Nova Notes

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

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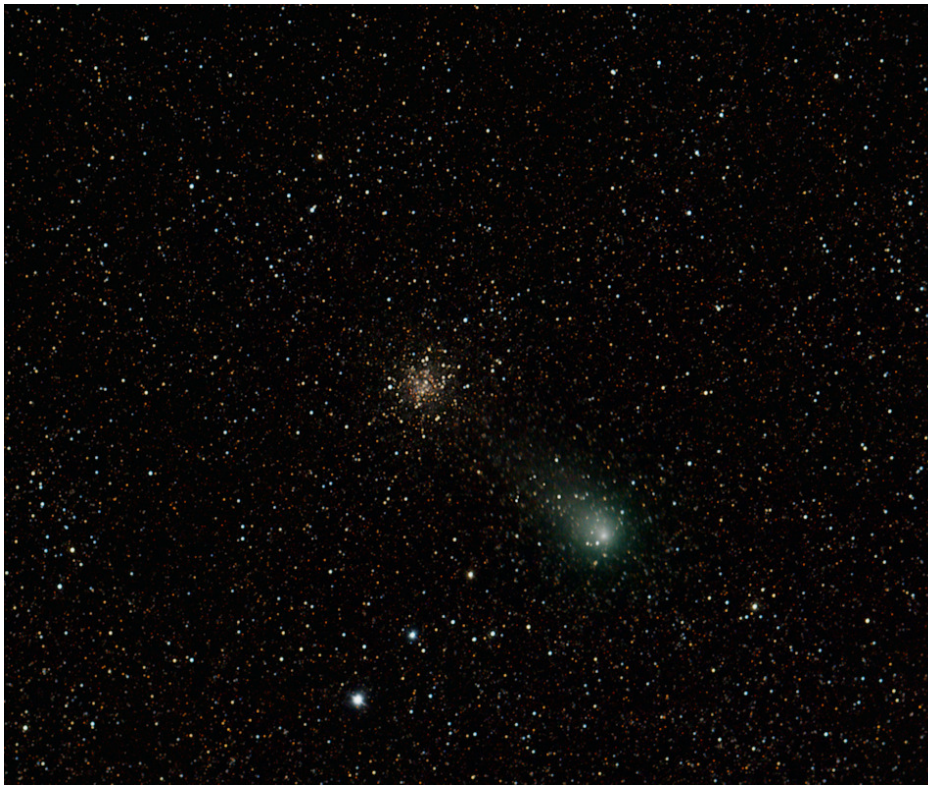
In this issue:

Front Page Photo: Blair McDonald
Comet Garradd and M71

This photo was taken at the Nova East Star Party at Smily's Provincial Park on the night of Friday August 26 2011



From the editor *Quinn Smith*

It is with great pleasure that I can report that we had a wonderful Nova East. Although we had the possibility of a visiting hurricane (Irene), it turned out we had fantastic weather and the opportunity for some great observing. Thanks to Blair and all the Nova East committee and helpers. And thanks to everyone who dared the hurricane and came to support this event.

The week before Nova East, Kejimkujik Park hosted a Dark Sky weekend. This was an opportunity to celebrate the anniversary of the Park becoming a Dark Sky Preserve and an opportunity to introduce the "Sky Circle" (an observing platform) to the general public. Thanks to the Park and the many RASC members who made this event such a success..

As we enter the fall observing season, the nights are drawing in, the evenings remain comfortable and the bugs have gone (for the most part). Sagittarius is getting lower and lower in the west and Orion rises earlier in the night. I do not consider myself a very experienced observer, but despite my limited skill, I enjoy the opportunity of presenting evening shows at the Planetarium (located in Dalhousie University). I have learned more about the position and recognition of the constellations by preparing for these shows than years of observing. For anyone who enjoys outreach and has a basic understanding of the night sky I recommend giving presentations at the planetarium a try. Contact Stephen Payne at (*stephen.payne@dal.ca*).

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 both members and guests.

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

Upcoming Observing Nights:

October 28th 2011
November 25th 2011
December holiday - no observing night

Meetings begin at 8 p.m. at Saint Mary's University

Our usual room is AT 101 although check the web site for room changes

October 21st 2011 Room TBA
Speaker's Night:: Vance Tiede will discuss "Stonehenge Wars: The Great Neolithic Computer Controversy"

November 18th 2011
A regular meeting: Paul Gray with talk about the Starmus Conference in the Canary Islands

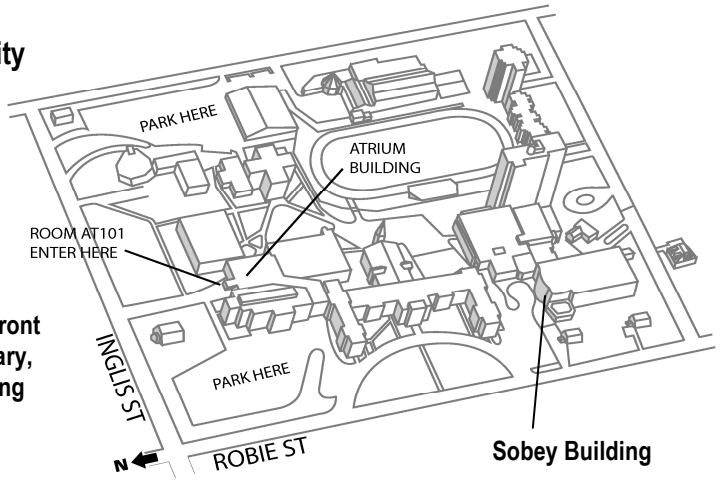
December 16th 2011
The Annual General Meeting followed by our "Who Wants to be a Gazer?" quiz show: fun for all!

[The content and location of all meetings is subject to change]

Meeting Location:

Saint Mary's University

Atrium Building
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.

The NOVA program (an introductory course in astronomy) starts at 7:00 p.m., in room AT 305 (room subject to change).

Executive meetings begin at 7:00 p.m., in room AT 306, and all members are welcome to attend.

Halifax RASC Executive, 2011:

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Councilor	Sean Dzafovic	902 430 9062	sdzafovic@gmail.com

Topaz and Sapphire

Pat d'Entremont

Topaz and Sapphire

Come with me and we will rove the skies,

And dusk will join us, soon as it can rise.

Three friends wait, and they with confidence

Will show us where to point our instrument

Where cygnet flies above us unafraid.

In turn, like through a jeweler's loupe,

Our eyes already filled with hope

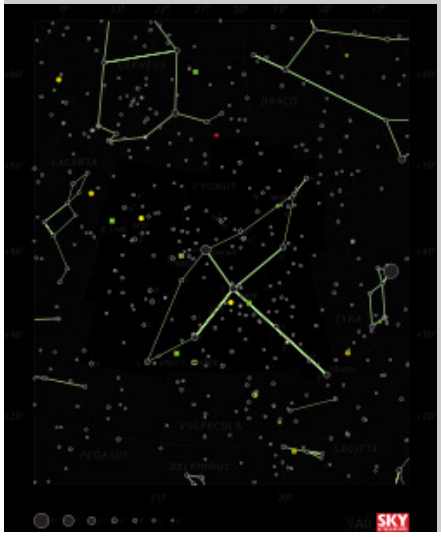
Will topaz and sapphire light,

On a table full of diamonds bright

On a velvet cloth which surely God has laid.

- Pat d'Entremont

Photo copyright 2005 Richard Yandrick



Albireo is 380 light-years (120 pc) away from the Earth. When viewed with the naked eye, it appears to be a single star. However, in a telescope it readily resolves into a double star, consisting of Albireo A (amber, apparent magnitude 3.1), and Albireo B (blue-green, apparent magnitude 5.1.) Separated by 35 seconds of arc, the two components provide one of the best contrasting double stars in the sky due to their different colours. It is not known whether the two components are orbiting around each other in a physical binary system. If they are, their orbital period is probably at least 100,000 years. (Wikipedia)

The NOVA Program

Editor

For the past few years the Halifax Centre has offered the ***NOVA*** program to members and guests.

The *NOVA* program (*New Observers to Visual Astronomy)* was created by the RASC Prince George Centre as an introductory program for their members.

This program, which is hosted by Sean Dzafovic, teaches new observers the basic astronomy knowledge and skills to enable them to become proficient amateurs.

The course consists of eight one hour sessions, usually held the hour before our monthly meeting (in the meeting room) and costs approximately $65.00 (to cover course material). As a bonus non-members will receive a membership discount if they join the Halifax Centre during the program.

The next program will begin in October, but for the course to be practical, a minimum enrolment is required. If you are interested please contact Sean at (*sdzafovic@gmail.com*).

Keji's Dark Sky Weekend

Quinn Smith

On August 19th–21st, Kejimkujik National Park hosted their first "Dark Sky Weekend". It was a great weekend and we hope it will become an annual event. My thanks go out to all the Staff at Keji and the many RASC members who participated and supported this event.

Last year, after 12 months of planning and preparation, Keji was pronounced Nova Scotia's first Dark Sky Preserve by the Royal Astronomical Society of Canada. This year's event was a celebration of the anniversary of this pronouncement and to showcase the programs and additions to the park that have occurred over the year.

As part of its DSP mandate, Keji had set aside a primary observing area, close to the public camping, where astronomy outreach and events could be conducted. This year the Park added a very attractive "Sky Circle" to this area, allowing a focal point for outreach activities (sorry for the pun!).

The Sky Circle consists of a 10-m diameter wooden octagonal platform with seating for about 50 people and a central concrete observing pad. It is an excellent venue for Mi'kmaq sky lore stories, laser-pointer sky tours, public observing and just plain relaxing under the stars. The Circle was built this spring and this was my first view (and use) of it. I was very impressed—the Park has done an excellent job.

The Sky Circle *Photo: John McPhee*

A laser tour of the sky on Saturday. *Photo: John McPhee*

The weekend activities began on Friday night with a presentation at the outdoor amphitheatre by Gerald Goade who talked about Mi'kmaq archeology. This was followed by Halifax member Tony Schellinck. Tony showed a series of his astro-photos and gave interesting accounts of "what, where, and how". There were over 100 campers in the audience and after Tony's presentation we adjourned to the nearby Sky Circle for Mi'kmaq sky stories presented by Park staff Ursula and Kayla. The sky was overcast that evening and so after the sky lore stories Dave Chapman hosted an "Ask an Astronomer" session.

The Park had donated free camping to RASC participants and several of us retired to our camp site and enjoyed the overcast but warm night.

Saturday was warm and sunny. In the morning Paul Heath gave one of his very "hands-on" presentations on Solar System distances at the Sky Circle. Dave Chapman gave an afternoon talk on beginner's astrophotography at the Visitor Centre. Afterwards, the RASC group enjoyed the facilities of the Park. That was up to 3 p.m. when the skies opened and we have a series of severe thunder storms. We all needed a nap anyway!

There was a concert planned for Saturday evening, but due to the weather, it was delayed by 30 minutes. Just before the concert, the clouds gave way to the setting sun, and by 9:30 p.m. we had clear skies.

After the concert, most of the audience made their way to the Sky Circle where again we were regaled by Ursula and Kayla with Mi'kmaq sky stories—this time actually under the stars. We had over 150 people attending at this point—far more than the Sky Circle could accommodate.

People were standing all around the outside as well as seated inside. After the sky stories, Quinn Smith gave a laser tour of the night sky, while members of the Halifax Centre set up scopes in the field adjacent to the Sky Circle.

We had about two hours of great observing and outreach until the sky "softened" and the clouds rolled in (just after midnight). I think everyone had a great time.

I would like to thank Wayne Mansfield, John McPhee, Tony Schellinck, Paul Heath, Andrea Misner, and Dave Chapman for setting up their equip-

ment and hosting the Public Astronomy. Thanks also to Roy Bishop and Mary Lou Whitehorne for attending and representing the RASC.

On Sunday night, events were officially cancelled, owing to an emergency that required the involvement of all park staff.

Tony Schellinck and Dave Chapman ran an "unofficial" program at the Sky Circle for the park visitors. In the words of Dave Chapman:
"we had a ball! Folks were gathering even as the Sun was setting, and we made a contest of who could spot the first star. The first one was spotted by an excited young girl, then everyone started seeing others. The girl's mother remarked 'they are just popping out, like Jiffy Pop.'

When we finally spotted the coloured double star Albireo, I trained my 100-mm f/9 SkyWatcher refractor on it and we all marveled at the colour contrast. "OH WOW," was the most frequent remark. Tony showed them M13 and M31 in his 200-mm SCT."

A great weekend!

Fundy Tides to be featured

Roy Bishop

For five days in September, a film team from the United States was in the Wolfville area to obtain images of the tides of Fundy for a major astronomy film entitled *Moonrise*. When presented at its opening in Chicago in November, the film will be accompanied by a live orchestra playing classical music. The producer and photographer is Dr. José Francisco Salgado, an astronomer and visual artist at Chicago's Adler Planetarium.

Dr. Salgado's astronomy-related films have been presented with orchestral accompaniment more than 50 times in 13 countries around the world. His mission is to use multimedia works to communicate science through art, to provoke curiosity and a sense of wonder about Earth and the Universe.

The central character in his new film is the Moon. To record the Moon's most dramatic influence upon our planet, Dr. Salgado came to the Bay of Fundy to record its famous tides. From September 10 through 14 he recorded high/low images and time-lapse sequences of the tides at Hantsport, Avonport, Evangeline Beach, Scots Bay, Baxters Harbour, and Halls Harbour, plus videos of tidal bores on the St. Croix, Herbert, and Kennetcook rivers. Several of those images will appear in the film, which will open with a beautiful moonrise over Minas Basin.
On September 10 Dr. Salgado very kindly gave a presentation to Minas Astronomy Group, at Acadia University. He and his assistant, Ann Barlow, had never been in Atlantic Canada before. They were impressed by the unspoiled, quiet beauty of the Minas Basin region, and were astounded by the tides.

Full Moon over Minas Basin, 2011 September 12. Slightly left of centre are four people walking on the tidal flats. Canon XTi, 24 mm, f/4, ISO 1600, 1.6 s. Photo: Roy Bishop.

HALIFAX CENTRE

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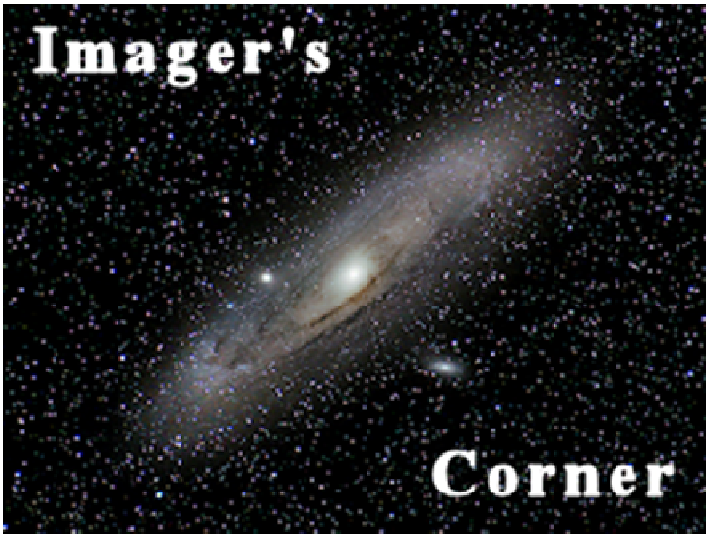
Articles on any aspect of Astronomy and Allied Sciences will be considered for publication.



Part 9 in a series by Blair MacDonald

This edition continues a group of Imager's Corner articles that will focus on a few techniques that are useful in processing astrophotos. Over the next several editions of Nova Notes, I'll attempt to give a guide to image stretching, background correction, SMI processing, and any other technique that I happen to find useful. All the techniques discussed will be useable with nothing more than a standard image processor that supports layers and masks. No special astro-image processor is required.

This edition deals with noise reduction. Noise is one of those things that seem simple at first blush. But in reality noise is a very complex topic. I have a 683 page textbook that gets well used in my day job (signal processing and electrical engineering) that only begins to scratch the surface of the topic. For purposes of this discussion, lets define noise as the random fluctuation in the value of a pixel not caused by the incoming signal. Again for the purpose of this article, this includes photon noise.

Now's where things get a little complicated. Here is where we have to dive into the realm of spatial frequencies. That just amounts to a fancy way of saying how fast the value of the pixels change. Let's assume that five pixels in a row in an image have the following values: 1, 2, 3, 2 and 1. In this case the values vary by two over five pixels so it is not a fast change and can be thought of a medium frequency variation. Now let's consider five pixels with different values: 1, 5, 1, 30 and 5. Now the value goes up and down rapidly over two pixels so it is a higher frequency variation.

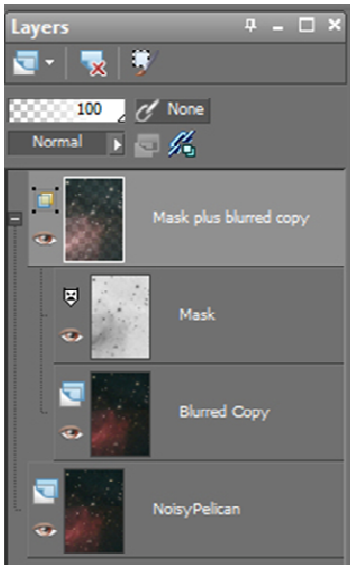
The more annoying noise in many images resides at higher spatial frequencies while the image detail varies over many pixels. When taken through a telescope, a single star typically occupies many pixels and generally represents the smallest visible detail in an image. As a result it is possible to use a filter that removes the higher frequency signal (the noise) while leaving the signal (the stars) unaffected. As with most of the techniques you will see in this column, this is best done with layers and a mask to fine tune the effect. Take the Pelican Nebula image below.

It has a lot of noise as can easily be seen in this crop of the top right of the pelican's head.

Now let's look at a way to reduce the impact of the noise on an otherwise reasonable image. First duplicate the image on another layer, then blur the upper layer with a Gaussian filter of about 1.5 pixels. If your image processing software has noise reduction functions, use them as they will work better than a simple filter. Over do the noise reduction a bit to get a smooth background.

Here is a crop of the same section of the image after blurring.

The noise has been reduced, but the stars have lost some of their sharpness leading to a soft image; here is where the wonders of masks come into play. Place a mask made from the inverted luminance channel of the blurred layer on top to let the brighter portions of the original image show through. Using Paint Shop Pro, simply right click on the top layer and select "New Mask Layer", select "From Image" in the popup menu, and finally select "Source Luminance" and "Invert mask data" from the dialog that appears and press OK. Other image editors will have similar ways to get the mask, check the help file or manual. The last step is to use a curve to adjust the mask. The idea is to darken the dark areas of the mask to hide the blurred layer in these areas. The layer stack is shown below to give you an indication of the arrangement.



Now flatten the layer stack and you will have a noise-reduced image with most of the detail of the original. The flattened final image looks much better than the original, as you can see below.

Again the same crop to better see the effect.

There is still some low frequency noise in the form of the larger blobs in the background, but that's a topic for a future column.

Remember, this column will be based on your questions, so keep them coming. You can send them to the list at hfxrasc@lists.rasc.ca or you can send them directly to me at (*b.macdonald@ns.sympatico.ca*). Please put "IC" as the first two letters in the topic so my email filters will sort the questions.

"Good Night Irene"

Quinn Smith

First there was Bob, then Earl, and now Irene. Well, we've had our share of hurricanes register for Nova East over the last few years. This year, however, Irene arrived late and decided not to stay. For the first time in a while, we had fantastic weather for Nova East.

I woke up near Halifax on Friday morning to heavy rain and distant thunder, but according to the Clear Sky Chart and Environment Canada, the weather was supposed to clear up. By the time I arrived at Smiley's Provincial Park at 11 a.m., the clouds were dispersing and the sun was shining. It was becoming a beautiful summer day.

I must thank Blair MacDonald and all the people who helped out, setting up the site and taking care of the 1001 things that have to be done to make such an event possible.

People arrived steadily all day and by the time we were ready for our guest speaker, Dr James Drummond, we had 47 attendees of which 25 were camping. Not the largest Nova East attendance for sure, but still a good turnout.

Dr James Drummond, a professor at Dalhousie University's Atmospheric Science Department, gave an excellent, and informative talk on Canada's contribution to several Mars exploration vehicles. Dr. Drummond explained the various projects, difficulties, and leading edge technologies that are being used, and outlined the possible implications of the data that would be collected in the next mission MATMOS.

Brian Giffin of Atlantic Photo Supply presents Len McBernie with the main door prize—a 6" Skywatcher Dob. Photo: Blair MacDonald

After Dr. Drummond's talk, we adjourned to the field for a wonderful night of observing. This was our chance to entertain the public and the large group of guests went away very happy with the sights they had seen. Our resident "Energizer Bunny" Paul Heath gave a continuous outreach program for many hours into the night.

Skies were transparent and steady with a Sky Quality Meter reading of 21.3 and a visual limiting magnitude of 6. Despite heavy dew, many of the telescopes were put to full use for most of the night. As usual, the views through Mark's 25" Obsession were fantastic. The stars in M13 were so clear I felt I could almost touch them! The high point of the evening for me was seeing Comet Gerradd and M71 in the same view in my C8 (see front page photo by Blair).

Saturday dawned bright, sunny, and hot! After breakfast we all gathered for a group photo – talk about herding cats! – just try to get 47+ astronomers in the same place at the same time! I for one was grateful that the group photo was a little later than usual this year, especially after a late night of observing.

At 11 a.m. Quinn Smith gave a talk titled "How High is the Sky" which discussed how astronomical distances are calculated.

After lunch, several workshops and talks were set up. Karl Penny gave a workshop on how to observe the Sun, followed by Dave Chapman, who discussed lunar observing. Later in the afternoon Dave Lane gave a workshop on collimation, Paul Heath gave a demonstration on the scale of the Solar System and Quinn Smith hosted a solar filter workshop. Supper and a short nap was the order of the late afternoon, as people prepared for the evening activities.

The door prize draw began at 7 p.m. with a fantastic selection of prizes. Thanks to Pat d'Entremont for his work in collecting the prizes. Thanks also to Brian Giffin of Atlantic Photo Supply who donated several prizes including a 6" SkyWatcher dob (the main prize). This was won by a very pleased member, Len McBernie. There were many excellent prizes and a lot of very happy winners.

NE 2011 group photo—talk about trouble makers! Photo: Blair MacDonald

The main talk of the evening was given by Roy Bishop who discussed various aspects of the rainbow. Roy always gives interesting talks, and this was no exception. Having discussed the physics of the rainbow and quoting from Newton, Roy left us to ponder the entire concept of colour and its perception within our brain.

The formal evening activities were concluded by Tony Schellinck who gave a talk, aimed at beginners, as to what to expect when looking through the eyepiece of a telescope.

Although the night sky was not as clear as Friday night, several telescopes were in use and we had several members of the public eager for more views through the eyepiece. Many of those in attendance decided that the skies were not good enough for observing and many groups could be heard discussing various aspects of astronomy. All in all, Saturday night was more for socialising than observing.

A few attendees decided to pack up and leave Saturday night. Irene (our hurricane for the weekend) was threatening rain for Sunday morning and some chose to avoid packing up in the rain. As it happened, the skies remained "soft" but clear till 3 a.m. and only then did we succumb to rain. By 6 a.m. on Sunday morning the rain had stopped, and most campers were able to pack up in the dry – although camping gear was rather wet.

It had been decided Saturday evening that the few scheduled activities for Sunday would be cancelled to allow an early clean up, and most people had left by noon on Sunday. Despite a little rain Saturday night, most people agreed that this was a great Nova East and a welcome change from the poor weather of the last years.

Hurricane – what hurricane?

Thanks to staff at Smiley's Provincial Park, everyone who helped with set-up, and the Nova East Committee:

Blair MacDonald (Chairman)
Pat d'Entremont Irene Moore
Ian Anderson Ron Mills
Tony Schellinck Quinn Smith

September Meeting Report

Quinn Smith

In our President's absence, the September meeting was opened by our 1st V-P, Wes Howie. It was a smaller than usual attendance with just 30 members and 5 guests. Wes welcomed everyone and introduced the Executive, although several were "missing in action" due to illness or previous commitments.

Wes noted that we will be looking for a new Exec. for 2012. The duties for each Exec. member will be posted on the Halifax Centre web site (*halifax.rasc.ca*). Please contact any Exec. Member (see page 2) if you are interested in joining the organizational team behind your Centre.

Wes introduced Blair MacDonald, the Nova East chairperson, who gave a brief summary of the recent, and very successful star party. Blair also showed the Centre's new 2012 astrophotography calendar. These are on sale for $15 and all proceeds go to supporting the St. Croix Observatory. Blair noted that this calendar is different from the National RASC calendar in so much that it contains photographs from the Atlantic area members as well as lots of astrophotography tips. Copies will be for sale at future meetings or from Blair (b.macdonald@ns.sympatico.ca).

Quinn then gave a short report on the recent Dark Sky Weekend held at Kejimkujik National Park (report on page 4). Quinn also mentioned that he had solar filter material left over from the recent workshop at Nova East. Several members took the opportunity of purchase some.

Paul Heath then discussed the Fall library outreach program within the Halifax library system. We will be giving several talks this fall and if you are interested in volunteering, please contact Paul (see page 2).

Wes then introduced the main speaker for the evening Dave Chapman. Dave's topic was "An Astronomical Tour of New Zealand".

His abstract for the talk reads: "Dave will take you on a tour of New Zealand's must-see spots for astronomers, including several observatories and Stonehenge Aotearoa, a beautiful site celebrating Maori sky lore and the science of astronomy. With his handy MusicBox EQ mount for his camera, he photographed the celestial wonders of the southern hemisphere from pristine rural locations with amazingly dark skies. Come hear about the Magellanic Clouds, the Southern Cross, the Coalsack, Alpha Centauri, and the Dark Doodad!

Dave became an amateur astronomer at the age of 8 and began observing with his first telescope at age 10. With the Halifax Centre, he has served as Librarian, President, Councillor, and *Nova Notes* proof-reader. Also, he was part of the team that helped Kejimkujik National Park become a Dark Sky Preserve. Nationally, he served on the RASC Awards Committee, was a Contributing Editor of the *Journal of the RASC*, writing a bimonthly column for 7 years, and is now an Assistant Editor. This summer, he has been editing the 2012 edition of the *Observer's Handbook*, which is now at the printer.

Dave started his talk by explaining the Maori name for the country "Aotearoa" (land of the long white cloud). Dave then noted that NZ was

(continued on page 10)

approximately the same latitude south as NS is north. It is also a remarkably similar shape (although five times the area). With a population of 5 million, it also has the same population density (and light pollution) of Nova Scotia.

Dave explained that some of the astronomical delights of the southern skies include:

- Finest emission nebulae
- Most observable dark nebulae
- Most impressive globular cluster
- Biggest and brightest globular clusters
- Detailed naked eye galaxies
- Closest naked eye star

These sights were on Dave "to do" list and he added one more. He noted that the southern sky contains more bright stars than the northern sky.

Dave took limited astronomical equipment; a camera, a tripod and his MusicBox EQ camera mount. Of course this guider was set up for the northern hemisphere and Dave explained how it had to be mounted upside down to cope with the southern skies (the unit could not be made to operate in reverse).

Dave then gave a quick overview of how he found the southern celestial pole (no handy "pole star" down there!) before showing us a series of astro-photographs he had taken.

Dave concluded that although he thought he was prepared for observing in the southern hemisphere, he found the unfamiliar sky a challenge. Even the recognizable constellations were upside down! Dave noted that it brought back memories of being an astronomy beginner many years ago. Confusion in looking at the night sky is something we should all remember when sharing our hobby with beginners.

Dave finished his talk with a Maori sky lore story about the pole of Hine-nue-te-po (great lady of the night) which uses the vertical alignment of Orion's belt (when setting) and Sirius as a theme.

The evening's entertainment was concluded by Paul Heath who gave the monthly "What's up?" Paul noted that Jupiter reaches opposition on October 29th and Venus can be seen low in the west in October. On October 27th and 28th Venus and Mercury can be seen near the crescent moon. Finally Paul mentioned the Draconid meteor shower, peaking on October 8th. Check details in the Observer's Handbook page 121.

All photos: Dave Chapman

Right top: pole of Hine-nue-te-po showing the southern Pleiades

Right bottom: the alignment of Sirius and the setting Orion

International Observe the Moon Night

Quinn Smith

This year, the International Observe the Moon Night is on the Canadian Thanksgiving weekend (Saturday October 8th).

Karl Penney will be observing at Keji and Wayne Mansfield will be observing at Thomas Raddall Provincial Park. Thank you to both of them!

So far there is no planned event for Halifax, and unfortunately I will be out of town. Dave Chapman has offered to co-ordinate a Halifax event if the are members who would like to take part. He is interested to hear from anyone who might want to mobilize if the sky forecast looks promising. This would be an easy activity just about anywhere people gather as there is no concern about light pollution when observing the Moon.

Please contact Dave on the "list" or at (dave.chapman@ns.sympatico.ca).

For more information about International Observe the Moon Night go to: http://observethemoonnight.org/

To quote the group:

"The International Observe the Moon Night Team consists of scientists, educators, and Moon enthusiasts from government, non-profit organizations, and businesses throughout the United States and across the globe. We believe in the inspirational power of the Moon — a celestial body that has influenced human lives since the dawn of time. International Observe the Moon Night has created the opportunity to for people to take notice of the Moon's beauty and share that experience with one another. "

Photo (left): Roy Bishop

Here is a photo I took from Evangeline Beach last evening (August 5) at 23:17 ADT.

The aurora is reflected on the bottom of Minas Basin (low tide). Beyond the horizon the sky glows of (left-to-right) Moncton, Parrsboro (by Cape Blomidon), Amherst, and Springhill are visible.

Canon XTi, 10 mm, f/3.5, 30 s, ISO 1600.

Photo: Dave Chapman
Capella rising (taken August at Keji DSP) The photo was shot with the MusicBox EQ mount. Note that the stars are tracked, but their reflections are not!

Photos above: Blair MacDonald
Moon through different 'scopes
(Top) 8 inch f/4 reflector
(Bottom) 4 inch f/9 refractor (Sky Watcher APO)

Cosmic Debris

Odds and Sods from the World of Astronomy and Cosmology.

August 1, 2011: NASA release

When a NASA spacecraft goes into orbit around a new world for the first time, the control room is usually packed to capacity with scientists, engineers, and dignitaries ready to leap and shout when the retro-rockets fire. It's a big, noisy event.

July 15, 2011, was one of those days. NASA's Dawn spacecraft approached Vesta and became the first probe from Earth to orbit a main-belt asteroid. Dawn's cameras revealed a desolate world of transcendent beauty, thrilling everyone who worked on the project.

Needless to say, the control room was .... *silent?*

"Actually it was empty," says Dawn Chief Engineer Marc Rayman of JPL. "Dawn entered orbit on a Friday night; I myself was out dancing with my wife and friends."

What gives? Rayman, an avid folk dancer, explains: "Our mission has a unique choreography."

Indeed, Dawn has its own way of doing things. While most spacecraft blast off Earth atop a firestorm of conventional rocket exhaust, then coast to their destinations with engines turned off to conserve fuel, Dawn was able to continue thrusting throughout its voyage. Fuel-efficient ion engines gently propelled the spacecraft toward Vesta for more than three years, never exerting more force than the weight of a feather held in your open palm yet, over time, gathering enough speed to catch an asteroid racing halfway across the solar system.

With engines firing almost constantly, mission controllers were able to actively steer the probe, gradually reshaping Dawn's orbit around the Sun until it matched the orbit of Vesta itself. Meeting Vesta for orbital insertion wasn't a jarring encounter of mismatched velocities. It was more like two dancers merging in practiced rhythm to a familiar tune.

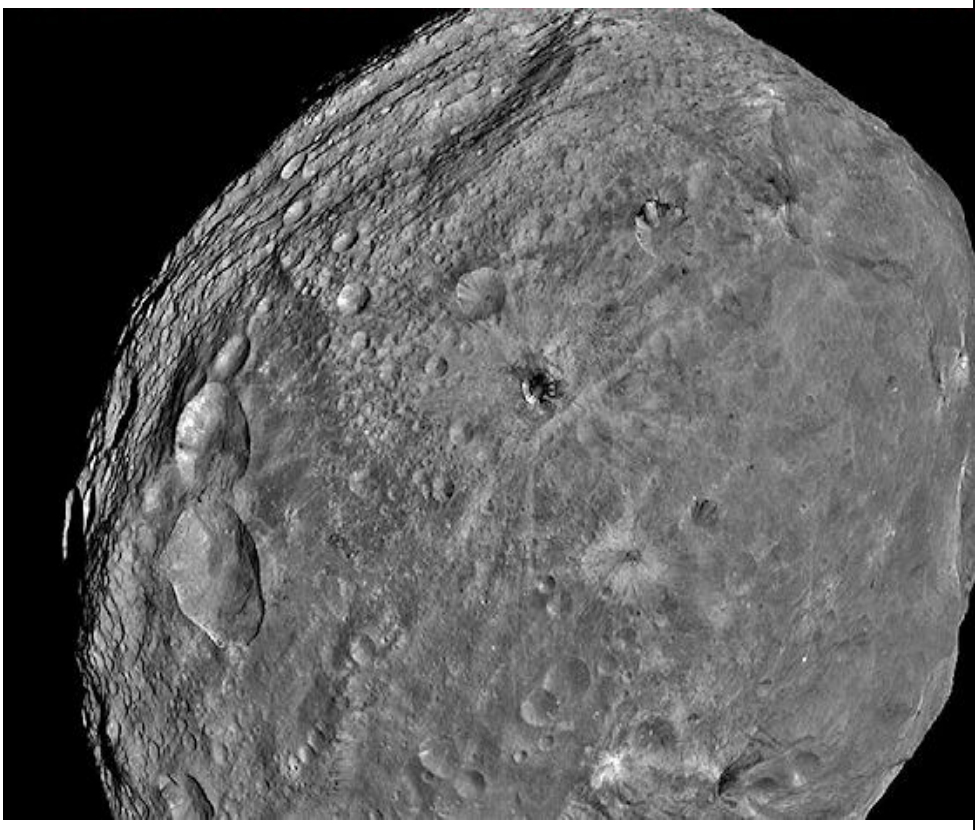
"Dawn did not miss a beat as it flew into Vesta's grasp," says Rayman. "The spacecraft moved gently into orbit with the same grace it has displayed during its nearly 1000 days of ion propulsion through the solar system."

The capture was so smooth, so low-key, that personnel felt no particular need to monitor the probe's operation. "I really was out dancing," says Rayman, "confident that the pas de deux being performed 188 million kilometres away would be executed with graceful beauty and flawless precision."

Calculations show that the moment of "orbit insertion" occurred on Friday night, July 15th, around 9:47 p.m. PDT. At that moment, Dawn's orbit around the Sun finally was so close to that of Vesta that the protoplanet's gravity could take hold of it. Radio signals picked up on schedule by the Deep Space Network later confirmed that the spaceship and asteroid were truly a pair.

Dawn will spend the next year circling Vesta in a series of descending passes, bringing the giant asteroid's ancient surface ever closer to Dawn's cameras and other science instruments. Because Vesta is a relic of long-ago planet formation, the history of our solar system could be revealed under Dawn's careful scrutiny.

"This really beautiful dance," says Rayman, "is just getting started."



Using its framing camera, Dawn obtained this image of Vesta on July 24, 2011, from a distance of about 3,200 miles (5,200 kilometres). The three vertically-aligned craters on the left have been nicknamed "the snowman" by camera team members.