK HERE

Our guest speaker will be our very own *John Gauvreau…*

"Knowing Galaxias;

How we have seen and understood the Milky Way through time.

Anyone who has ventured away from the city lights is struck by the vividness of the night sky and the abundance of stars that appear. The Milky Way is seen stretching across the sky, a soft yet bright light that circles us. Yet our understanding that the Milky Way is a galaxy, an island universe as it was called, is new and was, in astronomical terms, hotly debated as recently as the 20th century.

(Continued on page 3)

Masthead Photo: *IC 5070, The Pelican Nebula,* by *Alex Kepic*. Taken through his Explore Scientific ED102 scope on a Celestron AVX mount, with a ZWO ASI294MC Pro camera.

Chair's Report (continued)

Let's have a look at our galaxy through the eyes of the ancients, the discovery of the telescope and right up to the most recent views across the full spectrum available to us now, to really understand our place in our island universe, the Via Lactea."

Award recipients

Anastasia Morrisette is a recipient of the Pathways Award (Part A). Congratulations Anastasia!! On to the next part…

I have recently received the Advanced Observer Award certificate and pin from the Astronomical League. This award is the third step in the Master Observer Progression and is awarded after the Observer Award and the Master Observer Award.

When you have completed the requirements for the Advanced Observer Award, you will have completed at least 15 separate Observing Programs. https://www.astroleague.org

Worth Repeating

We are now less than 18 months away from the total eclipse on April 8, 2024, and planning is under way. I invite each of our members to participate in the planning of events and activities related to the eclipse. We will soon be putting together a task group that will help coordinate some of the planning. Want to help? Get in touch. eclipse@amateurastronomers.org

The new HAA Lunar Observing Program is active. You can find it and other programs on our website https://www.amateurastronomy.org/haa-observing-programs/

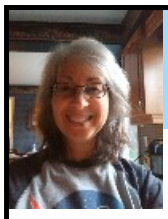
A reminder that a new page for members of the HAA is open on Facebook. The members page can be found at www.facebook.com/groups/hamiltonamateurastronomers. This is a group page for club members only. Please feel free to discuss anything astronomy related as well as post images of your gear or astronomy photos.

Membership growth… new members list… Welcome!!

We would like to take this opportunity to welcome new and/or returning members (June 21-).

Fred and Patricia Williams, Hamilton. Family membership.
Joshua VanVeen, Jerseyville. Individual membership.
Jethro Castasus, North York, Individual membership.
Jon Argosino, Ajax. Individual membership.
Arkadi Krasnopevtzev, Thornhill. Individual membership.
Edward Lovo Quintanilla, Hamilton. Family membership.
David Heinrich, Hamilton. Individual membership.
Bogdan Bunescu, Kitchener. Individual membership.
Andy Brunath, Burlington. Family membership.
Leroy Perrins, Hamilton, Individual membership.
Vijay Jos, Hamilton. Family membership.
Tony Wallace, Hamilton. Family membership.
Arpit Asthana, Hamilton, Individual membership.

The membership now consists of 82 individual memberships and 64 family memberships.



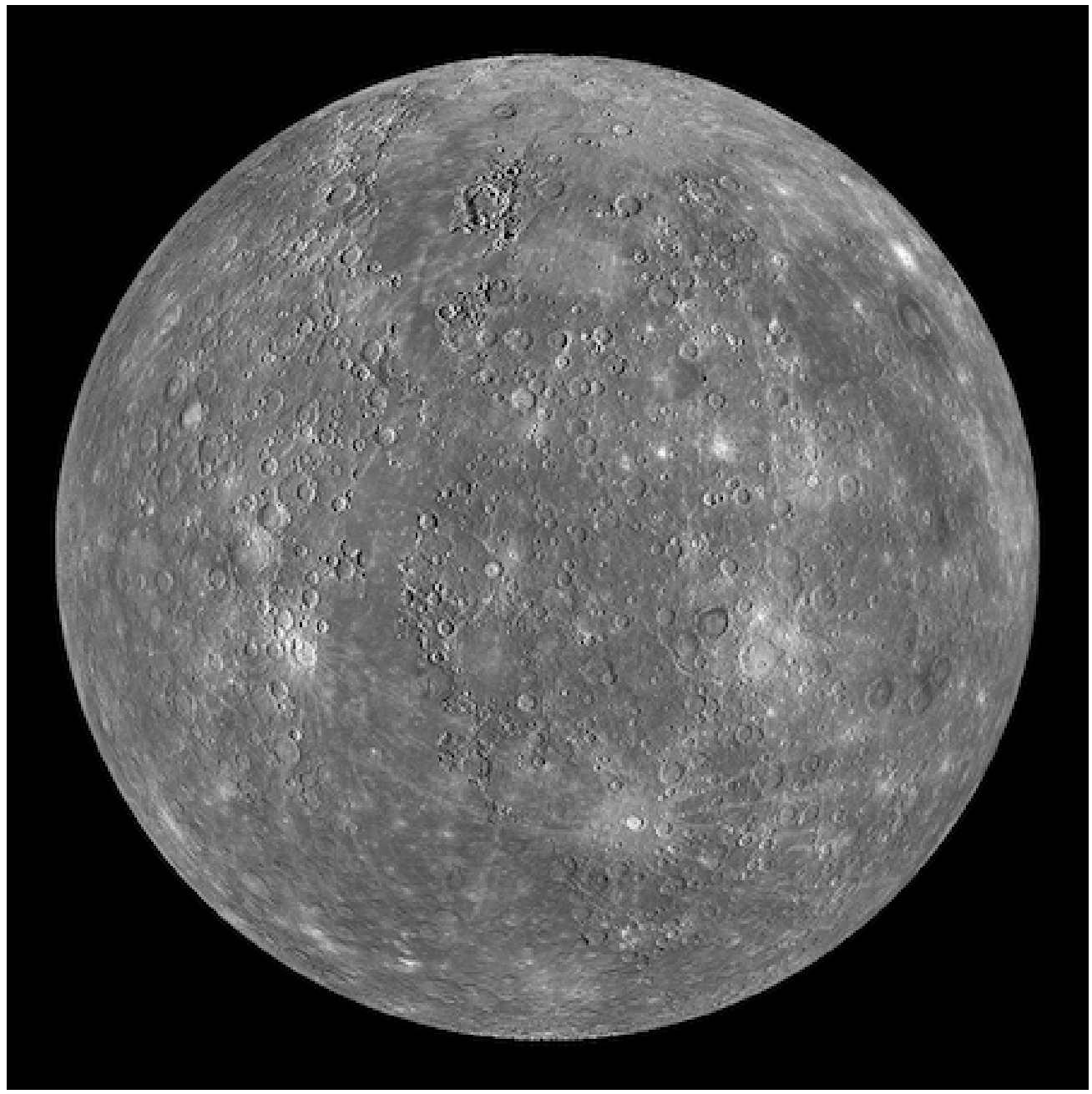
HAA Explorers by Jo Ann Salci

…A column for young astronomers - and those young at heart!

Welcome back! I hope you had a great summer! We will be exploring our close space neighbours in more detail, beginning this month with the planet Mercury. Let's go!

Speedy Mercury! ☿

The planet Mercury is the smallest of the 8 planets and closest to the Sun. It is named after the Roman messenger God who is often seen with winged feet. It only takes Mercury 88 Earth days to go around the Sun once. And it takes about 58.6 Earth days to spin on its axis once. Which means that it has 3 days for every 2 of its years!! What a long day it must feel like on Mercury!! And very hot days they are at 426˚ C on the side facing the Sun. And on the night side of Mercury, the temperature drops to -180˚C! This is the largest temperature variation in our Solar System. There is virtually no atmosphere on Mercury which accounts for this temperature variation. The wind from the Sun would blow away any atmosphere. The Sun's gravity would also pull away any moons, so Mercury does not have any moons.



Mercury

Image Credit: NASA Spaceplace

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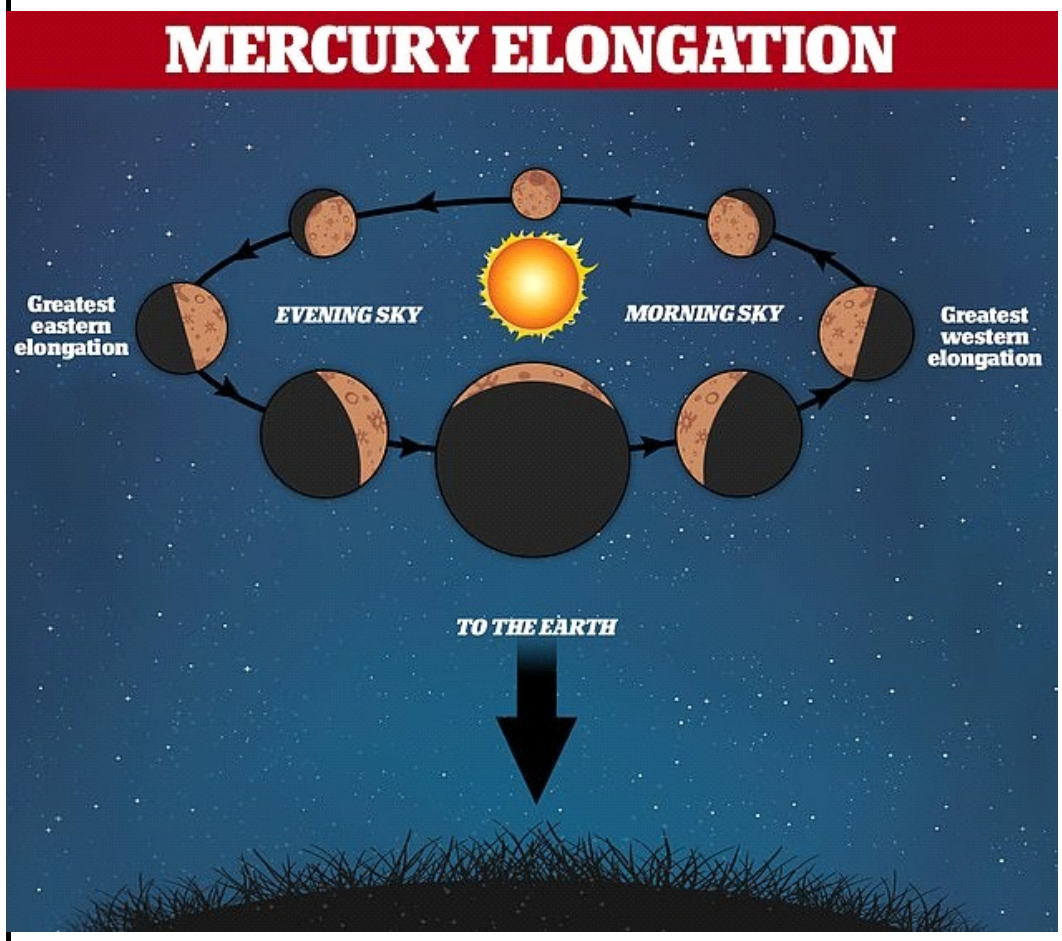


Image Credit: Daily Mail

Mercury orbits close to the Sun and has the most elliptical orbit (oval-shaped) of all the planets. Because it's so close to the Sun, it's hard to see and can best be seen when its orbit takes it furthest away from the Sun. This is called "Greatest Elongation". We can safely see Mercury at its best, either early in the morning before the Sun rises, which would be called the *Greatest Western Elongation*. We can also safely see Mercury at its best, in the evening just after sunset, which would be called its *Greatest Eastern Elongation*.

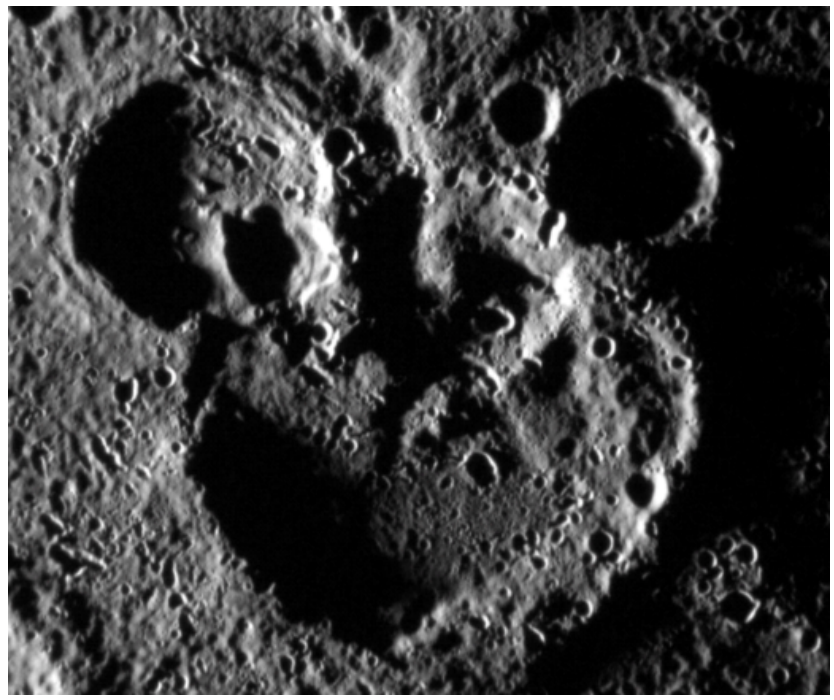
Because Mercury is so close to the Sun, humans cannot visit. Instead, we have sent orbiters. The first orbiter was *Mariner 10* launched in 1973. Next was *Messenger* which launched in August 2004. Messenger orbited Mercury and in 2011, mapped the planet. It found evidence of water ice at the poles and even discovered that Mercury had a "tail" …gas stripped by the solar wind. A mission currently underway is the *BepiColombo* mission which launched in October 2018. It is expected to arrive in December 2025, so mark your calendars!

BepiColombo Orbiter
Image Credit: NASA Solar System Exploration

(Continued on page 6)

HAA Explorers (continued)

Orbiters have shown us that Mercury has many craters and appears similar to our Moon, although it's about 1.5x larger. But, it's smaller than Jupiter's moon Ganymede! One of the largest impact basins in our solar system is found on Mercury and is named the Caloris Basin. It's as wide as the Gulf of Mexico! Craters on Mercury are named after artists, writers and musicians. There are craters named Disney, Beethoven and Van Gogh!



Crater named Disney on Mercury

Image Credit: Wikipedia

Search for a few of the craters on Mercury named after artists, writers and musicians!

The WordSearch.com

T	Y	N	B	A	A	I	M	T	R	A	Z	O	M
H	G	I	R	O	M	O	D	A	Y	E	A	T	S
P	H	M	A	Y	A	N	N	O	N	N	E	L	A
I	H	R	H	U	K	H	V	I	V	A	L	D	I
C	D	U	M	A	A	P	B	N	A	U	H	A	G
A	I	S	S	G	I	B	R	A	N	S	E	S	G
S	S	H	H	A	N	D	E	L	C	E	M	U	O
S	N	A	N	G	E	L	O	U	N	H	I	O	I
O	E	S	N	E	K	C	I	D	B	R	N	S	E
G	Y	N	E	V	O	H	T	E	E	B	G	R	E
K	Y	E	S	W	A	G	N	E	R	N	W	M	Y
A	I	Z	C	S	U	S	E	U	S	S	A	N	O
R	E	M	B	R	A	N	D	T	A	D	Y	B	O
N	N	B	M	T	O	L	K	E	I	N	Y	B	T

BRAHMS
BEETHOVEN
REMBRANDT
SEUSS
LENNON
PICASSO
SOUSA
WAGNER
BACH
HEMINGWAY
DISNEY
GIBRAN
MOZART
TOLKEIN
VIVALDI
DICKENS
YEATS
HANDEL
ANGELOU

Answers on page 22.

(Continued on page 7)

Things to do until next time **:

**** Check with your parents or caregivers before checking out websites.**

1. Visit this website to learn more about Mercury:
https://spaceplace.nasa.gov/all-about-mercury/en/

2. Visit this website to learn more about Messenger: https://messenger.jhuapl.edu/

3. Make your own Mercury mask: https://spaceplace.nasa.gov/planet-masks/en/

During September, check out:

1. On September 10th around 8:30 pm, check out the Full Moon with Jupiter to its left and Saturn to its right. You will need a clear view of the Eastern horizon:

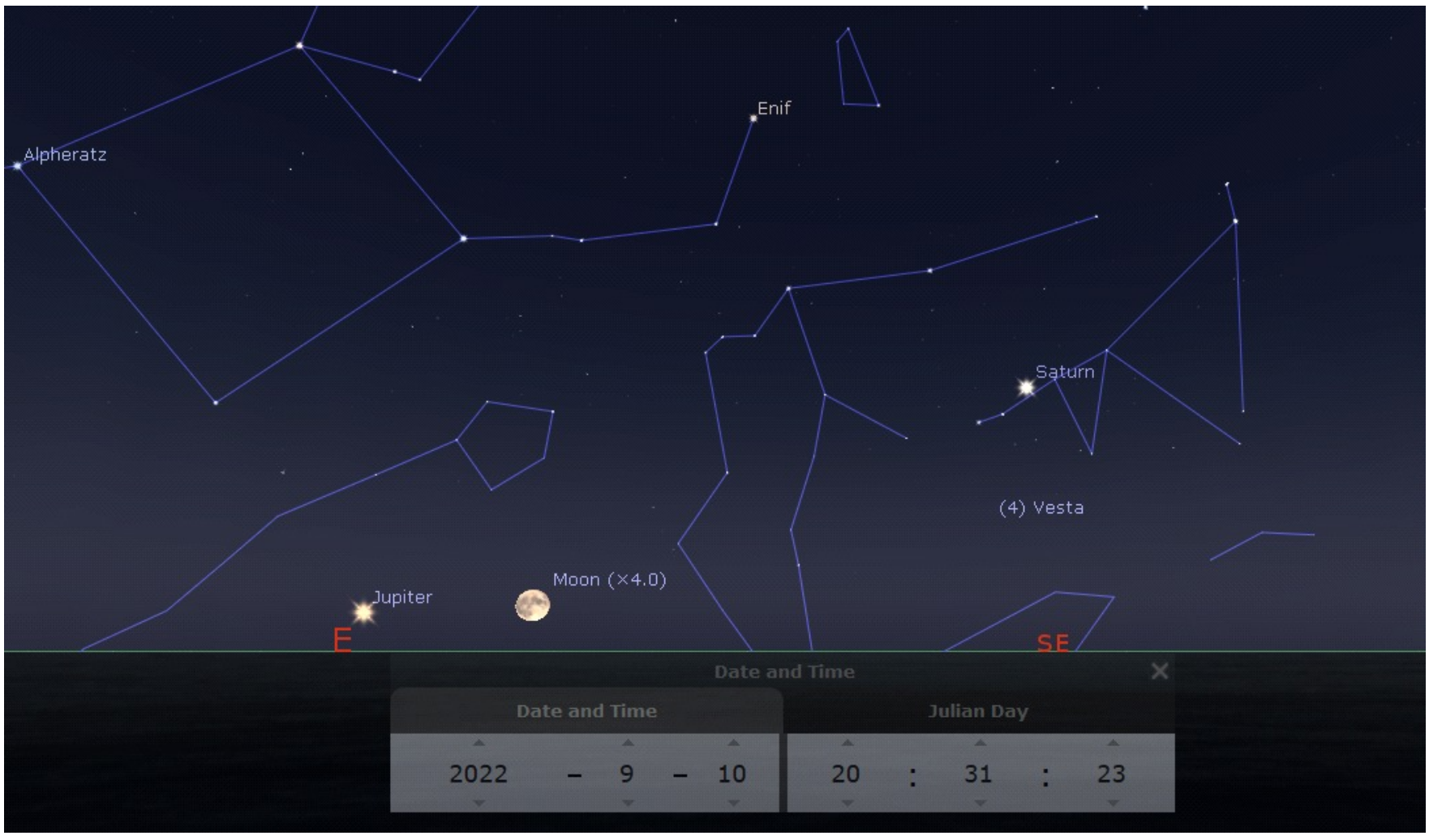


Image generated using Stellarium

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HAA Explorers (continued)

2. On September 30th around 8:00 pm, check out Jupiter, Saturn and the Waxing Crescent Moon which will be near the reddish star Antares:

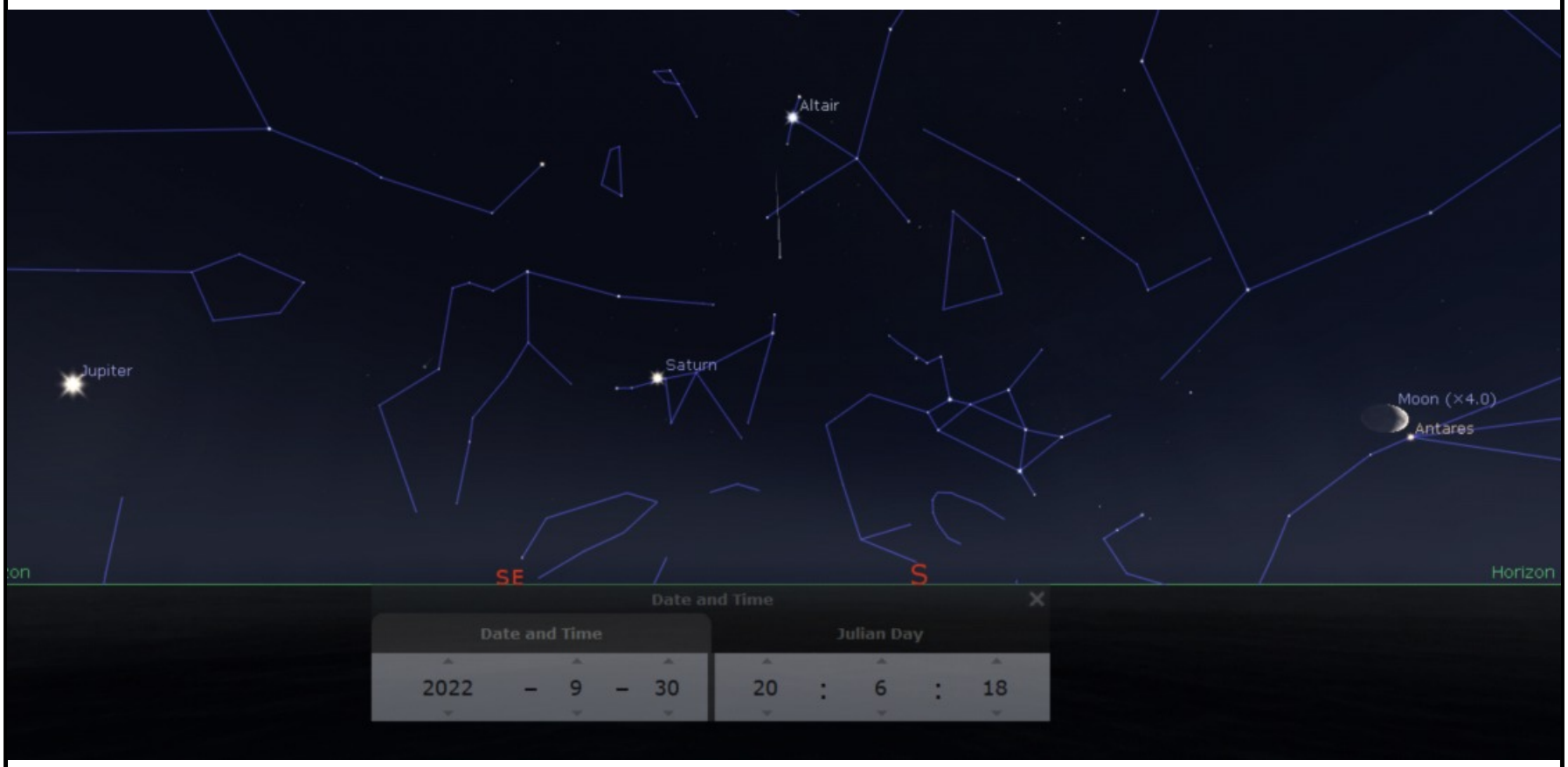


Image generated using Stellarium

Finally:

Why don't people like the restaurants on Mercury? Answer: Because they have no atmosphere!

If you have a question you would like answered in the newsletter, please send it to education@amateurastronomy.org.

Thank you to Ro for reviewing this article! 😊

References:

Astronomy for Kids. Astronomy Magazine. 2019.
The Backyard Astronomer's Guide. Dickenson and Dyer. 2021.
The Essential Guide to Space. Paul Sutherland. 2016.
How Space Works. DK Penguin Random House. 2021.
National Geographic Kids: Ultimate Explorer Field Guide: Night Sky. 2016.
National Geographic Kids: Ultimate Space Atlas, 2017.
RASC Observer's Handbook, 2022.

The Sky This Month for September 2022 by Matthew Mannering

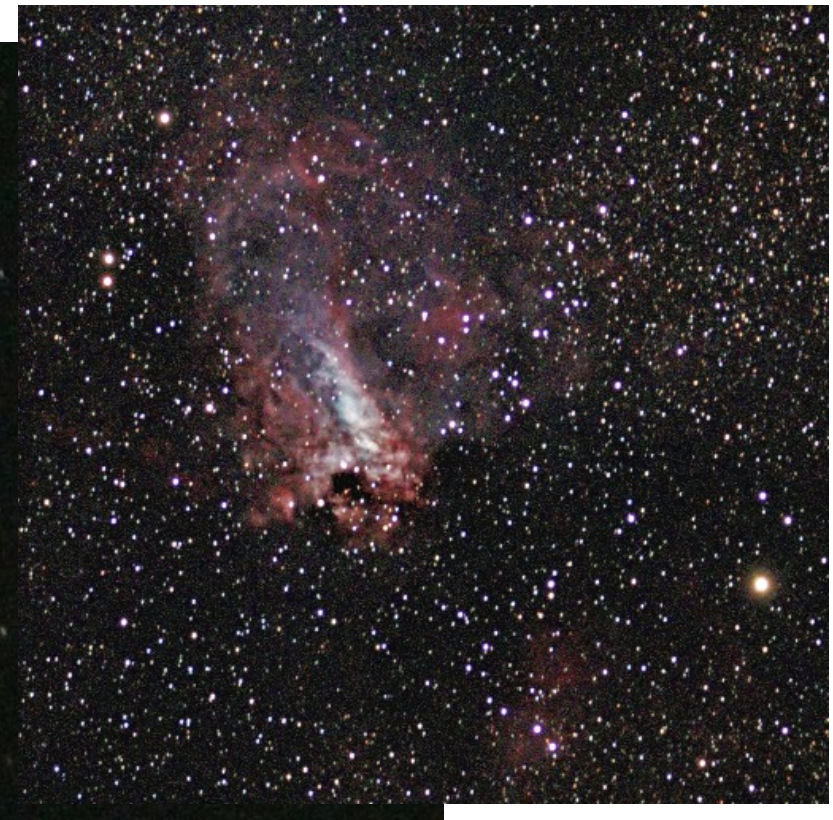
I hope everyone has had a safe and healthy summer so far. I don't consider the summer to be over until I need to trade in my shorts for jeans. Janice and I have managed to enjoy some very nice evenings doing observing and astrophotography. The observing site we use is near Port Rowan and is very dark by southern Ontario standards. However, the dew at this location is horrendous and entirely unpredictable. By mid-summer, we had determined that Janice needed a good dew controller and a properly sized refractor objective dew strap. What a difference dew control makes! On some evenings we would have been shut down within an hour of starting to observe. With dew heaters we can go until the battery runs down or until we are ready to pack it in.

On our last outing, I decided to observe visually using my 120mm Eon refractor on an EQ goto mount. I had some very nice views of Saturn and saw the Cassini gap in the rings. I was also able to see some of the very subtle banding of the atmosphere of Saturn.

Jupiter came up over the trees at about midnight. In moments of stable seeing, I was able to see the Great Red Spot about halfway between the centre meridian and the terminator. I checked SkySafari and it showed that Jupiter's Great Red Spot (GRS) was at the terminator. I went to another source on the web and confirmed that my siting was accurate. It turns out that older versions of SkySafari and Stellarium don't keep an accurate track of the GRS. The newest versions of both programs allow you to update the current Longitude of the GRS and the rate of change as the giant storm spins its way through Jupiter's atmosphere.

Speaking of the detail you can see on Jupiter, how about the latest image from the James Webb telescope? The view of Jupiter in the infrared is absolutely mind blowing. You know the image is exceptional when the imaging team at NASA comments that they didn't expect the image to be this good! Keep an eye on the James Webb web page as I expect to see many ground-breaking images in the months and years to come.

As some of you know, I like to take single shots of objects in the sky just for the heck of it. A single long exposure will show colour in the brighter objects with more detail than you can see visually. *NGC 7009* (the Saturn nebula) is a planetary nebula in Aquarius situated just above Capricornus. Coincidentally, Saturn spends much of this year in the same region of the sky. The Saturn nebula got its name from its shape. You can see this for yourself using very high magnification. I've included a couple examples of single deep sky shots. One is the Saturn nebula and the other is the *Swan Nebula* or *M17*. Note that I did run these single frames through some basic processing.



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The Sky This Month for September 2022 (continued)

Notes for September

Neptune reaches opposition on the 16th. This is an excellent opportunity to try and see Neptune's moon *Triton* with the good old "mark one eyeball". I would think that far less than 1% of amateurs have seen Triton. Seeing and identifying Triton would put you in a very small club! To have a reasonable chance of success, you will need a few things:

- A scope with a minimum aperture of 8" (200mm). 10" (250mm) would be better.
- High magnification of at least 250x.
- Steady skies.
- A tracking mount would provide a major advantage.

It can be done with a push-to Dob, but at high magnification Neptune will move very quickly across the field of view. The better choice would be a 10" (250mm) SCT. When Les and I saw Triton, we were lucky to be observing with a guy who owned a 16" SCT and it was an easy catch.

It's much easier to catch Triton in a smaller scope if you can photograph it. Here are some images of Neptune and Triton that I took with my 120mm refractor and a Canon DSLR. Thirty seconds at ISO 1600 seemed to do the trick. Neptune's diameter is only 2.3 arcseconds and therefore appears as a very bright star at the center of the first image. The great thing about digital imaging is that you can crop the image down to a very small portion of the original frame and still get a useable result. I would describe the resulting closeup view as being comparable to a tiny ball bearing rolling around the edge of a bigger ball bearing.

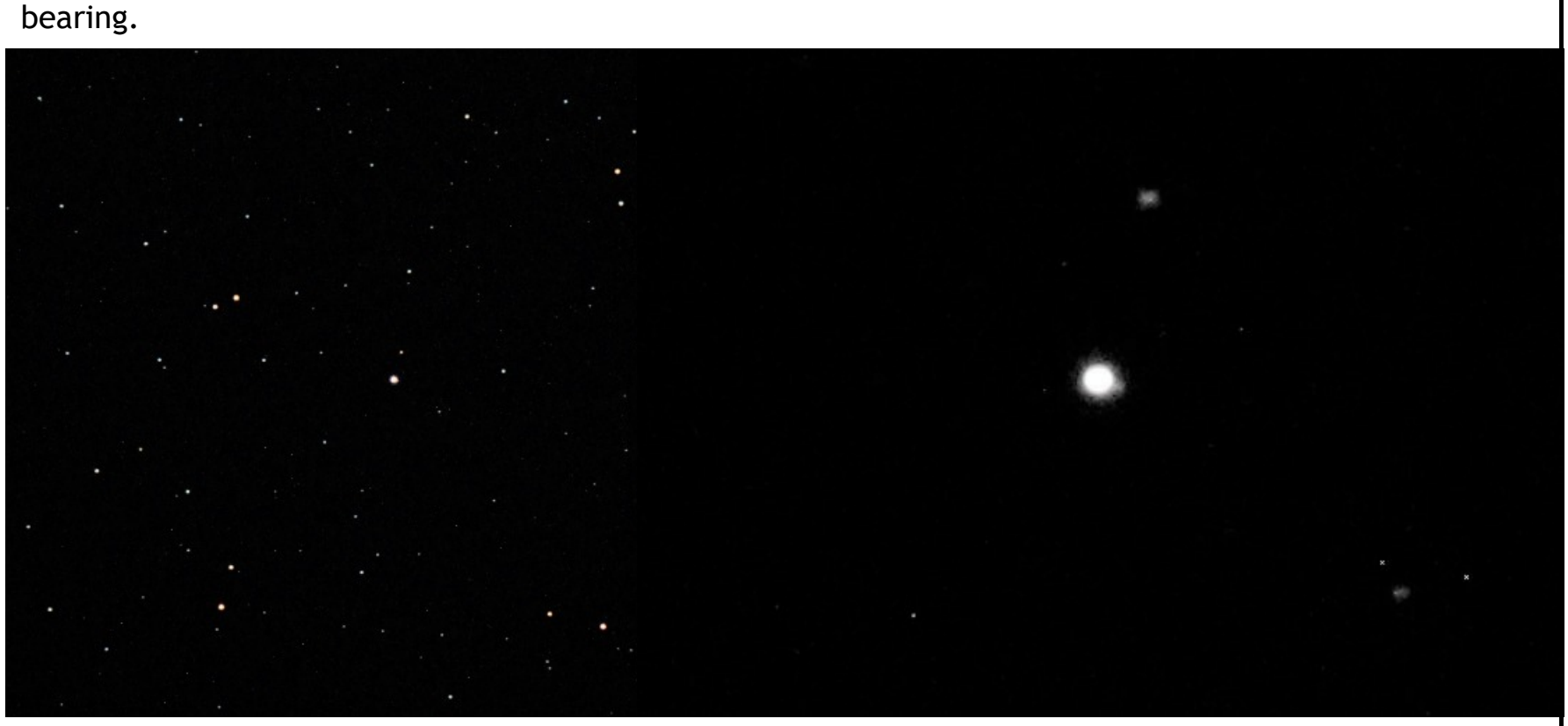


Image Credits: Matthew Mannering (all images on pages 9, 10 & 11)

Uranus at magnitude 5.8 is situated about 12° west of Jupiter at 1am.

Last month, *Saturn* reached opposition and is still available to view for most of the night. Look in the southeast as darkness falls. Saturn will be about 15-20° above the horizon and is by far the brightest object in that area of the sky. Saturn is an amazing sight in just about any scope. The angle of the rings is closing, and they will appear edge on at the end of March in 2025. Look for Saturn's moons and compare their locations with whatever flavour of astronomy sky map software you are using. Don't forget to allow for

(Continued on page 11)

The Sky This Month for September 2022 (continued)

the differing orientation of the moons in the eyepiece of your scope verses the software. The image will appear mirrored right to left in Refractors and SCTs and mirrored and upside down in Newtonians.

Jupiter reaches opposition on the 26th and should be well placed in the eastern sky by 10pm. Here is a list of times when the Great Red Spot (GRS) is centred on Jupiter. Dates and times are DST for Hamilton.

September	7 @ 00:15am	10 @ 9:45pm	12 @ 11:15pm
	14 @ 01:00am	16 @ 10:30pm	19 @ 00:10am
	23 @ 11:15pm	26 @ 00:50am	28 @ 10:20pm

Mars doesn't reach opposition until December 8th. Looking in my observer's handbook, I noticed that Mars will be occulted by the moon just 2 hours before opposition. Amazingly, we will be in the right place at the right time for this occultation. That makes this one of the most anticipated events for 2022!

Mars will be high enough to observe by 1am. What is important this month is that the diameter of Mars reaches 10 arcseconds in diameter. At this diameter, Mars starts to show some detail in backyard scopes. Use as much magnification as seeing allows as a 10 arcsecond target is still quite small in the eyepiece.

Mercury is in the evening sky in September, but the plane of the ecliptic is very shallow which makes observing Mercury extremely difficult. However, for the first half of October, Mercury gives us the best morning show of the year. The plane of the ecliptic will be very steep in the mornings which is what gives us the conditions needed. When the plane of the ecliptic is shallow, Mercury and the sun rise or set at almost the same time. This means that Mercury is lost in the glare of the sun. However, when the plane of the ecliptic is steep, Mercury will rise/set significantly before/after the sun.

The *Zodiacal Light* is another of those sightings that most astronomers never see (me included so far). It always appears around the equinoxes. In September, it appears before morning twilight for two weeks starting on the 23rd. Look for a narrow pyramid of light in the east that follows the plane of the ecliptic. New moon is the best time to see this phenomenon as any kind of light pollution (lunar or man made) will drown it out. New moon in September occurs on the 25th.

The last supermoon named the Sturgeon Moon occurred back in August. I went out with my camera the night before full moon and snapped a few pictures. Here is a sample.

The dates for the phases of the moon for this month are:

- September 3: first quarter.
- September 10: full moon.
- September 17: last quarter.
- September 25: new moon.

The dates of libration for the moon are:

- Western limb most exposed on the 1st and 27th.
- Eastern limb on the 13th.
- Northern limb on the 8th.
- Southern limb on the 22nd.

Now a few notes for beginners

When looking at deep sky objects, such as those contained in the Messier list, it is best to start with targets in the west and progress across the sky to the east. The reason is simple, targets in the west set first so you have a limited amount of time to view them.

(Continued on page 12)

The Sky This Month for September 2022 (continued)

If you are just starting out as an observer, try picking constellations and targets that are not at the zenith (looking straight up), especially if you are manually aiming your scope. Trying to find a target directly above your head is literally a pain in the neck. If you wait a couple of hours, your object will have moved to a lower altitude in the west.

For each target, start with low magnification and progress to a higher magnification when you are ready. Don't try and find a 12th magnitude galaxy when you are starting out. I can pretty much guarantee that you won't find it. Stick to brighter targets like globulars, open clusters, double stars and bright nebulae.

Dew will shut down your observing session early. In fact, I have been out some nights when dew is a problem within an hour of setting up. Invest in a dew controller and dew straps if you can.

Dress in layers for temperatures that are 15°C lower than you expect. Bring along a hat, gloves, red flashlight, extra batteries, table, chair, sky charts and a couple of blankets. If you expect dew, keep one blanket over your chair to keep it dry when not in use.

I have included sky maps for September 8/9 looking west and east for 9pm and 1am. I created the maps in Stellarium to only display Messier objects, as these are generally the brightest and easiest objects to find.

(Continued on page 13)

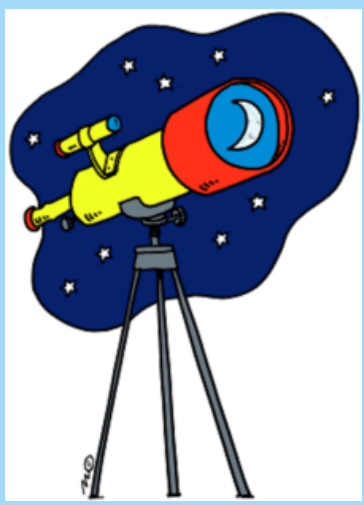
HAA Helps Hamilton

Hey, guess what? We're coming back in person! The H.A.A. will once again be accepting and collecting donations from our members and guests for local food banks at our general meetings.

The H.A.A. has always valued its relationships with food banks in the community, particularly Hamilton Food Share.

If you can't make an in-person meeting, you can make a donation directly to your local food bank.

H.A.A.'s Loaner Scope Program

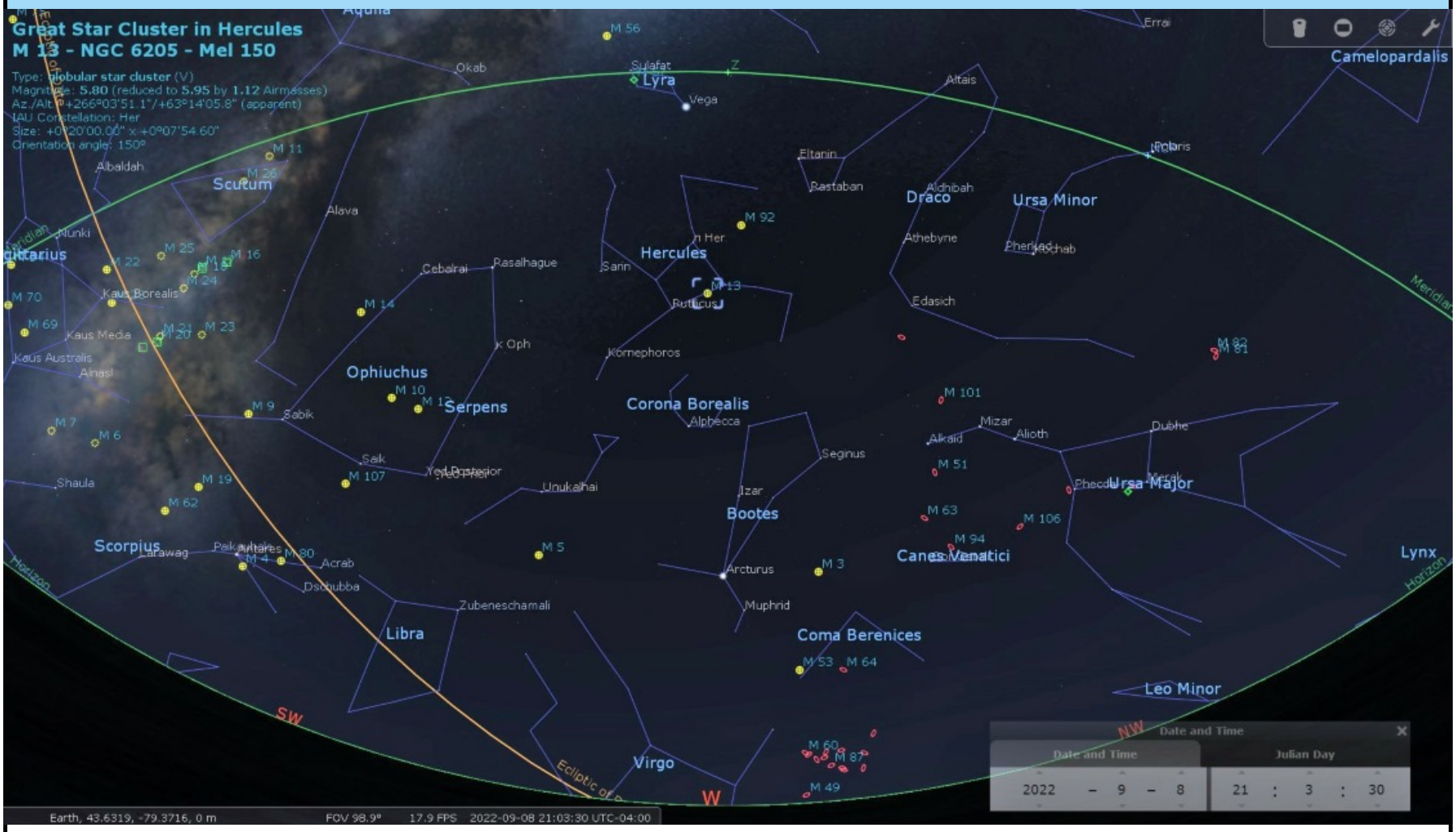


We at the HAA are proud of our Loaner Scope Program. It allows members who don't own a telescope to get more up close with the night sky, and it allows members to explore different types of telescopes! Paid members are welcome to borrow a telescope for one month. We have telescopes of varying expertise levels, a MallinCam, a spotter scope and various eyepieces. Please visit the HAA website for more information!

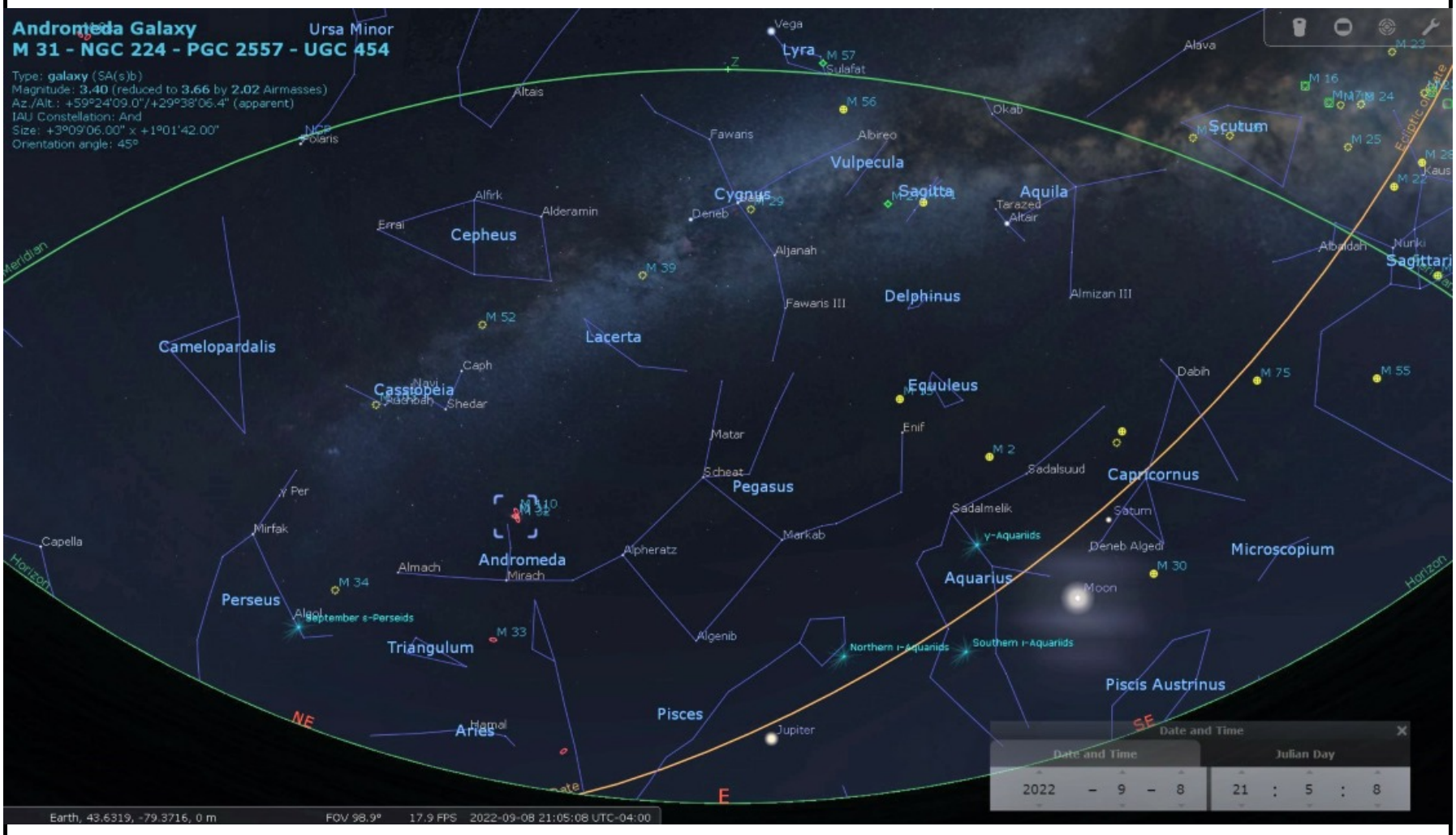
If you are interested in borrowing a telescope, please contact Paula Owen at loanerscope@amateurastronomy.org.

Telescopes are loaned out on a first come basis.

The Sky This Month for September 2022 (continued)



Looking West 9pm September 8, 2022. All charts generated using Stellarium



Looking East 9pm September 8, 2022.

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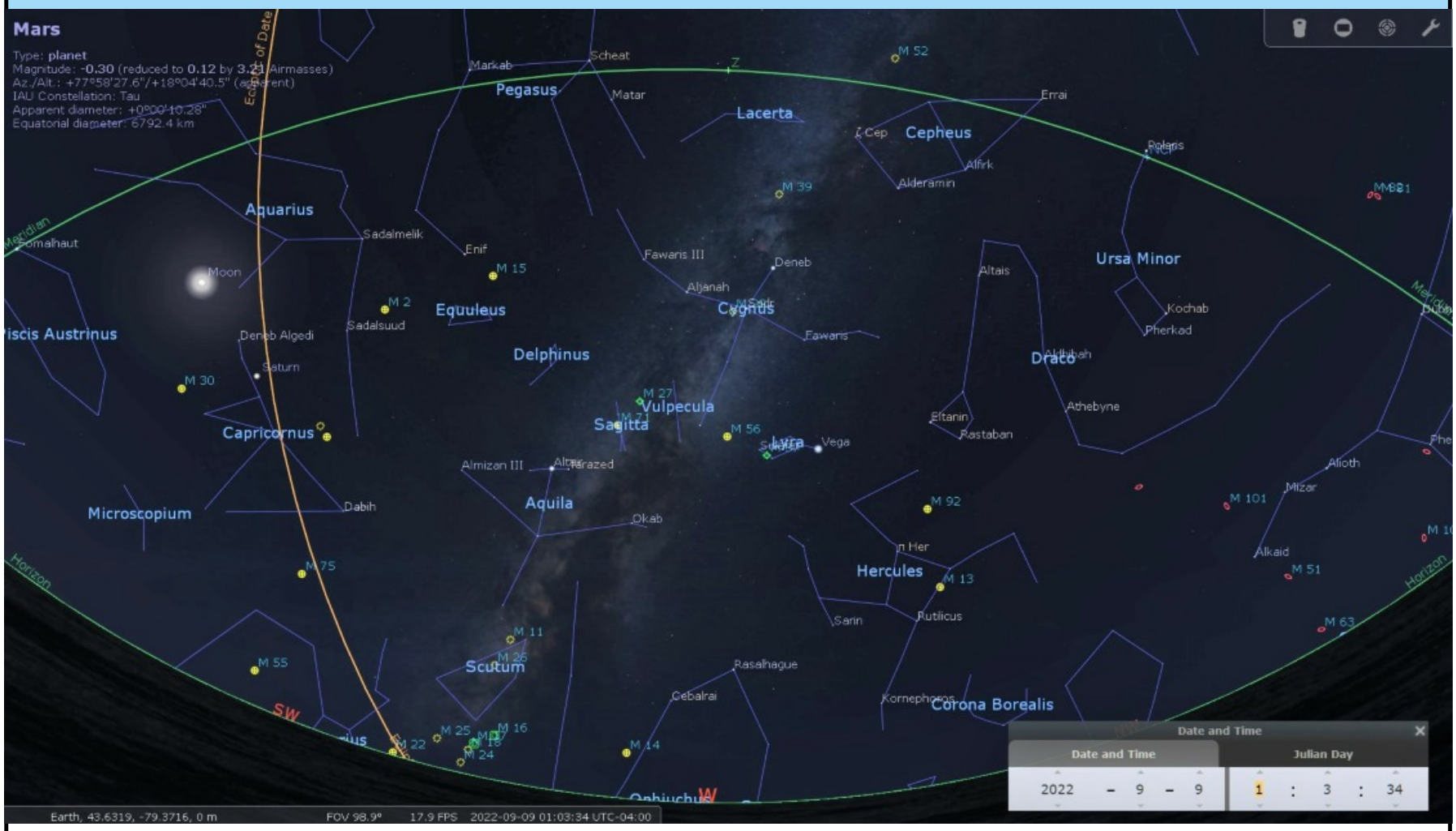
The Sky This Month for September 2022 (continued)



Looking West 1am September 9, 2022.

Looking East 1am September 9, 2022.

What's Up in Awards? September-October 2022 by Bernie Venasse

Contents:

What's Up in Awards?

The Hamilton Amateur Astronomers Observing Programs are designed to provide direction for amateur astronomer's observations and to reward their accomplishments. A certificate is awarded when the goals of the observing program are met. The HAA offer various certificates based upon achieving specific observing goals. There is no time limit for completing the required observing but good record keeping is required. Each observer must perform all the requirements of each Observing Program themselves. However, observers are able to receive help from (an)other observer(s) as they learn to find and identify different objects. Each observer will then need to locate and observe the object on their own to meet the goals of the program. Observing logs will be submitted to and examined by the HAA Observing Programs Project Coordinator to confirm all observations before a certificate is granted.

This column tells you which objects are visible this next month for the HAA Observing Programs and other sights of interest.

HAA Rising Star Observing Award

September
Constellations: Cepheus
Stars: Deneb
Double Stars: Albireo, 61 Cygni
Object Pairs: NGC 6939/NGC 6946
Messier objects: M15

October
Constellations: Pegasus
Stars: Alpheratz
Double Stars: delta Cephei
Object Pairs: NGC 7788/NGC 7790
Messier objects: M52

Pathways Observing Program

Observable in September

Group B,
Summer Constellations: Find, observe, sketch: *Hercules, Cepheus, Scorpius*.
Stars: Find, observe, sketch: *Altair, Vega, Antares*.
Asterisms: Find, observe, sketch: *Dragon Head, Hercules Keystone. Summer Triangle*.
Planet: Any one planet that is remaining in the list.

Observable in October-November-December

Group C,
Autumn Constellations: Find, observe, sketch: *Perseus, Cygnus, Lyra*.
Stars: Find, observe, sketch: *Algol, Deneb, Fomalhaut*.
Asterisms: Find, observe, sketch: *Great Square, Northern Cross, Circlet*.
Planet: Any one planet that is remaining in the list.

(Continued on page 16)

What's Up in Awards? September-October 2022 (continued)

HAA Messier Objects Observing Award

September Messier targets

M13 The great globular cluster in Hercules is bright enough to be seen with naked eye. Binoculars easily show this cluster as a bright fuzzy ball. M13 is partially resolvable in small aperture telescopes and becomes a fantastic swarm of tightly packed individual stars through larger scopes.

M92 Another globular cluster in Hercules, M92 is easy to find in binoculars appearing slightly dimmer and smaller than M13. As with M13 it is partially resolvable in small scopes and is a fine sight in large instruments.

M14 A small, bright globular cluster in Ophiuchus. It is a difficult binocular object, look for a small fuzzy patch of light. Through a telescope M14 is an even patch of light, the stars not resolvable except through large scopes.

M22 This is the other great globular in our tour this month. Located just above the Teapot asterism in Sagittarius, M22 can be seen with no optical aid. M22 is easy to find in binoculars, and easy to resolve in telescopes, with about the same impressiveness as M13.

M28 Located near M22 in Sagittarius, this is a small bright globular. A tough binocular object, look for a small fuzzy patch. Easily seen in a telescope, but requires large apertures to resolve individual stars.

M69, M70, M54 All of these are small bright globular clusters laying along the bottom of the teapot in Sagittarius. Very similar in appearance to M28, these are all tough binocular objects requiring dark skies and possibly averted vision to see. M54 is slightly brighter and appears more star-like through binoculars than the other globulars. These are all easily seen in telescopes, though not easily resolvable.

October Messier targets

M24 This "object" is actually a section of the Milky Way in Sagittarius. It is easily seen with the naked eye as a fuzzy, oval patch about four times the size of the full moon. The best views are through binoculars or rich field telescopes.

M25 Just east of M24 in Sagittarius we find this open cluster. Visible to the naked eye, M25 lies in the same binocular field as M24. In binoculars it appears as a partially resolved star cluster buried in faint nebulosity. A view through a telescope shows the nebulosity is in fact many faint stars that are not resolved in small instruments.

M18 This is a small open cluster just north of M24 in Sagittarius. In binoculars M18 is easy to see as a small fuzzy patch of light in the same field of view as M24. Telescopes reveal this cluster for what it is, a small, sparse collection of fairly bright stars.

M17 Just north of M18 and in the same binocular field as M24 and M18 lies the Omega nebula. Possible to see with the naked eye and easy with binoculars, this nebula appears as a small faint patch of fuzz. A telescope will show the unique V shape nebulosity that gives the cluster its name. The shape reminds me of a swan with two bright stars that power the cluster embedded in the head and neck of the swan.

(Continued on page 17)

What's Up in Awards? September-October 2022 (continued)

M16 Continuing north of M17 we find another nebula in Serpens. To the naked eye and binoculars, this small patch of haze is very similar in appearance to M17 which is in the same binocular field of view. Through a telescope the M16 looks like a sparse open cluster of stars surrounded by faint wisps of smoke.

M26 Continuing to head north through the Milky Way we find this open cluster in the constellation Scutum. This is a difficult object to find in binoculars, but possible as a faint patch of fuzz. Telescopes partially resolve this cluster and show several stars buried in a faint glow from the unresolved stars.

M11 Just north of M26 in Scutum lies the Wild Duck Cluster. Possible to see with the naked eye, binoculars show a small faint patch surrounding a bright star. Telescopes resolve many of the stars in this very rich cluster.

M55 Dipping back into Sagittarius we find two more globular clusters waiting for us. The first is one of the brightest and largest globulars in the catalogue. Possible to see naked eye, it is an easy binocular object appearing as a bright fuzzy ball of light. Telescopes show a round patch of light bright in the center and fading toward the edges. Large apertures are needed to resolve this globular.

M75 The last object of the month, and the last object to be visited in Sagittarius. In binoculars, M75 is not too hard to see, look for a small fuzzy star. A telescope will show a small fuzz ball with a bright center.

The Planets… September 2022 via (BBC) Sky at Night Magazine

Mercury: Poor at start of month but improves toward the end of September in the morning sky.
Venus: Morning planet. Ultra-thin waning crescent Moon close on 25 September.
Mars: Brightening planet in Taurus. Appears 11 arcseconds across at the end of September.
Jupiter: Opposition on 26 September. Attains a peak altitude of 37° from the centre of the UK.
Saturn: Well positioned planet. Bright waxing gibbous Moon nearby on evenings of 7 and 8 September.
Uranus: Lunar occultation on 14 September. Covered for 50 mins by 77%-lit waning gibbous Moon.
Neptune: Reaches opposition on 16 September, attaining highest altitude of 30° in true darkness.

The Planets… October 2022 via (BBC) Sky at Night Magazine

Mercury: Good morning appearance for most of October.
Venus: Bright morning planet, rises 40 minutes before sunrise at start of October, lost soon thereafter. Superior conjunction 22 October.
Mars: Rises around 22:30 EDT at the start of October. Brightens throughout the month.
Jupiter: Bright and well placed. Almost full Moon nearby on evening of 8 October.
Saturn: Well positioned evening planet. Bright waxing gibbous Moon nearby on evening of 5 October.
Uranus: Well placed for viewing in southern Aries. Approaching opposition on 9 November.
Neptune: Well positioned binocular planet near Jupiter and below the Circlet asterism in Pisces.

Future Visible Comets via Seiichi Yoshida — Click here for the chart:
http://www.aerith.net/comet/future-n.html

(Continued on page 18)

What's Up in Awards? September-October 2022 (continued)

Meteor Showers via American Meteor Society

Orionids

Period of activity: September 26th, 2022 to November 22nd, 2022
Peak Night: Oct 20-21, 2022

The Orionids are a medium strength shower that sometimes reaches high strength activity. In a normal year the Orionids produce 10-20 shower members at maximum. In exceptional years, such as 2006-2009, the peak rates were on par with the Perseids (50-75 per hour). Recent displays have produced low to average displays of this shower.

Shower details - Radiant: 06:21 +15.6° - ***ZHR:*** 20 - ***Velocity:*** 41 miles/sec (swift - 66 km/sec)
Parent Object: 1P/Halley
Next Peak - The Orionids will next peak on the Oct 20-21, 2022 night. On this night, the moon will be 21% full.

Southern Taurids

Period of activity: September 28th, 2022 to December 2nd, 2022
Peak Night: Nov 4-5, 2022

The Southern Taurids are a long-lasting shower that several peaks during its activity period. The shower is active for more than two months but rarely produces more than five shower members per hour, even at maximum activity. The Taurids (both branches) are rich in fireballs and are often responsible for increased number of fireball reports from September through November.

Shower details - Radiant: 03:35 +14.4° - ***ZHR:*** 5 - ***Velocity:*** 17.2 miles/sec (slow - 27.7 km/sec)
Parent Object: 2P/Encke
Next Peak - The Southern Taurids will next peak on the Nov 4-5, 2022 night. On this night, the moon will be 87% full.

Northern Taurids

Period of activity: October 13th, 2022 to December 2nd, 2022
Peak Night: Nov 11-12, 2022

This shower is much like the Southern Taurids, just active a bit later in the year. When the two showers are active simultaneously in late October and early November, there is sometimes a notable increase in the fireball activity. There seems to be a seven year periodicity with these fireballs. 2008 and 2015 both produced remarkable fireball activity. 2022 may be the next opportunity.

Shower details - Radiant: 03:55 +22.8° - ***ZHR:*** 5 - ***Velocity:*** 18 miles/sec (slow - 30 km/sec)
Parent Object: 2P/Encke
Next Peak - The Northern Taurids will next peak on the Nov 11-12, 2022 night. On this night, the moon will be 88% full.

(Continued on page 19)

What's Up in Awards? September-October 2022 (continued)

Observing Award Recipients

We would like to give recognition and congratulations to any member who completes an award program regardless of the sponsoring organization. Congratulations to the following:

HAA Pathfinder
++ A01 Anastasia Morissette

HAA Rising Star Awards
001 Jean Jefferson
002 Kevin Salwach
003 Jo Ann Salci (November 2021)

Astronomical League
Bernie Venasse
Binocular Double Star Observing Program 143
Binocular Variable Star Observing Program 051
Binocular Solar System Observing Award 183-B
Sketching Observing Program 052
Meteor Observing Program 207
Galileo (Binocular) Observing Award 75-B
++ Variable Star Observing Program 54
++ Open Cluster Observing Program (Advanced) 106
++ Advanced Observer Award 61

Advanced Observer Award Pin ... New!!...

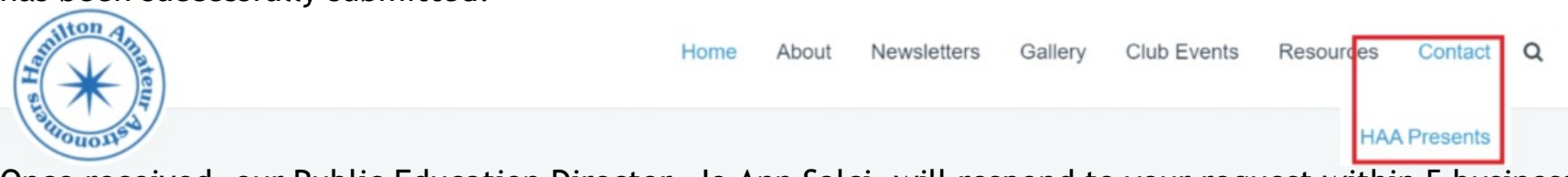
RASC
Jo Ann Salci
Exploring Exoplanets (on-line course)
Swapna Shrivastrava
Explore the Moon
Explore the Universe
Bernie Venasse
Explore the Universe

Please feel free to contact me with any questions or comments at chair@amateurastronomy.org
— Bernie

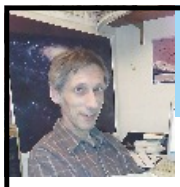
"HAA Presents"

Members of the public of any age in the GTHA can now request an in-person (once it is safe to do so) or virtual presentation from the HAA directly on our website.

Simply navigate to www.amateurastronomy.org and select "Contact" from the top menu bar and then click on "HAA Presents" (see image below). You will be presented with a request form and once all required fields are entered, click on the "Submit" button and you will see a confirmation message that your request has been successfully submitted.



Once received, our Public Education Director, Jo Ann Salci, will respond to your request within 5 business days to discuss next steps. If you have any questions, feel free to send an email to haapresents@amateurastronomy.org.



The Search for Life on Mars, Part 2 by Doug Currie

(editor's note: You can read "The Search for Life on Mars, Part 1" in the May 2022 Event Horizon, pages 19 - 21)

Mars Science Laboratory (Curiosity) Rover Results

Discovery of Past Neutral pH Water Environment
Although evidence of past water was already found in other parts of Mars by the twin Spirit and Opportunity rovers, Curiosity found the first clear neutral pH water that could even be fit to drink by humans (or earthly animals) if this water wasn't dried up.

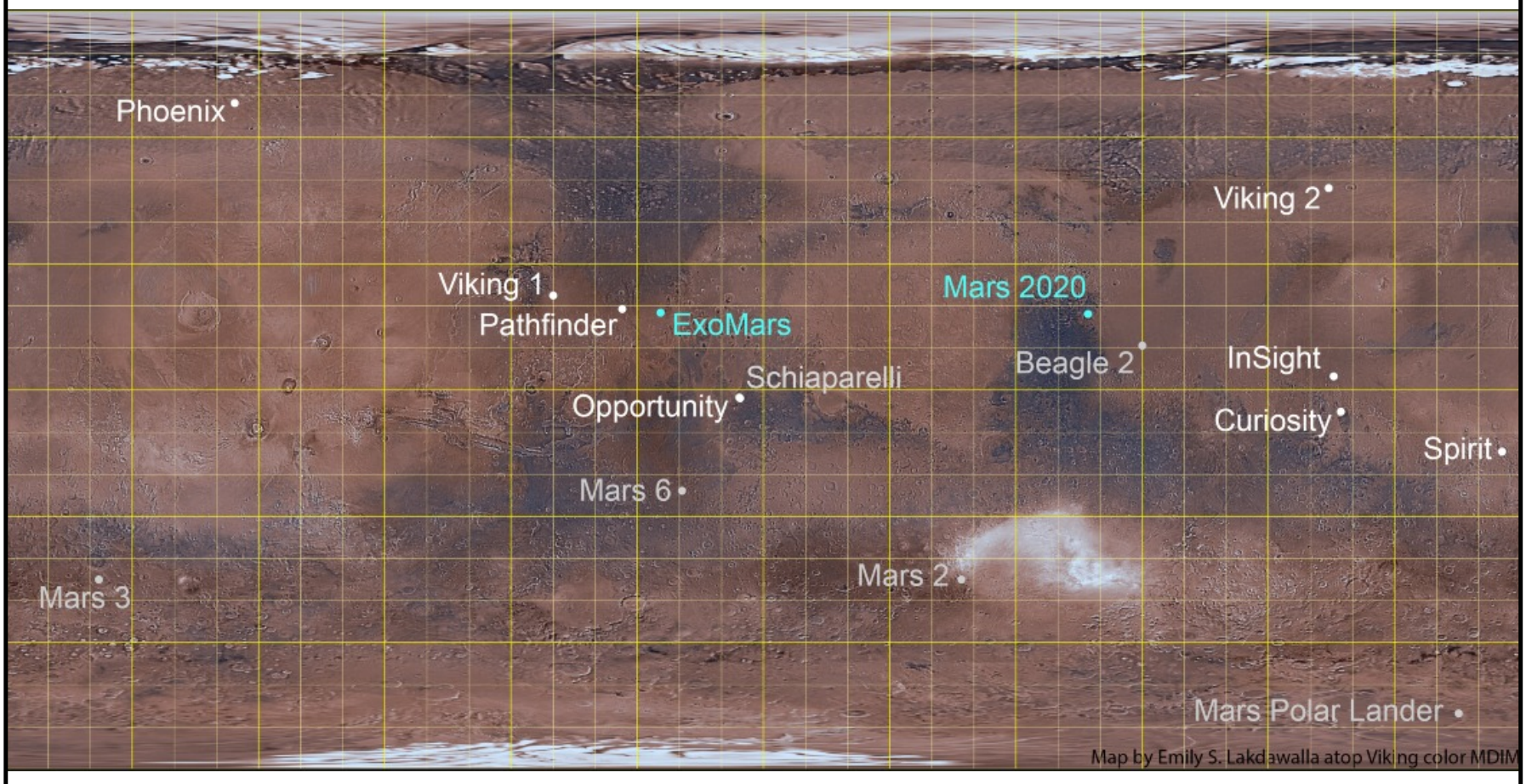
Discovery of Seasonal Background Methane in Martian Atmosphere
A background level of 0.3 to 0.7 parts per billion in the Martian atmosphere of methane has been found that continues on a seasonal variation over Gale Crater near the Martian equator by the Mars Science Laboratory (Curiosity) rover. (Curiosity also discovered methane emission at a more intense level for about two months in late 2013 and early 2014 at 5 to 9 parts per billion of the atmosphere a number of years ago.)

Discovery of Some Organics
There continue to be some organics found by the Curiosity rover including chlorinated methane and ethane molecules. There was also later discovered, around 2018, other organic chemicals including propane, butane and other small carbon chain compounds and some carbon ring organic molecules such as Benzene and Toluene and, a sulfur containing compound called Thiophene.

Recurring Slope Linnae (RSLs) on Martian Slopes

Many hundred RSLs have been found in the tropical up to temperate areas of Mars. They are almost all on slopes of features whether it is on the interior walls of craters or on the sides of valleys like the huge canyon Valles Marineris. They are generally more active when the sun is facing that slope. There does

(Continued on page 21)



Map Credit: Emily S. Lakdawalla atop Viking color VDIM

seem to be some above background level of water or hydrated (water containing) material found from these lines on these slope areas. These RSLs could be produced from temporary flows of salty (briny) water, or by wind erosion or by the effect of sublimating (turning directly from ice to gas) carbon dioxide. There doesn't seem to be a clear final weight of evidence for any of these possibilities.

Extremophiles – Bacteria on Earth Able to Survive in Extreme Environments

Extremophiles or bacteria that can tolerate or survive and sometimes even thrive in extreme environments have been found in many extreme environments on Earth in the last couple of decades. These bacteria are extreme because they are found either in extreme environments like in rock up to a couple miles or kilometers underground, in vents in mountain rides on the floor of oceans, in heavily acidified or very salty environments. The bacteria in these environments are sometimes based on different chemistry such as relying on methane, sulfur compounds or other chemicals than molecular oxygen or carbon dioxide to breathe. The (continuing) discovery of this great variety of extreme bacteria, as scientists looking for microbial life on other worlds point out, broaden the environments or chemical systems in other worlds (including Mars) that could possibly support or could have previously supported at least microbial life.

Claimed Discovery of Subsurface Water

There was a claim several years ago by scientists in Europe associated with the European Space Agency (ESA) that they had discovered a large subsurface body of water near the Martian South pole. This lake was supposed to be about 15 by 20 miles in area but perhaps a metre in depth. It was found by different type of returned radar signals from an orbiting spacecraft. I think this spacecraft was the ESA Mars Express orbiter. This lake would be under a lot of ice and would have to have a lot of dissolved salts to be liquid in its environment. However more recently there have been reports that the interpretation of this radar data as indicating liquid water was mistaken and that there is no subsurface Martian lake in this location.

Europe's Exo-Mars Trace Gas Observer

Capabilities

The ExoMars Trace Gas Observer has the capability to detect trace gases, including methane, at concentrations below 0.1 parts per billion.

Results So Far and Interpretation of Results

There have been no definite detection results of methane so far. Some astronomers have theorized this is because the Trace Gas Observer only observes Mars at times of Mars twilight and any recent emissions of methane or other trace gases could have already gone up from the surface into the atmosphere and become diluted to very small and unmeasurable concentrations. In contrast the Curiosity rover usually makes its measurements at night and the nature of the Martian atmosphere is said to maintain most of these recent methane or other emissions from the subsurface to near the surface. This allows great concentrations of methane that can more easily be measured, until the morning and the local atmosphere warms up and allows an easier path for surface gases including methane to ascend into the atmosphere and become more diluted.

Mars 2020 Perseverance Rover and Mars Sample Return

Nature of Jezero Crater – Mars 2020 Landing Site

A main reason this location was chosen is because it has a substantial former water river delta at the crater's edge that was formed by flowing water that formerly flowed into this crater from the surrounding land mostly above most of the crater. Also there were carbonates that can be formed out of water seen in this delta from Mars orbiting spacecraft before Perseverance was sent there. Another interesting

(Continued on page 22)

The Search for Life on Mars, Part 2 (continued)

attraction about the Jezero Crater location is that one feature near it is Nili Fossae which is a valley that also has carbonates and it is one of the main sources from which significant methane emissions have been seen from a distance to come from Mars' subsurface. This Nili Fossae region is on the delta side of Jezero Crater.

Role of Perseverance Rover in Mars Sample Return Process

The Perseverance rover's role in a long awaited Mars Sample return is to collect a couple dozen samples of Mars surface sample material in small test tubes. A European Space Agency (ESA) mission that will bring up the Mars surface samples collected by Perseverance to Mars orbit is called the Sample Retrieval Lander mission. This European Mars mission is intended to land in the immediate area of Perseverance, remotely take the device on Perseverance with all these samples in test tubes, put them on this other Ascent Vehicle, go into Mars orbit with these samples, dock with a third American NASA made third Mars vehicle. This American 3rd phase of Sample Return would then take these Mars samples back to either Earth's surface or a space station orbiting Earth for much more extensive analysis including the search for Martian life in these samples from Mars' surface. The NASA mission that is tasked with bringing the Mars samples from the European spacecraft back to Earth is called the Earth Return Orbiter mission. These samples would likely be returned to Earth or Earth's vicinity in the early 2030s.

Results So Far in Search for Life on Mars with Perseverance

There have been some minor discoveries of organics so far by Perseverance I believe.

Testing of Ingenuity Rotorcraft

The testing of the heavier than air Ingenuity Rotorcraft continues to be a great success and it has exceeded all expectations. It is now in its more than 20th flight and has come to be used as a guide for the rover. This could pave the way for other rotorcraft or aircraft on Mars in the future that could allow the closer examination of much more of the Martian surface directly or as scouts preceding rovers on more accessible territory.

Page 6 Word Search answers:

T	Y	N	B	A	A	I	M	T	R	A	Z	O	M
H	G	I	R	O	M	O	D	A	Y	E	A	T	S
P	H	M	A	Y	A	N	N	O	N	N	E	L	A
I	H	R	H	U	K	H	V	I	V	A	L	D	I
C	D	U	M	A	A	P	B	N	A	U	H	A	G
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The WordSearch.com

This article is distributed by NASA Night Sky Network (NSN).

Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

The Summer Triangle's Hidden Treasures

David Prosper

September skies bring the lovely Summer Triangle asterism into prime position after nightfall for observers in the Northern Hemisphere. Its position high in the sky may make it difficult for some to observe its member stars comfortably, since looking straight up while standing can be hard on one's neck! While that isn't much of a problem for those that just want to quickly spot its brightest stars and member constellations, this difficulty can prevent folks from seeing some of the lesser known and dimmer star patterns scattered around its informal borders. The solution? Lie down on the ground with a comfortable blanket or mat, or grab a lawn or gravity chair and sit luxuriously while facing up. You'll quickly spot the major constellations about the Summer Triangle's three corner stars: Lyra with bright star Vega, Cygnus with brilliant star Deneb, and Aquila with its blazing star, Altair. As you get comfortable and your eyes adjust, you'll soon find yourself able to spot a few constellations hidden in plain sight in the region around the Summer Triangle: **Vulpecula the Fox**, **Sagitta the Arrow**, and **Delphinus the Dolphin**! You could call these the Summer Triangle's "hidden treasures" – and they are hidden in plain sight for those that know where to look!

Vulpecula the Fox is located near the middle of the Summer Triangle, and is relatively small, like its namesake. Despite its size, it features the largest planetary nebula in our skies: M27, aka the Dumbbell Nebula! It's visible in binoculars as a fuzzy "star" and when seen through telescopes, its distinctive shape can be observed more readily - especially with larger telescopes. Planetary nebulae, named such because their round fuzzy appearances were initially thought to resemble the disc of a planet by early telescopic observers, form when stars similar to our Sun begin to die. The star will expand into a massive red giant, and its gasses drift off into space, forming a nebula. Eventually the star collapses into a white dwarf – as seen with M27 - and eventually the colorful shell of gasses will dissipate throughout the galaxy, leaving behind a solitary, tiny, dense, white dwarf star. You are getting a peek into our Sun's far-distant future when you observe this object!

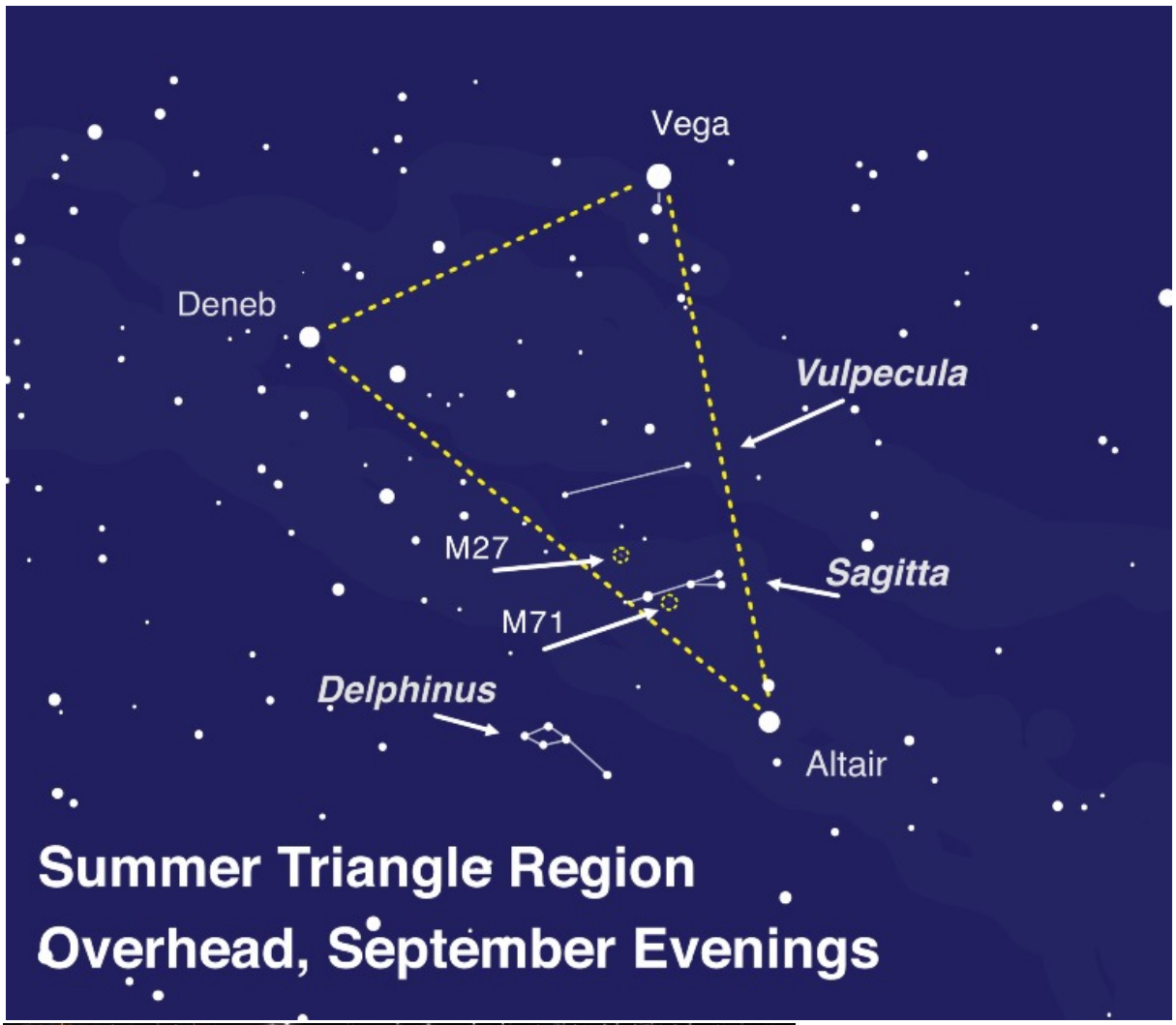
Sagitta the Arrow is even smaller than Vulpecula – it's the third smallest constellation in the sky! Located between the stars of Vulpecula and Aquila the Eagle, Sagitta's stars resemble its namesake arrow. It too contains an interesting deep-sky object: M71, an unusually small and young globular cluster whose lack of a strong central core has long confused and intrigued astronomers. It's visible in binoculars, and a larger telescope will enable you to separate its stars a bit more easily than most globulars; you'll certainly see why it was thought to be an open cluster!

Delicate **Delphinus the Dolphin** appears to dive in and out of the Milky Way near Aquilla and Sagitta! Many stargazers identify Delphinus as a herald of the fainter water constellations, rising in the east after

(Continued on page 24)

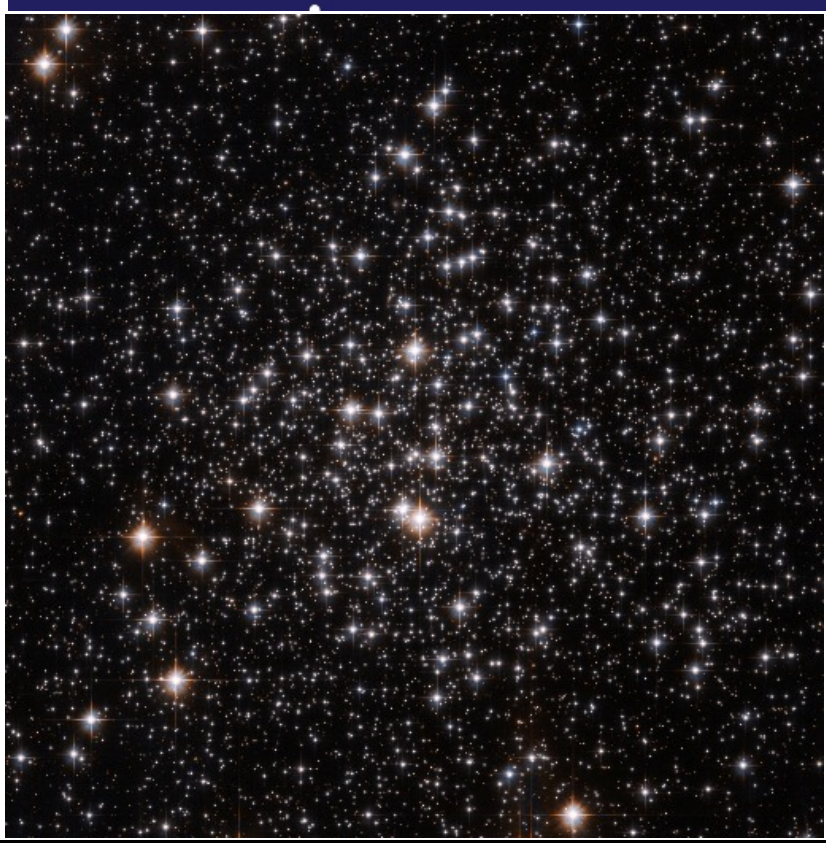
sunset as fall approaches. The starry dolphin appears to leap out of the great celestial ocean, announcing the arrival of more wonderful sights later in the evening.

Want to hunt for more treasures? You'll need a treasure map, and the Night Sky Network's "Trip Around the Triangle" handout is the perfect guide for your quest! Download one before your observing session at bit.ly/TriangleTrip. And of course, while you wait for the Sun to set - or skies to clear - you can always find out more about the objects and science hidden inside these treasures by checking out NASA's latest at nasa.gov.



Search around the Summer Triangle to spot some of its hidden treasures! To improve readability, the lines for the constellations of Aquilla, Lyra, and Cygnus have been removed, but you can find a map which includes them in our previous article, Spot the Stars of the Summer Triangle, from August 2019. These aren't the only wonderful celestial sights found around its borders; since the Milky Way passes through this region, it's littered with many incredible deep-sky objects for those using binoculars or a telescope to scan the heavens.

Image created with assistance from Stellarium: stellarium.org



M71 as seen by Hubble. Your own views very likely won't be as sharp or close as this. However, this photo does show the cluster's lack of a bright, concentrated core, which led astronomers until fairly recently to classify this unusual cluster as an "open cluster" rather than as a "globular cluster." Studies in the 1970s proved it to be a globular cluster after all – though an unusually young and small one! Credit ESA/Hubble and NASA.

Source: https://www.nasa.gov/feature/goddard/2017/messier-71

The Elephant Trunk Nebula (IC 1396) in Cepheus, by **Pavle Culum**

Taken with an ASI533MC camera through a Sky Watcher EvoStar 80 ED scope on an HEQ5 mount.

Exposures: 120 x 300s; 10 hours total exposure time.

Eye Candy the Members' Image Gallery

above:

The Iris Nebula, in Cepheus

by **Dan Copeland.**

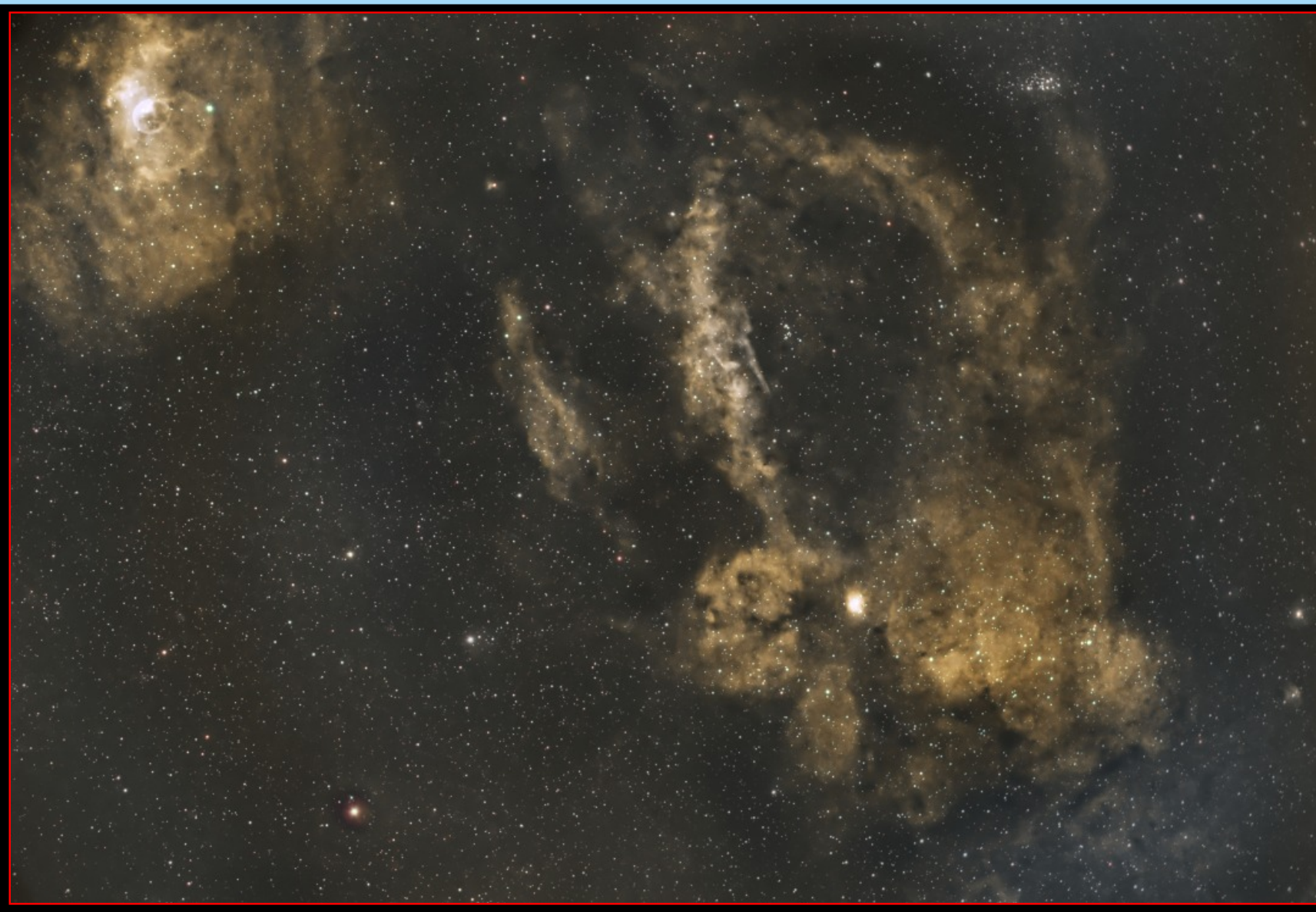
Taken with a modified Canon 5T1 and a 400mm lens and 1.4 adapter at f/2.8.

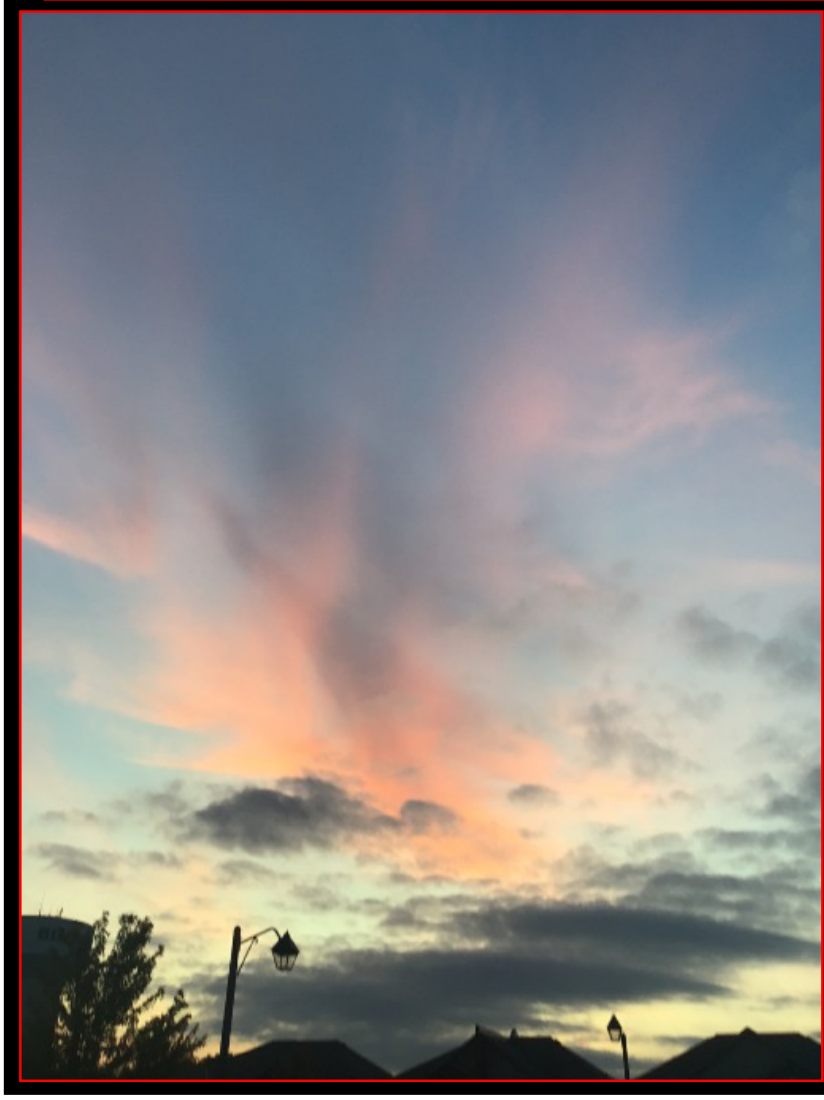
One image at 300 seconds at ISO 3200

The Lagoon Nebula (M8) in Sagittarius, by **Jason Colavecchia**

Taken with a Canon Rebel SL2 DSLR through an Orion 6" F4 Astrograph scope. Stack of 120 images.

Eye Candy the Members' Image Gallery





above:

The Lobster Claw and Bubble Nebula (Sh2 157 and NGC7635),
on the Cassiopeia/Cepheus border

by **Alex Kepic.**

Taken with a ZWO ASI294MC Pro camera through a Explore Scientific ED102 on a Celestron AVX mount.

left:

Sunset, by **Isabella Lopes.**

2023 HAA Celestial Events Calendar Image Submission Now Open

Believe it or not, it is time to start thinking about the HAA 2023 Celestial Events calendar. We have decided to open the image submission window earlier this year so, starting now, please feel free to submit as many images as you like to calendar@amateurastronomy.org. The sky's the limit! Seriously, send in as many photos as you would like but please refrain from submitting images that have already been printed in one of our past Celestial Events Calendars. But please be aware that there is a limited amount of space in our calendar so we will probably not be able to print all of the images you send. That's OK though because there is always next year for any images that do not get selected this time.

Speaking of time, the timeframe for submitting an image is any time between now and midnight on September 11th, 2022. If your image is over 10 megabytes then please send it (or them if there are multiple images) via a download link such as WeTransfer. Images that are less than 10MB can be submitted through email with a maximum of 2 images per email messages (preferably as attachments rather than as embedded images).

Submissions (or download links) should be sent to calendar@amateurastronomy.org along with a short description of the main subject of your image, e.g., "M8", "Zodiacal Light", or "Total Lunar Eclipse".

The technical guidelines for submitted images are found below but please consider these to be guidelines only. Images that do not meet these guidelines are welcome. However, the more an image varies from the guidelines, the more likely that print reproduction of that image will be disappointing. Also, if you have any questions about the guidelines or terms used below, please feel free to ask.

Finally, THANK YOU to everyone who takes an astrophotograph, even if you decide not to submit them to the HAA Calendar for consideration. Your pursuit of an image helps us all. —- *Editor, Calendar*

A brief review and discussion of these guidelines will be presented at the next HAA General Meeting.

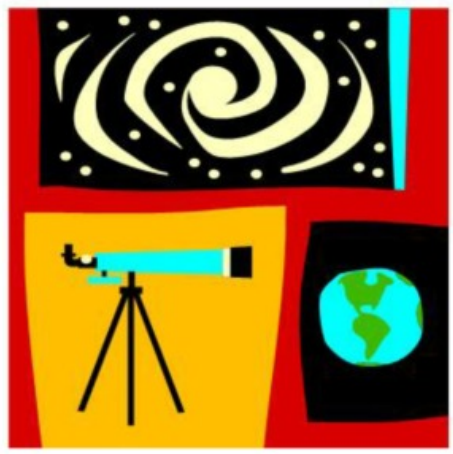
1) Orientation – Landscape, i.e. the image is wider than it is tall. Non-landscape images will likely need to be cropped to fit onto a calendar page.
2) Aspect Ratio – 1.294:1, or 11" (28cm) x 8.5" (21.6cm) which is the same as letter-sized paper. As with orientation, images that do not conform to this aspect ratio will likely need to be cropped or have borders added to the edges of the image
3) Resolution – Our printer strongly recommends 300 pixels per inch for best results and a minimum of 150ppi. Images with significantly lower resolution will may appear fuzzy or out of focus when printed.
4) File Type – TIFF or PSD files are preferred. The use of jpg image file format will always result in the loss of image quality when the image is prepared for printing.
5) File Size – maximum 125MB (this would be a very large TIFF file). Images over 10MB should be submitted using a file transfer service such as WeTransfer. Images under 10MB can be submitted in an email with a maximum of 2 images per email.
6) Image Colour Depth - 14 to 16 bits (or higher – up to 32bits) per colour channel is preferred and a minimum 8 bits per channel is acceptable. This colour depth specification applies to greyscale (blank and white) images as well.
7) Image Colour Space – In order of preference, CMYK (optimal), Adobe RGB or ProPhoto RGB, and sRGB are all acceptable image colour spaces. Please note that sRGB colour space submissions will likely result in some noticeable colour shifting when printed.

Overall Image Dimensions in pixels - Items 1, 2 and 3 above result in recommended dimensions of 3375 pixels by 2626 pixels and the minimum recommended dimensions for a full page image are 1687px by 1317px.

Both of the above overall size requirements include an allowance of 3.175mm or ⅛ inch on each side to aid in paper alignment. The printer refers to this alignment area around the outside of the image as "the bleed." It is strongly suggested that important elements of the image not be placed in the bleed area.

Images smaller than these overall size guidelines are very welcome but please be aware that images significantly smaller than 1687px by 1317px cannot be used as full page images. The absolute minimum image size requirement for potential inclusion in the calendar is 844px by 656px. An image that is between 1687px by 1317px & 844px by 656px will only have sufficient print resolution to appear on one of the gallery pages at the back of the calendar.

Come and join the HAA for a weekend of star gazing under the dark skies at Andromeda Meadow.



Excellent dark sky for visual observing and astrophotography.

2 Local Observatory Tours

Saturday Potluck Dinner

Registration opens in April 2022 for HAA members only

Date: September 23 to September 25, 2022

Extension to September 26 available

Where: 483161 Colpoys Range Road
South Bruce Peninsula

Between Wiarton and Big Bay Ontario

HAA Dark Sky Star Party

Hamilton Amateur Astronomers

All skill levels from beginner to experienced are welcome!

Accommodations

Onsite

15 back in travel trailer sites
20 ground camping sites

Off site

Motels, B&B's, cottage rentals, Airbnb, and camping/trailer parks in and around Wiarton, Ontario.

A small fee will be charged to all campers and non-campers to cover the cost of the porta potties.

Questions? Contact

Sue MacLachlan at
starparty@amateurastronomy.org
or
Matthew Mannering at
observing@amateurastronomy.org

Onsite Amenities

Porta-potties
Generators for charging astronomy equipment during the day.

No electricity
No running water
No flush toilets or showers

Come and make new friends under the stars!

William J. McCallion Planetarium

McMASTER UNIVERSITY, HAMILTON, ONTARIO

- **Public shows every Wednesday (7:00pm)**
- **Public transit available directly to McMaster campus**
- **Tickets $7 per person; private group bookings $150**
- **Different shows every week**
- **Upcoming shows include:**
  - **Sept 7: Introductory Astronomy for Kids — Galaxies**
  - **Sept 14: Nebulous Nebulae: The Birth, Life, and Death of Stars**
  - **Sept 21: The Celestial Bear: The Six Nations' Night Sky**
  - **Sept 28: The Sounds of Silence: The Expansion of Music through the Focal Point of Space**
- ***Masks strongly encouraged for duration of all shows.***
- **For more details, visit**

  www.physics.mcmaster.ca/planetarium

UPCOMING EVENTS

September 9, 2022 - 7:30 pm — H.A.A. Meeting at McMaster Innovation Park. Our main speaker will be **John Gauvreau**, who will talk about our Milky Way Galaxy. **This will be a "hybrid" meeting, with the attendance option of in-person or online via Facebook and Zoom.**

October 7, 2022 - 7:30 pm — H.A.A. Meeting at McMaster Innovation Park. This is our *Annual General Meeting*.

2021-2022 Council

Chair	Bernie Venasse
Second Chair	Christopher Strejch
Treasurer	Ann Tekatch
Digital Platforms Director	Christopher Strejch
Membership Director	Paula Owen
Observing Director	Matthew Mannering
Education Director	Jo Ann Salci
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Recorder	Brenda Frederick
Secretary	Denise White
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Councillors at Large	Swapna Shrivastrava Sue MacLachlin Melissa Whitman Mike Jefferson

Check out the H.A.A. **Website**
www.amateurastronomy.org

Follow us!

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Meeting Inquiries:
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Education:
education@amateurastronomy.org

Newsletter:
editor@amateurastronomy.org

Digital Platforms Director:
webmaster@amateurastronomy.org

All active HAA members have the privilege of access to an exclusive HAA members only dark sky location.

Be on the lookout for e-mails with dark sky observing details. Space is limited.

The Harvey Garden HAA Portable Library

Contact Information

E-mail: library@amateurastronomy.org