

# Event Horizon



**Volume 28, Number 7**  
**May 2021**



## From The Editor

Once again this month there's lots and lots of interesting articles from members on a huge variety of topics.

Thanks to all who contributed!

*Bob Christmas, Editor*

*editor 'AT'*  
*amateurastronomy.org*



## Chair's Report by John Gauvreau

### HAA Meetings

Last month we had an extraordinary treat as Mary Beth Laychak gave us a presentation from Maunakea in Hawaii, home to the Canada-France-Hawaii Telescope. She was very engaging and I couldn't be happier that we were able to take advantage of our current online format to hear from a speaker so far away.

This month we will have a long anticipated presentation from Kevin Salwach. Kevin will be introducing us to binocular astronomy. For many of us binoculars are a great way to start into observing the night sky with some optical equipment, and many an experienced observer still takes their binoculars out with them alongside their telescope. I know I do! I hope you will join in on Friday May 14th for this exciting talk.

*(Continued on [page 2](#))*

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- NASA Night Sky Notes
- Eye Candy
- Contact Information

## Chair's Report (continued)

A friendly reminder that all our meetings will be held online through the Zoom platform for the foreseeable future. If you have had any hesitation about joining in please feel free to get in touch and we will help you. And don't forget that you can always email 'zoomsupport@amateurastronomy.org' to get help joining the meeting, even once the meeting has started.

Also, since we are holding our meetings online there can be no collection for the foodbank, but don't let that stop you from contributing yourself. It doesn't matter if it comes from the club or straight from the club members; there are people in need and any donation is always welcome.

### Club Activities

The club's council has debated whether we should eliminate one of our two logos and stick to using only one or the other in the future. The two logos under debate are the one you see here on the front page of the newsletter and on the website, and the one we put on the club branded apparel a couple of years ago. Both are lovely but it has been suggested that we replace the one on the website and newsletter for the past years with the newer one. Or, we could keep both beautiful logos and use them for different purposes. There has been very little input from anyone outside of council and I think this is a decision that would benefit from the voices of many people. I would love to hear from you. Please feel free to get in touch and I will gladly give you details and listen to your input.

### Observing

Of course with the current restrictions in place from the provincial government we are unable to get out to Binbrook for observing. As soon as the restrictions are lifted and we get the all-clear from the NPCA, I will let you know and hopefully we will get back out observing soon.

### BASEF

Each year the HAA awards a prize to a deserving student in the Bay Area Science and Engineering Fair who submits the best project about astronomy or a related science.

The award is named for Jim Winger, and I would like to reprint the words of Jo Ann Salci, who penned the following paragraphs for BASEF, so they can let the students know who we are:

*The James A. Winger Award*

*Sponsored by the Hamilton Amateur Astronomers*

*"The Hamilton Amateur Astronomers (HAA) is the largest non-profit, independent astronomy club in Canada dedicated to the enjoyment and advancement of astronomy. Celebrating over 25 years! Each month we host public meetings featuring presentations by professional and amateur astronomers, release a monthly newsletter and hold public stargazing events in Hamilton and surrounding area. Our local dark sky site is available to members for observing.*

*(Continued on [page 3](#))*

**Masthead Photo:** Galaxy NGC 4565, by Michel Audette.

Taken on April 6, 2021 remotely using iTelescope's #11 scope, which is a 500mm f/6.8 reflector based in Mayhill, New Mexico. Taken through a Mono RGB Filter. 30 exposures x 300 seconds each, 10 red, 10 green and 10 blue.

## Chair's Report (continued)

*The club also offers new members two programs: an introduction to astronomy and loaner telescopes. If members do not have their own telescope, they can borrow one from the club. Other club activities and benefits may include the club's lending library, the telescope-making group, astronomy book club, astrophotography group and the cosmology discussion group.*

*Astronomy is the branch of science that studies everything beyond Earth and its atmosphere. That includes our Moon, the Sun, planets, stars, nebulae, galaxies and more.*

*The HAA sponsors an award at BASEF every year, called the James A. Winger Award.*

*James Winger was a founding member of the HAA and is the only person to have been named its Honorary Chair. Jim was a skilled astronomer, expert telescope maker and taught many people how to make their own telescope optics. Jim was always a great supporter of BASEF, personally donating prizes to foster the enthusiasm of young scientists.*

*Consideration for this Award is given to a student who does a project related to Astronomy, Physics, Light Pollution Abatement, or Space Travel. The Award consists of a \$200 prize and the opportunity to present the project to the HAA's membership."*

Well said, Jo Ann!

There are many members still in the club who remember Jim fondly, myself included, and it is worth a few words to remember him now. I actually met Jim when I was a teenager, long before the HAA was formed. We were both part of another astronomy club; Jim, an established and experienced amateur astronomy who was running the club, and I practically a kid who was just starting out. Jim and I had different approaches to amateur astronomy, and there were times when I think Jim was probably rolling his eyes at the cavalier attitude of a youth such as myself. But Jim was always tolerant of me and my youthful ways, and guided me well through my early years in amateur astronomy. Today, although Jim is long gone, I remember him fondly and have on my shelf his old copy of one of my favourite astronomy books, which I treasure.

The students that receive this prize from the club may never appreciate the significance of the name behind the award, but those who remember Jim know that he would be thrilled that his legacy of encouraging youth in this great hobby lives on. This award is a fitting tribute to him.

This year the Hamilton Amateur Astronomers James A. Winger award was presented to *Katelyn Johnson* of Westdale Secondary School, for her project called "Is CO<sub>2</sub> Affecting You?" Her project explored the varying amounts of CO<sub>2</sub> that are encountered in everyday environments and how it impacts us. This kind of exploration is applicable to spaceflight and her methodology is similar to that employed by various space agencies in places like the ISS. Katelyn's proper use of the scientific method and fair appraisal of her experiment and results made her a deserving recipient of our award. Congratulations and well done Katelyn!

## Conclusion

Here's the same message as last month. I invite you to get in touch with me about participating in any club activities like outreach, education, booking speakers, writing articles, giving talks and presentations, award programs or other behind-the-scenes work of the club. I would be very happy to see more members involved in these and other areas. The club's council is made of regular members who work behind the scenes to make all this happen for the other members benefit. I invite you to participate in any area of the club that interests you. You might have a great idea that nobody on council has thought of. Please feel free to join in any way you like. Reach out to me any time.





### ...A column for young astronomers - and those young at heart!

Welcome back! For the past two months we've been exploring our closest space-neighbour, the Moon. This month we are going to learn about our closest star-neighbour - the Sun!

### Our Shining Star: The Sun

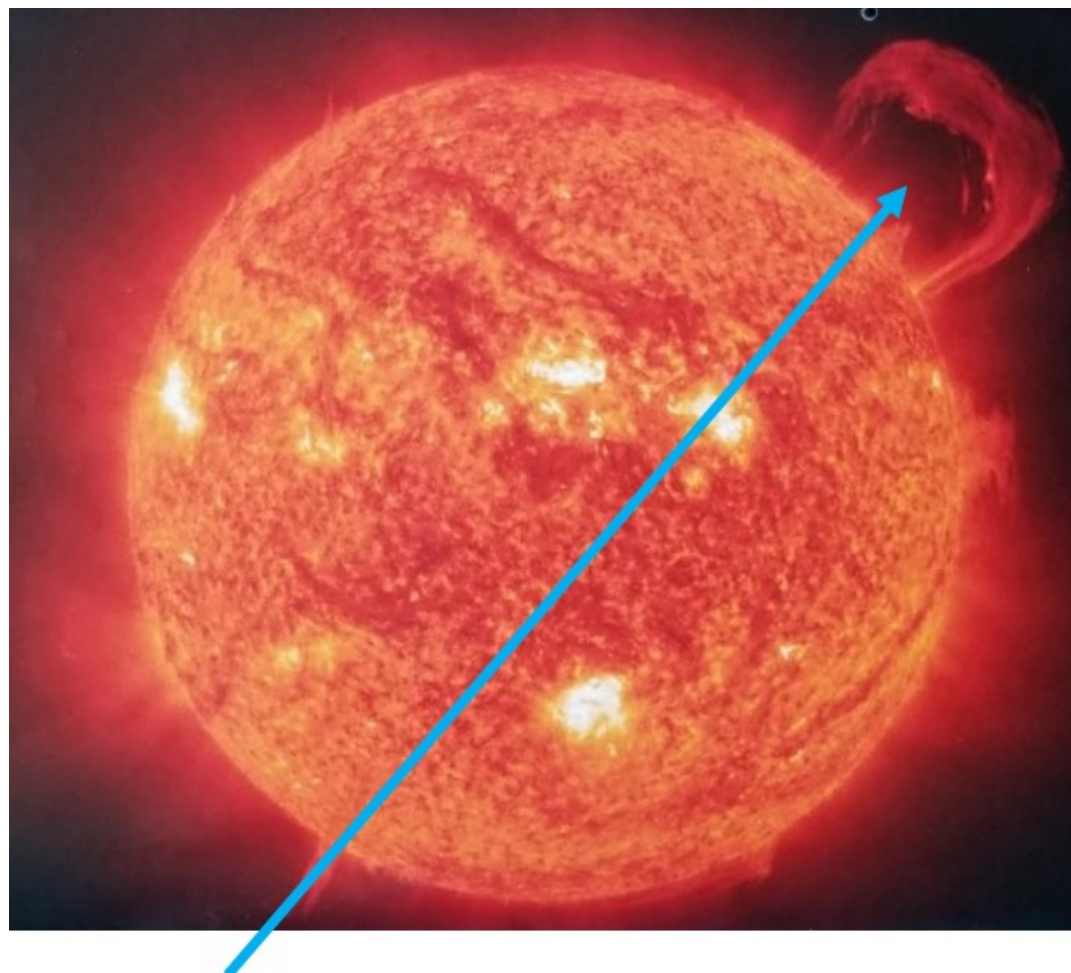
**First, a Safety Warning!** The Sun is so bright that even a few seconds of looking at it can cause severe damage and you could lose your eyesight. DO NOT look directly at the Sun. The same goes for adults, so make sure they know, too! Astronomers use special filters which allow them to study the Sun. For information on how to see the Sun safely, visit:

<https://pwg.gsfc.nasa.gov/istp/outreach/sunobserve1.pdf>

Our Sun, like all stars, spins and is made of very hot, burning gases. It gives us light, heat and energy. Earth happens to be in just the right place at 93 million miles away to get just the right amount of each! The Sun is a great star for us to learn from, as the next closest star called "Proxima Centauri" is very far away! It's so far that it takes 4 years for its light to reach Earth (The Sun's light only takes 8 minutes). The Sun is considered a medium-sized star, yet more than a MILLION Earths could fit inside it.

The temperature on the Sun's surface is  $5,500^{\circ}\text{C}$ . The temperature inside the Sun is even hotter at  $15,000,000^{\circ}\text{C}$ ! The Sun's energy comes from deep inside where hydrogen gas is turned into helium gas through constant nuclear reactions. That's where all the energy comes from!

The surface of the Sun often has dark spots and eruptions. Sometimes, extremely large loops of gas extend from the Sun's surface. These are called Solar (another word for Sun) prominences. Sometimes these explosions can cause radio interference on Earth.

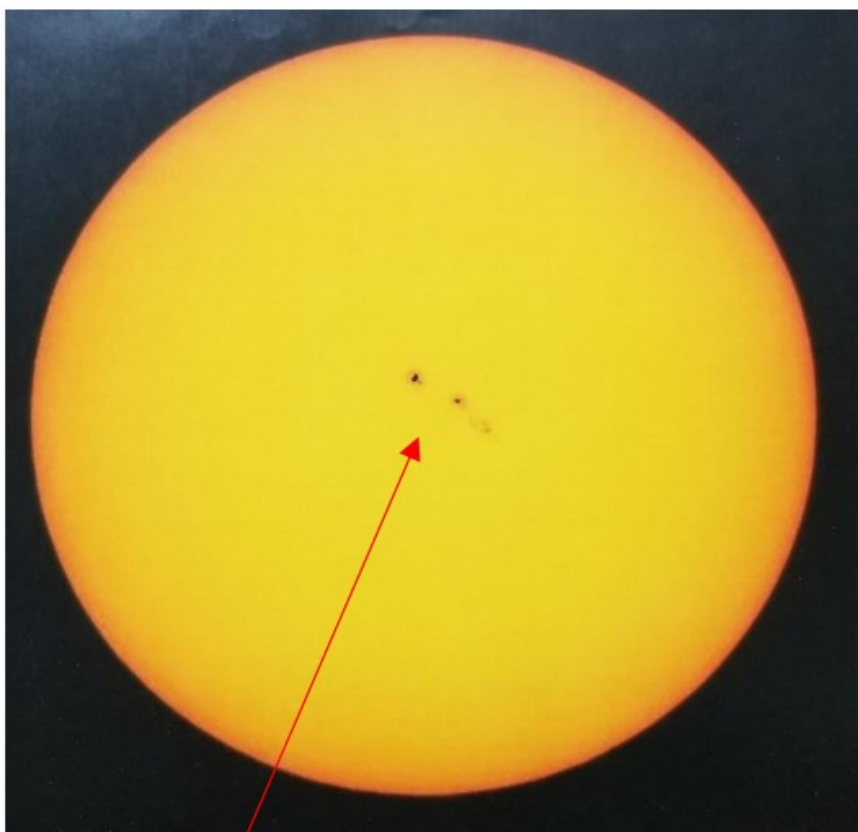


*This solar prominence was seen by the Solar and Heliospheric Observatory (SOHO) spacecraft  
Photo Credit: NASA*

*(Continued on [page 5](#))*

## HAA Explorers (continued)

The dark spots are called “sunspots” which are areas of magnetic storms that are cooler than the surrounding areas. The number of sunspots that can be seen changes over an 11-year cycle. We expect to see more sunspots over the next few years!

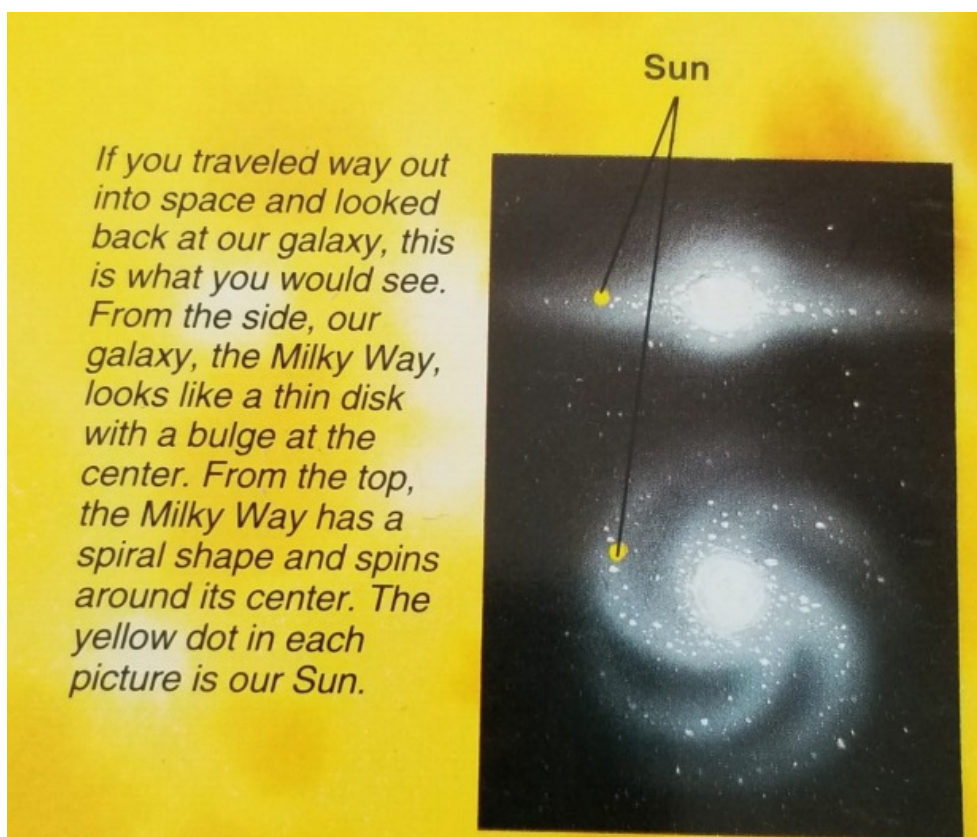


*Sunspots imaged by HAA Member Jim Wamsley  
Photo credit: Jim Wamsley*



*Sunspot seen by HAA Member Brian Whitman  
June 2020  
Photo credit: Melissa Whitman*

The Sun is located at the centre of our Solar System. Its large size means that it has a lot of gravity which keeps the planets in their orbits. The Sun is one of many stars located in our home galaxy, the Milky Way. To see where our Sun and Solar system are, see the picture below (the yellow dot is bigger than it should be and is for show-and-tell purposes only):



*Courtesy: Let's Look  
at the Planets, p. 6.*

*(Continued on [page 6](#))*



Have fun exploring our Sun!

## Our Shining Star

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

HYDROGEN  
SUNSPOTS  
MILKYWAY  
PHOTOSPHERE  
GRAVITY  
MAGNETIC  
LIGHT  
HELIUM  
SOLAR  
STORMS  
SOHO  
ENERGY  
PROMINENCE  
CORONA

Answers on page 7.

Courtesy:

[www.thewordsearch.com](http://www.thewordsearch.com)

During May, check out:

1. May 15th: Mars and the Moon at about 10pm while facing West:

Chart generated using  
Stellarium

(Crossword on [page 7](#))



## HAA Explorers (continued)

### Things to do until next time\*\*:

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

1. **What the Sun looks like right now:** [www.Helioviewer.org](http://www.Helioviewer.org) You can actually see how big the Sun is next to a small picture of the Earth. The Sun is not orange. It looks orange when it's seen through a different filter, as on this webpage, where it is shown with an ultraviolet filter. If we could look at the Sun, it would be white.

2. **Learn about eclipses** (HINT: There will be a Solar eclipse on June 10, 2021) Scroll down and watch the video: [https://nightsky.jpl.nasa.gov/download-view.cfm?Doc\\_ID=327](https://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=327)

3. **Learn so much more about the Sun**, including information about Auroras, a beautiful sight that the Sun's wind creates: <https://spaceplace.nasa.gov/menu/sun/>

### Finally:

Why didn't the Sun go to University? Answer: *jsæɹɟəp ʃo spuɔsnouɪ pəɪ ʌpɹəɪp ɹɪ* See you next month!

If you have a question you would like answered in the newsletter, please send it to

[education@amateurastronomy.org](mailto:education@amateurastronomy.org)

Thank you to An, Br, and Mi for their review of this article!



### References:

Exploring the Night Sky. Terence Dickinson. 1987.

Let's Look at the Planets. Laura Driscoll. 1996.

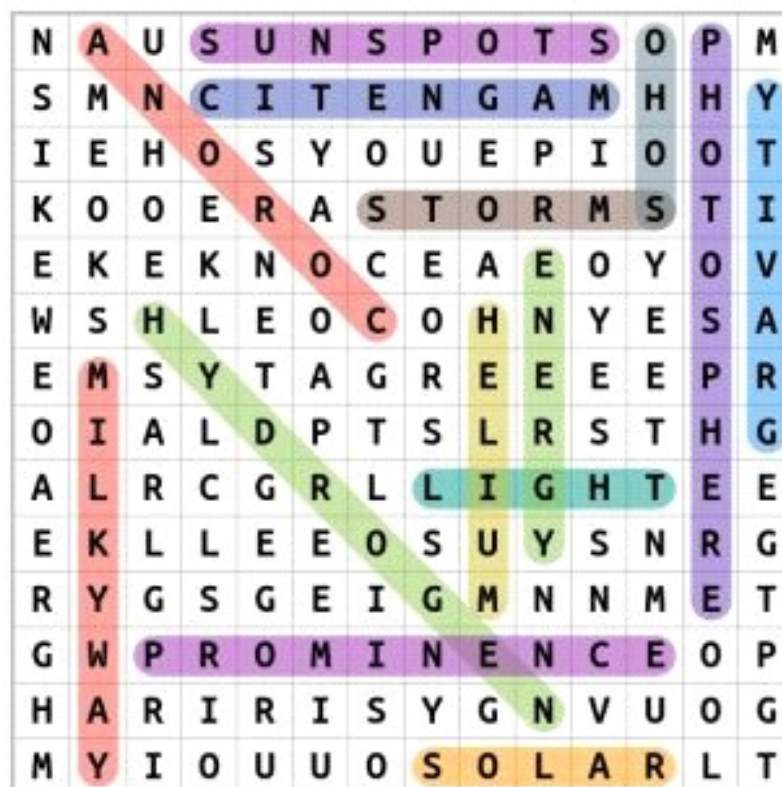
National Geographic Kids: Ultimate Space Atlas. 2017.

National Geographic Kids: Ultimate Explorer Field Guide: Night Sky. 2016.

Philip's Essential Guide to Space. Paul Sutherland. 2016.

The World Around Us: Space, Kingfisher Books, 1991.

### Word Search Answers:





## The Sky This Month for May 2021 by Matthew Mannering

April 28, 2021 marked the passing of astronaut Michael Collins, the third and largely unheralded member of Apollo 11. Collins orbited the Moon in the Command/Service module Columbia while Armstrong and Aldrin took the lander Eagle down to the surface and made history.



I was eleven years old in July of '69 and living in England. All major milestones for the mission were scheduled to occur during the day and evening in North America, which meant it was late into the night in the UK. I would love to be able to say that I saw the landing and subsequent Moon walk, but both occurred after my bedtime. Apparently, one of the most momentous moments in history was insufficient reason to stay up late. Instead, I got to see replays the next morning on the BBC.

Perhaps what has stuck with me the most (other than the landing itself) was the thought of the possibility of Collins coming home alone. Any one of a thousand things could have killed Armstrong and Aldrin during the descent, landing, EVA and ascent stages of the mission. Collins would say in the years that followed that he felt no stress about the possibility of having to leave the other two behind, but I think that it must have been on his mind.

I find it a little odd that Hollywood never made a movie of the Apollo 11 mission. However, a movie was made in Australia called "The Dish". It followed the techs and scientists who ran the Parkes

Observatory radio telescope that relayed Apollo 11 audio and video back to NASA during the Moon walk. Some liberties were taken with historical accuracy, but it was well written and acted and certainly worth your time.

The little helicopter named Ingenuity has completed four flights as of April 30. No matter how many fantastic images I see from the space programme, I am still amazed at what has been accomplished. At first glance it seems to be such a simple experiment. After all, we have helicopters and drones here on Earth. How hard can it be? Well how about a list...

- Remote control is impossible due to the time lag of signals going back and forth to Mars.
- The whole flight must be programmed in advance by a "pilot".
- The atmosphere is 1% Earth standard.
- The navigation system relies on visual cues and dead reckoning.
- The helicopter must survive extremely low temperatures at night.

NASA has just announced that once the initial set of demonstration flights are complete, they will start another set of flights which will allow Ingenuity to act as a scout for Perseverance. The ability to map the area around the rover in fine detail will allow NASA to better pinpoint targets of interest. Ingenuity will fly to the next target ahead of the rover and wait there. Then, once that target has been explored, Ingenuity will be sent up again hopping from one target to the next with Perseverance in hot pursuit. NASA hopes to follow this pattern of movement for at least a few months.

In future years we will be able to see time lapse flights over large areas of Mars. I don't know about you, but I would find that far more interesting than a computer simulation. Although to be honest, with today's technology it would be hard to tell the difference between the two views. I've included an image of the second flight of Ingenuity as seen from the rover Perseverance (top of next page).

*(Continued on [page 9](#))*



## The Sky This Month for May 2021 (continued)



*Image Credit: NASA/JPL-Caltech/ASU/MSSS.*

On May 26 there will be a Lunar Eclipse. Unfortunately for us, the Moon will have set just before the show begins.

Two weeks later, on June 10 at about 5:40am an annular Solar Eclipse will reach its maximum at sunrise. As you can see, Hamilton is not in the eclipse path.



*Map adapted by  
NationalEclipse.com  
from original at  
[eclipse.gsfc.nasa.gov](http://eclipse.gsfc.nasa.gov).*

*Map Copyright:  
Google, INEGI,  
ORION-ME.*

*Eclipse predictions  
courtesy of Fred  
Espenak,  
NASA/Goddard  
Space Flight Center*

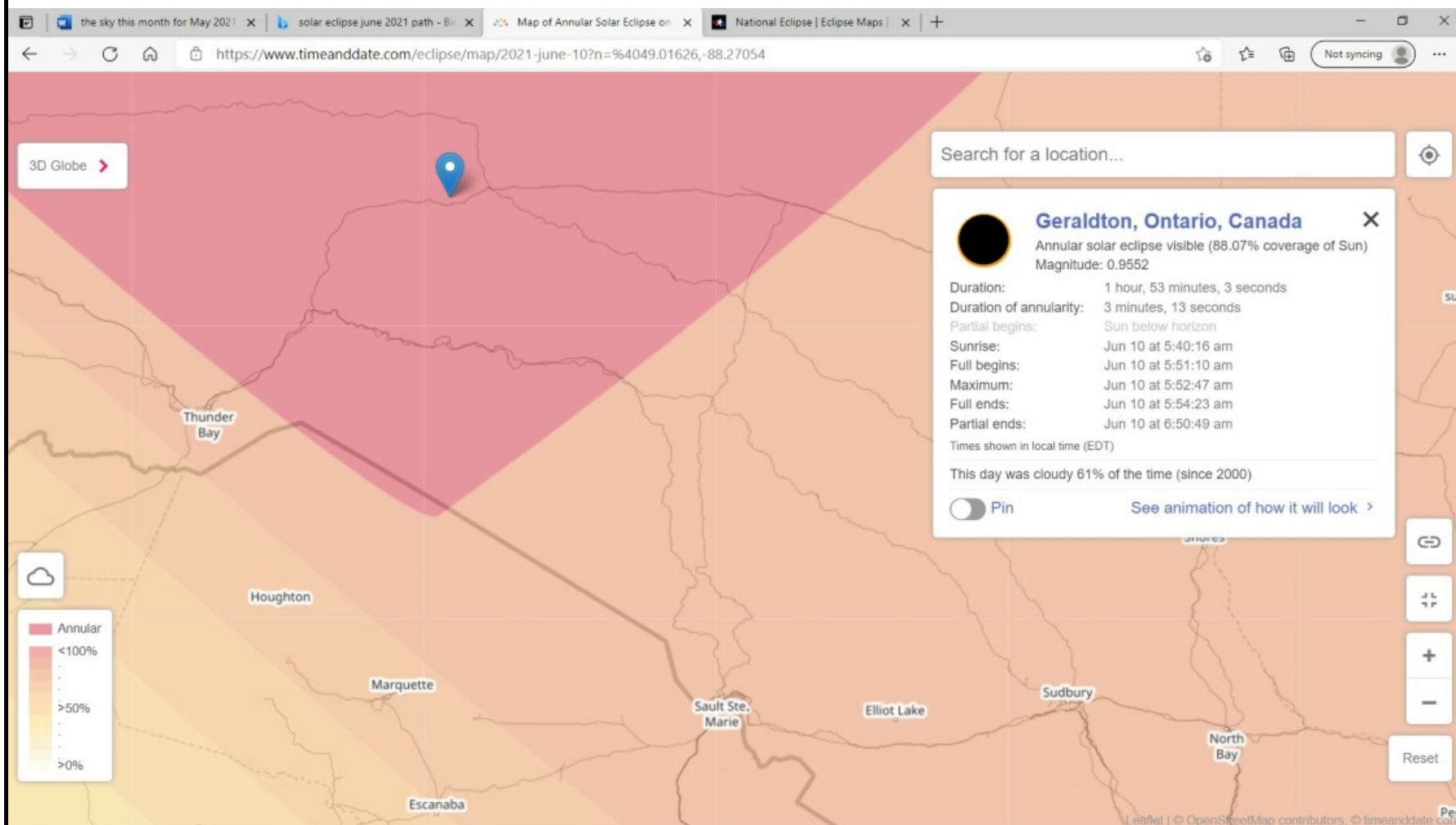
*(Continued on [page 10](#))*



## The Sky This Month for May 2021 (continued)

In fact, in Hamilton, the Sun will be about 72% eclipsed by the Moon at maximum coverage which again occurs at sunrise. You will need solar glasses or a solar telescope to watch this event safely. If you are in any doubt about how to safely watch the eclipse, **do not look at the Sun** as you will damage your eyesight permanently.

The duration of annularity will be greater than 3 minutes at locations in Northern Ontario such as Nipigon, Geraldton and Longlac. This map is from timeanddate.com, showing details of the eclipse from Geraldton.



*Jupiter and Saturn* make very fine morning targets all through May.

- On May 1st at 5am Jupiter will be at 15° altitude in the SE with Saturn 15° to the south of Jupiter at 18.5° altitude.
- By the end of May, Saturn will rise at 1am and Jupiter will follow suit at 1:45am.
- Saturn spends the year in Capricornus and this month is situated about 6° below NGC 7009 (Caldwell 55) better known as the 'Saturn nebula'. M72 (Globular cluster) and M73 (Open cluster) are very close to the nebula.

The *Saturn Nebula* (NGC 7009) gets its name from its shape which mimics the view of Saturn in a small refractor at low magnification. Both the nebula and the planet are similarly sized at roughly 40" of arc. The nebula is very bright and worth a look though it is quite small. Even a small refractor will show the football shape of the nebula. See the top of the next page for the diagram.

May also brings the best apparition of Mercury for the year and as a bonus, Venus will keep it company. The best time to view both planets is about one-half hour after sunset.

(Continued on [page 11](#))

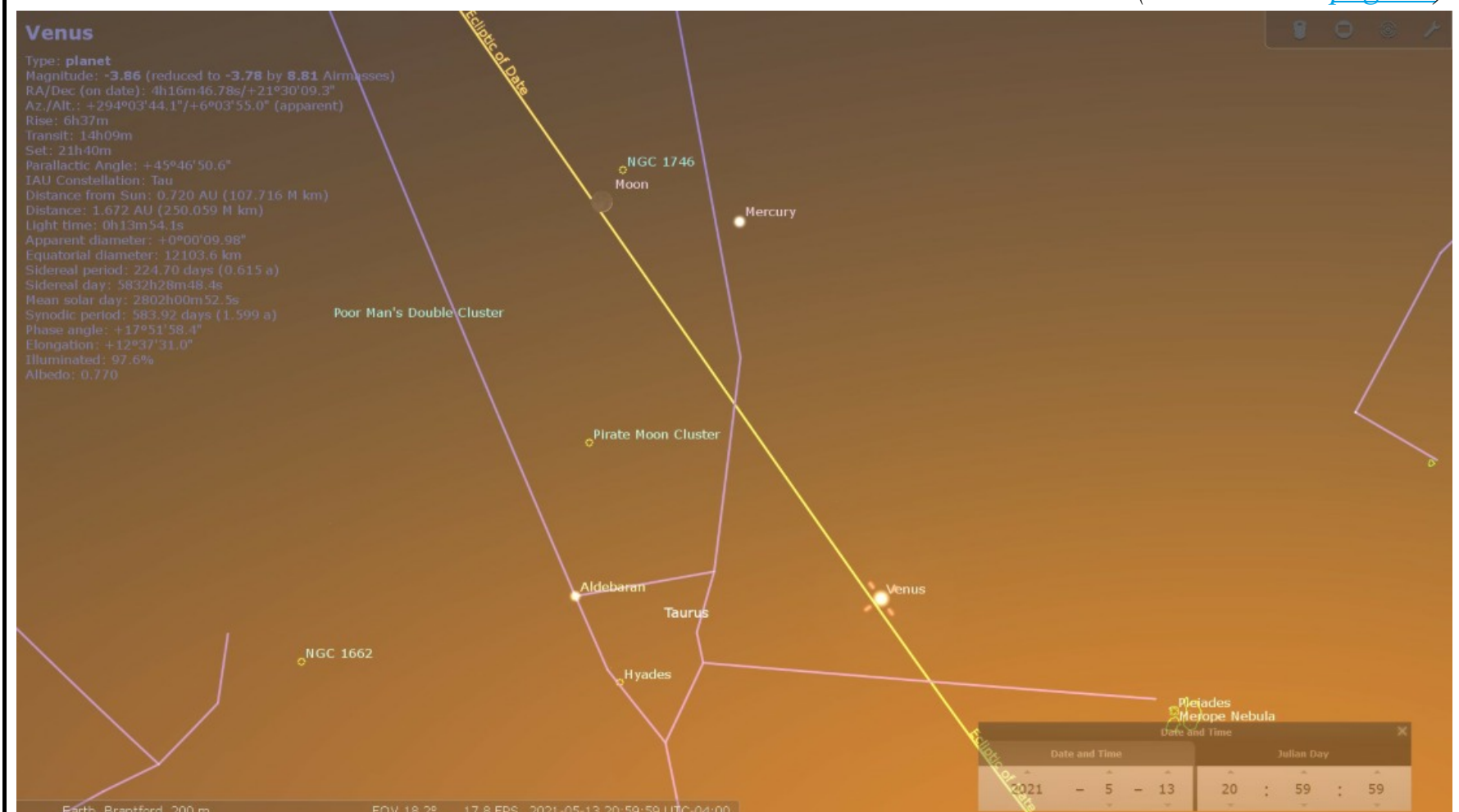
# The Sky This Month for May 2021 (continued)



The evenings in the first third of the month find Venus very low in the SW with Mercury keeping station between 5° and 8° above. May 13th adds a two-day old Moon (4.2% lit) to the mix.

Towards the end of the month on May 28th, look in the WNW at 9:15pm for Venus and Mercury which will be separated by less than 0.5°. Through a telescope, Venus will appear as an almost full disc while Mercury will be a thin crescent.

(Continued on [page 12](#))





## The Sky This Month for May 2021 (continued)



*Charts on pp. 11 and 12 generated using Stellarium*

Lastly, here are four targets for May that are all quite low in the South and East at midmonth at 10pm.

Start the session by finding the Constellation Corvus low in the south. then star hop to three of the targets.

- M68 is a small globular just below Corvus.
- M83 the *Southern Pinwheel galaxy* is a tough target even lower in the sky and slightly to the east of M68.
- M104 the *Sombrero galaxy* is above and slightly east of Corvus. Use as much magnification as conditions allow to see the dust lane that bisects the galaxy. Also note how the central bulge of the galaxy is larger on one side of the dust lane versus the other. This is due to the slight tilt of the galaxy from our perspective.

Now move east into Serpens and look for the globular M5. This is a beautiful example of a globular and in many ways rivals the great globular in Hercules (M13).

Springtime is galaxy season so be sure to spend some time searching for them. Many of the Messier galaxies are situated between Leo and Virgo and are visible from dark sites in Ontario. Remember to use averted vision to see them.

Good hunting!



## Notes from My Virtual Table, May 2021 by Bernie Venasse

### *This month at the table...*

What's Up? Webcasts of interest. From the Astronomical League. AAVSO Webinars.  
What's Up in Awards? ... Random Links IDA's 'Capture the Dark' Photography Contest

### What's Up? Webcast from Sky-Watcher at 1:00 PM Eastern

May 7, 2021... May Night Skies (2021 edition).  
May 14, 2021... Star Adventurer 2i.  
May 21, 2021... Photographing Lunar Eclipses.  
May 28, 2021... Dr. Jeff Hall, Lowell Observatory.  
June 4, 2021... June Night Skies (2021 edition).  
June 11, 2021... Evostar Overview.  
June 18, 2021... Understanding Modified DSLR/Mirrorless Cameras.

### From the Astronomical League... <https://www.astroleague.org/>

Although this program is offered by the Astronomical League, I encourage you to complete the observations and submit your results to me. You won't get a pin but you may receive a certificate from the HAA. Follow the rules set forth in the program and enjoy...

Double Star Observing Program: ... <https://www.astroleague.org/al/obsclubs/dblstar/dblstar1.html>

#### *"Introduction:*

*Welcome to the Astronomical League's Double Star Observing Program! This program introduces observers to 100 of the finest double and multiple star systems in the heavens. You do not need an expensive apochromatic refractor to view the objects on this list; a small refractor, Newtonian reflector, or Schmidt-Cassegrain telescope will do just fine. All objects on this list were originally observed with a three-inch refractor using between 75X and 150X. The program is meant to allow you to enjoy a different aspect of our wonderful hobby and not to test your equipment.*

*Double star observing is forgiving. Clear, dark, or moonless skies are not usually needed for observing many if not most of these objects. As usual in astronomy, the best results will be obtained under optimum conditions, particularly under good seeing conditions for splitting close pairs. However, a less-than-perfect night should not dissuade you from getting outside to observe double stars and enjoying this program."*

Download the Double-Star Observing Program checklist here:

<https://www.astroleague.org/files/u220/ALDoubleStarList-20181017.pdf>

### From the AAVSO.... <https://www.aavso.org/2021-webinars-april-june>

May 1, 2021... How to start with CCD photometry.  
May 8, 2021... Cataclysmic Variables as Universal Accretion Laboratories.  
May 8, 2021... Spectroscopy: which hardware for which observations?  
May 22, 2021... Solving the Red Supergiant Problem with a New Class of Pulsators.  
May 22, 2021... The Faintest and Smallest Galaxies.  
June 5, 2021... Your First Observatory: Keep It Simple!  
June 12, 2021... Observing the Next Galactic Supernova.  
June 26, 2021... A Romp With Betelgeuse.

*(Continued on [page 14](#))*

### What's Up in Awards? May 2021

The Hamilton Amateur Astronomers Observing Programs are designed to provide direction for the 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 of 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. The information is based (excluding planets), on 10:00 PM Eastern Daylight Time on the night of the New Moon... in this case, May 11, 2021. **CAPITALIZED, BOLD objects are most prominent this month.**

### HAA Rising Star Observing Award

*Constellations (12 required)*... Aquila, Auriga, **BOOTES**, Canis Major, Cassiopeia, Cepheus, Corona Borealis, Cygnus, Gemini, Hercules, **LEO**, Lyra, Ophiuchus, Orion, Pegasus, Perseus, Sagittarius, Scorpius, Taurus, Ursa Major, **URSA MINOR, VIRGO**

*Planets (4 required)*...

**MERCURY** Well positioned evening planet, setting 90 minutes after sunset on 1 May. Near the Pleiades on 3 May.

**VENUS** Evening planet, near a thin waxing crescent Moon on 12 May. Very close to Mercury on 28 May.

**MARS** struggles in evening twilight. A 14%-lit waxing crescent Moon lies nearby on 15 May.

**JUPITER** Morning planet. A 35%-lit waning crescent Moon lies close on the morning of 5 May.

**SATURN** Morning planet in Capricornus. The Moon pays it a visit on the mornings of 3, 4 and 31 May.

Uranus Not visible this month.

Neptune Not visible this month.

*Planetary Satellites (all required)*... **EARTH'S MOON, JUPITER'S 4 GALILEAN MOONS** (It is important to note the date and time of the observations of Jupiter's moons)

*Stars (Polaris + 5 others)*... Aldebaran, Altair, Antares, **ARCTURUS**, Betelgeuse, Capella, Deneb, **DUBHE**, Pollux, **REGULUS**, Rigel, Sirius, **SPICA**, Vega

*Multiple stars (2 required)*... Albireo, Almach, Castor, **MIZAR**, Zubenelgenubi (include observations about their colour if possible)

*Galaxy pairs (1 pair required)*... M31/M32, **M65/M66**, M81/M82

*Messier objects (4 required)*... M4, M6, M7, M8, M11, **M13**, M35, M42, M44, M45

*Other (1 Required)*... Aurora, an Eclipse (moon or sun, partial or full), **INTERNATIONAL SPACE STATION** (check heavens-above.com for ISS passes), **METEOR SHOWER**

(Continued on [page 15](#))



## Notes from My Virtual Table, May 2021 (continued)

### Meteor Showers: eta Aquariids

The Eta Aquariids are a strong shower when viewed from the southern tropics. From the equator northward, they usually only produce medium rates of 10-30 per hour just before dawn. Activity is good for a week centered the night of maximum activity. These are swift meteors that produce a high percentage of persistent trains, but few fireballs.

*Shower details* - Radiant: 22:32 -1° - ZHR: 40 - Velocity: 42 miles/sec (swift - 66.9km/sec)  
Parent Object: 1P/Halley

*Next Peak* - The eta Aquariids will next peak on the May 4-5, 2021 night. On this night, the moon will be 38% full. — American Meteor Society

### Pathways Observing Award

The Pathways Observing Program is a unique program designed specifically for the beginning observer either young or not-so-young. It is designed to help the new observer learn his or her way around the sky and to teach some of the basics of the night sky WITHOUT binoculars or a telescope!

*Planets* to be observed (In any order, reporting one per Group): Venus, Mars, Saturn, Jupiter.

#### Group A, Spring

*Constellations*. Find, observe, sketch or diagram: Ursa Major, Bootes, Virgo

*Stars*. Find, observe, sketch or illustrate: Polaris, Arcturus, Spica

*Asterisms*. Find, observe, sketch or illustrate: Big Dipper (Tail of Ursa Major)

Virgo Gt. Diamond, (Cor Caroli, Arcturus, Spica, Denobola)

Sickle (Head of Leo)

*Planet*: Find observe and sketch or diagram: Any one planet that is remaining in the list.

*Activity*: Use the pointer stars to find Polaris

### Random Links.... Explore....

<http://skymaps.com/downloads.htm>

<https://telescopius.com/>

<http://www.virtualcolony.com/sac/index.html>

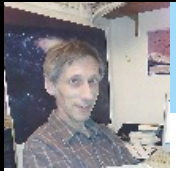
<https://transit-finder.com/>

Enter IDA's 'Capture the Dark' Photography Contest (details on their website)

<https://www.darksky.org/capturethedark/>



*A photographer captures the dark, Utah, May 2019.  
Photo Credit: Bettymaya Foott*



## The Artemis Space Program by Doug Currie

Significant Progress in 2021 Towards First Launch of NASA's Back to the Moon to Stay and On to Mars Crewed Artemis Program With Space Launch System and Orion

In April 2021, according to a new NASA article in April 2021 with title NASA's Space Launch System Core Stage Heads to Kennedy Space Center at NASA's own [www.nasa.gov](http://www.nasa.gov) website, it was mentioned that the Space Launch System had just been successfully put on the Pegasus Barge sideways. This barge will bring the Core Stage of NASA's Space Launch System Core Stage from the Stennis Test Stand in Bay St. Louis, Mississippi where it just finished the last of 8 tests in the Green Run series of tests for launch of its system to Kennedy Space Center.

This core stage is a very long 212 feet (or 65 metres) and produced at the hot fire test and is supposed to produce at launch about 2 million pounds of thrust. This core stage or 1st stage will be joined at launch by 2 solid fuel booster rockets on either side of the main stage with each of these booster rockets capable of producing about 3.2 million pounds of thrust. Altogether the Space Launch System (SLS) will be able to produce up to 8.8 million pounds of thrust that is significantly greater than the 7.5 million pounds of thrust produced by the Saturn V rockets in the previous NASA Apollo program that brought the first astronauts to the surface of the Moon in the 1960s and 1970s.

This Space Launch System (SLS) core stage is the last component needed for the launch of the Artemis Mission 1 which will be the first of NASA's program to bring astronauts from the US and international and commercial partners to the Moon to stay and then also on to Mars eventually. NASA has an agreement that there will be a Canadian astronaut among the probably four astronauts on the first crewed flight of SLS or the Artemis program probably sometime in 2022. All the other components, including the Orion crew capsule for the first Artemis launch are already at the Kennedy Space Center. This first mission of the Artemis program, that has been quite a few years in the making, will involve an uncrewed (unmanned) flight test of the Space Launch System and Orion around the Moon and back to Earth with splashdown of the Orion capsule in the Pacific Ocean off the California coast. This mission is currently scheduled for later this year from October to December depending on how well the remaining objectives until launch go.

The second mission, Artemis 2, will involve a crewed mission with the SLS and Orion on the same course around the Moon and back but with two or more, probably 4, astronauts on board. This will be the first time any astronauts have flown beyond low earth orbit (LEO) around 200-250 miles or 400 kilometres above Earth's surface, through Earth Van Allen magnetic field radiation belts and to the vicinity of the Moon that is about 240,000 miles or about 400,000 kilometres from Earth. It is planned that Artemis 2 will follow a similar course as Artemis 2 that is to loop around the far side of the Moon and come back to splashdown in Earth's Pacific Ocean. The main difference is that Artemis 2 will test the capability of Orion and SLS to handle astronauts and the life support systems much more than Artemis 1. Artemis 2 will probably fly in late 2022.

NASA plans that the third flight in the Artemis program, Artemis 3, will be the one involving astronauts reaching the surface of the Moon. The landing area on the Moon for that mission will possibly be close to the lunar south pole as that is the location NASA desires to set up a permanent crewed lunar base as there is more water ice and other materials there that could support a crewed or manned long-term lunar surface base. The SLS is capable of bringing 27 tons or about 60,000 pounds to near lunar space with each mission, with later planned versions of SLS able to bring about 40 tons to lunar orbit. This substantial mass carrying ability will be needed to bring the modules of a planned relatively small heavily automated but lunar orbiting space station called Deep Space Gateway. (Most or all of these modules are already under construction with Canada likely contributing another Canadarm for the outside of this lunar orbiting space station.) On the Artemis 3 mission NASA and partner agencies like the European Space Agency (ESA), the Canadian Space Agency (CSA) and the Japanese Space Agency (JAXA) plan to have the Orion capsule with

*(Continued on [page 17](#))*

## The Artemis Space Program (continued)

the Artemis 3 astronauts dock and transfer temporarily to the Deep Space Gateway. It is planned that they will wait there until a probably-modified smaller SpaceX Starship crewed vehicle is launched from Earth with the SpaceX heavy launcher and comes to rendezvous with another part of the Deep Space Gateway. The Artemis 3 astronauts would then transfer to the modified SpaceX Starship lunar lander to descend to the Moon's surface (probably near the lunar south pole). After some time on the surface of the Moon these astronauts would again board this Starship lunar shuttle and blast off to dock with the Deep Space Gateway. From the Deep Space Gateway they would transfer to the waiting SLS Orion capsule and return to Earth and splashdown in the Pacific Ocean off the California Coast. NASA is still hoping it can land the Artemis 3 astronauts on the Moon and have the Deep Space Gateway built and a working SpaceX Starship operating by some time in 2024, but most space experts believe this is too optimistic a schedule and that this Artemis 3 mission will have to be attempted some time after 2024.

NASA, ESA, JAXA and the Canadian Space Agency are planning additional Artemis missions after the third one that are intended to build up the infrastructure and supplied for a long-term crewed lunar surface base on the Moon by the late 2020s. However the first three Artemis missions will have to all be successful before this inspiring and pioneering goal of establishing a long-term crewed or manned lunar surface base can be attempted to go beyond what was achieved in the very temporary stays on the surface of the Moon by astronauts in the Apollo program several decades ago.

## Introducing “HAA Presents”

We are pleased to announce a brand-new feature on our website! 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](http://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.



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HAA Presents

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](mailto:haapresents@amateurastronomy.org).

Clear Skies!

— Christopher Strejch

*Digital Platforms Director*



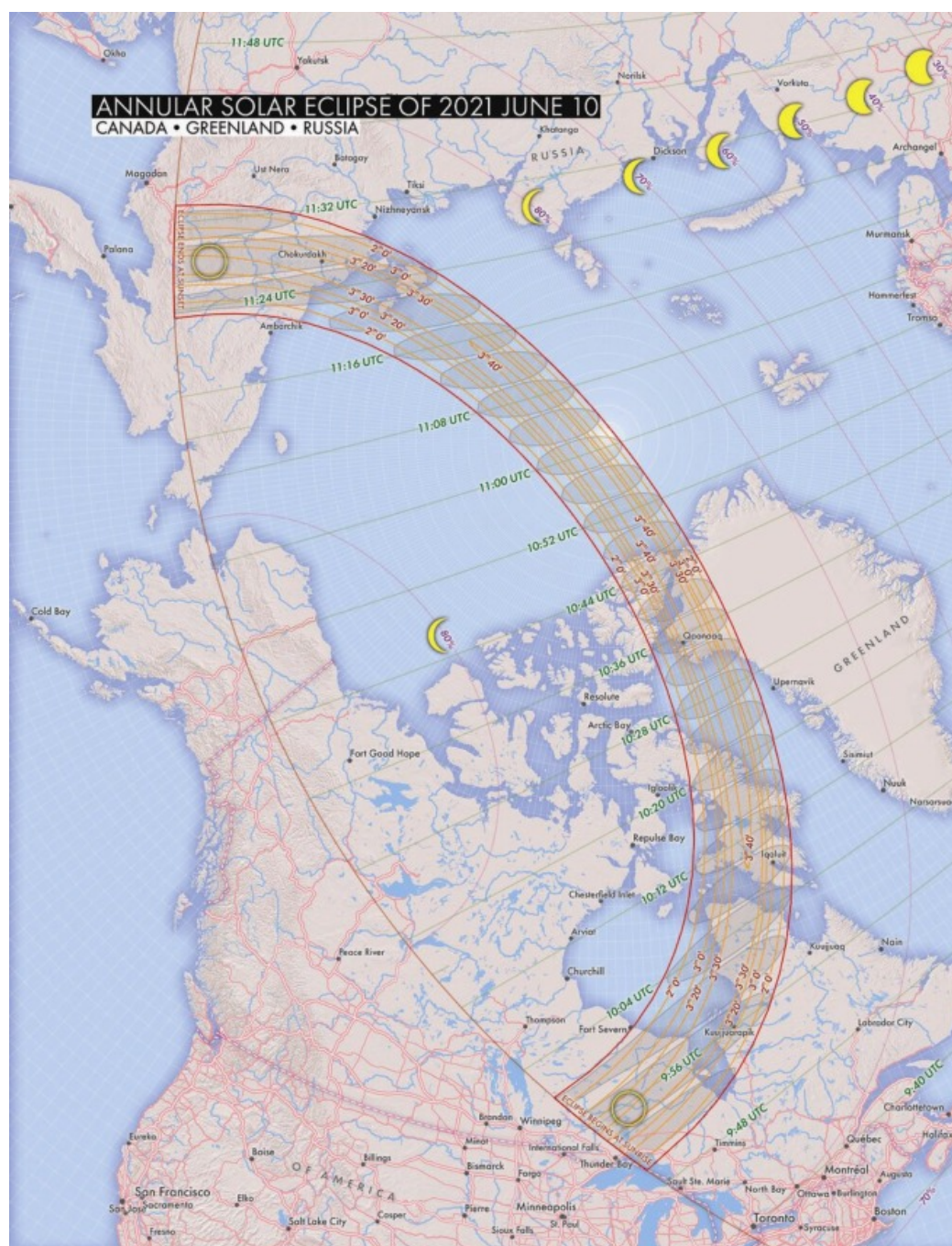


## The Annular Solar Eclipse of June 10, 2021 by Ray Badgerow

On the morning of Thursday, June 10th, Canada will experience a celestial event, an annular solar eclipse that will occur shortly after sunrise for residents of Ontario.

The antumbra touches down on the Earth's surface north of Thunder Bay at 9:49:43 UTC and moves rapidly northward across Hudson Bay into Nunavut where it reaches the point of greatest eclipse at 10:41:51 UTC off the coast of Ellesmere Island (3m51s) before going over the North Pole and ending at sunset in Eastern Russia at 11:33:45 UTC. Due to the circumpolar nature of the track, the moon's shadow stays on the Earth's surface for 1h47m and has a total path length of 7,775 km.

Based upon my analysis, the average duration of annular eclipses ( $n=276$ ) is 3m36.9s at an average altitude of 25.5 degrees.



*Images on pp. 18 and 19  
courtesy of  
Michael Zeiler,  
GreatAmericanEclipse.com*

The weather prospects for this eclipse are marginal at best, with Northern Ontario having a 55% chance of cloud cover and 85% chance further north in Nunavut. The best weather circumstances can be found in Western Greenland at Qaanaaq which has a 38% chance of cloud on eclipse day.

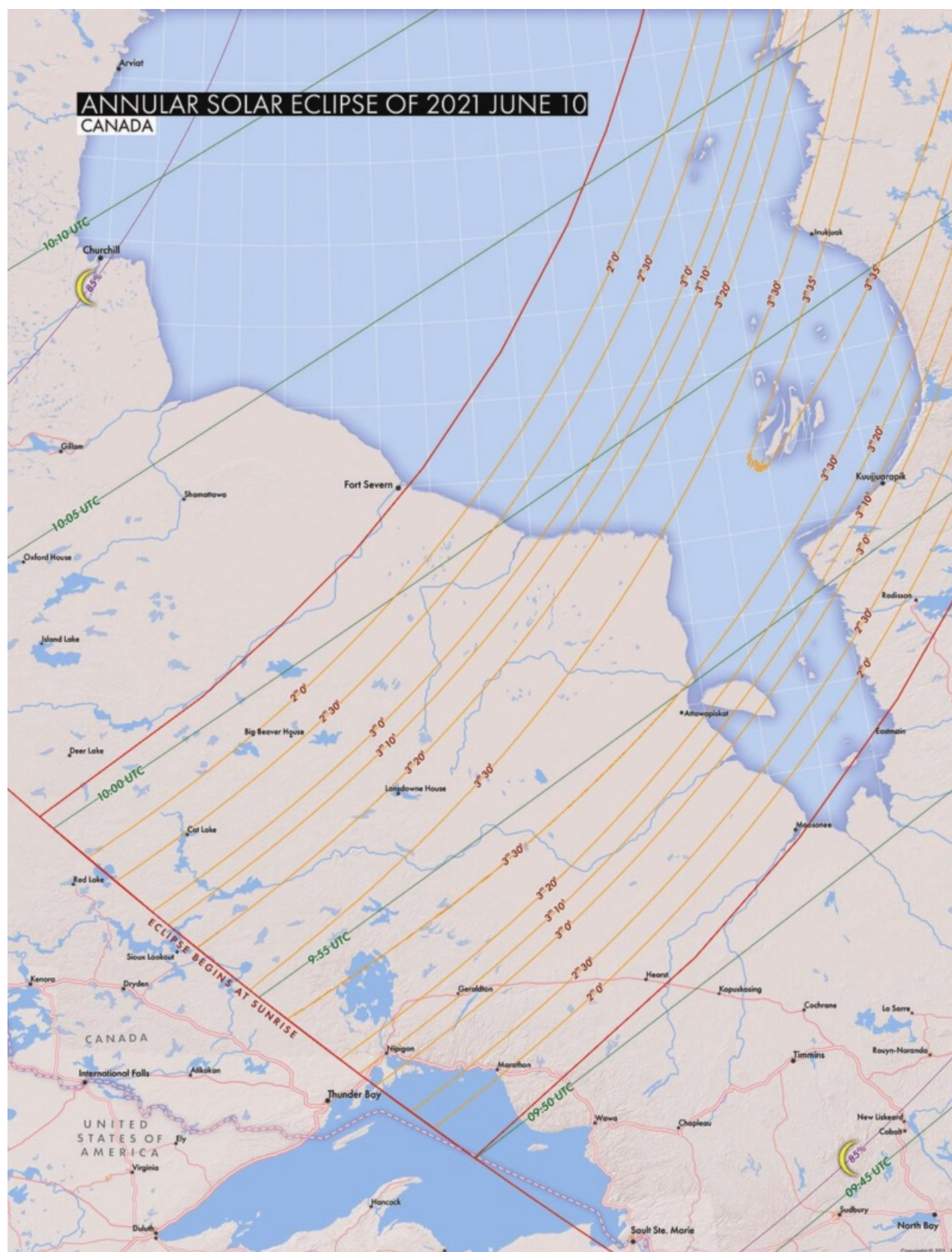
[Annular Solar Eclipse - June 10, 2021 | Eclipsophile](#)

This eclipse is the second annular for Saros series 147 that I had previously viewed from Northern Iceland on May 31, 2003 (refer to the June 2003 Event Horizon), and my tour group got lucky when the Sun emerged from the clouds minutes before annularity started. Will my luck hold up again?

*(Continued on [page 19](#))*



## The Annular Solar Eclipse of June 10, 2021 (continued)



Due to a combination of remote viewing areas, poor weather prospects and pandemic induced travel restrictions the number of people viewing this event will be very small. There are 2 expeditions planned to Baffin Island and Greenland. They will likely be cancelled due to lack of access before June 10th. Sky and Telescope magazine is sponsoring a flight, E219, which was recently approved, that will fly into the zone of annularity from Minneapolis, Minnesota on the morning of the eclipse. What are my plans for the eclipse? I traveled up to Northern Ontario last August and carried out an initial survey and found several potential observing sites along Highway 11. If all goes well, I will head back to do a more detailed survey, find the best location with a prime site in Hearst and backup sites further west toward Geraldton. As a backup plan, dependant upon weather, I may charter a bush plane from Hearst Air (Carey Lake) to increase my chances of seeing the eclipse. Since this eclipse occurs shortly after sunrise there is very little margin for error, since it will be rising in the ENE (Az=54) in the boreal forests of NW Ontario. My final decision will not be made until several days before in early June based upon weather forecasts and COVID restrictions.



## The Hazards of Celestial Real Estate by Mike Jefferson

When purchasing a piece of real estate, a prospective buyer wants location, good neighbours and ease of getting to needed services and other necessities. Parcels of land that carry any concern about flooding, subduction, landslides, etc., are not likely going to sell very well at all. However, celestial, real estate comes with severe warnings and consequences for those of us living on Planet Earth! On February 15/2013, over Chelyabinsk, Russia, a meteorite landed causing extensive damage and medical casualties with its shock wave. Soon after, Duende came within 27,000 kilometres of Earth's surface. Both of these projectiles were cosmic bodies, or, if you like, cosmic real estate. Years ago in National Geographic, there was a picture taken beside a mid-Western lake in the United States of a meteor, the size of a boxcar, coming into Earth's atmosphere and then, fortuitously skipping back out into space. This body and Duende earned the name 'meteor' because they did not land. Had they done so, they would have been labelled 'meteorite'. As inhabitants of the target planet Earth, we like the term 'meteor' better because it is cosmic real estate that is safe for us. This bombardment of our home goes on all the time. Most of it is harmless to us because it is in the form of small fragments that do us no harm and reach the ground only in the form of dust and ash. We like to refer to this as 'meteor' showers because they do not impact the Earth. These showers are named for the constellation that they SEEM to come from. In fact, most of this material actually comes from inside the Solar System. We give them such names as Lyrids, Quadrantids, Leonids, Perseids, Aquariids,...etc. And they make a welcome addition to any star party or night of observing. However, we are not very good at spotting natural projectiles before they hit us or even float down to our surface, as some actually do. Since 1988, over 1,200 asteroids bigger than a metre have collided with us and we detected only 5 of them. Right now NASA, which has been given the task of tracking space debris that is potentially dangerous for us, has 2,078 targets in its sights. If any one of them becomes dangerous for us, we are not yet in a position where we know just how to handle it. The giant Didymos represents such a potential threat in 2022. However, I say POTENTIAL. This author feels that there are enough gravitational perturbations out there that such collisions will only happen extremely rarely. Worrying about such things is for ...cowards who "...die many times before their deaths..." according to Julius Caesar, through the pen of Shakespeare.

The HAA has 3 very nice meteorite specimens in its possession and Jim Wamsley has his own collection, as does John Gauvreau. Some years ago, I became intrigued with the concept of micro-meteorites and I purchased two very nice, large, stainless steel bowls to do my collecting. I won't go into the mechanics of how this works, here. However, I later purchased a book which detailed the activity of doing such an undertaking. To my chagrin, I found out that about 1 in 11,000 pieces of dust collected is a bonifide micro-meteorite. The rest are imposters... pieces of atmospheric dust! On top of that, one needed an electron microscope to make a positive identification! So, I have never identified a real micro-meteorite. However, I do have a lovely book, "In Search of Stardust" by Jon Larsen which gives me many beautiful colour photographs of specimens that the author has imaged - lucky man!

My two small display cases, purchased in Rochester, New York many years ago (which are shown in the pictures, next page, accompanying this discussion), show my "collection" and depict the dinosaur extinction, meteorites, tektites and impactites.

Debris flying through space in the Solar System and from without the Solar System comes in numerous varieties. Much of it is in the form of comets, meteors, large solar system bodies in general, micro-meteorites and asteroids. The gravitational attraction from the planets, moons, the Sun, the Earth and our Moon, govern their actions and behaviour. So, it is gravity which rules not only our lives on this planet, but also the comings, goings and dangers that all of this celestial real estate poses for us and all life here.

The Dinosaur Extinction display shows a fossil oyster from Cody, Wyoming, a fossil ammonite from Newcastle, Wyoming, and a dinosaur bone from Utah. The idea here is that all 3 were the victims of a meteoric impact 65 million years ago from a projectile represented in this display by a piece of meteorite oxide crust from Odessa, Texas.

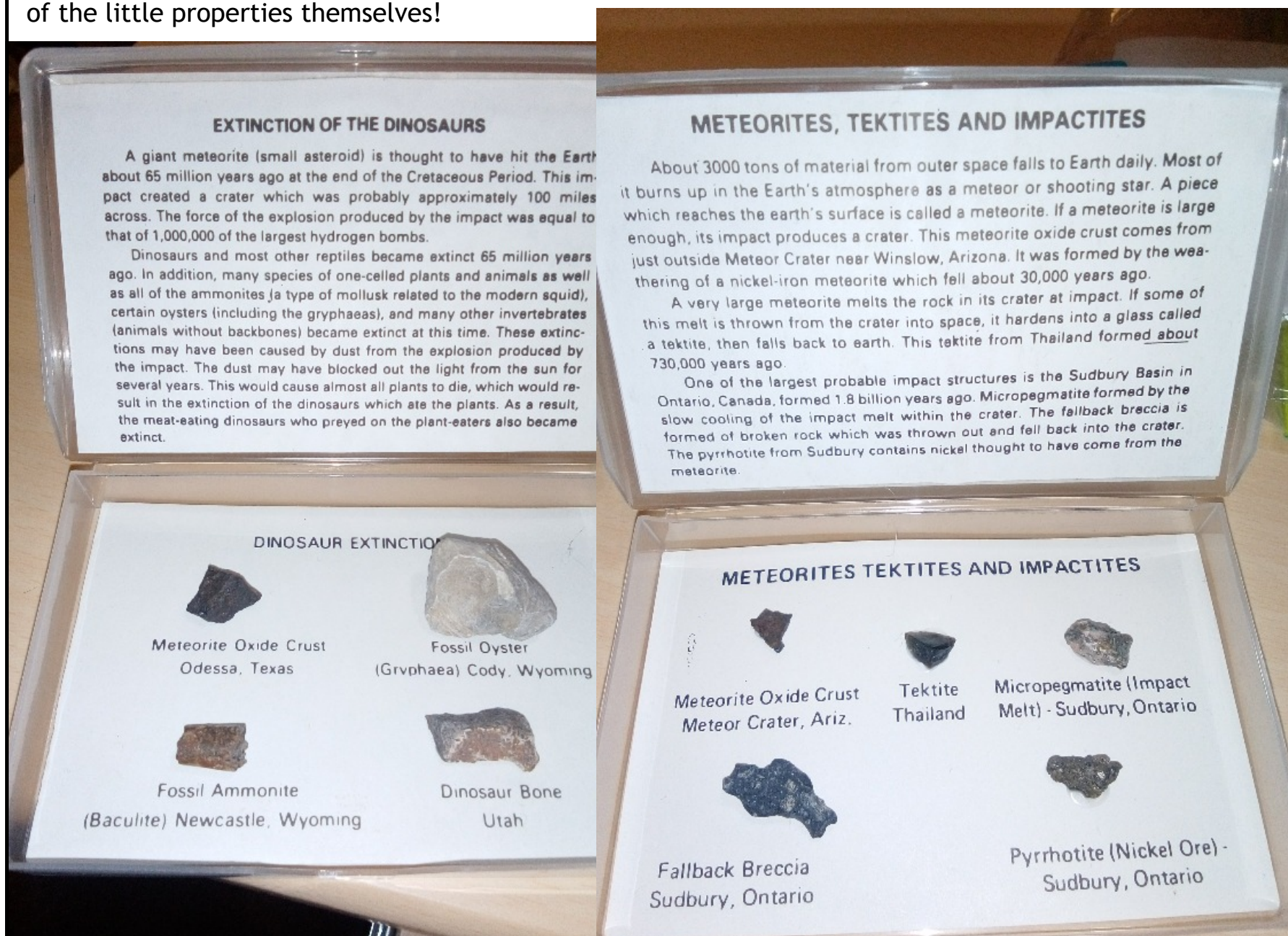
*(Continued on [page 21](#))*



## The Hazards of Celestial Real Estate (continued)

The other case contains a meteor oxide crust from Meteor Crater, Arizona, a tektite from Thailand, an impact melt from Sudbury, Ontario, fallback breccia and pyrrhotite (nickel ore) also from Sudbury, Ontario.

I am quite delighted to say that I am the owner, not only of pictures of cosmic real estate, but also some of the little properties themselves!



*Image Credit: Mike Jefferson (both)*

### HAA Helps Hamilton

While during the pandemic, the H.A.A. hasn't been able to collect 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](#).

In that spirit, we encourage you to continue making donations directly to your local food banks.





**This article is distributed by NASA Night Sky Network.**

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach.

Visit [nightsky.jpl.nasa.gov](https://nightsky.jpl.nasa.gov) to find local clubs, events, and more!

### Virgo's Galactic Harvest

David Prosper

May is a good month for fans of galaxies, since the constellation Virgo is up after sunset and for most of the night, following Leo across the night sky. Featured in some ancient societies as a goddess of agriculture and fertility, Virgo offers a bounty of galaxies as its celestial harvest for curious stargazers and professional astronomers alike.

Virgo is the second-largest constellation and largest in the Zodiac, and easily spotted once you know how to spot Spica, its brightest star. How can you find it? Look to the North and start with the Big Dipper! Follow the general curve of the Dipper's handle away from its "ladle" and towards the bright orange-red star Arcturus, in Boötes – and from there continue straight until you meet the next bright star, Spica! This particular star-hopping trick is summed up by the famous phrase, "arc to Arcturus, and spike to Spica."

This large constellation is home to the Virgo Cluster, a massive group of galaxies. While the individual stars in Virgo are a part of our own galaxy, known as the Milky Way, the Virgo Cluster's members exist far beyond our own galaxy's borders. Teeming with around 2,000 known members, this massive group of galaxies are all gravitationally bound to each other, and are themselves members of the even larger Virgo Supercluster of galaxies, a sort of "super-group" made up of groups of galaxies. Our own Milky Way is a member of the "Local Group" of galaxies, which in turn is also a member of the Virgo Supercluster! In a sense, when we gaze upon the galaxies of the Virgo Cluster, we are looking at some of our most distant cosmic neighbors. At an average distance of over 65 million light years away, the light from these galaxies first started towards our planet when the dinosaurs were enjoying their last moments as Earth's dominant land animals! Dark clear skies and a telescope with a mirror of six inches or more will reveal many of the cluster's brightest and largest members, and it lends itself well to stunning astrophotos.

Virgo is naturally host to numerous studies of galaxies and cosmological research, which have revealed much about the structure of our universe and the evolution of stars and galaxies. The "Universe of Galaxies" activity can help you visualize the scale of the universe, starting with our home in the Milky Way Galaxy

*(Continued on [page 23](#))*



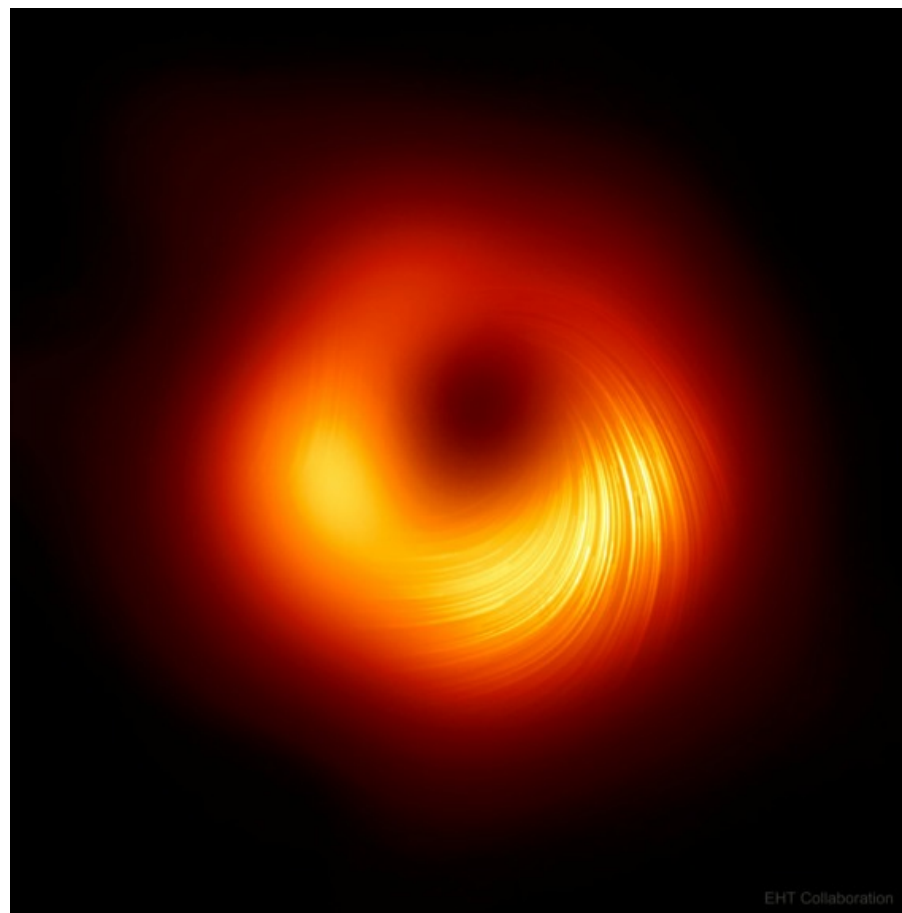
## NASA Night Sky Notes (continued)

before heading out to the Local Group, Virgo Cluster and well beyond! You can find it at [bit.ly/universeofgalaxies](https://bit.ly/universeofgalaxies). You can further explore the science of galaxies across the Universe, along with the latest discoveries and mission news, at [nasa.gov](https://nasa.gov).

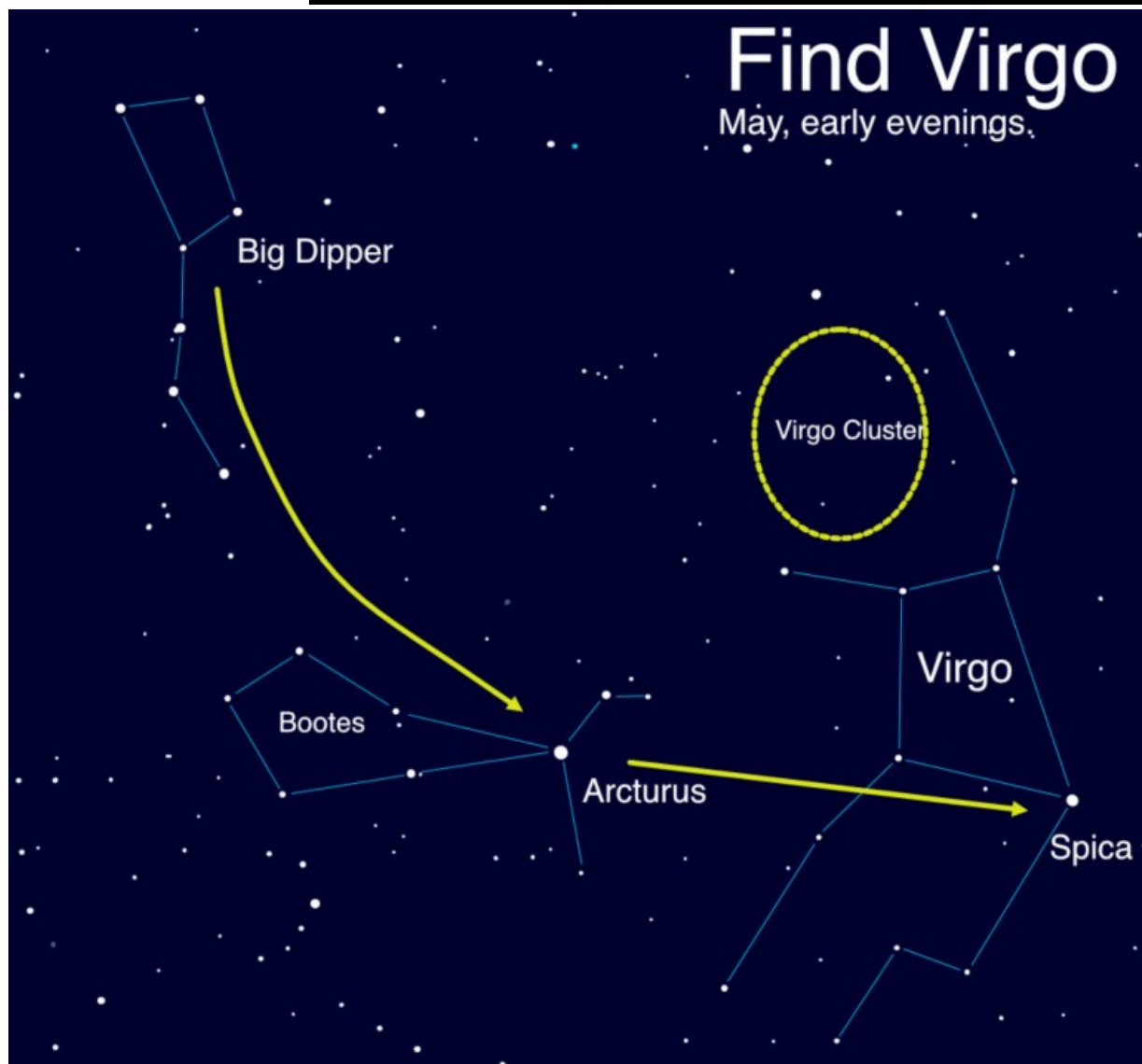
*The first image of a black hole's event horizon was taken in the center of one of the most prominent galaxies in Virgo, M87! This follow up image, created by further study of the EHT data, reveals polarization in the radiation around the black hole. Mapping the polarization unveils new insights into how matter flows around and into the black hole - and even hints at how some matter escapes!*

More details: [apod.nasa.gov/apod/ap210331.html](https://apod.nasa.gov/apod/ap210331.html)

Credit: Event Horizon Telescope Collaboration



*Find Virgo by “arc-ing to Arcturus, then spiking on to Spica.” Please note that in this illustration, the location of the Virgo Cluster is approximate - the borders are not exact.*







*(above)*

**The Rosette Nebula**

Composite of 4 hours  
of 5 minute subs.

by **Mike Hamilton**



*(left)*

**Rare “Snow Shadows”  
in the grass**

as seen on April 21,  
2021 from Brantford  
ON.

by **Leslie Webb**



## UPCOMING EVENTS

May 14, 2021 - 7:30 pm – Virtual Online H.A.A. Meeting for members. The meeting will be conducted on the platform Zoom. Our main speaker will be H.A.A. member Kevin Salwach. Be on the lookout for an invitation e-mail with a meeting link.

You may download the Zoom app for various platforms from Zoom's [Download Center](#)

Due to the COVID-19 Coronavirus pandemic, all *in-person* Hamilton Amateur Astronomers meetings are suspended until further notice.

### 2020-2021 Council

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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](mailto:library@amateurastronomy.org)