

Nova Notes

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



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Front page photo : Michael Boschat

Saturn, Venus, and the Moon

6.28 a.m. on February 4th 2008

Exposures: 3.2 secs, f/3.2, 400 ISO. @ 30x



From the editor

Quinn Smith

“Spring has sprung, the grass is “ris”, I wonder where them Messiers is?” Well, maybe that’s not how it goes, but observing is getting warmer, and I for one am very grateful for that. I love to chase down those faint “fuzzies”, and spring is my favourite time for observing. With the winter constellations still visible, the summer stars rising (albeit late) in the east, the lack of bugs, and beautiful skies (when there are no clouds!), it is a joy to haul out the C8 and tick off my Messier list.

There are a couple of important items in this edition that I would like to bring to your attention.

The first is an article on page 4 relating to changes in the tax laws that directly affect the way the RASC conducts its financial affairs. This is a complicated issue, and will effect many members in one way or another.

The second is the upcoming Astronomy Week which will be held from May 4th to May 10th. This year the centre is organising a Mall display and Public Observing on May 10th (details on page 3). To complement these activities the May meeting (May 23rd) will be geared toward beginners, and hopefully, toward prospective new members reached during the Astronomy Week activities. We have booked a larger room for this meeting so I encourage as many of our members to attend as possible.

As many of you will be aware, 2009 has been designated International Year of Astronomy (IYA). The Halifax Centre has initiated a IYA committee to plan events for the IYA. If you are interested in participating in the committee, just making suggestions, or helping with events, please contact the editor at novanoteseditor@rasc.ca. We could do with all the help we can get.

Meeting Announcements

Meetings begin at 8:00 p.m.

Meetings are held every third Friday of the month, except for the months of July and August, when there are no meetings.

Meetings take place in room 176, Loyola Building (#3 on map) at Saint Mary's University.

All members—but especially new ones—are invited to come to the meetings 20 – 30 minutes early to participate in our new informal “Meet and Greet”. It’s a chance to ask questions about astronomy, the RASC, memberships, or to just say hello.

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

Next Meeting Dates:

Please note the May meeting is on the 23rd, and will be held in Loyola room # L170

April 18, 2008 - Meeting night

A regular meeting night. Pat d'Entremont will be discussing remote observing. Controlling and using a telescope from your living room!

May 23, 2008 - Meeting night

This meeting is designated “Beginners Night” It is a follow up to Astronomy week and will introduce beginners and new members to aspects of astronomy, telescopes and the RASC.

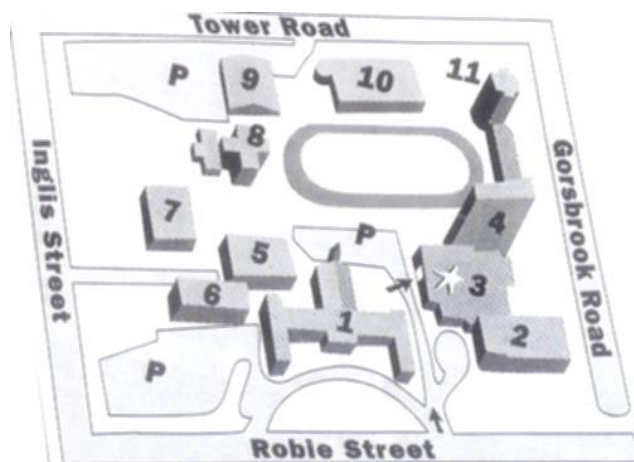
June 20, 2008 - Meeting night

A regular meeting night - the program to be announced.

[The content of all meetings is subject to change]

Meeting Location:

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
- P Parking



Halifax RASC Executive, 2008:

Honorary President	Dr. Roy Bishop	902 542 3992
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Councilor	Jim Dorey	464-8781



Astronomy Week

May 4th - 10th 2008

International Astronomy Day 2008 will be held on the 10th of May. The Halifax Centre of the RASC will be hosting two public events on this day. There will be a mall display at the Mic Mac Mall as well as a free public observing session. The location for the public observing event is still being determined. Details will be posted on the website at <http://halifax.rasc.ca/activities.html> and on the email list.

Astronomy day is a great public outreach event in which we "bring astronomy to the people". We do not focus on the "faint fuzzies" but on the bright objects that have the "wow!" effect like the Moon, Saturn and a few other objects. If you have never been to a sidewalk observing session then now is your chance. If you own a telescope

bring it along with you and join us in showing others the wonders of the night sky.

As this event is weather dependent and a "GO" or "NO GO" will be posted on the centre website and announced on the email list.

Anyone wishing to participate in either of these events please contact any of the executive, or Quinn Smith at novanoteseditor@rasc.ca

In order to complement these events, the May meeting of the Halifax Centre (May 23rd) has been designated "Beginners Night" and will feature several talks aimed at beginners.

We will also be holding an open house and barbeque at the St Croix Observatory on Saturday June 7th. The open house will begin at 4 p.m., with a barbeque at 6 p.m., and observing in the evening. This should be a great event, and

will be an excellent opportunity to meet other members, learn about the observatory, and introduce beginners to the joy of observing.

Finally, a great opportunity to introduce young people to astronomy is the Discovery Centre, 1593 Barrington in Halifax. On Friday May 9th through Sunday May 11th, the Discovery Centre will be featuring Astronomy displays and will be operating their "Star Lab" observing display. Contact the Discovery Center at 492 4422

Additional information about sidewalk observing and astronomy day can be found at the following websites.

<http://www.rasc.ca/astroday/resources.shtml>

<http://www.astroleague.org/al/astroday/astroday.html>

www.sidewalkastronomers.us/http://

www.sfsidewalkastronomers.org/http://

www.rasc.ca/education/iya/index.shtml

Nova East 2008

Aug 29th - Sept 1st 2008

The Nova East Star Party will be held at Smileys Park (near St Croix) over the long weekend: Friday August 29th to Monday September 1st.

Nova East 2008 will be bigger and better than ever, with nine presentations and two tours extending from Saturday morning through Sunday evening, and, weather permitting, three nights of dark-sky observing. The key-

note speaker will be Terence Dickinson.

Terence Dickinson, Canada's preeminent astronomy writer and amateur astronomer, begins the program on Friday evening and will be staying through to Monday.

Everyone is invited to donate astronomical/photographic gear and books that they no longer need to the "Awesome Astronomy Auction" at Nova East 2008. Bring donations to Nova East and give them to John Liddard or Quinn Smith no later than 7

p.m. Saturday, August 30th. All \$ raised by the auction go to the Nova East account, to the benefit of Atlantic Canada's largest star party in future years.

Mark your calendar now for the astronomy highlight of 2008 in Atlantic Canada!

Registration forms and the star party agenda are now available through the Halifax Centre website. Go to : <http://halifax.rasc.ca/ne/agenda.html>

HALIFAX CENTRE

Nova Notes The Newsletter of the Halifax Centre of the RASC

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Newsletter editor: Quinn Smith

Nova Notes is published bi-monthly in February, April, June, August, October and December. The opinions expressed herein are not necessarily those of the Halifax Centre. Articles on any aspect of Astronomy will be considered for publication.

Deadline for the next edition is May 20th 2008.

Changes to Donation and other Transfers to RASC Centres

Overview

Recent changes to the Canadian Income Tax Act relating to Charities have required the National Executive Committee to make some immediate changes to the way the Society operates, particularly in how it transfers money from the National Society to the Centres.

The law no longer permits registered Charities (the National RASC) to transfer money to organizations that are not also registered Charities (most Centres), except under certain conditions. In addition, there is the expectation that National Society-controlled funds transferred to Centres that are also registered Charities will be used for charitable purposes.

The changes in policy outlined here and other related issues will be discussed in detail at the National Council meeting on 30 March 2008.

Centre-Directed Donations Received by the National Society and Forwarded to a Centre

We have received expert legal advice that the National Society, which is a registered Charity, cannot receive donations directed to a Centre that is not also a registered charity (i.e.: Halifax centre), issue receipts for income tax purposes, and forward that donation to the Centre.

Effective immediately, the option to donate to a Centre as part of the National membership renewal process has been removed from renewal forms and the eStore.

For Centres that are **not registered Charities**, the National Society cannot legally forward donation payments to those centres, nor can the National Society accept such donations and issue receipts for Income Tax purposes to the donors. As a result, the National

Society has returned the amount of 2007 donations directly to all donors with a letter of explanation. This letter encourages the donor to follow through on their donation intention by forwarding the donation to their Centre (without the expectation of receiving a tax receipt for Income Tax purposes).

Centres that have already received these donated amounts must also refund them to the National Society, as the Society should not have made such payments. Statements will be sent to each affected Centre outlining donations processed in 2007, and indicating the total amount of money that must be refunded.

Annual Life Member Transfer to Centres

Annually before the end of February, the Society is required by its By-Laws to send every Centre \$22 times their number of Life Members. This is equivalent to the current Centre Portion of the annual membership fees.

As a result of changes in Canada's laws, we have received legal advice that the Society should hold the Centre portion of Life Membership fees for the 2008 year until we can resolve this problem. This unfortunately will have an impact on the Centres. The total amount of money involved for all affected Centres is about \$6000.

A letter has been sent to all life members attached to a Centre, suggesting that they consider making a voluntary payment to their local Centre to support the local programs for this year.

In the coming months, we will be working to find a long-term solution to this problem. We ask for the support and patience of all Centres as we work to resolve this problem. We acknowledge that the national bylaws may permit Centres to notify the National Office that life members currently attached to them are no longer attached. We hope that Centres will consider not doing this.

Annual Membership Fee and Surcharge Transfers

Monthly membership fees and surcharge payments will continue as normal. However, in order to clarify and formalize the processes in place, we have been advised by our lawyer that:

A legal agreement should be established between every Centre and the National Society to clearly document that the National Society is acting as an agent for the Centres when collecting and transferring Centre membership fees and surcharges, etc. This agreement will be prepared and circulated to each Centre as soon as it has been drafted.

Our By-Laws may have to be changed to more clearly separate the National and Centre membership fees and remove Society "control" over Centre fees. The extent and nature of these changes is still under study.

Centre Projects Fund Grants

The Centre Projects Fund, which provides grants to Centres, is on hold pending the setting up of a suitable method to be able to legally transfer funds to non-registered Centres. Revisions to the trust declaration of the fund will likely be necessary.

Centre Exchange Travel Grants

This program, re-established in the 2008 budget, is used to pay for the legitimate travel expenses for a member of one Centre to speak at another Centre. Effective immediately, the reimbursement for expenses is to be claimed by, and paid directly to, the speaker and not through the Centre. The forms and program documentation will be updated to reflect this change.

The above measures have been approved by the National Executive (and endorsed by the Board Pilot Committee) in consultation with expert legal counsel. These measures are necessary to protect the National Society's charitable status and we appreciate your understanding and cooperation.

Prepared by:
Dave Lane, 1st Vice-President
Mary Lou Whitehorne, 2nd Vice-President



Photo: Blair MacDonald

A wide field shot of Orion showing the various nebulae and dust clouds in the area.

Barnard's Loop is faintly visible as are dust lanes in the upper left of the image.

Image calibrated and stacked with Deep Sky Stacker. Contrast stretch, noise reduction and SIM processing done in Paint Shop Pro.

Canon EOS 350D , Canon lens (28mm-80mm) ISO 1600 Aperture f/5 Exposure 50 minutes full exif.

Monthly Meeting Report

February 15th 2008

John Vandermeulen

The meeting was called to order at 8pm by Chairman Paul Evans. The membership was well represented, with the room about 2/3rds filled.

For the benefit of new members and non-member guests Paul gave a general overview of the Centre, introduced the executive members of the Halifax Centre, and the two Centre members who represent our centre on the national council.

Paul then presented the agenda for the evening, and gave an update on the progress of our centre's participation in a numbers of public awareness programs.

Paul described plans for the local program to publicize the role and activities of our Centre, with an organized program scheduled for May. In the planning are several special public events.

Astronomy week is in May (4th - 10th), and the Centre is planning a Mall display at the Mic Mac Mall on May 10th as well as public observing event/s on the same day (location to be announced). This will be followed by a "Beginner's Night" meeting at SMU on May 23rd. We will have several speakers and a display of telescopes. On June 7th there will be an Open House & BBQ at our St. Croix Observatory. The objective of both is to publicize our Centre and raise public awareness of it, and secondarily, to attract and bring in potentially new members.

Quinn Smith (IYA committee chair) then spoke about the upcoming International Year of Astronomy.

The year 2009 has been formally designated International Year of Astronomy (IYA). Quinn briefly spoke about some of the ideas the Centre is considering for this special year (talks, mall displays, public observing, "Galileo moments" and general public outreach). The Centre has a IYA committee in place and if

anyone would like to join the committee, give IYA event suggestion, or offer to help in any way, please contact the Nova Notes editor at novanoteseditor@rasc.ca

The meeting then moved on the main topic of the evening, that of RASC Observing Programs.

NOVA program

John Liddard & Gilles Arsenault (Co-chairs) introduced the NOVA program (New Observers to Visual Astronomy). It is a Halifax Centre program and is intended for new observers. Please contact either John or Gilles (see Executive List on page 2).

RASC award programs

Members Paul Gray (Observing Chair, National RASC) and John Jarvo (former founder, Nova Central Astronomy Club) spoke about several awards programs within the National RASC, available to all RASC members. Based on guidelines set out within these programs certain awards or certificates are presented to members having demonstrated a satisfactory level of knowledge. These are not competitive programs, and so members can work at their own speed

Paul Gray described three National programs aimed at increasing knowledge of astronomy and the universe. The three certificated awards programs are:

- Explore the Universe certificate.
- Messier Program
- Finest NGC Objects

Information on all these programs can be found by going to the RASC National web site at www.rasc.ca and then following the link to **observing** and then **certificate programs**.

Explore the Universe Certificate

A challenging program for the new astronomer covering all major astronomical objects including constellations, bright stars, the Moon, Deep Sky Objects, and Double Stars. Suitable for both binoculars and telescopes.

Messier Certificate

Take a stroll through astronomical history as you follow Charles Messier's 18th century journey through the north-

ern skies. His famous list of 110 "not comets" includes some of the most spectacular objects in the northern hemisphere.

Finest NGC Certificate.

A somewhat more challenging list for the experienced observer, developed by Sky News Magazine Associate Editor Alan Dyer. The Finest NGC list includes a further 110 objects, mainly from the New General Catalogue.

There was extensive discussion over the method of locating and identifying these objects, in particular whether the Go-To capability could be used in this exercise. Although the Messier program is not a competition, and the award is given regardless of the method used, Go-To obviously makes the exercise simpler, not requiring much knowledge of star and galaxy locations.

Isabel Williamson Lunar Certificate

John Jarvo spoke about the "Isabel Williamson Lunar Observing Program", the RASC's lunar observing certificate program. It includes a comprehensive list of the best features visible on the surface of the Moon and detailed observing notes and explanations that will guide you through a complete tour of the amazing surface of our nearest neighbour in space.

There is one small problem in acquiring this award as John recommended that lunar studies will require telescopes with a minimum of 80 mm or larger aperture, and he specifically advised the "Atlas of the Moon" as aids during observation.

The meeting concluded with our regular "What's up" feature. Gary Weber took on the role, if not the personage, of Dr. Roy Bishop, our regular presenter, with his view on this month's stellar highlights.

Paul Evans ended the meeting just before goodies and refreshments, with the next formal meeting date of the Halifax Centre being March 14th, 2008.

Musings

Threads from the web (and such)

First light - John Vandermeulen

By now I would have thought that my new 8" Cass would have had its baptism weeks ago, certainly Clint Shannon, my wife Gail, and I did. And the dark was good for it, although it was blessed cold. Clint came in every four minutes from the sundeck to warm up his hands.

But things were not going right - Clint was fiddling with the control paddle, Gail had a quick glimpse of the Orion Nebula, Clint muttered a finale, and we called it a day. Washed out. Hauled the gear back into the house.

Eventually after various consultations Lauri Kangas of Perceptor in Ontario said to send the paddle back. Which I did yesterday via Canada Post Express (2 days only they said!!).

Meanwhile I asked Lauri about the GPS accessory I had ordered - and Lauri found that the self same Canada Post had taken 10 days to get it from Schomberg to Mississauga. I wonder how long it will take Canada Post to get it the rest of the way to Oakfield - I figure around sixty days. Express has a different meaning from what it was in days of yore.

This is all part of the abilities of that human race (i.e. us) that descended after many trials (insects, worms, Giant Irish Elk, apes) from that handful of molecules and crud that somehow got together in some moist corner on a cooling planet some 4 billion years ago.

Have faith,

Eclipse - Dave Chapman

Not to make anyone jealous, but I just returned from sea trial Q312 on CFAV Quest in Exuma Sound. On eclipse night, we were out on the ocean in a warm breeze and I watched the eclipse from the upper deck (trying to avoid the ship's floodlights). It had been cloudy most of the day but the night sky was clear. I persuaded a few of the scientific staff and crew to watch the eclipse, or at least look once in a while.

I watched the entire course of totality with unaided eyes and 7x50 binoculars. It was actually difficult to estimate when totality actually started and ended, owing to the bright limb. I did not even attempt photography on the moving vessel. It was enjoyable to observe the winter sky in summer conditions. At latitude 24 North, I was able to see well below Canis Major into the Southern Milky Way. Canopus was prominent. I was thinking about all the folks from different parts of the world watching the eclipse at the same time: my wife in Halifax, watching the eclipse from the floor of our daughter's bedroom, through the window; my daughter, watching from a beach in Mexico with her student friends; all the RASCals and other amateur astronomers.

The Facebook eclipse "event" was overwhelming, with over 400,000 people signing up. I was not near an internet access point, but apparently people were posting observations, comments, and photos every minute or so. I received a few personal messages of thanks from people who might have missed the event otherwise. Interestingly, there are quite a few time-zone and date-challenged people out there: despite my specific warnings about the date and time of this event, there were those who went out on Thursday night to see the already-passed event! One of the things that I learned from the Facebook experience is that people approach cosmic phenomena from a very wide range of backgrounds. This is food for thought for "2009 Year of Astronomy" organizers.

Stellarvue ED80 - Quinn Smith

Finally, after three months of waiting, I am the proud owner of a Stellarvue Nighthawk 80ED.

I have been considering a portable refractor to complement my C8 for some time. William Optics, Vixen, Borg, and Stellarvue were all considered, but after borrowing a Nighthawk last November, I decided to purchase a scope that I had tried.

I purchased through O'Neil Optical (London Ontario), and according to both O'Neil and Stellarvue delivery would be 2 - 3 weeks. That was in November. By late January not only was there no sign of the scope, O'Neil could not get even get a ship date from Stellarvue.

To make a long story short, Joe at O'Neil picked up a scope from a business friend at the Winter Star Party in Florida. Since I was in Ontario in mid March, I went to London to pick up the scope. And I'm glad I did!

Whilst checking out the scope we found that the focuser had screws missing, and I am grateful to O'Neil for swapping out the defective focuser for a good one.

I had already purchased a Vixen "Porta Mount" from Kendrick and the scope and mount saw first light on the Lunar eclipse on February 20th.

I must say that the optics of the Stellarvue are great, and the mount works as well as I had hoped (it is a Alt/Az. mount with slow motion on both axis).

The scope and case are Aircraft carry-on size (I also got the soft travel bag), and the mount fits into my checked luggage (with minor dismantling).

Back in Nova Scotia, the real value of a good portable refractor was apparent, with excellent high power planetary and Lunar views (200x).

Patience is a virtue!

Monthly Meeting Report

March 14th 2008

Quinn Smith

The well attended meeting was brought to order by our Chairman, Paul Evens at 8pm. There were 45 people present at the meeting, 35 members and 10 guests. It was certainly very good to see such a well attended meeting.

Paul explained the advantages of membership in the Halifax, and then introduced the Executive to the group.

Several pieces of business were addressed.

There was a short discussion on the financial changes being undertaken by the National, in response to recent tax changes (A full account is on page 4).

The upcoming Astronomy Week events were outlined by Gilles Arsenault and Quinn Smith (see "Astronomy Week" on page 3).

There was a brief update to the preparations being made for 2009 (International Year of Astronomy). The IYA committee still needs more members. If you are interested on being a part of the IYA committee, please contact the IYA Chair Quinn Smith at novanoteseditor@rasc.ca.

Both Astronomy Week events and IYA events will need support and help from the membership. Please contact any Executive member, or the Editor at: novanoteseditor@rasc.ca. to offer your services.

Nova East (our Star Party on August 29th to September 1st 2008) was discussed. Details can be found on page 3 of this edition.

Finally before the main speaker was introduced Paul discussed the possibility of a room change (due to exams) for the April meeting. Any changes will be posted on the web site as well as on the door of the usual meeting room.

Dave Lane then introduced our main speaker Mary Lou Whitehorne. Mary-Lou has been an integral member of the RASC since 1985 and is extremely active in promoting Astronomy education in schools. She has devoted much of her life to educating young people in the basics of astronomy. Her original and interesting approach has led to a surge of interest in astronomy among young people throughout Canada.

She has served both on the Halifax Executive and the National Executive, and is currently Second Vice-President of the Royal Astronomical Society of Canada. She has held most if not all positions the Halifax Centre Executive at one time or another, and in 1993 organized and chaired the General Assembly in Halifax.

Mary Lou's presentation was titled "A visual tour of the lives of stars, from their dusty beginnings to their interesting, and occasionally spectacular, ends"

Mary Lou described how in the early stages of her astronomical career she thought of stars as rather boring "tiny shiny speckles in the night sky" As things turned out, her astronomical studies turned to variables stars, and she quickly discovered that these "tiny speckles" were far from boring.

She went on to show the tremendous range of star types and sizes, ranging from stars 1/10th the size of our Sun, to the "Pistol Star" which is over 100 times the size of our Sun, and the brightest in our Milky Way.

Mary Lou showed a cross section of our Sun showing the various layers. In our Sun (unit mass =1) the center core contains the region of thermo nuclear energy release, where hydrogen is fused into helium.

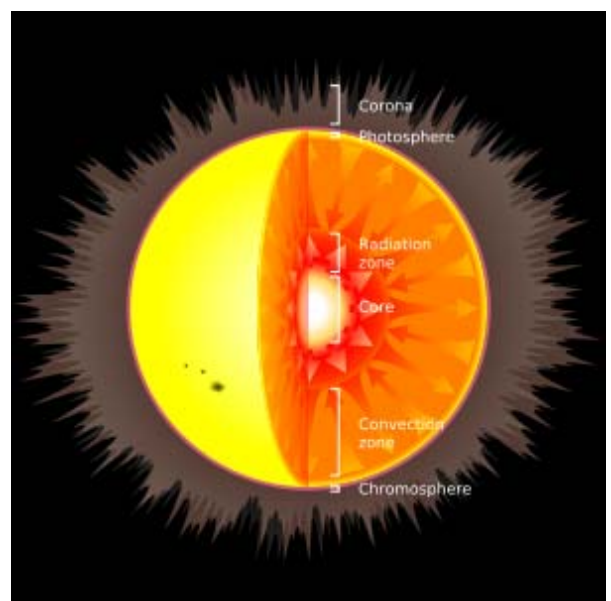
She then described the Radiative layer, and the Convective layer. These names describe how the cores' energy is moved towards the surface.

As a final view of our Sun Mary Lou showed images of the Sun's surface and atmosphere in different wavelengths of light highlighting different aspects of these features.

As she said, fortunately for us, the Sun is a normal, very stable star, but as she showed it is far from boring.

Having described our (typical) star, she went on to explain the answer to a common question "Why are stars spherical". Mary Lou explained that a stars shape is due to a hydrostatic equilibrium caused by the stars energy output (causing the star to expand) being balanced by the inward pull of gravity. As the star gets bigger, it's energy output drops and gravity wins causing the star to collapse. As the star collapse and get smaller, the energy output increases, stopping the gravitational collapse. In a star like our Sun these two forces will remain in balance for billions of years.

But this long term stability is true of stars of our Sun's size only. Stars are like bonfires explained Mary Lou. The larger they are, the faster they burn. She showed a chart of typical star life expectancy compared to it's size.



Star size (solar masses)	Life expectancy (years)
60	2 million
30	5 million
10	25 million
3	350 million
1.5	1.6 billion
1.0	9 billion
0.1	trillions!

In the early period of the universe, stars were very large, very energetic and “burned” out in massive explosions (Supernova) in only a few million years. This was the period of proto galaxies, where the early star energies were so huge that they prevented the formation of large stable galaxies. However these early stars “seeded” surrounding space with the heavy elements formed in their massive super nova death throws. This led to the formation of second and third generation stars, which because of the “metal contamination” from earlier stars, were generally smaller and far more stable.

Our Sun is one such third generation, stable star.

Mary Lou then went on to describe many other types of stars. She described multiple star systems which turn out to be very common. She also described several types of variable stars, explaining some of the reasons why their brightness varies.

Some stars vary in brightness because their size changes, Some stars vary because they are eclipsed by another stellar companion. Other stars vary due to interactions with other (companion) stars.

Mary Lou continued with descriptions of how stars behaved as they aged. How they could end their lives by just running out of nuclear fuel and collapsing into a white dwarf , brown dwarf, or neutron star, depending on their initial size. During this collapse the star would often shed material in stellar explosions called a nova.



The Crab nebula

These novae would spread stellar material throughout their neighborhood.

As a final point, Mary Lou described how larger stars could end their lives in truly catastrophic events called supernovae. In a supernova event a star could outshine the brightness of its host galaxy spreading heavy elements throughout the galaxy. She showed amazing images of the result of catastrophic stellar deaths (supernovae). She showed the Crab nebula, which is the remnant of a supernova that occurred in 1054, and was recorded by astronomers of the day. It was so bright that the “star” was visible in daylight.

As Mary Lou said in conclusion, there is never enough time. “Our galaxy is big, the universe is bigger”



HST image of an interesting star, V838

The meeting concluded with our regular “what’s up” feature. It was noted that an opportunity exists to see a crescent Moon less than 24 hours old. This will occur on the evening of April 6th (or was it April 5th?) Damn that UT and daylight savings time. Check your Observer’s handbook.

Cookies and soft drinks were served, and the meeting wound up around 10pm.

Member's photographs of the Total Lunar eclipse Feb 20th 2008



Eclipse sequence: photographed and created by Sherman Williams
Sony "Cybershot" 8.1 mega pixel camera, tripod mount, manual setting.
Photos taken at St Croix.



Photo by James Crombie
Taken at 9:40 EST, from Brampton,
Ont.
Canon XTi @ ISO 800, 0.6 sec,
2000 mm F/10 Celestron scope.



Photo by John Liddard 11:24 p.m.
AST
Shot with a tripod-mounted Canon
Digital Rebel XT - 1/2 second expo-
sure, 500 mm, f/6.3, ISO 1600



Photo by Jeff Donaldson
Kodak Easyshare V530 digital camera
on flash off auto, Celestron Nexstar
102SLT and a Speers-Waler 13.4 mm
eyepiece. The camera was held up to
the eyepiece.

Cosmic Debris

Odds & sods from the world of Astronomy and Cosmology

“Houston - we have anomalies!”

By Charles Q. Choi
Special to SPACE.com
posted: 03 March 2008 10:03 am ET

Mysteriously, four spacecraft that flew past the Earth have each displayed unexpected anomalies in their motions.

These newfound enigmas join the so-called "Pioneer anomaly" as hints that unexplained forces may appear to act on spacecraft.

A decade ago, after rigorous analyses, anomalies were seen with the identical Pioneer 10 and 11 spacecraft as they hurtled out of the solar system. Both seemed to experience a tiny but unexplained constant acceleration toward the sun.

A host of explanations have been bandied about for the Pioneer anomaly. At times these are rooted in conventional science — perhaps leaks from the spacecraft have affected their trajectories. At times these are rooted in more speculative physics — maybe the law of gravity itself needs to be modified.

Now Jet Propulsion Laboratory astronomer John Anderson and his colleagues — who originally helped uncover the Pioneer anomaly — have discovered that four spacecraft each raced either a tiny bit faster or slower than expected when they flew past the Earth en route to other parts of the solar system.

The researchers looked at five deep-space probes — Galileo to Jupiter, the NEAR mission to the asteroid Eros, the Rosetta probe to a comet, Cassini to Saturn, and the MESSENGER craft to Mercury. Each spacecraft flew past the our planet to either gain or lose orbital

energy in their quests to reach their eventual targets. (Galileo made two flybys.) In five of the six flybys, the scientists have confirmed anomalies.

"I am feeling both humble and perplexed by this," said Anderson, who is now working as a retiree. "There is something very strange going on with spacecraft motions. We have no convincing explanation for either the Pioneer anomaly or the flyby anomaly."

In the one probe the researchers did not confirm a noticeable anomaly with, MESSENGER, the spacecraft approached the Earth at about latitude 31 degrees north and receded from the Earth at about latitude 32 degrees south. "This near-perfect symmetry about the equator seemed to result in a very small velocity change, in contrast to the five other flybys," Anderson explained — so small no anomaly could be confirmed.

The five other flybys involved flights whose incoming and outgoing trajectories were asymmetrical with each other in terms of their orientation with Earth's equator.

For instance, the NEAR mission approached Earth at about latitude 20 south and receded from the planet at about latitude 72 south. The spacecraft then seemed to fly 13 millimeters per second faster than expected. While this is just one-millionth of that probe's total velocity, the precision of the velocity measurements was 0.1 millimeters per second, carried out as they were using radio waves bounced off the craft. This suggests the anomaly seen is real — and one needing an explanation.

The fact this effect seems most evident with flybys most asymmetrical with respect to Earth's equator "suggests that the anomaly is related to Earth's rotation," Anderson said.

As to whether these new anomalies are linked with the Pioneer anomaly, "I would be very surprised if we have

discovered two independent spacecraft anomalies," Anderson told SPACE.com. "I suspect they are connected, but I really do not know."

These anomalies might be effects we see with an object possessing a spacecraft's mass, between 660 and 2,200 lbs. (300 and 1,000 kg), Anderson speculated.

"Another thing in common between the Pioneer and these flybys is what you would call an unbound orbit around a central body," Anderson said. "For instance, the Pioneers are flying out of the solar system — they're not bound to their central body, the sun. For the other flybys, the Earth is the central body. These kinds of orbits just don't occur very often in nature — it could be when you get into an unbound orbit around a central body, something goes on that's not in our standard models."

The researchers are now collaborating with German colleagues to search for possible anomalies in the Rosetta probe's second flyby of the Earth on November 13.

"We should continue to monitor spacecraft during Earth flybys. We should look carefully at newly recovered Pioneer data for more evidence of the Pioneer anomaly," Anderson added. "We should think about launching a dedicated mission on an escape trajectory from the solar system, just to look for anomalies in its motion."

Montana State University physicist Ronald Hellings, who did not participate in this study, said, "There's definitely something going on. Whether that's because of new physics or some problem with the model we have is yet to be worked out, as far as I know. A lot of people are trying to look into this."

Anderson and his colleagues will detail their latest findings in an upcoming issue of the journal *Physical Review Letter*.



St. Croix Observatory

Observing Chair: John Liddard 902 865 7607

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:

Every weekend closest to the new Moon, there is an “Observing Night” at St. Croix. The purpose of “Observing Night” is to encourage Centre members, their guests and visitors to share an evening of observing at St Croix. It’s also a great night for beginners to try out different scopes and see the sky under dark conditions. For more information or transportation arrangements, please contact the Observing Chair.

Future dates for Observing Nights:

May	2nd, 2008
May	30th, 2008
July	4th, 2008
August	29th 2008 (Nova East!)
September	26th, 2008

These dates are all Fridays. If this is a meeting night, or cloudy, the alternate date will be the following Saturday.

Directions from Halifax:

- 1) Take Hwy 102 (the Bi-Hi) to Exit 4 (Sackville).
2. Take Hwy 101 to Exit 4 (St. Croix).
3. At the end of the off ramp, turn left.
4. Drive about 1.5 km until you cross the St. Croix River Bridge. You’ll see a power dam on your left.
5. Drive about 0.2 km past the bridge and take the first left (Salmon Hole Dam Road).
6. Drive about 1 km until the pavement ends.
7. Drive another 1 km on the dirt road to the site.
8. You will recognize the site by the 3 small white buildings on the left.

Become a St. Croix Key Holder:

For a modest “key fee”, members in good standing for more than a year, who have been briefed on observatory , may gain access to the St.Croix facility. For more information on becoming a key holder, contact the Observing Chair.

Rules for using the SCO equipment:

There are several pieces of astronomical equipment available for members (and guests) to use, including a 17.5” dob and a magnificent pair of tripod mounted, 100mm binoculars. If you are unfamiliar with the use of these pieces of equipment, please ask for assistance—any knowledgeable member would be more than willing to help you out. Please share the equipment with other members; and treat the equipment, the facilities, and the site with respect. Enjoy!