

Nova Notes

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



Volume 32 | Number 6 | December 2001

PO Box 31011, Halifax, Nova Scotia, Canada B3K 5T9 www.halifax.rasc.ca halifax@rasc.ca

In This Issue...

Astrophotos of the month.....	1
RASC Executive Reports	2
Membership Survey Report	3
The Sundial at Montegufoni, Italy – Dave Chapman	4
Astro Ad.....	5
eyesUp!.....	6
Oct. 2001 Meeting Report – Pat Kelly	7
EQ-1 Mount Review – Paul Evans	8
Nov. 2001 Meeting Report – Pat Kelly	9
Saint Croix Observatory Information.....	11
Upcoming Meeting Information.....	12



DT

Note about Darren's Pictures

I submitted the shots to spaceweather.com and they replied back exclaiming "WOW! Excellent shot, we're posting it now, thanks!" and the next day I was receiving an email about every 15 minutes on average from people all over the world, congratulating me, asking me about the fireball, if it made any sound, what the exact time was, or where they could obtain a copy of the photo etc etc. A few days later, Paul Heath and Keith posted on the listserv about NASA using the picture on their website. I was pretty happy and excited that the shot was gaining exposure on such high profile websites. - Darren ☆



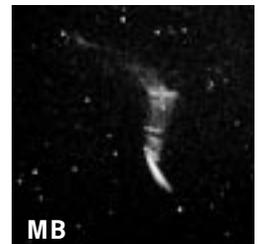
MB



DT



MB



MB

Astrophotos of the Month Darren Talbot, Michael Boschat 2001 Leonid Meteor Shower

The camera specs are: Pentax ME Super SLR camera, with a 28mm wide angle lens @ f/2.8. The fireball and dipper shots were taken on Kodak P1600 slide film that Dave Lane loaned me when we were out at the SCO. Both shots were approx 2-4 minutes long. – DT

All photographs from St. Croix Observatory using various exposures—film used was Kodak Gold 400 ASA and my old Soviet Zenit-B camera with a 50mm f/1.7 lens. – MB

RASC Executive Reports

Librarian

Mike Falk

Since the instituting of our new mobile library system, based on Steve's Cart, books have been made available for browsing and loans to members at all RASC meetings. As a result, business has been brisk.

A total of 34 books have been borrowed during the twelve months ending in September 2001, compared with only 2 over the previous year. So, after a longish gap, RASC library is up and running again.

Stop by the Cart and browse! ★

Secretary

Steven Tancock

The Halifax Centre has settled nicely into its new home at St. Mary's University.

There were a few more changes to come. At the beginning of the year we held an extra meeting of the council to organize a new format for our main meetings. We wanted to do more for members, and encourage attendance of old and new members alike by appealing to what they like. Another goal was to improve the interaction between members and the council. It seems to have worked – the meetings are much more active in conversation and attendance than last year. Our membership has also grown to 180 despite the move.

The new Members' Night observing sessions started by our observing chair Paul Evans have really taken off—they have become permanent—and with a good turn-out the observing space gets tight. In fact, I have heard on a few occasions during a meeting or event people asking when are we going to build another roll-off observatory?

There was a loss in the centre this year, long-time member Graham Millar passed away

July 27, 2001. He will be missed.

Nova East was a success for the second year back in Nova Scotia. There were lots of interesting talks and the nights were clear at least some of the time.

Awards were all around the Halifax Centre this year. I'm sure we are all proud of our fellow members and their accomplishments.

Congratulations again to:

Michael Boschat (*Ken Chilton Prize*)

Past centre member Dan Falk (*Simon Newcomb Award*)

Blair MacDonald (*Burke Gaffney Award*)

David Turner (*Service Award*)

The Leonid shower was a real entertainer this year, with peak ZHR counts in the 180 to 260 range. Stories and pictures of a –13 mag fireball, as well as reports of noises coming from St. Croix between 3 and 6 A.M. that sounded like screams and howls.

Our meetings were as follows.

January: Paul Evans, Astronomical Observing Projects, and Canada & the ISS Video.

February: Dr. Francine Marleau, Galaxy Formation and the Origin of the Hubble Sequence.

March: Aidan Keane, Relativity and Black Holes.

April: Jeff Kowalski and Kevin Casteels, Time-Lapse Photography & Animation in Astronomy, and Dave Lane, Work Shop Report.

May: Gary Welch, Interstellar Gas & Galaxy Evolution.

June: Dwight Whynot and Jill Johnston, Minas Basin Pulp & Power, and Pat Kelly, Who Wants to be a Gazer.

September: Dan Falk, The England of Isaac Newton, and Members' Nova East reports.

October: Blair Macdonald, CCD Image Processing.

November: Dr. Bob Garrison, Bizarre stars I've Known.

December: Dr. Roy Bishop, Rainbows. ★

Treasurer

David Lane

(as of November 20, 2001)

2000/2001 has been another great financial year for the Halifax Centre and a routine one for its treasurer. I have now completed four years as your treasurer, however this is my last full year – Paul Evans will be taking over on January 1, 2002.

At our September 30th year-end, we had a surplus of \$2,704.39. Membership levels have increased slightly over last year – at year-end our membership stood at 180 paid-up members. Counting the observatory, we are now worth (at least on paper) \$40,181.21 and have no significant liabilities. Below are some explanatory details pertaining to the Income Statement and Balance Sheet.

Respectfully submitted,

Dave Lane, Treasurer

Details of the 2000/2001 Income Statement

Revenues:

Membership Fees \$2587.23: Membership fees were up slightly from last year.

Life Members Grant \$448.00: Our grant from National Office was up slightly due to the fee increase, but actually represents 3 fewer life members.



Nova Notes

The Newsletter of the
Halifax Centre of the RASC

PO Box 31011
Halifax, Nova Scotia
B3K 5T9

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

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.

"Letters to the Editor" or letters to our resident expert "Gazer" are also most welcome.

Contact the editor at the following:

Michael Gatto
michael@allura.com
453-5486 (Home) 482-1013 (Work)

Nova Notes is also available as a PDF file on our centre's website at www.halifax.rasc.ca

Material for the next issue should reach the editor by Jan. 25

Donations and Observatory Donations

\$535.00: The centre received these generous donations from its members.

Interest \$113.24: This was earned mainly in our money market mutual fund, which included the final quarter of the previous fiscal year but not the interest received during the final quarter of this fiscal year. Our bank account earns very little interest.

Handbook Sales (net) \$326.71: Handbook sales were up about 40% over last year.

Sales of Merchandise (net) \$1135.43: Merchandise sales were up nearly 300% over last year, with Observer's Calendars being our best seller. This year's figure includes \$265 realized from the sale of surplus telescope equipment to members.

Nova East (net) \$247.64: Nova East made a modest profit this year, despite higher than usual expenses associated with bringing in a speaker from Ontario. Following a motion of the executive at its September 1999 meeting, two-thirds of this profit is to be recorded as profit earned by the other two astronomy clubs that co-hosted Nova East. Ordinarily, the RASC would have paid this profit to these clubs, however neither the Minas Astronomy Club nor the Nova Central Astronomy Club have bank accounts. See Assets – Cash below.

Expenses:

Meetings and Newsletter \$1294.57: \$162.60 was spent on our meeting treats, prizes, and meals for out-of-town speakers. Nova Notes cost us \$456.21 to print and \$661.97 to mail to our members.

Office Administration \$184.12: This includes the cost of postage for routine correspondence, office supplies, and the rental of our post office box.

Legal Expenses \$25.00: This is the annual fee paid to the Provincial Government to maintain our registration under the Society's Act.

Educational Activities \$46.00: This was for the printing of our Centre and "Getting Started in Astronomy" flyers.

Insurance \$519.00: This is entirely the insurance for the observatory.

Observatory – Operating \$288.63: This figure includes the \$1 annual land lease and some operating expenses such as gas for the generator, propane for the furnace, and

bug spray! Also included are the property taxes, which amounted to only \$23.52.

The council also decided to give Jamie Carmichael, the St. Croix Dam caretaker, a gift certificate of \$100 value to thank him for keeping an eye on the observatory for us. Capital spending that has been expensed on the observatory has totalled \$19,584.01 since the project was started in the spring of 1996.

Miscellaneous Expenses \$331.54: This item is mostly travel expenses for sending our National Council Representative to Toronto for two meetings.

Details of the 2000/2001 Balance Sheet

Assets:

Cash \$4464.36: This represents the cash balance at the TD Bank in Halifax on September 30, 2001 (but not including the profits from Nova East attributed to the Minas Astronomy Group and the Nova Central Astronomy Club, see below).

Cash – Nova East Profits \$481.39: This represents two-thirds of the profits from the 2001 and 2000 Nova East star parties which are attributed to the Minas Astronomy Group and the Nova Central Astronomy Club (see Expenses – Nova East above). This profit is currently held in our regular TD bank account but recorded separately within our accounting system.

Undeposited Funds \$127.00: This represents cash and cheques that were on hand but not deposited at year-end.

Merchandise Inventory \$1415.39: This consists of our inventory of 23 T-Shirts, 15 BOGs, 78 2002 Calendars, 40 centre Pins, 5 bumper stickers, 100 RASC stickers, 20 RASC embroidered crests, and 6 Star chart place mats.

Investments \$2000.00: The Halifax Centre holds a money market account with the TD Bank.

Accrued Interest \$565.11: Accrued interest on our money market account as reported on four quarterly statements from the TD Bank. This includes income from the last quarter of the previous fiscal year but does not include income from the last quarter of this year since it was not known at the time that the statements were prepared.

Estimated Library \$3076.60: Our library's value is probably an estimate of all money

Membership Survey Report

by Pat Kelly, First Vice-President

You may recall that the centre executive recently did a survey of the membership on the subject of the monthly centre meetings. There had been some concern, especially with the change to the new location at Saint Mary's University that there might be a drop-off in attendance. Hence, a survey to see how members felt about various aspects of the monthly meetings.

In one way, the survey appeared to be unnecessary in the sense that in the period leading up to the survey being distributed, attendance at the monthly meetings steadily increased, and for several recent meetings, we have been hard pressed to find a seat for everyone! Nevertheless, the executive will be looking at the results when planning future meetings.

In addition to the "raw results" that I have compiled, I felt that I would add comments for each of the questions.

As a reminder, here were the questions:

- 1. Are you a member of the Halifax Centre*
- 2. How often do you attend the monthly centre meetings?*
- 3. If you do not attend frequently, what are the main reasons when you do attend?*
- 4. Centre meetings are currently held on Friday evenings. Would you be more likely to attend meetings if they were held on a different night of the week? If so, what night(s) would you prefer?*
- 5. Do you think the centre should spend money to bring in external speakers (e.g. from other centres, universities)*
- 6. Are there any topics that you would like to see presented at a centre meeting?*
- 7. How do you find out about the monthly meetings?*
- 8. Can you think of any places where you think notices of centre meetings would be useful?*
- 9. What method do you prefer for announcements of centre events other than regular meetings?*
- 10. Do you know the people who are currently on the centre's executive?*
- 11. If you attend meetings, are the executive members easily identifiable?*
- 12. If you attend meetings, are the executive members approachable to answer questions?*

Continues on page 5

spent there since the beginning, including \$90.90 spent this year to purchase four new books. Its also includes \$356.20 spent on materials to build the portable library cart.

Observatory Equipment \$8191.36: This year \$400.00 was spent to purchase a used Celestron 6" Dobsonian telescope and \$83.15 was spent to upgrade the 10" Halverson

telescope. We also removed the Celestron 80mm refractor (it was sold to a member) and the Intes 6" Maksutov (it was returned to the original donor) from our inventory.

Estimated Miscellaneous \$452.54: These other holdings of the Centre were unchanged this year. Historically, \$250 has included a slide projector, a mirror grinding apparatus,

and some slides and material available for use at the planetarium.

Liabilities:

Accounts Payable \$176.55: At year-end, the centre owed the National Office for stickers and crests that were received during Sept. 2001. ☆

ROYAL ASTRONOMICAL SOCIETY OF CANADA, HALIFAX CENTRE

Comparative Income Statement for 1999/2000 and 2000/2001 Membership Years

	Year Oct 2000 to Sept. 2001	Year Oct 1999 to Sept. 2000	Increase over 1999/2000
REVENUE			
Membership Fees	\$ 2,587.23	\$ 2,457.35	\$ 129.88
Life Members Grant	448.00	446.40	1.60
Donations and Obs. Donations	535.00	372.69	162.31
Interest	113.24	107.44	5.80
Handbook Sales (Net)	326.71	232.43	94.28
Sales of Merchandise (Net)	1,135.43	364.51	770.92
Nova East (Net)	247.64	474.45	-226.81
Miscellaneous	\$ 0.00	\$ 0.00	\$ 0.00
Total Income	\$ 5,393.25	\$ 4,455.27	\$ 937.98
EXPENSES			
Meetings & Newsletter	\$ 1,294.57	\$ 1,010.33	\$ 284.24
Equipment & Supplies	0.00	0.00	0.00
Office Administration	184.12	103.74	80.38
Legal Expenses	25.00	25.00	0.00
Educational Activities	46.00	0.00	46.00
Insurance	519.00	500.00	19.00
Awards & Donations	0.00	\$0.00	0.00
Observatory - Operating	288.63	434.54	-145.91
Miscellaneous Expenses	\$ 331.54	\$ 390.79	\$ -59.25
Total Expenses	\$ 2,688.86	\$ 2,464.40	\$ 224.46
NET INCOME	\$ 2,704.39	\$ 1,990.87	\$ 713.52

Approved by:

"David Lane, Treasurer"

"David Tindall, President"

Comparative Balance Sheet for 1999/2000 and 2000/2001 Membership Years

	Year Oct 2000 to Sep 2001	Year Oct 1999 to Sep 2000	Increase over 1999/2000				
ASSETS							
Cash	\$ 4,464.36	\$ 1,896.18	\$ 2,568.18				
Nova East Profits (MAG/NCAC)	481.39	316.30	165.09				
Undeposited Funds	127.00	680.18	-553.18				
Accounts Receivable	0.00	77.40	-77.40				
Handbook Inventory	0.00	0.00	0.00				
Merchandise Inventory	1,415.39	1,423.45	-8.06				
Investments	2,000.00	2,000.00	0.00				
Accrued Interest	565.11	453.06	112.05				
Estimated Library	3,076.60	2,985.70	90.90				
Observatory Equipment	8,191.36	7,608.00	583.36				
Estimated Miscellaneous	\$ 452.54	\$ 452.54	\$ 0.00				
Total Assets	\$ 20,773.75	\$ 17,892.81	\$ 2,880.94				
LIABILITIES							
Accounts Payable	\$ 176.55	\$ 0.00	\$ 176.55				
Est. Handbook Payable	0.00	0.00	0.00				
Fees owed to National Office	0.00	0.00	0.00				
Other Liabilities	\$ 0.00	\$ 0.00	\$ 0.00				
Total Liabilities	\$ 176.55	\$ 0.00	\$ 176.55				
EQUITY	\$ 20,597.20	\$ 17,892.81	\$ 2,704.39				
Observatory Investment to Date	\$ 19,584.01	\$ 19,584.01	\$ 0.00				
Approved by:	"David Lane, Treasurer"	"David Tindall, President"					
MEMBERSHIP							
	1995	1996	1997	1998	1999	2000	2001
	123	127	135	164	157	164	180

The Sundial at Montegufoni, Italy

by David M.F. Chapman

Last summer's European vacation gave me a wonderful opportunity to indulge in one of my favorite pastimes: sundials. I see them everywhere I go, and I keep on finding new styles. The one near our vacation spot in Tuscany was no exception: a beautifully maintained sundial painted on the sunny side of an old castle that is now a block of vacation apartments. The location was

Montegufoni, in the Commune of Montespetoli in the hills outside of Firenze (Florence). When I first saw the sundial, which bears the year 1699, I thought it was a more-or-less standard vertical dial, but when I looked again I realized that I did not understand the markings. I continued not to understand the markings until I returned home and sent a photo to my sundial buddy Steve Lelievre:

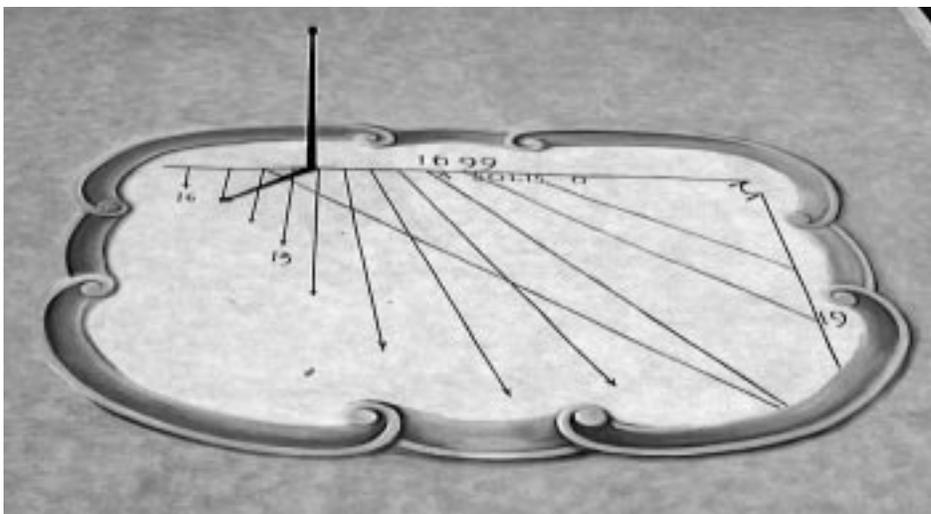
with some assistance, he finally decided that the dial was set up to indicate "Italian hours", which are the number of hours since sunset the previous day. (When I mentioned this to Dave Turner, he said "You mean, Jewish hours!", referring to the Hebrew calendar in which the day begins at sunset.)

I am not sure about the origin of the "Italian hours", but there is some discussion of this on internet sites devoted to sundial "furniture". (This is sundial jargon for the markings on the dial.) It may have something to do with

the Church: evening prayers, or “vespers” began one half hour following sunset. I could use some help with this!

Steve also pointed out that the markings on the dial were probably incorrect, as the hour marked “16” ought really to be marked “10”. One can imagine how this mistake could have been made by someone re-painting the markings without understanding their function. At any rate, the markings now make a little more sense, as the sequence of hours is 10–20, with the hours 10, 13 and 19 especially labeled.

I set out to validate the hypothesis of “hours since sunset”. The day was July 21, which happened to be my birthday (this is relevant!). The sundial was reading about 11:12 when I took the picture, but according to my digital camera, I took the photo at 2:54 A.M. “Wait a minute!” I hear you objecting, “How can the Sun be out casting a shadow at 3 o’clock in the morning? Easy: I set my digital camera clock back in Nova Scotia, on Atlantic Daylight Savings Time, and I did not bother to alter it when I flew 5 time zones East. It was actually 7:54 A.M. (Daylight Savings Time) in Italy, or 6:54 Standard Time. Oh yes, I forgot about my birthday: Normally I would have been on breakfast duty, but as it was my birthday I was relieved from this, so I took the opportunity to take a stroll with my camera to take sundial photos.



Astro Ad *Just in time for Christmas!*

For Sale:

Meade 8" Schmidt-Cassegrain telescope Model 2080, with tripod, finder, some eyepieces, and a carrying case. Asking \$1,200 or best offer.

Call Robert Riendeau at 827-2321 (Porter's Lake)

Now back to the sundial. The position of Montespertoli from the atlas is North 43.38 degrees, East 11.04 degrees. From the Observer's Handbook, the interpolated sunset time for July 20 at that latitude is 7:35 P.M.; however, this is local solar time and to get Standard Time we must add 16 minutes to account for the location being 4 degrees West of the Standard Meridian for the time zone. Sunset was at 7:51 P.M. Standard Time.

The sundial reading was 11:12, but we must correct for the Equation of Time. On this date of the year, sundials run 6 minutes slow due to the combined effects of the tilt of the ecliptic and the elliptical nature of the Earth's orbit (you can read all about this in the Observer's Handbook). So, the corrected sundial time is 11:18 after sunset the previous night, or 7:09 A.M.

My digital time was 6:54 and my sundial time was 7:09, a difference of 15 minutes. Who am I to quibble over a quarter of an hour, on vacation, on my birthday?

I am still puzzled why anyone would want to set up a sundial this way, and I am a little glad that it did not catch on. It was fun to work this all out and validate that the markings were indeed “Italian hours”, but I know what you are thinking: That Dave Chapman has far too much time on his hands! ★

Membership Survey Continued

Q1: 38 replies is close to one-quarter of the centre's membership. Such a high response rate is encouraging. All submissions were made by members. That was a bit of a disappointment as they had been circulated at two meetings and non-members were encouraged to submit one. Responses were split about 50/50 between printed replies and e-mail replies. (The e-mail replies had one big advantage: when it came to questions that asked for written answers, I did not have to worry about trying to read the handwriting!) Not everyone answered all questions, so you will find that the responses for some questions do not add up to 38.

Q2: It appears that many members try to attend at least a few meetings during the year. Distance from Halifax appears to be the biggest single reason for those who do not attend.

Q3: Obviously, good speakers are a main attraction for those who do not attend frequently.

Q4: Almost everyone who responded picked a single day of the week. A very few picked two different days, so I counted both. Two responses were of the form: “Any day except Friday” and “Any day except Friday or Saturday.” Rather than adding one to all of the other days, which might be misleading, I indicated these responses with negative numbers, which have not been subtracted from the positive counts.

Q5: Some people who answered “Yes” also wanted to ensure that costs were kept reasonable.

Q6: A bit of everything...

Q7: This question would have been a lot more useful if we had gotten replies from non-members. Nova Notes is obviously a vital way to keep members informed of centre events. Some of the “other” responses were rather unexpected!

Q8: There are some promising items here which I am following up.

Q9: I combined “e-mail” and “list server” and included several responses that were “electronic” or words to that effect.

Q10, Q11, Q12: Gee, what a great bunch the executive seem to be. Want to get in on the fun? There is always room for one more!
★

eyes Up!

eyes Up! is a forum for observing news from Centre members. This is where you can see what your fellow members have been looking at for the last two months and share your own latest discoveries.

News may include observing reports, observational project status, witnessed daytime or nighttime astronomical phenomena, new equipment reviews, or any other notes of observational interest.

Paul Heath—Lion's Roar

They gather in, in anticipatory quiet
Huddle close beneath the fires.
Each year, swept into the hollow,
In fear, in hope, to see the Roar.

A few sparks, the wind gusts
Fires stirred above.

They gather in, in nervous fear
Wrapped tight beneath the fires.
Drum beater joins,
Eyes dart round and round to seek the Roar.

Embers flash, wind blows
Fires stirred above.

They're gathered in, in watchfulness
Voices call beneath the fires.
Brownian seeking, eyes clicking
Veil fearing, turn and face the coming Roar.

Coals scatter, wind howls
Fires stirred above.

They're gathered in, in wonderment
Amazed beneath the fires.
Eyes locked, veil shrouding
They all behold the Roar!

Coals darken, wind calms
Fires quenched above.

They wander out, veil shrouded
Hollow swept clear by light.
Until, Time calls them again to gather
And watch the Lion Roar!

Walter Zukauskas—Leonids Report

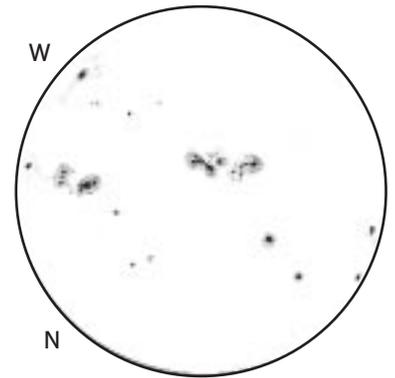
Went out 'gawking' for meteors from my back yard at Hubley, near Tantallon. Checked a few times during evening until about 12:30 A.M. – nothing unusual – a few meteors per hour. Skies nice and clear, frost all over everything (high humidity), no wind.

Between 5:00 and 6:10 A.M. counted 114 meteors in 32 actual minutes of observing,

9692



9690



for an hourly rate of 210. Occasional cloud and haze interfered, but my limiting mag. was about 5.7 or fainter under the best conditions.

Loved all the bright ones, and the fireballs. All of NS must have seen the "Big One" – I suspect the one I saw was the same as seen from SCO. Mine travelled from S to N, was strongly coloured, finished off in a blaze of glory, and illuminated the landscape.

I told Theresa I would wake her for the finale, and she in turn suggested I be very careful about waking her at 5 A.M. I decided – for self-preservation – that one meteor every couple of seconds would be the criterion. Well, we got to one every 20 seconds, and she got her sleep.

Roy Bishop—Observation of Comet C/2000 WM1 LINEAR

(Extracted from email thread on Halifax RASCals list.)

Tonight (Monday) I had a more careful look at the comet and it certainly DOES have a tail. Craig [Levine] was right. The tail must have been there two nights ago. I apparently missed it because I did not scan at low power, and perhaps I was in a hurry to get back to looking for Leonids!

Tonight the tail extended visually about 0.6 degree, at P.A. near 300 degrees. It is moderately broad but not fan-shaped. Very likely the tail as we see it is considerably foreshortened because the comet is near "opposition".

(I was using my 444 mm telescope at 57x and 124 x, without a filter.)

Using binoculars I threw the nearby stars out of focus until they resembled the comet, and located a star that appeared about equally bright. This gave a magnitude estimate of about 6.3.

Michael Gatto—Solar Observing, Nov. 10

One of the best things I looked forward to in buying a house this year was the ability to go into the backyard and do solar and lunar observing. (The apartment we moved from had a North facing balcony.) This weekend I got the chance to do some solar observing and I was not disappointed. I observed the Sun on Saturday for around an hour and a half with my 6 inch dob and a bader solar filter. I hadn't done a lot of solar observing before, but the seeing was better than I have ever experienced. Not only could I see lots of spots – and there were a lot – but I could also clearly make out white details on the surface. They could best be described as "cracks" or "spider webs" that in some cases connected one spot to another. I'd never been able to pick these up in my scope before. (After some digging since then I have come to find out they are called Faculae.) They were more visible near the limbs where the sun looked darker than it did towards the centre.

The extremely steady air and numerous sun spots inspired me to do some sketching. I did a detailed drawing of the whole sun, as well as detailed drawings of the 2 main sun-spot groups, 9690 and 9692. See sketches above.

You may forward your submissions for eyesUp! to Paul Evans by email, mail or phone:

Email evans@hfx.eastlink.ca

Phone 902.423.4746

Mail 26 Carrington Place, Apt 403
Halifax, Nova Scotia B3S 1J8

October 2001 Meeting Report

by Pat Kelly

We had another packed house for the October meeting. As David Tindall was away on business, this reporter got to exercise his power as First Vice-President and preside over the meeting. There were some who immediately noticed the difference in management style, as David does not normally get everyone's attention at the beginning of the meeting by pounding his Swiss army knife on the table. Bwaaahaaahaaa!

Elsewhere in this issue, you should find the results of the recent membership survey. One result that you will not find there is answer to the really important question: Who won the T-shirt that was being offered as a participation incentive? The draw was held at this meeting, but we first had to find someone to pull the lucky contestant's name from the magic grocery bag. It had to be someone of unquestionable honesty and impeccable character—which ruled out the members of the executive! A suitable candidate was found in the audience and the lucky winner was Darren Talbot. There were protests from some who claimed that to collect the prize, Darren had to be at the meeting, not out observing at St. Croix!

Before the main presentation, there was one other item of business that needed to be dealt with. In addition to being our main speaker, Blair MacDonald was also the recipient of this year's Burke-Gaffney Award, which is given annually to writer of the best article in Nova Notes. Blair won the award for his articles on digital image processing. He received a nice certificate, and a copy of the book "The Backyard Astronomer's Guide" by Terry Dickinson and Alan Dyer. Blair noted that the cover may have depicted the view from a back yard, but it certainly was not the view from his!

Blair then proceeded with the main presentation which was on the subject of CCD (Charge-Coupled Device) cameras. Blair started with a basic description of how a CCD camera works. The main factors which affect the performance of these devices are: chip quality (most cameras no longer have this as a problem); readout noise from the circuitry that transfers the signal from the camera to an external device; and temperature (the colder the camera, the better).

The holy grail of CCD imaging is to get a

high signal-to-noise ratio. In order for a star to be detectable, it has to have a signal strength that is at least three times that of the average background noise. If the signal-to-noise ratio is not sufficiently high, it also limits the amount of image processing that can be done later.

There are several sources of noise. Readout noise, previously mentioned, is a constant and limits the length of the shortest exposures that can be taken. Photon noise is caused by extraneous light entering the camera. Skyglow, is a major source and the more "stray" photons that enter the camera, the more noise there is. This source of noise also has an effect on the length of the longest exposures that can be taken. Thermal noise is caused when pixels in the camera capture electrons as a result of thermal energy due to the camera's temperature. This source of noise can be reduced by a factor of two, for every 7°C drop in the camera's temperature. For this reason, CCD cameras made for amateur astronomy are cooled, either with electronics, or dry ice.

One of the way to limit the noise is to take a series of short exposures and add them together using a computer. We saw an example which compared a single 0.25 second exposure of Jupiter, with an image made by adding together 25 separate 0.01-second exposures. There was a lot of extra detail visible in the composite image.

Blair also mentioned that there is a certain amount of image processing that is required just to remove or correct various artifacts that occur in the camera system. One example is that not all of the individual pixels in the camera are equally sensitive to light, so there is an operation that has to be performed on any image to correct for this. He showed us two images of a galaxy, one which was the raw data, and the other with all of these corrections applied to it. There was an amazing difference in the two images.

CCD cameras are prone to several problems that do not affect conventional film photography. Due to the extreme sensitivity of a CCD camera, any vibrations made during an exposure will be obvious in the final image. Film, with its much slower response to light, is a more forgiving medium. CCD cameras are also difficult to focus. Using a conventional camera, the user is able to look out through the lens system and bring the object into focus before releasing the shutter. With a CCD camera, this is not possible so images have to be obtained from the camera, the focus adjusted and another image taken. The

process is something like this:

```
REPEAT
  get_image(CCD_camera);
  view_image(monitor);
  note_focus(monitor);
  CURSE;
  adjust_focus(knob)
UNTIL (FOCUS) OR (TIME_WASTED>10)
OR (NO_UNUSED_CURSE);
```

The focussing process can be made easier with the use of a Hartmann mask. It is similar to an aperture stop as it covers the front of the telescope with an opaque cover, but it has two circular openings. When the camera is out of focus, the circles of light that shine on the CCD chip show up separately; when the system is in focus, they overlap perfectly.

Another, similar, technique looks at the diffraction spikes coming from the image of a bright star. Blair made a cross-shape diffraction tool from an old coathanger. The tool is placed in front of the optical system. When the system is out of focus, each of the diffraction spikes is doubled, when it is in focus, they show up as single spikes. Blair told us that he has found this method the best, in terms of its repeatability, and that until he had come across this technique, he had been unable to get any decent planetary shots.

The inability to look through a CCD camera system to adjust the focus also introduces another problem, namely ensuring that the telescope is actually pointing at the target object. This problem is exacerbated by the fact that a CCD camera can only look at a small part of the sky, compared to a regular camera. You have to have the telescope very close to the actual target, to even have it show up in a CCD camera. Again, there is a standard protocol that is used:

```
REPEAT
  get_image(CCD_camera);
  view_image(monitor);
  IF OBJECT_NOT_VISIBLE OR
  NOT_ALL_VISIBLE THEN
  BEGIN CURSE;
  calculate_scope_move
  (SkyAtlas_2000);
  move_telescope(right_ascension);
  move_telescope(declination)
  END
UNTIL (IMAGE_CENTERED OR
(TIME_WASTED>10) OR
(NO_UNUSED_CURSE));
```

Colour images can also be produced by CCD cameras. Colour CCD cameras are beginning to become available on the market,

but they have their own problems. Their biggest drawback is a greatly reduced resolution caused by the need for pixels that are sensitive to blue, green, and red light. This is accomplished by making every third pixel sensitive to a different colour of light.

The preferred method is to use a black-and-white CCD camera and take three exposures of the same object, with each exposure being made with a different colour filter in front of the CCD chip. Software is then used to “overlay” the red, green, and blue images to produce a colour image. This may sound straightforward, but again there are problems. CCD chips are not very sensitive to blue light so the image made with this filter comes out too faint and must be corrected. Similarly, a normal “red” filter lets through a lot of infrared radiation, to which normal film (and the human eye) do not respond, the same cannot be said of CCD chips, so the red image ends up being too bright, again requiring correction.

According to Blair, the ultimate challenge for using a CCD camera is to obtain an image of any celestial object that span a considerable angle on the sky. Since CCD cameras only let you image a small part of the sky, large objects must be imaged as a mosaic of smaller, overlapping images. To pull one of these off requires good calibration, preferably a computer-controlled telescope, good image processing software, and, most of all, a lot of patience. He treated us to a composite picture of the Andromeda Galaxy, which was made from a 5X5 mosaic of smaller images. He also had produced a 5X4 mosaic of the Virgo Cluster, in which 12 galaxies were visible. (At least Blair claimed that you could see 12 on the computer monitor; the data projector in the room has a lower resolution and some of them did not show up.)

Despite all of the hurdles involved in CCD photography, there is one benefit which definitely makes up for the complexity of the process: the ability to do astrophotography from the city. The view from Blair’s backyard includes a container pier, an apartment building parking lot, a house, and a large number of trees. His observing is done in a narrow strip of southern sky in which, on a good night, you can see down to third magnitude. The CCD camera allows him to “subtract” the light pollution from the image, permitting him to produce beautiful images

such as the ones he shared with us.

After the treat break, Paul Evans continued with the “What’s Up” talk. The main areas that he covered were the joint appearance of Mercury and Venus in the morning sky later in the month, the coming Orionid and Leonid meteor showers, and an upcoming double shadow transit on Jupiter.

He continued by showing those assembled, two new telescopes that the centre had purchased to loan to novice astronomers. There are two, a 6-inch Dobsonian, and an “Astrosca” clone from National Geographic. Each comes equipped with a good star atlas, a finder, and several eyepieces.

The last presentation of the regular meeting was Clint Shannon who wanted to show everyone how an airline safety feature could be used to protect telescopes during public observing sessions. He came up with the idea during a sidewalk astronomy session where there had been a few near misses between telescopes and members of the general public. Paul Evans admitted that he had actually managed to walk into his own telescope. Clint’s solution to the problem was a plastic film container that had a battery, a red LED and a circuit to flash the LED at regular intervals, just like the navigation lights on aircraft. The finishing touch was a bit of Velcro, one piece goes on the bottom of the film container and the matching piece goes somewhere on the telescope.

After things were cleaned up, it was off to observatory for a quick peek at the heavens. We trooped over to the elevator, and had so many people we had to go up in two carloads. Once there, the sky was still clear, but we ran into an unexpected problem with the telescope. The computer that is used to control and guide the telescope runs a copy of Dave Lane’s Earth-Centered Universe and appeared to be malfunctioning. Dave Lane said that it must be a problem with the Windows system, as he wrote the rest of the software himself! Despite rebooting the machine there was still no luck, so we were unable to use the scope that evening. After most of the people had left, it was determined that the likely cause of the problem was a faulty board in the “black box” that converts the signal from the optical data encoders on the telescope into the signal that is sent to the computer. Hopefully we will get a second chance at a future meeting. ✪

A Short Review of the EQ-1 Mount

Paul Evans

I’ve been keeping my eye open for an equatorial mount for my small refractor for some time. My telescope is an Omcon 708 80mm f/7 refractor. The weight of this scope is around 4 pounds depending on what accessories are attached.



My original mount was a sturdy set of tripod legs with a Manfrotto fluid video head. This arrangement works well for wide field views, however, for high powered views it was never easy to track an object smoothly.

While traveling recently, I had the opportunity to visit the show room of a Canadian telescope equipment retailer. While discussing available mounts with one of the sales staff, he suggested that I consider the EQ-1 mount. My research to date pointed to a much heavier mount. My initial opinion was one of skepticism – in particular since most advice I have heard or read is to buy the heaviest duty and highest quality mount you can afford.

Could this light weight mount possibly improve my mount situation?

A quick test helped bring me to start considering it. With a scope heavier than mine on the mount, the ‘tap test’ revealed good vibration dampening properties. The next factor was price. The mount, including tripod legs, was being sold for \$99 Canadian. This price is much less than what I thought I would need to pay. Since I was going to be in town for several days I decided to postpone the decision.

A quick online search revealed that a similar price is available from other retailers as well. A search of some message boards revealed some general satisfaction from users of this mount. My intention is to use this mount for visual observing only. This mount is not appropriate for photography/imaging purposes.

The next step, I decided, was that I should carefully kick the proverbial tires on this mount. I went back to the store and took about a half an hour to exercise this mount and decide if I would be happy with it. On the mount was a scope a couple of pounds heavier than mine. In the end I bought the mount, and here are the observations I have to share about it.

Once properly balanced, I could loosen the Right Ascension and Declination locking screws and start pointing the mount. It moved smoothly and would stay pointed wherever I let go.

The mount has two holes where tube rings can be attached. A 1/4"-20 adapter is available. A quick release mechanism would make this mount more user friendly and allow for quicker set up. There are slow motion controls for both the RA and Dec axes. The RA slow motion control can be flipped to either side.

An electronic drive is available for this mount (I do not have any first hand experience with this drive however).

The counter weight bar has a lip at the bottom that prevents it from dropping onto unsuspecting toes (not to mention leaving the telescope unbalanced which could lead to it being damaged).

The declination axis slow motion control is a spring loaded screw mechanism, which means there is limited travel. I estimate that the travel is between 20° and 25°. I do not view this as a significant limitation since most adjustment will be in RA, however, this may be a concern for some.

This scope does not have a polar alignment scope, or a hole through the polar axis in order to be fitted for one. However, after a couple of observing sessions I found that I was able to do a rough polar alignment that was sufficient for visual observing very quickly.

The locking mechanism for the RA and Dec axes are screws with wide flat heads that are easy to hold. I worry that when I stop using the slow motion controls that I will forget to loosen the locking screws before aiming the scope. I really do not want to strip the casting that holds the locking screws since I can see no way of ever fixing that. I am not sure if this is something to worry about or not? I suspect this issue also exists with mounts that are much more expensive.

The part I was the least happy with on my initial inspection is the tripod. The legs are made of light metal, I suspect that these would be the primary source of what vibration there is. One point of particular annoyance is the metal accessory tray. The tray is attached to flanges on the tripod legs using screws with two washers and a wing nut. Trying to screw on three sets of these small metal bits in the dark would be an efficient recipe for frustration. In terms of the usability of the scope I think this is the biggest issue. I can not leave the tray off since it is necessary for the stability of the tripod legs. Before buying it I thought of a couple of options on how to improve this.

What I decided to do was modify the flanges that the tray connects to. Each flange has a slit 3 cm long that is wide enough for the metal screws to pass through in order to attach the tray. What I did was use a 'Dremel' type tool to widen the outside end of the this opening to make a hole large enough to allow the screw head and washer to pass through. In order to set up I leave the 3 sets of screw/washers/wingnut on the metal tray. I just need to loosen the wingnut and pass the screw head and washer through the new widened end. Then by sliding the tripod leg out, the screw head and washer slide down to the narrow part of the slit where it can be hand tightened. This means there are no loose bits to fiddle with – therefore resolving my worry. Another minor alteration I prefer is to flip the metal tray upside down. The metal tray has a small ridge that folds down on each of the three edges. By flipping the tray upside down these ridges now go up – which will help keep things from rolling off that don't fit into the precut accessory holes.

As mentioned previously, the tripod legs are the least sturdy part of the mount. After using the mount for a period of time I may decide to replace the tripod legs with a nice set of wooden legs like those available from Naturewatch (www.naturewatchshop.com).

Once out in the field my general feeling is that this mount is a good fit for my scope. It isn't a massive mount and I like that. This mount with my scope is stable. A solid tap on the side of the optical tube assembly settles in under a second or two, even with the cheap metal tripod legs. As mentioned earlier, when the telescope is properly balanced I can point it in any direction and once I take my hand off it just stays there. I only need to tighten the locking screw in order to

use the slow motion cables and prevent it from moving if bumped.

This mount was cheaper than my previous mount setup but it is far superior. I had originally expected to spend much more money for a solid mount suitable for visual observing. In the future I may decide to upgrade to a much more substantial mount in order to support heavier accessories as well as motor drives. For now, however, this no-frills mount suits my needs for visual observing with a small telescope. ✪

November 2001 Meeting Report

by Pat Kelly

Our esteemed president David Tindall kicked off the meeting accompanied by a surprise musical fanfare – the result of a Windows computer being booted with the volume up too high. He made a point of thanking everyone who had turned out for the meeting instead of going to the premiere of the Harry Potter movie! As we had a packed program for the evening, he immediately got down to business and called the centre's annual meeting to order. He pointed out that at the October executive meeting, which he had been unable to attend, the executive had decided that only he and the treasurer would make reports at the annual meeting, while everyone else would submit reports to Nova Notes. While the cats away...

David reviewed the year's major highlights, which covered a variety of subjects: moving the centre's monthly meetings from the Nova Scotia Museum to Saint Mary's University; an informal executive meeting aimed at revitalizing the format of the meetings (changes were implemented with a lot of positive feedback); the introduction of Members' Nights at the St. Croix Observatory; another successful NOVA EAST; and the formation of a light pollution abatement committee. David had to reiterate that statement, as he keeps forgetting the "abatement" part of the committee's name. After all the committee is supposed to try and get rid of light pollution, not make more!

He was able to draw out his report long enough so that David Lane, who had thought

the annual meeting would be after the refreshment break, would have enough time to reconfigure several computers and their connections to the data projector, as well as power to the overhead projector, etc. It reminded me of a scene from one of the early episodes of *Star Trek: The Next Generation*, where Data had to put all of the isolar chips from the warp drive computer back in the correct sequence! David (Lane) presented the financial report, which you will find elsewhere in this issue. I am not sure if it is a good sign, but Ian Anderson, this year's auditor, was making notes to himself throughout Dave's entire presentation!

Lastly, we had an introduction to the members of next year's centre executive. David (Tindall) pointed out that some people were being reused, some were being recycled, and that we actually had some new faces as well, which is always good news.

This scribe did the handbook talk on the subject of the nearest stars. I did have some people fooled when I started by putting up a transparency of the handbook's index, not to do talk on the index, but to show where it was in this year's issue. Munchies time!

After the refreshment break, David Tindall introduced the main speaker for the evening. Dr. Bob Garrison is currently the national president of the RASC, and so far during his term has visited 20 of the society's 26 centres. His visit to our centre was part of a tour of the four Atlantic centres.

Dr Garrison is now professor emeritus at the Department of Astronomy and Astrophysics at the University of Toronto, having retired this summer. During his career he published over 150 papers and two books. He taught the first Life in the Universe course in North America (over 25 years ago) and always had a full class of 200 students plus many on a waiting list! He always enjoyed his work, and saw spectroscopy as a method to learn about the 'personalities' of individual stars. Using this tool, he also was able to discover quite a number of 'peculiar' stars. He said that it was not that hard to find weird stars when there are millions of stars to observe. The best way to start was with a survey of a particular type of star. The survey could be all of the stars at a single declination; all stars within a certain distance of the Sun; all stars with a certain surface temperature; as long as you looked at lots of stars.

Over his career he has discovered many stars that definitely qualify as weird. In

1973 he discovered a 'helium' star. Its spectrum showed lots of helium lines, but no sign of any hydrogen. He announced the results at a conference in India, and was being interviewed by a particularly keen reporter who understood the concept of hydrogen-deficient stars, but asked Dr. Garrison what he was going to do about the lack of hydrogen in this particular star!

Another discovery made by Dr. Garrison was, as he liked to call it, the People's CV. Most cataclysmic variable (CV) stars reach a maximum visual magnitude that rarely exceeds 14. His reached a brightness of 9.4, putting it well into the reach of amateur astronomers.

He also found aluminum oxide in the spectrum of Mira-type variable. (He described Mira-type variables as sinks for astronomers because they get into the field because of the strange properties of these objects, spend a lot of time studying them, but never learn much in the end.) He has also found stars with very strong barium lines, and Population II stars (the ones that are only supposed to have hydrogen and helium) with carbon lines.

He then showed some pictures of the various telescopes that he has used over the years. He has made many trips to Chile and over a 26 year period has obtained over 30,000 spectra of more than 10,000 stars. He has also used the David Dunlap Observatory. He noted that the surrounding municipalities have light pollution abatement ordinances which has resulted in no increase in the light pollution at the DDO. The telescope is still used every clear night, and the new operator is actually a RASC member who believes that she has died and gone to heaven!

Spectroscopy can also be used to determine the distance to a star that is too far away to have its distance measured by parallax. The technique is quite straightforward. First, you find a star whose distance can be found by parallax. By knowing its visual magnitude and distance, you can then calculate its absolute magnitude (the visual magnitude it would have at a distance of 10 parsecs). If you now find a distant star that has the same spectrum, you know that it must have the same properties, including absolute magnitude. By knowing its absolute magnitude and observing its visual magnitude, you can now calculate its distance. Refinements have been made to this method as the parallax data from the Hipparcos satellite now allows us to calibrate the spectra of stars out to a distance of 100 parsecs.

At this point, Dr. Garrison reviewed the classification system that is used to categorize stars, the MK process. A star is classified by comparing its spectrum to those of standard spectral types. One advantage of this system, is that it takes advantage of the human brain's tremendous ability to recognize patterns. (Think of how little data the brain needs to recognize the face of a friend – or an enemy – at great distances.) In fact, someone who has no idea what they are looking at can still classify stellar spectra!

He showed some examples of how the patterns change. These included all of the subtypes within the O-type stars (O5, O6, etc.) and one A-star subtype, going from luminosity class I (supergiant) down to luminosity class V (main sequence). He also shown a series of spectra of the L-class stars, ranging from L0 to L8. Oh, you have never heard of an L-class star before? That makes two of us! These stars are on the main sequence, but are cooler than M-type stars, with surface temperatures measured in hundreds of degrees. The reason they had not been seen before is because they are faint, very faint, 26th magnitude faint. To see them you need something like the Keck Telescope.

Dr. Garrison concluded his talk by stating that a large number of automated telescopes will soon be used to obtain the spectra of stars, and that these systems will produce a lot of data, which will also require a lot of pattern-recognizing brains to classify the results.

After a number of questions from the audience, the official meeting concluded. Those who stayed were treated to a travelogue of Dr. Garrison's trips to Chile. There were some spectacular pictures of the scenery, and instruments. There was limited wildlife but he had a picture of a fox that would always manage to spot him whenever he returned from a 2-km walk to the American residence. She would follow several metres behind him and when he reached the Canadian residence, she would be rewarded with an egg which she would pick up in her mouth and carry back to her den. We also saw a close-up picture of a condor. These birds have wingspans of five metres, and the number visible was actually used during the day to gauge the seeing for the coming night! The rating went from one condor (a prediction of very good seeing as there were very few thermals) to ten condor (poor seeing, many thermals). Two great talks from one person! What more can you ask for? ★

The St. Croix Observatory



The St. Croix observatory. Pictured from left to right, the RASCan, the warm room and the roll-off roof observatory.



The roll-off with the roof partially open.

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.

Members' Night

Every Friday night closest to the new Moon is Members' Night at St. Croix. The purpose of members' night is to attract members from the centre to share an evening of observing with other members. 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 Chairman Paul Evans at 423-4746. *Dates for Members' Nights for the following two months are:*

Sat. Dec. 15th (*One-time only Sat. date*)

Fri. Jan. 11th (*rain date Sat. 12th*)

Directions from Halifax

(from Bayers Road Shopping Centre)

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 can gain access to the St. Croix facility. For more information on becoming a key holder, contact the Observing Chairman Paul Evans at 423-4746.

Adventures at the SCO.

The Daryl Dewolfe Protocol

After Daryl announced on the email list that he would –gasp– skip the meeting and instead go observing at the SCO, fellow “slimeball observer” Darren Talbot joined in, dragging fellow slimer Gary Weber with him: *“I didn’t expect another slimeball meeting so soon. Wonder if other members will join us such as Gary Weber (voted Slimeball President for going to a RASC meeting THEN leaving mid-meeting to go observing) unlike myself and Daryl who just go observing not wanting to face the ridicule of the meeting mob.”*

In an attempt to correct the problem of members observing on meeting nights, there had been some discussion on the centre list server of making a motion to install floodlights and an electric fence around the SCO, with them set to be automatically activated on the evening of the third Friday of every month.

Dave Lane offered the following motion, which was seconded by Mary Lou Whitehorne. To purchase and install at St. Croix; (1) a programmable time-lock system to operate as follows: activated once per month, 10 months per year, on the 3rd Friday of each month at 7 P.M. local time, de-activated at 2 A.M. local time to following day. When activated, the unit emits a broad spectrum of visible light which will illuminate the ground to a level of at least 10,000 lux within 0.1 km radius of the observatory. (2) one electric fence and gate activated on same schedule as above.

Fortunately for some members, the *Daryl DeWolfe Protocol*, as it became known, was not actually approved!

Meeting Announcements

Halifax Centre of the Royal Astronomical Society of Canada



Due to the Holiday season the December Meeting of the RASC is traditionally moved up one week.

December 14

"The Rainbow: The Search for Understanding"

Roy Bishop

For centuries the rainbow has captured the minds of poets and philosophers, sailors and scientists. Seemingly too ethereal to be part of this world, rainbows are apparitions created by the interaction of light, water drops, and the observer. The unraveling of its secrets during the past 2,300 years has only enhanced the subtlety and beauty of the rainbow.

ROOM CHANGES

Due to the expected high attendance for Roy's talk, the December meeting will be held in room L170, with a capacity for 250 people! (Or it may have been moved because of something to do with the SMU exam schedules, who can say for sure?) The executive meeting will be held in L179.



January 18

*"A Date with the Stars:
the Astronomical Basis of the Calendar"*

Dave Chapman

Dave Chapman will review how our calendar evolved from early times, and how special dates are linked to celestial phenomena involving the Sun, Moon, and stars. Topics include: New Year's Day, Groundhog Day, Chinese New Year, Easter, leap years, May Day, St. John's Day, Hallowe'en, St. Lucy's Day, Christmas, and more...

Meetings begin at **8:00** P.M.

Members of the general public are welcome.

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.

Room 176 Loyola Building (December's meeting will be held in L170)

Saint Mary's University (See Map Below)

The Halifax RASC

Executive meetings

begin at 7:00 P.M.,

and members are

welcome to attend.



Executive Members

<i>Honorary President</i>	Dr. Roy Bishop	
President	Dr. David Tindall	455-7456
<i>1st vice-president</i>	Pat Kelly	798-3329
2nd vice-president	David Croston	477-5817
<i>Secretary</i>	Steve Tancock	465-4092
Treasurer	David Lane	826-7956
<i>Nova Notes Editor</i>	Michael Gatto	453-5486
<i>National Representative</i>	David Lane	826-7956
<i>Librarian</i>	Dr. Michael Falk	422-5173
Observing Chairman	Paul Evans	423-4746
<i>Councilor</i>	Clint Shannon	889-2426
<i>Councilor</i>	Dave Chapman	463-9103
<i>Councilor</i>	John Jarvo	897-0529

Meeting Location

Meetings are held every third Friday of the month, except for the months of July and August. Meetings take place in room 176, Loyola Building (#3 on map) at Saint Mary's University.

1. McNally
 2. Sobeys 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 Residence
- P = Parking

