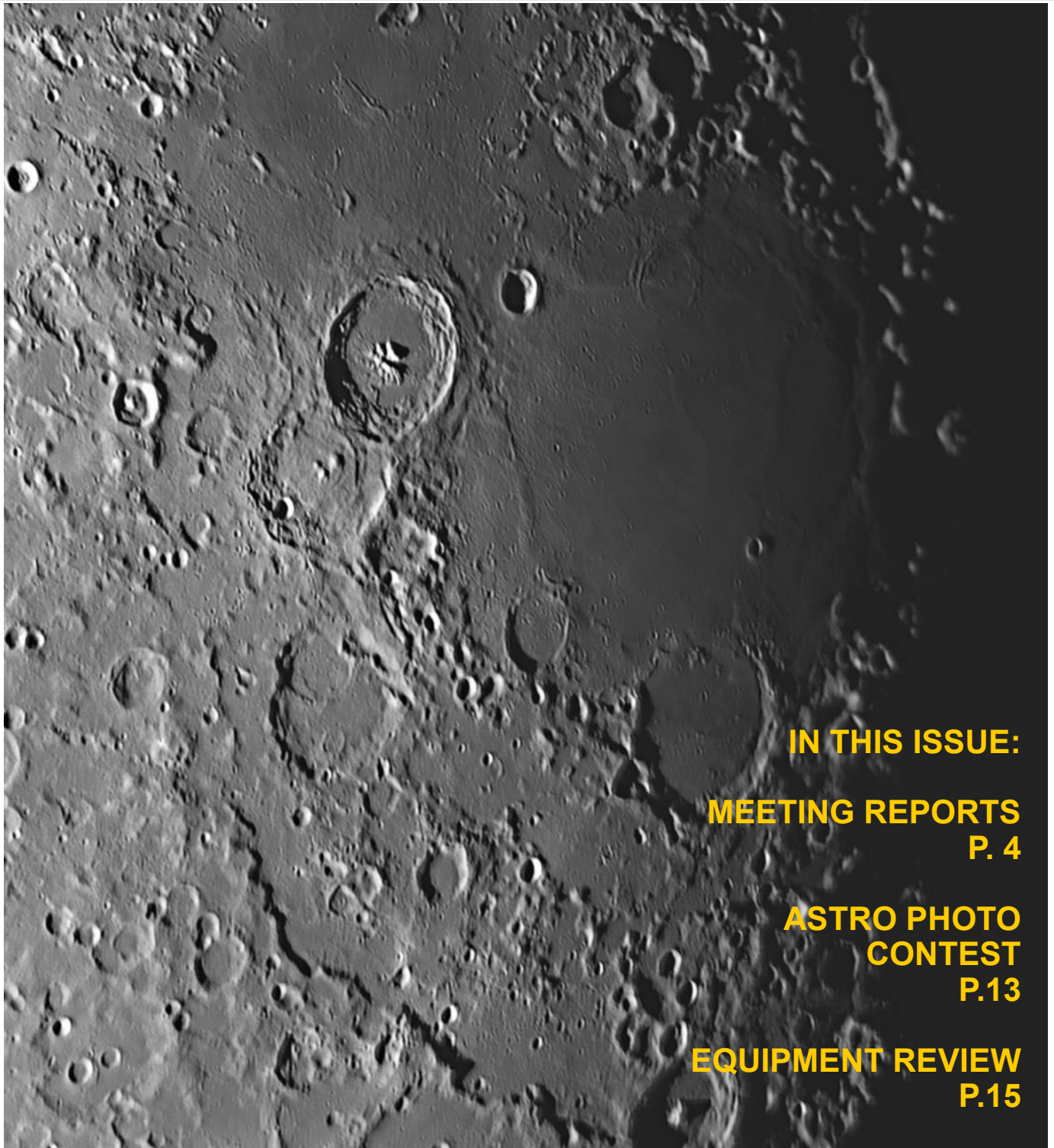


Nova Notes

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



PO Box 31011, Halifax, Nova Scotia, Canada B3K 5T9 www.halifax.rasc.ca



IN THIS ISSUE:

**MEETING REPORTS
P. 4**

**ASTRO PHOTO
CONTEST
P.13**

**EQUIPMENT REVIEW
P.15**

In this issue:

From the Editor	2
Centre Information	3
May Meeting Report	4
June Meeting Report	5
Sept. Meeting Report	7
Oct. Meeting Report	9
Nova East	10
Astro Imaging Contest	12
Redcat 51 Review	13
Food for the Soul	15

From the Editor —

Here we are, almost to the end of the year and sadly we are still dealing with Covid-19. The “new normal” it has been called has been a rather large change for most of us, however with the nights getting darker, faster this will at least allow those of us who have to still follow restrictions at least a faster opportunity to get outside faster.

For me, August into autumn is the best time of year for viewing. I am a solar system objects guy and that time of year really lends itself well to view and show off Jupiter and Saturn. Which are always crowd pleasers, even if this summer the only crowd pleasing we had were those in our small groups or even just ourselves catching up with “old friends”. As the night sets in faster and we’re leaving work for home and it feels like midnight there are two other planets that do not get a lot of love but are in the sky and should deserve some attention too.

They are two of my favourite objects, the ice giants, Uranus and Neptune. They got to be two of my favourite planets and it’s not because they are the most stunning to look at visually. It’s the fact that we really don’t know much about them at all compared to the other planets. We’ve only had the single flyby when Voyager 2 flew by them on its way out of the solar system. We’ve never gone back, and that’s precisely why I think these two worlds are so cool. There is a sort of mystery there and discoveries waiting to be found!

My very first observing challenge was Uranus, and over the course of a month, I recorded it in my logbook and tracked its movement through the night sky against background stars. A small project, see it move and try and determine its motion. I’ve now started to look into photometry and if anyone has any insight on how to do it. I would love for you to reach out to me. I’m sure it’s in the handbook, but at time of writing, I’ve not been able to find it. You can observe the seasonal brightening and dimming of Uranus and Neptune, as well as do measurements of both planets visible moons. If you’ve got a large enough telescope of course.

Aside from photometry, there is also a visual element as well for looking at Uranus. All you need is a larger aperture and a standard red filter. I’ve tried with my 203mm Dob with mixed results, but on nights of very good seeing and still skies, you can make out the bright polar region on the planet and a gradient that tapers off from there outwards. Weather hasn’t really been cooperating for continued observations, but I have been told that you can monitor it and see the bright area grow and shrink over time.

So there are a couple observing projects that you can work on during these early nights, and since we’ve got no place to go, might as well get out and observe. Ice giants or no. Lets make the most of it.

Stay safe, happy and healthy.

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

PO Box 31011, Halifax, Nova Scotia, B3K 5T9

E-mail: charleswhiteproductions@gmail.com Newsletter Editor: Charles White

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

The deadline for the next edition is 24 December 2020.

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.

St. Croix Observatory

Part of your membership in the Halifax RASC includes access to our observatory, located in the community of St. Croix. The site has expanded over the last few years and includes a roll-off roof observatory with electrical outlets, a warm-room, and washroom facilities. We welcome you to bring your own equipment or to use the Centre's 400-mm Dobsonian telescope, 100-mm binoculars, and the recently acquired SCT and gear for astro-imaging.

Enjoy dark pristine skies far away from city lights and the company of like-minded observers searching out those faint "fuzzies" in the night. Most clear Moon-free nights, you will find our keen observers out there! Announcements of members visiting SCO are made on the Centre's Discussion List. If you are not a key holder and would like to become one or need more information, please contact the SCO Manager, John Liddard.

Meeting Dates for 2020

5 December, 2020
(Includes AGM)

In lieu of a face-to-face meeting, we will now be hosting Members' Meetings using Zoom. You do not require a Zoom account to join in but you are required to register for this webinar. The webinar is limited to 100 registrants - first come, first served. The panellists' presentations are being recorded and will become accessible via a link on <https://halifax.rasc.ca>

Halifax RASC Board of Directors, 2020:

Honorary President : Mary Lou Whitehorne	(Appointed)
President: Judy Black	(Elected)
Vice-President: Paul Gray	(Elected)
Secretary: Peter Hurley	(Elected)
Treasurer: Gregg Dill	(Elected)
National Council Rep: Pat Kelly	(Appointed)
Director: Pat Kelly	(Elected)
Director: Matthew Dyer	(Elected)
Director: Paul Heath	(Elected)
Director: Wayne Harasimovitch	(Elected)
Director: Tom Crosman	(Elected)
Director: David Hoskin	(Elected)
Librarian: Wayne Harasimovitch	(Appointed)
SCO Manager: John Liddard	(Appointed)
Observing Chair: Dave Chapman	(Appointed)
Outreach Chair: Paul Heath	(Appointed)
DSP Committee: Dave Chapman (interim)	(Appointed)
Nova Notes Editor : Charles White	(Appointed)

Cover photo

By David Hoskin

The three large craters on the western side of Mare Nectaris are, top to bottom, Theophilus, Cyrillus, and Catharina

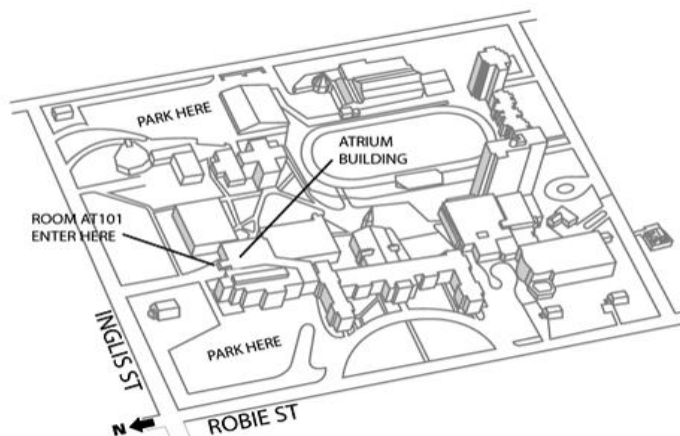
Imaged with a Celestron C8 SCT and ASI290MM CMOS camera; 750 frames of video stacked and processed.

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.

Board meetings begin at 10:30 a.m., usually in room AT217, and all members are welcome.

Members Meetings Covid-19

COVID-19 caused interesting things to happen as of the end of March. Members' meetings and special events had to be held in a different format – Zoom.

Since the March 22 provincial State of Emergency was declared, five members' meetings along with a special meeting regarding the SCO upgrade were held virtually with the RASC and RASC Halifax Centre Zoom accounts.

The agenda for every Members' Meetings contain ongoing presentations:

Photo montage: Paul Gray prepares the collection of photos taken and sketches drawn by members over the previous month for all members to view

What's Up?: Dave Chapman prepares the list of events and viewings for each month. He provides the presentation at each meeting that is also posted to the RASC Halifax Centre website home page.

News from the Board: Judy Black provides information regarding RASC and Halifax Centre business and events, and features members with recognition for their accomplishments in imaging and observing.

Content details of the above types of presentations will begin again with the October 3 meeting. Numerous speakers from near and far addressed Observer's Handbook chapters and special presentations at meetings held on Saturday afternoons, 1:00 PM to 4:30 PM. In this issue of Nova Notes are the presentation highlights of meetings held May 2, June 13, September 12 and October 3, 2020. A link to the RASC Halifax YouTube channel is provided for each meeting for those who wish to learn more.

The dates of our next meetings are:
December 5 (Members' meeting + AGM)

May Members Meeting

President Judy Black welcomed the thirty-eight members and guests in attendance at the May 2, 2020 meeting.

The Observer's Handbook topic of weather resources on the internet (OH pages 74-78) was presented by Judy Black. She explained the GOES-R satellite series, types of satellite images and radar images and described a few apps related to weather forecasting to assist astronomers in planning imaging and observing sessions.



Above: RASC Halifax President, Judy Black welcomes members to the May meeting.

Jerry Black and Blair MacDonald gave part 3 of *Anatomy of an Imaging System: What Toys do You need? Macintosh / Unix Raspberry Pi*. Jerry explained the software, Instrument-Neutral-Distributed-Interface (INDI) architecture and clients, and KStars and Ekos interaction and connectivity. He then described the workflow and provided a Demo of KStars. Judy thanked Blair and Jerry for their 3-part presentation regarding astro-imaging on differing platforms.

Judy Black welcomed RASC Executive Director Phil Groff who began his role in October 2019. He was excited about being with RASC due to his lifelong interested in astronomy and astrophysics. His goal was to visit every Centre in his first year to build the relationship between the national RASC and its 5,000 plus members. Consequent to COVID-19, the face-to-face meetings became virtual meetings. The strategic objectives of the Society and an overview of the structure of the RASC were presented. He also provided an overview of revenue and expenditures.

Phil Groff noted the challenges facing not only RASC but also other membership-based associations: competing time pressures, volunteers feeling burned out, aging membership, changing value expectations due to change in member demographics, market changes, generational differences in opinion on joining and what it means to join, competition, and technology.



Above: RASC Executive Director, Phil Groff during his presentation.

The good news is there are answers to these challenges and ways to navigate the new normal:

- Overhaul the governance model and committee operations
- Empower the ED and enhance staff expertise (and their accountability)
- Rigorously define the member market (market and their expectations are changing)
- Rationalize programs and services (consider long and short-term environment)
- Build a robust technology framework (found solution for new database and lists server for better infrastructure)

He introduced RASC Board of Directors and staff through photographs and described the current RASC offerings during COVID-19 such as the *Insider's Guide to the Galaxy, How to Use the Observer's Handbook*, and the speaker series. He also re-introduced the Domer Telescope Museum and the robotic telescope project that will be updated to allow member usage in the coming year for imaging, science and outreach.

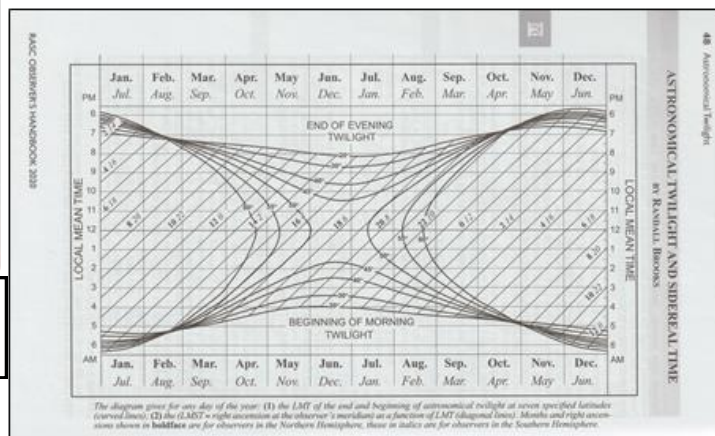
Editor's note: The video of the May members' meeting can be found at this URL: <https://www.youtube.com/watch?v=0XWnDGN8JIM>

June Members Meeting

President Judy Black welcomed the forty-six members and guests attending the third Members' Meeting being hosted June 13, 2020 on Zoom.

The Observer's Handbook talk by Patrick Kelly was an explanation of the chart on page 48 regarding *Astronomical Twilight and Sidereal Time*. There are three components to the chart: a table, diagonal lines and several curves.

The *table* is 12x12 with the vertical axis for the local mean time of day from 6 PM to 6 AM and the horizontal axis for month of the year.



There are 24 hours of right ascension and when divided by the 12 months meant there was a shift of 2 hours of right ascension every month (left). The *diagonal lines* join identical times of right ascension as the months progress. *Curved lines* are labelled according to degrees latitude and depict the length of darkness, if any, at various latitudes. For example, Halifax at 45 degrees in June does have darkness from 10:30 PM to 1:30 AM whereas at 60 degrees you would not have a dark observable sky from around mid-April to end of August.

Judy Black noted that guidelines for use of SCO during COVID-19 had been determined by the Board and were now on the Centre's home page.

Paul Heath then described how to build a scaled Solar System. He explained how he used Styrofoam balls to build the models for a solar system walk. He used photos from NASA's orbiters – Voyager, Messenger and the Mars probe – to make as accurate a drawing of the features on each planet. The scale for the model began with the Earth at 1-5/8" diameter then scaled the other planets based on diameter information in the Observer's Handbook. The Sun's scale is 7 feet 2" across relative to the planet models. Paul's slides can be found at https://halifax.rasc.ca/images/documents/presentations/2020-06-13_Paul_Heath_Solar_System.pdf.



Above: Paul Heath shows how to make to scale model of an object in the solar system.

Tim Doucette provided a photo montage of the images he took at his Deep Sky Eye Observatory and explained the equipment he used. He then gave his presentation *Cap the Light. Save the Night*. He asked us to think about why, where and when do we need light at night and how much do we really need.

The Earth has always been dark at night until the last 100 years or so, following the invention of the lightbulb. 'Light pollution' is defined as light that shines where it is not needed or wanted.

The main components of light are the amount of light, its brightness and the amount of energy used. Various energy sources make lightbulbs nowadays more efficient than the standard 100W lightbulb. The lowest Nova Scotia Power uses is 45 W LED when a 25 W would provide the effect desired.

Brightness					
Brightness In Lumens	229+	400+	700+	900+	1300+
Standard	25 W	40 W	60 W	75 W	100 W
Halogen	18 W	28 W	42 W	53 W	70 W
CFL	6 W	9 W	12 W	15 W	20 W
LED	4 W	6 W	10 W	13 W	18 W

The colour of the light does make a difference. Everything above 3,000 Kelvin is called a bioactive light which means the blue light produced has an effect on the environment and yourself. You also want to make sure there is appropriate shielding to have light directed where you need it.

Tim then discussed two myths related to lighting.

- More light = better security. Not true. Better lighting design = better security
- More light improves visibility – not necessarily.

Exposure to blue light at night is harmful to us and the world around us. It reduces the production of melatonin that helps us sleep at night, weakens our immune system, creates sleep disorders and makes us more susceptible to some types of cancer. Many nocturnal animals such as bats, amphibians, deer, and fireflies require dark nights to survive, reproduce, and hunt. Plants reduces tree life by 20% and confuses them as to when they should lose their leaves. Migratory birds also get confused in bright lights. Light can contribute to increased algae growth in lakes.

Tim explained the mandate and role of the Starlight Foundation I the Canary Islands. South West Nova was the first in North America and the fourth in the world to receive two of their designations in 2014 – Starlight Preserve and Starlight Tourist Destination. It is unique to North America and provides a tourist destination for interested in observing in dark skies. The Deep Sky Eye Observatory also won the Parks Canada Sustainable Tourism Award. Tim works with others in his Community to develop and create star gazing experiences.

What we can do as individuals and as part of RASC is to teach people about light pollution and work to change the laws regarding outdoor lighting. Putting lighting as part of land use by-laws that takes into account protection of the night sky holds more power than lighting by-law alone.

If you have a neighbour with whom you would like to discuss light pollution:

- Be tactful.
- Remember your neighbour has the right to light up 'their' property.
- Strike up a conversation: "Hey, I wonder if you could help me out?"
- Offer to help them get the proper fixture or light.
- Keep in mind that not everyone will agree with you.
- You can't reason with the unreasonable.

Editor's note: The video of the June members' meeting can be found at this URL: <https://www.youtube.com/watch?v=DAPJCq5VoXU>

September Members Meeting

President Judy Black welcomed the forty-five members and guests attending the third Members' Meeting being hosted September 12, 2020 on Zoom. After explaining the perks of becoming a RASC Halifax Centre member, she welcomed Paul Heath and his presentation of *Food for the Soul* – his poem entitled *Powder Puff*.

What's Up in the September Skies?

Dave Chapman, Observing Chair, described what to look for in the September skies. His presentation is also accessible on the Centre's home page. Dave encouraged members to do the RASC Explore the Universe (ETU) observing program. He noted that September is the month to begin observing Mars and referenced the 2020 Observer's Handbook, page 217. To encourage members to begin the ETU, he challenged them to observe several objects easily seen this month.

News from the Board

Judy Black informed members that Dave Chapman received the ETU certificate and Melody Hamilton received the Isabel Williamson Lunar Observing Program (IWLOP). 'Stars' of Halifax Centre were highlighted in the Sept/Oct edition of SkyNews – Tim Doucette, Jason Dain, Barry Burgess, John Read, and Dave Chapman. Members were needed for the nominating committee. Discussions regarding an electrical upgrade to the St. Croix Observatory are underway. A policy was in place regarding members' use of SCO during COVID-19.

On behalf of Halifax Centre, condolences were given to the family and friends of Walter Zukauskas who died on September 3, 2020. He was a longtime member of Halifax Centre, served as President in 1972 and was a Board member for several years.

Discovery Centre

The partnership with the Discovery Centre was described by two members, Peter Hurley and Wayne Harasimovitch. Wayne explained there was an opportunity to work with them for an astronomy event at the Discovery Centre on September 26-27 as part of International Observe the Moon Night (InOMN). Concerns for the safety of RASC members and the Discovery Centre guests were top of mind.

Our Centre will host three activity areas: Information booth, an area dedicated to various telescopes (for viewing only, not hands-on), and monitors to feature members' images using photos taken with telescopes on display.

Peter confirmed the telescopes will be behind a cordoned area; they can be talked about but cannot be touched or handled to avoid issues of infection and cleaning. All volunteers will be wearing masks as are the guests coming into the Discovery Centre. If there are any changes in health status within Nova Scotia in the coming two weeks, the session might be cancelled.



Observer's Handbook Presentation: Solar Observing

David Hoskin provided the Observer's Handbook presentation; the information is found on pages 186-188. With some very inexpensive equipment you can observe some interesting features on the Sun. David stated the first rule of solar observing is to NEVER look directly at it. Exposure of your eye's retina to the intense sunlight seen through binoculars can cause severe and perhaps permanent damage to eyesight, and it is even worse through a telescope. He explained ways to view the sun safely:

Eyepiece Projection: An image of the Sun can be projected onto a piece of white cardstock paper for safe sharing with others. This works with refractor or reflector telescopes and is especially effective to observe eclipses.

Solar Safety Filters: There are several types that can be used – glass (most expensive), black polymer film, Mylar film, Baader film and commercial filters. He stressed to NEVER use an eyepiece filter – the heat buildup on the dark eyepiece filter may lead to shattering of the filter. The intensified light then goes right to your eye causing damage. Ensure your filter is intact and has no pinholes. Commercial filters will block 99.999% of the sunlight.

Using Telescopes with Solar Safety Filters: Solar safety filters are mounted securely with Velcro straps to ensure they don't blow off in a wind, causing severe or permanent eye damage. Ensure the finder scope is capped to avoid accidental viewing through it.

Never leave a telescope unattended to avoid someone taking the filter off to view the Sun. Eclipse glasses protect the eyes but be sure they are obtained from a reputable supplier. Solar filters can also be used on binoculars.

To safely find the Sun, find the angle that casts the smallest shadow, or use a commercial or DIY solar finder. Dave explained how sunspots are formed and decay. You can use afocal and prime focus imaging to capture satisfying photographs of sunspots of varying sizes. We are about to start cycle 25 so there should be an increase in the number of sunspots.

For more advance solar observing, you must use dedicated solar telescopes fitted with hydrogen-alpha and calcium K-Line narrow band filters. Members are encouraged to sketch or image solar spots.

Mars: The Science of What You're Seeing

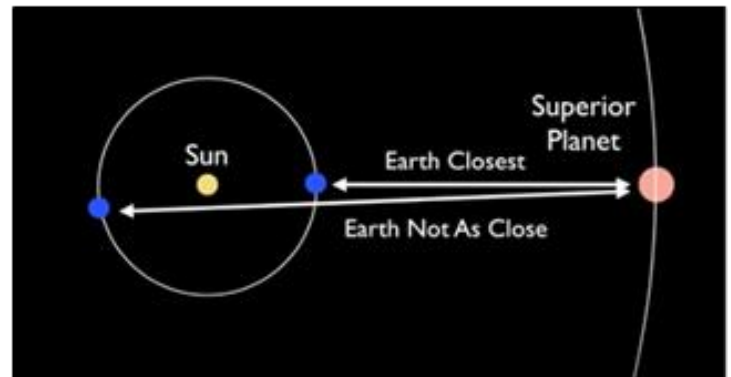
Pat Kelly gave this presentation as part of the Nova East Speaker Series as well as for the Members' Meeting. He explained there is interest in Mars because it has an opposition from time to time, that point where the Earth is between the planet and the Sun. Other planets also can be in opposition: Jupiter, Saturn, Uranus and Neptune.

The time between oppositions of each of the planets and Earth will vary due to their synodic periods, i.e., how long it takes the Sun, the Earth and the planet to go from a given alignment back to the same alignment. It will always take longer than one year as the planet has moved more slowly than the Earth. Pat explained the differences in the synodic periods of the superior planets. For example, Neptune (368 days), Uranus (370 days) and Saturn (378 days) don't go very far in their orbit compared to the Earth as it goes around once. However, Jupiter takes 399 days (1 year plus a month) to be in opposition. Mars takes over 2 years to reach the next alignment.

We can observe the superior planet in opposition, i.e., when we are closest due to our location in the cycle. When we are on the opposite side of our cycle, the Earth is not as close. As the Earth goes around in its orbit, the distance to the planet changes which changes two observable properties of that planet: apparent size and brightness.

The superior planets, when in opposition do not double in apparent size. For example, Neptune only increase from 2.1" (arcseconds) to 2.3 "and even Jupiter doesn't double in size (30" to 50"). But what is exciting about Mars is that it goes from 3.4" to 25", making it almost as big as Jupiter at its smallest. Mars in close opposition is the best time to observe its features. Whereas the brightness of Jupiter and Saturn do not

change much throughout the year, the brightness of Mars increases significantly when it's in opposition in October. The brightness of Mars can be lessened with an eyepiece neutral density filter or an aperture stop over the end of your telescope. Colour filters (reds, yellows) can also be used.



Because Earth has an inclination of 23.5° and Mars is 25.2° , both planets have seasons. The southern ice cap in summer gets extra sunlight that generates heat to drive winds stronger than during the rest of Mars' orbit. When Mars is closest to us, there is the risk of planet-wide dust storms that will blot out details. The optimum positions for viewing the planet come in October 2020 and November 2022 when Mars is high in sky, closer to us, and the weather half decent for observing. The time of night that is best for observing Mars during opposition is all night!

Earth rotates every 24 hours compared to Mars at 24 hours 37 minutes. Because Mars rotates more slowly than Earth, at the same time the next night plus 37 minutes, you will get the exact same view of Mars. Two nights later you would have wait 74 minutes to capture the same view.

Youth Activity – Star Charts

Paul Heath explained the constellation charts he uses on his bus to show the main stars of various constellations, their names and special features. The bristol board posters can be as simple or as complicated as desired. Lamination of the sheets ensures longer wear. The stars are cut to differing sizes to brightness – higher magnitude would be larger. You can position the star charts to show how they change in orientation through the seasons or with time of night. This is a simple, inexpensive project; the major expense is the lamination.

Editor's note: The video of the September members' meeting can be found at this URL: <https://www.youtube.com/watch?v=AQUowIDI-QU&t=4004s>

October Members Meeting

President Judy Black welcomed the forty-five members and guests attending the Members' Meeting being hosted October 3, 2020 on Zoom.

Food for the Soul

Paul Heath, Outreach Chair, explained *Food for the Soul* evolved from writing about each of our astronomy meetings. Today he reprised one about Mars – *God of War*.

News from the Board

The Members' Meeting on Requisition regarding the proposal for the electrical upgrade for SCO was scheduled for October 24. Members were reminded of the policy regarding the use of SCO during COVID-19. Congratulations to Stewart Cameron for completion of the Explore the Universe certificate. The Nomination Committee welcomes nominations for all elected and appointed positions. Members can acquire copies of the 2021 RASC Calendars in which three members have photographs – Keith Eggar, Jason Dain and youth member Fiona Morris.

What's Up in the October Skies?

Dave Chapman, Observing Chair, described what to look for in the October skies; his presentation is also accessible on the Centre's home page. The Moon will be close to three planets: Uranus (Oct 3), Jupiter (Oct 22) and Mars (Oct 29). The Draconid meteor shower may have an outburst on the 6th and the Orionid meteor shower is later this month. Members should be focusing on Mars as the closest approach is October 6 and opposition is on the 13th. He challenged members to view the polar cap and dark markings on Mars. He showed the star charts for the autumn constellation and stars cited in the ETU, as were deep-sky objects and double stars.

Photo & Sketch Montage

Paul Gray shared 76 images of photos and sketches taken since May. Thanks go to Roy Bishop, Jerry Black, Judy Black, Michael Boschat, Dave Chapman, Art Cole, Simon Dent, Paul Evans, Michael Gatto (especially for his series of Mars sketches), Paul Gray, Bruce Hamilton, Melody Hamilton, David Hoskin, and John McPhee. Paul commented it was an amazing summer in terms of dry weather, clear skies, no planes and interesting features to observe.

Winners of Halifax Centre Astroimaging Contest

Judy gave a special thank you to Atlantic Photo Supply for providing first place prizes to the winners. Adjudicator Blair MacDonald thanked all entrants and noted how difficult it was to pick a winner. The Nova East website has all 34 entries and highlights the four winning photographs.

Deep-Sky (18 entries): Jeff Donaldson – *Heart Nebula Mosaic*

Wide Field (11 entries): Jason Dain – *Bayswater Milky Way*

Lunar/Solar System (5 entries): David Hoskin – *Aristoteles and Eudoxus, the 'Bike Wheel' lunar craters*

People's Choice Award: Jerry Black – *Comet NEOWISE observed in solitude*

Video: International Observe the Moon Night (InOMN), September 26, 2020 – How to observe the Moon

Members viewed the video produced by Tony Schellinck regarding observing the moon during InOMN. It can be viewed in the video of this meeting, or separately at <https://youtu.be/YiYNrBjXIRo>.

Youth Activity – Youth Program Development

Paul Heath described the sessions to be held at a local community recreation centre; provincial COVID-19 restrictions were considered during the program's development. The main purpose of these sessions is to excite them and to encourage them to do more. Hands on activities are planned for each session. Each week covers a different topic including: discovering what they know about the solar system, galaxies, etc.; explanation of how we see and what do we see; constellations; Solar system; where we will find Aliens and what would they look like based on the type of planet; star formation and decay; and RASC ETU and ETM observing programs.

Special Presentation - A Snapshot of DRDC Space Situational Awareness (SSA) Research & Development

Lauchie Scott is a defense scientist and the principal investigator of the space object tracking mission on the NEOSat micro satellite. He is located in Shirley's Bay, sandwiched in with the Canadian Space Agency and the Communications Research Centre.

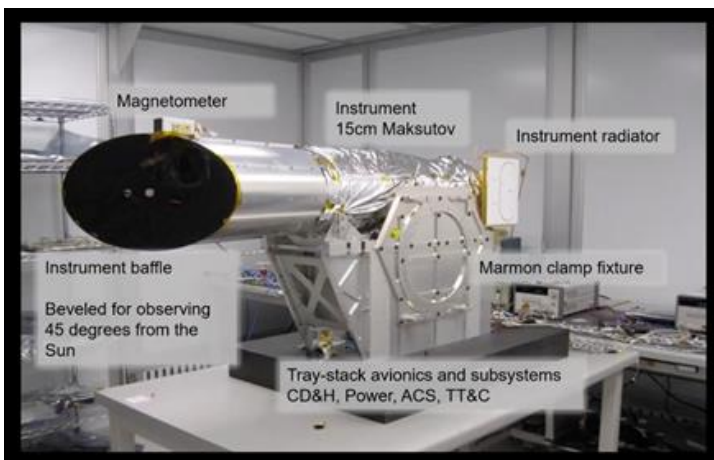
Why are we concerned? Asset protection

Canadian Forces have numerous space assets they wish to protect related to GPS, SATCOM, weather, missile warning and overhead imagery. There are about 20,000 objects (of a predicted 1,000,000 objects) larger than 10 cm in size they can track of which 99% are considered space junk. Space is becoming more polluted, creating a bigger tracking problem. For example, less than 2 hours after the Chinese tested their first anti-satellite weapon, the RadarSat-1 satellite started grazing the outer edge of the debris cloud and subsequently had to do avoidance manoeuvres. The Sapphire satellite narrowly missed a fragment from a US DMSP weather satellite at a relative speed of 14.8 km/sec in space (at sea level is Mach 50); had they collided, the 6-month-old \$80M asset would have been destroyed.

Low Earth Orbit (LEO) to 1200 km altitude holds numerous satellites such as RadarSat and NEOSat. Geosynchronous Earth Orbit satellites (GEO) are further out; the 4,000 km ring you see around the Earth contains satellites that maintain the same geographic site on Earth. Canada also has SSA Tracking Systems.

Sapphire (DND) is for operational deep space surveillance as part of the Space Surveillance Network. Its two antennas are in Guildford UK and Abbotsford BC.

NEOSat (DND/CSA), a micro satellite launched in 2013, is a smaller, less expensive space telescope with two objectives: to test the military utility of the micro satellite, and to conduct experiments that cannot be done from the ground. The telescope is a 15 cm Maksutov with a CCD and a radiator to take heat away from the instrument. The time between launch and when the satellite becomes functional is about 1 hour, provided it works as expected and calls home. Five Eyes multinational experiment (Phantom Echoes) was conducted to track satellites performing commercial docking and captivation in GEO. There are the benefits to servicing and extending the life of satellites but there is also the potential for nefarious purposes and security risks. They are experimenting to determine how well they can be tracked. NEOSat is currently observing the SpaceX Starlink constellation from 200 km above their orbital planes.



Above: A breakdown on the equipment of NEOSat

Ground-based optical is a set of sensors for space surveillance of LEO objects. The imagery produced allows for pinpointing locations of objects within 50 meters.

Photometry helps determine the stability of a satellite; the recorded line of brightness should be smooth, but variable brightness means it is not controlled. NEOSat tracked asteroids such as 2012-TC04 because they wanted to know in a planetary

defence context where exactly on Earth the asteroid would hit so that global governments could be notified. Canada is investing in technologies to reduce the risk of objects being in orbit perpetually and causing risk to other spacecrafts. In 2017, they developed the CANX-7 nanosatellite to deploy a drag sail that when deployed grabs small space particles to slow it down and cause descent. When the second sail was deployed, it became naked-eye visible.

NEOSat astronomy images are released to the public from the Canadian Space Agency at ftp://ftp.asc-csa.gc.ca/users/OpenData_DonneesOuvertes/pub/NEOSSAT/

Adjournment at 3:05 PM.

Editor's note: The video of the October 2020 members' meeting can be found at this URL: <https://www.youtube.com/watch?v=lfQJKAuTKzw&t=4925s>

Nova East – the 2020 Virtual Experience

Planning the Nova East Star Party began in February 2020 when all was well with world, or at least within Nova Scotia. By early March, the schedule and speakers were confirmed. On March 22, the provincial government ordered a Provincial State of Emergency, shutting down the province and forcing a rethink of if and how this event could be held.

The Committee wanted to continue the celebration of the many facets of astronomy, to reinforce connections between members, and to provide education and entertainment to our membership. A Zoom meeting was held April 25 when, for numerous reasons, the Committee recommended that Nova East 2020 as a camping event at Smileys Provincial Park be cancelled, unless there was substantial change to the social distancing situation.

Some Nova East activities did, however, remain intact; for instance, a Star Party t-shirt was designed then redesigned to indicate the effect of the pandemic – COVID cancelled. The Centre's Astroimaging Contest went forward. And our speakers? The keynote speaker 'from away' agreed to come next year provided their schedule allowed. Our local speakers were featured every Tuesday evening from August 4 to September 1, with the sixth presentation held at the September 12 Members' Meeting. Moderators of the sessions were Dave Chapman and Judy Black.

August 4 – Kathy Walker

Beginner Image Processing for Astrophotographers
(Length- 1:13:44)

August 11 – David Hoskin (Length- 1:09:48)

Lucky Imaging: Astrophotography of the Moon and Planets

August 18 – Fiona Morris & Keegan Oickle

RASC – The Next Generation (Length – 59:27)

August 25 – Tony Schellinck

Astronomy on the Cheap – Summer/Fall Challenge Using Binoculars (Length: 1:19:50)

September 1 – Paul Heath

Walk the Solar System (How to) (Length- 47:20)

September 12 – Patrick Kelly

All About Mars: The Science of What You're Seeing
(Length 41:21)

Also, thanks to our event consultants Paul Gray, John Read and Mary Lou Whitehorne. Well done!

Submitted by Judy Black, Chair, 2020 Nova East Planning Committee

Editor's note: The full meeting can be found at this URL:
https://www.youtube.com/playlist?list=PLebMPxNPb_h18XkW2bwBWlbneacLWNmbo

Zoom! Zoom!

No, this isn't a Mazda advertisement!

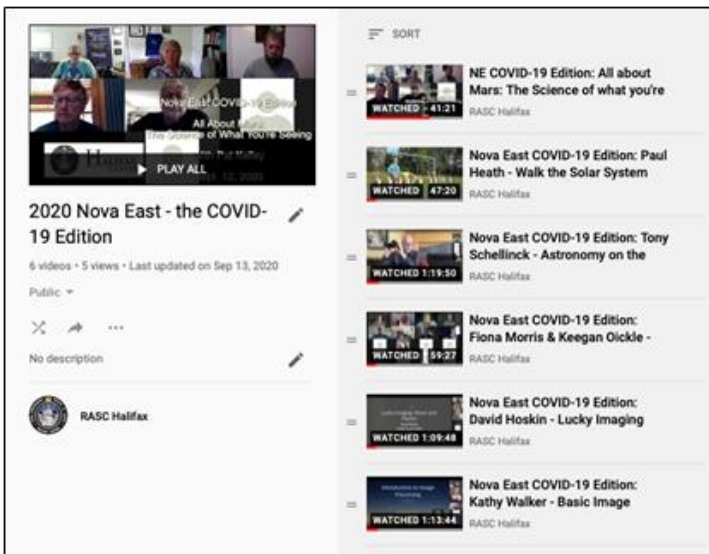
COVID-19 interrupted not only our daily lives but affected RASC Halifax Centre. How do we keep members engaged and the business of the Centre going forward? How do we host observing sessions? How were committees to meet? These were questions the Board had to answer.

Thanks to the national RASC office, their Zoom meeting and webinar accounts allowed the 29 Centres across Canada to keep members apprised of what's up in the night sky and the work being conducted on their behalf by their fellow members and the Board of Directors. One of the many benefits of these accounts was the ability to attend meetings and special presentations hosted by the many Centres across Canada. How has Halifax Centre used the Zoom technology?

Board of Director and Committee Meetings, Special Presentations:

Because the number within these groups was small, the 'meeting' capability of Zoom that allowed up to 100 was used. The Board of Directors used the RASC Zoom account for the first time for their proceedings of 26 March 2020. Shortly thereafter, Halifax Centre acquired its own Zoom meeting account, thinking it would be short term. Little did we know. Using Zoom for Board meetings has proven beneficial for many reasons:

- No travel time involved (except to the front of their computers), especially for those members outside Metro Halifax.
- Weather and road conditions didn't impact a director's ability to attend (unless a power outage occurs), nor would weather prevent the business of the Centre going forward.
- Members from across the province could comprise the Board, not just those who live in the Metro Halifax area.



Members may not have attended the speaker series when it was 'live', but they haven't missed them! Search for *RASC Halifax* on YouTube and the *2020 Nova East – the COVID-19 Edition* presentations are there. For those who enjoy the camping experience, it is hoped the next Nova East Star Party slated for August 6-8, 2021 can go forward under the stars at Smiley's Provincial Park.

I would like to thank my fellow teammates for the work they have done to ensure the Nova East experience, albeit a virtual one, was continued in these unusual times – Dave Chapman, Gregg Dill, Liz Greenough, Wayne Harasimovitch, Patrick Kelly, and Chris Young.

- It is now more common to have *all* directors in attendance, as well as some appointed positions attending.

Recognizing that COVID-19 could have a longer-term impact on the Board conducting business and that Zoom was proving a highly useful tool in conducting Board business, the Board determined at their June meeting to upgrade the account to Standard Pro Annual for 'meetings' of the Board and its committees.

Summary of Meetings (using the Centre's Meeting account):

- 9 Board meetings
- Members' Meeting on Requisition (MMoR).
- 2 meetings of the Nova East Planning Committee plus the 6 sessions of the speaker series
- 5 astroimaging sessions
- 2 lunar observing sessions
- Pre-meeting sessions held for MMoR presenters and for the Centre's Discovery Centre team.
- SCO Fundraising Committee meeting
- Nominating Committee

Members' Meetings:

The Board initially utilized the RASC 'webinar' capability as we were not sure of how many of the 172 Halifax Centre members would participate and, being new to this technology, also not sure of how to handle 100 or more registrants. As of October 3, five of the eight meetings were conducted using the national RASC Zoom webinar account.

The benefits are numerous. It means that even though we no longer meet face-to-face, our members from across the province or living in New England, and others across Canada could participate. Travel not necessary! And on the reciprocal side, our members could also attend meetings and special sessions that other RASC Centres offered. Win, win!



Above: An image of the virtual meeting room of the RASC: Halifax Centre

Concluding Thoughts?

Board of Director meetings and perhaps some if not all Committee meetings may still be held via Zoom in the future, especially if members of these groups come from across the province or further afield. As for Members' Meetings, they may be face-to-face again in the post-COVID world for those who can make it into Halifax combined with Zoom capability for those who do not travel in. Once back into the real world, snacks could be brought in by our 'Cookie Chair', Pat Kelly. Right, Pat?

In any case, much to look forward to in the future. Here we go. Zoom. Zoom.

Submitted by Judy Black, President

Halifax Centre Astroimaging Contest

As of April 2019, the Astroimaging Contest, formerly only within the purview of the Nova East Star Party, is now a Halifax Centre contest thereby opening it to more than Nova East registrants. Planning for the contest is done by the Nova East Planning Committee with guidance from the Board of Directors.

Submissions were accepted from any Halifax Centre member or any resident of Nova Scotia. The contest had three categories: wide field, deep-sky/prime focus and solar system. Criteria for each category are posted on the Nova East website throughout the year for members to reference, should they wish to consider entering their photos in the annual contest (<https://novaeast.rasc.ca/index.php/contest>).

There were thirty-four entries in the 2020 Astroimaging Contest, four more than last year. Adjudicators Blair MacDonald and Mary Lou Whitehorne certainly had challenges ranking the high-quality photos in each category. Kudos to the imagers for such amazing captures of the night skies. Normally, the winners are announced during Nova East. However, given the Star Party was replaced with a speaker series, the 2020 winners of the three categories were announced at the October 3, 2020 Members' Meeting:

Deep-Sky: IC 1805 / Heart Nebula – Jeff Donaldson

Solar System: Aristoteles and Eudoxus, the 'Bike Wheel' lunar craters - David Hoskin

Wide Field: Milky Way Bayswater - Jason Dain



Above: IC 1805 / Heart Nebula – Jeff Donaldson

Left: Milky Way Bayswater - Jason Dain



Allen Sutherland of Atlantic Photo Supply (APS) notified the winners by email as to how they could claim their prize of a 16"x20" wrapped-canvas reproduction of their photo. Halifax Centre would like to thank APS for their continuing support of the Nova East Star Party and especially the Centre's contest.

All photos entered into the contest were put on the Nova East website for members to preview and a poll allowed them to vote for their favourite. The winner of the People's Choice Award was Jerry Black with his photo *Observing Comet NEOWISE in solitude*. He received a \$50.00 gift card from Atlantic Photo Supply.

Submitted by Nova East Planning Committee

William Optics RedCat 51: Is it the cat's meow?

Earlier this year I was looking for a light-weight wide-field refractor to pair with my Sky-Watcher Star Adventurer Pro tracking mount and Canon T3i DSLR, which would allow me to image night sky targets that were too large to image with my Orion 80mm f/6 apochromatic refractor and ASI183MC CMOS camera. I had heard good things about William Optics RedCat 51. Trevor Jones' rave review on AstroBackyard and the gorgeous images captured by our own Fiona Morris using her RedCat 51 convinced me to order my own RedCat 51 from Astronomy Plus in early July. However, demand for this little refractor was so great that I had to wait over 6 weeks for new stock to arrive so that my order could be filled.

At last, the package from Astronomy Plus arrived at my door. Opening the shipping box, I was presented with a sturdy soft carry case embroidered with the Big Dipper and the iconic William Optics cat face and whiskers.



Above: Aristoteles and Eudoxus, the 'Bike Wheel' lunar craters - David Hoskin



Above: The RedCat 51 with protective case. Ruler for scale

Nestled in dense foam within the case was the RedCat 51, as well as 2 Allen keys and documentation that included a flat field test report. I was immediately struck by the exceptional quality of the workmanship.

This little f/4.9 apochromatic refractor, which weighs only 1.3kg, is a solid piece of kit! The metallic red finish is flawless and visually striking. The objective is 51mm in diameter and the focal length is 250mm. For those who like technical details, the RedCat 51 uses a Petzval 4-element design incorporating FPL51 and FPL53 glass elements. The result is a flat imaging field with no false color. Focus is via a silky-smooth helical focuser incorporated into the optical tube assembly. The camera adapter, which requires a M48 T-mount, can be adjusted for camera tilt and will accept a 48mm filter.

The RedCat 51 does not come with a finder/guide scope bracket, but it is pre-drilled and easily accepted a bracket from my odds and ends collection. A custom finder/guide scope bracket is also available from William Optics. The mounting plate is fully adjustable and can be used with either an Arca-Swiss style camera tripod head or a standard vixen-style saddle on any telescope mount. The length of the mounting plates makes it very

easy to balance the RedCat 51 with guide scope and camera attached.

The metal lens cap incorporates a Bahtinov mask, which is a nice touch. First light with the RedCat 51 did not disappoint!



This image of the Milky Way was captured just outside of York Redoubt using my RedCat 51 and Canon T3i DSLR on a Star Adventurer Pro tracking mount. Am I pleased with my purchase? The answer is a definite yes! However, I do have a couple of small quibbles. The design of the RedCat 51 does not allow attachment of a standard star diagonal for visual use, although a screw-on star diagonal with an erecting prism is available from William Optics. I also find that the helical focuser lacks the precision of a dual speed focuser.

This is not a major issue when using a DSLR and focusing via live image on the camera LCD screen; however, I found it a challenge to achieve perfect focus when I put the RedCat 51 on my EQ6R Pro mount and used my ASI183MC CMOS camera with a laptop running SharpCap to image the Double Cluster. Use of my ASI183MC required the purchase of a M42-to-M48 adapter ring. A spacer was also necessary for the camera to focus. Neither of these purchases were a major expense and, focusing challenges aside, will enhance my use of the RedCat 51, which will no doubt be extensive. Meow!

- Submitted by David Hoskin

Food for the Soul - Sept 2020

September 1 was an incredibly clear night all night for observing and it inspired this poem of observing at dusk.

POWDER PUFF

The canvas lay wide,
Unmarked, its pale blue motion unseen.
Then with subtle, delicate touches
A thin brush, brightening points upon the
unmarred piece did lay.

With wide and oh so subtle strokes,
Across the pale blue canvas wide,
In quiet silence, darkening rose up, the
canvas wide.

Again, with thin brush, upon the unmarred
piece did touch,
Many brightening points now scattered laid.
As if intended, these clustered, brightening
points,
Slight patterns upon the canvas made.

With wide and oh so subtle strokes
Upon the darkened pale blue canvas wide,
Sharp blackness in silence, crept up the
canvas wide.

Then upon each brightening point
The thin brush, with rapid twists a sparkle
placed
As spread, clenched in hand,
A hundred thin brushes danced the canvas
wide.

Down upon the palette the wide brush
splayed,
With a stiff-armed flic, an arc across the
canvas laid.
As with a wide and oh so subtle stroke,
The last faint brightness, from the canvas
was swept away.

Then the final touch to the canvas subtlety
was made,
With the tenderest and delicate of touches,
The shiny points, the arc within,
A Powder Puff allayed.

By Paul Heath

Halifax Centre Showcase

Taken from submissions and from the RASC Halifax Mailing list:

Mars: Photo taken by Art Cole

Monkey Head Nebula: David Hoskin

Moon: Photo taken by Michael Boschat

Uranus: Photo taken by David Hoskin

Theta Sagittae: Sketch done by Dave Chapman

Mars: Sketch done by Michael Gatto

