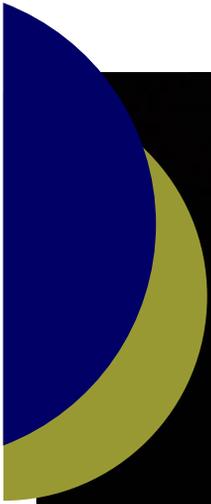


Orbit



The Official Publication of The Hamilton Centre,
Royal Astronomical Society of Canada
Volume 51, Issue 4: February, 2019

Issue Number 4, February, 2019

Roger Hill, Editor

Okay...it's cloudy tonight, which is odd. Last month I mentioned that it was clear the night I was writing, and I was annoyed because I had some more work to do on my mount. I did, however, have a couple of clear-ish evenings to do some work on it before last month's Lunar Eclipse.

You see, I LOVE eclipses. It doesn't really matter what type, either, partial or total, lunar or solar, I'll take a lot of time, and a lot of effort, to observe one. I don't know what it is, either, that holds me in thrall. Perhaps unlike so many other astronomical events, an eclipse is when you can see, in a visceral sense, the motions of celestial bodies. There's the drama, too. I certainly wouldn't travel for thousands of kilometers to view a lunar eclipse, but a total solar one? that's a different thing altogether.

By comparison, Lunar eclipses are stately affairs. The events occurring at a slower pace give you time to contemplate what you're seeing.

You also get to try different things, too. Whether it's relaxing in the backyard doing crater timings (does anyone do this, anymore?), or photographing it with different exposures to bring out different parts of the Earth's shadow. Also, taking a regular series of pictures to string together into a movie, or arranging your images to show the shape of the Earth's shadow.

I'd tried making a movie before. It was actually good enough to be shown on a background TV in a Canadian TV show that was set on the night of a lunar eclipse. Normally to do this, you either hope that your polar alignment is good enough, or you guide on a star.

I wanted something slightly different, though. I wanted to track the centre of the Earth's shadow, and therefore show the Moon moving through it. I thought that the effect would be much better if the shadow itself did not move. In other words, it had to track the anti-Sun...have the telescope move at a rate of 360 degrees in 24 hours, and not 23 hours and 56-ish minutes. There are a number of different rates built in to many telescopes, from Sidereal, to Lunar, to King and Solar. Few mounts, though allow you to track at a Solar rate. After all, it's close to sidereal...it's off by one part in 365.24. However, during the several hours that the Moon would spend in the Umbra, it would be noticeable.

The new mount, though, does have a solar rate, and it worked very well, but not perfectly. Again, one of those differences between a fork mount and a German Equatorial conspired to defeat me, and it wasn't just the need for a meridian flip, either. The problem was orienting the camera in such a way as to have the Moon travel across the width of the sensor. In a fork mount it's easy...when the scope is pointing Due South, the camera will be perfectly horizontal, with the camera above the base of the mount. I got it wrong with my new mount, and it took me some time figure out why the moon was moving down, and not across, the sensor. All this means that I should have this perfected by the time I'll next get a chance to photograph one.

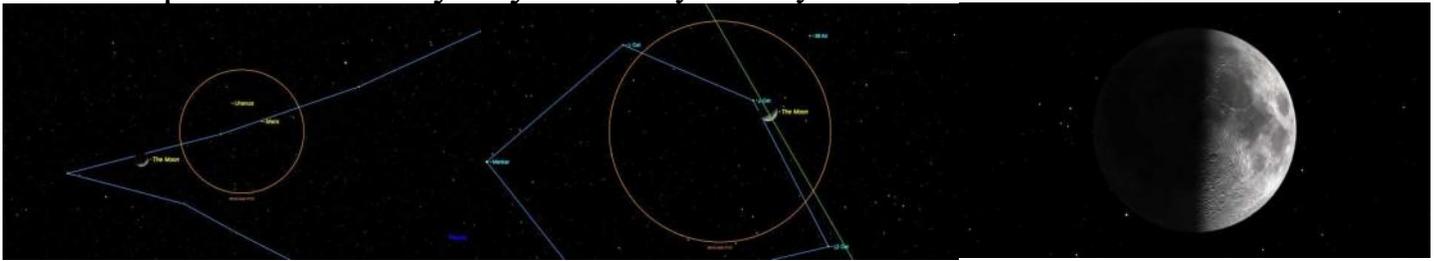
I've also figured out a way to avoid the meridian flip, too, but I want to test that before I say anything.

See you in the dark,

Roger

Front cover image **comes from Scott Barrie.**

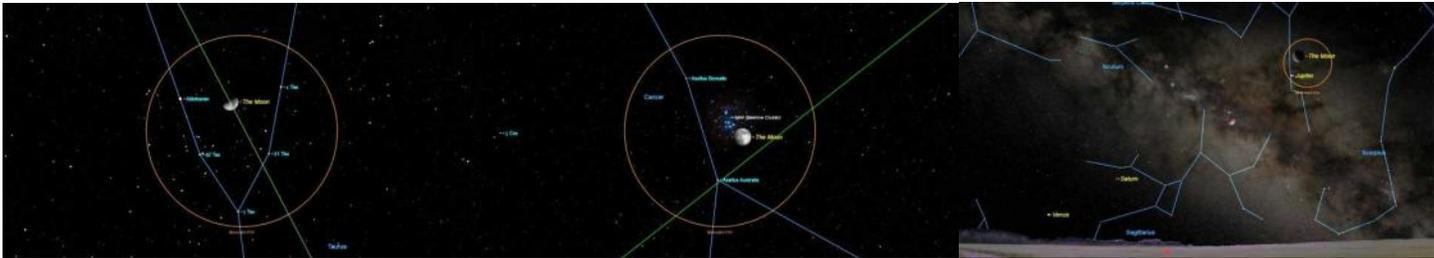
What's up in the February Sky from Troy McCoy



Sunday, February 10 evening – Young Moon Passes Mars and Uranus. In the western evening sky, the waxing crescent moon will pass approximately 5 degrees to the south of Mars and Uranus. Reddish Mars will be visible to the naked eye, but much more distant Uranus, 1.6 degrees to Mars' upper left, will require binoculars or a telescope.

Monday, February 11 evening – Lunar occultation. The moon will occult naked-eye star Mu Ceti. Near Hamilton, the dark edge of the moon will cover the star at about 8:24 p.m. ET. The star reappear about an hour later. Timings vary with latitude, so find the star near the moon well ahead of time and watch their separation shrink. Exact times for your location can be obtained from Starry Night and other planetarium software.

Tuesday, February 12 at 5:26 p.m. EST - First Quarter Moon. At first quarter, the relative positions of the Earth, sun, and moon cause us to see the moon half illuminated. Sunlight at a shallow angle produces spectacularly illuminated landscapes along the terminator. The term quarter moon refers not to its appearance, but the fact that our natural satellite has now completed the first quarter of its orbit around Earth since the last new moon.



Wednesday, February 13 evening - Moon Crosses the Bull. On the evening of Wednesday, February 13, the waxing gibbous moon's orbit (green line) will carry it directly through the triangular grouping of stars that make up the face of Taurus, the bull. In late evening, the moon will pass within a finger's width of the bright reddish star Aldebaran, which marks the bull's southerly eye.

High in the southeastern sky on the evening of Sunday, February 17, the nearly full moon will skim the southerly edge of The Beehive (M44) in Cancer. The moon and the cluster will both fit within the field of view of binoculars (orange circle) or a low magnification telescope. The moon's brilliance will mostly overwhelm the clusters' stars. These encounters occur frequently because the cluster is only a degree north of the ecliptic (green line).

Wednesday, February 27 pre-dawn – Waning Moon meets Jupiter. The waning last quarter moon will sit 2 degrees to the upper right of Jupiter. Both will fit into the field of view of binoculars and telescopes at low magnification (orange circle). Observers in western North America and the Pacific region will see the moon when it is closer to Jupiter. Saturn and Venus will be visible approximately 30 degrees (three fist diameters) to their lower left.



Mercury will re-appear in the western evening sky after February 11. It will brighten and grow in apparent disk diameter while it climbs higher, swinging away from the sun until it reaches greatest elongation east on February 26. With Mercury sitting above a nearly vertical evening ecliptic during the last week of February, this will be the best appearance of the planet in 2019 for Northern Hemisphere observers, with the optimal viewing times between 6:15 and 7:15 p.m. local time

Very bright **Jupiter** will shine in the eastern pre-dawn sky during February, slowly climbing away from the sun while moving eastward through southern Ophiuchus. By month end, it will be rising at around 2:30 a.m. local time, but it won't rise before midnight until late April. Jupiter will grow slightly brighter and larger in telescopes as Earth slowly draws closer to it ahead of this spring's opposition. On February 27, the waning last quarter moon will sit 2 degrees to the upper right of Jupiter. Both objects will fit into the field of view of binoculars and telescopes at low magnification.

Saturn will be observable in the southeastern pre-dawn sky during February, although it will become easier to see later in the month. It will appear as a yellowish, visual magnitude 0.6 object moving eastward through the stars of Sagittarius while it climbs farther from the sun. The mornings surrounding February 18 will see rapidly descending Venus pass very close to Saturn. At closest approach extremely bright, white Venus will be located 1 degree above, and slightly to the left of, dimmer, yellowish Saturn – placing both planets within the field of view of a backyard telescope.

Venus will spend February in the east-southeastern pre-dawn sky, swinging eastward towards the sun. During the month, the planet will slowly decrease in brightness and apparent disk size while its illuminated phase grows slightly. From February 3 to February 11, Venus's orbit will take it through the Milky Way and close to some well-known deep sky objects, setting up nice pairings in binoculars or telescopes at low magnification. On Sunday, February 3, the planet will pass 2 degrees to the lower right (south) of the open star cluster designated Messier 23. On Monday, February 4, Venus will pass 2 degrees above (north of) the Trifid Nebula (Messier 20) and the Messier 21 open cluster. On Thursday, February 7, Venus will pass 2 degrees to the lower right of (below) the Sagittarius Star Cloud (Messier 24). On Monday, February 11, the planet will cross between the open cluster designated Messier 22 and the globular cluster designated Messier 25. On February 18, extremely bright, white Venus will be located 1 degree above, and slightly to the left of, dimmer, yellowish Saturn – placing both planets within the field of view of a backyard telescope.

Blue-green **Uranus** will be available for observing in the southwestern early evening sky. At visual magnitude 5.8, Uranus is bright enough to observe in binoculars under dark sky conditions. On February 5, it will move from Pisces into southwestern Aries. On the evenings surrounding February 12, Mars' faster eastward orbital motion will carry it close past Uranus on the northern (higher) side. At their smallest separation of only 1 degree, the red and blue planets will appear together in the eyepiece of a backyard telescope at low magnification.

Blue-tinted **Neptune** will spend February located about 3 degrees east of the star Lambda Aquarii in Aquarius. With a visual magnitude of 8.0, the distant planet will only be observable with telescopes during early evening for about the first two weeks of February. After that, it will rapidly descend into the western twilight.

Monthly Sky watching information is provided by Chris Vaughn of Starry Night Education. Chris is a member of the Toronto Centre of the RASC. Follow Starry Night on Twitter @starrynightedu and Chris at @astrogoegy

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs dedicated to astronomy outreach. Visit night-sky.jpl.nasa.org to find local clubs, events, and more!



Hexagon at Night, Quartet in the Morning by David Prosper

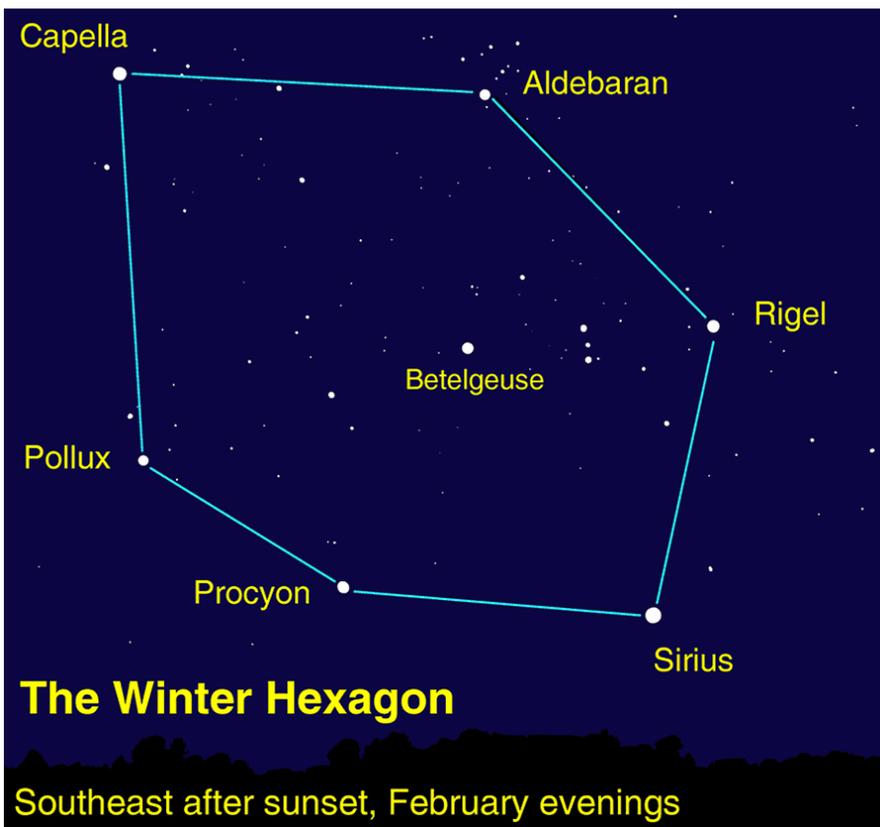
The stars that make up the Winter Hexagon asterism are some of the brightest in the night sky and February evenings are a great time to enjoy their sparkly splendor. The Winter Hexagon is so large in size that the six stars that make up its points are also the brightest members of six different constellations, making the Hexagon a great starting point for learning the winter sky. Find the Hexagon by looking southeast after sunset and finding the bright red star that forms the “left shoulder” of the constellation Orion: Betelgeuse. You can think of Betelgeuse as the center of a large irregular clock, with the Winter Hexagon stars as the clock’s hour numbers. Move diagonally across Orion to spot its “right foot,” the bright star Rigel. Now move clockwise from Rigel to the brightest star in the night sky: Sirius in Canis Major. Continue ticking along clockwise to Procyon in Canis Minor and then towards Pollux, the brighter of the Gemini twins. Keep moving around the circuit to find Capella in Auriga, and finish at orange Aldebaran, the “eye” of the V-shaped face of Taurus the Bull.

Two naked-eye planets are visible in the evening sky this month. As red Mars moves across Pisces, NASA’s InSight Mission is readying its suite of geological instruments designed to study the Martian interior. InSight and the rest of humanity’s robotic Martian emissaries will soon be joined by the Mars 2020 rover. The SUV-sized robot is slated to launch next year on a mission to study the possibility of past life on the red planet. A conjunction between Mars and Uranus on February 13 will be a treat for telescopic observers. Mars will pass a little over a degree away from Uranus and larger magnifications will allow comparisons between the small red disc of dusty Mars with the smaller and much more distant blue-green disc of ice giant Uranus.

Speedy Mercury has a good showing this month and makes its highest appearance in the evening on February 27; spot it above the western horizon at sunset. An unobstructed western view and binoculars will greatly help in catching Mercury against the glow of evening twilight.

The morning planets put on quite a show in February. Look for the bright planets Venus, Jupiter, and Saturn above the eastern horizon all month, at times forming a neat lineup. A crescent Moon makes a stunning addition on the mornings of February 1-2, and again on the 28th. Watch over the course of the month as Venus travels from its position above Jupiter to below dimmer Saturn. Venus and Saturn will be in close conjunction on the 18th; see if you can fit both planets into the same telescopic field of view. A telescope reveals the brilliant thin crescent phase of Venus waxing into a wide gibbous phase as the planet passes around the other side of our Sun. The Night Sky Network has a simple activity that helps explain the nature of both Venus and Mercury’s phases at bit.ly/venusphases

You can catch up on all of NASA’s current and future missions at nasa.gov



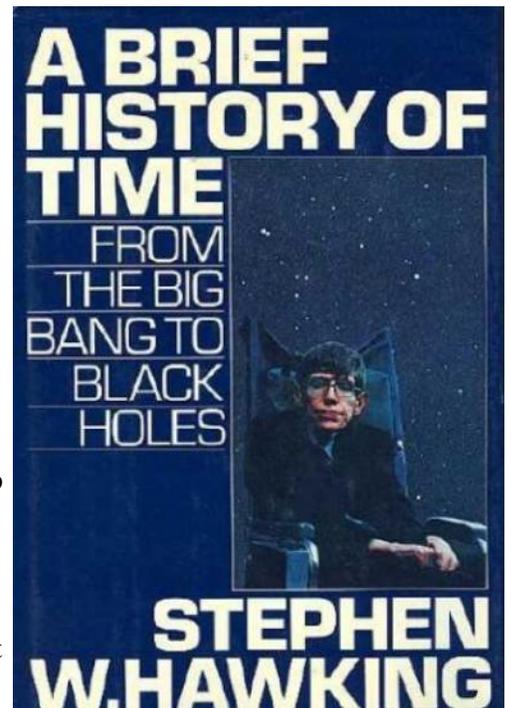
Remembering the Classics

Abigail Hughes reviews *A Brief History of Time* by Stephen W. Hawking

A Brief History of Time: From the Big Bang to Black Holes. Pages 198. Bantam Books, 1988. ISBN 0-553-05340-X. \$18 at Indigo.ca.

In literary history, there are countless classic books, either by author or title, that if not read, are at least familiar to most people. Authors such as Charles Dickens, Mark Twain, William Shakespeare, Emily Dickenson, the brothers Grimm, all beloved for their writings. More often than not, non-fiction is overlooked in classic literature due to the ever-changing nature of knowledge and facts within the subject. However, Stephen Hawking has managed to transcend the precedent of fame in literature. One of the books that contributed to Hawking's public infamy is the one that I have chosen to review, *A Brief History of Time*.

This book, I would say, is worthy of its place in literary, science, and cultural history. Hawking was one of the first scientists to try and make complex theories of the universe understandable to everyone. In the book, Hawking states up front that he will only use one equation in the entire book. The choice to only use one equation arises because an unknown source told him that "each equation [he] included in the book would halve the sales" (vi). As a result, the only equation called out by name is Einstein's famous $E=mc^2$. There are hints and nods to other famous equations such as Newton's $F=ma$ or Kepler's $P^2=a^3$, but none are directly called to except Einstein's. What is phenomenal is the fact that Hawking is able to discuss incredibly complicated ideas, some which were in their early stages, without the use of math. Hawking is also able to explain these concepts briefly, keeping the book concise but inclusive and informative of the more nuanced topics in astrophysics.



One of my favourite parts of Hawking's writing is how clear his sense of humour comes across. His writing flawlessly transitions from the explanation of complex theories to humorous anecdotes. Sprinkled through the book are the personal stories and experiences that Hawking had relating to the development, change, or debunking of a variety of theories. By writing in this manner, Hawking humanizes the heroes in physics and their research. A legend in and of himself, he never strays from the fact that the real hero in astronomy is the universe.

One part of Hawking's writing that I found fascinating is the smattering of religion throughout the book. Hawking was, as they say, a devout atheist, so his inclusion of God within the pages was an interesting choice. After knowing a little bit about Hawking's personal life, the insertion of God within the book is indicative of his relationship with his first wife, Jane, at the time of writing.

Despite the amount of time that has passed since the writing of this book, and the amount of knowledge that has been gained by mankind, I stand by that *A Brief History of Time* is well worth the read. At no point does Hawking "talk down" to the reader nor does he make it simple enough to bore a more educated audience. With the mastery of his subject, Hawking truly has earned his place as one of the great geniuses through all of humankind.

To all the readers,

Although I am far from short of reading materials to cover for the monthly reviews, some help in narrowing down the selection would be appreciated. I would love to receive feedback regarding what books or specific topics you would like to see reviewed. Club members are also welcomed to write their own reviews and submit them for publication in Orbit and on the club's website. All comments, questions, concerns, or submissions can be sent to library@hamiltonrasc.ca.

Observatory Night—Friday, January 18/Sunday 20, 2019

Due to a number of issues, I had to cancel this night a couple of days ahead of time. No-one yelled at me, so I can only presume that no-one was massively inconvenienced.

Instead, what I offered to do was to go to the Hamilton Centre Observatory well before the start of the lunar eclipse on Sunday the 20th, and anyone who wanted help with viewing the eclipse could come early. So, the gates opened at 7:30, the heaters were turned on, and I got my cold weather gear ready.

And then I tried to get the observatory roof open. Due to the cold and the recently deposited snow, though, I suspect there were some rock-like chunks of frozen water stuck to the rails. The cordless drill was not sufficiently strong enough to open the roof. So, I took the drill and put it on one of the heaters, hoping that a warm battery would have enough power to be able to either finish opening the roof, or enough to close it once I'd given up.

When Abigail Hughes arrived, she noticed the drill on the baseboard heater, but didn't immediately say anything. The warmed up battery made little difference, though. Fortunately, years ago, I'd taken up a big 120V drill, and it was still there.

Using it, I was able to get the roof open another couple of feet, nearly breaking my wrists in the process when the roof stopped moving and that torque had to go into rotating something, or someONE. We managed to get the roof closed, though, and hooked down.

Abigail and I waited until about 9pm, and headed our separate ways when no-one else showed up.

An image from Jeff Booth via The Forum

Messier 42 -- otherwise known as the Great Orion Nebula -- is a winter favourite for skywatchers.

It offers a remarkably stunning and detailed nebula that is easily visible with the naked eye - and which offers even more to modest optics.

However, it can be a torment for astrophotography, in that its core is dazzlingly brilliant and is regularly "burned out" ... overexposed to the point where detail in that brilliant region is impossible to see.

Certainly, there are way to mitigate this problem -- it only involves work ...

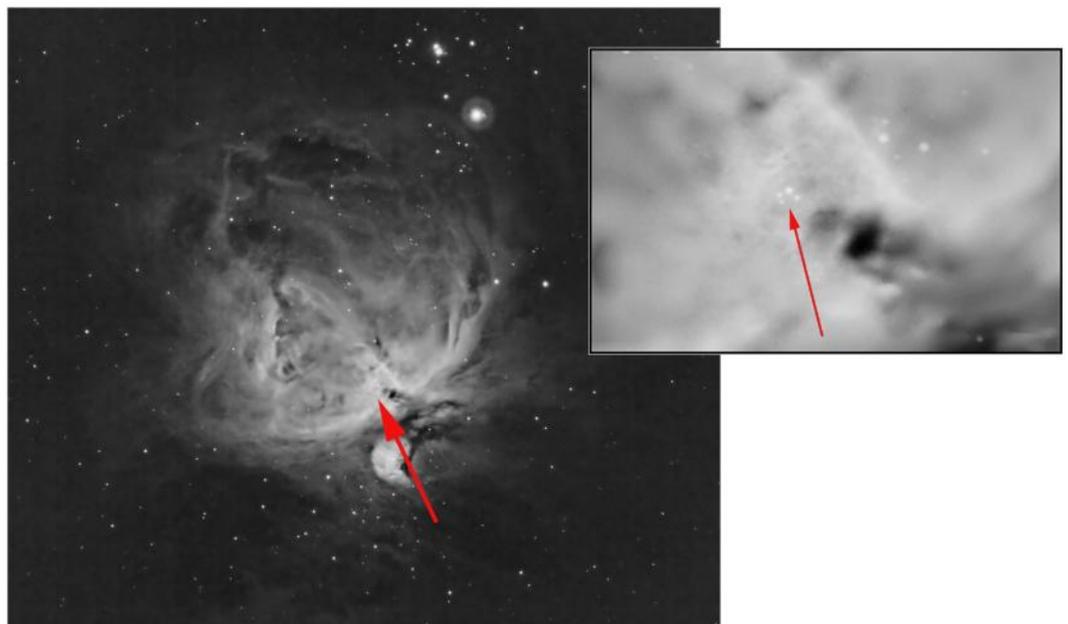
While testing some gear a few weeks ago, I also performed a test of a wide variety of exposures ... some overexposed, some just right, some underexposed ...

knowing that some would gather faint data, while others would gather only the brightest. Let the processing sort them out *(which is where the work is, believe me...)*.

The attached image is merely a TEST ONLY of the *concept* of bracketing exposures ... sets of 1s, 5s, 10, 60s ... in Ha, processed in PixInsight.

As a test, I am delighted with the result. Why? because if you look into the core of the nebula you can see the very-hard-to-image set of four stars known as the Trapezium.

This set of stars is an exciting place in the cosmos.



The following motion was presented to the Board at the meeting held on January, 16, 2019.

A MOTION TO DESIGNATE

Whereas:

The RASC Hamilton Centre conducts frequent Public Outreach events at various times of the year, in order to continue to fulfil its mandate of generating interest and disseminating knowledge about astronomy within the General Public. And;

Whereas:

The Hamilton Centre would wish to further include more of the younger generation in its membership. And;

Whereas:

Great interest has been noted by children at Public Outreach events over the past two Hallowe'en seasons, in the concept of a 'Hallowe'en Star' - as narrated by certain Hamilton Centre members attending and conducting these functions - in particular during the Hallowe'en Season. And;

Whereas:

As the star ALGOL is most suitably seen to fit the description, both physically, historically and visually, of a star which has for a great many generations evoked mystery and interest in people and does indeed continue to elicit interest, due to it's suitably located astronomical position in the night-sky, its time of year appearance, and the intriguing nature of it variable brightenings and dimmings. And;

Therefore;

Let it be known henceforth that the star commonly known as ALGOL, otherwise known as Beta Persei, 26 Persei, HD19356, HIP14576, HR936, the 'demon star', the head of the ogre &etc, located in the Constellation of Perseus, Epoch 2000; at Right Ascension 03h 08m 10.13245s, and Declination +40° 57' 20.3280", of Apparent variable magnitude 2.12 to 3.39, be henceforth adopted, designated and otherwise referred to as the 'HALLOWE'EN STAR' - both within and without the RASC Hamilton Centre, for the purposes of generating intrigue and recreational interest for younger children, in particular at Public Outreach events.

Furthermore;

Upon adoption of this motion, the Hamilton Centre therefore claims the Rights of Origin for the naming of Algol as the Hallowe'en Star, but not for any proprietary ownership of the term. If any other RASC Centre or similar astronomical organization, club, or an individual, wishes to adopt the said named star (ALGOL) as the Hallowe'en Star, they shall be allowed do so without fear of legal, monetary, social, scientific or other penalty.

Dated: January 16, 2019

Moved by: Mr. Eric Golding (RASC, Hamilton Centre Councillor 2018-19)

Seconded by: Mr. Roger Hill

Please note that the MOTION was UNANIMOUSLY CARRIED.

APPENDIX

Reference Information:

Burnham's Celestial Handbook Vol 3, pg 1409; S&T Pocket Sky Atlas - Chart 2 & 13; Wikipedia.

Algol names: Algol, Beta Persei, 26 Persei, HD19356, HIP14576, HR936

Algol's star type

Eclipsing main sequence star that can be located in the constellation of Perseus. ...

Algol is a main star of the constellation outline.

Based on the spectral type (B8V) of the star, the star's colour is blue .

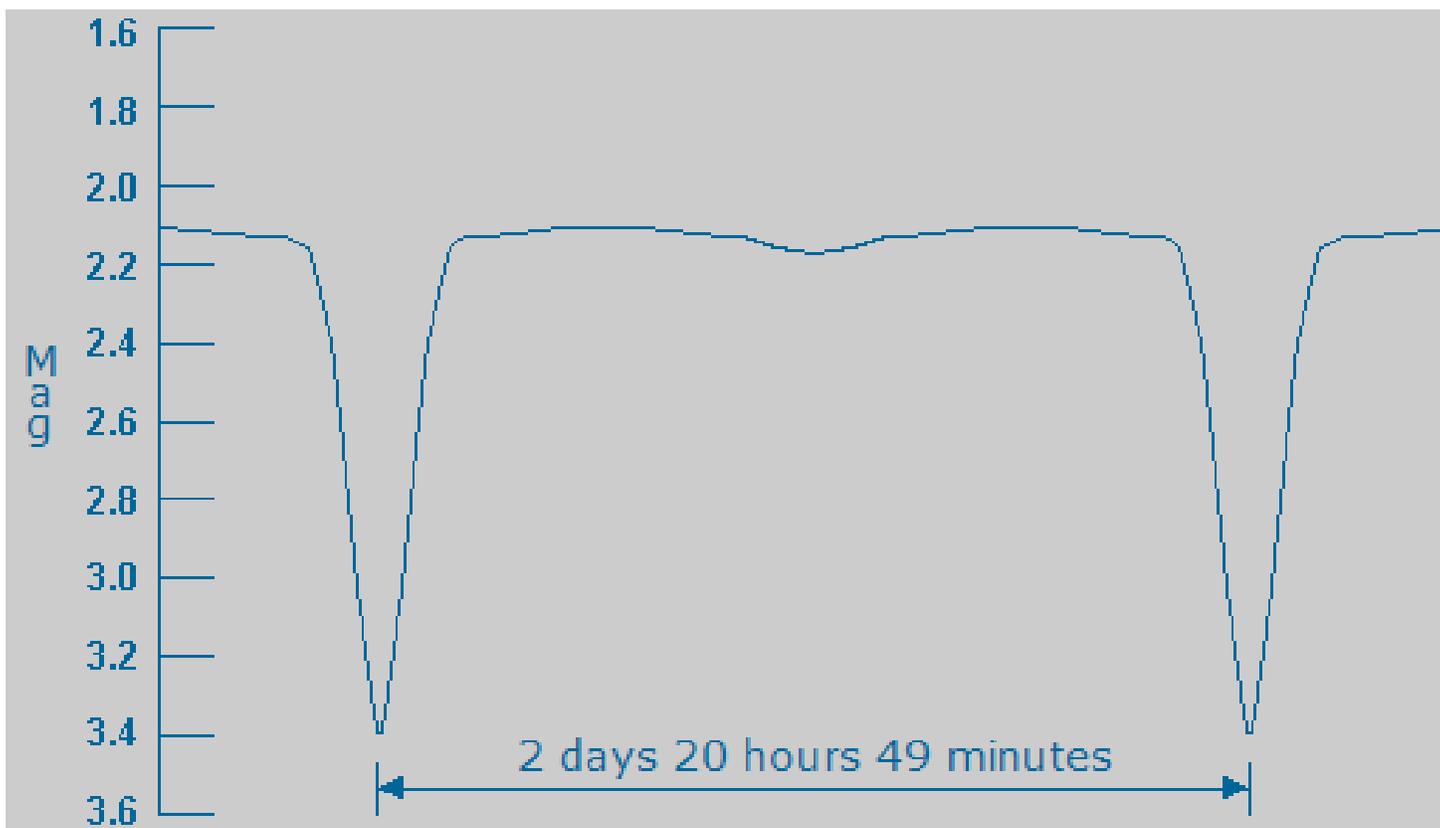
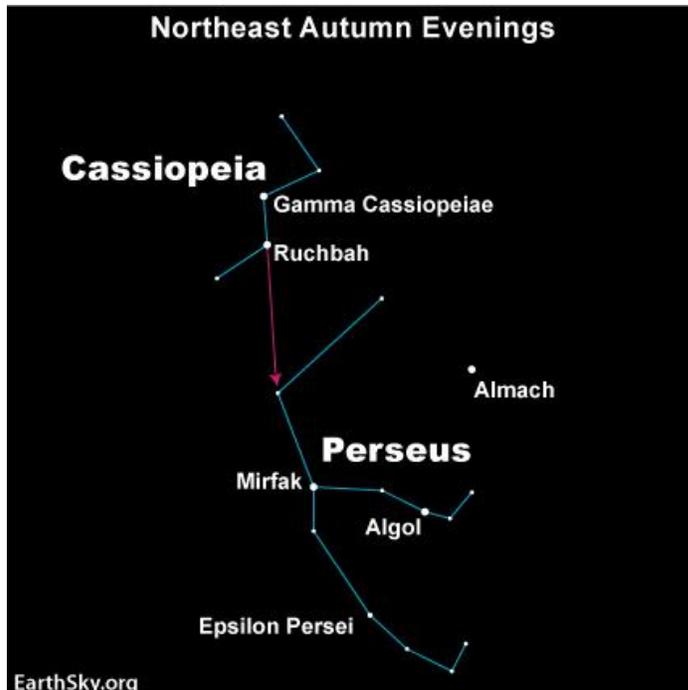
Beta Persei is the Bayer name for the star

Algol (/ˈælgəl, -gəl/), designated Beta Persei (β Persei, abbreviated Beta Per, β Per), known colloquially as the Demon Star, is a bright multiple star in the constellation of Perseus and one of the first non-nova variable stars to be discovered.

Algol is a three-star system, consisting of Beta Persei Aa1, Aa2, and Ab - in which the hot luminous primary β Persei Aa1 and the larger, but cooler and fainter, β Persei Aa2 regularly pass in front of each-other causing eclipses. Thus Algol's magnitude is usually near-constant at 2.1, but regularly dips to 3.4

every 2.86 days during the roughly 10-hour-long partial eclipses. The secondary eclipse when the brighter primary star occults the fainter secondary is very shallow and can only be detected photoelectrically.[9]

Algol gives its name to its class of eclipsing variable, known as Algol variables.



Monthly Meeting – January 6, 2019 from Abigail Hughes

The January 2019 monthly meeting took place on the 6th and started at 8:10pm. With one of the largest audiences for the club, the meeting was attended by approximately 50 people. The meeting was kicked off with a membership update from Bob Procuik. Three new members had joined the club since the previous month. Then, the new membership certificates were handed out to members celebrating 3 years with the Hamilton branch.

After the membership portion of the evening, I briefly discussed the events the club was hosting over three days on behalf of 100 Hours of Astronomy. Roger followed by briefly talking about the Heavy METUL night which was postponed one week for the month of January. Muhammad then talked about the lunar eclipse phases, timing, and altitude for viewing.

Subsequently, Muhammad launched the newest portion of the monthly meetings, the Astrophotography Contest. Members send in their photos which are then posted on the forum anonymously. The top images from the two categories are then shared during the meeting for the attendees to vote on. The final winner in each category wins a gift card. Category 1 was reserved for beginner astrophotography and the winner won with 32 votes, and in the second category, the winner won by a landslide.

Next, Muhammad talked about the RASC telescope and Mark Smith officially announced the launch of CAPS 2019. Muhammad briefly reminded people about the club library and social media account and then mentioned how he had a message beamed to New Horizons on behalf of RASC Hamilton. Housekeeping was completed at 8:28pm for a brief break.



At 8:39pm, Muhammad introduced the guest speaker of the evening, Dr. Ian Shelton.

Dr. Shelton is an honorary lifetime member of RASC, was the first to observe SN1987A, and is the chair of David Dunlap Defenders.

The presentation for the evening was focused around Man's drive and determination to land on the Moon – the space race during the Cold War. With unparalleled enthusiasm and excitement, Dr. Ian Shelton took us on a tour of the feats and accomplishments that resulted in Neil Armstrong and Buzz Aldrin walking on the moon and so much more.



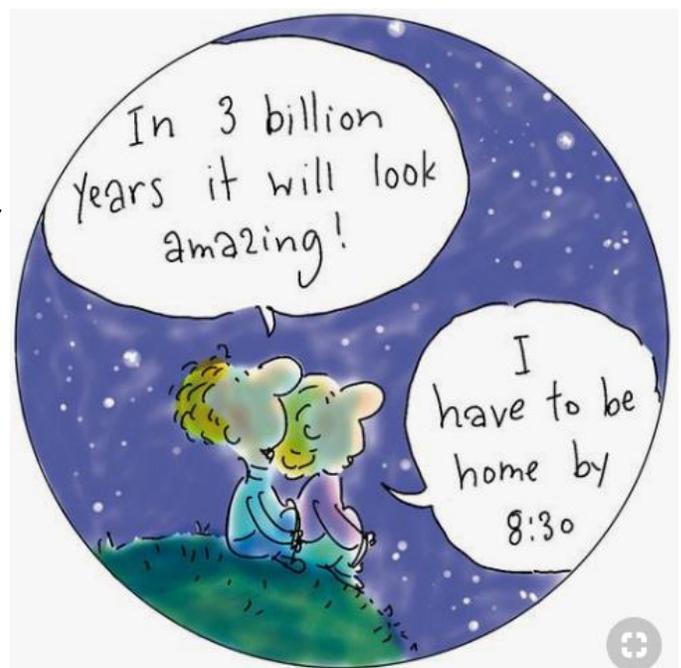
Shelton talked about the many successes, and the many failures, that drove the space race forward. The American's inability to beat the Russians to be the first in space, first to orbit the Earth, first to land vehicles onto the Moon. Basically, the Russians beat the American's at every stage except the Moonwalk. He talked about the unspoken hurdles that nearly caused Apollo 11 to cancel their Moon landing and the technological limitations of the time that make the accomplishments even more amazing. Shelton ended his presentation by looking toward the present and future of space exploration. The meeting was brought to a close at 10:17pm.

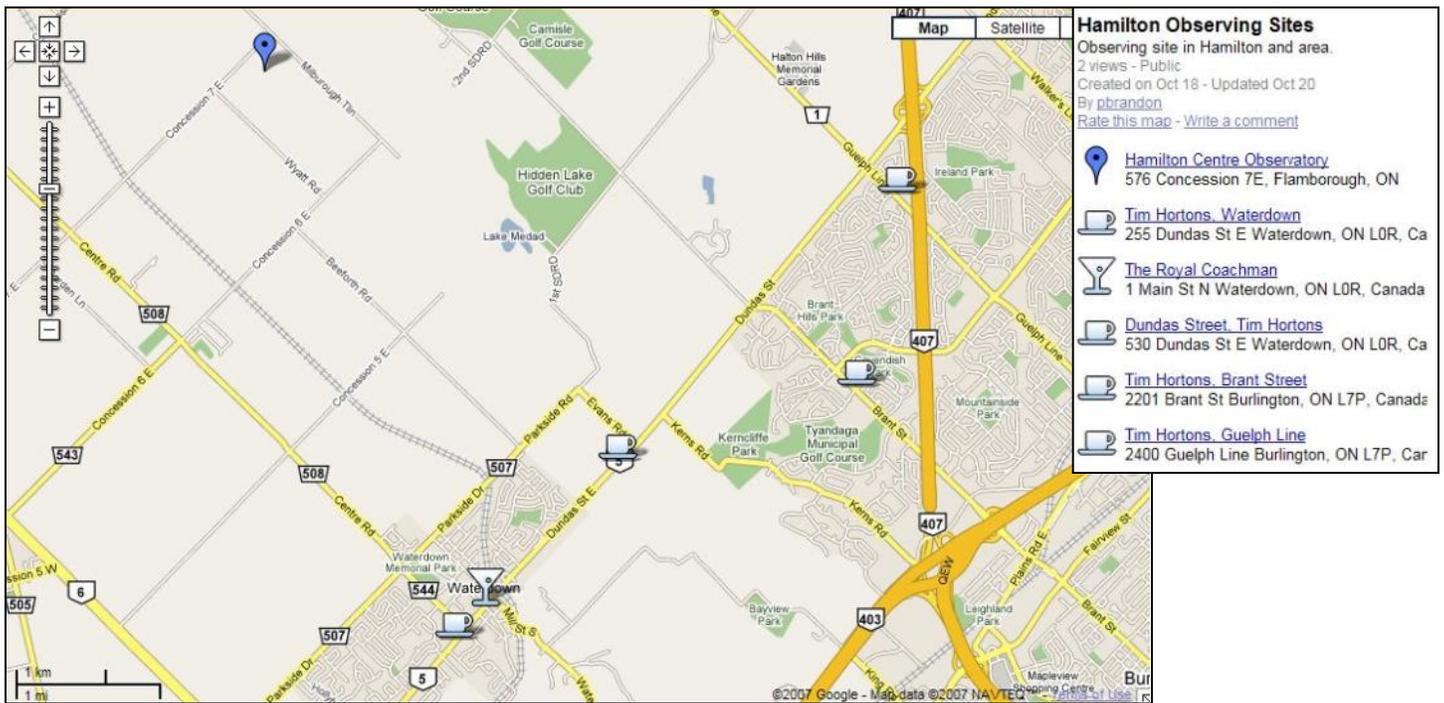
The problems of being a young astronomer: A recollection from Roger Hill

When I was about 12 years old, I found Saturn for the first time with my little 4" reflector. It was about 9:30pm on a Friday evening, and I went running next door to where my best friend, Alan, lived. His mother informed me that he was in bed, asleep. As I should be.

But, I replied...it's Saturn!

Alan didn't see the ringed planet until the next clear night, a few days later.





576 Concession 7 East, Flamborough ON
 N43° 23' 27" W79° 55' 20"
**RASC Hamilton, P.O. Box 969,
 Waterdown, Ontario L0R 2H0**

Email: hamiltonrasc@hamiltonrasc.ca
 Facebook: RASC Hamilton Centre - Amateur Astronomy Club
 Or fb.me/RASCHamilton
 Forum: <http://hamiltonrasc.ca/forum/index.php>
 Website: WWW.HamiltonRASC.ca
 Twitter: @RASCHamilton

President	Muhammad Ahmad	Orbit Editor, Observing Director	Roger Hill
Vice President	Bob Prociuk	Outreach	Abigail Hughes
Recording Secretary	Erin Vassair	Councillor	Eric Golding
Treasurer	Bill Leggit	Councillor	Bob Speck

Prior to the Lunar eclipse, Jeff Booth managed to capture the ISS crossing the Moon.

To the right, is a screen capture of what to do to see if via YouTube, and you can find the link below. Well done Jeff!

The space station passes just after halfway through the video, when you hear the crunching of footsteps on the -17C snow.
 If you can't see it, click the **SPROCKET/GEAR** icon on your YouTube video ... then **QUALITY** then **720**.
 That should do it.

<https://www.youtube.com/watch?v=UHSF88XZLQI>

If you want to try this soft of thing yourself, Jeff suggests that you check out <http://transit-finder.com/results> .



International Space Station crosses full moon
 Private

Two great pictures from the Lunar eclipse. The top one is from Scott Barrie, and the one below is from Jeff Booth.

Enjoy!

