



# Event Horizon

Volume 26, Number 1  
November 2018



## From The Editor

It's onwards and upwards with a new membership year.... our 26th!

It's so hard to believe the H.A.A. now has 25 full years under its belt!

Enjoy the first E.H. of the 26th!

*Bob Christmas,  
Editor  
editor 'AT'  
amateurastronomy.org*



## Chair's Report by John Gauvreau

Sitting down to write my first report as Chair I thought I would look back to the last time I held this position and see what I wrote then. Turns out it was pretty close to what I wanted to do this time, so at the risk of paraphrasing myself, here goes;

This month marks the 25th anniversary of the first meeting of the HAA. It has grown and evolved over the years, into not just a large club, but an active and dynamic one. Stroll around one of our meetings and chat with other members and you'll encounter a varied and interesting group with beginners and experts alike. But even with all this growth the club has held true to its founding principles; to promote the advancement and enjoyment of astronomy. Teach, learn, explore and have fun doing it!

One of the reasons the club has thrived so much over the past years are the capable people who have guided it. Most recently, Bernie Venasse has chaired the HAA and over the past 3 years has been an enthusiastic and friendly face for the club. I  
*(Continued on [page 2](#))*

## IN THIS ISSUE:

- The 2019 HAA Celestial Events Calendar
- Cartoon Corner
- October Astrophysics Group Meeting Summary
- The Sky This Month for November 2018
- Treasurer's Report
- NASA Mission to the Asteroid Bennu
- NASA Night Sky Notes
- Eye Candy
- Upcoming McCallion Planetarium Shows
- Upcoming Events
- Contact Information

## Chair's Report (continued)

personally am grateful to have such a healthy and happy club put in to my hands and that is due in no small part to Bernie and the great team of people that have worked with him over the years.

With the anniversary upon us it is no surprise that we begin a new year with a new council. I'd like to introduce you to the elected councillors this month, and next month introduce the appointed councillors at large.

There are eleven elected positions, each volunteering their time, effort and energy to make this club the best it can be.

Second Chair is a valued right hand to bounce ideas off and a capable member who can step in and take the reins should the chair not be available (sniffle, sniffle...achoo!). *Michael Jefferson* returns to this position again and I am delighted to know the club is in capable hands without me. Michael is one of the founding members of the HAA, there from day one, and is a rarity among amateurs these days as someone who has experience with both radio astronomy and spectroscopy.

The club's Treasurer is *Ann Tekatch*, another founding member. She has the nearly thankless job of keeping the club's finances in order, doing the taxes and paying the bills. It is not a job I would enjoy for a second and yet it is so important. Ann is the most recent in a long line of very trustworthy people to take this responsibility. I rest easy knowing this is one area of club business that I don't have to worry about, thanks to Ann (see, I told you it was only 'nearly' thankless!).

Our club Secretary is *Jim Wamsley*. Jim first assumed this role back in 2010 when I first became Chair. I have previously described Jim as the club's ambassador to the outside world and nobody is better suited than he. You know Jim as the contact for the club's telescope loaner program and overseer of the food bank donations. Of course that is just a drop in the big bucket of things Jim does for the club.

The Membership Director maintains the membership database, keeps track of new enrollees and welcomes you at the door every meeting. *Leslie Webb* has been doing a fine job here for several years now and is a cheery face to welcome you each month.

The Observing Director has one of the hardest and most enjoyable positions. *Steve Germann* entertains us and educates us each month with lively talks at our monthly meetings and detailed articles, like the one you can find in this very edition of the EH. Like me, Steve is doing his second round at this position and has truly excelled both in person and in print.

Speaking of the Event Horizon, our club's newsletter (which you are reading now!), our editor is *Bob Christmas*. The reliability, quality and consistency of the EH is due to Bob's guiding hand and I know he, like so many of us, is very grateful to the contributors who make the EH worth reading every month.

*Mario Carr* is the club's Publicity Director, providing information to the print and electronic news media, getting the word out about our meetings and public programming. Mario has been doing this since before the position existed; publicity and public education were rolled into one position at one point, but both jobs became so big that they were separated into individual posts.

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

**Masthead Photo:** *Saturn, and the Lagoon & Trifid Nebulas in Sagittarius, by Bob Christmas.*

Clockwise from left is Saturn, the Trifid Nebula (M20) and the Lagoon Nebula (M8).

Taken October 9, 2018 from Barry's Bay, ON, with his Canon 40D DSLR through his Tamron 300mm lens, at ISO 800 and f/2.8. Exposures: 6 x 85 secs (average) = 8 minutes 30 seconds total.

## Chair's Report (continued)

The rest of our media output is overseen by *Christopher Strejch*, our newly instated Digital Platforms Director. Our website and social media presence is in his capable hands.

Also new to a director's position is *Jo Ann Salci*, who takes on the role of Education Director. The HAA visits libraries, schools and many other venues over the year, teaching astronomy and giving people of all ages the chance to look through telescopes, handle meteorites and learn so much about this fascinating topic. The job requires lots of help from other members so if you would like to reach out to an enthusiastic public group just get in touch with Jo Ann. She joined the club as a beginner and is just the person to reach out to other beginners and guide them.

Now we come to the club's Recorder. *Matthew Mannering* keeps track of all the club's business and keeps us all informed of what has been done and what should be done. We would be lost without him (at least I would be; my memory can't be trusted that much!). Apart from that job, Matthew is also editor of our Celestial Events Calendar, which is no small task.

And that just leaves the Chair. I've been around this club for a long time now and like many of the people I just mentioned have done a few of the jobs listed above; Observing Director, Education Director, Second Chair and Chair are on my past list. I really look forward to working with this great group of people. They are the good folk who make this club work and make it such a fun club to be a part of. I really am appreciative of all they do. It will be a fun year.

Definitely worth mentioning are two other people who are not on the list above; *Kevin Salwach* and *David Tym*. Unfortunately for us, they won't be on council this year, as life has brought them great bounty and full schedules. Kevin is well known from his many excellent talks to the club and I will be badgering him to do more. David worked hard and tirelessly as Webmaster and although he stayed behind the scenes he evolved and advanced our digital presence a great amount. Both David and Kevin are wonderful people who I have really enjoyed knowing, both have contributed a great amount to the club, and not only do I thank them for all they have done but I look forward to seeing them whenever they find opportunity to visit.

Next month I will introduce you to the Councillors at Large, those people who join council without a specific job but jump in to help with all the varied things that come up. If you think this sounds appealing (it is!) and would like to join this great group of people on council (there's usually cookies at the council meetings...just sayin'!), just get in touch with me. I'd be happy to hear from you.

You can contact many of the key positions using the emails listed in the back of this newsletter, or you can contact me with any inquiries at *chair 'AT' amateurastronomy.org*.

*John Gauvreau*      *November 2018*



### HAA Helps Hamilton

To support our community, we collect non-perishable food items and cash for local food banks at our general meetings. Please bring a non-perishable food item to the meeting or a donation of cash and help us help others.

Our donations go to [Hamilton Food Share](#), which delivers them to various food banks around the Hamilton area.



## Hamilton Amateur Astronomers 2019 Celestial Events Calendar

The HAA once again offers its wall calendar available for sale starting in November. This beautiful calendar features images exclusively by your fellow HAA members. They make wonderful gifts and look great when displayed at home or office.

The price is \$15 each or two for \$25.

Any revenue generated from sales goes back into the club to help support club activities.





Happy 25th Anniversary, Hamilton Amateur Astronomers



### H.A.A.'s Loaner Scope Program

We at the HAA are proud of our Loaner Scope Program.

If you don't have a telescope of your own and want to make use of one for a month or so, you can borrow one of our fine loaner scopes.

Please contact Jim Wamsley, at: 905-627-4323  
or e-mail Jim at: [secretary 'AT' amateurastronomy.org](mailto:secretary@amateurastronomy.org)

and we'll gladly get one signed out for you.



### Carbon Stars

Carbon stars are typically asymptotic giant branch stars, luminous red giants, whose atmospheres contain more carbon than oxygen; the two elements combine in the upper layers of the star, forming carbon monoxide, which consumes all the oxygen in the atmosphere, leaving carbon atoms free to form other carbon compounds, giving the star a “sooty” atmosphere and a strikingly ruby red appearance. There are also some dwarf and super giant carbon stars, with the more common giant stars sometimes being called classical carbon stars to distinguish them. In most stars, the atmospheres are richer in oxygen. Carbon stars were first recognized by their spectral carbon bands by Angelo Secchi in the 1860's, a pioneering time in astronomical spectroscopy.

Our group convened to discuss the topic of carbon stars. Present at this meeting were Doug Black, Doug Currie, Steve Germann, Mike Jefferson and Gary Sutton at the home of Doug Black. This seminar was conducted by Steve Germann. He researched the December 15/08 issue of “The Astrophysical Journal” to uncover the following information about these red stars.

Carbon stars are very red giants with carbon in their atmospheres. Their placement on the Hertzsprung-Russell Diagram is to the right-hand side, and they are located in the red end of the visual spectrum. Steve showed a number of links to various carbon star sites on the Internet. It seems there are two kinds of them: intrinsic or classical, which make their own carbon; and extrinsic or non-classical which are binaries; and so, some of these have matter accreted from partner stars rotating around them.

All of them exhibit lots of light in the infra-red, but are not bright. They usually have more carbon soot than oxygen (O<sub>2</sub>) and can release O<sub>2</sub> and CO. Some are HD (hydrogen deficient). There may be about 2,000 of them in the Milky Way alone. All are variable stars and some even radiate in the UV. How they can exist is a bit of a puzzle at the present time. We think they operate on 'dredge-up' cycles of 1,2 and 3. They cannot have all three. They can have only 1 & 2 for dredging up carbon or 1 & 3 for dredging up oxygen. Gravity, which is a big player in their existence, holds them together and competes with fusion which tries to push them apart, as they drop carbon onto their cores.

They are subject to a number of radioactive decay (RD) processes (the slow S-process, the R-process, neutron capture and other forms of RD like the beta decay of electrons). They are responsible for some of the elements of the Periodic Table (which can be used to show the development of various classes of stars). They are on the asymptotic giant branch (AGB) region of the Hertzsprung-Russell Diagram populated by evolved, cool, luminous stars. This a period of stellar evolution undertaken by all low-to intermediate-mass stars (0.6-10 solar masses) late in their lives.

The December 03/2014 “Sky and Telescope” had an article on observing carbon stars. They are on the data records of “The American Association of Variable Star Observers” because they are variable. They are seen better with larger backyard telescopes, especially large Dobsonians and good dark adaptation. A very interesting topic.

Our thanks for the hospitality, food and drinks are extended to the Blacks and to Mike Jefferson for the desserts.

The next meeting will occur on Friday, November 23/18 @ 7:30. Watch the website for an announcement.



### November

November... a month whose name evokes memories of clouds... (at least for me).

Well, it's not all that bad.

There will be times of cloud, but not necessarily all evening nor every night.

### Longer Nights

With daylight savings time ending (better described as summer time), where the clocks were adjusted to move supertime one hour later compared to the sun, there are some advantages.

At least Eastern Daylight Time time gave us more time to set up the telescope after dinner before sunset.

Now we have the opposite. It's practically already dark on the way home from work.

This opens the book for possibilities like:

- seeing a fireball in the sky when you are driving home from work.
- having a chance to see the summer constellations before they set in the evening.
- having more time all night to view the planets, especially ones approaching opposition,
- having more time to observe the polar constellations, as each one will have more chance to be at the zenith over a longer night.
- as the weeks pass, since sunset is getting earlier more rapidly than the constellations are rotating out of sight, it is like we get another shot at the Summer constellations and even the Summer planets as a result.

As written, it sounds like November is ideal observing time. It's not too cold yet. The mosquitoes are gone. Some (and eventually, most) leaves are off the trees so you can see more of the sky.

### The Winter Constellations

I found this website, from the US Naval Observatory, which allows computing rise, transit, and set times for stars:

<http://aa.usno.navy.mil/data/docs/mrst.php>

Transit times were big things when seagoers used the stars to determine longitude.

Now we can thank the Naval Observatory for continuing this tradition.

### Orion

The quintessential Winter constellation is *Orion*. It has more bright stars than any other constellation.

*Betelgeuse* rises at about 8 PM and sets at 9 AM.

So basically, you can see Orion all night, excepting twilight. Sadly, they only use US cities, so I picked Buffalo, being pretty close to us.

(Continued on [page 8](#))

## The Sky This Month for November 2018 (continued)

Astronomical Applications Department  
U. S. Naval Observatory  
Washington, DC 20392-5420

Betelgeuse

BUFFALO, NEW YORK

Location: W 78°51'00.0", N42°54'36.0", 290m  
(Longitude referred to Greenwich meridian)

Time Zone: 5h 00m west of Greenwich

| Date<br>(Zone)    | Rise Az. |     | Transit Alt. |     | Set Az. |     |
|-------------------|----------|-----|--------------|-----|---------|-----|
|                   | h        | m ° | h            | m ° | h       | m ° |
| 2018 Nov 15 (Thu) | 20:00    | 79  | 02:34        | 55S | 09:04   | 281 |
| 2018 Nov 16 (Fri) | 19:57    | 79  | 02:30        | 55S | 09:00   | 281 |
| 2018 Nov 17 (Sat) | 19:53    | 79  | 02:26        | 55S | 08:56   | 281 |
| 2018 Nov 18 (Sun) | 19:49    | 79  | 02:22        | 55S | 08:52   | 281 |
| 2018 Nov 19 (Mon) | 19:45    | 79  | 02:19        | 55S | 08:48   | 281 |

**Rigel, the other corner of Orion, rises about 17 minutes later...**

Astronomical Applications Department  
U. S. Naval Observatory  
Washington, DC 20392-5420

Rigel

BUFFALO, NEW YORK

Location: W 78°51'00.0", N42°54'36.0", 290m  
(Longitude referred to Greenwich meridian)

Time Zone: 5h 00m west of Greenwich

| Date<br>(Zone)    | Rise Az. |     | Transit Alt. |     | Set Az. |     |
|-------------------|----------|-----|--------------|-----|---------|-----|
|                   | h        | m ° | h            | m ° | h       | m ° |
| 2018 Nov 15 (Thu) | 20:18    | 101 | 01:54        | 39S | 07:25   | 259 |
| 2018 Nov 16 (Fri) | 20:14    | 101 | 01:50        | 39S | 07:21   | 259 |
| 2018 Nov 17 (Sat) | 20:10    | 101 | 01:46        | 39S | 07:17   | 259 |
| 2018 Nov 18 (Sun) | 20:06    | 101 | 01:42        | 39S | 07:13   | 259 |
| 2018 Nov 19 (Mon) | 20:02    | 101 | 01:38        | 39S | 07:09   | 259 |

So by the time Rigel is up, all of Orion is visible.

As an aside, I tried different altitudes, and altitude (above or below the escarpment) did not affect the reported times, which have a precision of 1 minute. *(Continued on [page 9](#))*

### Meteors in November

The *Leonids* are probably the best meteor shower of the year for visibility, if you can handle the cold. The radiant is right in the mane of Leo's head. This year's Leonids show is going to be a treat. Here's some basic info on the shower.

<https://www.timeanddate.com/astronomy/meteor-shower/leonids.html>

The Moon will set at 1:53 AM and this year the peak is on a Saturday night.

74 percent of the time in the past it has been cloudy on November 16th, so you won't get a better chance, if it's clear, and you simply must take advantage of the opportunity.

If November 17-18th turns out to be cloudy when you want to observe, try taking another look later at night, and you might be rewarded with clear skies. Although the Moon will be 72 percent illuminated, it will be low in the sky and setting, so do not despair.

The Leonids are THE FASTEST meteor shower of them all.... At 71 km/s they pack a bigger energy per mass, and power output, than the Perseids, by about 15 percent.

Below is a Wikipedia article talking about the Leonid 'storm' of 1833 which lasted 9 hours.

The earth would have moved several earth diameters in space during the storm, implying that if we hit the stream dead on, it's large. They model the Leonid stream in space based on past observations, always attempting to predict the next Leonid Storm, or gauge its probability.

All we know for sure is there's a cloud of meteoroids in that orbit, still.

During a meteor shower, you can only see meteors which hit the atmosphere within a few hundred km of your location. For a meteor storm to be seen all across the USA, there were a lot of meteors everywhere. The Earth moved 70 Earth-diameters in space during that time.

At 71 km/s closing speed, I compute a cloud 2.3 million kilometers in diameter, having well over 240 thousand meteors in a state-size cross section, implying that the entire cloud still has trillions of meteors still orbiting the Sun. And this is assuming the storm did not continue in daylight.

You can read more about that famous storm here:

<https://en.wikipedia.org/wiki/Leonids>

You should have no trouble seeing some Leonids and you might see a fireball if you watch long enough.

As a comparison, the Geminids on December 14th hold the record for maximum Zenithal Hourly Rate (beating the Perseids), but they are much slower (36 km/s) and therefore dimmer for a given particle. And it will be much colder.

(Continued on [page 10](#))

# The Sky This Month for November 2018 (continued)

## Interesting Planets

I am still in the 'Pluto is a planet' department, and I anticipate staying there. Pluto is big. Pluto is interesting. Pluto is not the moon of another planet. That's good enough for me.

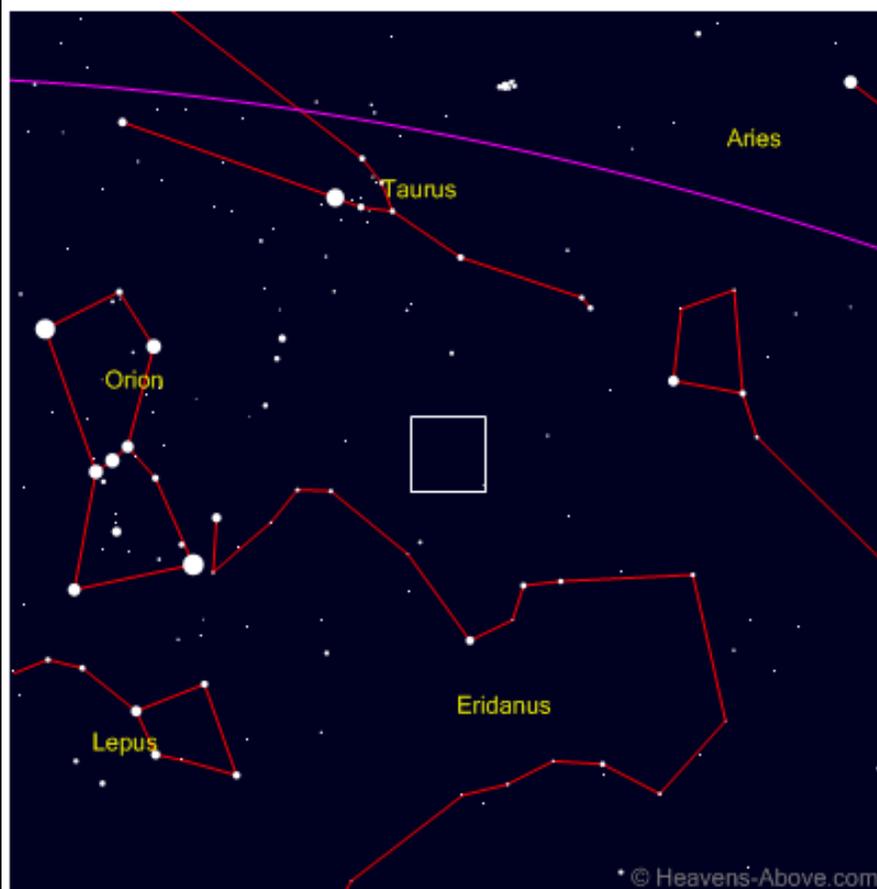
Pluto is in the sky, setting early. It will be almost impossible to see this time of year, from anyplace north of Cherry Springs, but that does not stop the RASC handbook from featuring a detailed path of its motion relative to the stars each year.

3 Juno is in the sky, and in reach of binoculars. It is brighter than Magnitude 8.

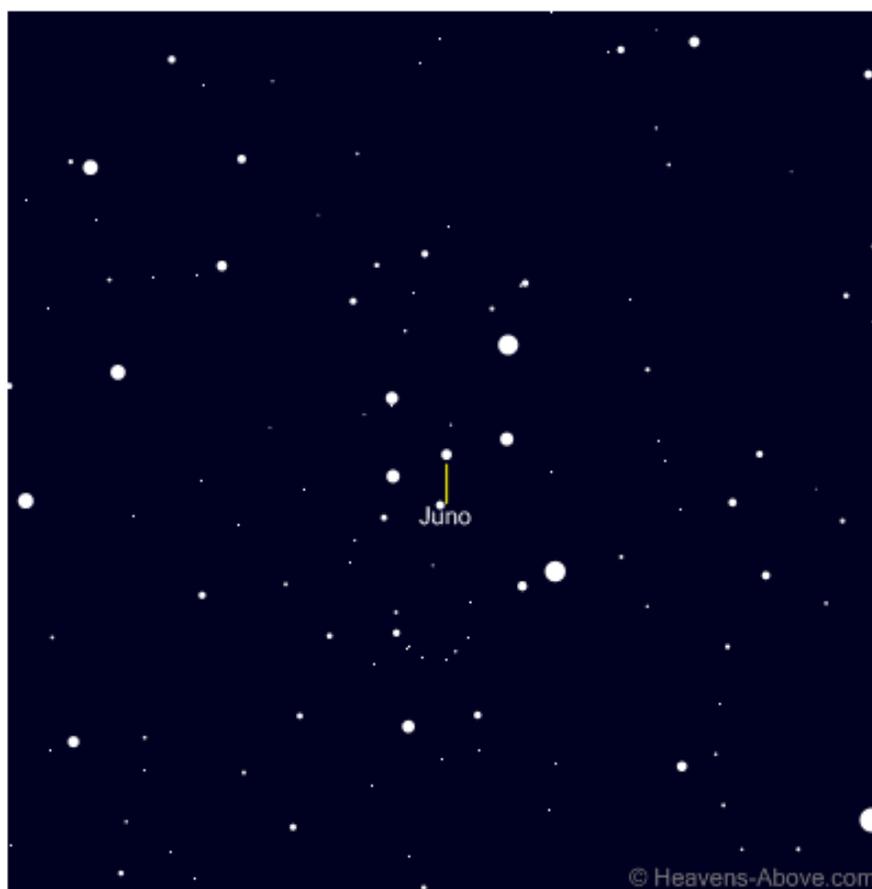
Here's a finder chart for 3 Juno. As usual, I refer you to [Heavens-Above.com](http://Heavens-Above.com) for up to date information.

## Asteroid 3 Juno

Year  Month  Day  Time



Coarse finder chart  
(Field of view=60°, Limiting magnitude=5)



Fine finder chart  
(Field of view=5°, Limiting magnitude=10)

| Position            |                                 |
|---------------------|---------------------------------|
| Right ascension     | 4 <sup>h</sup> 4.0 <sup>m</sup> |
| Declination         | -0° 53'                         |
| Constellation       | <a href="#">Eridanus</a>        |
| Magnitude           | 7.6                             |
| Distance from Earth | 1.061 AU                        |

| Orbit                   |                          |
|-------------------------|--------------------------|
| Distance from Sun       | 1.988 AU                 |
| Perihelion              | 1.983 AU<br>(23/11/2018) |
| Aphelion                | 3.355 AU                 |
| Period                  | 4.36 years               |
| Eccentricity            | 0.256942                 |
| Inclination to ecliptic | 13.0°                    |
| Epoch                   | 27/04/2019               |

(Continued on [page 11](#))

## The Sky This Month for November 2018 (continued)

One thing to note. You need to login to Heavens-above, or the times you put in will be in UTC, such as is shown in the image I grabbed. (It was 10 PM October 31 EDT)

Juno rises before Orion. You can see it all night now.

### New Horizons

The excitement is building for New Horizons' next encounter. Very soon, New Horizons will reach *Ultima Thule*, a few AU past Pluto.

Here is a chart showing where New Horizons is now. Its general direction does not change much, in terms of distance from the nearby bright star.

This link allows you to compute your own chart: <https://theskylive.com/planetarium?obj=newhorizons>

Basically, northeast of Sagittarius.

### New Horizons Sky Charts and Coordinates

This is a simplified sky chart, showing where New Horizons is now with respect to the brightest stars and constellations.

More advanced sky charts are available on TheSkyLive for this object: 1) the [Online Planetarium](#) which is interactive and allows to select dates and additional objects to visualize; and 2) the [Live Position and Data Tracker](#) which provides the highest precision position data and features deep sky imagery from the Digitized Sky Survey.



New Horizons in Sagittarius on November, 1 2018  
High Precision Live Sky Chart

= current altitude  $\geq 30^\circ$  = current altitude  $< 30^\circ$  = below the horizon  
Location: Greenwich, United Kingdom [\[change\]](#)

Right Ascension 19h 03m 38s

Declination  $-20^\circ 41' 11''$

| Su | Mo | Tu | We | Th | Fr | Sa |
|----|----|----|----|----|----|----|
|    |    |    |    | 1  | 2  | 3  |
| 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 |    |

Time: 02 : 53 UTC

Compute Ephemeris

### The Evening Planets

*Saturn* sets after sunset, so you can still get a good view.

*Jupiter* is too close to the Sun to be of much use, but it technically sets after sunset, at 7 PM, so it is also still available.

*Mars* is still prominent in the sky, setting after Midnight. You can easily point it out to a friend in the evening sky. *(Continued on [page 12](#))*

# The Sky This Month for November 2018 (continued)

## The Morning (yawn) Planets

Venus rises at 5 AM for the next while, and is our only morning planet.

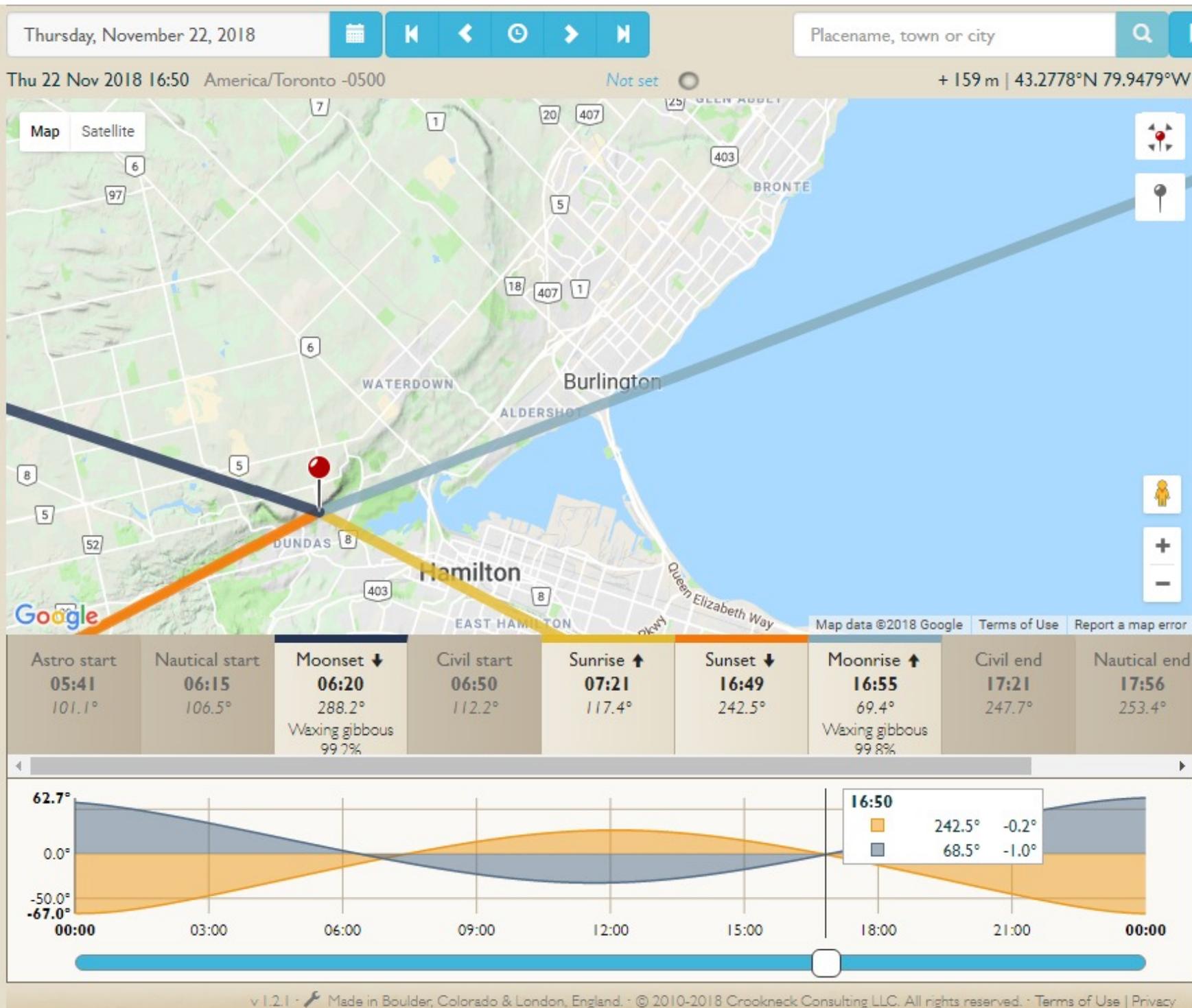
## Moonrise

Moonrise for the November Full Moon is on November 22nd, before 5 PM. So it will not conflict with your evening activities.

This is one of the earliest Full Moon rises of the year. The December moonrise is actually 9 minutes later.

Previously I have been recommending the pier in Burlington, near Brant Street and Lakeshore Road, however, at that time of day, there is no free parking, and that is a factor.

So here's the map for the Sydenham Road Lookout instead:



(Continued on [page 13](#))

## The Sky This Month for November 2018 (continued)

The key detail is the time, 16:55 and the azimuth, 69.4 degrees. With that information you can point a telescope, or telephoto lens on your camera, and be ready. Note that the line at 69.4 degrees is almost directly from Sydenham road lookout to the Burlington pier which is near the hotel at Spencer Smith Park.

Google saw nothing but tree branches there, because they did not stop at the lookout (shame on them), but I can assure you there's a good eastern horizon view from the edge of the lookout.



### RASC Handbooks

I picked up the handbooks and they will be available at the meeting. If you did not pay in advance, please bring \$20 and get yours at the start of our meeting on November 9th. In fact, thanks to pre-sales and post sales, the handbooks are all sold out. If you did not reserve one, there's no extras. But...

There will actually be one handbook in the HAA library which you can borrow in that case. (Members only)

You can still benefit from a prior year copy, which still has a bunch of fine articles on all things astronomy, which don't change from year to year, such as how to select a good pair of binoculars, and how the eye adapts to darkness, to name just two of them.

*I hope you will enjoy intervals of clear skies in November!*



### Treasurer's Report by Ann Tekatch

#### Treasurer's Report for October 2018 (Unaudited)

|                         |            |
|-------------------------|------------|
| Opening balance:        | \$8,763.84 |
| <u>Revenue:</u>         |            |
| Memberships:            | \$530.00   |
| Memberships via PayPal: | \$225.00   |
| 50/50 Draw:             | \$51.00    |
| Donations:              | \$20.00    |
| <u>Expenses:</u>        |            |
| PayPal Fees             | \$9.97     |
| Insurance               | \$1,083.24 |
| Speaker's Honorarium    | \$50.00    |
| Speaker's Dinner        | \$46.06    |
| Closing Balance:        | \$8,400.57 |



### NASA's OSIRIS-REx Probe (Origins, Spectral Interpretation, Resource Identification and Security, Regolith Explorer)

The *OSIRIS-REx* probe was launched September 8, 2016 from Cape Canaveral, FL by an Atlas 5 Rocket. It began a 7-year journey to a nearby asteroid, *Bennu*, to help scientists understand more about the origins of our solar system.

It would take 2 years to arrive at Bennu and is scheduled to do so in December 2018. It will take another 2 years of investigation of the asteroid before it lands on it in July 2020. The Canadian Space Agency's contribution to this investigation is the *OLA (OSIRIS-Rex Laser Altimeter)* which was developed in Canada. It will scan and measure the entire surface to create an accurate 3D model. After this is done, scientists will determine where to land the probe for the collection of samples. A robotic arm will collect up to 60 grams of the surface's fine gravel, dust and rocks (known as regolith). It will then return to Earth with the samples in September of 2023. At that time, only 25% of the samples will be studied by OSIRIS-Rex scientists. The rest will be studied by scientists around the globe and saved for future generations of scientists to study. Canada's Royal Ontario Museum's (ROM) Curator of Mineralogy, Dr. Kim Tait, will be part of the team studying the samples. The ROM was also involved with the development of the OLA by providing meteor samples to be used for practicing with and fine-tune testing of the potential samples.

Dimensions of the OSIRIS-Rex Probe:

Length: 6.2m (20.25 ft) with solar panels deployed

Width: 2.4 m (8ft)

Height: 3.2 m (10.33 ft)

### Why Bennu?

Asteroids are rocky debris left over from the formation of the solar system over 4 billion years ago. They are like cosmic time-capsules containing many materials that are potential precursors to life. (Once an asteroid passes through Earth's atmosphere and lands on Earth, it is called a meteorite.) Bennu is one of about 780,000 asteroids in our solar system and discovered in 1999. It is a primitive type of asteroid and is carbon-rich with other organic elements. It may also contain water locked in its rocks. It is close to Earth and gets closest every 6 years. Its orbit is on the same plane as the Earth's, so it is relatively easy to get to, although the Earth's gravity was necessary to launch it into Bennu's orbit. It's a little smaller than Toronto's CN Tower (553 m) at 510 m in diameter. Asteroids spin on an axis and smaller ones would spin too fast for a probe to land on them, but Bennu is the right size for a probe to land on it.

### Credits:

<https://www.asteroidmission.org/>

<https://www.nasa.gov/subject/6880/bennu/>

*Artist's conception of the OSIRIS-REx spacecraft with robotic arm extended at Bennu. The spacecraft will bring at least a 60 gram sample back to Earth for study.  
Credit: NASA/GSFC.*



*Editor's Note: This from NASA's Space Place:*

*"We have an important update: your monthly article has moved from NASA's Space Place to the NASA Night Sky Network. The monthly article's name has also changed; it is now NASA Night Sky Notes! We look forward to bringing you the highest quality content every month. Per your suggestions, we will be introducing some changes to these articles in the coming months to better serve your audiences."*



**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.org](https://nightsky.jpl.nasa.org) to find local clubs, events, and more!

### November's Dance of the Planets

By Jane Houston Jones and David Prosper

November's crisp autumn skies bring great views of our planetary neighbors. The Moon pairs up with Saturn and Mars in the evenings, and mornings feature eye-catching arrangements with dazzling Venus. Stargazers wanting a challenge can observe a notable opposition by asteroid 3 Juno on the 17<sup>th</sup> and watch for a few bright Leonid meteors.

Red **Mars** gleams high in the southern sky after sunset. **Saturn** sits westward in the constellation Sagittarius. A young crescent Moon passes near Saturn on the 10<sup>th</sup> and 11<sup>th</sup>. On the 15<sup>th</sup> a first quarter Moon skims by Mars, coming within 1 degree of the planet. The red planet receives a new visitor on November 26<sup>th</sup>, when NASA's InSight mission lands and begins its investigation of the planet's interior. News briefings and commentary will be streamed live at: [bit.ly/landsafe](https://bit.ly/landsafe)

Two bright planets hang low over the western horizon after sunset as November begins: **Jupiter** and **Mercury**. They may be hard to see, but binoculars and an unobstructed western horizon will help determined observers spot them right after sunset. Both disappear into the Sun's glare by mid-month.

Early risers are treated to brilliant **Venus** sparkling in the eastern sky before dawn, easily outshining everything except the Sun and Moon. On November 6<sup>th</sup>, find a location with clear view of the eastern horizon to spot Venus next to a thin crescent Moon, making a triangle with the bright star Spica. The following mornings watch Venus move up towards Spica, coming within two degrees of the star by the second full week of November. Venus will be up three hours before sunrise by

*(Continued on [page 16](#))*

## NASA Night Sky Notes (continued)

month's end – a huge change in just weeks! Telescopic observers are treated to a large, 61" wide, yet razor-thin crescent at November's beginning, shrinking to 41" across by the end of the month as its crescent waxes.

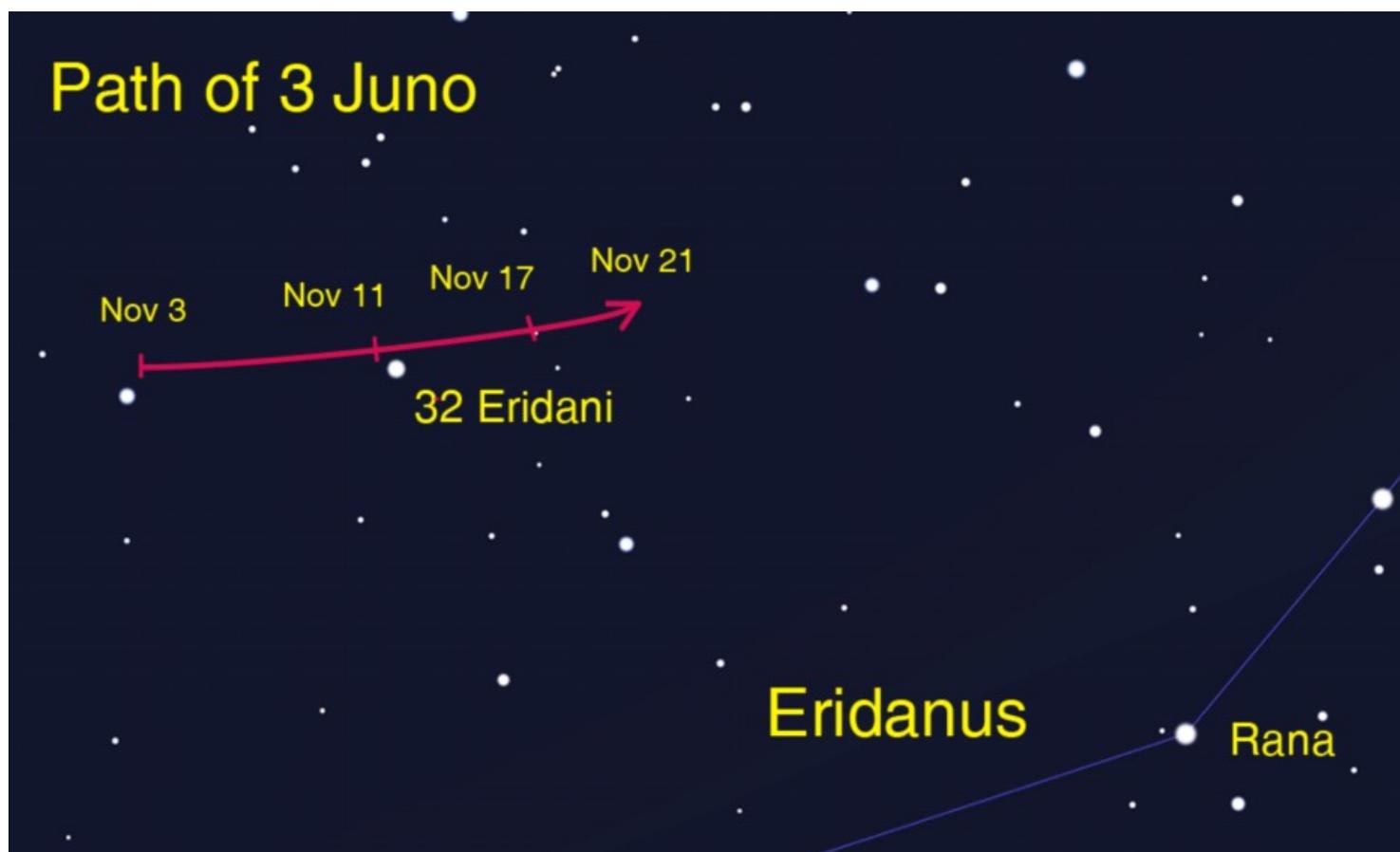
Observers looking for a challenge can hunt asteroid **3 Juno**, so named because it was the third asteroid discovered. Juno travels through the constellation Eridanus and rises in the east after sunset. On November 17<sup>th</sup>, Juno is at opposition and shines at magnitude 7.4, its brightest showing since 1983! Look for Juno near the 4.7 magnitude double star 32 Eridani in the nights leading up to opposition. It is bright enough to spot through binoculars, but still appears as a star-like point of light. If you aren't sure if you have identified Juno, try sketching or photographing its star field, then return to the same area over the next several days to spot its movement.

The **Leonids** are expected to peak on the night of the 17<sup>th</sup> through the morning of the 18<sup>th</sup>. This meteor shower has brought "meteor storms" as recently as 2002, but a storm is not expected this year. All but the brightest meteors will be drowned out by a waxing gibbous Moon.

Stay warm and enjoy this month's dance of the planets!

You can catch up on all of NASA's current and future missions at [nasa.gov](https://nasa.gov)

With articles, activities and games **NASA Space Place** encourages everyone to get excited about science and technology. Visit [spaceplace.nasa.gov](https://spaceplace.nasa.gov) to explore space and Earth science!



*This finder chart shows the path of the asteroid 3 Juno as it glides past 32 Eridani in November 2018. The asteroid's position is highlighted for selected dates, including its opposition on the 17th. Image created in Stellarium for NASA Night Sky Network.*



**The California Nebula (NGC 1499) in Perseus, by Peter Wolsley**

Taken October 8, 2018 from Sauble Beach, ON.

Peter used his Ha-modified Nikon D5300, through his Skywatcher 80mm refractor with a 0.85 reducer.  
Stack of twelve 4-minute exposures at ISO 800.



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[www.physics.mcmaster.ca/planetarium](http://www.physics.mcmaster.ca/planetarium)

## UPCOMING EVENTS

**November 9, 2018 - 7:30 pm** – *HAA Meeting* at the Hamilton Spectator Auditorium. This is the 25th anniversary of the first meeting of the HAA. Speakers: *Ann Tekatch* gives a brief History of the HAA, *Steve Germann*, with *The Sky This Month*, and *John Gauvreau*, with a talk entitled ‘25 Cents Worth of Astronomy’. Everyone welcome.

**November 16, 2018 - 6:00 pm - 10:00 pm** – *Fall Telescope Clinic* at the Hamilton Spectator Auditorium. Doors open at 6pm, workshops begin at 7pm. Everyone welcome.

**December 14, 2018 - 7:30 pm** – *HAA Meeting* at the Hamilton Spectator Auditorium. Everyone welcome.

### 2018-2019 Council

Check out the H.A.A. Website  
[www.amateurastronomy.org](http://www.amateurastronomy.org)

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