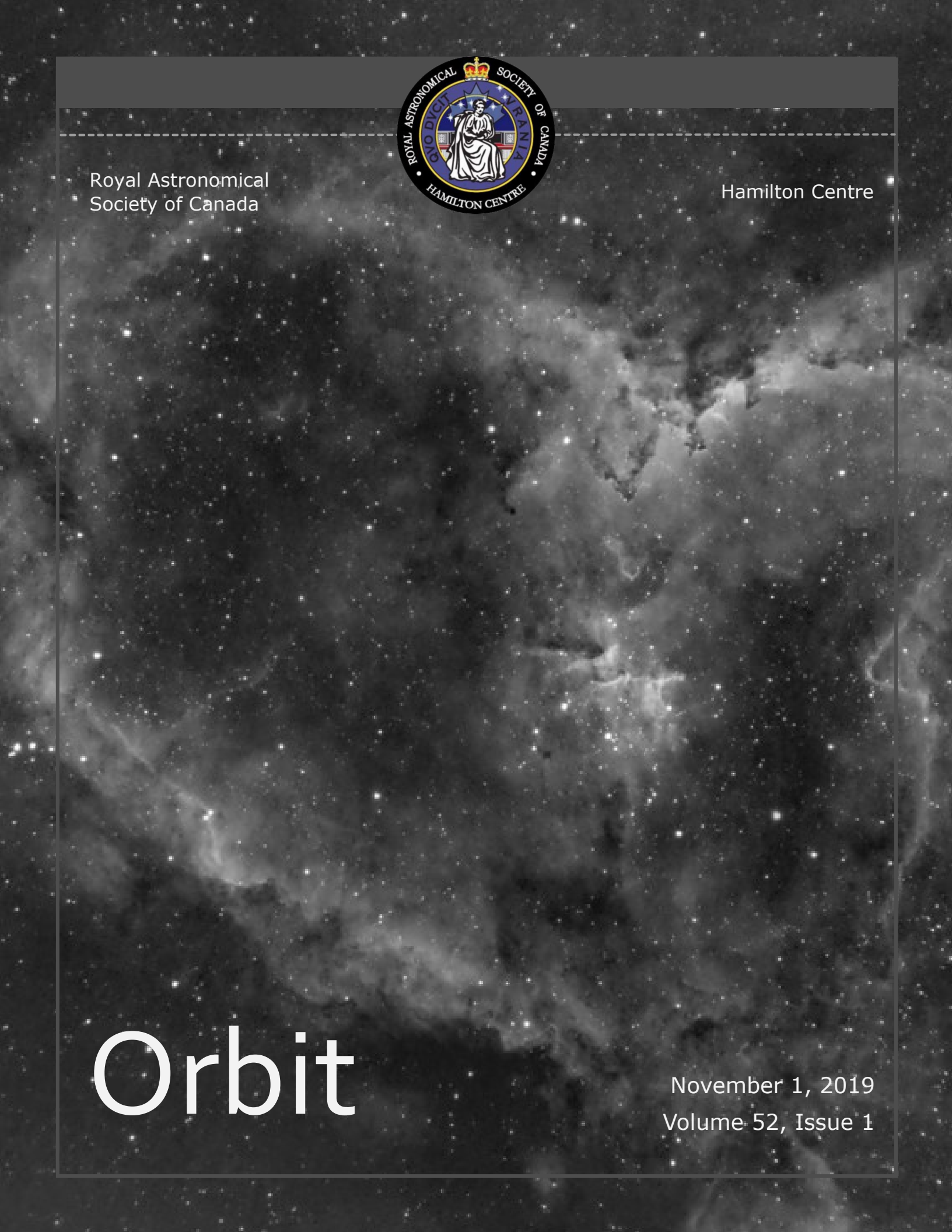


Royal Astronomical
Society of Canada

Hamilton Centre

Orbit

November 1, 2019
Volume 52, Issue 1

Inside this Issue:

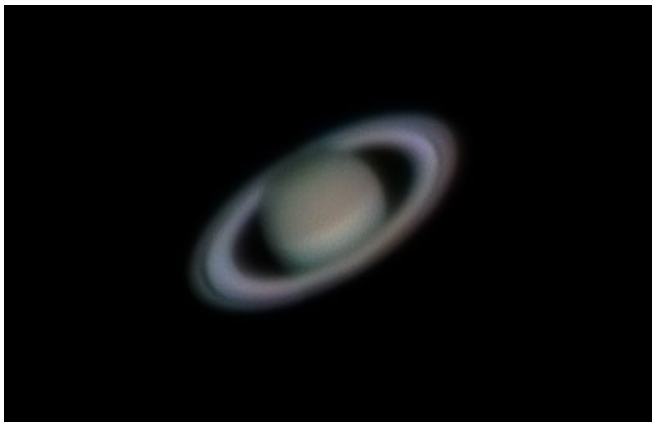


Image credit to Martin Palenik, 2016

Famous Astronomers Born this Month	
November 8, 1656	Edmond Halley, born in Haggerston, Middlesex (d. 1742)
November 9, 1934	Carl Sagan, born in Brooklyn, New York (d. 1996)
November 15, 1738	William Herschel, born in Hanover, Brunswick-Lüneburg, Holy Roman Empire (d. 1822)
November 20, 1889	Edwin Hubble, born in Marshfield, Missouri (d. 1953)

Cover image credit to Jeff Booth, 2018

Letter from the Editor

My first issue.

Even though I have, however briefly, contributed to a few Orbit issues in the last volume with some book reviews; I never truly anticipated taking over this newsletter. Nonetheless, here I am as the new editor of a publication that precedes my existence on this pale blue dot.

I was as startled as anyone else to hear I was officially taking over Roger Hill in the role of editor of Orbit. It was not until Ed Mizzi messaged me, what I can be certain was mere minutes after the October issue of Orbit was published, to congratulate me on the new role. In the spring I had momentarily mentioned to Roger an interest in taking over Orbit, a passing instant I thought would be forgotten, I most certainly forgot about it. I did not realize Roger would have the audacity to hold me accountable to my words six months later.

And alas, here I am; metaphorically quivering in my boots, and what large shoes they are to fill. Do not be mistaken, I am excited to take on this new role. Thrilled, honoured, grateful, flattered, all the other synonyms in the thesaurus. Albeit, petrified, stupefied, terrified too. It is not easy to take over any roll that has been so undeniably mastered by the predecessor. Roger's encyclopedic knowledge in all thing's astronomy is a tough act to follow; particularly for someone as novice as myself.

My interest in astronomy was all but restrained to the armchair until I started to help with outreach two years ago. Now I can go to public outreach events with my head held high (so long as my phone is fully charged with my star map app at the ready). Perhaps taken over Orbit will provide me the same challenge as outreach – a constant motive to learn and explore all things astronomy and to better myself as an amateur astronomy.

Let this stand as a warning to all who read this… I am a novice at best. My knowledge base is limited and my experience even more so. I do not contain the technical knowledge that Roger has accumulated. There will be many, *many* mistakes to come but with mistakes comes the opportunity to learn and improve.

Despite my best efforts, Orbit will most likely be shorted as a reflection of my capacity. I want to be able to produce the newsletter every month, but I do not think I will have the ability to do so while keeping the same volume and quality of content that Roger sustained. I hope that my taking over as editor I can encourage more members to contribute; making this role an actual editorial role instead of copywriter, editor, and publisher. Roger, you've done a fantastic job and for that everyone at the club thanks you. All I can hope now is to do half as well as you had (or so terribly that you take Orbit back).

Clear skies!

Abigail Hughes, Editor

National Representative Update

By Abigail Hughes

As the National Representative (NR) for the 2018/2019 year, I was rather silent and less than diligent about reporting NR updates to the members throughout the year. Seeing as the 2018/2019 year end has passed, I wanted to provide a summary of the main issues from the NR meetings that are pertinent to our club and members.

To start, a large focus since the General Assembly in June was the push for centres to register as not-for-profit organizations (NPO). Since the Hamilton Centre is already a NPO, the issue of registering is not relevant. However, as more clubs register the NR committee will be looking at more way to maximize the benefits of the NPO status for members and fundraising. I personally look forward to the discussions around how to better utilize our NPO status so that we can better position our club.

Another ongoing discussion at the NR meetings is the issue of finances at the National level. At the 2019 GA, National reported a net loss for the society. However, the society also announced the large donations made to National. One of the donations is to support the creation of the new Marking Coordinator role at National. The new role is designed to help bring a more cohesive vision to all the clubs across Canada and to help provide marketing resources and assistance to the centres.

In line with the finances was the issue of publications from National, in particular Sky News Magazine. For those of you who did not know, RASC National is a shareholder of Sky News and one of the largest supporters of the publications through membership subscription. With traditional forms of paper-publications losing profitability or just completely going under, Sky News has not been a profitable investment for National, particularly this last year. At the NR meeting in June, we discussed whether it would be more beneficial for RASC National to sell its shares, taking the loss now rather than later or investing more into Sky News to support it and help make it more profitable in the end. Although there was no conclusion on how to best advise RASC National, the bi-monthly arrival of the magazine will continue until further notice.

Lastly and most importantly regards the use of green light lasers (GLLs) for outreach and observing nights. There has been much confusion on the topic, particularly since regulations surrounding the use of GLLs goes through three government bodies.

National has previously sent out information regarding the use of GLL but I wanted to provide a concise update to make acceptable usage as clear as possible. In short, no one is permitted to use a GLL, or any source of light (including but not limited to flashlights and red lasers) and point it into airspace (everything above the ground).

To be clear, RASC and the centres are exempt from the Interim Order placed by Transport Canada that bans GLL usage. However, we are still under the regulations of the Canadian Aviation Regulations (CAR) and Health Canada. CAR requires that each club have a permit in order to allow the usage of GLL in approved zones. At this moment in time, RASC Hamilton does not have a permit; CAR is restricting the amount of permits they will be issuing and National is working to have one permit for RASC Canada that is applicable to all centres. Health Canada also has regulations regarding the "public" use of lasers, limited to 5MW or less. Any lasers that are greater than 5MW are deemed to be a "public health hazard".

Alex, et al. "Best Astronomy Laser Pointers - Why Green Is Best!" *Sky Tech Lasers*, 15 Sept. 2019, https://skytechlasers.com/astronomy-laser-pointers/.

Although GLLs are a favourite astronomy tool, until further notice we must all find alternative means of navigating the night sky with groups of people. As an alternative, I would suggest the use of star maps on mobile phones or old-fashioned paper star finders and planispheres. The solution may also include more volunteers at outreach so that larger groups of people can be broken up. Despite the inconvenience that the temporary ban on GLLs, remember that astronomy is a science that predates history. If the ancients could find a way to share the stars than we certainly can too.

As indicated by this short summary there was not much to report over the 2018/2019 year. Other than the official announcement to stop using GLL until further notice, much of the discussions were about planning. I hope to stay on and see what changes come into place and to report good news to the Hamilton Centre.

Comfort in the Big Dipper

By Abigail Hughes

As I was driving home the other night, I looked up into the sky to see the Big Dipper over my house and in that moment, I had a resounding sense of comfort. The feeling of ease after seeing the Big Dipper was not entirely related to the fact that I was also seeing my home. As far as I can remember, I have always had the sense of wellbeing and comfort when looking at those stars. Perhaps viewing the Big Dipper as a type of iconography is entirely my own infliction of importance and no one else gives the asterism a second thought. However, that cannot be the case because after all, even my most astronomically ignorant friends can recognize the Big Dipper.

Arguably, the most recognizable of all the asterisms, the Big Dipper is visible all year round and mostly used to find the North Star. Other than its size, being the largest of the asterisms, there is not much to it. With a simple shape and made of only seven (technically eight) stars, the asterism is easy to discern in the night sky. So why is this group of stars so memorable and iconic?

Considering its prominence in the night sky, the Big Dipper has a fair amount of cultural history and myth associated with it throughout the northern hemisphere. During the Underground Railroad, the Big Dipper was used as a navigational tool so that runaway slaves could orient themselves north during the night (Howell). Some Native American groups interpreted the bowl as a bear and the trailing stars as either cubs or hunters following it and when the group of stars fall low in the sky in the fall, the blood from the bear makes the leaves turn red (Big Dipper).

Figure 1

Image credit to Abigail Hughes, 2015

One Arabian story says that the four bowl stars represent the coffin of a murdered father and the three trailing stars are mourning children; the asterism's motion around Polaris is the motion of the children circling the murderer, awaiting vengeance (Alioth). The first star in the Big Dipper (see Figure 1) is named Alkaid. The name Alkaid is a reference to the mourners in Arabic history, the world deriving form the phrase "the leader of the daughters of the bier" (Christoforou). The phrase itself is a reference to the mourning children.

Mizar and Alcor are the binary stars that appear as one, or two depending on your eyesight, in the middle of the Big Dipper's handle. Historically the ability to see both the stars in the binary indicated that someone had 20/20 vision. Mizar is the brighter of the two while Alcor sits slightly off side from the rest of the stars in the asterism. The two stars are the most famous and most easily visible binary stars in the northern night sky. However, the star pairing goes farther past than what meets the eye; "Mizar in itself became known a double star in 1650. In fact, it was the first double star to be seen through a telescope" (McClure). Additionally, because Mizar is comprised of two sets of binary stars, it was also the first star ever discovered by spectroscopic methods (McClure). In 2009, Alcor was confirmed to be a binary star in and of itself, consisting of creatively named stars Alcor A and Alcor B (McClure).

Despite all the interesting facts surrounding the stars in the Big Dipper, no amount of Google searches uprooted any clear reason as to why the asterism is so popular that just about everyone in the northern hemisphere recognizes it. I suppose it could very well be the size of the asterism, it could be the fact it is visible all year round. Maybe a combination of the size, simplicity, and easy to remember name makes for an iconic asterism. Perhaps because of how recognizable the Big Dipper is, I have come to associate it with stargazing in my childhood. Perhaps that connection between my childhood and the asterism is where my sense of comfort derives from. In the end, even if I never figure out why it happens, it's always nice to have a sense of comfort when looking at the Big Dipper.

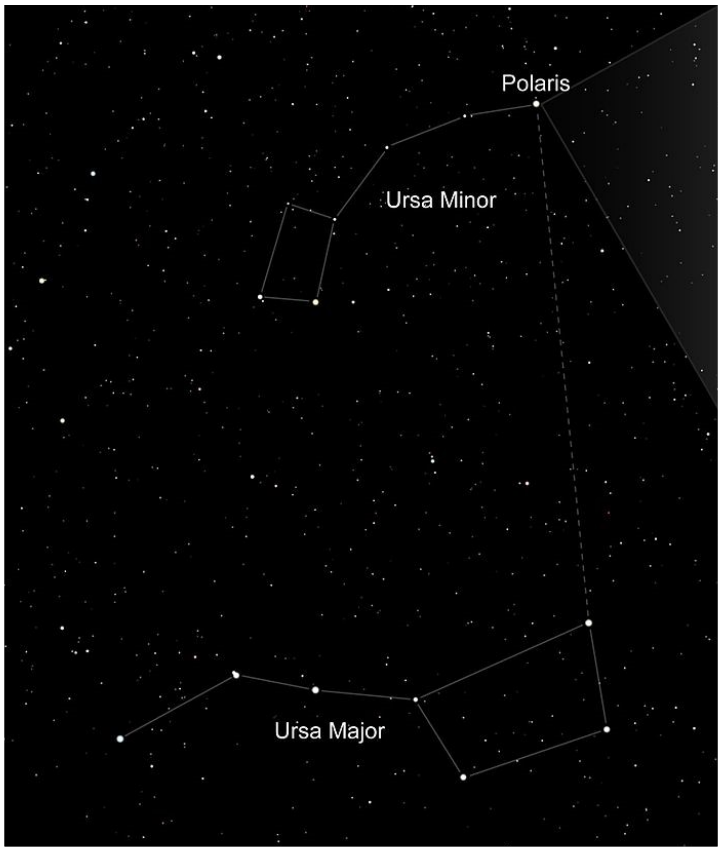


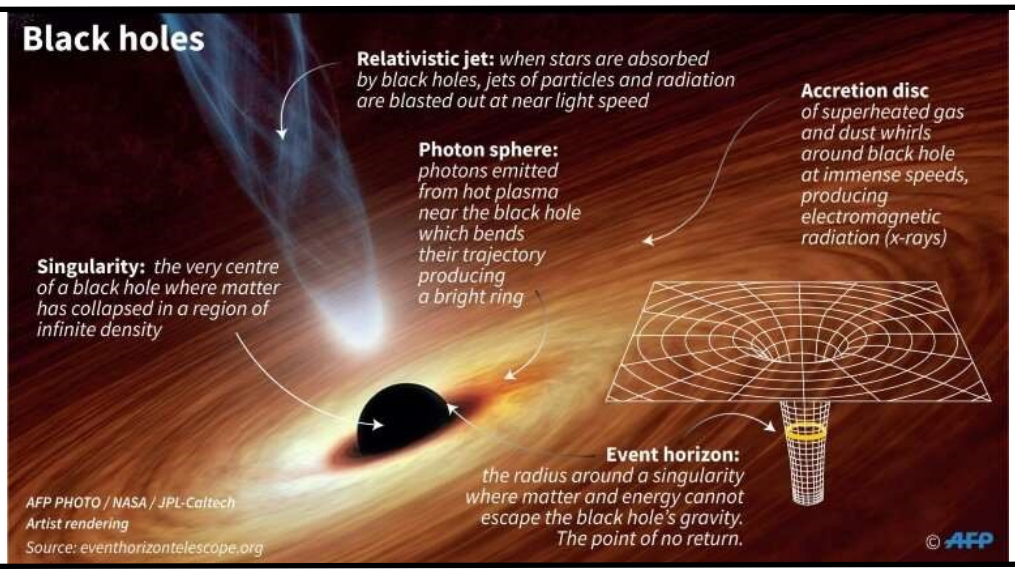
Image credit to NASA/Hubble Space Telescope (Merak)

A New Kind of Black Hole

By Abigail Hughes

On November 1, 2019, Thompson et al. published their research paper titled *A noninteracting low-mass black hole-giant star binary system* which showed that star 2MASS J05215658+4359220 (hereafter referred to as J05215658) is part of a noninteracting binary system which includes a black hole. Before you run away, I promise this is not a technical article and there will be no math included.

For those who may not know, a binary system is two objects that orbit around a common center point of gravity. The most familiar type of binary system are binary stars where two stars orbit around each other (the stars may have planets orbiting themselves but that is a discussion for another day).



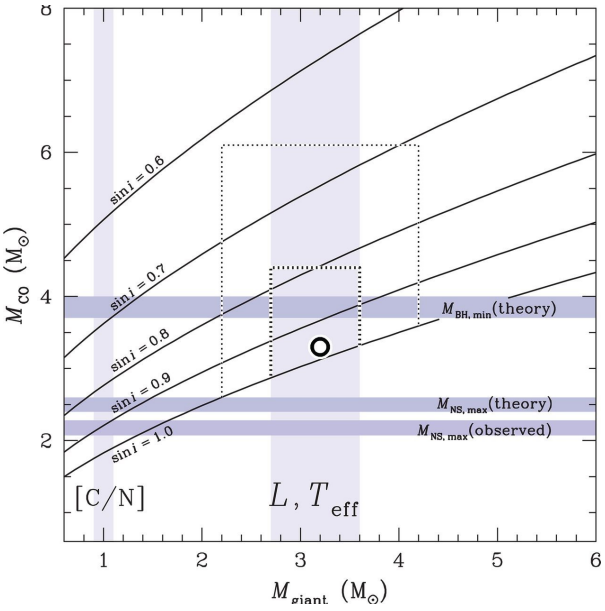
Coustal, Laurence. "What Is a Black Hole? Searching for What Can't Be Seen." *Phys.org*, Phys.org, 9 Apr. 2019, https://phys.org/news/2019-04-black-hole.html.

The existence of binary systems is not in itself a unique occasion. In fact, plenty of "massive stars have low mass, long-lived companions" (Thompson et al, 1). However, one of the issues is that in searching for these objects is that most studies are limited by our ability to detect and properly identify the objects in said systems. For example, the merging systems of black hole and neutron star binaries which are detected through gravitational wave experiments are a biased subset of the whole because the mass measurements of these objects are "obtained almost exclusively for pulsar and accreting binary systems selected from radio, x-ray, and gamma-ray surveys" (Thompson et al, 1). The main issue with the data collection bias is that researchers use the known information to create models of the universe; and with plenty of missing data, the models are incomplete at best.

The key difference in methodology between the previously identified black hole binary systems and the one featured in Thompson et al. research paper is that before, the binary systems were identified by the interaction between the two objects and, more importantly, the accretion from the system. In the case of this research paper, the black hole was identified indirectly by it's effect on the star within the binary system. The two objects are considered noninteracting because although they are gravitationally bound, there is no other significant affect of the objects upon each other.

Fortunately, with the constant advent of new technologies and methods, discoveries are being made constantly. Case and point is J05215658, which is a binary system with a giant star and a black hole. Plenty of other binary systems between stars and black holes or neutron stars have been discovered, often using the methods listed above. Although J05215658 is unique because binary system demanded the use of indirect methods to measure the black hole, that is not the importance of this article. What I found most interesting out of the research paper was the data on the objects measured.

The star in the system is a giant predicted to be about 3.2 times the mass of our Sun (Thompson et al, 3). Notably, the star has a "near-solar carbon-to-nitrogen abundance ratio" which is unusual for high mass giants with masses greater than the mass of our Sun (Thompson et al, 3). The companion to the star is a low-mass black hole with its mass being approximately equal to 3.3 of the Sun (Thompson et al, 3). A black hole weighing only 3 times that of our Sun is small. In fact, the mass is so small that if falls below the standard mass range for black holes but is larger than the range for neutron stars; it lies in what is called the "mass gap" (Thompson et al, 3). In fact, the largest a neutron star can weigh before it collapses is 2.5 times that of our Sun while the lightest well-measured black hole has a mass equaling five Suns. J05215658 is not the only binary system that resides within this new range; other system such as GX 339-4 and 4U 1543-47 may also host compact companions (Thompson et al, 3).



Thompson et al., 2019

Although at face value this research may come across as bland, boring, or even tiresome, there is still excitement to be found. This research exemplifies why now is the most exciting time for astronomy; never in the history of humankind has there been more progress or discoveries made. Despite all the best efforts by all the brilliant minds across the globe to create accurate models of the universe, the universe is constantly surprising us.

The original paper can be found at https://science.sciencemag.org/content/366/6465/637.

Historic Astronomical Events in November

November 2, 1906	Bengt Edlén, Swedish Astrophysicist who specialized in spectroscopy and discovered the source of unidentified emission lines in solar spectrum, born in Gusum, Sweden (d. 2003)
November 3, 2957	Soviet Union launches Sputnik 2 with dog Laika aboard, a mostly-Siberian husky, the 1st animal in space
November 5, 2007	China's first lunar satellite, Chang'e 1 goes into orbit around the Moon.
November 5, 2018	NASA's Voyager 2 probe leaves the solar system, becoming the second human-made object to reach interstellar space
November 6, 1967	Surveyor 6 launched for soft landing on Moon
November 8, 1980	Voyager 1 space probe discovers 15th moon of Saturn
November 9, 1967	Surveyor 6 soft lands on Moon
November 10, 1966	Lunar Orbiter 2 reaches 196-1871 km around Moon
November 13, 1971	Mariner 9, 1st to orbit another planet (Mars)
November 14, 1969	Apollo 12 (Conrad/Gordon/Bean) launched for 2nd manned Moon landing
November 14, 2012	CFBDSIR 2149-0403 is discovered, the closest rogue planet to earth (100 light-years away)
November 14, 2018	Astronomers announce discovery of Super-Earth planet (3.2x bigger than Earth) orbiting red dwarf Barnard's star, 6 light years away
November 15, 1972	Small Astronomy Satellite Explorer 48 launched to study gamma rays
November 16, 1965	Venera 3 launched, 1st to land on another planet (crashes into Venus)
November 17, 1967	Surveyor 6 becomes 1st man-made object to lift off Moon
November 17, 1970	Russia lands Lunokhod 1 unmanned remote-controlled vehicle on Moon
November 18, 1970	Russia lands self propelled rover on Moon
November 19, 1969	Apollo 12's Charles Conrad & Alan Bean become 3rd & 4th humans on the Moon
November 19, 2017	Oumuamua first detected by scientists, 400 meters long and reddish, first known interstellar object in our solar system first and of possible alien origin
November 24, 1639	1st observation of transit of Venus by Jeremiah Horrocks and William Crabtree - helped establish size of the Solar System
November 27, 2001	A hydrogen atmosphere is discovered on the extrasolar planet Osiris by the Hubble Space Telescope, the first atmosphere detected on an extrasolar planet.
November 28, 1660	The Royal Society is formed at Gresham College, London, after a lecture by Christopher Wren, Gresham Professor of Astronomy

References

Famous Astronomers Born this Month

"Search Results for: Astronomer in November." *Astronomer in November - Search Results - On This Day*, 5 Nov. 1500, https://www.onthisday.com/search?q=astronomer&m=11.

Comfort in the Big Dipper

"Alioth." Star Facts, 20 Oct. 2019, https://www.star-facts.com/alioth/.

"Big Dipper." Constellation Guide, 22 June 2013, https://www.constellation-guide.com/big-dipper/.

Christoforou, Peter. "Star Facts: Alioth." Astronomy Trek, 2 July 2017, http://www.astronomytrek.com/star-facts-alioth/.

Howell, Elizabeth. "The Big Dipper: A Useful Pointer in the Sky." Space.com, Space.com, 12 May 2017, https://www.space.com/27758-big-dipper.html.

McClure, Bruce. "Mizar and Alcor, Famous Double Star." EarthSky, 28 Mar. 2018, https://earthsky.org/brightest-stars/mizar-and-alcor-the-horse-and-rider.

"Merak." Star Facts, 20 Oct. 2019, https://www.star-facts.com/merak/.

A New Kind of Black Hole

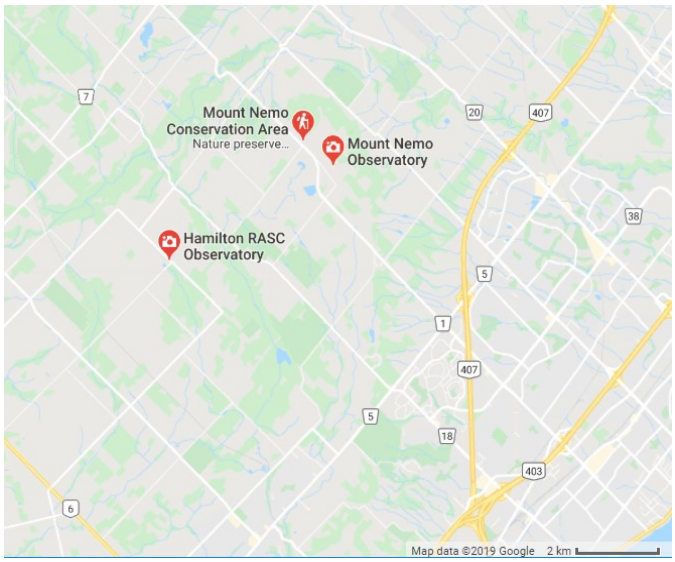
Coustal, Laurence. "What Is a Black Hole? Searching for What Can't Be Seen." *Phys.org*, Phys.org, 9 Apr. 2019, https://phys.org/news/2019-04-black-hole.html.

Thompson, Todd A, et al. "A Noninteracting Low-Mass Black Hole–Giant Star Binary System." *Science Magazine*, vol. 366, no. 6465, 1 Nov. 2019, pp. 637–640., doi:10.1126/science.aau4005.

Historic Astronomical Events in November

"Search Results for: Astronomer in November." *Astronomer in November - Search Results - On This Day*, 5 Nov. 1500, https://www.onthisday.com/search?q=astronomer&m=11.

Hamilton Centre Information



OBSERVATORY

576 Concession 7 East, Flamborough

N43O 23′ 27″ W79O 55′ 20″

Mail

RASC Hamilton
P.O. Box 969
Waterdown, ON LOR 2H0

Email

info@hamiltonrasc.ca

Twitter and Instagram

@RASCHamilton

Facebook

RASC Hamilton Centre

Website

www.hamiltonrasc.ca

Board Members

President	Gary Colwell	Observatory Director	Roger Hill
Vice President	Bob Prociuk	Councilor	Eric Golding
Recording Secretary	Greg Stopelli	Councilor	Bob Speck
Treasurer, Orbit Editor, National Representative	Abigail Hughes		