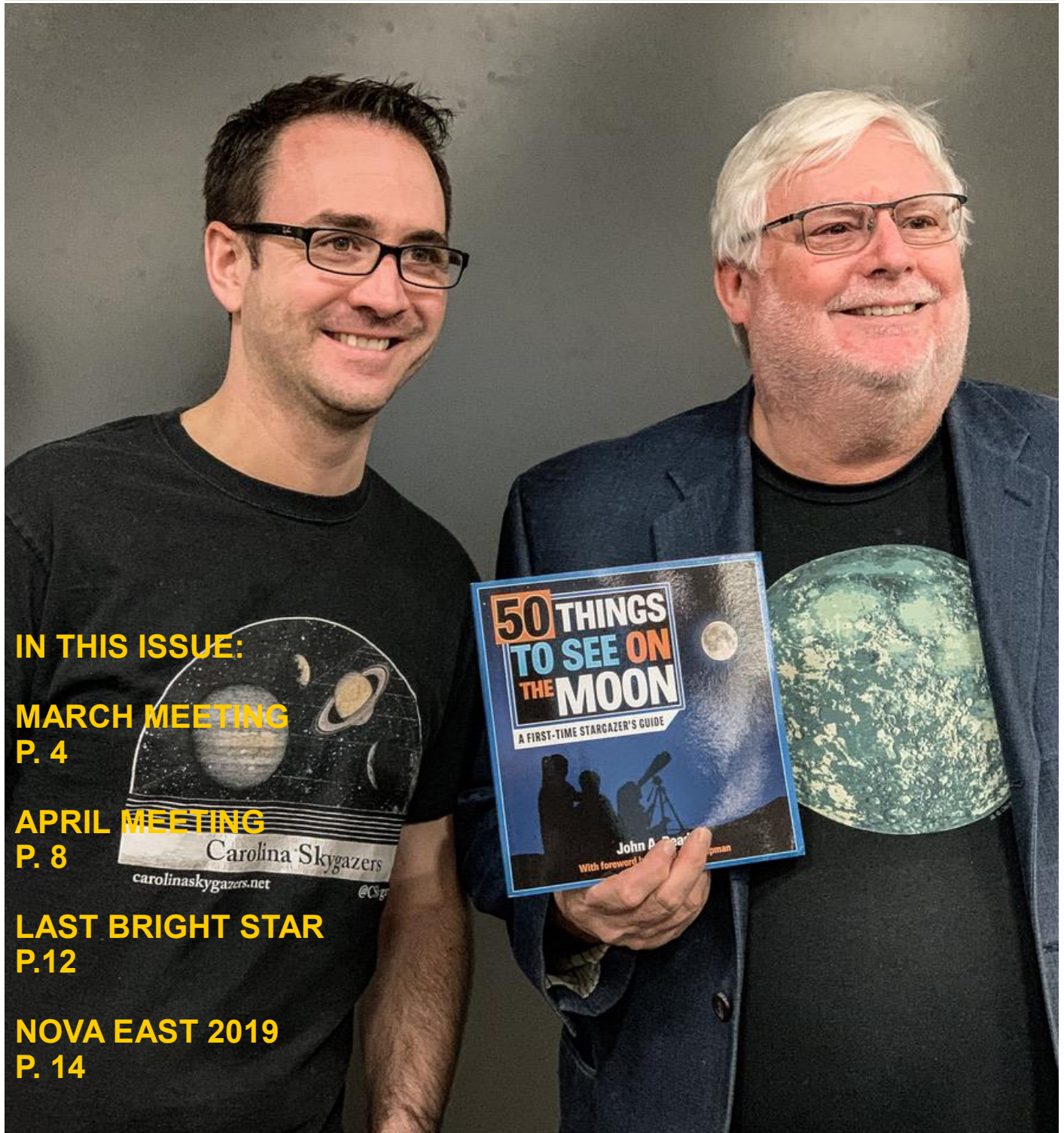


Nova Notes

The Newsletter of the Halifax Centre of the Royal Astronomical Society of Canada



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St. Croix Observatory

Part of your membership in the Halifax RASC includes access to our observatory, located in the community of St. Croix, NS. The site has expanded over the last few years and includes a roll-off roof observatory with electrical outlets, use of the Centre's new Go-To 400-mm Dobsonian telescope and 100-mm binoculars, a warm-room, and washroom facilities.

Enjoy dark pristine skies far away from city lights and the company of like minded observers searching out those faint "fuzzies" in the night. Observing nights (Fridays close to the New Moon or Saturday backup) are open to both members and their guests. If you are not a key holder and would like to become one, or need more information, please contact the SCO Manager, John MacPhee

Meetings usually begin at 1:00 p.m. at Saint Mary's University in Room 101 of the Atrium Building (AT).

All meeting locations and presentations subject to change

Meeting Dates for 2019

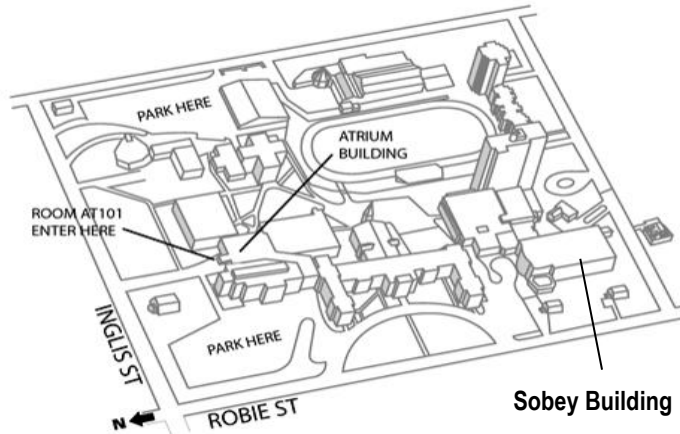
Regular Meeting:
Saturday, 1st June

Last regular meeting until September.

Meeting Location: Saint Mary's University

Atrium Building (AT) Room AT 101

The Atrium is located in front of the Patrick Power Library, between the Burke Building and Science Building.



Meetings are usually held on the first Saturday of the month, except for the months of July and August.

Executive meetings begin at 11:00 a.m., usually in room AT306, and all members are welcome.

Halifax RASC Board of Directors, 2019:

Honorary President : Mary Lou Whitehorne	(Appointed)
President:	(Vacant)
Vice-President: Charles White	(Elected)
Secretary: Judy Black	(Elected)
Treasurer: Gregg Dill	(Elected)
National Council Rep: Patrick Kelly	(Elected)
Director: Paul Grey	(Elected)
Director: Peter Hurley	(Elected)
Director: Paul Heath	(Elected)
Director: John Read	(Elected)
Director: Tom Crosman	(Elected)
Librarians: John Read	(Appointed)
SCO Manager: John McPhee	(Appointed)
Observing Chair: Sean Dzafovic	(Appointed)
Outreach Chair: Paul Heath	(Appointed)
Nova Notes Editor : Charles White	(Appointed)

Cover Photo By:

Judy Black "Book launch"

Photo taken at the Centre Member's Meeting in March showcasing John Read's new book, "*50 Things to See on the Moon*"

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From the Editor —

Spring has sprung, and the grass has ris'. Instead of in the dead of winter in the bitter windchills and temperatures we had, the weather is beginning to get warmer

Spring is interesting for us astronomers. The weather begins to get warmer so we are more inclined to go and stay out to observe. Instead of in the dead of Winter in the bitter windchills and temperatures we had. So to that is indeed a positive. However, night gets pushed back further and further each day until the first day of Summer where the time caps out and night comes sooner and sooner.

This puts us in an interesting pickle, of great conditions for the observer but a poor amount of time to observe, especially if you've got to get up early for work the next day. So if you're like me, you try and grab every opportunity on a night off to get set up and observe. I've even setup in conditions that weren't exactly prime to just scratch the itch due to the dry spell of observing the night sky we all enjoy so much.

I imagine the astrophotographers reading this as well may have even more complex feeling towards Spring than I do. Having to coordinate for DSOs, to consider the timing of the Moon, and to wait for it to be truly dark can place the photographer into the early hours of the next morning before they can even start.

All this is what makes writing Nova Notes great and seeing email postings on members' endeavours -to sketch that crater on the Moon, to photograph that galaxy so many lightyears away. Spring is a time of renewal for a lot of things and for myself personally, it signals a renewal in my observing that gets hindered during the early evenings but bitter temperatures. So, here's to Spring and the great evenings under the stars we'll start having again. I look forward to hearing about them all.

- Charles

Call for articles!

Looking for members who would be interested in writing a series for upcoming editions of Nova Notes.

Nova Notes: The Newsletter of the Halifax Centre of the RASC

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Nova Notes is published five times a year, in February, April, June/July, September/October and December.

The deadline for the next edition is 28th June 2019.

The opinions expressed herein are not necessarily those of the Halifax Centre.
Articles on any aspect of astronomy and related activities will be considered for publication.

March Members' Meeting (2 March 2019)

Paul Gray, emcee of the Halifax Centre Members' Meeting, welcomed the 58 members and guests to the March 2 gathering.

Paul noted that Paul Heath, who could not attend this meeting, coordinated outreach events for Cubs, Scouts, Guides and other groups requesting presentations. Our Centre will once again be at Saltscapes thanks to the generosity of Atlantic Photo Supply (APS) on April 24-26. Paul will be sending out a request for volunteers in the next couple of weeks.

There were 11 RASC Calendars still available for sale. It is an observers' calendar with astronomical highlights to note as well as events from across Canada. Given this was March, the price dropped to \$10.00. (NOTE: At the end of the meeting, there were only two remaining.)

Observer's Handbook Highlight:

John Read presented Immortalized in which the section regarding lunar observation by Bruce McCurdy was featured. The current scheme of naming craters of the moon was introduced by Giovanni Riccioli. John noted that if a crater was named after a person, they were immortalized (note craters Riccioli named such as Kepler, Galileo, Lansbergius, Copernicus and Tycho).

Since the 1960's, the Planetary System of Nomenclature of the International Astronomical Union (IAU) has standardized the naming of lunar craters and other astronomical objects.

There are six Canadians immortalized by having craters named after them. Remarkably, three were born in Nova Scotia:

1- Simon Newcomb: Born in Wallace, NS. There is a national RASC writing award named in his honour. Crater Newcomb (39 km) is located west of Mare Serenitatis and east of Mare Crisium.

2- Oswald Avery, Jr: Born in Halifax, NS. Crater Avery (9 km) is in the eastern border of the Sea of Smyth and is best seen during a favourable libration.

3- Sir Frederick Grant Banting: Born in Alliston, Ontario. His crater (5 km) is near the centre of Mare Serenitatis.

4- Carlyle Beals: Born in Canso, NS. Crater Beals (48 km) is on the northwest limb adjacent to the crater Gauss. Notably, a crater on Mars is named after his home town of Canso.

5- Reginald Daly: Born in Napanee, Ontario. Crater Daly (17 km) is below the southern margins of Mare Crisium.

6- John Plaskett: Born in Hickson, Ontario. Crater Plaskett (110 km) is located on the northern limb on the far side of the Moon. Plausible (albeit improbable) to observe during favorable libration.

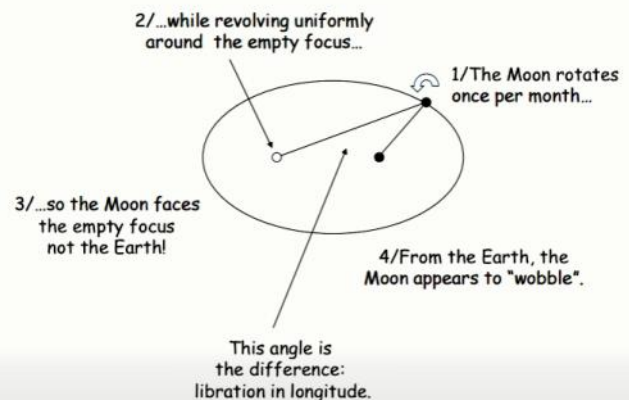
There are also five craters on the far side of the Moon named after Canadians: C.A. Chant, J.S. Foster, F.S. Hogg, A.M. McKellar and R.M. Petrie.

The question was asked as to whether there were craters named after women. Another member cited the April edition of the magazine Astronomy had an article entitled "*Women on the Moon*" that cited features such as Mount Marilyn, the craters Hypatia and Catharina, and others.

What's Up with the Moon?

Dave Chapman mentioned the recently announced involvement of the Canadian Space Agency (CSA) in the Lunar Gateway, a lunar space station from which humans can go to and from the Moon, an asteroid or even Mars. It will circumnavigate the Moon from pole to pole so that constant communication with Earth is possible. Construction is scheduled to begin in 2022.

Libration in Longitude



Dave then began his explanation of Longitudinal Libration (East–West). He defined “libration” as an apparent rocking motion caused by the changing point of view of the Moon from the Earth.

The North–South and the East–West librations are not synchronized. In March, from the Handbook, the greatest limb exposures are on the following dates:

- March 10 – greatest northern libration
- March 23 – greatest southern libration
- March 13 – greatest western libration
- March 26 – greatest eastern libration

The libration and lunar phase determine what can be seen on the limb. For example, Mare Marginis on the eastern limb may be seen close to the full Moon on March 20 but would not be seen on March 12.

He explained Kepler’s First Law of Planetary Motion (the orbit of every planet is an ellipse with the Sun at one of the two foci, and Kepler’s Second Law of Planetary Motion (a line segment joining a planet and the Sun sweeps out equal areas during equal intervals of time).

This also applies to the Moon orbiting the Earth. He then explained Ptolemy’s theory regarding the equant point, a hypothetical point opposite the Earth used to explain the observed speed change of lunar motion along its orbit. If the Moon travelled around the equant, at constant angular speed, it would nearly match what we see in the sky. This approximate relation is supported by current celestial mechanics.

He had two volunteers – one played the Earth, the other the Equant. He demonstrated that the Moon, with the “near” side facing the Equant while in orbit, was seen from Earth not only to occupy apogee and perigee distances, but to apparently wobble from side to side, first exposing the east limb and then the west limb.

He explained libration in longitude as follows:

- The Moon rotates steadily once per month
- It does this while revolving uniformly around the empty focus (Ptolemy’s Equant)
- So, the Moon’s “near” side continually faces the empty focus (Equant) not the Earth
- The Earth-Moon-Equant angle represents the angle of libration.

What’s Up?

Paul Gray provided the NASA video then used the RASC Calendar to highlight this month’s astronomical events.

- 5th - 40th Anniversary of Voyager I flyby of Jupiter
- 10th - Daylight Savings Time begins
- 11th - One satellite of Jupiter visible
- 14th - Lunar Straight Wall visible this evening
- 18th - One satellite plus two satellite shadows on Jupiter visible
- 19th - Moon at perigee
- 22th - Zodiacal Light readily visible in the west after evening Twilight for next 2 weeks
- 25th - Two satellite shadows on Jupiter visible

Observation Challenge:

For March: M44, the Beehive Cluster
Members were encouraged to look for the cluster then forward their observations (sketched or photographed) to Paul Gray. Paul showed Charles White’s sketch of the Messier object; Dave Hoskin and Paul Gray each submitted a photograph of the cluster.

For April: M67, an open cluster in Cancer
Paul challenged members to find M67 and to submit their photos or sketches to him or Judy Black for presentation at the April meeting.

Book Launch:

John Read’s “50 Things to See on the Moon, a first-time stargazers guide.”

Below: John Read talks about his new book, “50 Things to See on the Moon, a first-time stargazers guide.”



John explained this book was originally Dave Chapman's idea as a joke or a challenge. Consequently, he had asked Dave to provide the foreword to the book. John then pitched the idea when he talked to his publisher in 2017 about 50 things to see with a telescope. He then provided an overview of some of the pages in the book and had signed copies on sale.

Library Report:

John Read highlighted Gary Seronik's book *Binocular Highlights* that provides a tour of numerous sky objects easily seen with binoculars. However, John noted that in suburban skies these may become telescope objects.

Members then gathered for a social time with food and beverages provided. Judy Black was thanked for the lunar rhubarb cake she had brought in honour of the lunar theme.

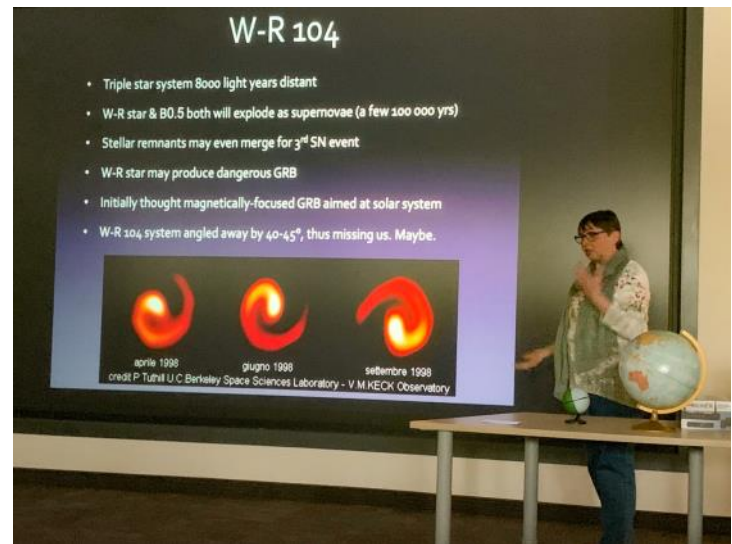
Guest Speaker:

Mary Lou Whitehorne, FRASC Wolf – Rayet Stars: Truly Scary Monster Stars

Paul Gray explained that for more than thirty years Mary Lou Whitehorne has contributed much to the promotion of astronomy in Canada. Indicative of her talents and contributions, positions she has held include: President of the Halifax Centre of the Royal Astronomical Society of Canada (RASC), national President of the RASC (2010-2012), and currently Honorary President of the Halifax Centre.

Among her many publications promoting astronomy education is her book *Skyways, Astronomy Handbook for Teachers*, published by the RASC, with both English and French versions. In 1993, she received the Chant Medal in honour of her work as an amateur astronomer. At the RASC's 2015 annual meeting, she received the Fellowship Award for her outstanding performance and lasting contributions to the Society. The International Astronomical Union has named asteroid 144907 "Whitehorne" in her honour.

Mary Lou is also an accomplished artist: <https://marylouwhitehorne.ca/gallery>
Mary Lou Whitehorne began her presentation by explaining that Wolf-Rayet (WR) stars were first discovered in 1867 at a Paris observatory by



Honorary President of the RASC Halifax Centre, Mary Lou Whitehorne, gives a presentation on WR stars.

Charles Wolf and Georges Rayet. The stars showed unusual emission lines but no absorption lines. She provided an explanation of the cause of the emission lines, the classifications and sub-classifications of these stars based on their composition (helium, carbon, silicon, oxygen and nitrogen). She showed examples of WR stars (Gamma Velorum, Theta Muscae, and R136a1 in 30 Doradus) and WR galaxies (for example, NGC 5253 and NGC 2363).

These stars are rare because of their high mass and fast evolution, and are doomed to die young and spectacularly, usually in a supernova. During her presentation, she explained:

- WR stars MASSIVE! WR stars can be up to 50 solar masses, or more. They are the most massive stars out there.
- Surface temperature is 30,000 – 200,000 Kelvin. They are the hottest stars out there. They are late O-type stars that blast away their outsides, stripping away their hydrogen envelope to reveal their inner layers, sometimes right down to the star's nuclear-burning core.
- Unlike lower-mass stars, the outer layers of high-mass stars like W-R stars are radiative rather than convective. This results in powerful stellar winds that strip away a W-R star's outer layers.
- Very luminous, several 100,000's times that of our Sun
- Short-lived, only a few million years. They have a vigorous mass loss at a rate of 10^{-7} –

10 -4 solar masses per year.

- Windy, radiating themselves to death. They have an enormous, violent stellar wind that leads to rapid mass loss. The strong radiation pressure drives the expanding envelope outwards. Hot gases are ejected at 300 – 2,400 km/sec (1 million to 8.5 million kph). They are late O-type stars that blast away their outsides, stripping away their hydrogen envelope to reveal their nuclear-burning cores (that include iron).

- They are “fluffy” with no detectable surface.
- Not visually bright, W-R stars shine primarily in ultraviolet wavelengths, which is a dangerously ionizing form of radiation.

In essence, WR stars are HOSTILE - you do not want to be anywhere near them! Following her presentation, she entertained questions from the audience.

Paul Gray then thanked everyone for coming and invited them to attend the April 6th meeting.

FOOD for the SOUL

(April meeting 2019)

By. Paul Heath

O-H

A tome of wondrous renown.
Often dog eared and dew crinkled its pages are,
As it sits often in easy reach, we've found
For this Tome is held close, throughout the year.

With Time it has locked each future moment away.
Like a glass of premonitions vast
It's searched for gems and diligent tasks,
For this Tome we hold close, throughout the year.

For facts in truth are bound.
And mysteries of motion, sight and time expound
Upon its pages so very clear . . . well mostly . . .
maybe?
For this Tome must be used within this year.

Yet each and every year.
Without fail a puzzle or mystery will breach the
mind
The Question will be asked, an answer Can I,
WILL I FIND?
Wait for IT!

The answer has already be-ee-en found,
The answer you see will be quite clear.
It is in the O-H . . .

I
NSERT PAGE NUMBER HERE!!

April Members Meeting

(6 April 2019)

Paul Gray, emcee of the Halifax Centre Members' Meeting, welcomed the 52 members and guests to the April gathering and noted there were 2 remaining RASC calendars for sale. (NOTE: At the end of the meeting, there were sold.)

Paul Heath gave a summary of upcoming outreach events involving schools and youth groups. In his presentation of Food for the Soul, he read his lighthearted poem "O-H", a look at log booking and Dr. Roy Bishop's "It's on page X of the O-H."

Board News:

Judy Black gave a brief update of news from the Board of Directors.

- The addition in Bylaw #1 that allowed the Board to make decisions between meetings was approved by the Registry of Joint Stock Companies. The newly approved version is now on the website.

- The Nova East Star party date is now posted on the Halifax Centre home page. She reminded members that the information regarding Nova East currently on our website is totally incorrect. Members are to look for the newly revised website and information in late May; a notice will be provided to members once it goes live.

Observer's Handbook Highlight:

Judy Black then presented the highlights of the chapter "*The Observing Logbook*". She told members, in answer to Paul's poem, "the information is on pages 86-87 of the O-H," and Paul Markov was the author.

There are three components to observing:

- 1- Locate: Find something to look at
- 2- Identify: What is it you are looking at?
- 3- Observe: Look for details (size, shape, density, etc.), make notes, and maybe sketch.

After explaining that everyone should log their observations, the rationale for "why" log? Was collecting data, recalling or comparing previous observations, and the fact that describing an object forces the observer to look for more details which in turn sharpens their observing skills.

"How" the session was logged was a completely personal decision, whatever worked best for the observer,
– 3-ring binder, spiral bound notebooks, RASC or personally developed observing forms, audio recorder, or taking a photo.

"What" should be recorded for each session as well as for each object observed within the session was provided. She emphasized that members should not be afraid to sketch; after all, none of us need to be da Vinci when we sketch. Observations considered to be unsuccessful either because you couldn't find an object or observe it well or equipment challenges should also be logged and a suggestion for how best to correct it next time.

How to describe clusters, galaxies, nebula as well as general questions for all object types had also been provided by Mr. Markov.

The form of the logbook and recording mechanisms were then highlighted; again, it was all personal preference. Her choice between a notebook or a binder was the latter because of the ease of adding material to it. She showed observing forms the Messier Objects program, Isabel Williamson Lunar Observing Program (IWLOP), the generic form provided by RASC, as well as one she had developed for her own use. Descriptive information or sketching was a requirement for most RASC observing certificates.

She then explained there was more than one way to organize the log. Again, how it was done is a personal decision. It could be organized as a chronological record of observations or by object. It was also important to record "non-recorded" items, i.e. those items you locate and identify but don't truly observe, and 'yes' to including photos. Her photo of her 5-year-old and 2.5-year-old grandchildren looking through her 6" Dobsonian proved one is never too young to observe and to log. Her grandson was very excited to see five planets that night Mars, Venus, Saturn, Jupiter, and (of course) Earth.

Electronic databases could be used for planning an observing session, creating observing lists, and tracking (dates, locations, objects). Mr. Markov had



Above: Judy Black and her grandchildren observe multiple planets.
 Below: A sketch from Judy's grandson William of Saturn and Mars.



cited freeware available (www.saguaroaastro.org), and there were other commercial sources such as *SkySafari* and *Excel*. She asked the audience to send her any information they may have about other programs being used for this purpose.

She summarized by stating that the amount of detail was up to the observer. It could create a data point for one day, or simply be a return path to a pleasant memory.

Observing Challenge – M67

Paul Gray inquired as to who had taken Roy Bishop's challenge when observing M67. With reference to p. 69 in your *Observer's Handbook*, he asked members to determine how faint a star we could each see in

M67 with our own telescope. As mentioned on p. 49, this should be done under transparent, dark sky conditions with good seeing, and using a magnification at least equal to the aperture of your telescope in millimetres (according to Chapman's Magnification Rule on p. 49, that means an eyepiece focal length in millimetres equal to or less than the focal ratio of the objective of your telescope).

Anyone who tried this challenge was to send Roy four numbers: the magnitude of the faintest star that you can see in M67, the aperture of the telescope used, the magnification used, and the observer's age (optional, but it can influence the result).

He will tabulate the numbers and announce the results in May. Paul Stated he was able to get down to magnification 13.2 on his 10" scope. Other members had found M67 and the cold wind prevented other members from remaining out long enough to make the observation.

What's Up with the Moon?

Dave Chapman promoted member John Read's book *50 Things to see on the Moon*. He noted it was now available in hard cover from Amazon and that the soft cover price had been reduced. He also noted it was now "Egg Laying Moon" (Pnatmuiku's). Dave began *What's Up with the Moon – Light and Shadow* by stating its purpose was to explain how shadows will differ during the waxing and waning phases.

The inspiration for this topic came from a comment on the RASC Discussion list about how bright Montes Apennine was in Michael Boschat's photo. Dave then showed the same mountain range taken by Astro Bob in which the range was not as well illuminated due to a differing phase.

He showed six photos of Tycho, demonstrating how different the crater appeared during each phase of the moon, from looking like a deep dark crater to being flattened at full Moon and then changing to what appears to be a mound with the shadow on the opposite side.

What time of day affects what lunar phases you can observe. The Gang of 4 (Langrenus, Vendelinus, Petavius, Furnerius) were shown as

they appeared one night at 8 PM when the Moon appeared as a waxing crescent. The benefit of being a morning person is that the differences can be seen in their appearance three weeks later at 6 AM when the Moon appeared as a waning crescent. He then showed three craters (Theophilis, Cyrillus and Catharina) to show how different they appear after lunar sunrise and before lunar sunset about two weeks later.

The Straight Wall (Rupes Recta) on Mare Nubium also differs in appearance at lunar sunrise and lunar sunset. After sunrise, a shadow from the 250-metre wall (approximately) appeared on the mare floor and Rima Birt was illuminated on one of its walls as well. The craters Birt and Birt A also showed tall shadows across their floors. He then compared them to before sunset when the Wall and the opposite wall within Rima Birt were very well illuminated.

The two crater floors were darkened and cast shadows towards Rupes Recta.

He then showed photos of Plato-Archimedes-Eratosthenes and the Straight Wall-Tycho-Clavius to illustrate the direction of the terminator at those features on the dates of lunar sunrise and lunar sunset, leading to much different lighting effects.

What's Up in the Night Sky?

Paul Gray provided the NASA video then used the RASC Calendar and the OH to highlight this month's astronomical events.

5th - New Moon

6th - Asteroid 2 Pallas is at opposition and detectable in good binoculars at magnitude 7.9 (the same brightness as Neptune). This asteroid is well placed for viewing throughout the month

7th - Thin crescent Moon shines down below the arc of Aldebaran, Mars and the Pleiades

9th - Moon 5 degrees below Mars

12th - First Quarter Moon; Lunar X not visible in eastern N. America

19th - Full Moon, "Birds Lay Eggs Moon"

22nd - Lyrid meteor peaks

23rd - Moon 1.6 degrees north of Jupiter in western N. America; Jup

26th - Last Quarter Moon

28th - Lunar Curtis "X" visible in eastern N. America at 3 AM

Paul then showed photos from members (in alphabetical order): Bruce Armstrong, Jerry Black,

Michael Boschat, Dave Chapman, Paul Gray, David Hoskin, Blair MacDonald and Chris Turner.

Miranda Gray gave a demonstration of her Sun-Earth-Moon 460-piece Lego model. It was built as part of her science project presentation on the Solar System. By turning the handle once, the Earth had a one-day rotation.

Twenty-eight turns had the Moon rotate through one of its days. Twenty-five and half days represented one rotation of the Sun. It had been difficult to build, and she did require assistance with the mechanical elements of the model. Paul Gray explained that this did not come in a kit; pieces had to be purchased separately through various sources.

Youth Activity:

Paul Heath explained how he used star charts to show children as they entered his school bus. He explained how differing cultures used the constellation star patterns to find stars (such as the North Star) and other constellations. Various cultures used star and constellation myths and legends to explain their own histories.

With the assistance of volunteers Andrew Frank, Gillian Webster, Pat Kelly, Blair MacDonald and Connor Gray, he demonstrated the relationship of some constellations (Auriga, Orion, Taurus, Gemini and Canes Major), and how this could be used to explain one of the many legends.

Paul stated *Astronomy Nova Scotia* (ANS) had announced the next Halifax Planetarium presentation on April 25, 2019 – Cosmic Clockwork. Quinn Smith will explain how the night sky is always changing - from hour to hour, night to night, and season to season. He will show how this Cosmic Clockwork unfolds in all its predictability and beauty.

Guest Speaker – Dr. Rob Thacker

"The RASC in 2019"

Paul Gray briefly introduced Dr. Rob Thacker who is a RASC Board member. Dr. Thacker thanked Paul and explained how 2018 that focused on RASC's 150th anniversary had been a highly successful year for the organization. RASC coins and stamps had been issued, the latter being revealed at the GA held in Calgary AB.

There had been strategic plan work on committees that introduced term limits on Chairs of committees; there were also challenges in follow through due to operational changes. National Council had been revitalized to be an advisory to the Board.

There was huge success to fund raising thanks in very large part to the hiring of fund-raising consultant Lisa DeVito. He noted there had been a few challenges with the 16" remote telescope. They were in the process of determining user rights on the data obtained from the telescope's use. Equipment testing is underway, and they are now assembling a science team, planning outreach work and deciding on time allocations for members.

Dr. Thacker outlined the numerous benefits of being a RASC member, including receiving the *Observer's Handbook*, *SkyNews*, online and print access to *The Journal*, access to other RASC publications, education and outreach activities, and observing programs and certificates to name a few.

He also explained the financial situation of RASC. The main source of income for membership services included membership dues that have not been significantly increased for quite some time, profits from publications and merchandise, and income from investments. There were rising costs in mailing and production, staff salaries and the website. He explained the Society cannot continue to depend on investment income to cover growing costs. The Society also works to increase profits from merchandise and publication sales.

RASC is a registered charity and can therefore seek donations, gifts, premium memberships, sponsorships and bequests. However, donations cannot be used to support direct member benefits such as publications but can be used to support activities such as the robotic telescope, free star finders, moon gazer's guide, light pollution abatement, public speaker program and others. A successful grant application has meant the hiring of the RASC Outreach Coordinator.

Membership dues increased for the first time in three years and he stated that an increase would be required in 2019 and for future years to match inflation. The Board has ordered cutbacks to

reduce the 2019 deficit. There are also some challenges relating to SkyNews and other publications. He noted that activities funded by donation advance the RASC mission without any increasing pressure on dues.

Dr. Thacker then provided a strategic plan update. In 2018, new ideas for planning and implementing the General Assembly was discussed, and National revitalization was begun. The RASC committee structure is now being reviewed for efficiency and effectiveness. Education, public outreach, marketing and communications committees are being set up. The Inclusiveness & Diversity Committee has been established.

Rob asked members to provide input regarding changes needed to increase the value and effectiveness of RASC. Input can be provided to the Board, national office or through the RASCals discussion list.

There is a Board of Directors election in 2019. Dr. Thacker noted he will not re-offer in 2019. Three positions will be up for election in June. Electronic voting will take place before the 2019 GA in Toronto.

Any RASC member in good standing may be nominated to run for a seat on the Board (Note: nomination deadline was April 7) as per RASC Policy G9. Election of new directors will be for three years.

Dr. Thacker promoted the 2019 General Assembly that is a joint meeting of RASC and the American Association of Variable Star Observers (AAVSO) on June 13-16, 2019 at the University of Toronto. The GA includes featured speaker James Hansen, author of First Man biography of Neil Armstrong, SL-9 discoverer David Levy and his new book, plus activities for the whole family. He then entertained questions from the audience.

Paul Gray thanked Dr. Thacker. Meeting adjourned at 3:52 PM.

The Last Bright Star

By Pat Kelly

As a young child with a passion for astronomy, I learned the constellations from a book called *Find the Constellations* by H. A. Rey. (Yes, the same guy who wrote the Curious George books!) In fact, it is still in print and I still recommend it to people, along with his other book, *The Stars*.

Like many starting guides to the night sky, you start with the things that are easiest to see, the brightest stars. Most of the easiest to find constellations have a bright star to mark them. Some, like Orion, have more than one.

They are signpost of the seasons, returning each year to their places and bringing their constellations, and memories, with them. At the end of the book was a list of the "15 Brightest Stars" that could be seen from Canada and the United States. A nice round number. There was a note that there was one more you could see if you lived in the really southern parts of the United States, but I had no plans as a child to go there, and, until recently, my travels have all been east, west, or north from Nova Scotia, so my list of 15 was all I needed.

As I got more involved in astronomy, I realized that there were other bright stars, and a lot of them were brighter than many of the 15 that I knew. So if one wants to see all of the bright stars, how many are there?

The brightness of stars is confusing to those who first encounter it. It dates back to Hipparchus of Nicaea, a Greek astronomer and mathematician, who lived from c. 190 BCE to c. 120 BCE.

I have always found it ironic that we count the years in which he lived "backwards" (in effect: –190, –189 stopping at –120) because his system for measuring the brightness of stars also seems backwards to many people, especially first-year astronomy students!

He is credited with essentially grouping stars together into "magnitudes" with the brightest being "first magnitude", the next brightest "second

magnitude" and the stars that you could barely see were "sixth magnitude". As you can imagine, there were not that many first-magnitude stars compared to the number of second-magnitude stars, even more of stars of third magnitude and lots and lots of sixth-magnitude stars. You can see why this is backwards. When you measure, mass, electrical current, etc. as there is more of the thing you are measuring, the number gets bigger. With magnitudes, as you go to brighter stars, the number gets smaller!

In the 1800s, as science progressed, more exact ways were determined to measure stellar brightness and it was noted that a change in brightness was pretty close to a factor of 100, so the system was slightly redefined so that a change in brightness of 100 corresponded exactly to a change of 5 magnitudes. (A change of one magnitude is a change of brightness of the fifth root of 100 or about 2.512. This is where the magnitude system gets even weirder. Some of the first-magnitude stars are a lot brighter than the rest.

This meant that with the new scale you needed magnitudes that were brighter than first. What to do...what to do? Let's do this! A star that is one magnitude brighter than a first-magnitude star will be zero magnitude! One brighter than that will be –1 magnitude. Yes, that is how it really works! Sirius, the brightest star in the night sky has a magnitude of –1.47. At their brightest, Mars and Jupiter get up to (or down to, if you think about it!) magnitude –2.9; Venus a blazing –4.9! On this scale, the Full Moon is around –12.9 and the Sun is –26.7, which is about 400,000 times brighter than the Full Moon.

So where does that leave someone wanting to see all the bright stars? Clearly Sirius is brightest, but at what point do you draw the line to cut off the list. As you go to fainter stars there are more and more of them, so one either has to pick a reasonable number at which to stop (say, the 25 brightest) or stop at a point where you no longer think of them as bright. As you go to dimmer stars the difference in magnitude to the next-faintest star becomes smaller and smaller, with eventually a lot of stars having the same magnitude. So where is there a big enough gap that will also give a relatively short list? The gap between Regulus (magnitude 1.39) and Adhara (1.50) is a good place to stop. There is a gap of 0.11 magnitudes

and Adhara, at magnitude 1.50 places it exactly halfway between stars of magnitude 1 and 2. That gives the following list of 21 stars, the 15 stars from my childhood, plus six others listed in boldface.

Mag.	Name	Constellation	Dec. (°)
-1.46	Sirius	Canis Major	-17
-0.74	Canopus, Carina		-53
-0.27	Rigil Kentaurus*, Centaurus		-61
-0.05	Arcturus	Boötes	+19
0.03	Vega	Lyra	+39
0.08	Capella	Auriga	+46
0.13	Rigel	Orion	-8
0.34	Procyon	Canis Minor	+5
0.46	Achernar, Eridanus		-57
0.50	Betelgeuse,	Orion	+7
0.61	Hadar	Centaurus	-60
0.76	Altair	Aquila	+9
0.76	Acrux	CruX	-63
0.86	Aldebaran,	Taurus	+17
0.96	Antares	Scorpius	-26
0.97	Spica	Virgo	-11
1.14	Pollux	Gemini	+28
1.16	Fomalhaut,	Piscis Austrinus	-30
1.25	Deneb	Cygnus	+45
1.25	Mimosa, CruX		-60
1.39	Regulus,	Leo	+12

*Better known as Alpha Centauri, the nearest star system to the Sun.

The column giving declination (Dec.) is important. Declination is one of two numbers that gives a star's position on the celestial sphere. It is the equivalent to latitude on Earth, and is measured in degrees, from +90° at the north celestial pole, to 0° on the celestial equator, and southwards to -90° at the south celestial pole. From the latitude of Nova Scotia (effectively +45°), any star with a declination between +45° and +90° never sets, stars with declinations between (+45° and -45°) will be visible for part of the year (with those closest to -45° barely making it above the southern horizon), and stars with declinations between -45° and -90° are never visible.

You can see that the six stars listed in boldface are not visible from Nova Scotia, no matter how badly you would like to see them! For every degree south that you travel, the stars you can never see is "reduced by one degree". Since Canopus misses out cut off by 8° (53°-45°) to see it you would have to go at least 8° south which would place you at the latitude of Tennessee and

Southern California. That would only put Canopus just above your southern horizon, to see it clearly you need to go farther south. When you stand on the equator you get to see the entire celestial sphere from +90° to -90° declination! The advantage is that no stars are hidden; the disadvantage is that none are up all the time!

In the summer of 2017, I went to Peru, and despite the clouds, light pollution, and mountains, I was able to see Rigil Kentaurus, Hadar, Acrux and Mimosa as they are all in the same, relatively small, part of the sky. In fact, these six stars are "crammed" into a rectangle that is only 20° by 6°, smaller than the area occupied by the Big Dipper!

In February of this year, I finally went the Caribbean and stayed at a resort that had very dark skies. There, below Orion and Sirius, was a really bright star, my first sighting of Canopus. It was about 50 years from the first time I had heard of this star, until I was able to see it! It is too bad that it is close to Sirius, as it is clear at a glance which is the brighter. This tale now brings me to the last bright star, Achernar. It is at almost the same declination as Canopus, but is about 40° west of it. That meant that from the Caribbean, at that time of the year, Achernar sets at the same time as the Sun.

If I went back to that area in November when both it and Canopus will be up at the same time, along with all of the bright stars in the Orion area, it would be a very pretty sight.

Save the Date! Nova East 2019

By Judy Black

It's the event you have all been waiting for!

The Nova East Star Party returns this summer to Smiley's Provincial Park on August 31 – September 2, 2019.

The theme again this year is "The stars belong to everyone." The Nova East Star Party Planning Committee (NEPC) are working to present a speaker series that will intrigue astronomers of all interests.

The potluck BBQ, Astronomer's Lounge, Astronomers' breakfasts on Saturday and Sunday morning, will satisfy everyone's appetite. Telescope Medics will again assist with telescope woes and the field events will once again star in the agenda.

The Astrophotography Contest and People's Choice Award will be hosted by Nova East. Prizes? Of course there will be prizes – door prizes for all ages and for the Astrophotography Contest and People's Choice Award. There may even be an added attraction – wait for details later in the planning stages.

Mark Your Calendar:

August 31 – September 2, 2019

Place: Smiley's Provincial Park, NS

Exciting news - a new Nova East website is under construction! For now, please note the information on the current site is last year's information regarding the event date, program details and registration requirements. Stay tuned! Everyone will be apprised as to when in May the NEW site will be going LIVE.

Even if you don't enjoy camping, you can still register to attend the events. Take up residence for the weekend in a B&B or motel in the area. Or perhaps drive in from home for the day and enjoy the daytime presentations. Either way, come learn with us and join in the camaraderie. Hope to see you there!

A thank you is extended to my fellow NEPC members for their ongoing work behind the scenes to ensure another successful Nova East – Dave Chapman, Melody Hamilton, Gregg Dill, Chris Young, Liz Greenough, and consultants Pat Kelly, Mary Lou Whitehorne, Paul Gray, and John Read.

Respectfully Submitted,

Judy Black, Chair

Nova East Star Party Planning Committee

P.S. Member suggestions are always welcomed!

Halifax Centre Showcase

Thanks to those who submitted and shared their photos to Nova Notes for this edition. There is some great work going on at Halifax Centre.

Submissions for March and April:

David Hoskin - M27

David Hoskin - Sugar Maple Moon

David Hoskin - M57

Dave Chapman - Iwomoto

David Hoskin - Sunspot

Charles White - Sunspot

Charles White - Unknown crater





Dave Chapman
Nova Scotia, Canada
SMU BGO "Ralph"

C/2018 Y1 (Iwamoto) 2019 March 16–20 ~21:30 ADT

