Event Horizon

Volume 31, Number 2
December 2023

From The Editor

Here's 2023's jam-packed December edition of the Event Horizon, which includes outgoing treasurer Ann Tekatch's final annual Financial Statements on page 24. Thank you Ann for all those years of hard work!

Happy Reading and Clear Skies!

Bob Christmas,
Editor

editor 'AT'
amateurastronomy.org

Chair's Report by Sue MacLachlan

Welcome to December everyone. I am just marveling at how fast time goes. It seems like just yesterday that it was summer!

The 2023-2024 Council positions have been filled. Thanks to all who have stepped forward to volunteer. Welcome to Council. I am looking forward to a great year of working together with all of you and our members as well. Please don't hesitate to reach out to any Council member with your thoughts, ideas, questions and concerns. All of Council's email addresses can be found at the end of each issue of the Event Horizon newsletter.

Chair	Sue MacLachlan
2nd Chair	Chris Strejch
Secretary	Ann Tekatch and Kevin Salwach
Treasurer	Marcus Freeman
Recorder	John Gauvreau
Observing	Matthew Mannering and Steve Germann (E.H. article)
Membership	Paula Owen

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Chair's Report (continued)

Public Ed.	Jo Ann Salci
E.H. Editor	Bob Christmas
Digital Platforms	Chris Strejch
Publicity	Mario Carr
Loaner Scope	Mélanie Lebel
Library	Denise White and Mélanie Lebel
Councilors-at-Large	Chris Cheatley, Brenda Frederick, Leslie Webb, Dan Copeland

The new location committee has been hard at work exploring potential rental spaces. Thank you to everyone who has shared location ideas. To date the committee has explored 21 potential locations. Of those 21 locations, the committee has visited 5 that met our criteria. Council will be discussing the 5 options and will narrow the choice down to 2 locations. At the December 8th meeting the members who are present will have their say on which of the two locations would be best for the club. So, if you want to have your say please come to the December meeting.

With the April 8th total solar eclipse only 4 months away, Council has developed an eclipse plan. The plan focuses the club's efforts on education and outreach events prior to the eclipse. The club will not be holding any official outreach events on the day of the eclipse to allow all members to be free on April 8th to enjoy and observe the eclipse for themselves. Stayed tuned for information about volunteer opportunities with outreach events closer to the eclipse.

The 2024 HAA Celestial Calendar is out. As always it is full of stunning photographs of night sky wonders! Thanks to Doug Turner for all of the work he did putting the calendar together. Thanks to the photographers and artists who submitted pictures. We have some very talented people in our club. The calendars will be for sale for $10 at the December meeting. On the website the calendars are $10 + the Paypal charge if you want to pick a calendar up at the December meeting, or $20 if you order online and want to calendar mailed to you. Hurry, get your calendar before we sell out!

Friday December 8th is our Seasonal Social. I will have some announcements and Matthew Mannering will present the Sky this Month. There will not be a guest speaker. After Matthew's presentation the door prizes will be drawn and we will head into an extended break. So, come out and spend time with other members chatting about our shared interest in astronomy. Potluck contributions of seasonal treats are most welcome. Coffee, tea and water will be provided by the club.

In January the Astro 101 course will begin. Astro 101 is free with your membership and geared to people who are new to the hobby but more experienced amateur astronomers are always welcome to join in. You never know when you might be able to share a tip or pick up an idea for yourself. For more information contact John Gauvreau at astro101@amateurastronomy.org

Don't forget, coming up at our January 12th meeting the guest speakers will be Brett Tatton and Frank Williams from the Blue Water Astronomical Society; they will be talking about engaging youth in astronomy through the use of technology.

On behalf of Council, I would like to wish everyone a wonderful holiday season.

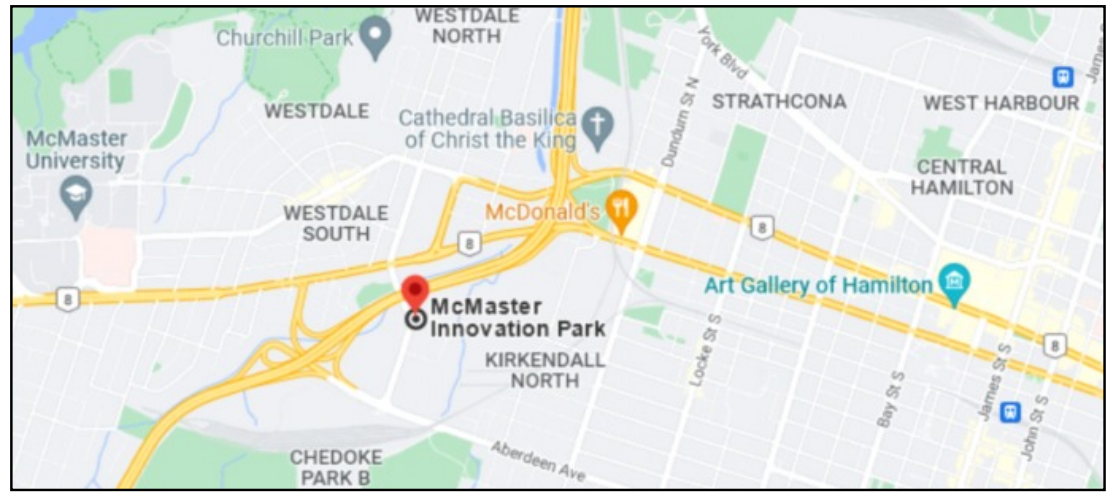
Clear skies,
Sue MacLachlan

Masthead Photo: *The Dumbbell Nebula (M27)*, by *Andrew Brenyo*.

Taken September 19, 2023 at Tobermory, ON.
30 minute exposure @ ISO 800 with a Canon Ra camera through a Mak 10" scope.

Meeting Location

Our upcoming meeting is scheduled for *December 8th, 2023*, at McMaster Innovation Park. This will be our *Seasonal Social* (see notice next page). MIP is located at 175 Longwood Rd. S. in Hamilton. Doors open at 7:00 and the meeting begins at 7:30.



HAA Helps Hamilton

The H.A.A. is once again 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.

Astro 101 – The club's beginner group!

Don't know a black hole from a white dwarf? How about a planet from a planetary nebula? Wondering which end of the telescope to look through? Wondering which end is even supposed to point at the sky? Then Astro 101 is for you!

Astro 101 is a series of casual, online sessions aimed at the absolute beginner, who might be new to the club or new to the hobby.

Every year the HAA hosts Astro 101, where we talk about things like how to use a telescope, what is in the sky to look at and how to find them. The sessions are interactive and casual. This means that some experienced club members will guide us through some interesting topics, but everyone is encouraged to participate, ask questions, offer input and just talk! This is a great way to get to know the hobby and your fellow club members. Or maybe you have some insight to share with your fellow club members. Let me know and we can schedule it in. Beginners can learn a lot from other beginners.

We will begin in January and we get together online about once every two weeks. Hopefully we can even get together in person a couple of times! We will have enough sessions to get us through to late spring, and then we hope to finish with an observing session!

If this sounds like something you would like to participate in just get in touch (email address below) and we will put you on the list. Then you will get emails with links to the online sessions.

Please feel free to get in touch if you have any questions or suggestions (yes, if there is a topic you want to talk about just let me know and we will do our best).

Hope to see you there.

— John Gauvreau
astro101@amateurastronomy.org

Seasonal Social

Friday December 8, 2023

7:30 pm at McMaster Innovation Park

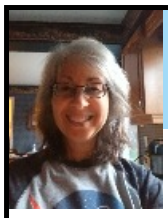
THE MEETING WILL INCLUDE **THE SKY THIS MONTH PRESENTED BY MATTHEW MANNERING** FOLLOWED BY THE SOCIAL.

POTLUCK SEASONAL TREATS ARE WELCOME

COFFEE, TEA AND WATER ARE PROVIDED

As always the HAA will be accepting non-perishable food items or cash donations for the

HAMILTON Food Share



HAA Explorers by Jo Ann Salci

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

Over the past few months, we've been learning about light and shadows, and Solar eclipses. This month we are going to focus on our Moon and Lunar eclipses. Let's go!

Looking at Lunar Eclipses!

There are NO warnings this month! Lunar eclipses are safe to look at without special filters. A common thing about eclipses is that they involve the Sun, the Moon and the Earth. With Solar eclipses, the Moon is between the Sun and the Earth. With Lunar eclipses, the Earth is between the Sun and the Moon. So, when we are watching a Lunar eclipse, we are looking at the Moon and not towards the Sun.

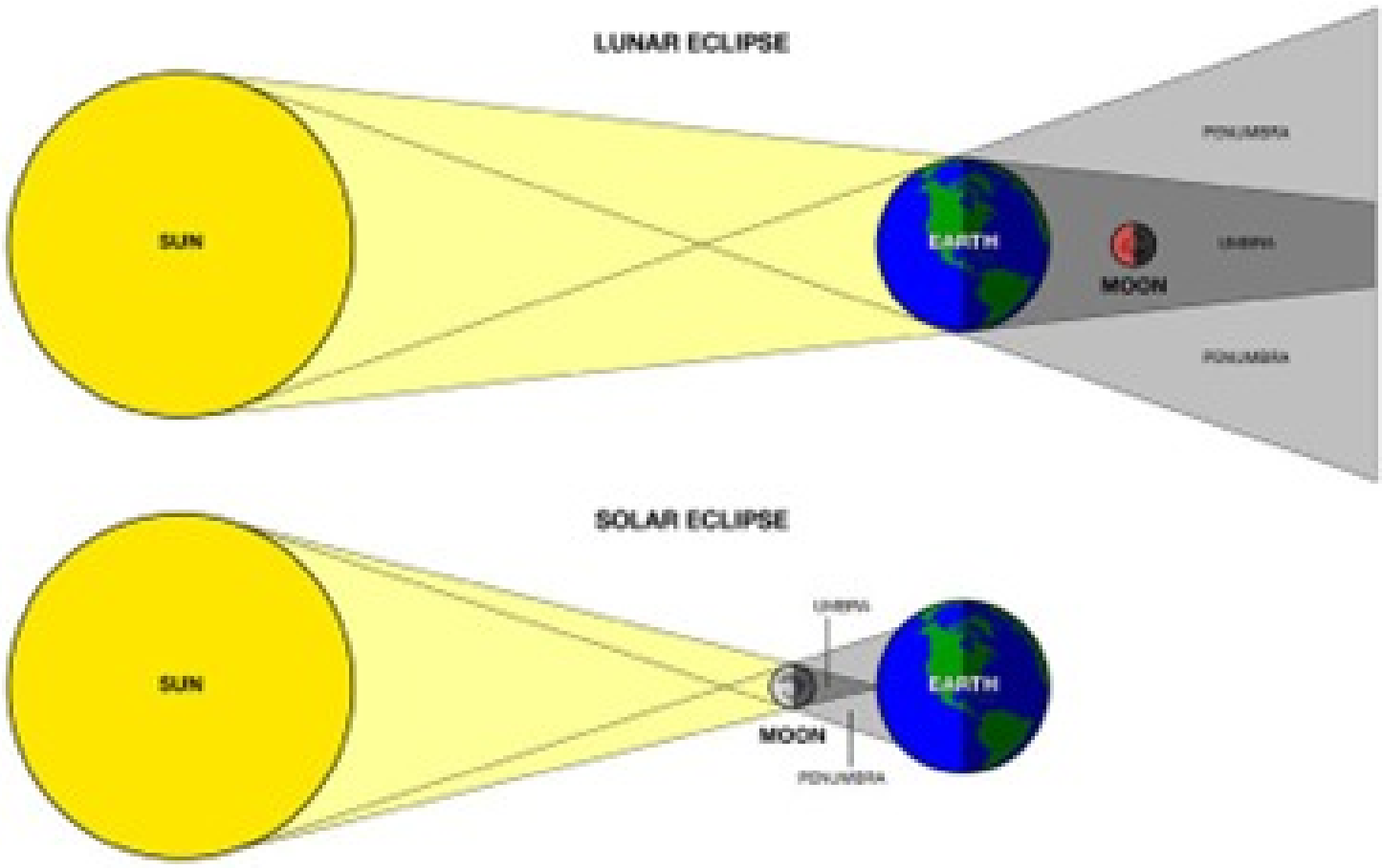


Image Credit: https://dyer.vanderbilt.edu/teacher-resources/solar-eclipse/

During a Lunar eclipse, Earth's shadow falls on the Moon. Solar eclipses are more common than Lunar eclipses, however, we see more Lunar than Solar eclipses! Why is that? The Moon's shadow on Earth is very narrow, and the likelihood of you being in that shadow is very small (more on that in a future article). On the other hand, Earth's shadow on the Moon is wider, and everyone facing the Moon can see the Lunar eclipse. And Lunar eclipses always happen in the dark when there is a Full Moon. Solar eclipses happen during the day.

Lunar eclipses happen about once or twice a year. Why don't we have a Lunar eclipse every month when there is a Full Moon? Good question! The Moon travels around the Earth in an elliptical orbit and is on a 5° tilt. You can see in the photo that the Moon can be behind the Earth and we would see it as a Full Moon, but the Earth is not blocking the light. This is why we don't get a Lunar eclipse every month when there is a full Moon.

Image Credit: NASA Space Place

(Continued on page 6)

HAA Explorers (continued)

Just like with Solar eclipses, there are a variety of Lunar eclipses. There are penumbral, partial and total Lunar eclipses. Depending on where the Moon lies in Earth's shadow will determine this. When the Moon is entirely in the Penumbral shadow, it is a Penumbral Lunar eclipse and isn't as noticeable. When the Moon falls in a part of Earth's shadow, it is a Partial Lunar eclipse. When the Moon lies completely in Earth's shadow, it is a Total Lunar eclipse and it is a beautiful sight to see! I took this picture of a Total Lunar eclipse on the early morning of November 8th, 2022 with my cell phone. It was just as beautiful viewing it with my binoculars and my own eyes!

Image Credit:

Jo Ann Salci

So why is the Moon red? It's because of Earth's atmosphere! It soaks up other colours at the same time it is bending the Sun's light around the Earth towards the Moon. What's left to shine on the Moon is the same reddish colour we see when our atmosphere absorbs and bends light during our sunrises and sunsets. So, the Moon ends up looking reddish, like our sunrises and sunsets on Earth.

Unlike Solar eclipses that last a few minutes, Lunar eclipses last a few hours, with totality sometimes lasting close to an hour. That's because Earth's shadow is much larger than the Moon and it takes the Moon that long to pass through it.

Mark your calendars now for the next Total Lunar Eclipse: ***March 13-14, 2025!*** To find out when there are other partial or penumbral Lunar eclipses, as well as Solar eclipses, check out: https://www.timeanddate.com/eclipse/in/canada/hamilton

Things to do until next time **:

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

1. ***Check out the Canadian Space Agency Website to see a video of a Lunar Eclipse***: https://www.asc-csa.gc.ca/eng/multimedia/search/video/18456

2. ***Check out the NASA Spaceplace Website about Lunar and Solar Eclipses***: https://spaceplace.nasa.gov/eclipses/en/

3. ***Make No-Bake Moon Cookies (Add a little cinnamon to the powdered sugar for a Lunar Eclipse Moon cookie!):*** https://spaceplace.nasa.gov/moon-cookies/en/

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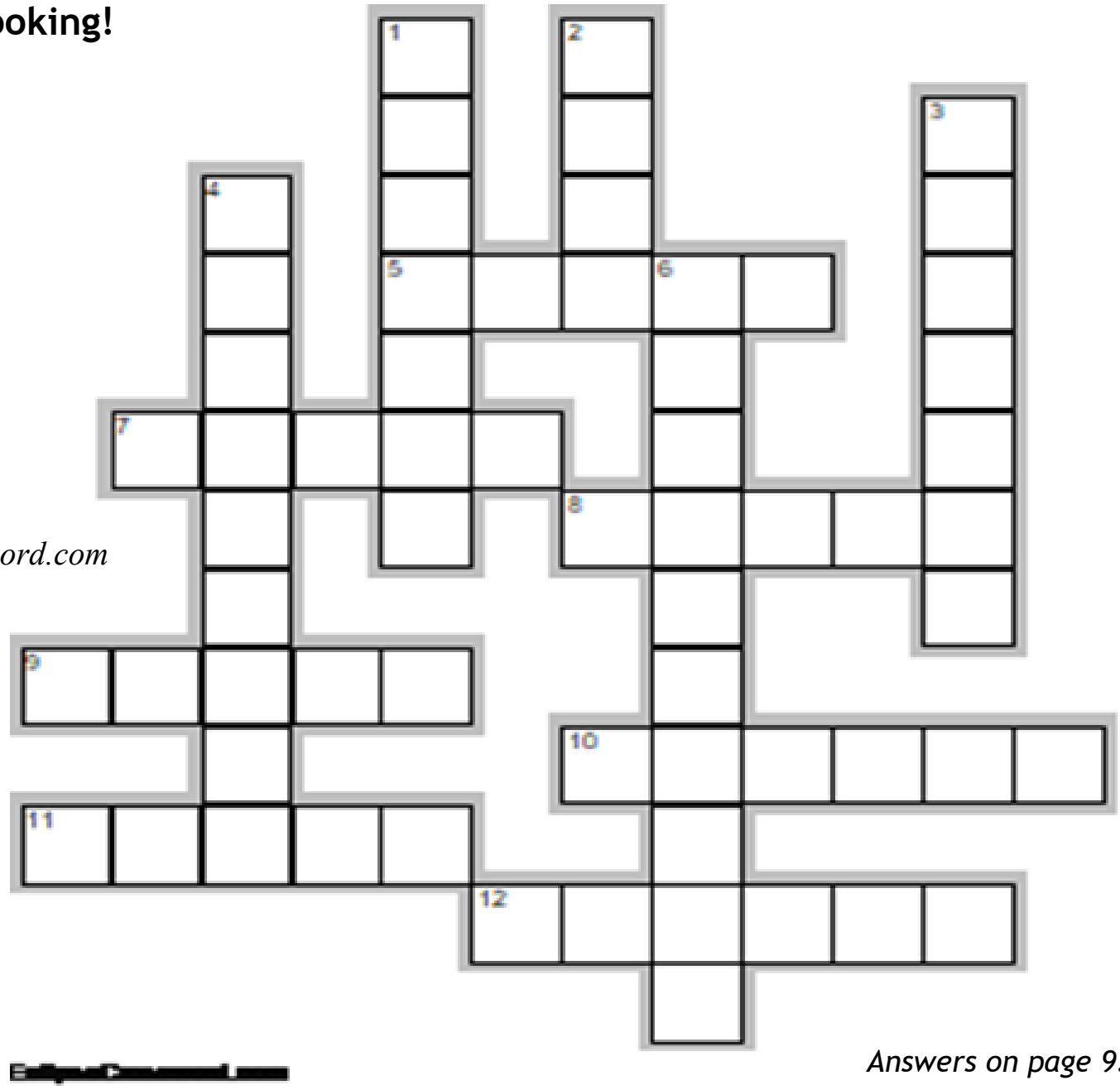
Lunar Looking!



EclipseCrossword.com

Answers on page 9.

Across

5. The type of eclipse when the Moon lies completely in Earth's shadow.
7. The eclipse where the Earth blocks the light from the Sun.
8. Lunar eclipses last this long.
9. The Sun, the _____ and the Moon are involved in all types of eclipses.
10. Created when light is blocked.
11. The eclipse where the Moon blocks the light from the Sun.
12. The Sun's shadow on Earth.

Down

1. The type of eclipse when the Moon lies in a part of the Earth's shadow.
2. The Moon's orbit is on a 5° _____.
3. Caused by the blocking of light.
4. The type of eclipse when the Moon lies in Earth's penumbral shadow.
6. Earth's _____ causes the Moon to appear reddish during a total Lunar eclipse.

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During December, check out:

1. On December 17th around 7 pm, check out Saturn near the Moon with bright Jupiter shining in the southeastern sky. You'll also see reddish Aldebaran, along with the beautiful Pleiades!

2. On December 22nd around 7pm, see how the Moon is now close to Jupiter? In just five days the Moon has moved across our skies from Saturn to Jupiter!

Images generated using Stellarium

(Continued on page 9)

HAA Explorers (continued)

Finally:

How does the Man on the Moon cut his hair? E-clips it!! 😉

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

Thank you to Ro for reviewing this article! 😊

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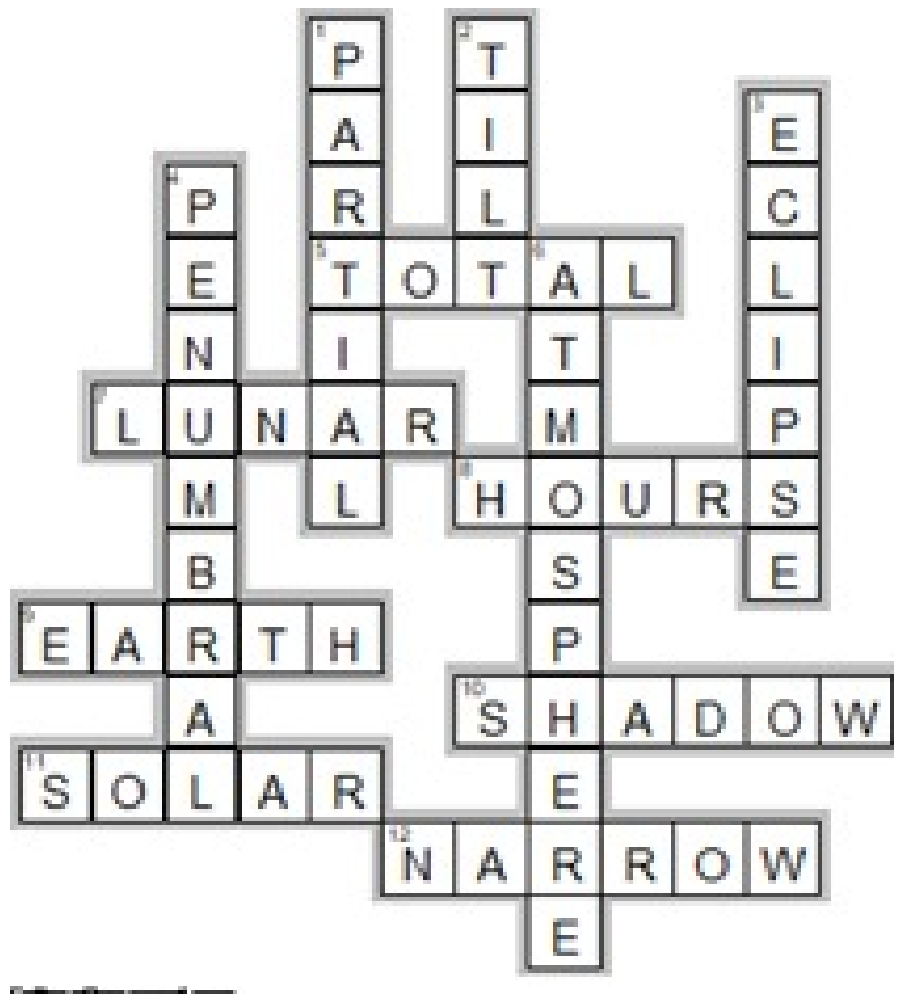
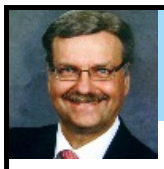
Page 7 Crossword Answers:





The Sky for December 2023 by Steve Germann

December has arrived and with it, early evenings, at last.

And it's going to be clear a lot more often than Nebulous November.

December is also the month where we get a good first look at the annual RASC Observer's Handbook. If you ordered (and paid for) one, I will have it for you at the monthly meeting on December 8th. If you cannot be there, ask a friend to claim it for you. Starting this month, for the next year, I will be highlighting one aspect of the (remarkably hard to get) RASC Handbook and expanding on it, bringing in timely and (more) useful online resources, which aid the amateur astronomer, especially. This month, it's occultations (see page 20).

The RASC handbook has been in print for more than 100 years, and features excellent sections on general astronomy information, which do not change from year to year. If you have a copy from years past, it's going to be just the same in that regard.

Of course, the handbook also features sections which assist in planning all manner of amateur astronomy, which do change each year.

Last Month's Armchair Astronomer Challenge

November's armchair astronomer's challenge was to rise from your armchair and seek a Leonid Meteor track. The weather was not exactly cooperative, but I would be keen to hear of any successes. If you looked, you win the armchair award. If you saw a meteor and traced it to Leo, then you have stratospheric bragging rights up there with living in a town that won a sporting league championship, in my opinion.

Mercury Maximum Eastern Elongation

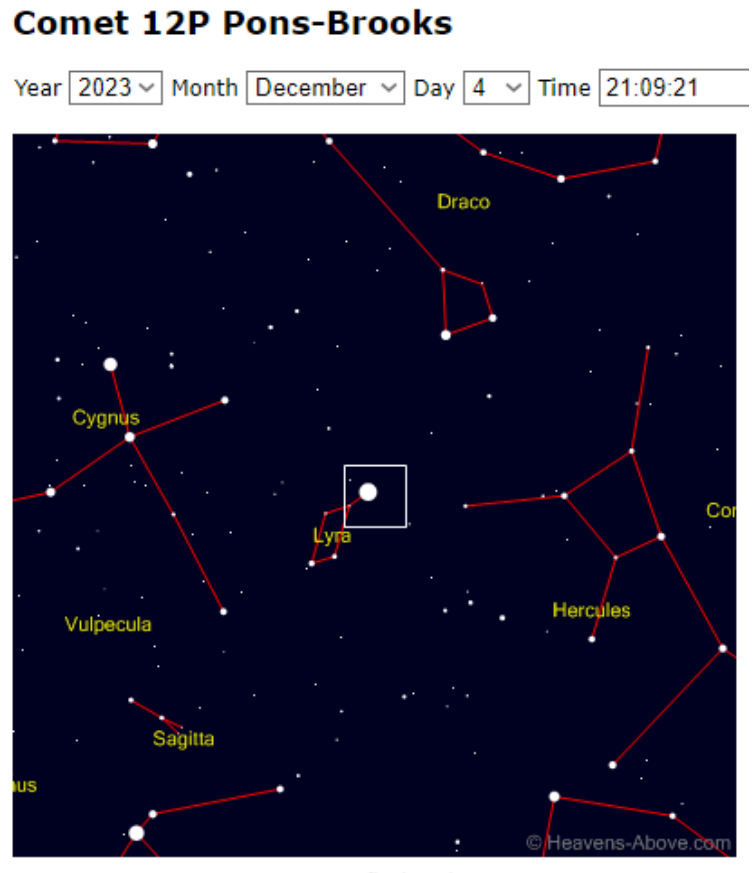
Mercury reaches its point of maximum Eastern Elongation (apparent angle from the Sun) on December 4, 2023. This is the ideal time to seek to see Mercury in the evening sky. Many people have never seen Mercury and known it (at the same time).

Here is your chance to look in the direction of the setting Sun around 6:45 PM. Mercury will be 21° behind the Sun, meaning that it will be past Nautical Twilight when it sets, although it will be very low at the end of Astronomical Twilight; 7 arc seconds in size, you should be able to see a not-round disk in a good pair of binoculars. Kudos if you can sketch the phase of Mercury on paper. You have a week or so each way to find a clear western horizon on a clear evening.

Comets

Comet *12P Pons-Brooks* will pass very close to Vega on December 4th.

It is only a photographic target however, except in the largest scopes in the darkest skies. Try a telephoto shot with 4 seconds to pick up this 9th magnitude comet.



Coarse finder chart
(Field of view: 60°, Max. star mag.: 5)

Chart generated using Heavens-Above

(Continued on page 11)

The Sky for December 2023 (continued)

Asteroids

Three reasonably easy binocular targets are up in the sky right now, including asteroid number 4 (Vesta). As always, if you plan to seek a target, use your Heavens-Above account to get good finder charts, then head out to where you will be able to see the constellation it names.

Asteroid Occultations - The Next Best Asteroid Occultation will be of asteroid Olympia on December 17th.

Asteroids

This table shows the brightest currently observable astero
details, including finder charts.

Asteroid	Brightness	Altitude	Constellation
4 Vesta	7.1	23.1°	Gemini
18 Melpomene	8.4	37.5°	Eridanus
1 Ceres	8.6	-47.6°	Libra
9 Metis	9.1	25.8°	Gemini

Chart generated using Heavens-Above

Here begins the 'occultation of the month' listing.

Using my trusty Occult Watcher app, I would say the best attraction in December is going to be Olympia.

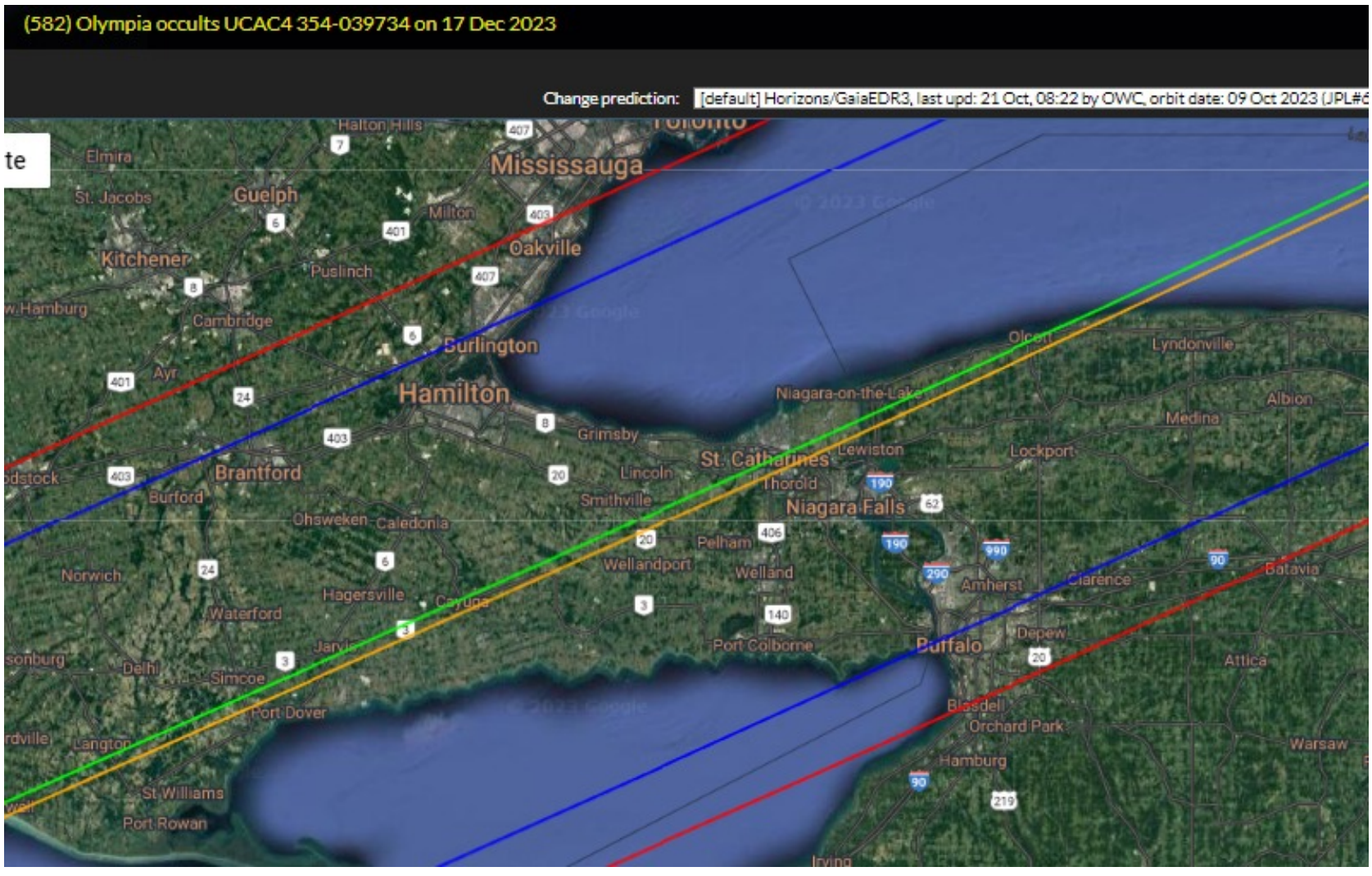


Chart generated using Occult Watcher

You don't have to travel. You can do science from where you live. The star is 11th magnitude, so if you can record the eyepiece with your phone, you will do science. You will need at least a 4 inch scope on a tracking mount, and of course, to know where to look.

The orange/brown line represents a planned observation by another observer on the track. So anywhere in the Hamilton area, within those 2 blue lines is going to provide science. This asteroid is about 44 km in diameter, and is only a twentieth of an arc-second in apparent size viewed from Earth, but we can still get measurements of its diameter along the chord we choose. Outside the blue lines, is the uncertainty of the orbit. A sighting there helps to refine the orbit too, but you might get nothing, which also refines the orbit (!). Imagine doing science by seeing nothing. It's like the 'dog in the nighttime' referenced by Sherlock Holmes.

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The Sky for December 2023 (continued)

The Armchair Astronomer Challenge for December 2023

If you haven't knowingly sighted Mercury before, here's your chance. See the mention earlier in the article.

but don't stop there...

The best meteor shower of the year, the *Geminids*, is coming, on the evening of December 13th. I mean, this is definitely an armchair challenge class event. It is 50 percent better than the summer Perseids, but it's cold. You need to take care. And dress warm. Very warm.

The meteors are visible all night (the radiant is in opposition, in Gemini) and they say '75 per hour' but I say, take a look and bag the best ones.

Kudos for anyone who sketches the path of a meteor on a planisphere, photographs that sketch with their phone, (use a dry-erase marker and a glossy planisphere) and notes the time. Report observations to Matt and he will relay them to me for collation. OR if it is cloudy on the 13th of December, just download and install the Occult Watcher program and configure it for a few minutes. That puts you high in the list of people likely (or at least able) to do Occultation science in the future.

Moonrise

The Moon looks full to us, for about 3 nights in a row, so if you get clouded out, don't frown, look up the figures for the next night. Here's 3 shots at Moonrise in December: (the final 2 are best):

Date, Time, Azimuth:

December 25,3:21PM,51.15 degrees, but 1 hour before sunset;
December 26,4:12PM,49.76 degrees;
December 27,5:12PM,50.95 degrees,

In December, the only decent vantage point is going to be on the Lakeshore anywhere near Hutches. The other usual locations will be obscured by topography, docks, land masses, etc.

As I write this, today is November 26, still in time for the November Moonrise on the 27th of November. I plan to seek it. The Burlington pier at Brant Street is an adequate vantage point, and a chance to point out the Moon to a few passers by.

I wish for you that skies clear when you look, and that you look at the best times!

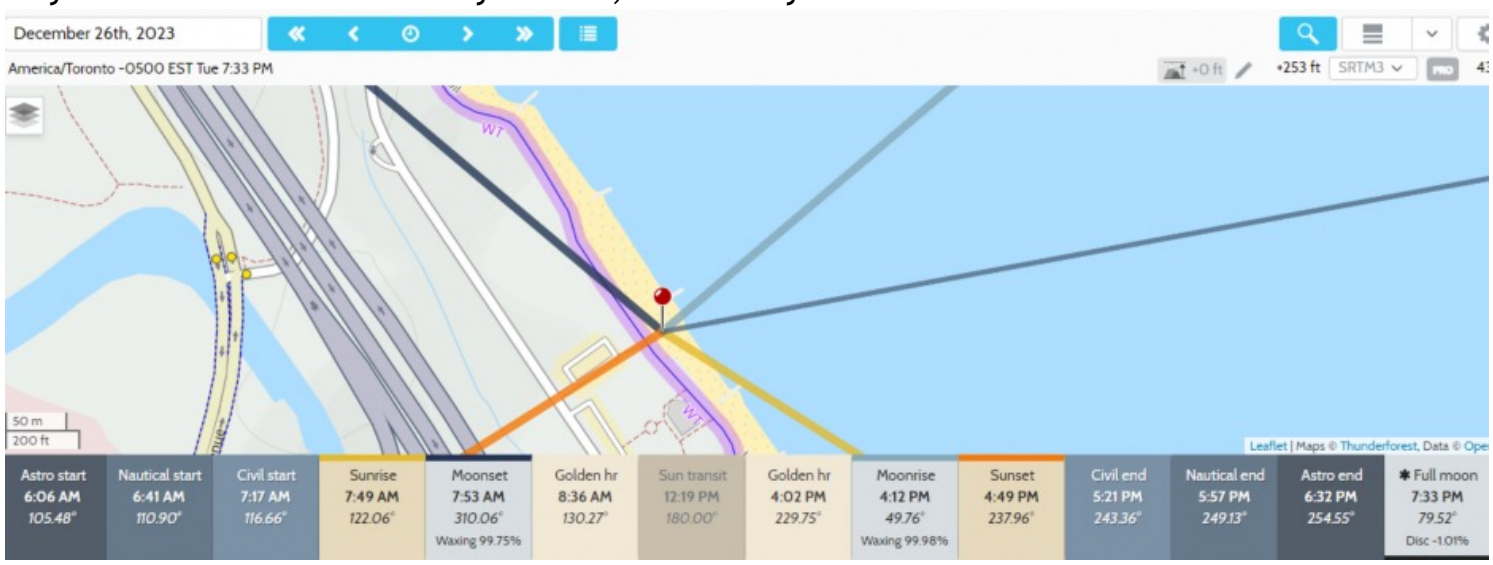

Image generated using Photographer's Ephemeris

What's Up in Awards? December 2023 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

December
Constellations: Taurus, Perseus
Stars: Hamal
Double Stars: Alcyone
Object Pairs: NGC 1325/NGC 1332
Messier objects: M45

Pathways Observing Program

Group C
Observable in October, November, December.
Winter 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.

HAA Messier Objects Observing Award

December Messier targets

M2 This is a small, bright globular cluster in Aquarius. A low power telescope field will show a round fuzzy patch, brighter in the center and fading to the edge, in a field with no other bright objects.

M15 This globular cluster in Pegasus is very similar to M2 in size and brightness, except it is surrounded by several bright stars. Best view is through a telescope at medium to high power.

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What's Up in Awards? December 2023 (continued)

M29 This galactic cluster is a small, sparse group of stars in Cygnus. A telescope will easily resolve the members of this cluster.

M39 Dark skies will allow this large, bright cluster in Cygnus to be seen with the naked eye as a hazy patch of light. Binoculars easily resolve this cluster into it's bright and widely scattered members and provide a better view than can be seen with most telescopes.

M31 This is the famous Andromeda Galaxy, our closest galactic neighbor, and the largest, brightest galaxy to be seen in the northern sky. The ability to see M31 with the naked eye provides a good test of the darkness of your skies. M31 is so large that binoculars provide the best view, allowing the entire galaxy to be seen in one field of view. Look for an elongated patch of light, with a bright, round central core.

M32 This is an elliptical companion galaxy to M31. Through a telescope look for a slightly oval ball of fuzz in the same low power field as the core of M31.

M110 Another elliptical companion galaxy to M31, lying on the opposite side of the core as M32. Through a telescope look for a large, oval patch of light. Although M110 is as bright as M32 it is much larger and thus has a lower surface brightness making it a difficult object in light polluted skies.

The Planets… December 2023 via (BBC) Sky at Night Magazine

- 9 December: Morning waning crescent Moon near Venus.
- 13 December: Earliest sunset of the year.
- 13/14 & 14/15 December: Geminid meteor shower peak (favourable)
- 21 December: Vesta reaches opposition (see chart below).
- 30 December: Latest sunrise of the year.

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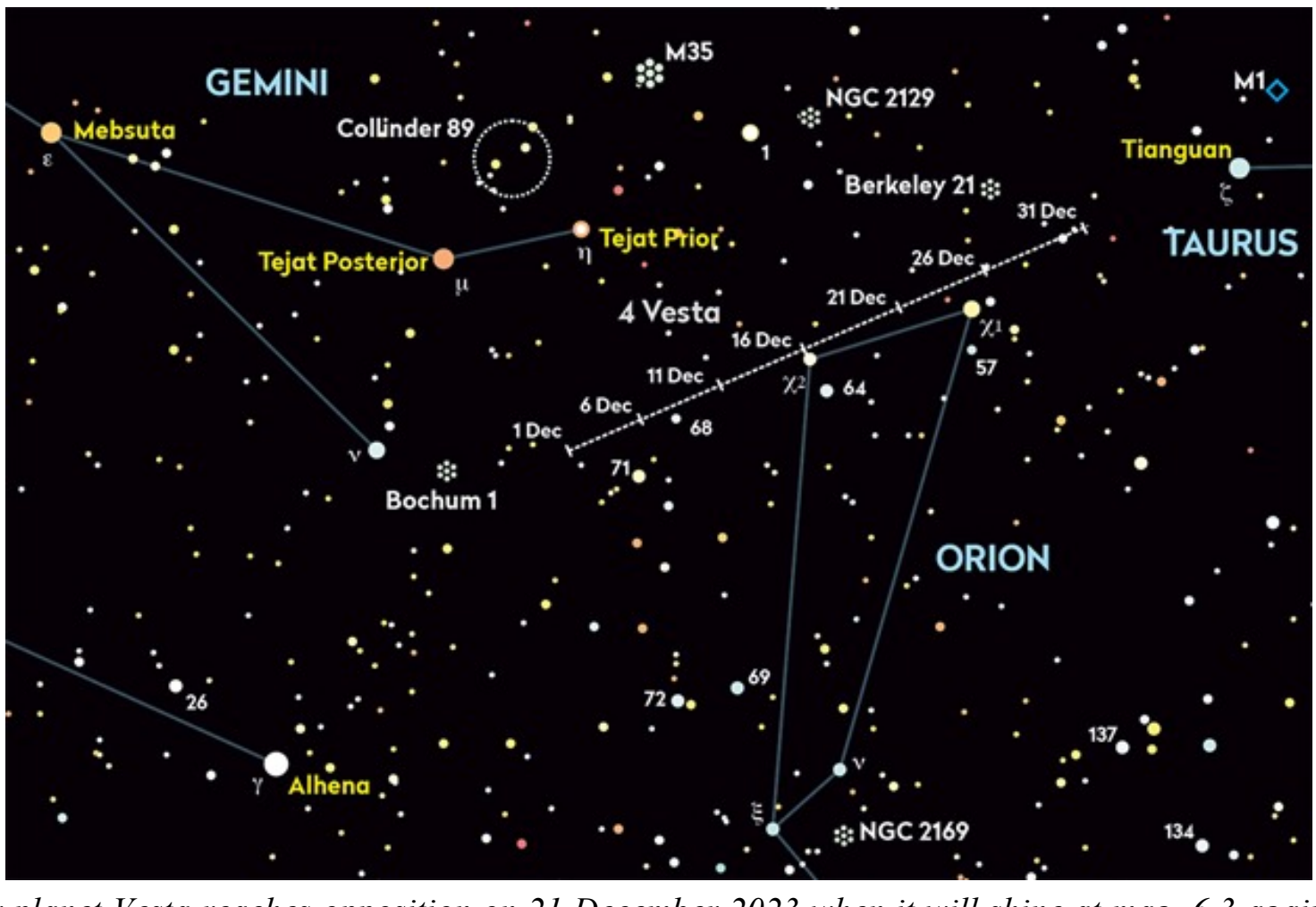


Minor planet Vesta reaches opposition on 21 December 2023 when it will shine at mag. 6.3 against the stars of northern Orion. Credit: Pete Lawrence

What's Up in Awards? December 2023 (continued)

Mercury: Best in the morning sky on 31 December, Mercury is visible one hour before sunrise low above the southeast horizon.
Venus: Bright morning planet, best at start of December when near Spica (Alpha (α) Virginis). The Moon is close on 9 December.
Mars: Currently in the morning sky, but too close to the Sun to see well.
Jupiter: Superb, bright, evening planet. The Moon lies nearby on the evenings of 21 and 22 December.
Saturn: Well-placed in early December but loses altitude later in the month. The Moon is close on 17 December.
Uranus: Well-placed evening planet, near Jupiter. 3º south of Botein (Delta (δ) Arietis).
Neptune: Evening planet south of the Circlet. Loses altitude towards month end.

Comets December 2023 via Seiichi Yoshida — Click here:

http://www.aerith.net/comet/future-n.html

Meteor Showers via American Meteor Society

Leonids

Period of activity: November 3rd, 2023 to December 2nd, 2023
Peak Night: Nov 17-18, 2023

The Leonids are best known for producing meteor storms in the years of 1833, 1866, 1966, 1999, and 2001. These outbursts of meteor activity are best seen when the parent object, comet 55P/Tempel-Tuttle, is near perihelion (closest approach to the sun). Yet it is not the fresh material we see from the comet, but rather debris from earlier returns that also happen to be most dense at the same time. Unfortunately, it appears that the earth will not encounter any dense clouds of debris until 2099. Therefore, when the comet returns in 2031 and 2064, there may not be any meteor storms, but perhaps several good displays of Leonid activity when rates are in excess of 100 per hour. Each passing year also presents new possibilities from old debris fields. In 2022, model calculations of Maslov (2007) and Sato (2021) show an approach of the 1733 dust trail on November 19. Maslov gives 06h UT, Sato obtains 06h20m − 06h27m UT (λ = 236 .◦576 and λ = 236 .◦581; different ejection velocities).The possible activity level depends on the ejection velocity (which has a negative sign in this case and observations of meteors from such trails are scarce). Maslov adds: meteors should be bright, a ZHR of 200+ seems possible despite the uncertainties. Sato comments: ZHR may reach 50+ because the model suggests that the dust tends to be concentrated. An encounter with the 1600 trail (weak rate possible near November 18, 07h UT; λ = 235 .◦6) is found by Vaubaillon (2021). A weak rate enhancement may be visible due to the 1800 trail later on November 21, 15h UT (Maslov, 2007).The Leonids are often bright meteors with a high percentage of persistent trains.

Shower details - Radiant: 10:17 +21.6° - ***ZHR:*** 15 - ***Velocity:*** 43.5 miles/sec (swift - 70km/sec)
Parent Object: 55P/Tempel-Tuttle
Next Peak - The Leonids will peak the night of Nov 17-18, 2023. On this night, the moon will be 23% full.

Geminids

Period of activity: November 19th, 2023 to December 24th, 2023
Peak Night: Dec 13-14, 2023

The Geminids are usually the strongest meteor shower of the year and meteor enthusiasts are certain to circle December 13 and 14 on their calendars. This is the one major shower that provides good activity prior to midnight as the constellation of Gemini is well placed from 22:00 onward. The Geminids are often

(Continued on page 16)

What's Up in Awards? December 2023 (continued)

bright and intensely colored. Due to their medium-slow velocity, persistent trains are not usually seen. These meteors are also seen in the southern hemisphere, but only during the middle of the night and at a reduced rate.

Shower details - Radiant: 07:24 +32.3° - ***ZHR:*** 150 - ***Velocity:*** 21 miles/sec (medium - 34km/sec)
Parent Object: 3200 Phaethon (asteroid)
Next Peak - The Geminids will peak the night of Dec 13-14, 2023. On this night, the moon will be 1% full.

Ursids

Period of activity: December 13th, 2023 to December 24th, 2023
Peak Night: Dec 21-22, 2023

The Ursids are often neglected due to the fact it peaks just before Christmas and the rates are much less than the Geminds, which peaks just a week before the Ursids. Observers will normally see 5-10 Ursids per hour during the late morning hours on the date of maximum activity. There have been occasional outbursts when rates have exceeded 25 per hour. These outbursts appear unrelated to the perihelion dates of comet 8P/Tuttle. This shower is strictly a northern hemisphere event as the radiant fails to clear the horizon or does so simultaneously with the start of morning twilight as seen from the southern tropics.

Shower details - Radiant: 14:36 +75.3° - ***ZHR:*** 10 - ***Velocity:*** 20.5 miles/sec (medium - 33km/sec)
Parent Object: 8P/Tuttle
Next Peak - The Ursids will peak the night of Dec 21-22, 2023. On this night, the moon will be 74% full.

Quadrantids

Period of activity: December 26th, 2023 to January 16th, 2024
Peak Night: Jan 3-4, 2024

The Quadrantids have the potential to be the strongest shower of the year but usually fall short due to the short length of maximum activity (6 hours) and the poor weather experienced during early January. The average hourly rates one can expect under dark skies is 25. These meteors usually lack persistent trains but often produce bright fireballs. Due to the high northerly declination (celestial latitude) these meteors are not well seen from the southern hemisphere.

Shower details - Radiant: 15:20 +49.7° - ***ZHR:*** 120 - ***Velocity:*** 25 miles/sec (medium - 40.2km/sec)
Parent Object: 2003 EH (Asteroid)
Next Peak - The Ursids will peak the night of Jan 3-4, 2024. On this night, the moon will be 51% full.

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

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

(Continued on page 17)

What's Up in Awards? December 2023 (continued)

HAA Messier Award
No recipients

HAA Lunar Award
No recipients

Astronomical League
Bernie Venasse (2023)
Sunspotters Observing Program
Hydrogen Alpha Solar Observing Program
Lunar Evolution
Asteroid Observing Program-Gold
Master Observer-Silver
Herschel II *(new this month)*

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

The Twelve Days of Christmas by Bernie Venasse

The Twelve Days of Christmas is most likely the observance of the relationship of two astronomical cycles and events.

The Feast of the Epiphany is a Christian observance, and the reason there are "Twelve Days" of Christmas is because there are 12 days between the birth of Jesus on December 25 and the Feast of the Epiphany on January 6. The Feast of the Epiphany is "A Christian feast celebrating the manifestation of the divine nature of Jesus to the Gentiles as represented by the Magi."

There is a very interesting relationship between two astronomical events, one in December and one in January, that further research revealed occurs on the average of twelve days apart every year: twelve is the number of days between the December Winter Solstice and the date in January that the Sun is at Perihelion (closest to the planet Earth).

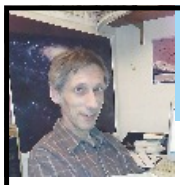
Could it possibly be a coincidence that the number of days between Winter Solstice, when the Sun's strength is reborn, and Perihelion, when we in our orbit are closest to the Sun, is the same as the number of days between Christmas, the day we celebrate the birth of a male deity, and Epiphany, the day the people were enlightened as to his holiness? Keep in mind: There is no such thing as coincidence.

The Sun has almost always been a symbol of masculine energy, strength, and divinity; most cultures did at one time worship a male deity represented by the Sun. The god most often associated with the Winter Solstice is Mithra or Mithras, the masculine Sun god of the Persians (and later worshiped by the Romans) who was born on the day of the Winter Solstice, the day the Sun regains his strength.

Another spiritual symbol associated with the Sun is the halo (often associated with Jesus) which is representative of the inner light or divinity that shines forth from holy people. Light itself is very often symbolic of intelligence, as when we say a person is "bright" which is a way to say he is "smart," or spiritual achievement as when one is "enlightened."

A couple of thousand years ago, the Winter Solstice was on the twenty-fifth of December, so Perihelion would have occurred around January 6. Due to calendar reform over the millennium, the Winter Solstice now falls as early as December 20, and as late as December 23, and Perihelion usually occurs between January 2 and 4, occasionally as late as January 5.

Astronomical events don't always follow an exact schedule, so the number of days between the Winter Solstice and Perihelion can be as few as 11 and as many as 14. However, on the average, the Winter Solstice and Perihelion are separated by twelve days – those Twelve Days of Christmas.



Planets of Binary Star Systems Part 2 by Doug Currie

Relative Occurrence of Planets in Different Orbits in Binary Star Systems

Circumprimary
Circumsecondary
Circumbinary

Relative Occurrence of Debris Disks Around Binary Star Systems

In an article “Binaries Among Debris Disk Stars” by David R. Rodriquez and B. Zuckerman, it was observed “that 25% +/- 4% of our debris disk systems are binary or triple star systems, substantially less than the expected ~ 50%” in a study conducted in 2011. The abstract of this study began: “We have gathered a sample of 112 main-sequence stars with known debris disks.”

Some Illustrations of Planets in Binary Star Systems in Science Fact

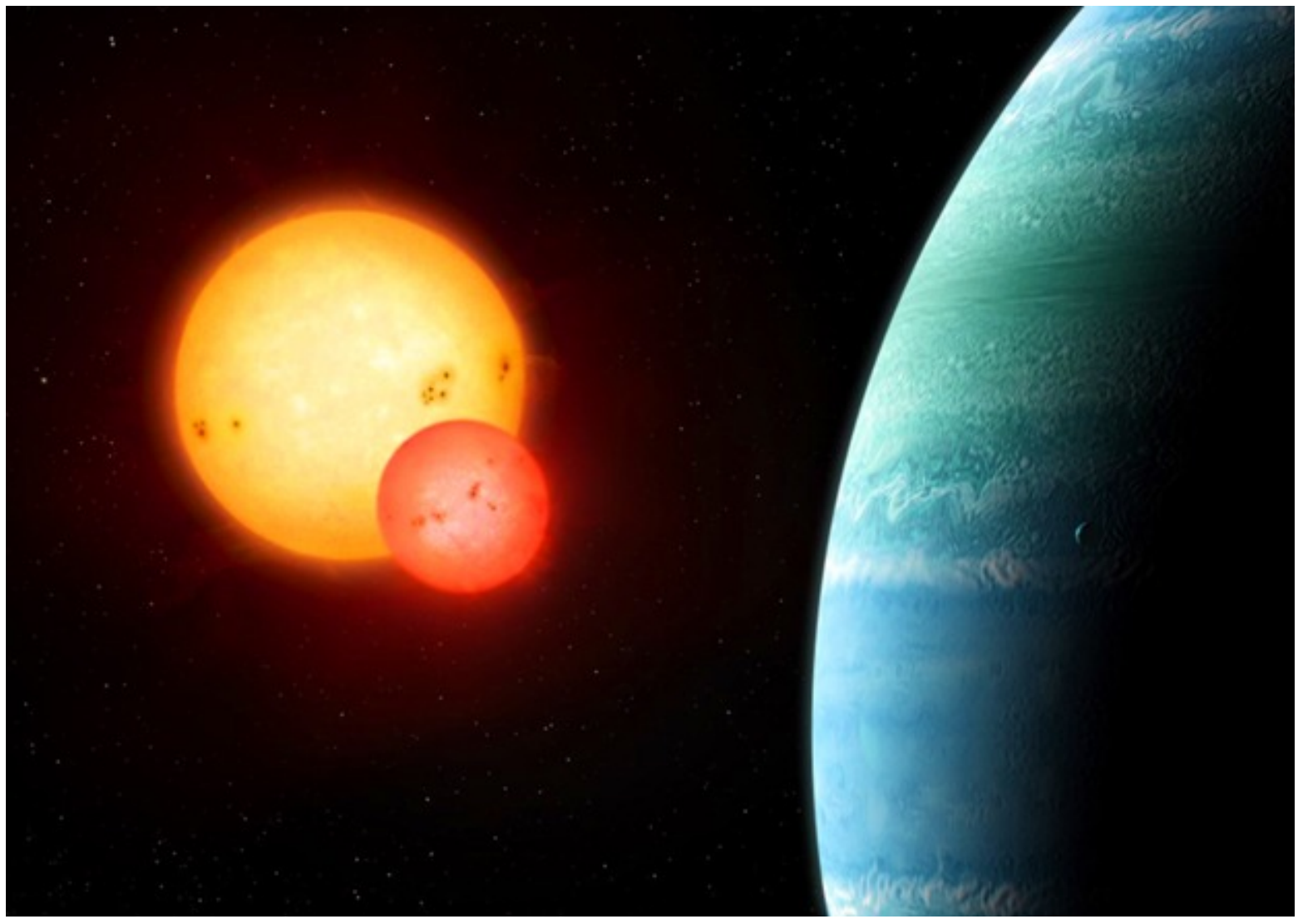


Illustration of the Circumbinary planet Kepler 453 AB b. Image Credit: Mark Garlick, markgarlick.com

The above illustration is from Kepler 453b and New Planet: 10th Planet Found by Kepler Mission – YouTube Description on Youtube article: “In a discovery that for astronomers – and the rest of us – may never get old, a new planet, Kepler-453b, has been found orbiting a pair of stars. It is the 10th ‘circumbinary’ planet NASA’s Kepler Mission has discovered. Each such planet is orbiting two stars.” This illustration is at link: https://www.youtube.com/watch?v=E1Vso3TEmIA.

(Continued on page 19)

Planets of Binary Star Systems Part 2 (continued)

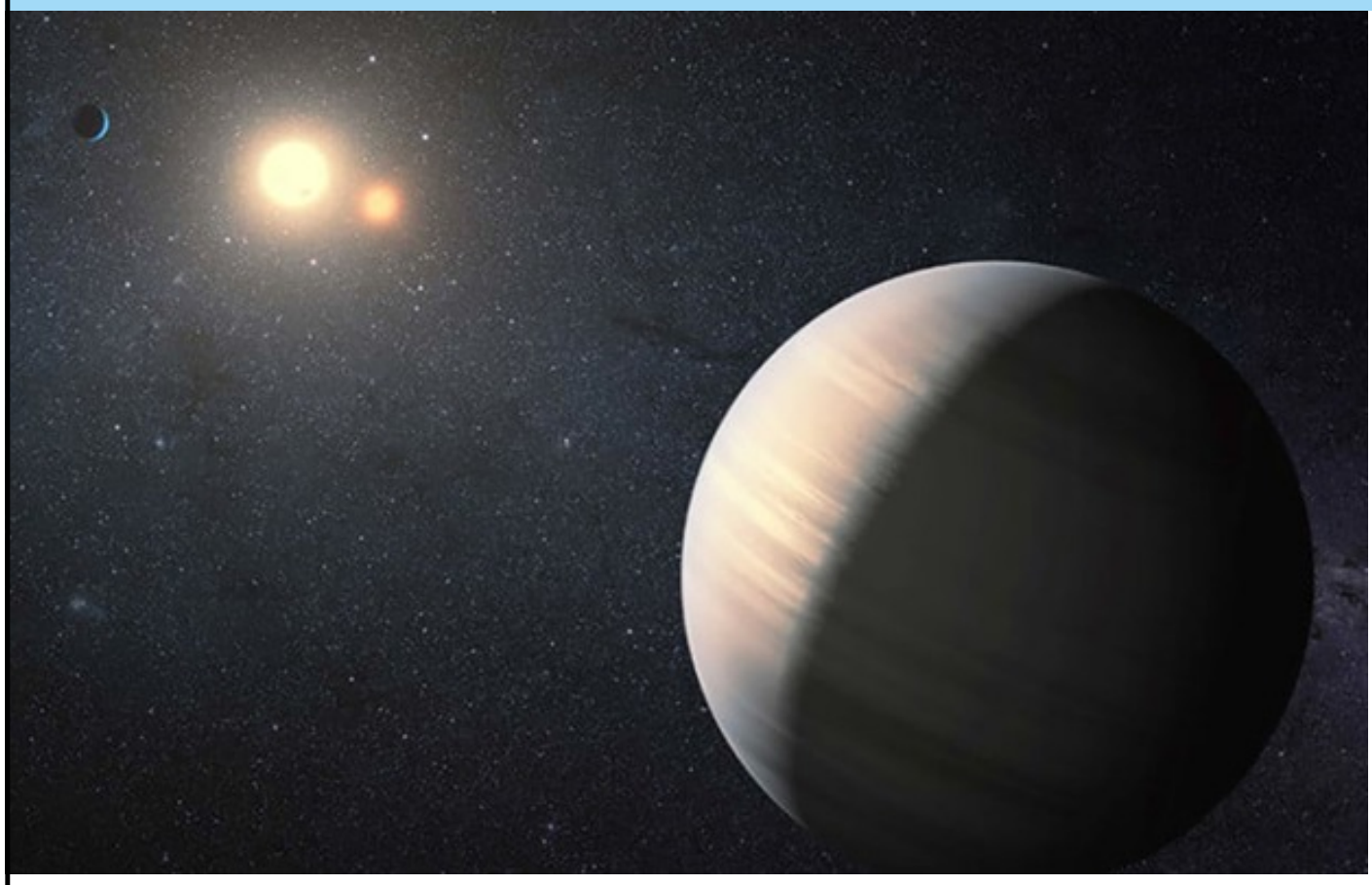


Illustration of the Circumprimary planet Gliese 15 A c

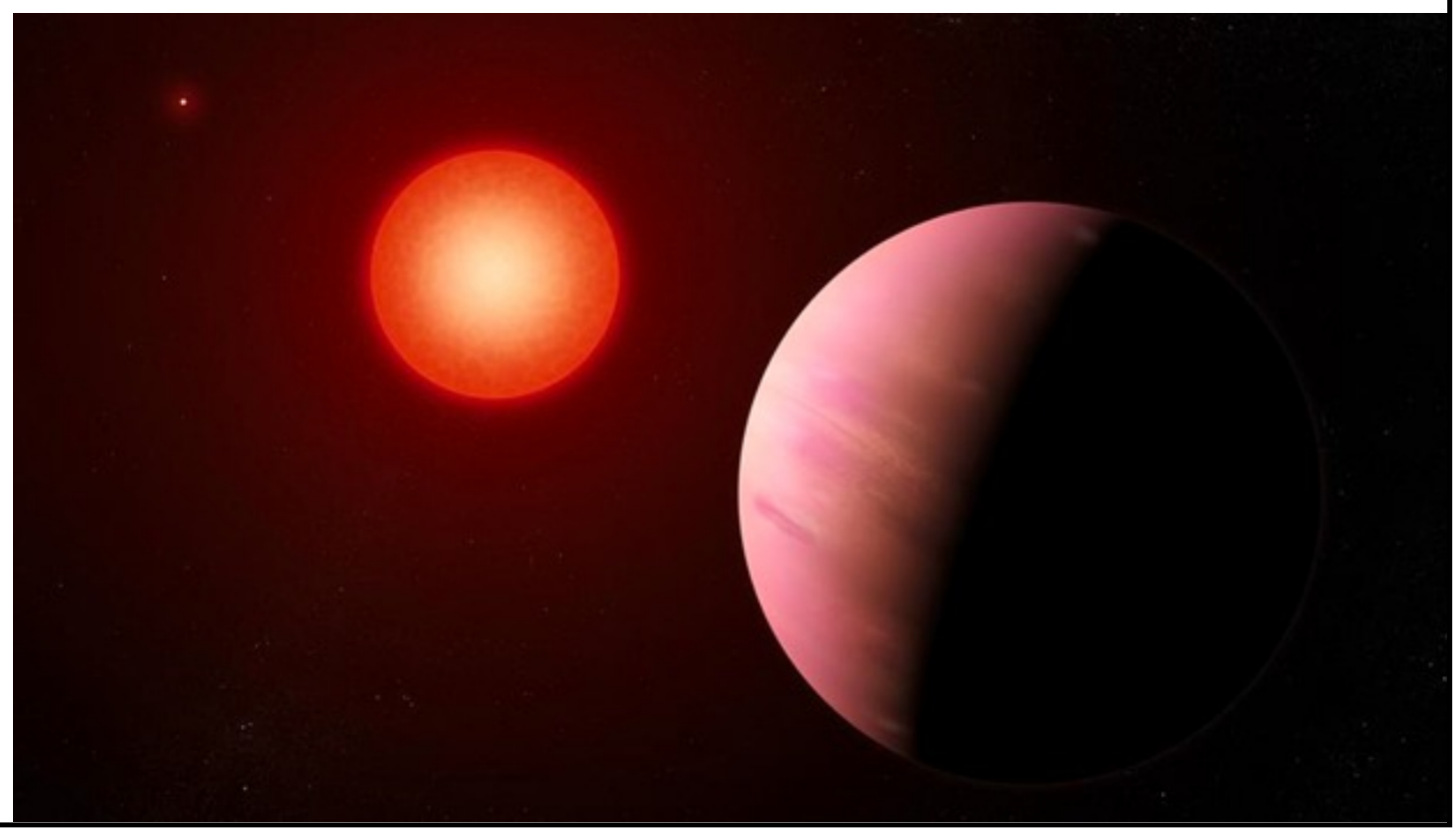
Image Credit: NASA / JPL-Caltech / T. Pyle / Sci-News.com

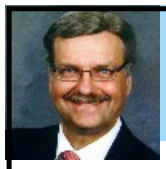
The above illustration is from the article: Super-Neptune Exoplanet Discovered in Gliese 15 Binary System – TechEBlog and written by Jackson Chung. The link is:
https://www.techeblog.com/super-neptune-exoplanet-gliese-15/
Summary is Gliese 15 A is a double star about 11.6 light years from Earth and the planet Gliese 15 A c has a mass of about 5 to 7 Earth masses and orbits the brighter or primary star of the Gliese 15 system in about 20.8 Earth years or in about 7,600 days.

The illustration below is from Google Images 1960. K2-288Bb Planet Photograph by Kiguni – Fine Art America at link: https://fineartamerica.com/featured/1960-k2-288bb-planet-kiguni.html
The description is: "The newfound planet K2-288Bb, illustrated here, is slightly smaller than Neptune. Located about 226 light-years away. It orbits the fainter (secondary) member of a pair of cool M-type stars every 31.3 days.

Illustration of the Circumsecondary planet K2-288 B b

Image Credit: NASA





Occultations - Perhaps the Ultimate Amateur Astronomy

by Steve Germann

Starting this month, for the next 12 months, I will be distinguishing one selected aspect of the RASC Observer's Handbook's annually changing sections, and expanding on it, bringing in timely and (more) useful online resources, which aid the amateur astronomer, especially.

Every year when I (finally) lay hands on my new copy of the RASC Observer's Handbook, I turn to the section with maps of lunar grazing occultations of bright stars, where the path of the edge of the Moon's shadow (from that star) passes near southern Ontario, with a desire to know if there will be a chance for our members to be part of a team to plot a set of timings of the star going behind shadows on the Moon's northern (or sometimes southern) limb.

Here's a link for a video of an occultation party, synchronized to show the 5 telescope views, spread out over a few hundred meters along a road near the graze edge.

Aldebaran Grazing Occultation March 5, 2017 Combined Videos on Vimeo

There's a gotcha though… there's only one Moon in the sky, and there are a bunch of factors that are needed for a good occultation party. It must graze along a dark part of the limb, the Moon must be high enough in the sky (sort of a catch 22, since the full Moon has no dark limb but will be high in the sky) and of course, the weather must cooperate, and finally, there must be a place to set up which is conveniently located. Depending on the brightness of the star, light pollution can be a factor too.

So simply flipping open the book, you will get maybe 2 paths, and then can read the tables to determine whether it's an "Occultation Party Class" event. It turns out, however, that for the last 10 years or so, lunar grazing occultations are not adding to the science of the profile of the Moon's limb anymore, since lunar orbiters have now mapped the surface in exquisite precision. That might explain why the above video timings were not painstakingly sent to the IOTA for scientific purposes.

The end of that era in lunar science for amateurs allows us to highlight a different, better, and more appropriate role for us. So much better if all the stars in the sky were in play, and all the phases of the Moon including new Moon were in play. Stand in any dark place with a telescope, and look at the sky first without the telescope, and then with it. If it is a reasonable sized instrument, you will see about 50 stars through its narrow field of view. Consider that the field of view might be about equal to the Moon's area, and the sky above you has about 25,000 Moon areas, and about 1 million visible stars at any given time after twilight.

Now imagine the five hundred thousand known (and trillions of unknown) asteroids which roam the asteroid belt and inner solar system, and out beyond the orbit of Jupiter. Any of those is large enough to occult just about any star in the sky.

Asteroid occultations are the last, best chance for Amateur Astronomers (yes, with Capital A's) to contribute to the science of Astronomy, and have fun at the same time.

Here's why.

All those asteroids cast shadows from every star, out into space around them. The stars being so far away, the shadow (unlike that of the Moon blocking the Sun which barely reaches the Earth) extends for hundreds of millions of kilometers into space around them. They are like very thin cones with their base resting on the asteroid, like a sea urchin with incredibly long spikes. Each asteroid has about a million such useful spikes (blocking stars we can see in real time with a telescope), and those are all over the inner solar system. Those spikes will cross the night side of the Earth from time to time.

(Continued on page 21)

Occultations - Perhaps the Ultimate Amateur Astronomy (continued)

We care about the asteroids for many reasons, and 2 of them are uppermost in mind for this article.

By watching for an asteroid to occult a star, we effectively can measure the asteroid's position, and its breadth along a chord drawn through its disk on the sky. Occasionally we will see a second blip which indicates that the asteroid has a satellite. Knowing the exact size of the asteroid, helps in determining its composition and *albedo* (reflectivity) since it is easy to measure the total light, but hard to know how much surface is reflecting it. This helps us to put the asteroids into families of similar surface (and by extension, inner) composition.

The second aspect of asteroids that is refined by the observations of amateur astronomers through the detection of stellar occultations is the exact location of the asteroid in its orbit. If you want to avoid an asteroid hitting something of value, you need to know, well in advance, exact information about its orbit.

These asteroids can be small and locating a tiny object to within a fraction of a km in space a hundred million km away, is almost impossible without supporting information. A typical asteroid might have an apparent disk of only 1/50 of an arcsecond in width. Our telescopes tap out at about 1/2 an arcsecond. The Hubble might get to 1/10 with a lot of effort. We simply cannot locate asteroids more accurately by just looking. But when an asteroid occults a star, it's a whole new ball game, literally.

The path of the asteroid's shadow on the Earth can be plotted, and then Amateur Astronomers with telescopes can set up to stare at the star, ideally with video cameras recording at the eyepiece and WWV time beeping on the audio, and especially if a group, a profile of the asteroid can result, and of course the orbit can be refined with exact data. Here is a link to a video describing a tool you can use to play with orbits. https://www.youtube.com/watch?v=Jc0ZW0ke_jc, with the tool at this link here, or a shorter version here.

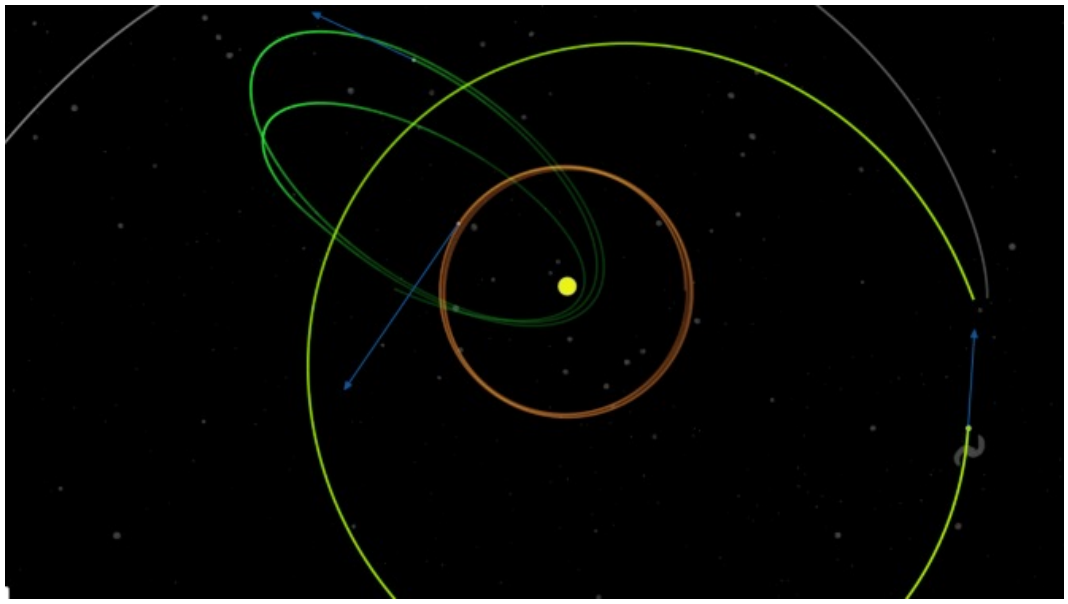


Illustration and Animation Credit: MinuteLabs.io

To give an example of how exact data helps, in this article (https://www.nature.com/articles/nature08096), they ran simulations of the inner planets of the solar system for 5 billion years of orbits.

Depending on the exact starting positions, varying by less than two *metres* from the estimated actual planetary positions, Mars collides with Mercury or Venus with Earth. The solar system has been around more than 4 billion years, so it was probably not at that precise starting point in the past. But the same can apply to the asteroids. The more refined their position, the easier it is to know their total orbit.

So, getting to the good part…. Here's the pitch……. the tracks of these asteroids are very narrow. Only a few km wide usually. There is a timing uncertainty, which coupled with the Earth's rotation, can mean you might not get to see an occultation from your point of view. I calculated that 'they' would need a telescope along every line of longitude, every km, looking at every field of view in the sky, for a passive array to do the work of a few hundred intrepid Amateur Astronomers. That would be something like 36,000 locations, and 50,000 telescopes at EACH location. Even NASA does not have money for that.

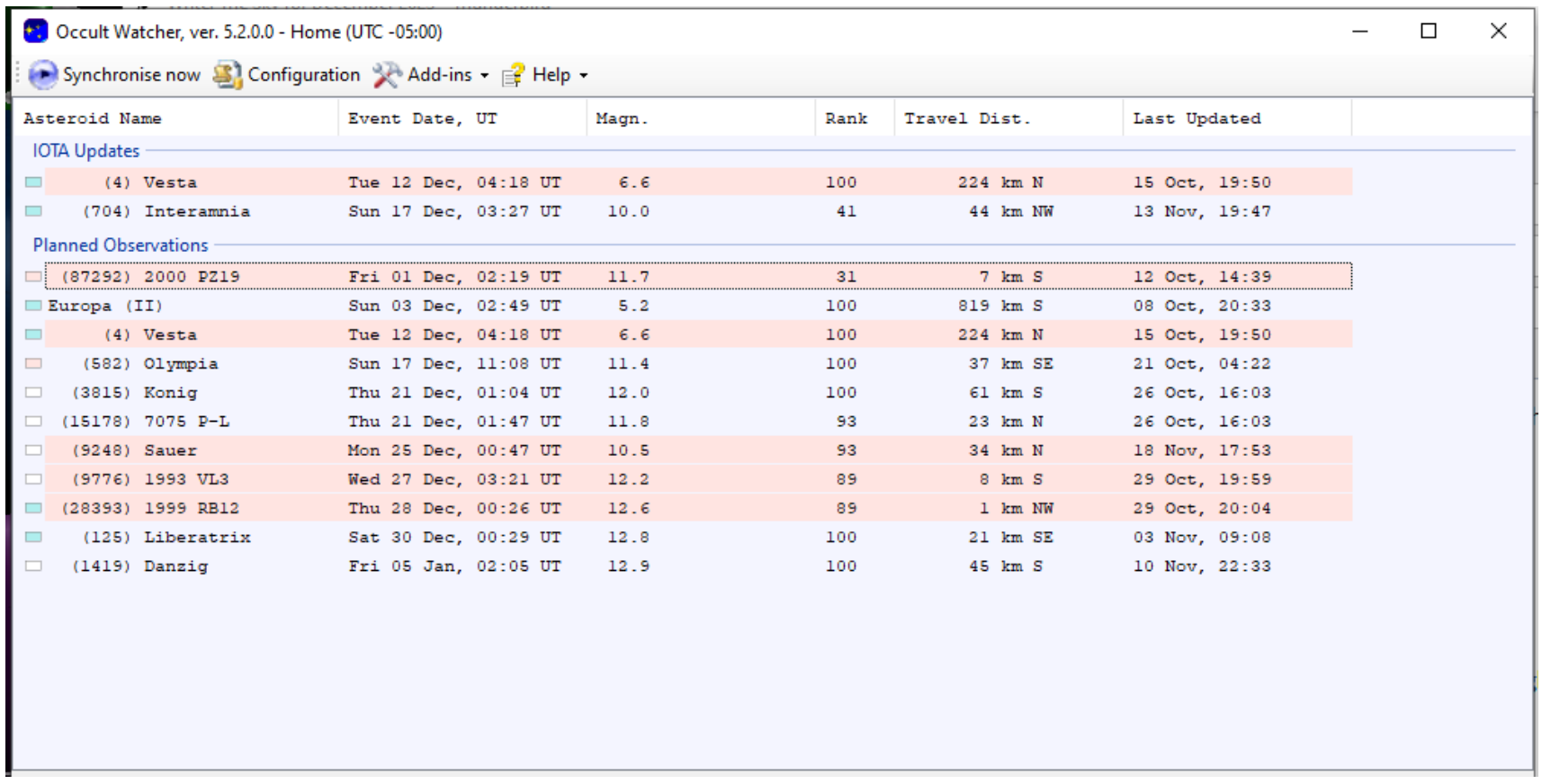
(Continued on page 22)

Occultations - Perhaps the Ultimate Amateur Astronomy (continued)

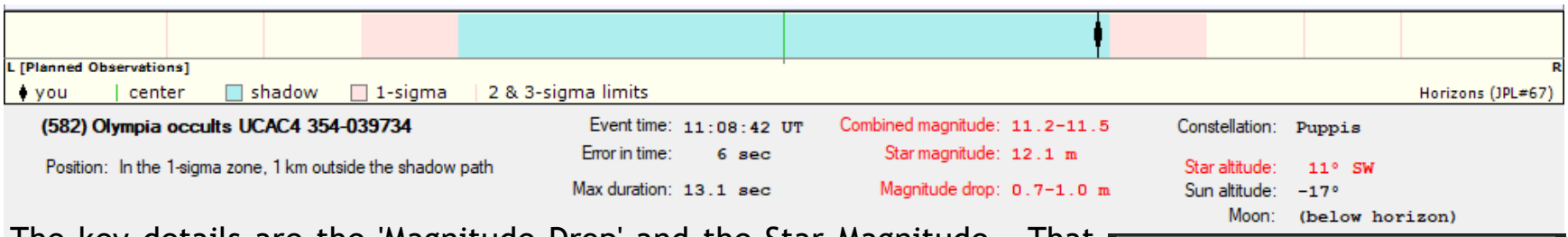
Such an enterprise would pick up occultations for asteroids we don't know about yet, provided they are about 1km or more in size. But I digress. Instead, a few telescopes (and owners) scattered around the world, willing to travel to the right places, pointing at the right stars at the right times, will capture the lion's share of the available information. The problem really is, even if NASA spent the money, without an orbit to compare it to, an occultation does not mean enough to connect the dots. I do not say it is totally beyond mathematicians to compute an orbit from an occultation path with timing.

Computing an orbit is hard. Constraining an orbit already estimated is easy. That's our role.

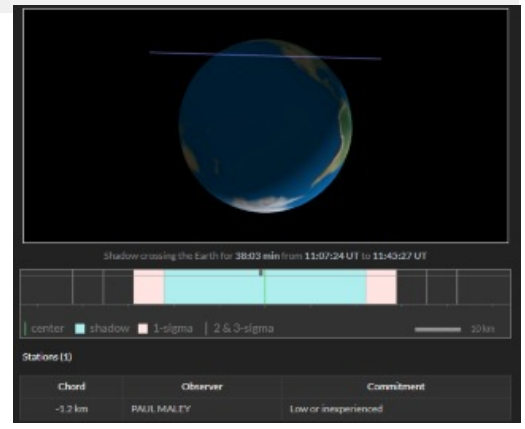
Cue the Occult Watcher program. (Pictured here)



Occult Watcher can be configured to do all the searching for you, and has features where you can say how far you are willing to travel, and how bright the star has to be, how far from the horizon etc. Another really handy feature is that you can indicate to the program that you intend to observe one of the occultations, and it will alert others to take more interest in that track too, possibly resulting in much better shape determination for the asteroid. Here is what I see when I click on a row:



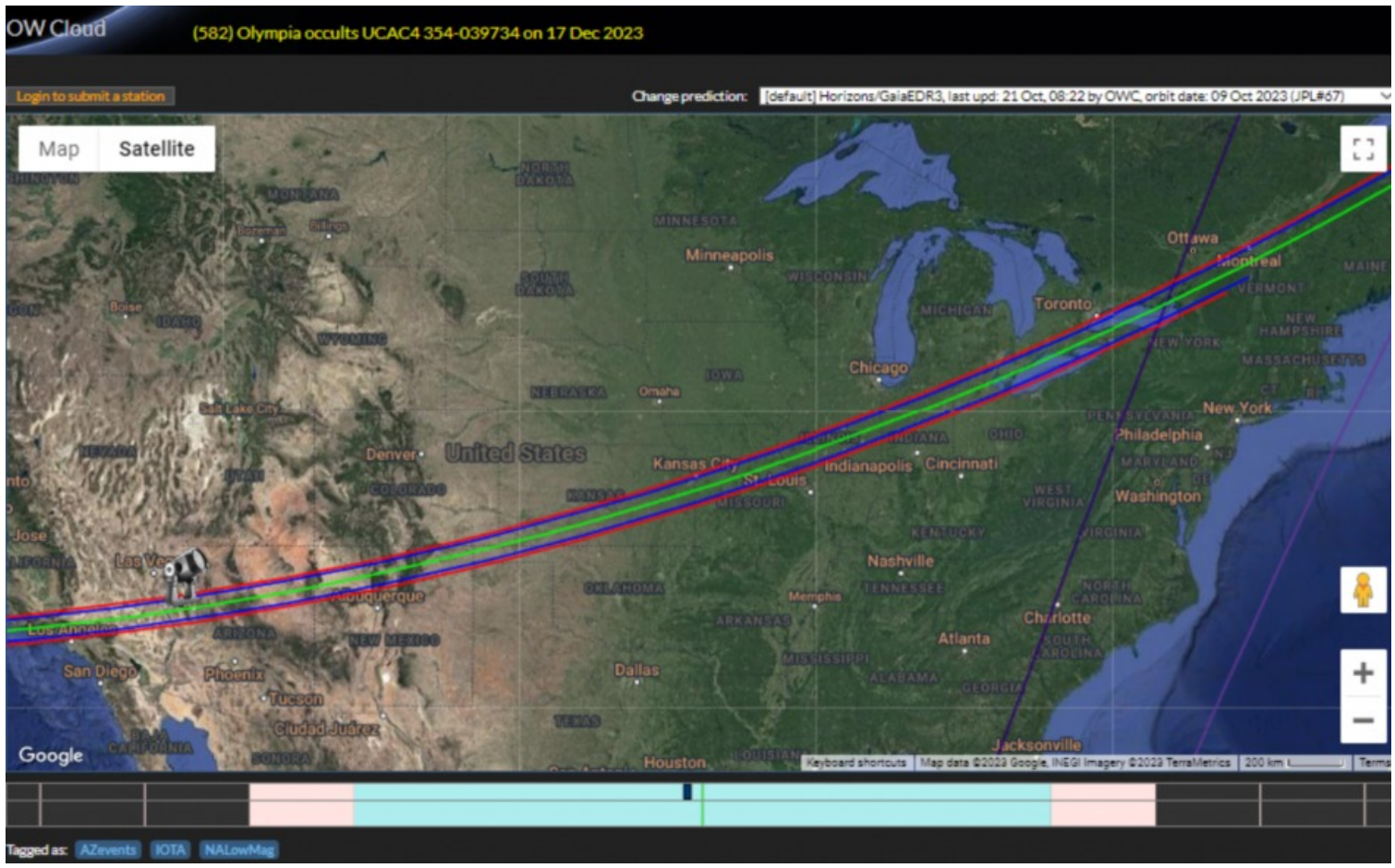
The key details are the 'Magnitude Drop' and the Star Magnitude. That determines if you are going to be able to see it by yourself or if you will need sophisticated video recording to capture it. It also brings up a live web page, which shows who else, and where across the path, is going to be watching it. That mark in the blue zone indicates which chord of the asteroid is being probed by an observation. Closer to pink gives more information about shape. Closer to center gives more information about orbit parameters.



(Continued on page 23)

Occultations - Perhaps the Ultimate Amateur Astronomy (continued)

Clicking on the map of the world brings up the detailed track, centered at my location.

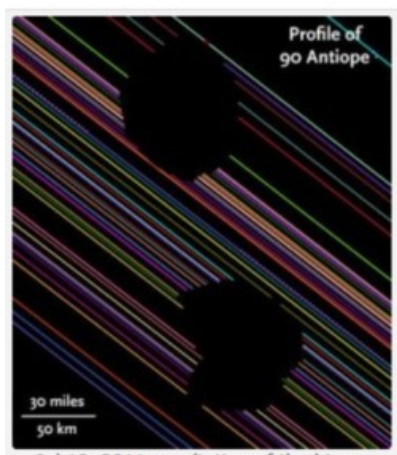


Zooming in gives me the view shown on page 11 in The Sky This Month.

The lines show the center line, the edges, and the one-sigma uncertainties.

Clicking anywhere on the map will give you detailed predictions and timings. Once you have some observations, 'we have ways' to report them. Here is a striking example of what can result.

I downloaded my free copy of the Occult Watcher, and configured it to beep when it does a daily update.



Jul 19, 2011 occultation of the binary asteroid (90) Antiope

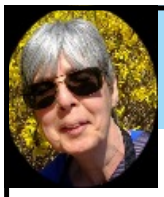
Welcome to the home page of the International Oc
data from timings of astronomical occultations and

We provide predictions of occultations of stars by a
regions. By observing and timing occultations, ama
hundreds of asteroids and helped map the Lunar p

We provide information and recommendations on c
at all levels of experience are encouraged to becom

last modified December 18th, 2017

Check back in these articles in future months for the 'best next occultation' listing in these pages (starting now).



2022-2023 Financial Statements by Ann Tekatch

Our expenses far exceeded our revenue this year by a whopping $2,840.66. Don't panic - there are good reasons why this happened.

This past year saw our return to McMaster Innovation Park for a full year of in-person membership meetings. It was a welcome change from online Zoom meetings. Of course, our return to in-person meetings was reflected in the total amount we paid for our room at MIP. A total of 9 monthly meetings at $247.13 each (our March meeting was held online due to a winter storm) plus one telescope workshop at $366.12 resulted in an annual expense of $2,590.29. This was a big jump from our previous year's total of $494.26 for just two meetings.

We incurred a number of onetime expenses in 2022-2023:

- In anticipation of the partial solar eclipse in October 2023 and the total eclipse in April 2024, the club placed an order for eclipse glasses totalling $1,480.17 Cdn.
- Our Zoom subscription is $226.00 annually, but the cost for the previous year's renewal was paid in fiscal year 2022-2023 resulting in an apparent doubling of the usual amount. As our club library expanded, so did the need for a more organized lending system and a bulk order of library card pockets (to meet present and future needs) was made to the tune of $197.26.
- To promote the club, business cards were printed instead of brochures. The cards are less expensive, carry the same information and are easier to carry and hand out. This cost your club $190.97.
- A used $200 telescope was purchased for December 2022's meeting as a giveaway prize to promote the club and encourage members of the public as well as our own members to attend.

Our club's fixed assets (equipment such as loaner telescopes, laptop, banner, etc.) is depreciated annually by 20%. This recognizes that stuff wears out and needs to eventually be replaced. This depreciation ($734.81) is reflected in our bottom line.

The total of the onetime expenses is approximately $2300. This combined with the depreciation amount of $734.81 gives us a total of more than $3000. Without these expenses, we would have had a small surplus even with the increased rental costs.

The club continues to be financially healthy and your council has done an excellent job of being fiscally responsible with your membership money.

This was my last year as your treasurer. It has been a privilege. I would like to thank my fellow council members for their support. Paula Owen stepped up to help collect money at the meetings when my health would not allow me to be there. You are a rockstar, Paula! I would also like to thank Steve Germann (again) for developing the spreadsheet I've been using to keep the ledger and generate the info needed for these financial statements. I am confident that our new treasurer, Marcus Freeman, will benefit from the support and all the help I enjoyed.

Finally, I would like to thank the people at McMaster Innovation Park. They have been very generous in their dealings with us since the beginning. We had the use of their very professional and well-appointed facilities at a discounted rate. (We often had the use of a larger room than we were actually paying for.) They have very kindly hosted our library at no additional cost. Although our lease stated otherwise, they gladly waived any charge when we had to cancel on short notice due to pandemic- or weather-related issues. The announced 2024 rent increase was delayed as long as they could manage. They have been a pleasure to deal with and very supportive of the club. I don't want anyone to think otherwise. I can only hope that our new landlord, whoever that turns out to be, will be as awesome.

Cheers,
Ann Tekatch, (former) Treasurer

(Continued on page 25)

2022-2023 Financial Statements (continued)

CASH FLOW

Income	**31-Oct 2023**	**31-Oct 2022**
Memberships	$5,750.00	$5,560.00
HAA Calendars	$2,367.00	$1,790.00
50/50	$0.00	$80.00
Cash Donations	$130.00	$0.00
Star Party Revenue	$563.30	$765.04
Total Income	**$8,810.30**	**$8,195.04**

Expenses	**31-Oct 2023**	**31-Oct 2022**
Insurance	$1,251.72	$1,205.28
Brochures	$190.97	$0.00
Telescope Giveaway	$200.00	$0.00
HAA Calendars	$1,915.37	$1,751.25
Donations Outgoing	$1,000.00	$1,000.00
Depreciation Expense	$734.81	$581.99
PO Box Rental	$200.01	$195.49
Speakers Allowance	$75.00	$50.00
Office Supplies	$88.33	$73.11
Sympathy Flowers	$100.57	$0.00
Library (book pockets)	$197.26	$0.00
Postage	$95.03	$166.19
Star Party Costs	$412.69	$649.56
Public Education	$111.24	$144.67
Eclipse Glasses	$1,480.17	$0.00
Hall Rental	$2,590.29	$494.26
PayPal Fees	$129.64	$182.28
Zoom Subscription*	$452.00	$0.00
Christmas Coffee	$77.48	$0.00
Door Prize Books	$48.87	$0.00
Website	$299.51	$237.42
Total Expenses	**$11,650.96**	**$6,731.50**
Surplus/Deficit	**-$2,840.66**	**$1,463.54**

* Zoom subscription for 2022 and 2023

(Continued on page 26)

BALANCE SHEET

Assets	31-Oct 2023	31-Oct 2022
Bank	$8,911.80	$11,374.67
Cash	$0.00	$0.00
Inventory	$0.00	$0.00
Prepaid PO Box Rental	$205.66	$200.01
Prepaid Liability Insurance	$0.00	$0.00
Accounts Receivable	$0.00	$0.00
Total Current Assets	**$9,117.46**	**$12,194.99**
Fixed Assets	$0.00	$0.00
Equipment	$3,407.44	$3,205.88
Total Fixed Assets	**$3,407.44**	**$3,205.88**
Total Assets	**$12,524.90**	**$14,780.56**

Liabilities	31-Oct 2023	31-Oct 2022
Deferred Membership Revenue	$1,935.00	$2,000.00
Accounts Payable	$0.00	$0.00
Total Liabilities	**$1,935.00**	**$2,000.00**
Equity		
Opening Balance	$12,780.56	$11,317.02
Adjustments	$0.00	$0.00
Donated Equipment (Book Value)	$650.00	$0.00
Current Year	-$2,840.66	$1,463.54
Closing Balance	$10,589.89	$12,780.56
Total Liabilities and Equity	**$12,524.89**	**$14,780.56**

(Continued on page 27)

2022-2023 Financial Statements (continued)

PROFIT & LOSS

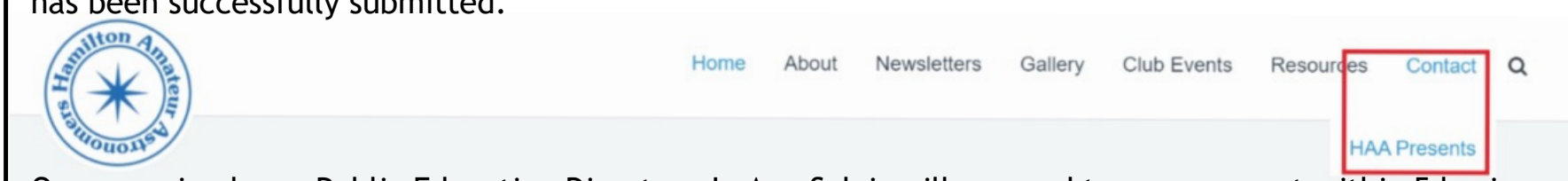
Revenue (Net)	**31-Oct 2023**	**31-Oct 2022**
Membership	$5,750.00	$5,560.00
Calendars	$451.63	$38.75
Cash Donations	$130.00	$0.00
50/50 Draw	$0.00	$80.00
RASC Handbook Sales	$0.00	$0.00
Donations in Kind	$650.00	$0.00
Intangible Donations	$0.00	$0.00
Banquet/Star Party	$150.61	$115.48
Clothing Sales	$0.00	$0.00
Net Revenue	**$7,132.24**	**$5,794.23**

Depreciation Table	**31-Oct 2023**	**31-Oct 2022**
Opening Balance	$3,205.88	$2,032.03
Depreciation Full Year	$641.18	$406.41
Donated Equipment	$650.00	$0.00
Additions	$286.37	$1,755.84
Sales	$0.00	$0.00
Net	$936.37	$1,755.84
Depreciation Part Year	$93.64	$175.58
Total Depreciation	$734.81	$581.99
Closing Balance	**$3,407.44**	**$3,205.88**

"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 Crescent Moon and Venus, by **Jo Ann Salci**
Taken in Ancaster, ON, with her cell phone.

HAA Outreach Presentations with Vulnerable Sectors

The HAA executive has created a policy for any HAA member who wishes to do outreach presentations to vulnerable sectors, which includes children under 18 years of age and vulnerable adults. This does not include our general club outreach activities.

Presentations include in-person or virtual sessions where parents/guardians may not be present. **As it is not always possible to anticipate caregiver attendance at outreach activities for children under the age of 18, or vulnerable adults, it is therefore a requirement for HAA member-volunteers who work with these vulnerable populations to complete a Police Vulnerable Sector Check**.

These can be obtained only in your region of residency. Costs vary from one area to another. They will be kept on file by the HAA Education Director. No details regarding the findings of the check will be made in any way public or viewed beyond the HAA Education Director.

The HAA will reimburse any member who wishes to do outreach presentations to vulnerable individuals, provided a receipt is submitted.

Please contact Jo Ann Salci if you have any questions about this policy and/or if you wish to put your name forward to help with outreach activities to young people! This policy is effective immediately.

William J. McCallion Planetarium

McMASTER UNIVERSITY, HAMILTON, ONTARIO

- Public shows Wednesdays and some Saturdays
- Public transit available directly to McMaster campus
- Tickets $7 per person; private group bookings $150
- Different shows every week
- Upcoming shows include:

  – Dec 6: Introductory Astronomy for Kids — Solar System

  – Dec 13: Introductory Astronomy for Kids — Galaxies

- For show times and further details, visit www.physics.mcmaster.ca/planetarium

UPCOMING EVENTS

December 8, 2023 - 7:30 pm — H.A.A. Meeting at McMaster Innovation Park. This will be our December "Seasonal Social". **This will be a "hybrid" meeting, with the attendance option of in-person or online via Facebook and Zoom.**

January 12, 2024 - 7:30 pm — H.A.A. Meeting at McMaster Innovation Park.

2023-2024 Council

Chair	Sue MacLachlan
Second Chair	Christopher Strejch
Treasurer	Marcus Freeman
Digital Platforms Director	Christopher Strejch
Membership Director	Paula Owen
Observing Director	Matthew Mennering/ Steve Germann
Education Director	Jo Ann Salci
Event Horizon Editor	Bob Christmas
Recorder	John Gauvreau
Secretary	Ann Tekatch/Kevin Salwach
Publicity Director	Mario Carr
Councillors at Large	Denise White Mélanie Lebel Chris Cheatley Brenda Frederick Leslie Webb Dan Copeland

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

Follow us!

Contact Us
Hamilton Amateur Astronomers
PO Box 65578
Dundas, ON
L9H 6Y6

www.amateurastronomy.org

General Inquiries:
secretary@amateurastronomy.org

Membership:
membership@amateurastronomy.org

Meeting Inquiries:
chair@amateurastronomy.org

Public Events:
publicity@amateurastronomy.org

Observing Inquiries:
observing@amateurastronomy.org

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