Nova Notes

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

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Volume 37 | Number 6 | December 2006

HALIFAX CENTRE

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

PO Box 31011 Halifax, Nova Scotia B3K 5T9

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

Contact the editor at the following: *(New editor info to follow next issue, send stuff to me and I will forward it, MG)*

If you are a person who downloads the latest issue of Nova Notes off of the web to print it at home, then you may be interested in taking your name off of the mailing list for the printed version. If so, please email me at the address above with the subject line "Remove from mailing list" and you will no longer be mailed a paper copy.

The Murray Cunningham Astrophotography Award

The Murray Cunningham Astrophotography Award was established by the Halifax Centre in 2003 to promote interest among Centre members in astrophotography, including digital imaging. The award is named after Dr. Murray Cunningham, one of the centre's founding members and long-time Honorary President, who always displayed a sense of wonder and marvel when looking at the photographic achievements of Centre members. 2003's winner was Calem Ewing.

Rules

1. Subject: The award will be given annually for photographs and digital images taken in a given calendar year. While photographs and digital images will be considered, submissions must be in the form of a print (see Rule 3).

2. Eligibility: Any member of the Halifax Centre in good standing is eligible. Previous winners are eligible after a five-year lapse (i.e. the '03 winner's eligible for the '08 award).

3. Submission of Entries: A call for submissions will appear in the last issue of Nova Notes for each year. Entries should be submitted to the Centre's First Vice-President no later than the last day of February of the following year, or mailed to the Centre in an envelope marked "Attention First Vice President" postmarked no later than the last day of February of the following year. A maximum of three images may be submitted by each eligible member. Submissions may only be made by the person who actually set up the equipment and took the exposure.

Images shared at meetings, posted on personal or RASC web sites, or appearing in Nova Notes, are acceptable. Images which have been previously published (magazine, book, calendar, etc.) or otherwise have been widely circulated are ineligible.

Submissions must be accompanied by a brief description of the equipment and processing used in its production.

Submissions are to consist of a print, measuring between 5x7 inches and 8x10 inches. Commercial printing of negatives, slides, or digital images to the photographer's satisfaction is permitted.

4. Judging: The winner will be selected by a committee that will be chaired by the First Vice-President and consisting of three members of the Centre, appointed by the Centre's executive. Judges cannot be immediate family members of candidates. The committee chair will circulate the submissions to the other members of the committee, so that, as much as possible, the submissions remain anonymous.

Images will be judged based on composition, subject matter, aesthetics, and technical merit. If the judges feel that no suitable images have been submitted, they have the option of not granting the award.

5. Prize: The winner will receive as a prize one book, or telescope accessory, of the winner's choice, to a maximum value of $75 (including taxes)

The Burke-Gaffney Award

The Burke-Gaffney Award was established by the Halifax Centre to promote the development of the writing skills of non-professional members of the centre. The award also acknowledges the contribution of the centre's first Honorary President to the formation of the group and to his long and

tireless efforts to educate the public in the mysteries of astronomy.

Rules

1. Topic: Awards will be given for articles relating to astronomy, astrophysics or space science. Topics should interest average to well-informed amateurs and may be of current or historical nature.

2. Presentation: Articles should be no longer than 1000 words, written in proper grammatical form and presented typewritten and double-spaced. Diagrams should be complete and ready for drafting and photographs should, when possible, be submitted with the original negatives.

3. Eligibility: Any member of the Halifax Centre in good standing is eligible with the exception of those who are professional astronomers.

4. Judging: Articles will be judged on scientific accuracy, originality and with a strong emphasis on overall literary merit. Papers must demonstrate that the author(s) has/have read widely and has/have contributed some original thought to the discussion. Judging will be carried out by a committee consisting of the President, NOVA NOTES Editor and a third person appointed by the Halifax Centre's executive.

5. Prize: The award will be given once annually. The winner of the Burke-Gaffney Award will receive as the prize one book, of the author(s) choice.

6. Submission of Entries: All qualifying articles received and published in the preceding year's Volume Number of NOVA NOTES will be considered and judged for the award. Inquiries concerning the rules may be directed to the President.

7. Previous Awards: The Burke-Gaffney Award has been won on sixteen previous occasions:

1979 - Bill Calnen
1980 - Bill Calnen
1981 - Diane Brooks
1982 - Michael Boschat
1983 - Jennifer Wells
1984 to 1987 - no award given
1988 - Dan Falk
1989 - no award given
1990 - no award given
1991- David Fleming
1992 to 1993 - no award given
1994 - Dave Lane
1995 - Larry Bogan
1996 - Diane Brooks
1997 - Roy Bishop
1998 - Michael Boschat
1999 - Graham Millar
2000 - no award given
2001 - Blair MacDonald
2002 - David Chapman
2003 - Andrea Misner
2004 - no award given
2005 - no award given

National Council Report

Patrick Kelly

The RASC's National Council met on Saturday, November 4. I attended by teleconference. The phone system used this time was much better than the last time. Bonnie Bird, our executive secretary did not sound like a Cylon this time!

In order to make the meeting as productive as possible, reports from the various committees were circulated well in advance, and did not appear formally on the agenda unless there was a motion contained in the report. That left most of the time for discussing bigger issues. I think that the new format worked quite well.

News for Members

The RASC web site will undergo a major overhaul later in November. The new version will have a cleaner look, and should make the site a lot easier to navigate.

A proposal to distribute a monthly electronic newsletter was approved. It will contain news items from the RASC news part of the web site, as well as links to other items of interest to RASC members.

Now that the terms of reference for the Centre Project Fund have been approved and there are sufficient funds to start accepting applications, the two remaining trustees (in addition to the national treasurer) had to be appointed. Randy Attwood and Patrice Scattolin were appointed. They will serve until the 2007 General Assembly.

Speaking of General Assemblies, the 2007 G.A. is being held in Calgary. Normally the 2008 G.A. would have been approved at the 2006 G.A. but no Centres had put forward proposals to host it. It now appears that the newly-minted

Mississauga Centre, in conjunction with the Toronto Centre will be putting in a bid. Approval is likely to come at the next council meeting.

Money Matters

While the budget for the coming fiscal year is not normally set until the winter council meeting, this was the first time that the fall council meeting had a preliminary budget, based on the best available data and, in the case of items like publication sales of 2007 calendars and handbooks, best estimates. The Society is currently showing a deficit of $6,000, which the treasurer reminded us could easily be changed by the same amount one way or the other. Still, that is much closer to a balanced budge than in some recent years ($23,000 deficit in 2003; $40,000 deficit in 2004, and $4,200 in 2005). The 2006 figures will not be known with certainty until early in 2007.

The RASC does not currently earn a lot of income from its investments as they are in GICs. Investing 60% of them in a well-managed mutual fund portfolio will increase investment income in the long-term, which should also help to fund the large liability that the society has due to life memberships. We were assisted in the discussion by a professional financial adviser who joined the meeting by teleconference. This proposal was approved.

Cost of Membership

Another item that generated some discussion was the Finance Committee's determination of the "best guess" as the actual per capita cost to the Society of providing services to members. There are a wide range of services and varying ideas as to how to separate the membership cost from the numbers. The method used was described in the report of the Finance Committee: "Over the past few months, the Finance and Executive Committees have managed to agree on a process where some costs are negotiated, and others are determined by averaging results of conflicting opinions. This process does not yield a firm accurate number, but the result is informative when discussing topics related to membership cost." The numbers obtained ranged from $41.66 to $48.59 with an average of $45.95.

The Society portion of the membership fee is currently $33. This means, in spite of all the cost-savings measures implemented recently, that we still have a $13 per member difference between what the society receives from membership fees and what it provides. If we have achieved a balanced budget, that shortfall will be "made up" from the proceeds of publication sales. The Council will then have to decide whether the Society wants to use the publications revenue to keep membership fees low, or raise fees to cover more of actual membership costs. The latter would then mean more funds available for things such as updating computers system, repairs to the national office property, re-establishing the speaker exchange, providing support for GAs, etc.

RASC Governance Structure

There was a lot of discussion over the Society's current governance structure. The discussion focused on several areas.

Size: The Council can have, under "ideal" circumstances, 58 members. That means that it is difficult to get a consensus, and the society spends a lot of money for council meetings whether for travel or teleconferencing. When compared with most organizations, that number is very high. Most have executive bodies that have from 10–20 people. This means that one possibility would be to go with a Council that has some sort of regional representation, rather than the current system of having representation from each centre, or in some cases, more than one representative from some centres.

Role of National Council Representatives: It was noted that there is also some confusion as to the role of national council representatives. They are elected, not to represent their centres, per se, but to make decisions that are in the best interest of the society as a whole. It was noted that in many organizations, the membership is more concerned with results rather than feeling a need for individual "chapter" representation, and that is why most organizations have much smaller councils.

By-laws: The Society's by-laws often mean that required changes to the Society's operation require a long lead time, as much of the Society's procedures are prescribed by the by-laws. (If a decision requiring a by-law change is approved at a Council meeting at one G.A., it cannot go into effect until the following G.A. at the earliest, without calling a special meeting of the Society. Many other groups are new separating their by-laws into by-laws which provide a basic structure, and a set of procedures which can be easily changed as needed.

Expertise Turnover: This shows up in two ways. Because the Society, and its workings, are complex. There is a big learning

curve for new members of the Council. A lot of time is often spent covering a lot of old ground. We are hoping to prepare a guide to how the Council works to shorten this period. Secondly, some of the most important things that the Society does are entrusted to people who have a short period of time to understand them, and as soon as they do, they are replaced. For example, the society's publications "empire" is the responsibility of the publication committee which is chaired by the first vice-president. After two years, a new first vice-president takes over the position. This means that there is not a lot of time to do long-range planning in this area. The same sort of thing occurs in other areas as well.

No doubt there will be lots of discussion before any concrete proposals emerge. If you have any feelings on any of these topics, I would love to hear from you.

Image Processing 101

Blair MacDonald

In the last installment of Image Processing 101 we looked at how an image is represented on a computer and some standard contrast stretching techniques. In this installment, we will look at image noise.

Noise is defined as any unwanted signal that can distort or add to the desired image. Noise is usually a random variation in the values of individual pixels. This means that if the same image is taken twice with the same exposure, lighting and the like; then there will be differences in the values of pixels, at the same location, in both images. The value of any pixel can be thought of as signal (that portion of the pixel value that is dependent upon light from the image) plus some random value due to noise. Written mathematically: $\boldsymbol{V}pixel = \boldsymbol{S}pixel+\boldsymbol{N}pixel$, where V is the actual pixel value, S is the signal recorded by the pixel and N is the noise.

Many people think that by increasing the exposure the noise goes away. This is not true; the noise remains at the same or a higher level. The reason the image looks better is that the signal is increased. This means that the signal to noise ratio or SNR increases, thus improving the image.

There is nothing strange about noise in astronomical images; it looks like random noise or snow. There are several sources of noise in any image, some we can do something about, others you just have to live with. If you use a CCD camera, much of the noise in the original image can be removed by calibration with bias, dark and flat frames. This is because the noise removed by these frames is composed of a non-random, repeatable pattern plus a small random value. It is the repeatable pattern that is removed by calibration, the random portion remains after calibration. Fortunately, the random portion is rather small and the improvement in the image after calibration can be dramatic as shown in the two images below.

The type of noise I will concentrate on here, is the noise that is left after the images have been calibrated. The remaining noise is mostly photon noise and this noise source is due to the quantum nature of light. It shows up on photos as well as electronic images and follows a Poisson distribution.

One method that works for reducing noise is to add multiple images. These must be separate images, not copies of the same image. This works because the noise is a random signal that will cause the average value of a pixel to vary about its mean over many images. For those of you with a background in statistics, this means that the mean value of a pixel will increase linearly with the number of exposures while the standard deviation (a measure of the noise) increases with the square root of the number of exposures. So for N images added together, the SNR increases by root N. This can be seen graphically as follows: assume a Gaussian distribution of values for a pixel over several exposures, then the distribution looks like the plot in figure-1. Now if several of these series of exposures are added together you get the distribution shown in figure-2. As you can see, the mean is

much higher while the width of the distribution is narrow relative to the mean.

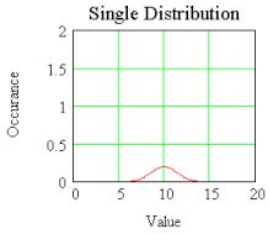


Figure-1

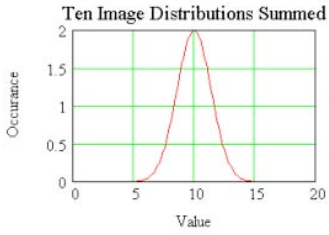
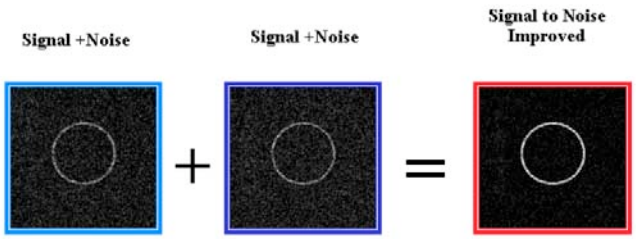


Figure-2

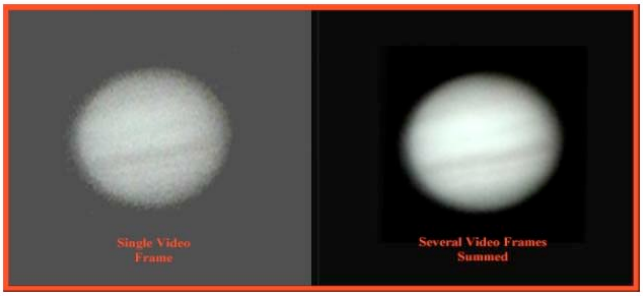
This means that the SNR has increased, producing a better representation of the true pixel value. This effect can be readily seen in the image below:



You will easily see that the image on the right is much less noisy than either on the left.

Another method that can make dramatic difference in the amount of noise is a pixel averaging filter. Instead of averaging several images, several adjacent pixels in the same image are averaged. A median filter also works very well on some types of noise. These techniques work because of the nature of noise in an image. Often the noise varies quickly from pixel to pixel, that is it has a high frequency component. The averaging filter acts as a low pass filter , removing some of the high frequency noise while leaving the image information essentially unchanged. In either case a small group of pixels should be used, say 3 by 3, and the value of the center pixel is made equal to either the average or the median of all the pixels.

If you are processing images taken from videotape, the dominant noise source is tape noise. As the tape plays, inconsistencies in the oxide coating produce a high frequency snow in the image. This can be drastically reduced by adding several frames together and increasing the SNR by root N as seen in the images of Jupiter below.



The image on the left is a single video frame while the image on the right is the sum of 20 frames. The frame was played back 20 times, but because the tape noise is random, the SNR was increased by the square root of 20.

As I have said at the top of this column, noise in the image sets the limits of what can be achieved with image processing. I have shown several methods of reducing its effects on your final image and as a closing note, you should (at least in general) attempt to reduce the noise in your images before you attempt further processing. Most image sharpening methods will make the noise in your images much more pronounced. This means that unless you have a very good SNR starting out you may make your images worse instead of better if you do not reduce the noise in the image.

Letter from the Editor

Michael Gatto

Well here it is, my last issue of Nova Notes as editor. I have had a lot of fun working on it for the last six years, but it has also been a lot of work. The one perk that never materialized, unfortunately, was that as editor I was supposed to find out the identity of "Gazer", but since I never got one " ask Gazer" request I still do not know who this mystery member is.

You may notice that this issue has a different look/format. The software and files that I usually use to produce the newsletter are fairly specific to the design/publishing world and I was unable to turn over any files to Quinn Smith – our upcoming editor – to use as a template. I thought it would be an easier transition if I did up the final issue as a MS Word document so that I could hand off a working template for him to run with. Boy do I hate Word!

I am looking forward to see what Quinn will do with Nova Notes, he is coming to the position with lots of enthusiasm, and we all owe him thanks for taking on this important executive position. I will support him with what ever he needs to get the first issues out, and we should all support him by making contributions to the newsletter – it is the only way that it will survive.

I'd like to thank anyone who ever sent in an article, meeting report, image, sketch, or idea, and to those who have sent me their encouragement. I also want to thank Dave Lane for handling the printing, and to Dave Chapman who proof-read nearly every one of the 33 issues, you always make me look good. See you at SCO! –MG

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.

2006/2007 Observing Chair: Tony McGrath 463-4018

Members' Night

Every weekend closest to the new Moon there is a 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 Chair.

Dates for Members' Nights for the next seven months:

22 December 2006 | 19 January 2007
16 February 2007 | 16 March 2007
20 April 2007 | 18 May 2007
15 June 2007

These dates are all Fridays, and the alternate date will be the following Saturday.

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 Chair.

Rules for the 17.5" Scope

(or any RASC scope at SCO)

On Members' Nights the 17.5" scope must be shared by all members. The 17.5" scope can be used by anyone, but all views have to be shared with anyone interested in taking a look. On non Members' Nights the scope can be used by individuals wishing to work on personal observing projects. Members should try to limit their use to under 45 minutes when other members are waiting to use it. Preference will be given to members who send an email to the hfxrasc list, or call the observing chair on the night they want to go out. If no one else wants to use the scope then feel free to use it all night, but it would be considerate every so often to ask members there if anyone has been quietly waiting to use it. Please contact the Observing Chair for more information.

Meeting Announcements

Halifax Centre of the Royal Astronomical Society of Canada

Meeting Dates:

December 15, 2006

Annual General Meeting
Talk 1: Daniel Majaess - Research Under Goliath's Slayer
Talk 2: Larry Bogan - Construction of a Personal Observatory Building

January 16, 2007

Check the website closer to the meeting date for more details.

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.

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

Executive meetings begin at 7:00 P.M., and members are welcome to attend.

Outgoing Halifax RASC Executive, 2006

Honorary President	Dr. Roy Bishop	
President	Craig Levine	852-1245
1st vice-president	Paul Evans	423-4746
2nd vice-president	Marc Bourque	835-2589
Secretary	Andrea Misner	425-5074
Treasurer	Pat Kelly	798-3329
Nova Notes Editor	Michael Gatto	453-5486
National Rep.	Pat Kelly	798-3329
2nd National Rep.	Mary Lou Whitehorne	865-0235
Librarian	Alex LeCreux	404-5480
Observing Chairman	Tony McGrath	463-4018
Councilor	Jim Dorey	464-8781
Councilor	Wesley Howie	835-3966
Councilor	Gilles Arsenault	

Incoming Halifax RASC Executive, 2007

Honorary President	Dr. Roy Bishop	
President	Paul Evans	423-4746
1st vice-president	Gary Weber	
2nd vice-president	Alex LeCreux	404-5480
Secretary	Wes Howie	835-3966
Treasurer	Pat Kelly	798-3329
Nova Notes Editor	Quinn Smith	
National Rep.	Pat Kelly	798-3329
Librarian	Gilles Arsenault	
Observing Chairman	Tony McGrath	463-4018
Councilor	Paul Heath	
Councilor	Jim Dorey	464-8781
Councilor	— ? —	

Meeting Location

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

P = Parking