

# Nova Notes

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



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### Front Page Photo:

Roy Bishop                      26 hour moon  
March 16th 2010 @ 20:06 ADT  
Taken at Grand with Cannon XTi DSLR  
Exposure: 2 s, f/9, ISO 100, FL 200 mm,



## From the editor

*Quinn Smith*

This edition contains some important information about changes in the way Nova Notes will be delivered in the last half of 2010 and beyond. We are moving to an electronic version of the newsletter. If you wish to continue to receive a printed and mailed copy of this newsletter I urge you to read the article on page 3.

We have had some amazing weather in the first half of March. I cannot remember a March where we had 15 days of clear skies around the time of the new Moon - yes it's Messier Marathon time! I must confess I didn't even attempt the Marathon this year, and now looking back on the weather, I may never get a such a good chance again (in Nova Scotia anyway). I did however (thanks to John Walker) get the night panoramas done at Keji, in support of their DSP application. Dave Chapman and I have been trying for three months to get these panoramas finished. Thank you John for your photographic skills.

The executive has been discussing ways to offer more services to the membership. One thought is to make rental equipment available on a month by month basis, for a very minimal fee. Discussions will occur on the "list" and in next month's newsletter.

Finally, it's never too early to start thinking about Nova East. It is a three night event this year taking place over the Labour Day weekend in September. Registration is now open. Go to <http://halifax.rasc.ca/ne/> for more details.

## 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 grown over the last few years to include a roll-off roof observatory with electrical outlets, 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) are open to members and guests.

If you are not a key holder, or need more information please contact the Observing Chairman, John Liddard (see below).

### Upcoming Observing Nights:

April	9th,	2010
May	15th	2010
June	11th	2010

Meetings begin at 8:00 p.m. at Saint Mary's University in room Sobey SB 260

The May meeting has been moved to the 14th

April 16th, 2010

- Meeting night

Several RASC members will discuss topics associated with telescope mounts, including setting circles, polar alignment and Go-To mounts.

May 14th 2010

- Speakers night

Dr Jack Josefowcz of LED Roadway Lighting will discuss the advantages and disadvantages of LED lighting and astronomy.

June 18th 2010

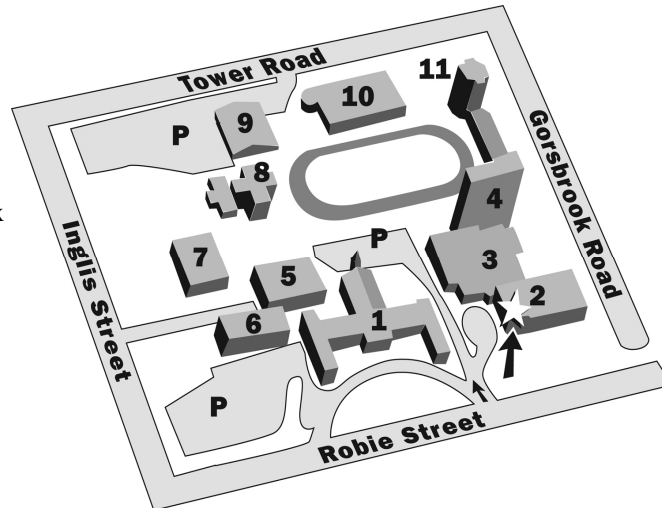
- Speakers night

“The Marquis De Chabert and the first observatory in Canada at Louisbourg 1750 - 1751”.

[The content of all meetings is subject to change]

## Meeting Location: Saint Mary's University

1. McNally
2. Sobey Building
3. Loyola Academic Complex
4. Loyola Residence
5. Patrick Power Library
6. Science Building
7. Burke Building
8. Bookstore
9. Alumni Arena
10. The Tower
11. Rice



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 7:00 p.m., (usually in room SB152), and all members are welcome to attend.

The NOVA program, hosted by Sean Dzafovic will begin in the meeting room at 7pm, prior to the regular meeting.

## Halifax RASC Executive, 2010:

Honorary President	Dr. Roy Bishop	902 542 3992	roy@xcountry.tv
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## Changes to Nova Notes

Quinn Smith

There is going to be a major change in the way that Nova Notes is delivered in 2010.

We are planning to phase out the printed version of Nova Notes in favor of the on-line version found on the Halifax Centre Website.

Anyone wishing to continue to receive a printed version of the newsletter will still have a copy mailed to them, however there will be a \$12 per year fee for the printed/mailed version.

We are expecting that this will reduce the environmental and financial cost associated with the newsletter, while minimizing the inconvenience to members.

We have undertaken this change for several reasons:

- Printing and mailing 150 copies of the newsletter uses many resources such as, paper, delivery costs, and fuel. An electronic version will reduce this environmental impact.
- The electronic version will be

available in colour (the printed version is black and white), the photo quality will be much better, and the edition will be available earlier in the month.

- The cost of printing and mailing the newsletter is in excess of \$1,500.00 per year (for 5 editions) and represents a major expense of the Centre.
- By going to an electronic newsletter, we will save a considerable amount of money, that can be directed towards other benefits and programs for the membership.

### How it will work:

- The first three editions of Nova Notes in 2010 (February, April, and July) will be delivered by mail in the normal way.
- The last two editions (October and December) will only be mailed to members who have specifically “opted-in” to the newsletter.
- All members who “opt-in” to the newsletter will continue to receive a newsletter until they renew their membership, even if that renewal does not occur till the first half of 2011.
- A member may “opt in” to the newsletter by e-mailing, or writ-

ing to the newsletter editor anytime between now and September 15th 2010 at:

novanoteseditor@rasc.ca  
or mail

Nova Notes Editor  
PO Box 31011,  
Halifax, NS., B3K 5T9

- There is no fee to “opt-in” to the newsletter, the print fee being paid at the next membership renewal.
- All members “opting in” to the newsletter will receive confirmation of their “opt in”.

After June 30th 2010 as a member renews their membership (at the National level), they will have a renewal option to receive the printed version of Nova Notes by paying a publication fee of \$12.00 (as an addition to the regular membership fee).

By June 30th 2011 all members should have renewed and all members wishing to receive the printed version of Nova Notes will have indicated such on their membership renewal.

Life members may continue to receive a printed version by paying \$12.00 through the renewal process at National (as is currently done with the Journal).

## Outreach Programs

Quinn Smith

On the weekend of March 19th - 21st the Halifax Centre put on an astronomy booth at the Outdoor Sports and RV show. We put on a similar display last year and again it was a great success. We estimated that over 800 people came and stopped at the booth to pick up our give-aways, talk about astronomy, or to discuss telescopes.

I would like thank the members who made presentations at the show and to those who helped out in the booth. I

particular I would like to thank Chris Young and Richard Vanderberg for giving presentations and to Paul Heath, Dave Lane, Wes Howie, Robert Bussieres, Cliff Wiseman, Chris Young, Greg Parsons, and Dave Chapman for working the booth. I think the whole membership owes big thank you for the participation in Centre activities shown by these members.

We will also attend the Earth Hour events in Parade Square on March 27th. Again this is a repeat performance as we had attended last year's events. I am writing this report on March 25th and so I do not know how many people will be at the event or

who from our membership will help out. Last year there was a good crowd and the public observing component lasted several hours after the main events had ended. Again I would like to thank all those members who helped out and brought telescopes for the observing session.

Our final event in this time period will be a Mall display that will take place on April 24th in the Centre Court at the Halifax Shopping Centre. This display is to celebrate Astronomy Day, and any member who would like to help out is very welcome. The display will start at 9 a.m. and will run through till the evening.

## February Meeting Report

Quinn Smith

Our acting President Richard Vanderberg opened the February meeting at 8 p.m. and welcomed the 38 people attending. We had 2 guests and Richard welcomed them to the Halifax Centre and gave a brief outline of the advantages of membership. He then introduced the Executive, noting that we still did not have a President, asking any member who is interested in taking on that most excellent role in our Centre to contact any member of the Executive (see page 2).

Quinn then spoke briefly on plans for upcoming Public Outreach events.

- We will be exhibiting at the Outdoor Sports and RV show at Exhibition Park on March 19th - 21st.
- We will be participating in the Earth Hour event at Parade Square in downtown Halifax on March 27th, starting at 8.30 p.m.
- We will have a Mall display at the Halifax Shopping Centre on April 24th. This is Astronomy Day and we will be putting up a display at Centre Court starting at 9 a.m.

Quinn asked for volunteers to support these events and asked anyone interested in helping out to contact him (see page 2).

Blair spoke briefly about the next Nova East Star Party which will take place at Smiley's Provincial Park. It will be held over Labour Day weekend this year and will start on Friday September 3rd and end on Monday September 6th. The Nova East web site is up and running and can be found at:  
<http://halifax.rasc.ca/ne/>

Mary Lou then gave the "What's Up" for the month (John Liddard was not able to attend the meeting). Mary Lou discussed the constellation Lepus (the Hare) which is well positioned this time of year, just below Orion in the southern sky. She showed the 13 major stars that make up the shape of the

constellation and then discussed M79 (a globular cluster), NGC 1964 (a spiral galaxy), and IC 418 (the Spira graph Nebulae).

Quinn then spoke about the upcoming changes in the delivery of Nova Notes. Starting with the September edition. Mailed versions of the newsletter will only be available to members who have specifically asked for it. The main delivery method of the newsletter will be from the Halifax Centre web site. There will be a fee of \$12 added to your next RASC renewal if you want a printed version mailed to you. Full details are in this edition on page 3.

Unfortunately Robert was away and could not attend the meeting. Because of this the library cart was not available. The library should be open for the next meeting.

We did not have a main speaker at this meeting, and Richard introduced the four Halifax members who were to speak on various topics.

- Richard Vanderberg - Globular Clusters.
- Chris Young - Comfort and Convenience in Observing.
- Dave Chapman - Modifications to a 4.5" Newtonian Reflector
- Dr Roy Bishop - Solar Filters

### Globular Clusters - Richard Vanderberg.

Richard has had a long interest in observing globular clusters. He moved to Halifax from Edmonton and described how beautiful the skies are in the Prairies. There are however a couple of problems.

- The skies are dark in winter but at -25 degrees C it's just too damn cold to enjoy observing!
- In the summer it's warm but for three months there are no really dark skies due to the northern latitude.

Richard pointed out that these problems made it difficult to observe "faint fuzzies" and so he concentrated on globular clusters that can easily be observed in the warm summer skies.



*M80 in the constellation of Scorpius*

Richard pointed out that many globular clusters lie in the magnitude range 5 to 11, with most with a magnitude between 8 and 9. Since globular clusters respond in a telescope more like point sources (unlike nebulae and galaxies) they respond well to magnification. This helps them stand out against a sky that is not very dark - ideal for observing in the Edmonton summer.

Richard mentioned that globular clusters are categorized by concentration (density) and that there are three constellations that contain a lot of globular clusters; Ophiuchus, Scorpius and Sagittarius.

In summarizing, Richard bestowed the virtues and ease of observing globular clusters, especially in light polluted (naturally or otherwise) skies.

### Comfort and Convenience in Observing - Chris Young

Before starting his astronomy equipment purchases Chris sought out some advice from Tony McGrath. He was advised that having equipment that was both convenient to use and comfortable while observing was the way to go. Heeding this wisdom Chris decided that he needed an easy setup portable telescope. Larger telescopes have their advantages, but can be difficult to set up and use. A smaller telescope, he felt, would get more use - aperture could follow later.

Chris started by purchasing an 80 mm



Williams Optics ED refractor and convinced himself that a Sirius Go-To German EQ mount was needed. He quickly found that dragging the 60 lb assembly up from the basement was a challenge as was the fact that the 'scope would hit the mount when slewing under Go-To control. Adding a mount extension tube safeguarded the OTA but the weight still discouraged setting up for only a few minutes in the backyard.

Chris then purchased a light weight Williams Optics Alt-Az mount (weight 17 lb). This simple mount is designed so that it can support two telescopes at the same time. This became the mount of choice being quick and easy to set up. As this is a "push-to" mount maintaining balance is very important and the weight change of eyepieces, and fact that they are offset from the centre line of the OTA, can create an imbalance and causing some slippage in the mount. Adjustable weights and offsetting the centerline of the mount so the true centre of balance is on the axis of rotation addresses this issue.

His favourite eyepiece is a Televue 8-24 Zoom which is sharp and a delight to use. You can find your object on low power, and then just dial in to the best magnification. It is several eyepieces in one and there is no fumbling about with several eyepieces. Eventually Chris expects he will evolve beyond the Zoom to a few select eye-

pieces but for now he finds it very convenient.

A prism diagonal adds to his observing pleasure by providing a correct image, simplifying finding objects and using sky charts. Another advantage is that using the scope for bird watching no longer has the birds upside down.

Chris confessed that he has not found the perfect observing chair which is a necessity for true comfort in observing but he is working on this.

Overall Chris is pleased with his equipment choices and recommends keeping "convenience and comfort" in mind when contemplating a purchase. The easier it is to use, the more you tend to use it. Consulting other members for their advice and experience is another valuable resource not to be overlooked!

#### **Modifications to a 4.5" Newtonian Reflector - Dave Chapman**

Dave was given an inexpensive 4.5" f/8 Newtonian Reflector on a small, shaky equatorial mount. The eyepieces were of the 0.96" diameter type, and the telescope was typical of the "beginner's" 'scope sold in many stores.

On checking out the optical tube Dave found the optics were actually quite good (a long focal length spherical mirror) but the mount and eyepieces left much to be desired. He also discovered that the focuser could be modified to accept 1.25" eyepieces. A project was born!

The first thing Dave did was to throw out the plastic 1" eyepieces (groans from the audience!) and then modify the focuser to accept larger (and better) 1.25" eyepieces.

He then set about tightening up the mount and found that after tightening the mount performed quite well. What was a problem with the mount was the long flexible slow motion control knobs. They were very awkwardly

placed when observing at the eyepiece. Removing the long flexible slow motion control on the R.A. axis and replacing it with a short, stubby control made by fellow member Steve Tancock, solved the problem.

As Dave pointed out, the optical tubes of most of these beginner's scopes are usually quite good (especially the long focal length type). It is the eyepieces and mounts that make the telescopes perform poorly and difficult to use.

#### **Solar Filters - Dr Roy Bishop**

There has been a lot of talk on the "list" lately about solar filters and Roy was here to set the record straight!

Roy explained that the luminance (L) of an object is its surface brightness and is measured in candelas per square metre (cd/m<sup>2</sup>). Think of it like a birthday cake said Roy; the more candles, the brighter the surface of the cake!

Neglecting losses, the surface brightness of an image equals the surface brightness of the object (L image = L object).

The eye, Roy said, could handle a maximum luminance of about 105 cd/m<sup>2</sup>. The Sun however, as seen from the Earth, has a luminance of 1.6 x 10<sup>9</sup> cd/m<sup>2</sup>, which is 16,000 times too bright to safely look at!

The way to safely look at the Sun is to reduce the brightness of the image by at least 16,000 times. This can be done with a neutral density filter (one that does not change the colour of the image).

Solar neutral density filters are usually rated by ND# where;  
ND# = log<sub>10</sub> (L object/L filtered).

To view the Sun safely we need a filter with a ND# = log<sub>10</sub> (16,000) = 4.2 (minimum). Visual solar filters are typically have a ND# of 5 (100,000 reduction in brightness).

*(Continued on page 6)*



Roy also pointed out that camera and lunar neutral density filters do not use the same ND number system (they usually indicate the percentage of transmission). To observe the Sun, you would need a transmission filter of only 0.001%!

Roy then discussed what could be used as a safe solar filter for visual observing (unaided eye only).

- Fully exposed and developed silver-type film could be used BUT most modern film does not contain silver and should not be used. Best to avoid exposed film.
- #14 welders glass works well, but produces a green image.
- Commercial solar eclipse viewer/glasses. Cheap, effective and safe.
- Aluminized Mylar solar filter is effective but is fragile, requires mounting and is difficult to find outside of an astronomy store.

As for telescope use Roy told us that there are two choices: a metal-coated glass filter, or a metal-coated Mylar

filter (to be mounted on the FRONT of a telescope). Never mount a solar filter at the eyepiece as it will get very hot and could shatter or melt. A home-made mount for a commercial Mylar solar filter sheet is acceptable, provided it is securely attached to the front of the telescope so it cannot fall or be blown off.

Roy also showed us a simple solar viewer: a small mirror covered with masking tape except for a small hole. It makes a great, safe way of projecting a "pinhole" image of the Sun onto any convenient surface. The larger the size of the hole, the brighter but fuzzier is the image. For projection across a small room, a hole (round or square is immaterial) about 6 mm in diameter works well.

Finally, with the aid of a PST (personal solar telescope) provided by Chris Young, Roy described briefly "H-alpha" solar filters that pass only a very narrow sliver of the visual spectrum centred on the red spectral line emitted by glowing hydrogen gas. Unlike a broad-spectrum, neutral den-

sity filter, an H-alpha solar filter reveals solar prominences and much otherwise-invisible structure on the solar disk.

Be safe out there!

#### **Below:**

#### **Sun Viewers: Photo Roy Bishop**

A selection of viewers for unaided-eye views of the Sun, especially for use during a solar eclipse or when a large sunspot is on the solar disc. On the left are two "sunglasses" designed to be worn. The bottom pair uses aluminized Mylar, the upper pair uses a black polymer. At the front is a #14 welder's glass. Behind the welder's glass is a Christmas ball covered in small mirrors that produces several images of the Sun on a distant viewing screen by "pinhole projection". To the right of the ball is a small flat mirror covered with masking tape, except for a small square aperture that projects a single solar image on a distant screen. Behind the flat mirror is a cardboard viewer with two openings covered with two layers of fully-exposed and developed, silver-based, black & white film.





## Keji - One step closer to a DSP

Quinn Smith

Dave Chapman and myself have spent the last year working closely with Jonathan Sheppard and other members of the Kejimikujik National Park in supporting their bid to become Nova Scotia's first Dark Sky Preserve.

Amongst other things, to become a DSP, a Park must have dark skies, year round access to the public, lighting that conforms to DSP lighting protocols, and a public outreach program.

The Halifax Centre has been helping the Park by identifying several observing sites within the Park, supplying day and night panoramas of those sites, taking SQM readings at different locations and seasons, and supporting the Park in their outreach programs.

If all goes according to plan, the Park will submit their DSP application to RASC National this April, with the hope of receiving a DSP notification in time for Parks Day on July 17th 2010.

We thought we would give the mem-

bership an update of where we stand.

Two observing sites have been selected, a primary site and a secondary site. There are a lot of trees at Keji, and finding open sites was not easy!

The primary site is situated close to the Jeremy's Bay Campground, and is at the location of a secondary parking lot (P1). It is a clear area with a good horizon. The observing field itself is on a south facing slope a short distance from the parking lot, and has the southern horizon obscured less than 10° high, and a northern horizon obscured approximately 15° high. The trees that surround the field make an excellent wind and light barrier. It is hoped that this site will (in time) feature a SkyCircle (a comfortable seating area for visual observing) and later on a small observatory featuring a 10" SCT. Site co-ordinates: 44° 24' 23.26" N; 65° 14' 54.09' W

The secondary site is located right on Kejimikujik Lake near Merrymecked Beach. It is at P2 near the location of the Mi'kmaw Encampment site. This site only has a 200 degree view (from 130° to 330°(true)) due to trees to the north, but the view is clear from the

zenith to the horizon! Talk about your big sky! Site co-ordinates: 44° 23' 01.95" N; 65° 12' 42.18" W

Earlier in the year (January) Dave Chapman and I took daytime panoramas of the two observing sites. On March 5th this year, John Walker and I took a set of night time panoramas. I have to thank John for his work - he did all the photography. All I did was keep the wild animals away!

We have also taken several SQM readings at the Park. In the summer of 2009 we were getting readings of 21.7 (best) and on my last visit (March 5th) 21.6. Not too bad.

I have enclosed a couple of the panoramas. These are not finished, they need processing and stitching. The printing process of NN tends to darken pictures so I hope they come out in print version.

There is virtually no light pollution visible on the primary site panorama (due to the 10° horizon). However in the secondary site panorama you can clearly see the sky glow from Yarmouth (centre and Digby (right)).



**Top: Panorama of the primary observing site (constellation names included)**

**Bottom: Panorama of secondary site overlooking Kejimikujik Lake**



## March Meeting Report

### Quinn Smith

The March meeting was brought to order by our acting President Richard Vanderberg. There were 42 members present and 5 guests.

Richard welcomed the group to the meeting and explained the advantages of joining the RASC. He then introduced the Executive and the business of the meeting began.

Quinn spoke briefly about public outreach events that are planned for the rest of March and April (see page 3) and gave a summary of the progress being made at Keji (see page 7).

Richard then introduced the main speaker of the evening Arne Henden who was going present a talk titled "Stars that go Bump in the Night".

Arne Henden is the Director of the AAVSO (American Association of Variable Star Observers), a scientific non-profit organization headquartered in Boston, dedicated to the study of variable stars. He obtained his PhD from Indiana University in 1985, and had been employed at the Goddard Space Flight Center, The Ohio State University, and the U.S. Naval Observatory (Flagstaff, Arizona), before joining the AAVSO. He is also a contributor to the Observer's Handbook.

To quote the talk abstract:

"Not every star is as peaceful as our Sun. About a dozen objects per year go "nova" in our own galaxy. Each nova is unique; some rise and fall in brightness quickly, some take years to return to their original brightness. All, however, involve enormous outbursts of energy, sufficient to kill off mankind if a nova occurred near our Solar System. The American Association of Variable Star Observer's (AAVSO) has been keeping records of novae for nearly a century, and the talk highlights some of the fun ones as well as giving some

observing hints".

Arne briefly discussed various types of variable stars that had interested him over the course of his career from Cepheid variables, to eclipsing binaries, supernovae and now, novae.

He talked about the various telescopes he had used, starting with a 2" Tasco as a boy, to the various 'scopes he used at the U.S. Naval Observatory in Flagstaff, Arizona (the largest being 1.55 metres). Now as the Director of the AAVSO he was back to using smaller 'scopes.

Arne went on to discuss the type of professional research being done on mapping stars and measuring their brightness. These surveys are being done with large telescopes and are concentrated on stars in the 15th magnitude and fainter. This leaves an opportunity for amateurs such as those in the AAVSO to study brighter stars.

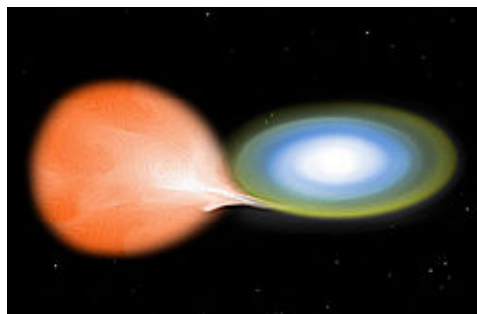
He talked about the ways amateurs can be involved in cutting-edge astronomy if the project is correctly chosen. Arne made some suggestions:

- Big 'scopes are not always needed
- Formal training helps but is not essential.
- Hook up with a professional
- Variable stars are a good choice!

Arne then went on to explain how all stars change their brightness over their lifetime - all stars are actually variable stars! He told us that by measuring the light curve from a variable star we can tell a lot about its physical structure, geometric variations, and its accretion disc.

Arne then discussed one type of variable star, the nova. You are never too old to learn. Before listening to Arne's talk I thought that novae were "exploding stars" - a small version of a supernova. Was I ever wrong!

Stars have limited amounts of fuel. As each type of their fuel is consumed, the star must burn successively differ-



*Artist's conception of a white dwarf star accreting hydrogen from a larger companion.*

ent types of fuel. In the beginning a star burns hydrogen in a process that synthesises helium. When the hydrogen is consumed, the helium is then burned and that in turn synthesises carbon.

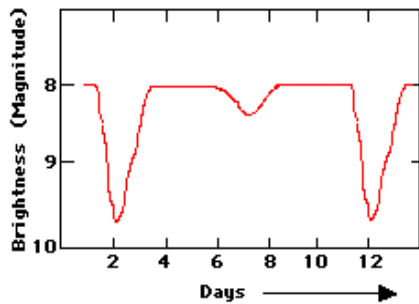
To continue to burn fuel produced at each stage, the star must be hot enough to convert progressively heavier elements. Smaller stars cannot generate sufficient heat to do so and eventually lose energy. Eventually, as the fuel is consumed, stars less than 5 solar masses swell into red giants which eventually eject their outer layers forming planetary nebula, leaving only the inner core, a white dwarf.

However a classic nova, the most common type, is the result of the accumulation of matter on the surface of a white dwarf in a binary system. White dwarfs are the remnants of old stars that have burned most of their fuel and have lost much of their outer layers, leaving them small and very hot. If the white dwarf is close enough to another star, it can draw material from its binary partner. Most of this material is hydrogen. When the hydrogen reaches the surface of the white dwarf, it ignites, creating a nuclear explosion on the surface of the white dwarf.

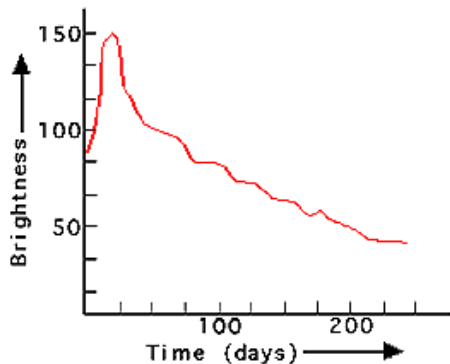
Arne showed us some typical light curves of variable stars, showing how a lot of information could be gained from studying the curve. However there are a lot of variable stars out there that require constant monitoring.

That is where the amateur, with a





Above: Light curve of an eclipsing binary  
 Below: Light curve of a nova



modest scope (or even the naked eye), is invaluable to the professional astronomer. There are too few professional ‘scopes, and too few professional astronomers. However there are lots of amateur astronomers with lots of small ‘scopes.

Arne then discussed a semi-periodic nova SS Cygni which has been studied from 1896 onwards. Its light curve varies, and it is amateurs, like those in the AAVSO, who are constantly monitoring the star and reporting interesting changes to the professionals. Arne pointed out that many transient astronomical events are, in fact, first observed by amateurs who report their findings to the professional organisations (our own Dave Lane has co-

discovered several supernovae with Paul Gray).

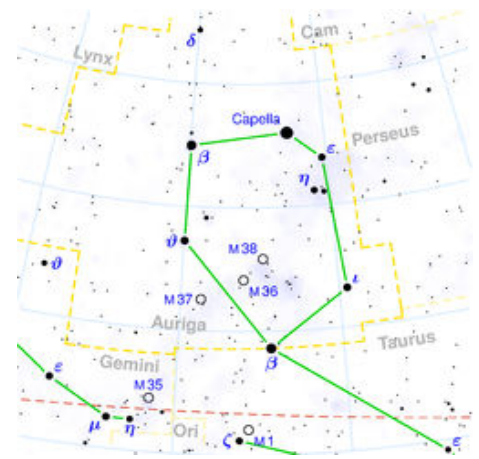
Arne ended this talk by discussing Epsilon Aurigae, an eclipsing binary with a 27 year period. The two stars that make up the system are due to eclipse each other this summer, with the darker of the two passing in front of its bright companion.

Epsilon Aurigae's eclipsing companion has been subject to much debate since the object does not emit as much light as is expected for an object its size. As of 2008, the most popularly accepted model for this companion object is a binary star system surrounded by a massive, opaque disk of dust.

The star is easily found because of its brightness and apparent proximity to the star Capella. It is the apex of the isosceles triangle formed as the 'nose' of the constellation Auriga. The star is bright enough to be seen from most urban locations even with moderate amounts of light pollution. Visual variable star observers make an estimate of its brightness by comparing its brightness with nearby stars with a known



Bright Class F star and companion Class B star surrounded by a dusty disk



brightness value. Because it is so bright, photometric observers must use equipment with very large fields of view such as photoelectric photometers or DSLR cameras.

Arne finished his talk by summarising thus;

- Dozens of galactic objects go “bang” every year.
- Amateurs are often their discoverers and provide most of the data.
- It doesn't take a big telescope or expensive equipment.
- It's fun and worthwhile to measure variable stars.
- Visit [www.aavso.org](http://www.aavso.org) for more information.

Michael Boschat finished the meeting with the monthly “What's up” . Mike spoke about the constellation of Cancer, discussing M44 and M67. Thanks to Mike for stepping in as John Liddard could not be at the meeting.

Richard closed the meeting around 9.30 pm when the hungry masses devoured the usual array of cookies and pop.



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

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

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



**"Two Stellar Astronomers,"**  
*Photo by Mary Lou Whitehorne*  
 March 13, 2010

Halifax Centre and SMU's Dave Turner, and AAVSO Director Arne Henden, who addressed the Halifax Centre on 12 March 2010, stand under the gold-leaf stars of St. John's Anglican church in Lunenburg, Nova Scotia. The church, a national historic site, was completely destroyed by fire in 2001. It has since been completely restored. During the restoration, Turner discovered that the stars on the domed roof represent the Lunenburg sky as it would have appeared at sunset, 24 December 1 BC, the eve of the first Christmas. For more of this star story see: <http://www.youtube.com/watch?v=l6nBvqz9UwY>



**Above:** Michael Boschat                      March 13th @ 8 a.m. ADT  
 Big spot group. 40 mm (50x) Plossl on C8 and handheld camera over eyepiece. I zoomed to 1.6x and took a shot and used Registax to process. The group was just naked eye.





*Photographs: John McPhee*

*Camera: Rebel XSi, all are single exposures taken on tripod.*

*Above: Big Dog jumps chimney: This shot of Canis Major was taken on March 6th 2010 with my new 50 mm f/1:8 lens. The settings were F4, ISO 1600, 7 second exposure.*

*Below: Space Station: High pass of March 6th 2010 in Port Williams. Settings were 18mm focal length, f/4, ISO 800, 63 second exposure.*





## Cosmic Debris

### Odds and Sods from the World of Astronomy and Cosmology

**March 18th 2010 NASA**  
**"The Multiplying Mystery of Moonwater"**

Moonwater. Look it up. You won't find it. It's not in the dictionary.

That's because we thought, until recently, that the Moon was just about the driest place in the solar system. Then reports of moonwater started "pouring" in – starting with estimates of scant amounts on the lunar surface, then gallons in a single crater, and now 600 million metric tons distributed among 40 craters near the lunar north pole.

"We thought we understood the Moon, but we don't," says Paul Spudis of the Lunar and Planetary Institute. "It's clear now that water exists up there in a variety of concentrations and geologic settings. And who'd have thought that today we'd be pondering the Moon's hydrosphere?"

Spudis is principal investigator of NASA's Mini-SAR team – the group with the latest and greatest moonwater "strike." Their instrument, a radar probe on India's Chandrayaan-1, found 40 craters each containing water ice at least 2 meters deep.

"If you converted those craters' water into rocket fuel, you'd have enough fuel to launch the equivalent of one space shuttle per day for more than 2000 years. But our observations are just a part of an even more tantalizing story about what's going on up on the Moon."

It's the story of a lunar water cycle, and it's based on the seemingly disparate – but perhaps connectable – results from Mini-SAR and NASA's recent LCROSS mission and Moon Mineralogy Mapper (M3 or "M-cubed") instrument also on Chandrayaan-1.

"So far we've found three types of moonwater," says Spudis. "We have Mini-SAR's thick lenses of nearly pure crater ice, LCROSS's fluffy mix of ice crystals and dirt, and M-cube's thin layer that comes and goes all across the surface of the Moon."

On October 9, 2009, LCROSS, short for Lunar Crater Observation and Sensing Satellite, struck water in a cold, permanently dark crater at the lunar south pole. Since then, the science team has been thoroughly mining their data.

"It looks as though at least two different layers of our crater soil contain water, and they represent two different time epochs," explains Anthony Colaprete, LCROSS principal investigator. "The first layer, ejected in the first 2 seconds from the crater after impact, contains water and hydroxyl bound up in the minerals, and even tiny pieces of pure ice mixed in. This layer is a thin film and may be relatively 'fresh,' perhaps recently replenished."

According to Colaprete, this brand of moonwater resembles the moonwater M3 discovered last year in scant but widespread amounts, bound to the rocks and dust in the very top millimeters of lunar soil.

The second layer is different. "It contains even more water ice plus a treasure chest of other compounds we weren't even looking for," he says. "So far the tally includes sulfur dioxide (SO<sub>2</sub>), methanol (CH<sub>3</sub>OH), and the curious organic molecule diacetylene (H<sub>2</sub>C<sub>4</sub>). This layer seems to extend below at least 0.5 meters and is probably older than the ice we're finding on the surface."

They don't know why some craters contain loads of pure ice while others are dominated by an ice-soil mixture. It's probably a sign that the moonwater

comes from more than one source.

"Some of the water may be made right there on the Moon," says Spudis. "Protons in the solar wind can make small amounts of water continuously on the lunar surface by interacting with metal oxides in the rocks. But some of the water is probably deposited on the Moon from other places in the solar system."

The Moon is constantly bombarded by impactors that add to the lunar water budget. Asteroids contain hydrated minerals, and comet cores are nearly pure ice.

The researchers also think that much of the crater water migrates to the poles from the Moon's warmer, lower latitudes. "All our findings are telling us there's an active water cycle on the Moon," marvels Colaprete.

Think about it. The "driest place in the solar system" has a water cycle.

"It's a different world up there," says Spudis, "and we've barely scratched the surface. Who knows what discoveries lie ahead?"

**Author: Dauna Coulter, Editor: Dr Tony Phillips, Credit: Science@NASA**

**Below: A plume of water-rich vapors billows up from crater Cabeus on Oct. 9, 2009, after LCROSS's Centaur booster hit the crater floor.**

