

Nova Notes

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

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June/July 2015

ODE TO HUBBLE: HUBBLE'S UNIVERSE

TWO NOVA SCOTIANS TAKE TOP PRIZE IN A NASA COMPETITION
COMMEMORATING HUBBLE'S 25TH YEAR IN SPACE

Dave Chapman in his Lunatic Ramblings tells us about the Gang of Four

Jerry Black gives advice about time-lapse astrophotography

Matt Paine asks "What can I hear from outer-space"?

A brief history of the RASC Halifax Centre by Roy Bishop

Art Cole reveals a 3-D world in astrophotography

Kejimikujik National Park and
Historic Site as Nova Scotia's
First Dark Sky Preserve

Member Profile:
David Griffith

Happy Birthday
SCO: Member
Thoughts

St. Croix Observatory

Part of your membership in the Halifax RASC includes access to our observatory, located in the community of St. Croix, N.S.. 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, Alex LeCreux (for contact info, see below).

Upcoming Observing Nights:

July 17th backup 18th

August 14th backup 15th

September 11th backup 12th

October 9th backup 10th

Meetings 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

September 18, 2015 TBA

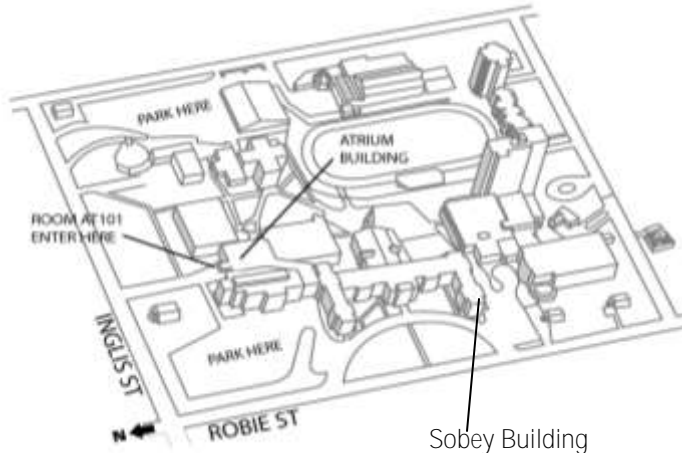
October 16, 2015 TBA

November 20, 2015 TBA

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, when there are no meetings.

Executive meetings begin at 6:30 p.m., usually in room AT 306, and all members are welcome.

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The cover photo of the Orion Nebula (M42) by Dave Lane and Greg Palman was taken at the Winter Star Party (see page 18), and the final version was processed under Blair MacDonald's tutelage during the excellent astrophoto processing workshop held the 9th of June at Saint Mary's University. (25 minutes, Canon 60Da, Astro-Physics 140mm refractor.)

From the editor *Tony Schellinck*

The next issue of Nova Notes does not come out until mid-October but a lot happens before then. The planetarium located at Dalhousie will continue to put on shows every two weeks. On June 25th, despite his work in preparing for the 2015 RASC general assembly, Quinn Smith will present "Cosmic Clockwork - what makes the Universe tick?". Others will be presenting this summer, myself included August 6th and 20th with "Journey to the Centre of the Galaxy". The Burke-Gaffney Observatory at Saint Mary's University has public telescope viewing on Friday nights. Each month there is a members' observing night at the Saint Croix Observatory (see Page 2 for a listing of nights). And, of course, members give talks or host public observing events all summer.

The Royal Astronomy Society's annual general meeting will be held in Halifax July 1st to 5th; its slogan is – "Stars by the Sea". The Ruth Northcott lecture on Saturday evening (July 4th) is open to the public. This year, Professor Rob Thacker (from SMU) will talk about Galactic Archeology. Anyone interested in amateur astronomy will benefit from attending this conference.

Another big weekend for the Halifax Centre members will take place August 7th to 10th at Kejimkujik National Park. This is the Dark Sky Weekend where several of us bring our scopes for public observing and there are presentations and workshops for the public. The following weekend (August 14th – 16th) is the Nova East Star Party held at Smiley's Provincial Park (<http://halifax.rasc.ca/ne/>) with special guest Alan Dyer. Again, there is public observing in the evenings.

I would like to thank the regular columnists, Dave Chapman, Matt Paine and Art Cole for their continued support. This issue, Jerry Black stepped up with an excellent article on time-lapse astrophotography, and Martin Hellmich tells us about his and Halley Davies' winning video on the 25th anniversary of the Hubble telescope. Thanks as well to Jim Millar and Chris Young for providing meeting reports. Quinn Smith and Roy Bishop penned the historical articles republished in this issue. David Griffith allowed me to interview him for this issue's member profile.

I know that my summer will be jam packed with astronomy related activities, I hope yours will be as well.

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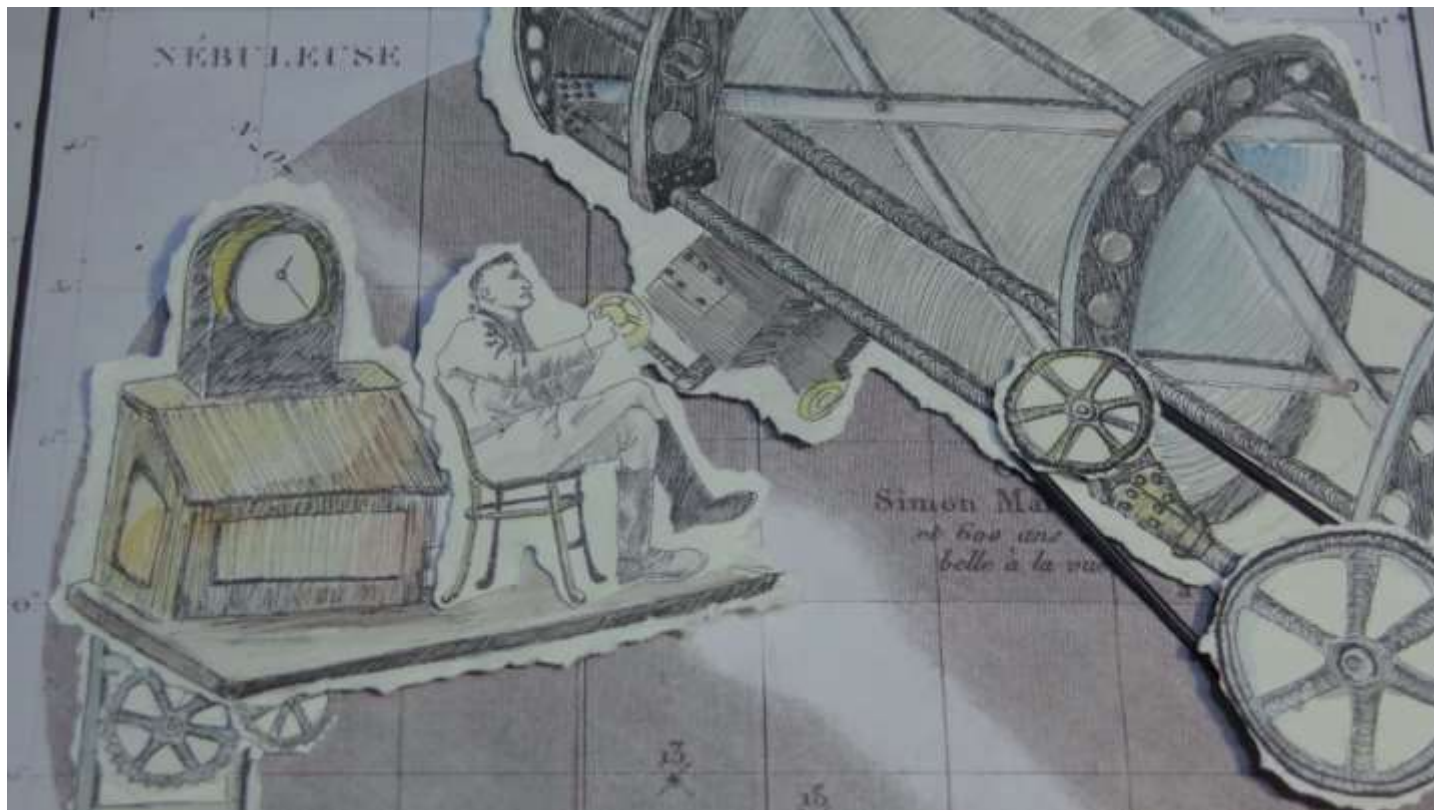
E-mail: novanoteseditor@rasc.ca Newsletter Editor: Tony Schellinck

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

The deadline for the next edition is October 16th, 2015

The opinions expressed herein are not necessarily those of the Halifax Centre.

Articles on any aspect of Astronomy and Allied Sciences will be considered for publication.



ODE TO HUBBLE: HUBBLE'S UNIVERSE

THE STORY OF HOW WE MADE A FILM AND WON A PIECE OF THE SPACE TELESCOPE

MARTIN HELLMICH

Halley Davies and I heard about ESA's video competition two weeks before the deadline from our friend and RASC member David Chapman. By chance we both mentioned to each other that a paper animation would be awesome. Realizing that we had both been brainstorming, it suddenly seemed like we could really pull it off. The script was inspired by the Hubble Deep Field images and historical drawings by famous astronomers. We wanted to explore how our perception of the universe has changed. What our ancestors saw when they looked at the sky, how Galileo discovered new worlds and how Hubble (the person) and Hubble (the telescope) unveiled a universe beyond anything we had imagined before. The Ultra Deep Field image shows 10,000 galaxies in a tiny patch of sky. In our video we showed a simplified way to estimate the number of galaxies in the observable universe and worked with Saint Mary's professor, Dr. Rob Thacker, to make sure the film didn't step over any nonsense boundaries. The universe is a much bigger place thanks to Hubble; we were glad to be making something to celebrate that.

To make the video we built a giant black box using supplies from the local filmmakers cooperative (AFCOOP) and Sim Digital. It was pitch black in there so we could shoot all day. I cut holes cut in the top so we could shine lights in. It was essentially a miniature theater. We used a combination of classic stop motion techniques, whiteboard animation, some puppetry, and a couple of other random ideas that I don't have names for. The production took over our apartment. There was the theater, a "Construction" area, and the crafts zone. Halley prepped props for about a week including paper cut outs of images, beautiful sketches, water color paintings, and even a pen and ink moon globe!

We barely managed to submit the film by the deadline. We only had time to export the final project once, hoping there would be no serious errors, before having to upload it. Once online we received amazing support from all our awesome friends and made it through the initial crowd judging phase. Our video was sent to the judges along with five others in the under 25 category. Following two suspenseful weeks, we



Behind the Scenes: stop Motion Trickery

and places. In a similar way we want share our prize with the community. It is a piece of the Hubble Space telescope's solar panel that flew in space for three years! It will be displayed at the Burke Gaffney Observatory which holds public observing tours. We want others to experience feeling so closely connected, as Halley and I now do, to probably the greatest invention of humanity so far.

References

The Film: <https://www.youtube.com/watch?v=iuvG8LaJDy8>

Hubble Hangout: <https://www.youtube.com/watch?v=ZLiVffQt1uM>

Hubble image: <http://hubblesite.org/newscenter/archive/releases/2015/12/>

CBC News: <http://www.cbc.ca/news/canada/nova-scotia/halifax-space-enthusiasts- create-winning-hubble-tribute-video-1.3048615>

received an email telling us that we had won! After double checking the email several times it was still shocking to us. Georgia from ESA asked us to come on their Google Hangout to talk about the film. We had a really fun time and great conversations talking about everything from everyone's favorite Hubble images to how important science outreach is. We were also featured in a CBC news article, on the radio show Mainstreet, and will be doing several show and tell presentations with one of the special prizes in the future.

This project is a product of an energetic creative community and a welcoming scientific community in Halifax. The Hubble Telescope has been so influential by sharing information and images with the public, inspiring people of all ages



On the Apr 24, 2015 Hubble Hangout [Watch Here](https://www.youtube.com/watch?v=ZLiVffQt1uM)
<https://www.youtube.com/watch?v=ZLiVffQt1uM>

The Universe's Symphony of Sound: **It's Big, It's Bright and it's loud**

Matt Paine

(PART - I)

I am often asked by people wanting to try radio astronomy for the first time “What can I hear from outer-space?” The people who ask that question think of Jodie Foster's movie Contact, the Socorro Array in New Mexico, or the National Radio Astronomy Observatory in West Virginia. Then those same people say, “but I need a giant antenna to hear from distant outer-space, right?.” My answer is usually quite simple. I tell people to stop, turn around, and look up. Confused, people respond by saying “What am I doing, I feel like an idiot in the middle of the sidewalk staring up at the sky.” I say “See the Sun shining down on you. The Sun is so loud why can't you hear it?”

Many people are astounded to learn the Sun, which provides life to our planet Earth, is constantly emitting radio signals we can detect and hear on Earth. In the last hundred years alone, our scientific understanding of the Sun has taken leaps and bounds. Radio astronomy has had a large role in our scientific understanding of the Sun, yet many people do not realize this. So what can someone like you or I do to listen to the Sun. Does listening require a big antenna or expensive radio receiver? No, in fact there are numerous small, easy projects one can do to hear our Sun.

Having been an amateur radio operator for 10 years, I am familiar with the High Frequency Bands that I am allotted to use under my United States amateur radio license. I am also familiar with how those radio bands react when the Sun's energy via a solar storm or solar flare hit the Earth's Ionosphere. As a result, I have learned that Jupiter and the Sun emit radio frequencies between 17Mhz and 30Mhz within the High Frequency Spectrum. However, because the Earth's Ionosphere effectively blocks radio frequencies around

or below 15Mhz, 20Mhz to 21Mhz is a popular frequency to listen to both Jupiter and our Sun.

Recently, I began to delve into a project to use an old Dell notebook computer with its simple built-in sound card, a receiver (more on the receiver in Part - II), and software called Radio-SkyPipe (RSP) (www.radiosky.com). This software is available free for a basic level and the pro level costs \$49.95. Right now I am just experimenting with the free version of the software. For the antenna, I have tried a random length of wire and the gutter on the side of my apartment building. Sometimes you need to think out-of-the-box and I figured maybe the metal gutter just might work. I might even go so far as to try an old DirecTV or DishNetwork small satellite dish like others have tried to utilize as an antenna. Setting up the software was straight forward and there was great documentation on the website.

Now, I just have to figure out what I want to use for a receiver. I could use an older ham radio transceiver that I own that is opened up for General Receiving or buy a kit online. There are several kits I have seen and researched but I have not made up my mind on whether to purchase one. NASA and the Radio JOVE Project offers several receiver kits pre-assembled or ready-to-build by the user. (<http://radiojove.gsfc.nasa.gov/telescope/>) These Radio JOVE kits offer convenience for the user in a small package that can be setup and interfaced to a computer program such as Radio-SkyPipe, without much difficulty. Now you just have to stay tuned to Part II of this column, to see if I can get all this stuff to work together to hear the Sun. I am hoping for success in the coming weeks.

So next time someone says “Did you hear that noise?” tell them to look up and think of the Sun shining down on them.

Matt Paine

... ..

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Nova Notes Columnist

RASC Halifax Centre

A Brief History of the RASC Halifax Centre

by Roy Bishop

I became President of the Halifax Centre in January 1975, and Paul Gray did the same precisely 40 years later. Paul and I spoke at the 2015 January meeting on the history of the Halifax Centre. Tony Schellinck, your new Editor of *Nova Notes*, asked us for a highlight report, and Paul told me to go ahead!

1951 – The *Nova Scotia Astronomical Society* (NSAS) was founded. Father Burke-Gaffney of St. Mary's University was involved, and became the Honorary President of the new society.

1955 January – The NSAS became the Halifax Centre of the RASC (with 30 members). Donald Crowdis, Director of the *Nova Scotia Museum of Science* was the central person in the Halifax Centre in the 1950s. Meetings were held in the Museum, located on Spring Garden Road, across from the old Halifax Library.

1956 – A planetarium with a Spitz model A-1 projector was added to the Science Museum. On March 5 that year I sat with my grade 11 class under the planetarium dome while Crowdis gave us a show. I was impressed. The planetarium was in active use until 1965 when Crowdis left Halifax to join the proposed Ontario Science Centre.

1967 to 1970 – The Centre was not active.

It may have been a coincidence, but four remarkable astronomical events took place in the months just prior to the reappearance of the Halifax Centre:

1. The first Moon landing (1969 July 20)
2. A total solar eclipse crossed Nova Scotia (1970 March 7)
3. A bright comet: Bennett (March & April 1970)
4. A transit of Mercury (1970 May 9)

1970 – That summer, Barry Matthews re-activated the Centre by calling a meeting for September 18 at the new *Nova Scotia Museum* on Summer Street. In addition to Barry, among the 37 present were Father Burke-Gaffney, a student from Acadia University named Da-

vid Levy, a prof from Acadia named Roy Bishop, and a teacher from the Valley, Sherman Williams. Barry Matthews moved to Ottawa shortly thereafter, but his initiative worked. The Halifax Centre was off and running again

1975 – The Halifax Centre hosted the first RASC GA in Atlantic Canada.

1977 – *Camping Observing Weekend* (later *Nova East*) began.

1978? – With help from some members of the Halifax



▲ These three gentlemen were at the first meeting of the re-activated Halifax Centre in 1970. Here, 35 years later, from left-to-right: Roy Bishop, Barry Matthews, and David Levy. (Roy Bishop photo)

Centre, the 1956 planetarium came out of storage and began operating in the Dunn Building at Dalhousie University.

1980 – The Halifax Centre hosted the second RASC GA in Atlantic Canada, a joint meeting with the Canadian Astronomical Society.

1987 – *Nova East* established at Fundy National Park.

1993 – The Halifax Centre hosted the third RASC GA in Atlantic Canada.

1995 – Using the Saint Mary’s *Burke-Gaffney Observatory*, two Centre members, Paul Gray and David Lane discovered the first supernova to be found from Canada.

1995 – Lease signed with Minas Basin Pulp & Power for the St. Croix Observatory site, and forest clearing began.

1996, night of March 24/25 – At St. Croix, Comet Hyakutake provided the sight of a lifetime.

1997 – *St. Croix Observatory* officially opened, at solar noon on the summer solstice.

1998 – Several Centre members viewed the February 26 total solar eclipse from Curaçao.

1999 – Several Centre members viewed the August 11 total solar eclipse off the coast of Nova Scotia.

2000 – *Nova East* moved to Smileys Provincial Park.

2002 – Five Centre members (Roy Bishop, David Lane,



▲ *Halifax Centre Honorary President Father Burke-Gaffney shakes hands with Carl Sagan while Cyrus Eaton speaks to them. Wallace Bridge, Nova Scotia, 1972 July 9, one day before a total solar eclipse crossed the province. (Roy Bishop photo)*

Greg Palman, Bill Thurlow, and Mary Lou Whitehorne) spent a week observing on the summit of Mauna Kea, Hawaii, resulting in three published papers.

2009 – The *International Year of Astronomy*. Several Centre members were active locally and nationally with public events. The *Astronomy Nova Scotia* website was created, and a radio link to astronaut Robert Thirsk on the *International Space Station* was part of *Nova East* that summer.

2010 – *Kejimikujik National Park* became a Dark Sky Preserve, thanks to Quinn Smith and David Chapman.

2012 – The Halifax Centre decided to host the 2015 GA.

Like any volunteer organization, the Halifax Centre could not exist without members willing to step forward and lead it. Lest they be forgotten, here are the Centre Presidents during the past 60 years:

1955 – B.J. Edwards
 1956, 1957 – James Paul
 1958 – Leonard Carrigan
 1959 – M.E. Higgins
 1960 – ?

1961 – B.W. Allen
 1962 – John Connelly
 1963, 1964 – A.A. Mills
 1965 – Robert Bagg
 1966 – Alan Whitman
 1967-1969 – (Nil)
 1970 – Barry Matthews
 1971 – John Shaw
 1972 – Walter Zukauskas
 1973, 1974 – Murray Cunningham
 1975, 1976 – Roy Bishop
 1977 – David DuPuy
 1978, 1979 – Michael Edwards
 1980 – Randall Brooks
 1981 – Peter Edwards



◀ *Paul Gray and Roy Bishop each presented their history of the Halifax RASC Centre during the January 2015 meeting. (Tony Schellinck photo)*

1983, 1984 – Kathy Oakley
 1985, 1986 – Norman Scrimger
 1987 – Kathy Oakley
 1988 – Darren Parker
 1989 – Joe Yurchesyn
 1990, 1991 – Mary Lou Whitehorne
 1992, 1993 – Patrick Kelly
 1994, 1995 – David Lane
 1996, 1997 – David Chapman
 1998, 1999 – Clint Shannon
 2000, 2001 – David Tindall
 2002 – Mary Lou Whitehorne
 2003, 2004 – Steve Tancock
 2005, 2006 – Craig Levine
 2007, 2008 – Paul Evans
 2009 – Andrea Misner, followed by Wes Howie
 2010, 2011 – Richard Vanderberg
 2012 – Robert Bussi eres
 2013, 2014 – Paul Heath
 2015, – Paul Gray

and the Honorary Presidents:

1955 – 1966, 1975 – 1979 Father Burke-Gaffney
 1980 – 1984 Dr. William Holden
 1985 – 1998 Dr. Murray Cunningham
 1998 – Dr. Roy Bishop

When I was appointed in 1998, I remarked to the audience: “I feel pretty good, so you might be stuck with me a long time!”



▲ *Comet Hyakutake on the night of 1996 March 24/25. 10 minute exposure on Ektachrome 1600 35 mm film, 100 mm, f/2.8, guided on the comet nucleus. (Roy Bishop photo)*



▲ *Halifax Centre Honorary Presidents Dr. William Holden (1980-84) on the left, and Dr. Murray Cunningham (1985-98). (Roy Bishop photos)*

Of the 29 RASC Centres across Canada, in terms of contributions to the National Society, the Halifax Centre has a remarkable record. Our Centre has provided three RASC Presidents, one Honorary President, two Secretaries and six Editors (one for the *Journal*, two for the *Observer’s Calendar* and three for the *Observer’s Handbook*). A dozen Halifax Centre members have contributed nationally in roles such as webmaster, director, assistant editor or contributing editor to the *Journal*, production and design of the *Journal*, and contributor to the *Observer’s Handbook*.

Dave XVII Chapman’s recent comment on the hfxrasclist cites more evidence for this remarkable national involvement: “3/8 of all FRASCals are RASC Halifax members! Halifax rocks! Especially in 2015!”

Perhaps it is the Atlantic fog that is responsible for this stellar national performance.

Lunatic Ramblings 2 :The

Gang of Four

Dave XVII Chapman

In my opinion, the best time to observe the Moon is around First Quarter (FQ):

- ◇ the day/night terminator lies down the centre of the Moon's disk, and the illumination just to the east perfectly highlights a large part of the Moon's disk, including the rough terrain of craters and mountains, and the subtle waves and wrinkles in the mare (seas);
- ◇ the Moon is at its highest at sunset, and remains well elevated for a few hours (longer in winter), making for a good evening's observing from home and
- ◇ there are dozens of lunar-list features that can be observed in the 3 days around FQ.

This is why I chose FQ (and also the Last Quarter, LQ) as the “zero” date for the *Explore the Moon* program—in that program, the recommended observing date of a lunar feature (i.e. when it is near the terminator) is figured in days before and after the quarter phases. In my system, the day of FQ is Q-day 0, the day after the FQ is Q-day +1 and the day before FQ is Q-day -1, and so on. The system not only tells you *where* to look for an object, but *when best* to look, relative to the FQ date. If you want to know more, contact me and I'll give you all the material.

I love the time of FQ, but for this column I want to tell you about the *Gang of Four*, a group of four large craters that appear together on Q-day -5, that is, about 5 days before FQ. The craters form a line in the south-equatorial to south latitudes of the Moon, not far from the southeastern limb. North to south, their names are Langrenus, Vendelinus (added to the

central peaks. Contrast this with Vendelinus, nearby to the south, a much older, heavily eroded, 147-km crater. Further south, Petavius is an even larger 177-km crater with a massive complex central peak and obvious fractures on its floor (Rimae Petavius). Even further south is the smallest of the group, 125-km Furnerius, still large enough for binocular viewing

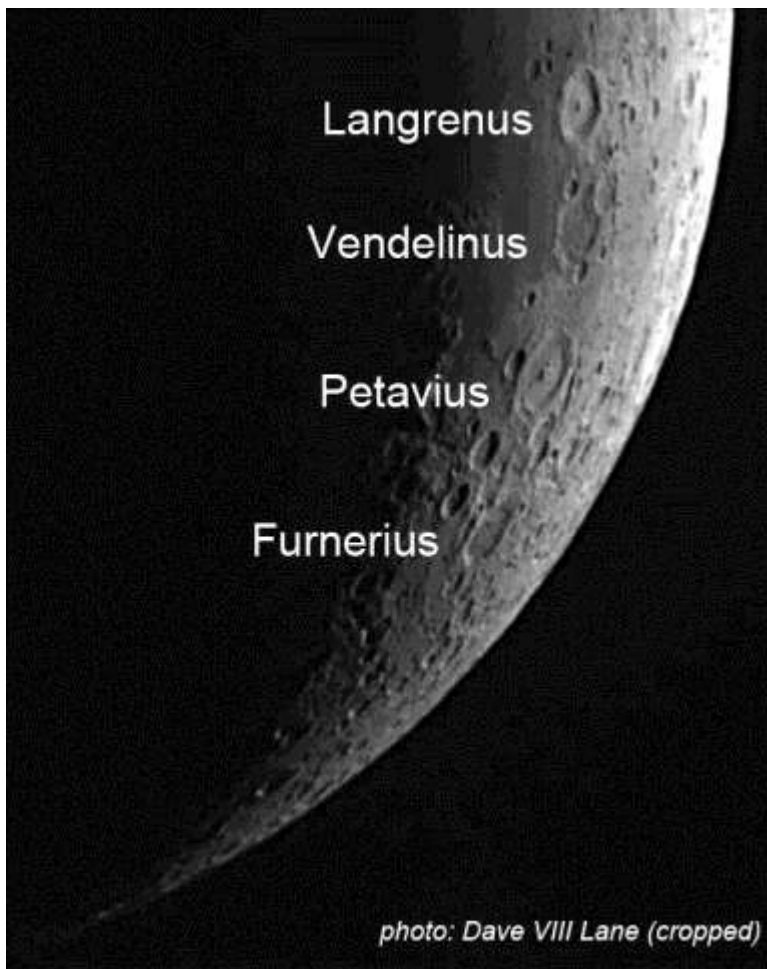
with the other three, under oblique lighting conditions.

How old is “old,” how young is “young”? Each of the Gang of Four represents a distinct era of lunar geology. From old to young, Vendelinus is “pre-Nectarian,” Furnerius is “Nectarian,” Petavius is “Lower Imbrian,” and Langrenus is “Eratosthenian.” What is the source of those selenological names, and how many billions of years ago do they represent? That is your homework assignment!

Upcoming opportunities to view the Gang of Four east of the sunrise terminator on the waxing crescent Moon are easily found by counting back from FQ dates on the calendar (using the previous day if the FQ phase occurs before 6 a.m. local time): July 18/19, August 17/18, and September 15/16. A little over 2 weeks *before* these dates, there are opportunities to view the group *west*

of the *sunset* terminator on the waning gibbous Moon: July 2/3, July 31/August 1, and August 30/31. The Q-day trick works for Last Quarter as well!

That's enough for now—in my next column, perhaps we'll move to Q-day -4 and look around. Email if you have questions or comments!
dave.chapman@ns.sympatico.ca



▲ The Gang of Four (Photo: Dave Lane)

Observer's Handbook map and list in 2014), Petavius, and Furnerius.

Remarkably, the four craters all lie along longitude 298° (i.e., 62° E), which provides dramatic sunrise (and sunset) views on the Moon as the terminator crosses them all together. Langrenus is a relatively “young” well-defined, 132-km crater on the edge of Mare Fecunditatis, with twin

Time-lapse Astrophotography

Jerry Black

If you haven't invested in a telescope yet, you may find time-lapse astrophotography a rewarding first-step before taking the plunge. At the May RASC meeting I presented some of my initial attempts at time-lapse photography and I thought it might be useful to provide a bit more information on the techniques I have used.

There are a few simple things you can do to make the process easier:

Location – Finding the right spot for a view of a dark sky (fog free) with an interesting view can be challenging. A dark sky improves your chances of getting that spectacular Milky Way shot. Knowing where to setup and point your camera can be aided by smart phone software to plan where and when the Milky Way will be visible. I use PhotoPills (<http://www.photopills.com>) which lets me plan in advance the shot from any location.

Weather – Time-lapse photo taking seems to generate spontaneous clouds. ClearDarkSky (<http://www.cleardarksky.com/c/Halifaxkey.html>) helps to plan for a clear night.

Camera – I use a Nikon D800 (I know, it's not a Canon). This is a full frame camera which captures 7360x4912 images. While the value of higher resolution/sensor size has been debated, capturing RAW images helps preserve the details. Your existing camera may work quite well, provided it allows you some control of your image exposure.

Star Movement – You will likely want to use a wide angle lens to capture a larger portion of the Milky Way. This also helps to reduce the potential for star trails in your shots. The “500 rule” will let you calculate how long your exposure can be before you see a visible trail (that rule might be optimistic <http://www.eveningphotography.com/night-photography-500-rule/>). The 500 rule says divide 500 by the



▲ <https://www.youtube.com/watch?v=qWByHBh5dT0> [6.5 mm Optek DX lens F3.5 (effectively a 9.75 mm with a 1.5 crop factor) ISO 3200 50 sec. Nikon D800] (Photo: Jerry Black)

focal length of your lens to calculate your maximum exposure time. A 24 mm lens would give $500 \div 24 = 20$ seconds. You will likely have to choose your widest aperture and an ISO sufficiently high to produce a well defined exposure (look at the exposure histogram of your test photos to confirm the exposure). A sturdy tripod is a necessity.

Multiple Images / Exposure Time – To expose your images sufficiently you may need an exposure time that exceeds the maximum exposure setting of your camera. Your camera may have a built-in intervalometer. An external intervalometer may assist you in setting both the exposure time you need and the number of exposures. I have



▲ <https://www.youtube.com/watch?v=BXBhKicVRtM> [14-24 mm Nikon FX Lens on a Nikon D800 @ISO 6400 F2.8 14mm 25 sec +5 ev] . (photo: Jerry Black)

used a CamRanger to assist with this (<http://camranger.com>) but am now experimenting with a Raspberry Pi for remote wireless camera control (<http://sourceforge.net/projects/iastrohub>). There are cheaper alternatives.

Battery Life – Your camera battery life may be an issue for longer time series. Try to avoid gaps in the time sequence while changing batteries. I have added a battery grip to provide 2 batteries worth of charge for almost all night sessions.

Dew Control – Around here, having your camera out for multiple hours will necessitate something to avoid dew. A simple solution for me was to purchase a LensMuff (<http://kadamphoto.com/catalog/digital-after-dark-lensmuff-keeping-your-lens-p-85.html>) and use hand warmers to heat the lens.

Post Processing – I have processed the individual frames in Aperture to increase the exposure and definition (perhaps at the expense of more noise) and then crop them into a HD 16x9 aspect ratio. Assembly into a movie was done with QuickTime Player 7. There are numerous alternative editing suites and ways of combining frames into movies.

Learn from the Experts – check out Alan Dyer's new ebook (<http://www.amazingsky.com/nightsapesbook.html>).

Starlight and Semiconductors: The 3rd Dimension

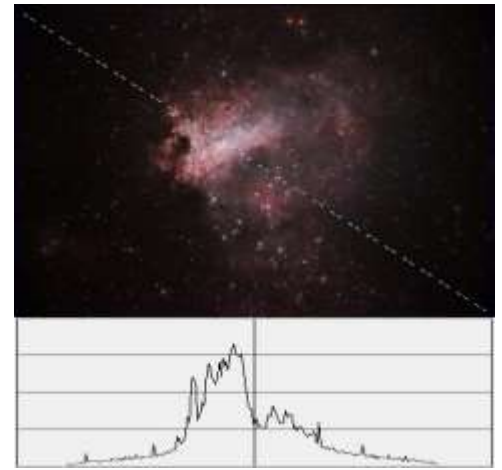
Art Cole

Did you know that your astrophotos are three-dimensional? It may be a bit hard to believe, but it's true. They're not 3-D in the sense that you can put on a pair of red-and-blue glasses and see stars and planets popping out of your computer screen, though. The third dimension in your images is a little more subtle. But once you understand what this third dimension is and how to visualize it, it becomes much easier to manipulate your images to get better-looking results.

Let's begin with the first two dimensions of your astrophotos, name-

ly, the width and height of your images. All computer images are made up a grid of tiny dots, called pixels, that collectively make up an image. When you look up an image's properties on your computer and it says that your image is 1024x512, that means your image is 1024 pixels wide and 512 pixels high (and thus contains 524,288 pixels).

So what is this magical third dimension? It's brightness! Every single pixel in an image has its own brightness value, commonly called its intensity; it's the pixel intensities in an image that give it information and make it interesting (okay, there's colour, too, but let's save that for another day). A photo of a bright, daytime beach scene would mostly contain pixels with high-intensity values,

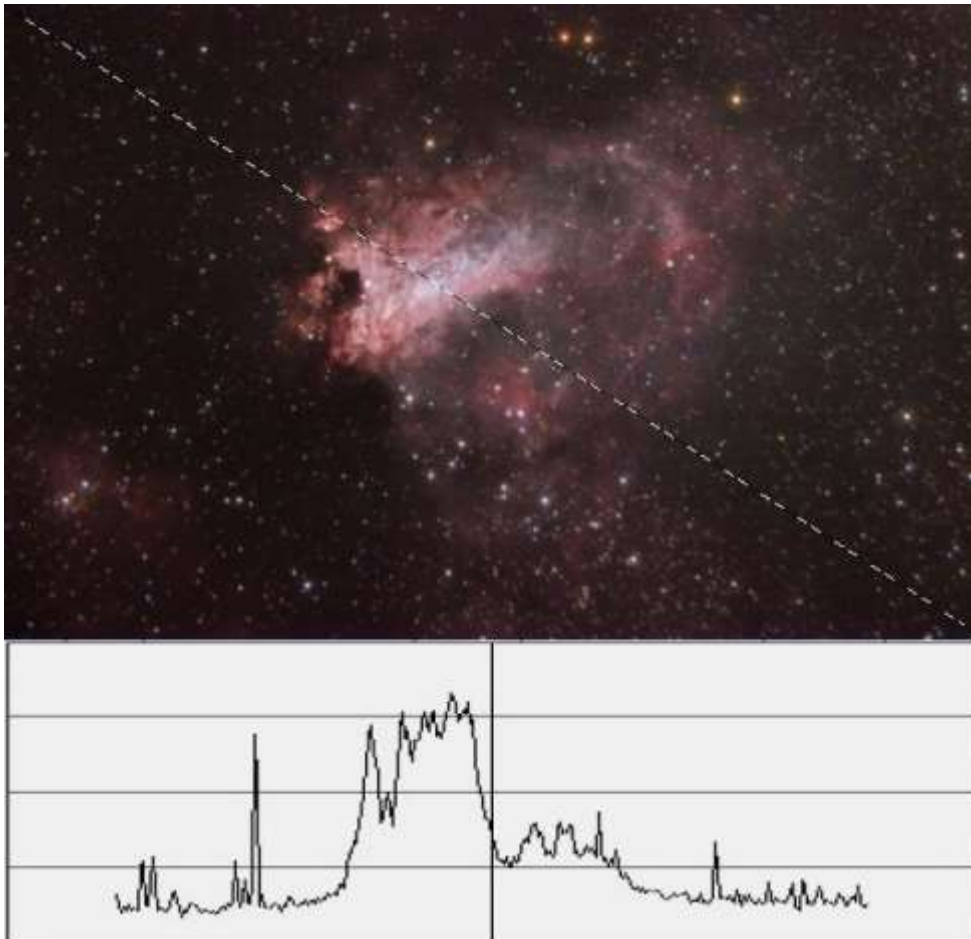


▲ Figure 2: With the unwanted effects of vignetting, the M17 image has a high brightness in the centre and a low brightness at the edge. (Photo: Art Cole)

while a nighttime photo would mostly contain pixels with low-intensity values.

But trying to visualize this third dimension for the first time can be a bit difficult. I usually explain it to people like this: Imagine you could peel your image off the computer screen, make it bigger, and then lay it on the floor like a big tapestry. Then, with a wave of your magic wand, the image would lift up off the floor, with bright areas of the image rising almost up to the ceiling and dark areas staying low. Your previously flat-looking image is now three-dimensional, with stars looking like tall, thin spikes, galaxies and nebulae looking like hills and mountains, and the sky background being a low, flat, fuzzy layer. And there are limits – the floor is as low as you can get (zero brightness, or black) and the ceiling is as high as you can get (maximum brightness or white).

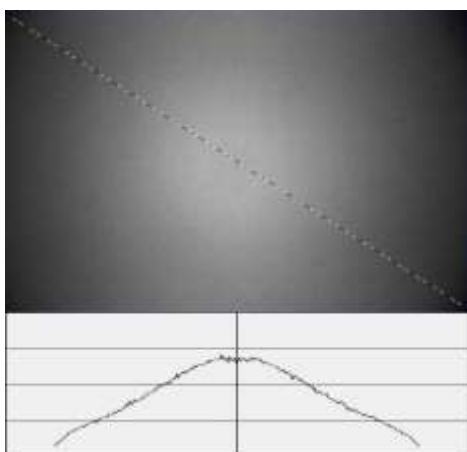
In order to show this visually, I took one of my images of the Swan Nebula (M17), drew a line through it, and plotted the brightness of the image along that line (Figure 1). If you look at that line profile and imagine that the bottom of the plot is the floor and the top is the ceiling, then, the 3-



▲ Figure 1: The line profile of an M17 image displays the nebula as a “mountain” that rises above a low sky background, with stars appearing as tall, thin spikes. (Photo: Art Cole)

D shape of the image becomes apparent. The image background is low and flat (being dark but not completely black), the stars are tall, thin spikes and M17 appears as a big “mountain” in the room, with two distinct height regions representing areas of two different intensities.

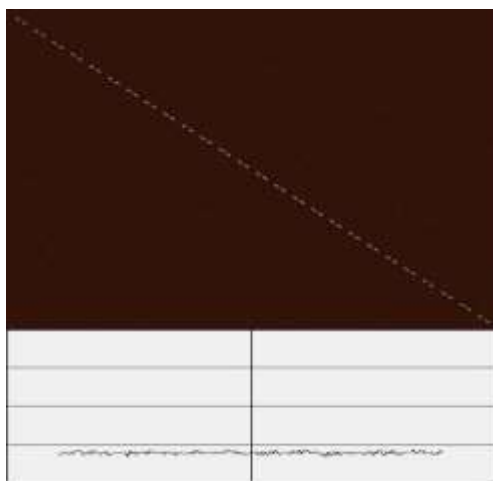
Now that we know how to visualise an image in 3-D, we can put this to work for us. Have you ever heard astrophotographers talk about “flat” frames? These are used to solve an optical problem called vignetting. Vignetting is an undesirable artefact produced by optical systems where the image captured by the camera appears darker in the corners than in the middle. Figure 2 shows the same view of M17, but with vignetting present. The corners of this image are very dark, making it impossible to see what’s there. If you look at the line profile, you can see that the 3-D shape of the image has been funda-



▲ Figure 3: The line profile of a “flat” calibration image shows that its 3-D intensity peaks in the centre and decreases towards the edges. (Photo: Art Cole)

mentally altered – the areas of the image away from the nebula “mountain” now slope away from it, making the sky background uneven. To fix this, astrophotographers use special images called “flats” to remove this distortion. Figure 3 shows

a typical flat image, along with its line profile. In 3D, this image would look like someone plopped a volcano in your room, with a tall central



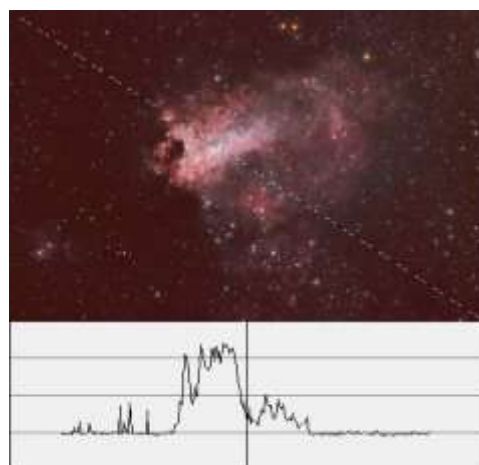
▲ Figure 4: The line profile of a light pollution-only image shows that the intensity is “flat” across the image. (Photo: Art Cole)

peak that slopes down to the corners. So how does the flat allow us to reduce vignetting? This is done by dividing each pixel’s value in the sky image by the value of its corresponding pixel in the flat image. Because the pixels in the corners of the flat image have lower intensities than those in the middle, dividing by those lower pixel values will boost the brightness in the corners of the original image (as we’re dividing by smaller numbers) and flatten the image background, getting us back to the “flat” image in Figure 1. In essence, what we’ve done is lifted up the perimeter of our outward-slanting image from figure 2 until the background is flat and has a nice, even brightness, just like how the sky actually looks.

We can also apply this visualisation technique to better understand the bane of astronomers everywhere: light pollution. If you could plot an image of pure light pollution in 3D in your magic room (Figure 4) it would look something like a level, opaque layer, with its height above

the floor representing how bright the light pollution is at your location. This layer would be almost down on the floor for an image taken at a very dark location, and it would be near the ceiling for an image taken in the centre of a large city.

Unlike with vignetting, which merely distorts your image, light pollution sets the lower bound on what you can see. It actually removes desired information from your image. Going back to our visualisation exercise from Figure 1 (with our dark sky background near the floor and the hills and valleys of M17 rising up to eye level), imagine laying our light pollution layer on top at knee height (Figure 5). Now we can only see features that rise above the light pollution layer, such as the bright centre of the nebula and the brighter stars. All of the dimmer areas of the nebula are now gone, as are the dim stars. By visualizing



▲ Figure 5: With the addition of the light pollution layer on top of the original M17 image, the darker portions of the image disappear. (Photo: Art Cole)

light pollution in your image in 3D, it becomes immediately obvious that the only way to mitigate its effect is to reduce it before it hits your camera, whether it’s done by using light-pollution filters or simply going to a dark location for imaging – there’s no digital quick fix for light pollution.

Kejimikujik National Park and
Historic Site as Nova Scotia's
 first Dark Sky Preserve
 Quinn Smith

I am giving a short history of the events leading up to the declaration of Kejimikujik National Park and Historic Site as Nova Scotia's first Dark Sky Preserve (DSP) as I suspect most of our members do not know how Keji became a DSP.

It all began in 2008 while we were discussing plans for the upcoming International Year of Astronomy (IYA) in 2009. I was the Chair of the IYA organising committee and amongst all the plans I thought it would be good to have a few "legacy" projects—ones that would extend well beyond IYA.

The three legacy projects we selected were:

1. Help Dalhousie University get the planetarium back as a regular public feature.
2. Start an astronomy web site that would make it easy for the general public to find out about all astronomy events taking place in Nova Scotia.
3. Create a DSP in Nova Scotia

The planetarium was easy! In fact no sooner had we decided on this project, Stephen Payne of Dalhousie University came to me with exactly the same thought. I wish I could take credit for this, but it was all the work of Stephen. The planetarium now has regular bi-weekly public shows, supported by several members of the Halifax Centre. Last year there were over 3,200 people attending shows at the planetarium. Great job Stephen!

Although I am an internet and computer Luddite, I was surrounded by many people far more knowledgeable than myself. Thanks to Saint Mary's University and Rob Thacker in particular, the As-



▲ July 2010, Mary Lou Whitehorne (then RASC President) presents the DSP certificate to MPP Hon. Gregg Kerr at the declaration event at Keji

tronomy Nova Scotia web site was set up, and remains an effective "point of contact" for all things astronomical in Nova Scotia. Thanks to Dave Chapman who currently maintains this site.

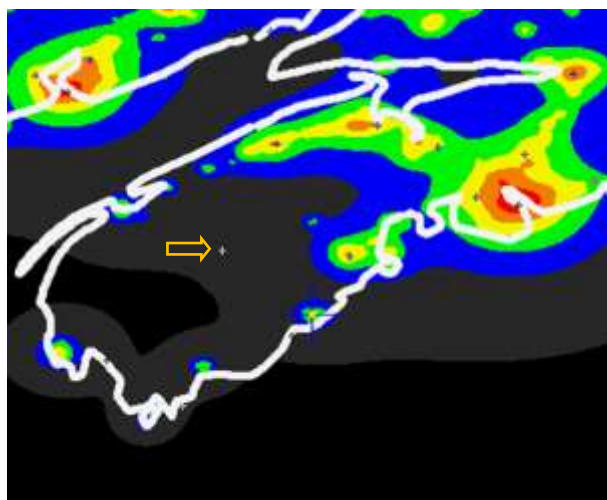
As for the DSP—are you sitting comfortably? then I'll begin.

To be honest, I didn't know where to begin with this project, and I thrashed around through most of 2008 looking for a good location. Dave Chapman joined me in the

quest for a DSP and suggested Keji. I had never been to Keji, and I also didn't know that Keji had been suggested years ago as an exceptional dark sky location. We visited Keji in the early spring of 2009 and agreed that it would make an excellent DSP. The question was—how to approach the Park, as the driving force for Keji to become a DSP would have to come from them. All we could do was to guide and support them.

I must have written a dozen or more emails to the Superintendent of the Park—none of which were sent, as they just didn't feel right. I suspected that this would be a hard sell to the Park and I was sure that we would only have one opportunity to convince them that this would be a good idea. It had to be a great e-mail!

Well, after several months of dithering, I met up with some of the folks from Keji at the 2009 Sports and RV Show (where we both had booths). I resolved that weekend to "damn the torpedoes" and just send an email. And that's what I did. It wasn't a great email, rather I just blurted out the idea of a DSP and suggested a meeting to discuss.



▲ A light pollution map of Nova Scotia. Keji is the small cross just to the left of centre.

Remember the happenstance of Stephen Payne contacting me about the planetarium, just as I was about to contact him? Well, serendipity raised her wonderful head again. The superintendent of Keji (Harry DeLong) had just returned from a national conference of Park Managers, where they discussed ideas for getting more peo-

ple into the Parks and increasing the courses that Parks could offer. In this conference they discussed DSPs!

thanked us and apologised for having to leave half way through the presentation. I was crushed!

As Harry was walking out of the room he turned to his associate, Jonathan Sheppard, and said “I’ve heard enough Jonathan, make this happen”. And that was that! Keji was on the road to becoming Nova Scotia’s

reason the Park staff were unwilling to clear cut for us! Eventually several good locations were selected, the main one being where the Sky Circle is now located.

In fact, the Sky Circle was suggested by Dave early on in the discussions and although it took a few years, it was designed, built and implemented by the Park staff without much input (other than the original suggestion) from us. There was a great sense of commitment by everyone at Keji.

Jonathan wrote the DSP application over the winter and spring of 2009/10, while at the same time the Park continued to make the required improvements to the lighting and infrastructure. Dave and myself had conducted a thorough lighting audit during that winter and that was used as a road map for the improvements.

By the late spring of 2010, the application was submitted to RASC National; it approved the application in June. I must say that Jonathan wrote what we consider the “gold standard” of DSP applications, which included both the current status of the Park and future plans and improvements. It also included (new to applications at that time) a requirement for our Centre to monitor and audit the Park over the next four years (as a minimum).

I’m glad to say that, despite some critical reductions in budget for the Park in recent years, the staff are very supportive to the DSP and its goals and the Park has integrated the whole concept into its day to day activities.

So there you have it! Kejimikujik National Park and Historic Site, a Dark Sky Preserve and a wonderful place to enjoy the beauty of the Nova Scotia wilderness and the wonders of some of the darkest skies in North America.

Dream BIG!



▲ *A view of the southern sky from Peter Point, Keji (photo: Andrea Misner)*

first DSP.

Jonathan Sheppard was an excellent choice to be put in charge of the project. He was enthusiastic, diligent, organised, and very, very capable. Dave and I both agree that the speed and success of the project was in no small part due to Jonathan.

Dave and I had several meetings over the summer and fall with the staff at the Park, discussing lighting, outreach, observing sites and DSP requirements in general. I must say what a pleasure it was to work with everyone at Keji, working towards a single goal.

My first surprise (remember I didn’t know Keji very well at that point) was that there were not a lot of obvious locations where there was a good overall view of the sky. Too many damn trees, which for some

Happy Birthday SCO Member thoughts ...

Roy Bishop

19 years ago Halifax Centre members acquired and built an observatory at St Croix now known as SCO (St Croix Observatory). I think all current members owe a debt of thanks to all the members who were involved in that enterprise. Because of their hard work and foresight we have a wonderful asset to enjoy our hobby. From the entire membership—thank you all!

The Halifax Centre web site has an excellent history of SCO. Go to: http://halifax.rasc.ca/sco_history.html

The following are a few comments provided by some of our members on the 15th anniversary of SCO's opening.

By the civil calendar, tomorrow (June 21st 2012) is the 15th anniversary of the official opening of Saint Croix Observatory, but I think we should celebrate it TODAY, because 1997 June 21 was the date of the Summer Solstice, which is June 20 this year. I was Centre President at the time (and take no credit for the building of SCO, which was carried out by an amazing team of Halifax RASC volunteers), but I presided over the official opening. I delayed the event sufficiently to open the roof at EXACTLY the instant of High (Solar) Noon, as calculated by Roy Bishop. So that event was about exactly 15 "tropical" years ago, almost to the instant I am writing this. The list of SCO volunteers and Centre executive that year includes several names of members who have served in prominent RASC positions. Happy Solstice and clear skies!
Dave XVII Chapman

WOW! 15 years ago! Was it that long? Ah the memories.....I remember the cold windy night on Courthouse Hill near Gore after which Roy told us to follow him to a site he knew about, now known as SCO. I recall the first load of gravel for the drive way and the crew spreading it. As well the day we cleared the land and brush and all watched how quickly Roy "the beaver" Bishop could cut down trees! I have a photo somewhere of me 20 feet up a tree tying a rope to it so we could pull it to free a chain saw. The roofing party was a beautiful sunny summer day! It was a lot of fun and honor to be part of the centre that built SCO.

I dropped by Friday night on my way back to the valley for another work week, my first time in a few years and I must say was impressed with how well it looks and the growth and improvement it has undergone. Great work Halifax RASC!
Paul Gray

That excursion to Gore was carefully planned by "the beaver" on the coldest, windiest night to make sure we figured out for ourselves that the Gore site was not a good one! :-)
Dave Lane

I was suffering from Astronomer's Fever in 97. I didn't pick up the Hobby until 2006 when I first joined the RASC. I was into astronomy ever since my first view of Saturn when I was 10 years old. I appreciate all of the work done at SCO, past present and future! I use SCO as often as I can. I am now an imager and my camera appreciates the extra photons. Thank you everyone who was involved!
Jeff Donaldson

This is the time frame regarding SCO, which should be recorded for posterity:
1993

The Halifax Centre forms an Observatory Land Search Committee.

Here are four of my photos taken at SCO, three in 1996 and one in 1997.



▲ The people "in" the warm room are (L to R): Gertrude Bishop, Frances Young, Andrew Young, Dr. Hamish Young. The Youngs are from New York, and Frances' father was Dr. William Holden, who was the Honorary President of the Halifax Centre 1980-1984. (Aug 2nd 1996)



▲ Walter Urban of Avonport volunteered his time and tractor to back-fill the foundation columns for the roll-off track. (Sept 24th 1996)



▲ David Levy (Nova East's 2012 special guest speaker) in the roll-off before the roof was constructed. (Oct 18th 1996)

April Meeting Report

Chris Young

The RASC meeting on April 17th was attended by approximately 22 members. President Paul Gray introduced the evening's presenters: Quinn Smith & Pat Kelly who gave an update on the Halifax General Assembly scheduled for July 1 through 4th. The GA overview is well presented in the April 2015 Nova Notes.

Paul then took us on a virtual tour of the "other" (other than Nova East!) star parties in the Maritimes. Google Earth took us to each location in Kou-

chibouguac National Park, Mactaquac Provincial Park, Mount Carleton Provincial Park and, Fundy National Park, New Brunswick, (see <http://www.skynews.ca/star-party-calendar-2015/> for details).

Paul described the sites, amenities and the miraculous dark skies "... shadows cast by the Milky Way... in the woods you couldn't see your hand in front of your face...". Rather than just a travelogue we learned of real, and enticing, options for dark sky observing.

Chris Young followed up with his first What's Up. In a short sky tour he referenced visible stars, constellations

and Messiers to the Explore the Universe requirements (www.rasc.ca/explore-universe). Mini- Messier List (<http://halifax.rasc.ca/documents/MiniMessier.pdf>). These observing challenges are easily met and many targets are visible at any time. Chris finished up with the schedule of the visible passes of the ISS and apart from correcting the times while at the Podium, all went well.

The evening finished up with GA volunteers signing up, conversation and refreshments – another great evening!

June Meeting Report

Jim Millar

After a 24 hour rain delay the regular June meeting was held on Saturday, 20 June at SCO. The weather was a little cloudy on the drive out but it cleared nicely as the evening wore on.

The meeting started with a BBQ and socialization. Thirty-three members showed up and enjoyed themselves thoroughly.

President Paul Gray opened the meeting at 8:30 with opening remarks and a reminder about the upcoming GA and asked everyone to consider attending some or all of the events.



▲ Blair MacDonald Prepares his equipment for a demonstration in astrophotography (Photo: Jim Millar)

Dave Chapman then gave a short talk about the young Nipniku's Moon "Trees Fully Leaved" as part of What's Up. He talked about the "Gang of Four" and other items along the terminator at that time. He also showed Jupiter and Venus that formed a beautiful triangle with the crescent moon.

People took the opportunity for some observing with the variety of scopes and binoculars available. Saturn also made an appearance for observing.

Blair MacDonald later gave a demonstration and talk on astrophotography with his gear.

1994

October - In a letter on the 15th to Dave Lane (Centre President), Shawn Mitchell and Clint Shannon, Roy Bishop proposed the St. Croix area for an observatory. On the 28th the Observatory Land Search Committee went to its proposed site at Gore, and then Roy took them to see St. Croix.

1995

June - Lease signed for St. Croix with Minas Basin Pulp & Power.
July - Site survey.
September, October, November - Cleared forest and prepared driveway.

1996

May - Cleared more trees, buildings designed, and permits received.
June - Excavated for foundations.
July & September - Concrete poured.
October - roofs on and rails installed for roll-off.
November - Vinyl siding completed.

1997 June 21 - SCO official opening (at solar noon 13:18 ADT).

During those years, Dave Lane and Dave Chapman served as Centre presidents.



▲ L to R: Wendee Levy, Clint Shannon, Paul Gray (behind Clint), Susan Gray, Carolyn Shoemaker, David Levy, Eugene Shoemaker. Seventeen days later, Eugene was killed in Australia. (July 1st, 1997)

May Meeting Report

Jim Millar

The meeting was called to order by President Paul Gray and 28 members were present. Paul announced that Mary Lou Whitehorn had completed the Explore the Universe Program to add to her long list of accomplishments. He gave a short explanation of what was involved in the program and encouraged old and new members to attempt to finish the program.

Dave Lane gave a short presentation on the Winter Star Party that he and others have attended several times. The party is held each February at the Southern Cross Astronomy Camp in the Florida Keys. The



▲ The Winged Figures of the Republic, placed on either side of the 142-foot flag pole. The terrazzo floor can be seen in the foreground. (Photo: Quinn Smith)

attend would need to decide early in September as the seats fill in a hurry. Dave is looking for others to attend.

Jerry Black gave a presentation on the time lapse photography that he has done. He discussed settings and how to do it and showed a series of movies that he had made. More can be seen on his YouTube Channel GapperNS.

Paul Gray gave an update on star parties in the area.

Nova East- Aug 14-16 at Smiley's Provincial Park- Alan Dyer will be the keynote presenter.
Keji Dark Sky Weekend- Aug 7-9 at Kejimikujik National Park
RASC New Brunswick Star Party – May 24th long weekend annually at Kouchibouquac National Park
RASC New Brunswick- The Dam Star Party- weekend nearest the new moon in July at Mactaquac Provincial Park near Fredericton.
RASC New Brunswick- Labor Day Weekend, Fundy National Park
Mt. Carlton Provincial Park Star Party- Aug 14-16. Extremely dark skies any time.

Quinn Smith gave a presentation on the Damn Calendar. On one of his many motor bike trips he visited the Hoover Dam. The builders of the dam also built a calendar in the ground at the dam site. The calendar has various star maps spread around the circle and covers 26,000 years. He wrote an article in Nova Notes April 2013 that gives more details.

Chris Young ended the presentations with "What's Up." He spoke briefly about his interest in the Messier Objects and listed those that were up in the month ahead.

The meeting ended as usual with treats and fellowship.



▲ Inscription: "This diagram traces a complete sidereal revolution of the Equinox, otherwise known as the Platonic or Great Year. The average length of a complete sidereal revolution is 25,694.8 tropical years. (Photo: Quinn Smith)



▲ The path of the north celestial pole among the stars due to precession. Vega is the bright star near the bottom. (Photo: Quinn Smith)

▲ Annual Winter Star Party Flashlight Photo (Photo: Dave Lane)

star party is run by the Miami Astronomy Club and has from 550-600 people in attendance. He showed a slide show that explained the variety of people, events and presentations. He advised that anyone wishing to

Member Profile: David Griffith

Tony Schellinck

David was ten when his parents gave him a 60mm Tasco refractor that came with a booklet called “Worlds Beyond” for Christmas. Several nights later he saw M42 for the first time. The moon was his next target and he was “blown away” by the sight. From that time on getting him into the house at night to go to bed was very difficult. He grew up in Sandy Point near Shelburne. There were no street lights and very dark skies. He observed all year, and particularly enjoyed viewing during the winter months.

His four years at Acadia University he calls his “Dark Period” with respect to astronomy. However, after graduation, standing under a dark sky, the urge came back to him: he had to do astronomy again. He bought his first quality scope, a 5” Tasco Schmidt Newtonian, and used star charts to plan each evening’s observing.

David went into teaching after university covering all topics in grades 2 to 12, and incorporated astronomy into his teachings when he could. He was teaching in the school in Port Mouton (pronounced ma-toon) about 20 km past Liverpool on the South Shore of Nova Scotia when a new principal at the school suggested it would be nice to teach astronomy there. He was encouraged to apply for a Nova Scotia Teachers Union grant to purchase a planetarium. David was successful with his application and received about \$3,000 toward the project. The School then put on fund raising events and with the added money they were able to purchase the planetarium and two telescopes. The planetarium consisted

of a large umbrella-like dome that hung from the ceiling, and a projector. With two Astroscans, David soon had a thriving astronomy program running that attracted both students and their parents to astron-



omy nights. It even attracted students from schools in the surrounding areas.

When his term finished at the school, he left for the Hebbville School in Bridgewater, leaving behind the equipment. By now he had an 8” Dobsonian, and 80mm refractor and an Astroscan. He would put on star parties after school and the parents would provide hot chocolate for all. His exploits were covered in a Nova Notes article at the time.

He then entered the second “Dark Period” where astronomically speaking, things went downhill. He learned a lesson that the best aperture for a scope is the aperture you will actually use. He sold his big scopes and purchased a 6” Schmidt Cassegrain. This was a mistake as the tube was small but

the mount was far too heavy and cumbersome. He only used it occasionally and then sold it after a few years. He then went through a time in his adult life when he did not own a telescope. Instead, he was a drummer in a band. This proved to be time consuming with rehearsals twice a week, weekend gigs, and the need to practice constantly.

Nonetheless, he decided he wanted a solar scope and his wife gave him one for their 25th wedding anniversary. Thus inspired, he got into the mindset of taking out a scope again. The next spring he purchased a Sky Watcher 4.7” Richfield refractor along with a Baader “Semi-Apo” filter that knocks off about 80% of the chromatic aberration. He says he likes it; it is small, hence portable, so he uses it. He has used it recently more than he used all his other scopes.

David has been in and out of RASC over the years. He always enjoyed being a member and never left for negative reasons. He plans to stick with it this time. His goal is to do what he has always done best: i.e., teach people about astronomy, again through outreach programs using his new refractor and his solar scope.

Editor’s Note: I spend much of my time in Port Mouton and so I tried to track down David’s planetarium. A friend had a conversation with a former principal of the school who said that when it shut down the planetarium was sent to a new school in Greenfield. However, the trail ran cold in Greenfield.

During his interview David neglected to mention that he is an avid collector of meteorites and has a collection of over 200 of them. He will be contributing an article describing his experiences collecting these and describing his collection for a future issue of Nova Notes.



The Astronomy Nova Scotia webpage: <http://www.astronomynovascotia.ca/>

Dave Chapman on Astronomy Nova Scotia

"Astronomy Nova Scotia does not exist. It has no members, directors, dues, bylaws, or meetings. Yet its webpage gets thousands of hits per month, its twitter feed @astronomyns has over 600 followers, and its Facebook page has nearly 700 subscribers. ANS was formed in 2008 by the loose collective of professional and amateur astronomers and science educators who were preparing for International Year of Astronomy 2009. The leading partners were volunteers from RASC Halifax Centre, Saint Mary's University Department of Astronomy & Physics, and Dalhousie University Department of Physics and Atmospheric Science.

The idea was to have a single, short, easily iden-

tifiable "brand" for promoting news and regional events on astronomy to the public for IYA2009, to reduce the confusion of the alphabet soup of organizational acronyms. People soon learned that ANS is the one-stop shop for astronomy in Nova Scotia, whether you are looking for an observatory open house, a planetarium show, an RASC meeting, a classroom or youth group speaker, an evening astronomy talk, or anything else.

It was easy to keep ANS alive beyond IYA, using the labour-saving tools of social media, and its following has continually grown. Today, only 2 or 3 volunteers keep it going, and ANS is one of the legacies of IYA 2009 in this region.

Many thanks to SMUAP for hosting the webpage."