

Nova Notes

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



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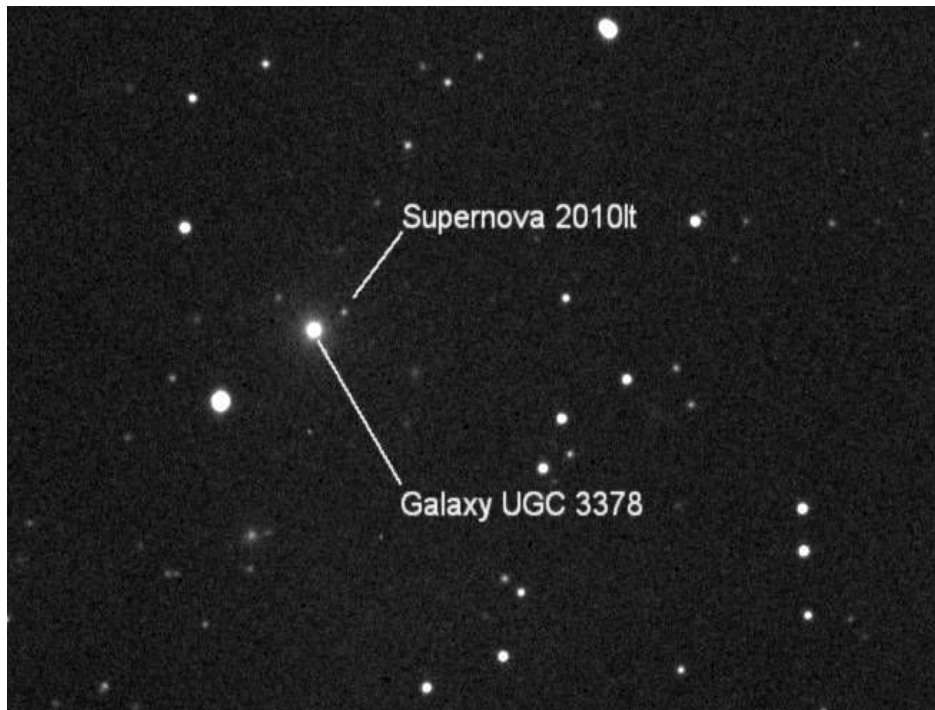
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Front Page Photo: Dave Lane

Super Nova discovery in Galaxy UGC 3378 in the constellation of Camelopardalis.

Equipment: Celestron 14 SCT, SBIG ST8 CCD camera, 45 seconds at f/5.5 taken at 6:06 pm AST December 31st 2010



For more details go to: <http://www.davelane.ca/aro/sn/sn2010lt.html>

From the editor

Quinn Smith

Welcome to 2011 and what I hope will be another great year for astronomy and the Halifax Centre. The first thing I would like to do is to thank all our members for their support and encouragement throughout the last year. This is my fourth year as editor, and without your support this would be a very sparse newsletter. Please keep those article, reviews, photos, comments and observing reports, coming. And if you have the odd astronomy joke or cartoon—I would like to include them as well!

I would like to thank Blair MacDonald for putting on a very successful astro-photography workshop on January 22nd. It was very well attended and from the reports I read on our Halifax e-mail list (the "list") it was enjoyed and appreciated by all who attended. I would like to thank Saint Mary's University for co-hosting and supplying the venue and to Atlantic Photo Supply (Spring Garden Road) for their support and donation of a door prize. There will be a full report in the next Nova Notes.

I also want to draw everyone's attention to the fact that our own summer Star Party - Nova East is well into the planning stages, and details will be forthcoming in the next (April) Nova Notes. Please set aside August 26th to 28th for this year's event which will take place (as usual) at Smily's Provincial Park. It will not rain, there will be no hurricanes and the Park will stay open for the whole event—guaranteed!. I've said that before haven't I?

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 and would like to become one, or need more information please contact the Observing Chairman, John Liddard (see below).

Upcoming Observing Nights:

March	4th	2011
April	1st	2011
May	6th	2011

Meetings begin at 8 p.m. at Saint Mary's University Please note room changes for 2011

NOVA program begins at 7:00 p.m. in the same room

February 18th 2011 - Atrium - AT 101

A regular meeting - Dave Lane will discuss "Amateur Variable Star Research at the Abbey Ridge Observatory"

March 18th 2011 - Atrium - AT 101

A regular meeting - Pat Kelly will discuss "It's the end of the World as we know it". The Earth is always undergoing transformations—what's in store for the future?

April 15th 2011 - Atrium - AT 101

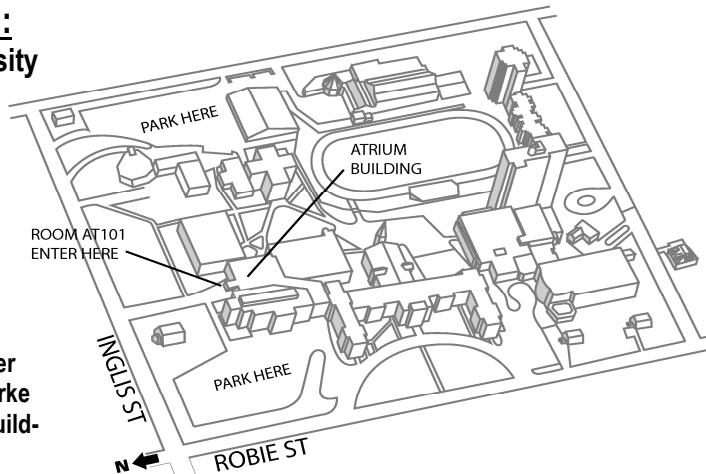
A regular meeting - Guest speaker Taro Sato will discuss the evolution of Galaxies in a talk titled "Gone with the Wind: What Scarlett O'Hara Has Been Hiding about Galaxies"

[The content 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 one hour before the main meeting, in the main meeting room.

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

Halifax RASC Executive, 2011:

Honorary President	Dr. Roy Bishop	902 542 3992	rlb@eastlink.ca
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Councilor	Michael Boschat	902 455 6831	boschat@mathstat.dal.ca

President's Report

Richard Vanderberg

This past year has been a very successful year for the Halifax Centre. This success is not because of one or two individuals, but because of the efforts of many of our members.

We have had a wide variety of excellent and informative speakers at our meetings. Some of our members have been presenters at the Planetarium, which is part of our outreach efforts. These efforts included sidewalk observing, talks at various locations and taking groups to the observatory.

Largely due to the efforts of two of our members, Keji is now an official Dark Sky Preserve. Both Mary Lou Whitehorne and myself were among the speakers at the official presentation in August.

Nova East (our annual summer Star Party) would have been a big success if the weatherman had cooperated. Instead it was cancelled due to the arrival of yet another hurricane! The 2011 Nova East planning is well under way.

Our Executive Committee approved the laying of flagstones and graveling at the Observatory at St Croix. The first has been completed and the second will be done in the Spring.

Our Treasurer has completely re-done our financial books, making them clearer and more relevant. Nova Notes has gone electronic with a sizeable financial saving as a result.

The Halifax Centre supplied the National RASC President for the last two years (Dave Lane) and the new National President, Mary Lou Whitehorne, is also a Halifax Centre member. Additionally, not only are both the last and current Handbook editors from our Centre, but many of the Handbook sections have been written by Halifax Centre members.

These activities illustrate why 2010 has been a successful and enjoyable year. It also provides the foundation for a successful 2011.

Kathryn Gray - SN Hunter

Quinn Smith

Nova Notes would like to join with the many who have congratulated 10 year old Kathryn Aurora Gray in becoming the youngest person to have discovered a Supernova.

For those of you who might not have been residing on planet Earth during the first part of January 2011, Kathryn is the daughter of (our) Paul Gray, a current member of the RASC New Brunswick Centre.

Dave Lane had taken some pictures with the Abby Ridge Observatory on

December 31st 2010 and forwarded them to Paul for evaluation. Even though Dave and Paul have previously discovered several Supernovae between them, they had moved on to other astronomical projects. It was Kathryn who asked if she could give it a try and hence the new set of pictures was taken by Dave for Kathryn and Paul.

Well it took Kathryn four frames and 15 minutes to find her first SN, now designated SN2010lt! It is in the galaxy UGC 3378 in the

constellation Camelopardalis.

As Paul said "with her luck, I should get her to pick lottery numbers!"

Photo: Paul Grey



HALIFAX
CENTRE

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

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

E mail: novanoteseditor@rasc.ca Newsletter editor: Quinn Smith

Nova Notes is published 5 times a year, in February, April, July, October and December.

The deadline for the next edition is March 20th 2011

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

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

Observing Chair:

John Liddard

Things have been fairly uneventful at our St. Croix Observatory during 2010. There were only a few scheduled observing nights this year with which the weather cooperated. However the "Lunar Adoration Night" in May was extremely successful with close to 20 people in attendance. We should do it again in May 2011, especially if we can recruit our resident "Lunatic", Dave Chapman, to attend as a special guest and provide his expert guidance for people not accustomed to staring at the Moon.

General maintenance such as paint touch ups, weeding and brush control were conducted over the summer. The most significant upgrade/maintenance project this year was the installation of the three observing pads on October 30th. You can view/download images from the work party here: <http://gallery.me.com/jliddard#100222>

Special recognition should be given to Blair MacDonald, Paul Heath, and Roy Bishop for their assistance in this very physically demanding upgrade. Without their help this project would not have been completed. SCO upgrade projects in planning for 2011 include new gravel for the parking lot, creation of a bunk platform in the warm room, a review of the heating system for the warm room and maintenance of the 17" scope in the observatory.

If any member has suggestions for improvements to SCO please contact myself or any member of the Executive.

Nova Notes Editor:

Quinn Smith

The biggest change with Nova Notes in 2010 was the ending of mass printing and mailing of the newsletter. As of September most members are receiving the newsletter on-line. We do

however have 14 members who have opted to continue to receive the printed version. Of these 14, 11 members are paying an annual fee of \$12 (with their membership renewal), and 3 are receiving a free copy as part of the one year transition.

Prior to this adoption of the electronic newsletter the Centre was spending approximately \$325 per edition to print and mail 150 newsletters. That was in excess of \$1,600 per year (5 editions). With the changes, the last two editions had only a 15 copy print run, with a total cost (including mailing) of approximately \$40 per edition. Offsetting this was an effective income of approximately \$25 per edition (newsletter opt-in fee). In the course of 2011 we can expect to continue a net expense of approximately \$15 per edition for the newsletter cost, totaling \$75 for the year. This results in a net saving of \$1,500 per year for the Centre.

Public outreach:

Quinn Smith

It has been a wonderful year for Public Outreach in Nova Scotia and I want to thank all the Centre members who have participated in these activities. There are some specific Outreach events that I would like to mention and some members that I would like to mention by name.

Your Outreach Committee consists of Karl Penny who has done a "stellar" job of organising many of the public observing events this year. Dave Chapman has worked extensively with Keji (now a DSP) and the Halifax Library system (public talks). Dave also maintains the Astronomy Nova Scotia web site. John Higgins is our data guru. He has worked quietly and diligently in the background and keeps track of all of the Outreach events throughout the year.

Keji was designated Nova Scotia's first Dark Sky Preserve in August 2010 after 2 years of hard work by members of the Halifax Centre and staff at Keji. In particular I would like

to thank our own Dave Chapman and Jonathan Sheppard of Keji for their hard and dedicated work. I also want to thank all the members who have participated in talks and observing sessions at the Park.

The Sports and RV show was another great success this spring. Thanks to the organisers for giving us the booth space no charge, and a very big thanks to all the members who took over the setup and organising from me, after I found myself stranded in Helsinki due to the ash cloud over Europe.

The Library talks continued again this year under the guidance of Dave Chapman.

The Planetarium continued to attract more and more people this year, and my thanks go out to Stephen Payne and David Tindall for their work in keeping this unique astronomical asset operating. Thanks to all the Centre members who have taken the time to present at the Planetarium, or have supported its operation.

Public observing has been well received by all those who attended. There have been dozens of observing outreach events and I thank all members who have participated. In particular thanks to Karl Penny who has spear-headed these events throughout the year.

Finally I want to thank all the members who have participated in talks with youth groups, school groups and scout and Guide groups. These groups contain future astronomers and RASC members.

It is due to the efforts and dedication of members who have participated in Public Outreach that the public awareness of astronomy and light pollution has increased enormously in the last few years. It is my pleasure and honour to thank you all for your participation in helping spread the word about the joy of astronomy, and the concerns about light pollution. Thank you all.

December Meeting Report

Quinn Smith

The December meeting of the Halifax Centre was opened by our President Richard Vanderberg. Richard welcomed the 36 members and 2 visitors.

The December meeting is the Annual General Meeting of the Halifax Centre and the AGM business was taken care of in the first part of the meeting.

The agenda of the 2010 AGM was approved as was the minutes of the 2009 AGM.

Richard gave the annual President's Report (page 3) which was followed by several Executive reports (see page 4). Dave Lane gave the Auditor's report for the 2008/2009 financial year (see page 9). Ian Anderson then gave a thorough 2009/2010 Treasure's Report (see pages 6,7,8).

Our Secretary, Chris Young, noted that the Centre had 162 members, of which 136 were regular members, 22 life members and 6 youth members. The membership numbers are virtually unchanged from last year.

An Auditor for 2009/2010 and 2010/2011 was chosen. Dave Lane offered to fill this position again. Dave noted that it would be possible to supply both reports at the 2011 AGM next December.

The new Executive was introduced, having been selected by acclamation. One Executive member left (Pat Kelly—National Rep.) and one new member was introduced - Karl Penny, who took over the role of 2nd VP. Jim Dorey moved from the role of 2nd VP to National Rep. Since the AGM another councillor Micheal Boschat has been added (see page 2 for a full list of Executive members).

Having concluded the business of the AGM, Richard introduced the guest speaker for the evening Mr. Charles O'Riley. Mr O'Riley was to speak on

“The Saxby Gale”

Charles O'Riley (retired) was the Chief of Tidal Analysis and Prediction (CHS/Atlantic Region). Mr. O'Riley has been active in coastal zone management issues, remote sensing and the establishment of 3-D vertical datum transforms. He has also been very active in researching the impacts of rising sea levels, storm surges and tsunamis.

The Saxby Gale is the name given to a tropical cyclone which struck the Bay of Fundy region on the night of October 4-5th, 1869. It caused extensive destruction to port facilities and communities along the coast in both New Brunswick and Nova Scotia as well as Maine.

Much of the devastation was attributed to a 2-metre storm surge which coincided with a perigean spring tide. The storm breached dykes protecting low-lying farmland inundating farms and communities. Sailing ships in various harbors were tossed about and/or broken up against wharves and breakwaters, which were also destroyed. Over a hundred lives were believed lost to this storm in the Maritimes alone.

This storm was given the name "Saxby" in honor of Lieutenant Stephen Saxby, Royal Navy, who was a naval instructor and amateur astronomer. Lt. Saxby had written a letter of warning, published December 25, 1868 in London's *The Standard* newspaper in which he noted the astronomical forces predicted for October 5, 1869 which would produce extremely high tides in the North Atlantic Ocean during the height of hurricane season.

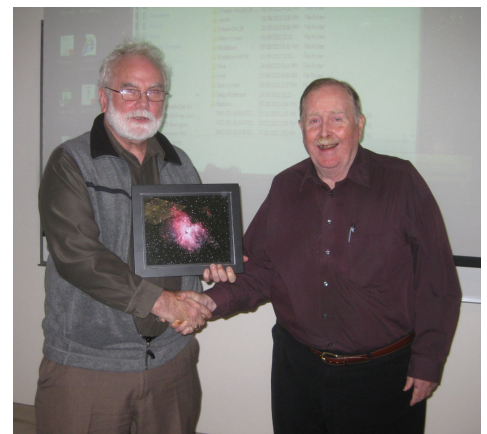
Lt. Saxby followed this warning with a reminder published on September 16, 1869 to *The Standard* in which he also warned of a major "atmospheric disturbance" that would coincide with the high water level at an undetermined location. Many newspapers took up Saxby's warning in the coming days but many readers dismissed his warn-

ing. (condensed from Wiki)

Mr O'Riley explained how the effects of storm surges and tidal variations were intertwined. He pointed out that in an area of small tidal variation (such as PEI) even a small storm surge would have a devastating effect, as such a surge, at almost any time of month, would easily exceed even the spring tide water level. However in the Bay of Fundy, which has a large tide variation (up to 15 metres), there would be very few tidal periods where a storm surge would exceed the normal tidal range. The Saxby Gale, was one such time.

Mr O'Riley showed many pictures of the devastation as well as charts and graphs showing the periodicity of tidal ranges at various locations around Nova Scotia and Atlantic Provinces. He also explained the complexity in producing charts that give water depths. The problem, as he explained it, is the difficulty in referencing a single standard water level. This is caused not only by geological features but because of a multitude of reference standards.

There were many questions, and there was not enough time for Mr O'Riley to answer them all. Discussions continued well into the social time at the end of the meeting when pop and snacks were served.



Richard presenting Mr O'Riley with a framed astro photo taken by Blair MacDonald

Treasurer's Report Year Ending Sept 2010

Ian Anderson

Since mid-decade, the Halifax Centre RASC has experienced a levelling off of membership, participation and overall wealth. This phenomenon extended into the year just ended on September 30th. Fiscal 2010 would have been average had we not received extraordinary revenues from several sources, one of which marks the demise of a long-standing legacy of the "Life Membership" program.

With many revenue sources waning, our future funding may have to come from sources we haven't yet imagined. We will be heavily reliant on the success of Nova East as it picks up the slack in revenue generation. Failing this, we must simply live within the means of what membership income affords - currently at \$22.70 per member. Re-thinking Nova Notes' distribution is an example of this.

As educational outreach programs may weigh heavily on our budget, I propose the entire entity be divided into Operational and Outreach Divisions. I suggest that profits earned by Nova East are earmarked the following year towards outreach activities, (since the NE equity is capped at \$5,000) and that the costs of meetings, SCO, Nova Notes, admin, legal, library and insurance be carried by membership fees. The income of 140 odd members is mostly consumed by these expenses.

The co-ordinators of outreach programs should thus base their annual budgets on the profit Nova East generates plus any revenues that arise from educational activities, which may be necessary in lean NE years as was 2010.

Respectfully submitted,

Ian Anderson, Treasurer,
Halifax Centre RASC

Details of the 2010 Income Statement

REVENUE:

Membership Fees \$3,288.49: At fiscal year-end membership stood at 162. There were 136 regular, 22 lifers and 4 youth. In August, we lost life member Ralph Fraser, our long-time cookie chairman.

Life Membership Settlement \$2,133.00: The last from a program chronically under-funded throughout the past two decades. Last year, National Office distributed the LM fund at \$92.74 per Lifer, and closed the program. \$2,133.00 was Halifax's 23 Life Members' share of the defunct program at settlement.

Donations (Includes Nova East Donations) \$654.64: I am pleased to report that this category sprang to life this year after three years of dormancy. Twelve members contributed to the year's total.

Educational Activities \$1,500.00: The second extraordinary surprise as activity from IYA 2009 spilled into 2010. Dalhousie shared printing costs of IYA materials. The Nova course generated \$500.

Interest \$ 7.72: Of this paltry sum, \$3.91 was earned in our operational account. The remaining \$3.81 is all \$3080 in money market investments earned in 2010 where the bottom may have been touched. Rates may be higher in 2011 but nothing spectacular is expected.

Sales of Merchandise (Gross) \$2,533.29: Some of these sales occurred in 2009, but our retailers were slow to pay up. Sales included Calendars at \$1399.79, Galileo scopes \$432, and Star finders \$300.

Nova East (net) \$38.24: Despite bad luck in 2010, T shirt sales alone put us barely in the black in 2010.

Miscellaneous \$ 11.32: Much of this

was US \$ exchange adjustments, and a \$2.38 adjustment made to YE 2009 accrued interest.

EXPENSES:

Meetings (Treats) \$249.40: Our ten meetings generally run about \$25.00 each.

Meetings (Speakers) \$420.93: Our June and September speakers cost us money. This is unusual and hopefully won't be repeated in 2011.

Newsletter \$1,530.26: Our last full-scale print run of five Nova Notes issues cost us slightly more than in 2009. This category will be sharply down in 2011.

Cost of Goods Sold \$1,231.14: This is the cost of 83 2010 Calendars, and 20 Galileo scopes sold.

Equipment and Supplies \$30.43: Purchased and expensed, a binder and a flash drive for data storage.

Office Administration \$269.62: This includes postage for correspondence, internal communications, office supplies, and the rental of our post office box.

Educational Activities (Outreach) \$943.08: At a third of 2009's Outreach expenses, this was still an active year as momentum carried forward. A large number of very active participants kept school talks, provincial park presentations, sidewalk astronomy, and dark sky preserve issues alive.

Legal Expenses \$28.03: A fee paid to the Province to maintain our registration under the Society's Act.

Insurance \$1,113.00: Insurance for the observatory is up about 2.4% from 2009.

Awards and Donations \$10.45: The value of a calendar presented to our January speaker.

Details continued on page 8

<u>Income Statement</u>	<u>2010</u>	<u>2009</u>	<u>Change</u>	
REVENUES				
Membership fees	\$3,288.49	\$3,266.43	\$22.06	
Life Members Settlement	2,133.00	N/A	2,133.00	
Donations (incl. NE)	654.64	0.00	654.64	
Educational Activities	1,500.00	0.00	1,500.00	
Interest	7.72	27.96	(20.24)	
Merchandise sales (gross)	2,533.29	(1,768.65)*	4,301.94	* Modified 2009 data
Nova East (net)	38.24	1,906.40	(1,868.16)	
Miscellaneous	11.32	10.00	1.32	
Total Revenues	\$10,166.70	\$3,442.14	\$6,724.56	
EXPENSES				
Meetings (Treats)	\$249.40	\$226.18	\$23.22	
" (Speakers)	420.93	0.00	420.93	
Nova Notes	1,530.26	1,473.95	56.31	
Cost of Goods sold	1,231.14	0.00*	1,231.41	* Modified 2009 data
Equipment & Supplies	30.43	25.74	4.69	
Office Administration	269.62	201.47	68.15	
Educational Outreach	943.08	2,590.17	(1,647.09)	
Legal Expenses	28.03	27.21	0.82	
Insurance	1,113.00	1,087.00	26.00	
Awards & Donations	10.45	100.00	(89.55)	
Observatory - Operating	258.46	28.96	229.50	
Depreciation & Write-offs	3,030.29	N/A	3,030.29	
Miscellaneous Expenses	149.37	31.51	117.86	
Total Expenses	\$9,264.46	\$5,792.19	\$3,472.27	
Net Income	\$ 902.24	(\$2,350.05)	\$3,252.29	

<u>Balance Sheet</u>	<u>2010</u>	<u>2009</u>	<u>Change</u>
ASSETS			
Cash	\$13,235.68	\$9,224.83	\$4,010.85
Accounts Receivable	589.48	0.00	589.48
Investments	3,083.85	3,077.66	6.19
Library Est'd	1,924.12	3,758.97	(1,834.85)
Observatory Capital Equ.	13,278.97	13,821.00	(542.03)
Miscellaneous Est'd	45.25	452.54	(407.29)
Total Assets	\$32,157.35	\$30,335.00	\$1,822.35
LIABILITIES			
Accounts payable	\$849.06	\$0.00	\$849.06
Prepaid Nova Notes Pr.	71.05	0.00	71.05
Total Liabilities	\$920.11	\$0.00	\$920.11
EQUITY			
NE Working Equity	\$5,000.00	\$5,000.00	\$0.00
Common Equity	\$26,237.24	\$25,335.00	\$902.24
Total Equity	\$31,237.24	\$30,335.00	\$902.24 < Profit for 2010
Total Liab. & Equity	\$32,157.35	\$30,335.00	\$1,822.35
OFF BALANCE SHEET			
Observatory Expensed To date	\$26,842.21	\$26,583.75	\$258.46
ALL TOTALS	\$58,999.56	\$56,918.75	\$2,080.81

Observatory — Operating \$258.46: Of note: \$111.50 as expenses from a work party at SCO in July '09, and \$100 was a gift to our ploughman.

Asset Depreciation and Loss Write-offs \$3,030.29: As approved by council, the library has taken a 50% write-down of \$1,924.11. Capitalised Observatory trimmed \$698.89 or about 5%, and Miscellaneous Assets was reduced 90% or \$407.29. The year's extraordinary revenues were seen as an opportunity to take this unusual expense without severely effecting the income statement.

Miscellaneous Expenses \$149.37: The largest of these expenses was the IDA membership fee of \$110.03. This also includes a \$6.30 adjustment to balance the books which have been out of sync with the bank account since 2001 - a cheque one of our members never cashed.

Details of the 2010 Balance Sheet

ASSETS:

Cash \$13,235.68: On September 30th 2010, our cash balance at the TD Bank was \$13,964.58. Seventeen cheques were outstanding at year-end of \$1,338.63. Membership Revenue for September was known to be \$609.73. This figure combines profits from Nova East, shown separately last year.

Accounts Receivable \$589.48: This is the portion of the costs of our September speaker that National Office pledged to reimburse us under the Public Speaker Program. The Halifax Centre was the first of the regional centres to take advantage of the program.

Investments \$3083.85: The current value of \$2,000 invested in interest bearing investments since 1997.

Estimated Library \$1,924.12: Our library's value is an estimate of money

spent there since the beginning. \$89.26 worth of material was added this year. Our Executive approved my recommendation that the value of this asset be halved to reflect a more realistic appraisal of the collection.

Observatory Equipment \$13,278.97: Real growth in this category: a sky light meter valued at \$156.86. Also, discovered in February, our \$1033 generator was expensed in 1996 by yours truly, rather than capitalised. As reversing this entry would have given us miscellaneous income which I found misleading, I retrofitted 2009's numbers. A 5% write-down was then approved and applied this year.

Estimated Miscellaneous \$45.25: Other holdings were estimated at \$452.54 in historic costs. But this category has been ignored since 1994. In 16 years those long forgotten assets would be worth a tiny fraction of their original values. No one remembers what these items were, nor where they might be found - let alone their value. I was permitted a 90% write-down here. I would be hard-pressed to present a list of miscellaneous items that could be fairly valued at \$45.25. (Hole punch, mirror grinder, stapler, umm, did I mention hole punch?) In April, our long lost mirror grinding machine was found. Apparently, this has been with the Centre since the early 1970s. Dave Lane invites anyone who wants to use it to take it out of his office.

LIABILITIES:

Accounts Payable \$ 849.06: At year-end, the costs of our September speaker had been acknowledged but not yet paid.

Prepaid Nova Notes Printed Subscriptions \$71.05: Since June, 6 members have paid for the print-run version. As these editions of Nova Notes are yet to be produced, their revenue represents unearned income, or a form of liability. As the newslet-

ter is produced, this liability gets converted into earned income in the following year.

EQUITY:

Nova East Reserve Equity \$5,000.00: Last year, the Nova East reserve was \$5,087.52. As this reserve was to be capped at \$5,000.00, I moved the \$87.52 surplus into general equity along with the \$38.24 "profit" made by Nova East this year.

Common Equity \$26,237.24: The difference between this and last year's \$25,335.00 is the "profitability" of our centre's activities including Nova East efforts. The figure for 2009 was \$24,214.19, but I amended this upward by \$87.52 (NE equity surplus) and \$1,033.29, reflecting the cost of the generator which should have been included since the 1990s as part of our equity.

The Bottom Line: \$902.24 in Profit for 2010: The growth in total equity stands at \$902.24 for 2010. This bottom line figure represents \$5.60 per member, or 24% of the \$23.00 membership fee. That is: with almost no participation from Nova East, and a \$3,030 asset write-down.

That was the kind of year it was - extraordinary. Not likely to be repeated any time soon!

OFF BALANCE SHEET:

Expensed Observatory \$26,842.21: Nominally up \$258.46 over 2009. This is a figure derived from a recent recount from available records since 1996.

The full treasurer's report contains information not published in this summary.

It is available to all members on request.

The Last Transit Of Venus In Our Lifetime: Arithmetic Poetry

Roy Bishop

Four centuries ago and after years of patient work, Johannes Kepler discovered something profoundly beautiful: the orbital period of a planet is proportional to the $3/2$ power of its distance from the Sun. Kepler had no idea why planets should obey such simple mathematics, but he was ecstatic that he had once again managed to read the mind of God. Earlier he had discovered that planetary orbits are simple mathematical curves (ellipses with the Sun at one focus), and how a planet moves in its orbit (the planet-Sun line sweeps out equal areas in equal times).

According to the Observer's Handbook (p. 23 of the 2011 edition) Venus is 0.72333 of Earth's distance from the Sun, so its period is $(0.72333) \exp 3/2 = 0.61518$ year. Thus, like a faster horse on a circular racetrack, Venus repeatedly laps Earth, passing between Earth and the Sun. How often that happens is given by dividing the product of the orbital periods by their difference. $(1 \times 0.61518) \div (1 - 0.61518) = 1.59862$ years. That result is itself an interesting number because five such laps will span $5 \times 1.59862 = 7.9931$ years or almost exactly 8 years, which means that Earth and Venus are at almost the same points in their respective orbits as they were five laps previously, and the intermediate four laps occur at equally-spaced intervals around Earth's orbit. At the fifth lap, Earth will have completed almost 8 orbits, and Venus almost $8 + 5 = 13$ orbits.

What happens when Venus laps Earth? Not much usually, other than Venus moves from the evening sky into the morning sky. Venus' orbit is tilted 3.4 degrees relative to Earth's orbit, so when Venus passes between Earth and Sun, as seen from Earth it nearly always passes either north or south of the solar disk. However, if Venus hap-

pens to be near Earth's orbital plane when it laps Earth, for a few hours it will be seen silhouetted against the Sun, a *transit of Venus*, and Earth will be immersed in Venus' penumbral shadow. The fact that the five-lap interval is not exactly 8 years is significant, for if it were exactly 8 years, transits of Venus would likely be so rare as to be of little interest.

The difference between 8 years and the 7.9931-year interval causes successive 5th-lap locations of Earth in its orbit to shift slowly around the orbit. It takes $[1/(8 - 7.9931)] \times 7.9931$ years = 1200 years (to two-figure precision) for a 5th-lap location to make one circuit around Earth's orbit, because " $1/(8 - 7.9931)$ " is the number of "5-lap intervals" that will fit around one Earth orbit, and 7.9931 years is the 5-lap interval. However, there are a total of *five* lap locations nearly equally spaced around the orbit and there are *two* "nodes" on either side of the Sun where the orbital planes of Earth and Venus intersect. Hence one or another lap location will encounter a node $5 \times 2 = 10$ times more frequently, every $1200/10 = 120$ years (again to two figure precision). That is, transits of Venus occur at intervals of about 120 years.

The tilt of Venus' orbit is small enough and the Sun's angular diameter large enough that transits can occur in pairs, 8 years apart, which is the situation during recent centuries. Beginning with the transit 8 years prior to the first recorded observation of a transit of Venus in 1639, here are the dates of transits during the following 500 years:

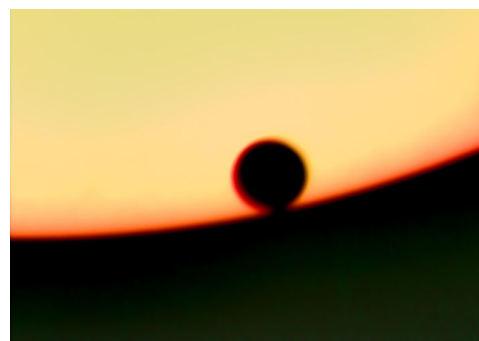
1631 December 7,	1639 December 4
1761 June 6,	1769 June 3
1874 December 9,	1882 December 6
2004 June 8,	2012 June 6
2117 December 11,	2125 December 8

The successive intervals between these transits are: 8, 121.5, 8, 105.5, 8, 121.5, 8, 105.5, 8. Thus the pattern repeats every 243 years, or pairs of transits recur, on average, every 121.5

years, in agreement with the approximate 120-year value calculated above. The intervals between pairs alternate from 105.5 to 121.5 mainly because Earth's orbit is appreciably elliptical, so its orbital speed varies. The June-December alternation is because the drifting lap positions encounter first one node and then the other, on opposite sides of Earth's orbit. The 2 or 3 day earlier date for the second member of a pair is the interval by which 7.9931 years falls short of 8 years.

Your great-great-grandchildren might see the transits of 2117 and 2125, but 2012 will be your last chance to see a transit of Venus. Venus last lapped Earth on October 29, 2010. That was 1.6 years ($1/5$ th of 8 years) prior to 2012 June 6. Thus when Venus next laps Earth, there will be a transit. Currently Venus is in the morning sky. It will pass behind the Sun on August 16 and move into the evening sky where it will draw ever closer to Earth prior to passing across the face of the Sun on 2012 June 6 (from 7:11 p.m. until sunset on June 5 from Nova Scotia).

Because of clouds, no one in Nova Scotia saw the 2004 transit . . . *except Sherman Williams!* Sherman was at his home on Horton Bluff that day, well aware of the transit, conscious that no one living had ever seen such an event, prepared to view the transit, and the heavens smiled upon him! A clearing in the cloud deck opened between Sherman and the Sun for barely half a minute, and he saw Venus silhouetted against the Sun. Yours truly was 8 km away, at Evangeline Beach that morning. All I saw was a brief moment of sunlight east of me, shining on Horton Bluff.



January Meeting Report

Chris Young

Despite snow, rain and icy roads 19 people attended the regular meeting in our new location in Room AT101 in the SMU Atrium Building.

Karl Penny filled in for the President and welcomed everyone including 2 new visitors who received our “welcome envelope” and were briefed on the benefits of membership in the RASC.

There was a brief discussion of some upcoming events and business.

- We are looking at having a weekend booth at either the “Sports and RV Show”(March 11-13) or the “Saltscapes Show” (April 29 - May 1) . Please consider volunteering.
- A Halifax RASC Astrophotography Calendar is in the works – any submissions are welcome - Contact Blair.

The evening’s presentation was a “Show and Tell” of recently acquired equipment by local members.

Blair MacDonald led off with his new Celestron CGE Pro Mount with a carrying capacity of 90 pounds. Blair is a



dedicated astrophotographer and wanted a mount which would look after his needs well into the future. Blair purchased the mount from Atlantic Photo and is very pleased with its 5 minute polar alignment and rock solid stability – it weighs 120 lb ! It uses half the power draw of his old Meade mount and has a peak to peak error of +/- 6 arc seconds without PEC correction turned on. It is easy to guide and discussion with the audience clarified the need for guiding with all mount to accommodate wind gusts and atmospheric refraction. Blair is delighted with the mount, which totally impressed most of those present. www.atlanticphotosupply.com/

Dave Chapman’s Christmas presents included a “MusicBox EQ” mount. This compact spring powered unit placed on a tripod functions as a barndoor mount and allows your camera to track the sky. Dave demonstrated the quick set up. The mount screws to a tripod and is polar aligned with 2 sighting holes. A ball head secures the camera to the device and allows camera positioning. You prepare your shot and “wind her up”. The spring power comes from an actual music box and the sounds of “Twinkle Twinkle Little Star” caught us by surprise. Upgrades for other tunes are not yet available. The unit is very portable, light and well made and judging by Dave’s photos it performs very well. The only downside – you can’t turn the music off. www.canadiantelescopes.com



Chris Young showed his Unimount parallelogram binocular mount. Originally this was intended to be a DIY project. However the time and effort was taking too long and Chris got a solidly made mount from Company Seven in the US. The anodized aluminum and stainless the mount is solid, balanced in all positions and smooth to operate. Many options are available. Chris’s preferred use is with a lounging chair. Completely satisfied with the mount and service (Company Seven assembles and quality checks all equipment prior to shipping), the only downside is more to store and transport! www.company7.com/

Dave Lane showed off a new Boltwood Cloud Sensor for the BG Observatory. This sophisticated cylindrical shaped device senses cloud cover, daylight, wind speeds and humidity and can interface with dome controls to automatically open and shut the dome. For the BGO it will allow operators to know what the conditions are remotely, enabling them help make decisions when running tours. www.cyanogen.com

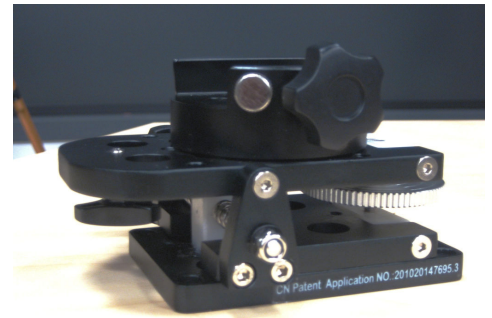


Dave intends to set up an automatic email "clear sky alert" for RASC members tied in to the Cloud Sensor's reporting.

Dave Lane also provided a quick demo of the Earth Centered Universe latest features which include animated planetary motions relative to the horizon and ecliptic assisting the planning of observing sessions. This software also helps in understanding the complex motions of the planets using animation trails to illustrates such things as retrograde motion. Software and upgrades available from www.nova-astro.com



what you see in the Live-view sensor is what you get. The ability to change higher quality DSLR lens is an advantage over camcorders. Jim hopes to utilize this for astrophotography as well as independent film making.



dovetail mounting and capable of +/- 12 degrees of movement on 3 axes using knob controls. Soon to be installed on Mark's Obsession, it is well machined and facilitates telescope guiding. www.skywatchertelescope.net

Jim Dorey acquired a new Panasonic Lumix GH1 DSLR camera at Henry's in a Boxing Day sale. Jim is interested in video photography and was aware of this camera's potential. The factory output of the camera is 17 megabits/sec. With a hack from the net, the output can (and now is) 50 megabits. This camera does not have a mirror box and

Following the presentation Mike Boschat did a "What's Up" on detailing upcoming events on satellites, planets and solar activity.

Refreshments and a close examination and discussion of all the gear finished a very interesting evening.

Mark Dryden brought in a new astrophotography accessory from Skywatcher – a guidescope mount using

Cosmic Debris

Odds and Sods from the World of Astronomy and Cosmology.

Nasa January 24, 2011

In an unexpected reversal of fortune, NASA's NanoSail-D spacecraft has unfurled a gleaming sheet of space-age fabric 650 km above Earth, becoming the first-ever solar sail to circle our planet.

"We're solar sailing!" says NanoSail-D principal investigator Dean Alhorn of the Marshall Space Flight Center in Huntsville, AL. "This is a momentous achievement."

NanoSail-D spent the previous month and a half stuck inside its mothership, the Fast, Affordable, Science and Technology SATellite (FASTSAT). FASTSAT was launched in November 2010 with NanoSail-D and five other experiments onboard. High above

Earth, a spring was supposed to push the breadbox-sized probe into an orbit of its own with room to unfurl a sail. But when the big moment arrived, NanoSail-D got stuck. "We couldn't get out of FASTSAT," says Alhorn. "It was heart-wrenching—yet another failure in the long and troubled history of solar sails."

Team members began to give up hope as weeks went by and NanoSail-D remained stubbornly and inexplicably onboard. The mission seemed to be over before it even began.

And then came Jan. 17th. For reasons engineers still don't fully understand, NanoSail-D spontaneously ejected itself. When Alhorn walked into the control room and saw the telemetry on the screen, he says "I couldn't believe my eyes. Our spacecraft was flying free!"

The team quickly enlisted amateur radio enthusiasts Alan Sieg and Stan



Sims at the Marshall Space Flight Center to try to pick up NanoSail-D's radio beacon.

"The timing could not have been better," says Sieg. "NanoSail-D was going to track right over Huntsville, and the chance to be the first ones to hear and decode the signal was irresistible." Right before 5pm CST, they heard a faint signal. As the spacecraft soared overhead, the signal grew stronger and the operators were able to decode the first packet. NanoSail-D was alive and well.

Continued bottom of page 12

Auditors Report 2008/2009

Dave Lane

To the members of the RASC Halifax Centre,

I have examined the financial records for the period October 1, 2008 to September 30, 2009. I believe that the Balance Sheet presented by the treasurer presents an accurate account of the financial position of the Centre (within a few dollars of errors that were noted to me by the current treasurer related to investment interest - \$2.39 – and a long standing reconciliation error of \$6.30).

I have looked closely at the Income Statement and the substantiating records and receipts and have not found anything of concern. I do note the following, however:

- An entry for \$70.40 was allocated to Nova Notes printing when it should have been Nova East printing.
- There is no receipt for the purchase

of IYA t-shirts for \$240. This does not concern me as I have personal knowledge that the T-Shirts exist (I have one!) and I was aware of the details of how the T-Shirts were acquired.

- The Centre received a significant fraction of its revenue in the form of cash, mainly the sales of Calendars and merchandise and on-site Nova East registrations. It was not possible for me to audit this from the records provided.

Recommendations:

- The Centre maintains a large amount of cash in its chequing account that is not earning any interest. The Centre already has a money market investment account which it could easily transfer funds to that are not needed in the short term. While at the moment, this will not earn much interest, interest rates will eventually improve.
- The Centre maintains a commercial insurance policy to provide property damage and liability protection for the St. Croix Observatory. The

insurable limits represent roughly the cost of materials when the buildings were built in the late 1990s. In the meantime, the cost of construction materials has increased considerably and I believe it also unlikely that, in the event of a major loss, the free labour talent available when it was built could be mustered today. Therefore, I recommend that the management examine what it would cost to replace the buildings without relying substantially on volunteer labour and adjust the policy accordingly.

- This year, management decided to write off the value of its merchandise and publications inventory and to stop selling all but the Observer's Calendars. It is my understanding that this was done largely due many years of difficulty in managing the related bookkeeping. The Centre had a long-standing history of earning income from non-membership fee sources. My recommendation is that the management re-consider this decision.

Clear skies,
David Lane, Auditor

Cosmic Debris—cont.

The biggest moment, however, was still to come. NanoSail-D had to actually unfurl its sail. This happened on Jan. 20th at 9 pm CST.

Activated by an onboard timer, a wire burner cut the 50lb fishing line holding the spacecraft's panels closed; a second wire burner released the booms. Within seconds they unrolled, spreading a thin polymer sheet of reflective material into a 10 m² sail.

Only one spacecraft has done anything like this before: Japan's IKAROS probe deployed a solar sail in interplanetary space and used it to fly by Venus in 2010. IKAROS is using the pressure of sunlight as its primary means of propulsion—a landmark

achievement, which has encouraged JAXA to plan a follow-up solar sail mission to Jupiter later this decade. NanoSail-D will remain closer to home. "Our mission is to circle Earth and investigate the possibility of using solar sails as a tool to de-orbit old satellites and space junk," explains Alhorn. "As the sail orbits our planet, it skims the top of our atmosphere and experiences aerodynamic drag. Eventually, this brings it down."

Indeed, mission planners expect NanoSail-D to return to Earth, meteor-style, in 70 to 120 days.

If this works, NanoSail-D could pave the way for a future clean-up of low-Earth orbit. Drag sails might become standard issue on future satellites. When a satellite's mission ends, it would deploy the sail and return to

Earth via aerodynamic drag, harmlessly disintegrating in the atmosphere before it reaches the ground. Experts agree that something like this is required to prevent an exponential buildup of space junk around Earth.

Alhorn and colleagues will be monitoring NanoSail-D in the months ahead to see how its orbit decays. They'd also like to measure the pressure of sunlight on the sail, although atmospheric drag could overwhelm that effect.

No matter what happens next, NanoSail-D has already made history: It has demonstrated an elegant and inexpensive method for deploying sails and become the first sail to orbit Earth. Eventually, the team will diagnose the sail's reluctance to leave FASTSAT—"and then we'll be batting a thousand,"