

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 halifax@rasc.ca

Matt Payne asks: will Trump and his administration change the direction of science and scientific research in the United States? p. 4

Paul Heath feeds us food for the soul: Snow Shadow p. 4

Dave Chapman tells us what to observe two days before the first-quarter moon p. 5

Pat Kelly reports on his adventures viewing the northern lights while visiting Tuktoyaktuk p. 10

Art Cole explains why we all should be dithering when we take astrophotos p. 8

Dave Lane gives us the latest on observing with a gravitational binary micro-Lens p. 6

Dave Chapman reports exciting times at the 2017 Winter Star Party p. 9

A must read! Annual and monthly reports p. 12—p.24

January/February 2017

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, Tony McGrath.

Upcoming Observing Nights:

March 24 (alt 25)

April 28 (alt 29)

May 26 (alt 27)

Meetings usually begin at 7:30 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 2017

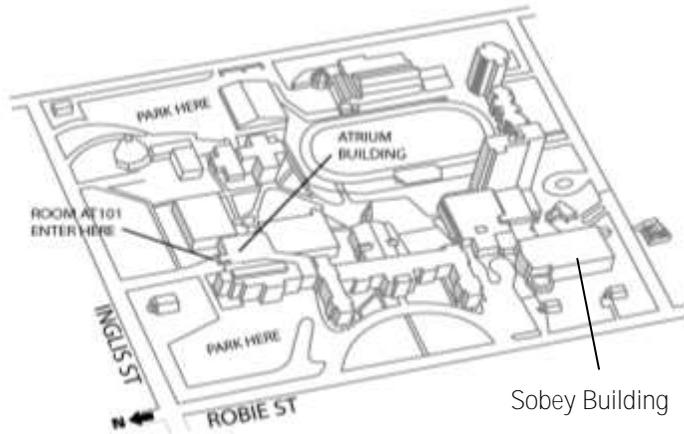
Jan. 20, Feb. 17, March 17, April 21, May 12, June 16 (annual BBQ), Sept. 15, Oct. 20, Nov. 17, Dec. 8 Annual General Meeting

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 third Friday of the month, except for the months of July and August.

Executive meetings begin at 6:30 p.m., usually in room AT306, and all members are welcome.

Halifax RASC Executive, 2016:

Honorary President	Dr. Roy Bishop	rlb@eastlink.ca
President		
Vice-President	Paul Gray	snpgray@gmail.com
Secretary	Judy Black	jblackns@icloud.com
Treasurer	Jim Millar	jim.govdoc@gmail.com
Nova Notes Editor	Tony Schellinck	schell@dal.ca
Librarians	Andy and Elli Hasler	andyhasler@hotmail.com
SCO Manager	Tony McGrath	tony.g.mcgrath@gmail.com
Observing Chair	Sean Dzafovic	sdzafovic@gmail.com
Councillor & Nat. Co-Chair	Patrick Kelly	patrick.kelly@dal.ca
Outreach Chair	Paul Heath	pheath@eastlink.ca
Councillor	Art Cole	Art.Cole@gmail.com
Councillor	Andrew Frank	a.frank.tt@gmx.com
Councillor	Melody Hamilton	melynnham@gmail.com
Councillor	John Read	johnaaronread@gmail.com

In this issue:

Meeting Announcements	2
Trump and Astronomy Research	4
Food for the Soul: Snow Shadow	4
Lunatic Ramblings 7	5
Gravitational Binary Micro-Lens	6
Starlight & Semiconductors: Dithering	8
Good Times at the Winter Star Party	9
An Astronomical Pain in the Neck	10
Annual Report: President	12
Annual Report: Observing Chair	13
2016 Treasurer's Report	14
Annual Report: Outreach	16
Meeting Report February 2017	17
Meeting Minutes: 2017 Halifax AGM	18
Annual Report: 1 st Vice-President	20
Annual Report: Nova East	21
Annual Report: National Council	22
Annual Report: 2 nd Vice-President	22
Annual Report: Nova Notes	23
Meeting Report January 2017	24

Cover Photo

Dave Chapman

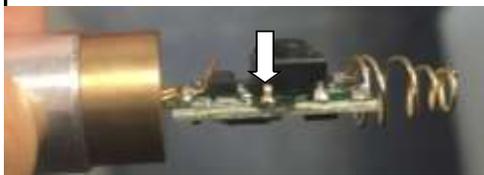
A 2017 Winter Star Party photo. I call this photo Southern Cross Reflections. I took it the morning of February 26th, near 3:00 am, when the Coal Sack culminated. Taken with my Canon SL1 with 50-mm lens set at f/2.8. It's a 4-minute tracked exposure at ISO 800.

From the editor *Tony Schellinck*

My daughter lives in Ottawa and we visit her there several times a year. Each time we visit I spend an hour or two at Focus Scientific where I have purchased most of my astronomy equipment and get advice on what to buy, how to use it and how to fix it when I inevitably break it. I purchased my first scope, an 8-inch Schmidt-Cass on a CG5 mount there in 2005 and have purchased several other scopes (80-mm ED, 16" Dob, 8" Newtonian Astrograph), mounts and accessories over the years. The same crew, Kent, Tristan and Nathan have been there to help me since day one; each with a wealth of experience and knowledge such that I can't stump them on any question, whether it is related to equipment, observing or astrophotography.

My one sore point has been that the laser pointers purchased from several locations, including Focus, would stop working after a short time, so I accumulated several mostly defunct pointers over the years. I tried pulling the spring out to improve the contact but that did not seem to have much impact. Often new batteries would help for a few minutes but then the green beam dimmed or disappeared. On my last trip I lamented the fact that the pointers didn't last. As Focus always tests the equipment before it is shipped out they had accumulated 24 inoperative laser pointers over the last while. Tristan took one to the back shop and started to take it apart. Since he had never done this before it took a while for him to figure out how to do this without damaging it. The diode and circuit board assembly is glued to the tube, but by gently tapping at the back of the assembly with a screw driver, he was able to push them out of the tube. Close examination with a magnifying glass revealed that one of the four contacts was not making contact with the circuit board. He quickly soldered the contact after which the laser pointer worked. He dismantled a second pointer and found the same problem, a quick soldering and the second pointer was fixed as well.

I had gone in mainly to get some training on how to properly use my Delos eyepiece with my Tele View PowerMate, and to purchase 21-mm and 36-mm



Tristan discovers poor soldering on laser circuit board. (Photo: Tony Schellinck)

Hyperion eyepieces (and the adaptor for afocal photography) but as I was leaving Tristan presented me with one of the repaired laser pointers. So far it seems to be working. Many of those who use these pointers for public viewing say they have the same problem. It seems that shoddy soldering may be responsible for the dimming of the light.

Tristan made it look easy to fix them but then they have been repairing astronomy equipment there for years and have the tools and skills to do it all. I suspect many of you are adept at repairing equipment such as this, so I am telling you this little tale in case you too have some semi-defunct laser pointers on the shelf; it may be worthwhile to check the contacts on the circuit board and solder them if

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

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

E-mail: novanoteseditor@rasc.ca Newsletter Editor: Tony Schellinck

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

The deadline for the next edition is April 20, 2017

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.

The Universe's Symphony of Sound:

Will Change Happen?

Matt Payne

So did you all survive the multiple snow storms? Wow, looks like we are getting all of winter in one week! First, one foot of snow, and then another foot of snow two days later! Are you sick of shoveling this stuff and all of the people on the road who forget how to drive on snow?

Anyway, hopefully winter is winding down now that the Sun is getting higher in the sky and the days are slowly getting warmer. Change is always a good thing when we all come off a long cold snowy winter, to a nice warm spring. However, change can also be confusing, scary, and come with unwelcome side effects. After a long, some may say too long, presidential race in the United States, Trump was elected as the 45th President of the United States. As an American and New Englander, I often have been asked since Trump was inaugurated, will Trump and his administration change the direction of science and scientific research in the United States.

With all the coverage of the difficulty in getting Trump's Secretary and Cabinet appointments through committee and the U.S. Senate, this begs the question: How will this affect science, its funding such as grants, and the direction scientific research takes in the United States. At this point in the beginning days of the Trump Administration, my opinion is neutral as to the "Trump Effect" on science and scientific research in

the United States. Why, because there are still numerous hold-over Obama appointees in U.S. Government positions relating to science or research. It takes time and resources to properly vet a person or appointee to a new position within the government. The Trump Administration is primarily focused on getting its Cabinet Secretaries in place now and will focus on other appointees (including those in the science fields) once that is completed. Then you throw into the mix the Congressional Budget which will not be taken up in full until March or April, 2017.

Change will be slow for the first year in the new administration. In fact, the only recent science related appointment that was uncontested was Ajit Pai the new designated Commissioner of the Federal Communication Commission. Do I think all of Trump's science-related appointments will be this easy? No, but we will have to wait and see what comes down the pipeline in terms of people who Trump nominates for these positions within the U.S. Government. Of course money is the big factor here and problems always crop up with funding agencies such as NASA, NOAA, FCC, etc. but I think the more money Congress pushes to allocate, the better off the outcome.

OK, we all have to admit that this article was one of my "heavier" articles for Nova Notes. But whether we all admit it or not, politics is so intertwined with science, scientific research, and how it progresses forward in the United States. Change will happen and I believe the change will be positive for science and scientific research going forward.

FOOD for the SOUL: Snow Shadow

Paul Heath

Snow Shadow

They laid their trap with subtle care.
Hid beneath hard-blown crystalline air.
A trapper's stealthy snare,
To gather fast, their winters fare.

And as it was His want to race
Up leapt above the Royal Hues embrace,
To claim His victory over night
And frolic brightly, midst the starry light.

But the trap had been laid with care,
Winter Wind had sculpted crystalline air
And wove within, glimmering starlight gems
To mesmerize and ensnare, that swiftly running
Hare.

When looking down, he paused, entranced
To see His stars, laid out upon the ground.
For in that instant, with cautious cat's paw steps
They tossed high their Gossamer Veil to bind Him
fast.

But as that Gossamer Veil descends
Their stealthy snare unbinds itself.
For the woven glimmering starlight ceased to
shine,
And the blackened shadows, fade to gray.

Undazed, the Hare leapt forth
And as the gossamer veil fell behind,
Looking down upon the sculpted crystalline air
He sees, it is, HIS light held glistening there.

(February meeting 2017)

Lunatic Ramblings 7: Basins and Craters (Q-day -2)

Dave Chapman

I'll take this opportunity to plug *Explore the Moon*, a new RASC observing program with certificate! For details, see www.rasc.ca/observing/explore-the-moon-observing-certificate. These *Nova Notes* columns (starting in April 2015) take you through this program (with occasional detours), night by night. This issue, we review features visible around Q-day -2, that is, about 2 nights *before* First Quarter. That's 2017 March 3 or April 3-4, coming up. Spring is a great season to observe the waxing crescent Moon in the evening, as it is high up in the sky, and it is not too cold.

Starting in the north, the topography is dominated by two large "seas," Mare Serenitatis (Serenity) and Mare Tranquillitatis (Tranquility), large basins flooded with dark lava and pockmarked with a few young craters. Northeast of Mare Tranquillitatis is one of the lunar "lakes," Lacus Somniorum (Dreams). Is anyone getting sleepy? In between is the prominent crater Posidonius (100 km), a lava-flooded crater with some interesting secondary craters, both within and without, and several fissures on the floor.

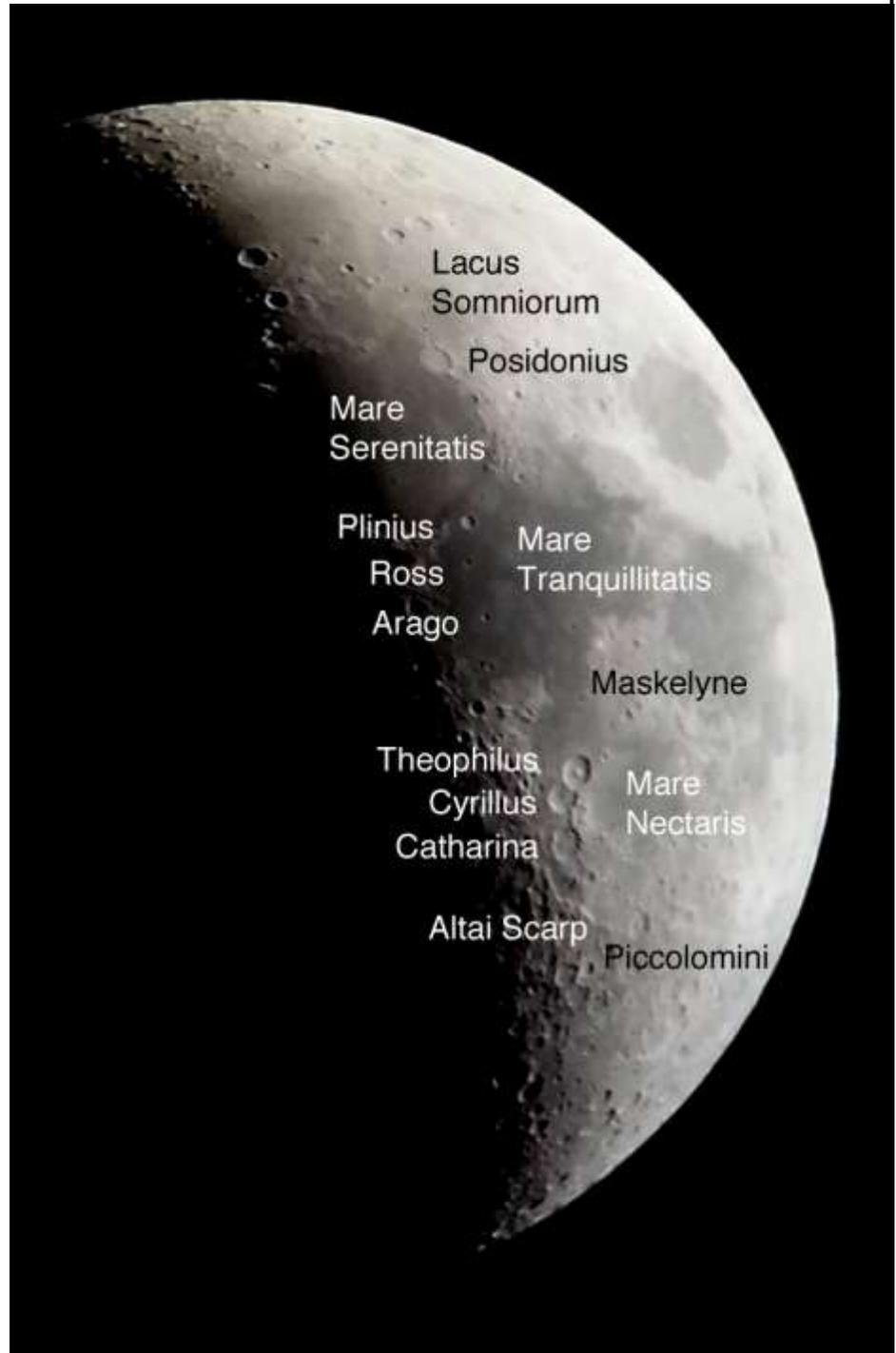
Further south, almost at the south shore of Mare Tranquillitatis, are the landing sites of *Apollo 11*, *Surveyor 5*, and *Ranger 8*. Nothing to see here folks, just time to reflect on where humans first explored the Moon in person! If you want a real challenge, for which a good telescope with high magnification is needed, look for the craters Aldrin, Collins, and Armstrong (these are not EtM objectives, and you will need a good lunar atlas to help you find them). Before leaving these "waters," look east to find the irregular crater Maskelyne (22 km)

Moving south, we find the smallest lunar sea, Mare Nectaris (Nectar). On its western shore, note the trio of increasingly eroded craters Theophilus, Cyrillus, and Catharina (all just under 100 km). South of Catharina, note the long Altai Scarp (550 km) running to the southeast,

ending at the crater Piccolomini (88 km). The scarp is best viewed at low sun angles, when the sunrise or sunset terminator is near.

That will keep you busy—in my next column, we'll move to Q-day -1 and look around. Email if you have questions or comments!

dave.chapman@ns.sympatico.ca



▲ The Moon 2 days before First Quarter (photo: Michael Boschat)

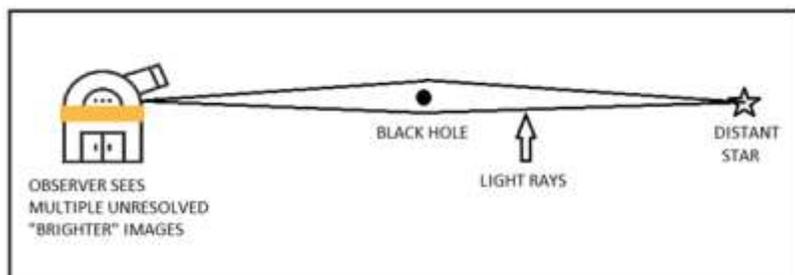
Observing a Gravitational Binary Micro-Lens

Dave Lane, Abbey Ridge Observatory (ARO)

Introduction

A gravitational what? As predicted by Einstein's general theory of relativity, high-mass objects can bend the path of light passing close by. Observations of background stars near the limb of the Sun during a solar eclipse in 1919 were the first confirmation of this phenomenon.

It was later suggested that light from an object located



▲ Figure 1: A “cartoon” model of the gravitational micro-lensing of a distant star.

directly behind a compact massive object (such as a black hole or neutron star) would be lensed – the result being that the distant object would be brighter than expected. Normally light intensity decreases by the inverse-square law where each doubling of the distance results in an intensity drop of a factor of four. The “lens” disrupts that process making the distant object brighter than it would otherwise be – this is because the “lens” allows the observer to receive light from multiple paths.

There are two main types of gravitational lenses:

Large scale: this is where a distant galaxy (or quasar) is located far behind a foreground massive galaxy or galaxy cluster. The foreground “mass” creates a “lens” for the light emitted by the distant object and it focuses its light, forming a brighter image of the distant object. Because the lens is not perfect, the images formed are rather poor! Visually, they often appear as multiple single images or arc-shapes surrounding the “lens”.

Small scale: these are called gravitational micro-lenses (the subject of this article) and are believed to be made when a compact massive object (such as a black hole) passes in front of a background object such as a star. Because both the source and lens are not resolved, a normally invisible object is “lensed” and becomes bright enough to observe or a known object becomes brighter. This type was first detected in 1989.

In the micro-lens type, because the relative distances between the light source, lens, and observer is small and due to their relative motions, objects can pass in and out of being “lensed” on a short time scale. Since many are discovered each year, this makes them quite useful for studying a variety of astrophysical phenomenon (e.g., constraining the number of stellar black holes – aka dark matter).

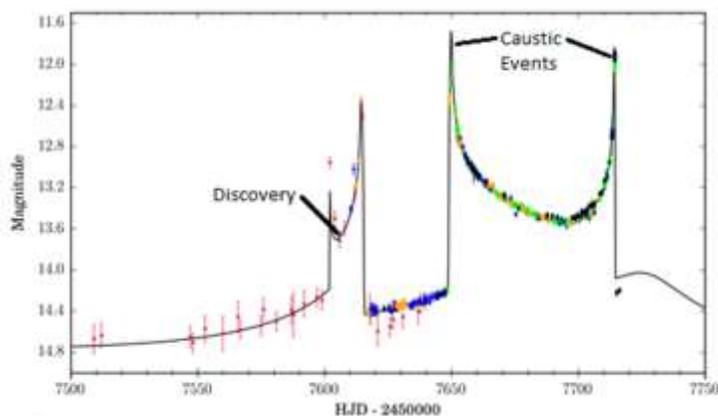
An even more bizarre variation is when there two compact massive objects in close orbit with a separation near the Einstein radius (the angle of the lensed ring around the object)! The resulting geometry can be complex and their “warped” gravitational fields create what are called “caustic events” that cause the lensed brightness to rapidly change.

These are called binary micro-lenses.

Discovery

This story begins on August 5, 2016 when the Gaia space telescope's operating programs detected an increase in brightness of a previously stable star by over one magnitude. It was then named *Gaia15aye*. This triggered an alert which resulted in ground based follow-up observations lead by the Gaia Photometric Science Alerts Team. The star continued to brighten, but instead of a rise and fall at the same rate – the typical signature of a micro-lens event - the fall was very rapid.

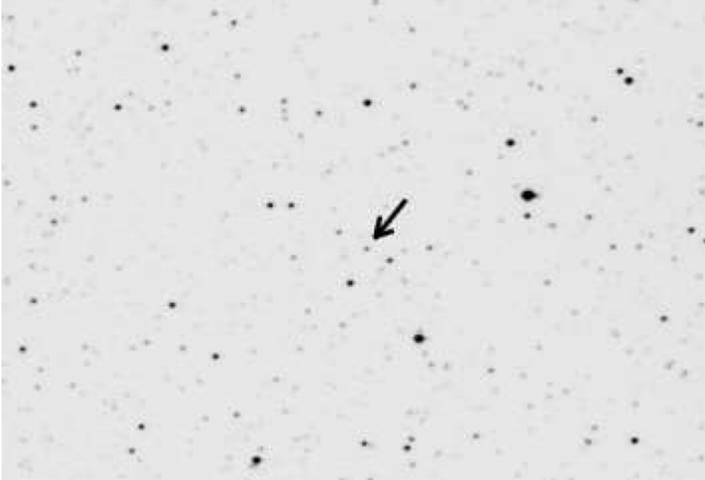
When the light curve (a fancy term for a graph of a star's brightness vs. time) was studied and more data came in, it was realized that this event was likely caused by a binary micro-lens! A “model” of the system from the observed light curve predicted a second pair of events would occur in mid-September and late November.



▲ Figure 2: The accumulated light curve of *Gaia15aye* from late April until just after the last caustic event in late November. The solid line is the model computed by Przemek Mróz, a PhD student at the University of Warsaw. The chart did not indicate the filter used – the magnitude scale is not V-band for sure.

Observing a Gravitational Binary Micro-Lens continued

Dave Lane, Abbey Ridge Observatory (ARO)



▲ Figure 3: My first image (cropped) of **Gaia15aye** (marked by the arrow) taken on the evening of September 20 when it was micro-lensed and nearly 2 magnitudes brighter than normal.

More Data Needed

The American Association of Variable Star Observers (AAVSO) mobilizes campaigns to observe stellar objects of interest to professional astronomers who, due to limited telescope resources, could not possibly dedicate the resources that a team of mostly amateur astronomers could.

After the mid-September caustic event took place (confirming the object's nature), Dr. Kirill Sokolovsky (National Observatory of Athens and Sternberg Astronomical Institute, Moscow State University) requested that the AAVSO initiate a campaign urgently requesting observations of **Gaia15aye**. It was clear in Halifax the evening after the campaign notice was published and my data was the second observation to be reported.

I continued to make measure-

ments of **Gaia15aye** every clear night from either the Burke-Gaffney Observatory (BGO) or my own Abbey Ridge Observatory. Up to December 6th, I submitted 248 V-band observations on 28 nights (who says the weather has been bad this fall?). Unfortunately, it was cloudy when the final caustic event took place, but it was clear on the next evening so those observations would help constrain the fall time.

In all, about 5,000 brightness measurements were made in five filters by 28 observers from 14 countries – citizen science in action!

Conclusion

Contributing to this project was fun and exciting, especially leading up the final caustic event when it was uncertain when it would take place. It was also helpful that the professional astronomers were engaged and appreciative of the work done by the AAVSO observers.

This sort of project could be done by any of you. Don't have the equipment? Use these Twitter-controlled telescopes yourself – see my article in the June issue of *Nova Notes*!

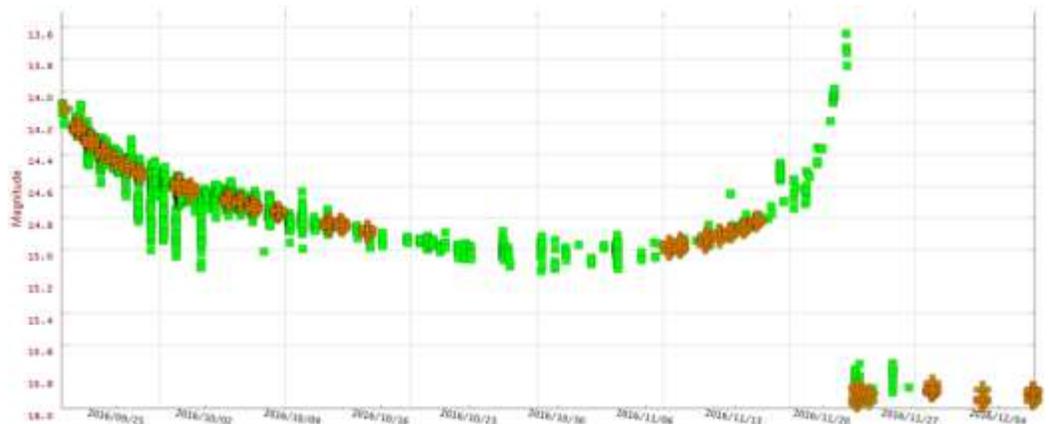
References

Wikipedia: Gravitational lens, https://en.wikipedia.org/wiki/Gravitational_lens

Wikipedia: Gravitational microlensing, https://en.wikipedia.org/wiki/Gravitational_microlensing

Gaia Spies Two Temporarily Magnified Stars, <http://sci.esa.int/gaia/58546-gaia-spies-two-temporarily-magnified-stars>

Models of **Gaia15aye**, Przemek Mróz, University of Warsaw, <http://www.astrouw.edu.pl/~pmroz/Gaia16aye.html>

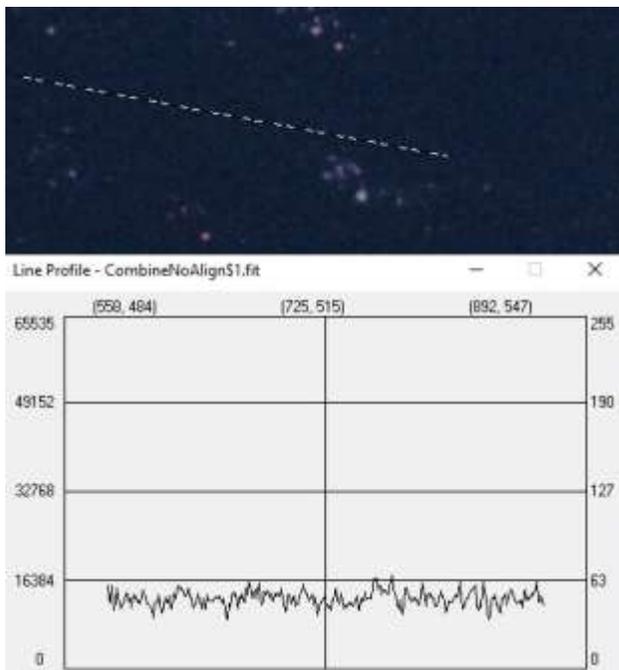


▲ Figure 4: The light curve of V-band (green filter) observations submitted to the AAVSO's database. The orange "cross" symbols mark the BGO and ARO observations which were taken on 28 separate nights.

Starlight and Semiconductors: Why We all Should be Dithering

Art Cole

Last November I attended a workshop given by Canadian astrophotography guru Ron Brecher. The topic of the workshop was how to use PixInsight to post-process astroimages, but Ron said something else that caught my attention: that dithering while collecting sub-frames was the number one thing you can do to reduce noise in images (before post-processing, of course). I knew what dithering was, but I had never done it before, so I gave it a try.



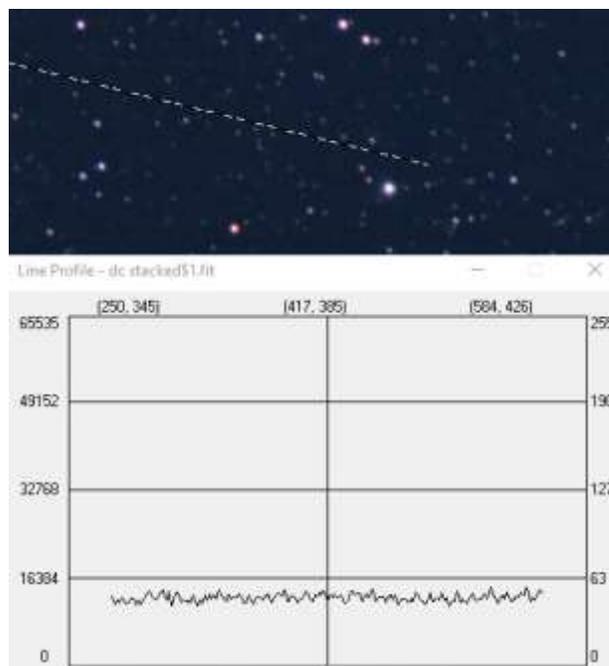
▲ Figure 1: Stacking without aligning emphasizes correlated noise in sub-frames, producing a noisier background.

First, a bit of an explanation. Dithering in astrophotography is when the camera is pointed in a slightly different (and randomized) direction each time a sub-frame is taken. After the subs are taken, they are calibrated, stacked, and combined as normal. Why does this make a difference? It begins with understanding the two types of noise you get in your sub-frames. The first is uncorrelated noise, which is random noise. From sub-frame to sub-frame this noise component is different, and stacking without alignment will reduce it. The second type of noise is correlated noise – this noise is non-random, and has the same pattern in all your sub-frames, as it is produced by the sensor and the camera electronics. Stacking the sub-frames without shifting each slightly will reduce the uncorrelated noise but not the correlated noise. DSLR colour blobs and other unwanted sensor patterns will be reinforced in the stacked result, and become even more apparent when the image is stretched to reveal fainter areas of the image.

Dithering helps by randomly shifting the wanted information (i.e., stars and other astrostuff) to a different offset in each sub-frame. Once the dithered images are aligned, the stuff you do want to see is now in the same location across sub-frames; the correlated noise, however, is now at random offsets (thus randomizing it). This is good, because when we stack images with randomized noise, the noise in the result is much lower, and we get a much smoother background.

To show the difference that dithering makes, I processed the same dithered image stack but in two different ways. First, I took the sub-frames, calibrated them, and stacked them without aligning them (see Figure 1). The stars are messed up because they are at different offsets in each sub-frame, and the correlated noise from the camera is lined up perfectly across the sub-frames (not a good thing). Next, I did the same processing but I aligned the images before stacking (Figure 2). The stars look fine but now the noise has been moved to random offsets. By looking at the profile of each image it's easy to see that the dithered result has dramatically lower noise. What this says, in fact, is that the last thing you want when collecting sub-frames is to have perfect autoguiding – your correlated noise will be at the same location in each sub-frame, and will be reinforced in the stacked result.

To perform dithering, you need a camera control program such as Backyard EOS and autoguider software like PHD that supports dithering. In my setup, each time BYEOS captures a sub with the camera, it sends a dithering command to PHD. PHD then randomly selects a new location to place the guide star on the autoguider sensor, and proceeds to move the mount until the star is in that new location. Once the movement is



▲ Figure 2: Dithering randomizes the correlated noise across the sub-frames, thus reducing noise in the stacked result and producing a smoother background.

Starlight and Semiconductors: Why we all Should be Dithering *continued*

Art Cole

complete, BYEOS takes the next sub, and so on. Remember to use a min/max exclusion average when combining so that these hot pixels are thrown out before the pixels are averaged - otherwise the hot pixels (which you have spread around

through dithering) will get included in the averaging, which you don't want. You also need to set the random dithering offset between sub-frames to be at least as large as the largest noise artefact you expect your camera to produce. Dithering also consumes a bit of time between each sub-frame, as the scope needs to be re-aimed. If your exposure times are long, this isn't so much of an issue, but if you have a fast lens or scope and your exposure times are short, then you'll find yourself capturing much less data in the same amount of time.

WINTER STAR PARTY (20–26 February, 2017) Dave Chapman

About fifteen RASC members from five Centres informally convened at this year's Winter Star Party in the Florida Keys (Centres represented were Belleville, Halifax, Ottawa, and Toronto, plus le Centre francophone de Montréal). The Halifax RASCals were Dave Lane, Greg Palman, Dave Chapman, and Tony Schellinck, joined by Charles Darrow of RASC Toronto Centre (but living near Boston). We all bunked in a single "chickee," which is a rustic thatched hut with a leaky roof.

The week got off to a windy, cloudy, rainy start, with limited viewing opportunities, but then improved, with Thursday through Friday nights offering long periods of dark, cloud-free skies. There is light pollution to the east, through north, to the northwest, at low altitude, but other directions and overhead are usually near-perfect. Measurements with a narrow-



▲ This photo was exposed February 24th and 25th, the last two nights of the 2017 Winter Star Party in the Florida Keys. It is an 80 minute exposure with a Canon 60Da camera and an Astro-Physics 130mm refractor. The only processing is a gamma stretch and minor colour adjustment. (*Photo: Dave Lane and Greg Palman*).

beam Unihedron Sky Quality Meter showed values in the range 21.7–21.9 magnitude per square arcsecond.

We undertook a variety of observing and imaging projects with a wide range of equipment: binoculars, premium 6" refractor, 13" travel Dobsonian (packs in a plywood box), several cameras and lenses.

Typical objects observed and/or imaged included Venus, the Zodiacal light, the Orion Nebula, the Horsehead Nebula, the Beehive Cluster, Jupiter, binocular double stars, and several other deep-sky objects in the rich Milky Way star fields south of Sirius. Midnight brought a large expanse of galaxies overhead. One of us spotted comet 3P/Encke.

The 20° latitude advantage allowed viewing of several of the "Southern Sky Splendours" from the *Observer's Handbook*, although these were somewhat attenuated by atmospheric extinction (see photo). Just before dawn, it was possible to take in the entire constellation of Scorpius, including the long "fishhook" tail—almost worth the entire price of admission!

But overall, it is simply a pleasure to sit back and enjoy the beauty of the "winter" night sky in "summer" conditions. It is a great event with good camaraderie. Consider it for your next winter getaway trip!

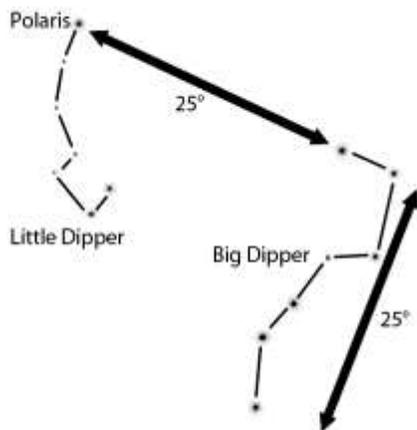


▲ The tail of Scorpius, in an image 30° across, including several features not seen well from Canada: Ptolemy's Cluster (to the left), the Lower Scorpius Dark Nebula Complex (Centre), bright nebula IC 4628 (right), and open cluster NGC 6231. Canon SL1 on my iOptron SkyTracker Pro (*Photo and interpretation: Dave Chapman*).

An Astronomical Pain in the Neck

Patrick Kelly

Having a son (and family) in the RCMP who volunteered to go to the Northwest Territory has allowed me to see some parts of Canada sooner than I had planned. In 2013 and 2014, I flew to Lutselk'e and explored the



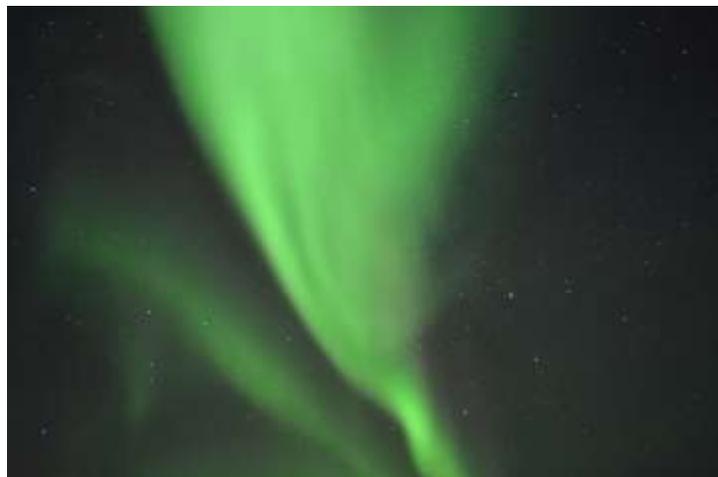
eastern arm of Great Slave Lake. I can see why it has been proposed as a national park, the scenery alone is amazing. In 2015, I flew to Whitehorse and rented a vehicle and drove to Dawson City and then up the Dempster Highway to Fort McPherson. All those trips have been in the summer, and while my son has taken



some amazing pictures of aurora, I have never seen them because, as he pointed out, I always come up in the summer when it never gets truly dark. This year

marked the first in which Dalhousie added a study week to the fall term, so with a chance to go in November before the winter got really underway, I decided to visit them at their new posting, Tuktoyaktuk, and this time there would be no problem with too much daytime!

The northern lights are unpredictable, but enjoying the night sky from an area with few lights is always a



treat. The first thing I noticed was that at sunset the Sun takes a long time to set, as it approaches the horizon at a shallow angle. The same is true of the Moon, it moves along the horizon for some time before setting. Once it is dark, the first thing I did was to find Polaris, the north star. As it is almost directly above the Earth's north pole, it moves north (or south) one degree for every degree change in latitude, moving higher as you go north and lower as you go south. From Nova Scotia, being midway between the pole and the equator, Polaris appears about 45° above the northern horizon. Tuktoyaktuk is 25° farther north than Nova Scotia, putting Polaris 25° higher in the sky.

That may not sound like a lot... but you can see for yourself just how big a change it is. On the next clear night find the Big Dipper. It is low on the northern horizon at sunset during the winter. The Big Dipper is 25° from end to end. Extend an arm fully, and spread your thumb and little finger as far apart as they can go. That should give you 25° . You can check it with the Big Dipper to see how close you come. The Big Dipper can be used to find Polaris by following the line made by the two pointer stars (the ones in the bowl farthest from the handle) 25° . That should get you to Polaris. (See the star chart.) Now use your hand to see where Polaris is as seen from Tuktoyaktuk. See how long you can stand there until your neck gets sore! I have done this in the planetarium, including going all the way to North Pole, but then it was only for a brief period!

An Astronomical Pain in the Neck continued Patrick Kelly

I was also lucky to get a chance to see a really amazing display of the northern lights. After having gotten a



sore neck from looking at Polaris I did spot a faint vertical band of aurora in the northwest, rising up from the horizon. It was barely visible. As my son put it, that is the worst display you get to see from here... but they are unpredictable. As his shift was not due to end until

4:00 a.m., he was going to check periodically and wake me up should a display flare up. I was woken up at 2:45 a.m. with two words "Let's go!". I quickly got dressed and stepped outside their house, and the sky was writhing with green! Not low on the horizon as I have often seen it from home, but large curtains of shifting green light rising in the northwest, passing right overhead, and ending in Orion in the eastern sky. Once again, I got a sore neck from staring up, but it was well worth it!

I tried to use my small digital camera to capture the spectacle, but even with the aperture opened up all the way and the shutter speed set to maximum (4 seconds) all the pictures I took came out black. As I had nothing to lose, I set the camera to "intelligent auto", pointed it at the aurora and half pressed the focus button. Up on the screen comes "dark sky mode" "hold camera steady". I pressed the shutter down and oddly the pictures taken this way show some green in them. My son has a large DSLR and also took some pictures. so the ones you are seeing with this article were taken by him. Gradually some high cloud moved in and after about 30 minutes the display had mostly faded away. As it turned out, the first two nights I was there were clear. After the aurora display, it was overcast with a few periods of light snow, for the rest of my stay, and it was close to a week and a half after I left before they saw sky again. Talk about lucky!



◀ Here is another image taken at the Winter Star Party - Omega Centauri, the most grand globular cluster in the sky containing some 10 million stars. Visually in Dave's 13-inch scope at medium power, it is truly mesmerizing. It is so bright to be easy naked eye (mag 3.6) - in fact it was cataloged as a star before the telescope was invented. Seeing this object is almost worth the trip!

This image was taken Sunday morning for 20 minutes with a 5-inch Astro-Physics refractor and a Canon 60Da camera. (Photo: Dave Lane and Greg Palman)

2015-2016 Annual Report: Secretary

Judy Black

The principal duty of the secretary is to provide minutes, agendas, and meeting announcements to the Council and members of the Centre. An additional duty is to book meeting rooms through SMU for meetings. We were welcomed back for another year and are grateful to Saint Mary's University for their very significant support related to meetings and special speaker events held at their institution.

There were 9 Council Meetings in 2015-2016 which usually occurred during the hour before the Centre Meeting. Members are welcome to attend Council meetings if they wish. There were no Council meetings held in June, July and August.

There were 9 regular Members' Meetings during 2016 along with the informal gathering at the Annual BBQ held in June 2016. All Members' Meetings had a guest speaker; however, there was a Members' Night in March in which members apprised fellow astronomers of special events to attend, special equipment tried out, and projects they completed. There were a minimum of three meeting reminders for every Council and Members' Meeting held.

Motions were made with a quorum of the Council to provide direction on policy, activities, support of the observatory at St. Croix, our budget, and definition of any spending not covered in the budget. Motions made this past year included:

Budget adjustments:

- Up to \$200.00 be provided to the three Handbook contributors to attend the AGM;
- Up to \$150.00 to repair the library cart;
- Up to \$650.00 towards RASC Halifax Centre participation in Kejimikujik Dark Sky Week-end;
- Up to \$600.00 be set aside in the 2016 Centre Budget to support 2 trips to Cape Breton Highlands National Park in support of their application for Dark-Sky Preserve status, with actual expenses subject to prior approval of the Council;
- \$100.00 for annual thank you gift to Jamie Carmichael.

Nomination of Martin Hellmich and Halley Davies for the Simon Newcomb Award (which they subsequently won)

Appointment of Councilor Dave Chapman as 1st Vice-President

RASC Halifax Centre Council appoint a By-Law Review Committee to carry out a review of the Halifax Centre By-Law #1, and that a report of proposed changes be provided to the Halifax Centre Council for consideration and approval at their September 2016 Council meeting.

Treasurer to acquire a tax accountant to assist with the T2 submission to CRA.

Halifax Centre would donate the Unihedron Sky Quality Meter of RASC Halifax Centre to Tim Doucette's Deep Sky Eye (DSE) Observatory.

Both the Burke Gaffney Award and the Murray Cunningham Award for Astrophotography were retired as of March 18, 2016. The rationale for discontinuance was that neither had been exercised for at least 10 years, astrophotography awards continue to be a part of Nova East, and a RASC astroimaging certificate was in development at the time (it is now available to members). RASC Halifax Centre Bylaw #1 requires that members are advised of the make-up of the membership of the Centre which as of the September 30 totaled 167 members:

- 13 Regular Family
- 121 Regular
- 3 Family Youth
- 4 Youth
- 21 Life
- 2 Regular International
- 3 Regular USA

I had the honour of acting as Chair of the Bylaw Review Committee that was formed in April 2016. As part of the review process, position descriptions were drafted for all Council positions with input from each of the members. They were approved with the understanding that they would require revisions to reflect changes made in the proposed Bylaw #1 (2016). They will be included in what we hope will be the RASC Halifax Centre's Council Policy & Procedure Manual. Development of this manual is to begin in next fiscal year.

This was my first year serving as RASC Halifax Centre Secretary. I would like to thank Halifax Centre members and the Council for their invaluable support over the past year. I would like to extend a special thank you to my mentor - Past-Secretary Chris Young - for his patient guidance while learning this position's responsibilities.

Respectfully Submitted,

Judy Black, Secretary
RASC, Halifax Centre

2015-2016 Annual Report: President

Paul Gray

Well, 2016 is almost over, and my, where has the time gone? I will be ending my two-year term as President in less than a month from now. Has it really been two years already? It seems like just yesterday that I chaired my first meeting and my, what a wonderful two years it has been. It has been a pleasure to work with so many dedicated RASC members that the Halifax Centre is blessed to have in its membership. As your President, I must thank all of you for all your efforts in the past two years. This past year was a busy one that think we can call successful.

Nova East was a huge success once again. We must thank Quinn Smith first and foremost for stepping up to chair the event to make sure that it would all come together. Just for note, we are seeking a chair for the 2017 Nova East so if you are interested please contact

me. Nova East this year was a hit again with some clear skies and no rain! Observing was done and enjoyed by many. Great talks by the speakers with observing being the theme, surrounded good food and company throughout the weekend.

Nova Notes, again had a banner year with Tony and his great work. Content has been awesome and the look is a pleasure to read. Tony is always looking for more stories, articles and photos so please consider submitting.

Outreach events at the Halifax Centre again was staggering in reach. Elsewhere you can read Paul Heath's report on outreach and see just what he and the Centre has done. Congrats to Paul and to all of those who volunteered time at outreach events.

The big behind the scenes work this year was our Bylaws. Last revised in 1995, they have become dated with new laws. Judy Black volunteered to lead this task and I cannot thank her enough or praise the work she had done for us on this front. It truly was amazing to see her take such ownership to see this through. Please be sure to

thank her when you see her! By now you should have seen the new bylaws and see the interesting changes coming. It should make 2017 a very interesting year in our Centre.

Throughout the year and previous year, I had tried to tweak the meetings a little as well as work with the executive in finding interesting speakers and topics. I feel we have done that and thank all our speakers and those who helped find them and provide ideas. We are typically having 35-50 members at monthly meetings, roughly 1/4 to 1/3 our membership. That is pretty good when I talk to other centres and hear what their numbers are like. Thank you all for coming out and I look forward to joining you in the seats next year.

Clear skies.

Respectfully Submitted,

Paul Gray, President
RASC, Halifax Centre

2015-2016 Annual Report: Observing Chair

Sean Dzafovic

Congratulations to the Halifax Centre members who completed RASC Observing Certificates this year:

Mary Lou Whitehorne – Explore the Universe Certificate

Bruce Hamilton – Astroimager (Wide Field)

Tony Schellinck - Messier Certificate

Paul Evans - Explore the Moon (Binocular)

Jim Millar - Explore the Moon (Telescope)

Melody Hamilton - Explore the Moon (Telescope)

Paul Evans - Explore the Moon (Telescope)

The NOVA Program is being rewritten using the new Explore the Universe Guide as reference material, to replace the out-of-print Beginner's Observing Guide.

Respectfully Submitted,
Sean Dzafovic, Observing Chair
RASC, Halifax Centre

RASC, Halifax Centre 2016 Treasurer's Report (For December 9th, 2016)

Jim Millar

Introduction:

The year 2016 was another financial success for the Halifax Centre. We had operational income of over \$850 before depreciation and write offs. To help to keep our surplus from being too large we continued to write off our equipment at approximately 3%. We improved our library quite significantly this year. Our library managers cleaned up the old inventory, fixed the cart and added \$500 in new books. We will continue to upgrade the library in the new year. We continue to write down the library at 10% per year. Nova East had a significant surplus of over \$1,800. We need to look at how Nova East is run to try and reduce the profit to a more manageable amount.

Surplus of \$290.50 for Fiscal 2016

The Centre continues to be successful and solvent. We are holding our own with membership and Nova East continues to be successful. We continue to follow good accounting procedures by depreciating our assets over time. We are continuing to invest in our library and the St. Croix Observatory.

Details of the 2016 Income Statement

REVENUE:

Membership Fees \$2,901.05: We had a slight increase in membership fees this year. At year end we had 167 members, up from 150 the previous year. Total income was up only slightly because we had more family memberships.

Donations \$1,000: We received a bequest of \$1,000 from the estate of Harry Roberts. Mr. Roberts was a past secretary of the club in the 1950s. He always had a passion for astronomy. In addition to our bequest, Mr. Roberts left a large bequest to Saint Mary's to establish a scholarship for astronomy and astrophysics majors hailing from Nova Scotia.

Educational / Outreach: We had no revenue in this category this year as we did not hold the NOVA program.

Interest \$80.24: Interest on our investments was down sig-

nificantly. Part of this is from declining interest rates. I also switched away from the accrual basis for calculating interest. I will only enter interest when we receive it and will no longer predict what interest is on a daily basis.

Sales of Merchandise (Gross) \$1,275: These were mainly RASC calendar and sales of star finders to the Friends of Keji for sale in their shop.

Nova East (net) \$1,815.329: We continue to make significant profits each year. The cost of camping has been reduced and we make significant profit from the T-shirts. We need to consider methods of giving the membership better value for their registration fees.

Printed Nova Notes Subscriptions Earned \$289.29: This is what printed newsletters earned this year from members subscribing to hardcopy. It appears to be more than previous years because of another change in accounting. Previously, the accrual method was used for this field. We ended up with an asset for the unused portion of the subscription fees. Now the full subscription fee is entered as income when received.

EXPENSES:

Meetings \$244.57: Pat Kelly did well to keep treat spending down again this year. He continues to provide a nice variety of treats for our meetings.

Newsletter \$309.13: *Nova Notes* expense is like previous years. We are subsidizing each issue by about \$5.

Cost of Goods Sold \$1,175.87: This is the cost of calendars for two years. We did not purchase the 2016 calendars until November and bought the 2017 calendars in August.

Equipment and Supplies \$442.35: We purchased wireless microphones and some supplies for them this year. The cost was not significant enough to add to our capital equipment.

Office Administration \$484.26: Postage and post office box rentals were up slightly this year. We are also reimbursing the secretary for personal supplies and photocopying that she does for the club.

Educational Activities (Outreach) \$1416.45: This is like previous years. The Keji Dark-Sky Weekend continues to be a large portion of these expenses.

Legal Expenses \$31.15: Our cost to Registry of Joint Stocks Companies of Nova Scotia.

Insurance \$1,231.00: Insurance for SCO was up a further

RASC, Halifax Centre 2016 Treasurer's Report (For December 9th, 2016) continued

Jim Millar

\$23 in 2016.

Awards and Donations \$203.730: We continue to donate to the Clear Sky Clock website and the International Dark-Sky Association.

Observatory - Operating \$636: This includes the usual gift to Mr. Carmichael, a BBQ, some propane, and the odd item. It also includes taxes to the Municipality of Hants West. We purchased a new BBQ for SCO. It is not included in equipment because they do not last long enough to depreciate.

Asset Depreciation \$587.03: We continue to depreciate equipment at 3% per year and library books at 10% per year.

Miscellaneous Expenses \$75: This was for a complementary membership.

Details of the 2016 Balance Sheet

ASSETS:

Cash \$3,638.56: This is the balance in our chequing account. We also had \$457.78 in accounts receivable for September membership fees owing from National Office.

Merchandise Inventory \$201.00: There is only a small change in inventory this year. We had some unsold calendars at year end.

Prepaid Expenses: I have stopped tracking prepaid expenses. I now track expenses as they are paid.

Investments and Accrued Interest \$16,128.05: This is now the value of the principal in our investments. I purchased an additional GIC for \$4,000. We now have four GICs that come due throughout the year and interest is only counted at maturity.

GA2015 Account: The GA2015 account was closed during the year and all assets transferred to the regular chequing account.

Estimated Library \$1,975.77: We spent approximately \$600 on new books this year. We will continue to upgrade the library.

Observatory Equipment \$12,369.85: After depreciation of observatory equipment of \$327.67 and the addition of some small pieces of equipment for SCO.

LIABILITIES:

Accounts Payable \$230.35: This is for bills for Nova Notes received after year end.

Prepaid Nova Notes Printed Subscription: I am no longer tracking prepaid Nova Notes subscriptions. I count the total amount received as income at the time it is received.

EQUITY:

Nova East Reserve Equity \$5,000.00: This reserve is capped at \$5,000.00.

Common Equity \$29,860.71: Common equity rose by \$290.50 from 2015. The statement shows a higher amount than can be accounted for by the change in accrual accounting and differences between actual and estimated accounts receivable and payable in the last year.

Summary and Recommendations:

I was pleased to serve as Treasurer again this year. I have become more comfortable in the role and have made it a little easier for a non-accountant to stay on top of things. Ian Anderson continued to provide support in the background.

I was able to get a budget passed midway through the year. We were under budget in all expense categories and over budget in income categories. I was able to give one update during the year. I will continue to improve on budgeting with experience.

I have enjoyed this year and look forward to serving you for another year as your Treasurer.

Respectfully submitted,

Jim Millar
Treasurer, RASC Halifax Centre
9 Dec 2016

2015 - 2016 Annual Report: Outreach

Paul Heath

We have once again had a busy year at outreach events. This year a number of our volunteers have stepped up their game and ventured into new outreach events connected to the communities they are in. It is very rewarding to see outreach spreading throughout Nova Scotia. In particular, Tony Schellinck's DSOs with binoculars (the indoor theatre program he has been doing at the Astor theatre in Liverpool), along with his binocular table at major outreach events and his Star Trek Universe play, have spread our outreach to new groups. Teaching an intro astronomy class for SCANS, helping with Privateers Days in Liverpool, Hal-Con, Caper-Con, library talks, Keji Dark-Sky, Nova East and the Halifax Planetarium, Tony is almost as busy as I am with outreach events.

I would like to thank the other members of the Queens County Astronomy group for their hard work as well – Privateers Days in Liverpool, InOMN in Annapolis Royal, park presentations, library talks, and school presentations. Tony Schellinck, Wayne Mansfield, Bruce and Melody Hamilton, Jerry Deveau, Dave Griffith and the others from the South Shore who helped out, many thanks for your hard work.

Our members helped with Planetarium shows, Quinn Smith, Chris Young, Pat Kelly and Tony Schellinck presented 30 shows to almost 800 people. Thanks to Stephen Payne of the Dalhousie Department of Physics and Atmospheric Science for supplying these numbers.

A lot of our events this year were repeats of past events, our success stories. Dave Chapman again organized the Keji Dark-Sky weekend, as well as a new event, an ART Walk at Citadel Hill. Dave also did classroom talks (Galileo scope) and library presentations, and helped with a Mercury transit event on the waterfront, with the help of Karl Penny, Quinn Smith and Jason Adams. Roy Bishop covered the Mercury Transit from Avonport. Dave Griffith, Blair MacDonald and Art Cole covered the transit from their respective job sites, and I was at the Halifax Independent School.

Saltscapes and the APS sidewalk event were also very successful again this year. With the Halifax Art Walk, Ross Creek Arts Centre event, AST conference, SCANS, YNC and Astor Theatre we have expanded our connection with the Arts, Youth Projects and Teaching communities in Nova Scotia, to our mutual benefit.

I have been again very busy with outreach this year. I am again the RASC board member for Youth Naturalists Club and organized a talk and observing session for them. I have repeated Gr.6 talks at nine schools and have picked up three new schools. Evening school presentations for Kings County Academy and Chester Middle School outdoor programs were a great success again this year, 60 and 20 students respectively. Special thanks to Bruce and Melody for their help at Kings. The early part of the year I did presentations at BGO, and the Discovery Centre and have done nine presentations for Cubs, Beavers, Brownies and Sparks. The Shubenacadie Wildlife presentation went well as did the one at the Ross Creek Arts Centre and Art Walk at Citadel Hill. Did two library talks and again helped at Keji Dark-Sky Weekend, Nova East, Saltscapes, Hal-Con, AST conference and the McLennan Lecture. I am the Outreach Coordinator for the Centre and have a few requests still to set up for the New Year.

The Halifax Centre can be proud of its outreach again this year. We participated in the following: Library talks, school presentations, park presentations, Youth group talks, outreach events: InOMN (three venues), Privateers Days on Liverpool waterfront, Keji Dark-Sky, Nova East, Saltscapes, transit of Mercury (four venues), APS sidewalk, AST conference, Intro Astronomy classes both classical (SCANS) and Theatrical (Star Trek Universe, Ross Creek Arts Centre). We expanded our connection with the Arts Community (Astor Theatre, Ross Creek, Halifax Arts Walk) Supported local astronomy venues with BGO and Planetarium talks. Members also did astronomy presentations in support of other groups events.

Overall between October 2015 and September 2016 the Halifax Centre did just over 92 events with roughly 700 youth and just under 4,000 adults participating. A tremendous effort from all the outreach volunteers! My sincerest thanks go out to all the Halifax Centre members that helped with these outreach events. This of course does not include all the times we set up our telescopes to show neighbours, friends and family the night sky, because that too is outreach.

Again, many thanks to all who helped support our outreach events over the past year. Let us continue to show the night sky to any and all who 'look up and wonder'.

Respectfully Submitted,

Paul Heath, Outreach Coordinator
RASC, Halifax Centre

Meeting Notes for RASC Halifax Meeting 17 Feb 2017

Jim Millar

Vice President, Paul Gray, opened the meeting and welcomed all the guests.

Paul Heath gave an update on upcoming outreach events.

Saltscapes will be in April and we will again be partner-

Sean Dzafovic gave a presentation on What is Up? For the next month.

Paul Gray presented Art Cole with his certificate for Astro Imaging of the Solar System. Congratulations Art.

Paul Gray mentioned that Nova East is coming on Jul 26-28 this year. It will coincide with a National Star Party that weekend. A committee has been formed but more volunteers may be needed.

Judy Black updated the members on the required changes to the Bylaw #1 passed at the Annual General Meeting in December 2016, The following Special Resolution was passed unanimously by the members present:

BE IT RESOLVED AS A SPECIAL RESOLUTION THAT:

Amendments to the RASC Halifax Centre Bylaw #1 (2016) as presented on February 17, 2017 be approved.

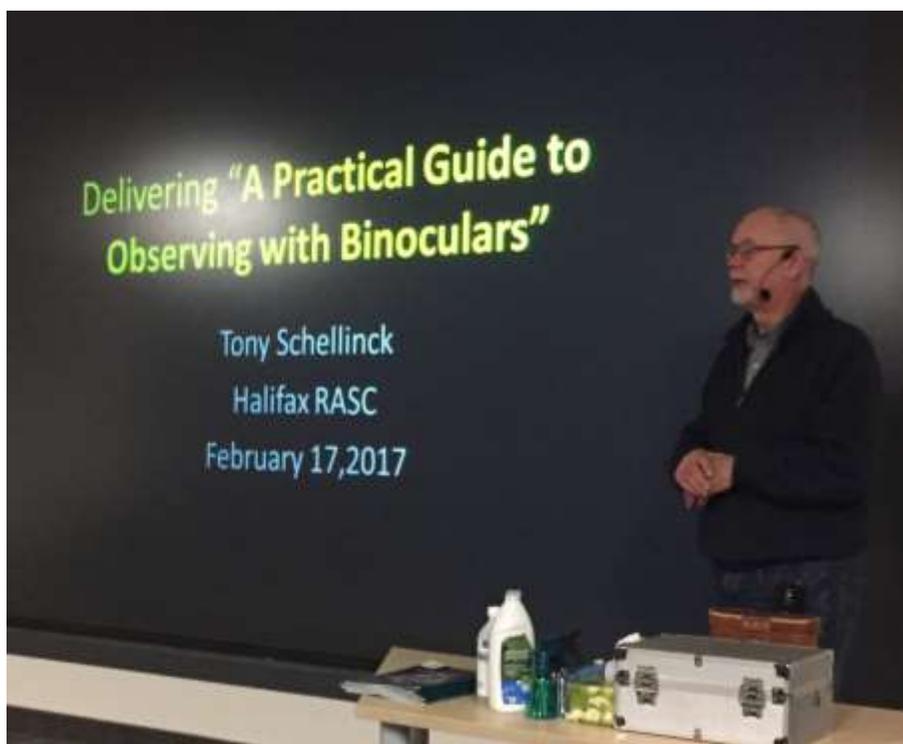
The revised Bylaw will be forwarded to the Registry of Joint Stocks for approval. Once approved, they will be implemented.

Tony Schellinck gave an interesting presentation entitled, Delivering "A Practical Guide to Observing with Binoculars." He gave an abbreviated view of the course that he has offered over several weeks to local and seniors groups. He showed how he could use a flat screen planetarium show and use it to give a practical hands on tutorial on the use of binoculars. Members found the practical

experience entertaining and useful.

Paul Gray then gave a brief presentation on how to clean optics.

The meeting ended with the usual refreshments and fellowship.



▲ Tony Schellinck demonstrated his technique for providing the students with the opportunity to practice observing with binoculars when he taught the SCANS course on practical observing. (Photo: Dave Chapman)

ing with Atlantic Photo Supply. Paul will be calling for volunteers in the near future.

We will be attending Hal-Con again this year in the fall.

There are a few Brownie and Cub programs coming in the next several months and he will need volunteers to help with some of them.

Minutes: Royal Astronomical Society of Canada - Halifax Centre Annual General Meeting (AGM) Friday, December 9, 2016

Judy Black

President Paul Gray welcomed the 19 members in attendance and provided opening remarks.

Welcome and Opening Remarks

1. Approval of 2016 Agenda

161209AGM-Mot01:

It was moved by Mary Lou Whitehorne and seconded by Chris Young to approve the 2016 AGM agenda as circulated. CARRIED.

2. Approval of 2015 AGM Minutes

The minutes of the 2015 AGM had been pre-circulated to members.

161209AGM-Mot02:

It was moved by Jim Millar and seconded by Jerry Black to approve the minutes of the 2015 AGM as circulated. CARRIED.

3. Appointment of a New Auditor

Jim Millar stated that Gregg Dill had re-offered to stand as auditor for 2016-2017.

161209AGM-Mot03:

It was moved by Chris Young and seconded by Tony Schellinck to appoint Gregg Dill as Auditor for 2016- 2017. CARRIED.

Council Reports

(Note: All reports will be in the Jan/Feb edition of Nova Notes)

4. President's Report – Paul Gray said he couldn't speak highly enough about Halifax Centre. The Council works well together and steps up when needed. He stated Tony Schellinck should be applauded for the wonderful work he does in producing Nova Notes, and that Paul Heath had done an incredible job overseeing outreach. Nationally, Halifax Centre is the most active in outreach. He also thanked Judy Black for her work in overseeing the bylaw review.

5. 1st Vice-President's Report – Dave Chapman stated he had been appointed to Council in January 2016. During his time with Council he developed the communications strategy agreed to by Council. He was involved with the bylaw review and filled in for Paul Gray when he was unable to attend Council meetings. He had been busy fulfilling other commitments for RASC (personal and organizational) and agreed with Paul that it is a very good Centre.

6. 2nd Vice-President's Report – Ian Anderson read the report he provided and noted that this was his last year as 2nd Vice-President. He did note that calendar sales were up from the previous year and that there was only one 2017 calendar left for sale. Ian was thanked by members for his work on

Council by a round of applause.

7. Secretary's Report – Judy Black stated what her general duties entailed. There were nine meetings in 2015-2016, including the informal members' BBQ at SCO. Members were notified three times about each of the meetings. There were numerous motions made by Council that had budgetary implications such as funds required for the Dark-Sky Weekend at Kejimikujik and repairs to the library cart. The nomination of Martin Hellmich and Halley Davies for the Simon Newcomb Award resulted in their winning that award. Halifax Centre also donated the Unihedron Sky Quality Meter to Tim Doucette's Deep Sky Eye (DSE) Observatory in Yarmouth. As required in Minutes of AGM (December 9, 2016) the current bylaws, she advised members of the make-up of the Halifax Centre membership. She thanked the Centre and Council members for their support in the past year, and extended a special thank you to her mentor, Past-Secretary Chris Young.

8. Auditor's Report – Jim Millar read the Auditor's letter as Gregg Dill could not attend the meeting. There were two recommendations:

a) Clause 12.01(1) of Bylaw #1 (1995) requires cheques to be signed by two people. If cheques are to be signed by the treasurer only, the necessary documentation needs to be put in place. I understand this will be incorporated in the revised Bylaw #1 (2016)

b) The Board may want to consider becoming a registered charity to encourage further donations. Fourteen Canadian RASC Centres are currently registered.

9. Treasurer's Report - Jim Millar spoke to the financial report he provided and explained the changes in revenue and expenses. He noted that calendar sales and donations had increased; a bequest of \$1000.00 had been received from the estate of Harry Roberts. Revenue was \$7360.90 with expenses at \$7070.40. Profit for the year was \$290.50. He then explained the assets of \$35,091.06, liabilities of \$230.35, and capital of \$34,860.71. As was recommended by the Auditor the previous year, he provided an income statement for Nova East that had a net profit of \$1815.32. Jim had asked Council to consider way to be revenue neutral at Nova East such as reducing registration fees and camp fees, and purchasing more prizes.

10. National Council Representative Report – Pat Kelly noted that much of the Society's work was accomplished in its committees. If Halifax Centre members want to know how they can become involved, go to the national website to find the committees and the types of work they do. RASC had recently undergone a SWOT analysis (strength-weakness-opportunities-threats). Two committees were getting a push. Fund-raising committee members are to get training on how to approach corporations for sponsorship. Membership promotion committee was to examine ways to reverse the high turnover rate (approximately 20% per year). They are considering mentoring of new members who typically join to learn about observation.

161209AGM-Mot04:

It was moved by Mary Lou Whitehorne and seconded by Tom Crossman to accept the Council Reports as presented.

CARRIED.

Committee Reports

(Note: Committee reports will be in the Jan/Feb edition of Nova Notes)

11. Observing Chair Report – Sean Dzafovic reported the six members who received RASC certificates in the past year – Mary Lou Whitehorne, Bruce Hamilton, Melody Hamilton, Tony Schellinck, Paul Evans, and Jim Millar. He also noted that the NOVA program is being rewritten using the Explore the Universe Guide.

12. St. Croix Observatory (SCO) Report – The report to be provided by Tony McGrath will be included in Nova Notes.

13. Nova Notes Report– Tony Schellinck provided an overview of *Nova Notes*, including both regular contributors and those who provided special articles, and members who provided photos for the cover and to enhance articles. He gave a special thank you to Dave Chapman for taking photos at members' meetings. He thanked all the members of his large team that produced five issues of Nova Notes per year.

14. Nova East Report – Quinn Smith was the Chair of Nova East. In his absence, Paul Gray provided the overview of his report. He noted that there is a change from the regular date in August to a weekend in July due to many members attending the Solar Eclipse in the United States.

15. Librarian Report – The report to be provided by Andy Hasler will be included in Nova Notes.

16. Outreach Report – Paul Heath could not attend the meeting and had sent his regrets at not being able to present his report and to not having a poem ready for the meeting; however, Chris Young provided an overview of his report.

161209AGM-Mot05:

It was moved by Chris Young and seconded by Pat Kelly to accept the Committee Reports as presented.

CARRIED.

Matters to be Determined by Special Resolution

17. Bylaw #1 Review Presentation – Judy Black explained the process of the review and provided an overview of the major changes to the current bylaw. It was noted that the Objectives of RASC Halifax Centre were to be removed from Bylaw #1. Because of the objectives being circulated to members, there were suggested changes to the second and fourth objective. These were cited and discussed. Members were then presented with the following Special Resolution:

SPECIAL RESOLUTION OF MEMBERS

WHEREAS the RASC Halifax Centre objectives were removed from the RASC Halifax Centre Bylaw #1 (1995) to be included in Schedule A: Memorandum of Association as per the legislative requirements of the Nova Scotia Societies Act; and

WHEREAS the Objectives were revised by the Council on 18 November 2016; and WHEREAS the RASC Halifax Centre Objectives (2016) was pre-circulated to all members on 19 November 2016 for consideration;

BE IT RESOLVED AS A SPECIAL RESOLUTION

THAT:

1. RASC Halifax Centre Objectives (2016) be approved at this

Annual General Meeting (AGM) as presented;

2. The existing objectives are repealed and are replaced with the RASC Halifax Centre Objectives (2016);

3. RASC Halifax Centre Objectives (2016) be forwarded to the Registry of Joint Stock Companies in Schedule A for approval prior to enactment.

161209AGM-Mot06:

It was moved by Mary Lou Whitehorne and seconded by Tony Schellinck to adopt the Special Resolution related to adoption of the modified RASC Halifax Centre Objectives (2016).

CARRIED UNANIMOUSLY.

Judy Black then presented the proposed changes to Bylaw #1 (2016). In addition to those presented, the following changes were suggested by members in attendance. Each suggestion was discussed.

a- In 5.3.1.2: Change "notify the Executive Director" to "notify the Society". This provides clarity as to which body should be notified.

b- In 6.2.2: It was noted the word "of" was duplicated, one of which should be removed.

c- In 10.3.2: Remove the phrase "in accordance with generally accepted accounting principles (GAAP)"

d- In 11.1.1: Leave the phrase as "may be signed", not "shall be signed" as suggested in the presentation.

Given there were no other comments or questions regarding changes to the proposed Bylaw #1 (2106), members were then presented with the following Special Resolution:

SPECIAL RESOLUTION OF MEMBERS

WHEREAS modifications to RASC Halifax Centre Bylaw #1 (1995) were desired to reflect current RASC bylaws and policies; and

WHEREAS modifications to RASC Halifax Centre Bylaw #1 (1995) were required to meet the legislative and regulatory requirements of the Nova Scotia Societies Act and the Registry of Joint Stock Companies; and

WHEREAS the Bylaw Review Committee of RASC Halifax Centre completed their mandate to revise the RASC Halifax Centre Bylaw #1 (1995) on 22 October 2016; and WHEREAS the RASC Halifax Centre Bylaw #1 (2016) was pre-circulated to all members on 30 October 2016 and 19 November 2016 for consideration;

BE IT RESOLVED AS A SPECIAL RESOLUTION

THAT:

1. RASC Halifax Centre Bylaw #1 (2016) with the amendments made at this Annual General Meeting (AGM) of December 9, 2016 be approved;

2. The existing bylaws are repealed and are replaced by the approved RASC Halifax Centre Bylaw #1 (2016);

3. RASC Halifax Centre Bylaw #1 (2016) be forwarded to the Registry of Joint Stock Companies for approval prior to enactment.

161209AGM-Mot07:

It was moved by David Lane and seconded by Mary Lou Whitehorne to adopt the Special Resolution related to adoption of the RASC Halifax Centre Bylaw#1 (2016).

CARRIED UNANIMOUSLY.

Minutes: RASC - Halifax Centre Annual General Meeting (AGM) Friday, December 9, 2016 continued

Judy Black

Call for Nominations and Election of 2017 Council

18. There was a call for nominations from the floor for the 2017 Executive and there were none. The slate of volunteers for the 2017 Council was as follows and included four new members:

President – no nominees

1st VP – Paul Gray

2nd VP – left vacant to accommodate approval of Bylaw #1 (2016)

Recording Secretary – Judy Black

Treasurer – Jim Millar

Nova Notes Editor – Tony Schellinck

National Representative – Pat Kelly

Librarian – Andy Hasler

Outreach Chair – Paul Heath

Observing Chair – Sean Dzafovic

SCO Manager – Tony McGrath

Councillor – Melody Hamilton

Councillor – Art Cole

Councillor – Andrew Frank

Councillor – John Read

There being no further nominations, the 2017 Council positions were approved by acclamation. Paul Gray stated that according to both the current and proposed Bylaw #1, he as Vice-President would fulfill the role of President until a person could be appointed to the position.

161209AGM-Mot08:

It was moved by Jim Millar to adjourn the AGM.

Regular Members' Meeting

What's Up? – Sean Dzafovic provided the overview of what to look for in the coming month.

Presentation: An Unexpected Solar System – Pat Kelly had visited Iceland this past summer and visited the southeastern community of Breiðdalsvík, a small fishing village on the large Breiðdalsvík cove. It was here that he found a scale model of the sun and all the planets, plus Pluto. Each location had a scaled model of the sun or planet along with a sign describing the features of the body, such as size, mass, distance from the sun, radius, and rotation duration. There was no explanation as to why the small town decided to provide the astronomical model.

Date of Next Members' Meeting: January 20, 2017: 7:30 – 9:30 PM in AT101. Kirsten Bonson will be addressing the membership on hot topics in astrophysics.

Adjournment at 10:09 PM.

2015-2016 Annual Report: 1st Vice-President David Chapman

As 1st Vice-President, I stood in for President Paul Gray to chair meetings of the Council on two occasions. My prime activity was to develop a communications plan for the Centre, in consultation with other Councilors, and distributed it to Council. This plan details both internal and external communications responsibilities.

I also contributed to bylaw review, recruitment of speakers, *Nova Notes* content, applications for observing certificates, and planning for Nova East. Communications-wise, I continued to co-manage the Astronomy Nova Scotia website, Facebook Page, and Twitter account, promoting both earthly and celestial events, and supervised the volunteer managing the RASC Halifax Facebook Group.

As National Council representative, I attended the RASC General Assembly in London, where I participated in Strategic Planning, and displayed the "25 Years of Hubble" award won by Centre members Halley Davies and Martin Hellmich, who also won the RASC's Simon Newcomb Award this year

for their animated video. I also participated in two National Council (NC) teleconferences. See the report of NC Co-chair Pat Kelly for more details.

As an active RASC member, I coordinated the Keji Dark-Sky Weekend, assisted Quinn Smith in the biennial lighting audit of Keji, served on the RASC Observing Committee, made several TV, radio, and internet "appearances" promoting astronomy, made several classroom visits, and created the new RASC "Explore the Moon" observing program with certificate.

On a personal level, I continued to work with Cathy LeBlanc on our Mi'kmaw Moons project, publishing an essay in the November 2016 issue of the *Griffith Observer*. The essay won 2nd prize in their science writing competition and earned us a little prize money. We have started a new project, advising Glooscap First Nation on a sky-viewing installation.

Respectfully Submitted,

David Chapman, 1st Vice-President
RASC, Halifax Centre

Thanks to everyone who participated and helped organize the 30th Nova East held at Smileys Provincial Park on the weekend of Aug 26th to 28th. I think everyone had a good time, reconnecting with friends and sharing the views of some excellent skies. We had a good attendance with 34 camp sites taken and a total of 54 registrants.

I would particularly like to thank the presenters: Roy Bishop, Melody Hamilton, Tony McGrath, Dave Lane, Chris Beckett, Dave Chapman, Paul Evans, Jerry Black, Sherman Williams, Paul Heath and Tony Schellinck. Also, I would like to mention and thank the Nova East organizing committee: Chris Young, Roy Bishop, Paul Heath, Melody Hamilton, Irene Moore, Paul Gray, Jim Millar, Judy Black, Dave Chapman and Michael Gatto.

The weather mainly co-operated this year with clouds and occasional light showers during set-up on Friday, but it was dry by the beginning of Roy's presentation at 8 pm. It was still quite cloudy in the early part of the evening but skies partially cleared to allow some observing on Friday night. The biting insects were minimal this year and it was a pleasant change not to have to cover ourselves with mosquito repellent! Saturday was forecast to be sunny, but there was broken cloud for most of the day. It was warm and was a perfect temperature for the talks and events throughout the day. I must thank Mo and Chris for doing such a great job of feeding the campers with their astronomers' breakfast of delicious pancakes and bannock. New to this Nova East was a noon swap meet, and although it was not well attended, maybe we will try again next year.

The BBQ was the gastronomic highlight of the afternoon, and I think everyone was quite full (over full?) by the end. Thanks to Paul Gray for cooking the pork loins, and to everyone who brought the contributions to the "pot luck". From all the positive accounts of the meal I received I think the BBQ is a keeper! The presentations and door prizes were held a little earlier than usual to allow a unique observing opportunity just after sunset. This observing opportunity replaced the usual Saturday evening talk, although Tony Schellinck had a presentation ready to "go"- just in case!

I would like to thank the participants of the Nova East astrophoto contest and to thank Brian Giffin of Atlantic Photo Supply for donating the winning prize of a framed photo of the winning entry. Congratulations to Jeff Donaldson for his winning submission of M108. All the photos were great, and thank you everyone for participating. There were several great door prizes with the main prize being a fully automated Celestron Sky Prodigy 6 telescope donated by Celestron and Brian Giffin of Atlantic Photo Supply. The main door prize was won by Wilfrid Maillet who only just managed to fit it into his car for the trip home.

Although the skies were cloudy for most of the day, it looked like there was a clearing trend coming in from the west.

After the presentations and door prizes, a convoy of cars headed out of the camp site to a nearby location (organized by Roy Bishop) to observe the close conjunction of Venus and Jupiter in the evening sky. The weather co-operated and those watching saw both planets sink below the horizon just after sunset, first Jupiter and then Venus. And as a special treat for those watching, we saw a "green flash" as Venus set in the west. How about that! As Roy Bishop often says, "Good fortune favours the prepared."

It was nearly dark by the time we arrived back at the camp site and many people busied themselves with outreach, to show our guests from other parts of the Park the celestial sights using laser pointers. Skies remained clear for the whole night and some serious observing and photography occurred after the lasers were shut off at 11 PM. In my case, my dew heaters could not keep up with the heavy dew that was present, but I heard the whine of telescopes late into the night.

It was a good weekend and I hope that many of you will be able to attend the 31st Nova East that will be held early next year in late July, again at Smileys Provincial Park.

Income Statement (for period covering 01/10/2015 to 30/09/2016)

Revenues		
BBQ	C\$150.00	
Camping	C\$630.00	
Miscellaneous	C\$0.00	
Registration	C\$1,703.55	
T-Shirts	C\$800.00	
Total Revenue		C\$3,284.05
Expenses		
BBQ	C\$228.43	
Camping	C\$264.95	
Miscellaneous	C\$296.75	
Nova East Prizes	C\$360.16	
T-Shirts	C\$318.44	
Total Expenses		C\$1468.73
Net Income for Period		C\$1815.32

Clear Skies,

Quinn Smith, Chairperson, 2016 NE Planning Committee
RASC, Halifax Centre

2015-2016 Annual Report:
National Council Co-Chair /
Representative
Patrick Kelly

The National Council continues to do most of its work through its many committees: Awards, Constitution, Education & Public Outreach, Finance, Fundraising, History, Information Technology, Light-Pollution Abatement, Membership & Development, Nominating, Observing, and Publications. Committee membership is "reset" at each General Assembly and for anyone interested in helping with any area within the Society, there is likely to be a spot for you.

The Fundraising Committee has been given some priority so that the society can get prepared to approach larger donors in a professional manner.

The Membership and Promotion committee is also active and looking at ways to attract new members, and just as importantly, keep the members we have.

Despite the increase in total membership, the society still has an annual turnover rate of over 20%. One main problem seems to be that while we (both as centres and nationally) do a lot of outreach, we should be doing more "inreach" at the Centre level to mentor new members, especially in observing, which is why many join the Society.

To keep closer contact between the Board of Directors and the National Council, it was decided that the council co-chair would be invited to attend on-line meetings of the board. While this sort of fell through the cracks initially, we seem to have that worked out now. The Board has also recently just completed a SWOT (strengths,

weaknesses, opportunities, and threats) analysis of the society and has asked the Council for advice on how to identify those areas that are the most pressing and to come up with strategies to deal with them.

Probably the best way to see how much work gets done at the national level is to log on to the members' section of the Society web site and look at the reports of the various committees, and if you see something to which you would like to contribute, contact the chair of the committee with an offer to volunteer!

Respectfully Submitted,

Patrick Kelly, National Council Co-Chair
RASC, Halifax Centre

2015-2016 Annual Report:
2nd Vice-President
Ian Anderson

This is the final report from the Centre's 2nd Vice President. It is also my last report as an executive of the Centre. Presuming an acceptance of the new Centre By-laws which have been drawn up this quarter, the position of Halifax Centre's Second Vice President is being retired. The position has long been a function of a by-gone era when sales responsibilities were assigned to this position. In the days before the internet and purchasing on-line from National Office was the norm, an organizer was needed to keep tabs of things we used to have on hand for resale and profit. In the current days of simplification, and downsizing of the Executive, it was wisely decided to reduce the Executive to four officers by eliminating

this position.

In addition, I've served as 2nd VP for two years, and I now step off the stage of directors to become once again, Member at Large.

Calendar sales found a price point of \$15 for 2016 and we were able to sell out by the end of the AGM meeting last December which was a record. Assuming the 2017 production would liquidate as quickly at that price, we were surprised to hear how poor sales have been this current period. We did attempt to sell 50% more, and had the benefit of an earlier start, but the hint that there was less interest in the calendar this year has become clear.

At the national level, calendar sales have been disappointing as well, suggesting a broadening of cash strapped buyers not just in the east here but across the entire society. As of this writing, I don't know if I will be handing over unsold inventory into the new year.

The question of merchandizing a

broader range of products has not been discussed lately, and I suspect would only become an issue if revenue was really needed, and a way to save members' shipping costs by taking bulk delivery was advantageous enough to do it. The new Explore the Universe publication, available tonight for \$20 is our first foray into a new line of merchandize in many years. It will be available from the Centre as long as it is in publication. Otherwise, calendar sales will probably be the main activity and hopefully remain at 2016 levels. The responsibility for merchandizing will be passed on to some director, but not necessarily an Executive.

Respectfully Submitted,

Ian R. Anderson, 2nd VP
RASC, Halifax Centre

2015-2016 Annual Report:
Nova Notes Editor
Tony Schellinck

Five issues of *Nova Notes* were published this year, with a range of 8 to 20 pages per issue, 68 pages in total. Three of them were themed: A Year in the Life of the RASC Halifax Centre, Astrophotography for Everyone!, and Making Summer Memories with special contributions on each of these themes by RASC members. Between 15 and 18 copies printed each issue.

There were seven regular contributors to *Nova Notes* this year: Dave Chapman, Art Cole, Paul Heath, Jim Millar, Tony McGrath, Matt Payne, Chris Young and myself. I would like to thank them all for their timely submission of interesting and well written articles. They made my job as editor much easier (that was the plan).

These were not the only members who submitted articles to *Nova Notes*; we also had special articles written by Michael Boschat, Quinn Smith, Sherman Williams, Dave Chapman, Jerry Black, David Lane, Keith Walker, and David Griffith. Several other RASC Members agreed to have their photographs printed on the front page of the issues: Michael

Boschat, Barry Burgess, Blair MacDonald and David Chapman.

Each issue was thoroughly edited before release by Pat Kelly, Michele Arenburg and Heather Schellinck. Pat Kelly posted the issues promptly on the Halifax RASC site when submitted to him and he has maintained the *Nova Notes* archives on the site. Judy Black put out the notification to all Halifax RASC members that the issue was ready. Paul Gray displayed the latest issue of *Nova Notes* at the next available RASC meeting to promote readership. As you can see, I am just one member of a very large team dedicated to producing a quality issue five times a year.

Columnists/Regular Contributors

Lunatic Ramblings by Dave Chapman
Starlight and Semiconductors by Art Cole
The Universe's Symphony of Sound by Matt Paine
Member Profile by Tony Schellinck
Book Reviews by Tony McGrath
Food for the Soul by Paul Heath
Meeting Reports by Jim Millar and Chris Young

Respectfully Submitted,

Tony Schellinck, *Nova Notes* Editor
RASC, Halifax Centre

The Waning and Waxing Moon Caught a Day on Either Side of the New Moon.



February 25th 2017, waning moon. Tony Schellinck and I rose at 6:00 am to catch a crescent Moon less than 30 hours from new. Technically it rose at 6:07 but I did not see it in binoculars until 6:13, 1° above the horizon. We followed it for about 20 minutes, and I glimpsed it with the unaided eye several times. iPhone photo (*Photo: Dave Chapman*)



This is the day old waxing crescent moon peeking over the top of the Peggy's Cove lighthouse, February 27, 2017. Nikon CoolPix P900, Exposure Time: 1/4, F-Number: 5.6, Focal Length In 35-mm Film: 800, Photographic Sensitivity (ISO): 1600. (*Photo: Jerry Black*)

Notes for RASC Halifax Centre Meeting 20 Jan 2017

Jim Millar

Paul Gray called the meeting to order and welcomed the many guests who were there.

Paul Heath announced that Ruining Zhang (Lillian) was granted an internship at the Chinese National Observatory in March 2017. This is a great honor and congratulations to Lillian.

Paul Gray announced the recipients of the new Astrophotography Program certificates. Congratulations to Dave Chapman, Blair MacDonald, Art Cole, Michael Gatto and Jeff Donaldson. It appears that most the recipients at this point are members of the Halifax Centre.

Our guest speaker for the evening was Kristen Bonson. Her topic was “New Frontiers in Astrophysics: from Supermassive Black Holes to Science Education.”

The first portion of the talk was about her current research into supermassive black holes in the x-ray emission spectrum. It was very informative.



▲ Kristen Bonson described her current research on black holes followed by a discussion on education and science. (Photo: Tony Schellinck)

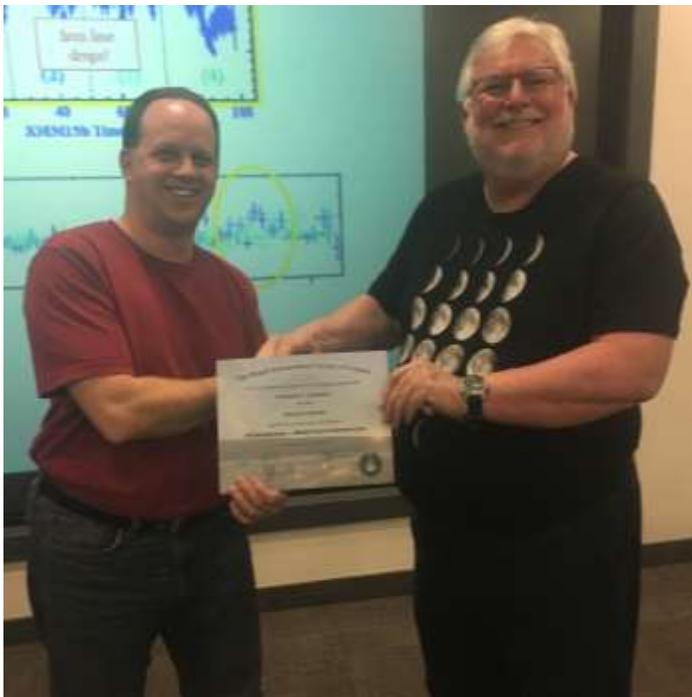
The second portion was about science education and how to make science more interesting. She presented several current programs that seemed to be helpful. There is a need to teach Science, Technology, Engineering and Math (STEM) skills to children at an early age to better prepare them for future education. There is also a need to teach and emphasize collaboration in science education. She emphasized that both hard and soft skills are required for STEM success.

Announcements:

- * *Explore the Universe* books are available
- * Nova East is the weekend of July 28-29 in conjunction with a National star party. Volunteers are needed, especially a chairman.
- * There will be two Keji Dark-Sky Weekends this year—August 11-13 and September 22-24. Volunteers have been organized and free campsites allotted.

Roy Bishop presented an entertaining “What’s Up?”

The meeting ended as usual with refreshments and social time. Many of the new attendees introduced themselves and had questions for those who presented during the meeting.



▲ Paul Gray presents Dave Chapman with his Wide Field Astrophotography Program certificate (Photo: Tony Schellinck)