

NOVA NOTES

VOLUME 31 — NUMBER 1 — FEBRUARY 2000

THE NEWSLETTER OF THE HALIFAX CENTRE OF THE RASC

PO BOX 31011, HALIFAX, NS, CANADA B3K 5T9

Website: <http://halifax.rasc.ca> E-mail: halifax@rasc.ca



INSIDE THIS ISSUE...

President's corner	1
First VP's Report	2
- Pat Kelly	
Image Processing 102	2
- Blair MacDonald	
Tercentennial Sundial At HerstManceux Castle	4
- Graham Miller	
Total Eclipse of the Moon	7
- Dr. Bill Thurlow	
What's Up	7
- Paul Evans	
Simulating the Solar System on your Home Computer	7
- Michael Watson	

Notice of Meetings and Other
Stuff

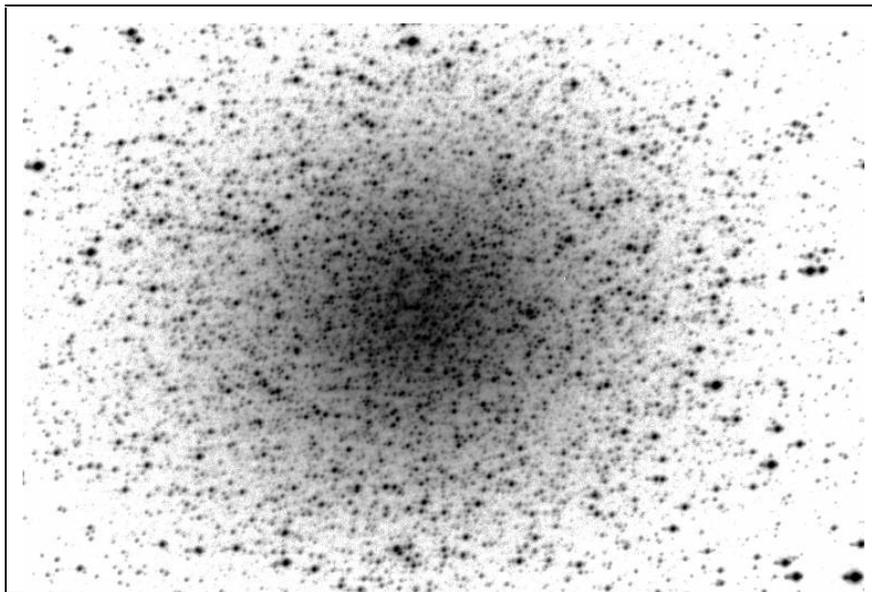
PRESIDENT'S CORNER: BY DAVID TINDALL

I am sorry to say that my first official act, as your President, was a very disappointing one for us all ... I had to cancel the January meeting because of a severe snowstorm. As far as anyone could recall, a meeting had not been cancelled due to weather in more years than anyone could remember. It was especially sad, because our old friend Randall Brooks, who moved to the Science Museum in Ottawa many years ago, was going to give us a fascinating talk. Fortunately, Walter Zukauskas offered his home for an impromptu, organised -by-e-mail, gathering on the following day and about a dozen members were able to be present.

Since I have had a low profile in Centre life recently, it is appropriate to introduce myself ... I've had an interest in Astronomy for longer than I care to recall! I almost went into PhD research in Radio Astronomy in Cambridge in 1967 -- but decided to pursue Low Temperature Physics (Superconductivity, in fact) instead. Largely, my decision was based on the fact that, for me, Astronomy was a hobby and might be spoiled by becoming a professional interest. Maybe I was wrong -- It might have been the graduate student who discovered Pulsars, but, of course that wouldn't have got me a Nobel Prize anymore than it did Jocelyn Bell!

I have been a Member of the Halifax Centre, since coming to Canada from England in 1972. I became a Life Member in 1981 ... just before one of those price increases! I was Vice President (1981-1983) and then Treasurer, from 1986 to 1987 when I resigned after being elected National Secretary of the Society for two terms ending in 1993. I then faded into obscurity ... mostly as a result of family difficulties that took a toll on my available time. Then last November, there came an appeal for a candidate for President and I decided that my "number had come up".

Apart from a very enjoyable 3 year hiatus at St. Francis Xavier



ASTROPHOTO OF THE MONTH — OMEGA CENTAURI

Image of Omega Centauri taken by Roy Uyematsu and Dave Lane at the Winter Star Party in February 2000 using an Astro-Physics 5.1" f/6 refractor and an SBIG ST7 CCD Camera.



NOVANOTES,

THE NEWSLETTER OF THE **HALIFAX CENTRE OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA**, IS PUBLISHED BI-MONTHLY IN FEBRUARY, APRIL, JUNE, AUGUST, OCTOBER, AND DECEMBER. THE OPINIONS EXPRESSED HEREIN ARE NOT NECESSARILY THOSE OF THE **HALIFAX CENTRE**. MATERIAL FOR THE NEXT ISSUE SHOULD REACH THE EDITOR BY **APRIL 14TH, 2000**. ARTICLES ON ANY ASPECT OF ASTRONOMY WILL BE CONSIDERED FOR PUBLICATION. "LETTERS TO THE EDITOR" OR TO OUR RESIDENT EXPERT: GAZER ARE ALSO MOST WELCOME. CONTACT THE EDITOR AT:

SHAWN MITCHELL
94 ALDER CRESCENT
LOWER SACKVILLE, NS
B4C 1A2

E-MAIL: SMITCHELL@AP.STMARYS.CA

HOME: (902) 865-7026
WORK (902) 420-5833

University, I have been in the Physics Department at Dalhousie University since 1971 (writing that make me feel old, old, OLD!). For my sins, I have ended up mixing "business" with "pleasure", because I currently teach an Introductory Astronomy class at Dal! However, this is not inconsistent

With my "professional/amateur" dilemma referred to above, because I teach it with a Physics slant, while trying to impart the love of Astronomy that my school Physics teacher, Mr. Jeffers, did for me forty years ago, Anyway! Enough of me! I truly am pleased to report that, as a newcomer to the present Executive Council of the Centre, I am impressed with the dedication, talents and hard work of the colleagues I have joined on the Executive Team. I was told, before I accepted the nomination that there would be lots of excellent people to help me in the running of the Centre -- and it's true. Perhaps it would be unfair to single out anyone, but I am particularly impressed by the dedication of the Team which is planning to host Nova East at Smiley's Park on the Long Weekend at the beginning of August. You'll be hearing more of that in the coming weeks and months and I'm sure it will be a great success.

Of course, you are always welcome to attend our Executive meetings, which begin at 19:00 on meeting nights -- and which we endeavor to finish by the start of the main meeting at 20:00. If we get delayed, I hope you'll forgive us ... one hour is often a short time to finish the important business of running the Centre.

If you have any suggestions on improvements that we can make to improve the way the Centre is run, I am always pleased to receive them. Ω

FIRST VP'S REPORT: BY PATRICK KELLY

I shall be brief! My duties are two-fold, public relations and filling in for the president in his/her absence. Clint Shannon has a very robust constitution, and I was not called upon in the last year

to fill in for him. So much for that duty.

In public relations, I have continued to send notices of upcoming meetings to the usual media outlets (local newspapers, television stations and radio stations) although these outlets seem to have less time and space for public service announcements as they did in the past. Several additions have been made to the list during the year, including The Space Channel, the two local newsgroups hfx.general and ns.events, as well as sending out a reminder of the meetings on the centre's list server.

Despite these efforts, there still seem to be a reduced turnout from both regular members and the general public at some meetings. In the coming year, I hope to expand our notice of meetings to include up-to-date meeting notices on our web site, as well as sending letter-sized posters in Acrobat Reader format (PDF) to any interested members who can then print them at home and post copies in their offices, etc. I would welcome any other suggestions from the membership on ways to inform the public about the centre and to spread notices of our meetings to the largest possible audience.

I told you I would be brief! Ω

IMAGE PROCESSING 102: BY BLAIR MACDONALD

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:

$$V_{pixel} = S_{pixel} + N_{pixel}$$

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* in the image. 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. 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:

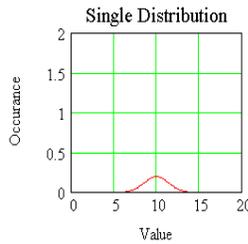


Figure-1

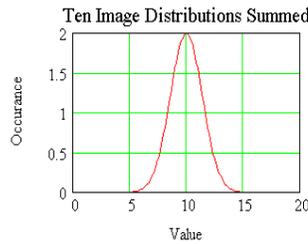
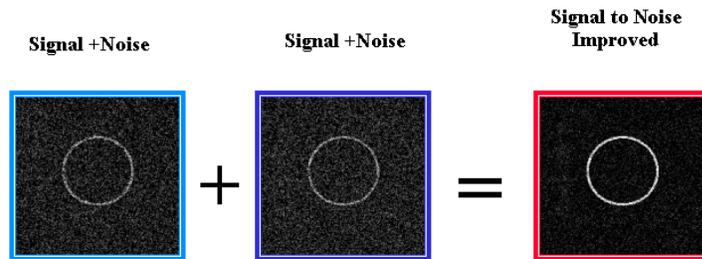


Figure-2

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.

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.

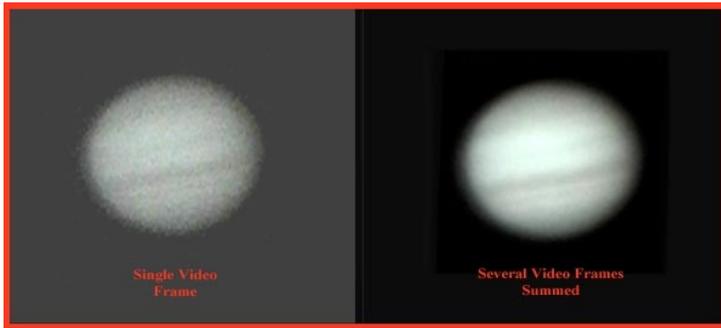
If you are processing images taken from videotape, the dominant noise source is tape noise. As the tape plays, inconsistencies in the oxide coating produce a high frequency snow in the image. This can be drastically reduced by adding several copies of the same frame together and increasing the SNR by 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 **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. Ω

**TERCENTENNIAL SUNDIAL AT
HERSTMONCEUX :
BY GRAHAM MILLAR**

THERE HAS been placed on the grounds of Herstmonceux Castle, near Hastings in southern England, the splendid Tercentennial Sundial, commemorating the founding of the Royal Greenwich Observatory in 1675. Alfred Bader, an alumnus of Queen's University, Kingston, Ontario, donated the Castle and Estate as the location for an International Study Centre. There are three interesting stories here, the founding of the Observatory, the history of the castle, and the biography of Bader. Unfortunately the sundial, having been unscientifically mounted, cannot show the time.

**THE ROYAL GREENWICH
OBSERVATORY**

The age of Discovery had revealed the overseas world to Europeans, and their conquests had opened the way to immense riches in the New World, accessible by ship. Because no way of determining longitude had yet been developed, monarchs did not know the extent or accurate boundaries of their dominions, and mariners knew only approximately the shapes of the coasts.

Worse, the uncertainty in longitude at sea caused many wrecks of ships laden with treasure. On an ocean crossing, not knowing the longitude within a distance of hours or days of sailing, the shipmaster was obliged to "sail the parallel" (of latitude) until he made a landfall. As a further result, a frequented parallel was infested with pirates and privateers. Latitude could be determined from the elevation of the sun at local noon, or of a star of known declination at its culmination. Longitude could only be known from the elevation of, generally, at least two heavenly bodies, sun, moon, or star -- timed to what we today call Universal Time, the time at the Greenwich Observatory. One minute of time is equivalent to a distance of up to fifteen sea miles. Pendulum clocks did not work at sea, and the best early watches were not accurate enough.

In 1514 the German astronomer Johannes Werner thought of using the moon to determine the reference time: its distance from some neighboring star as it went through its phases or, in daylight, its distance from the sun. He therefore proposed that the positions of the stars near the

ecliptic be accurately determined. Nothing came of the suggestion for over a century.

In 1610 Galileo, with his primitive telescope, discovered the four major satellites of Jupiter, and perceived that the times of their passing behind the planet, or emerging, would fix moments of Universal Time. He offered the idea to King Philip III of Spain who had put up a prize for a method of determining longitude. His staff (correctly) reported adversely on the method as not practical at sea, but Galileo continued to believe in it up to his death. After 1650 it became accepted for use on land, revolutionizing map making, and coasts were charted fairly accurately.

The need for determining longitude at sea remained pressing. To this purpose, at the urging of his chief minister Jean Colbert, Louis XIV of France in 1666 decreed the building of an astronomical observatory at Paris. The leading continental astronomers were recruited to it.

England, possessor of the largest merchant fleet in the world, soon followed. King Charles II appointed a commission that included Robert Hooke to investigate the problem of longitude, and they requested the Rev. Dr. John Flamsteed to bring in a report on the Jupiter method. He said it would be too difficult to use at sea, but noted that the positions of the bright stars, potentially useful for navigation, were not accurately known. In 1674 the King directed that an observatory be built at Greenwich, appointing Christopher Wren as architect and Hooke as overseer, and it was completed in ten months. The King appointed Flamsteed, aged 27, as the first Astronomer Royal and he, at the laying of the cornerstone, cast a horoscope. He would devote more than four decades to the compilation of his great work, a star catalog that

was published posthumously in 1725.

The need for a method of determining longitude at sea still remained, as illustrated by a naval disaster on an autumn night in 1702. British Admiral Sir Cloudisley Shovell was returning with his squadron of twelve ships from a victory over the French in the Mediterranean. It had been a cloudy passage, and they had to be sure of being far enough west to clear the Scilly Isles. The Admiral conferred with his officers who considered they would indeed pass clear. To the contrary, the sailing master of the flagship diffidently suggested they were dangerously too Far East. As the Regulations forbade any but officers to reckon position, the Admiral ordered him to be hanged for insubordination forthwith. All too soon the flagship struck the rocks, then five others, although two worked off with damage. Two thousand lives were lost; from the lost ships two men only were cast ashore barely alive -- one the Admiral. However, as she would confess on her deathbed three decades later, a woman murdered him on the beach for his splendid emerald ring.

In 1714 Parliament passed the Longitude Act, establishing a prize, worth millions in today's currency, for devising a practicable method of determining longitude at sea. The English clockmaker, John Harrison, a mechanical genius, devoted much of his life to developing the compact precision timekeeper we know as the chronometer. The Astronomer Royal, Maskelyne, coveting the prize, long obstructed recognition of Harrison's success, but Harrison's son appealed, on behalf of his aging father, to King George III whom was indignant on hearing the story. A niggardly Parliament only agreed to award half the prize money. Chronometers were soon

manufactured by a number of watchmakers and became indispensable to navigation.

Part Two

HERSTMONCEUX CASTLE AND ESTATE

HERSTMONCEUX is located in southern England near the hill of Hastings, where King Harold was killed in battle and William the Conqueror won England. The ancient manor contained the village of Herste, its name meaning a clearing in the wood. William granted the manor to his close supporter, the Count of Eu, who sublet it to one, Wilbert. According to the Domesday Book, it was worth only one pound Sterling, but by the end of the 12th century it had achieved status. A member of the holding family, the Lady Idonea de Herste, married a nobleman named Ingelram de Monceux, and the manor began to be called the Herste of the Monceux.

When the last male Monceux died in 1330, his sister Maud, the heiress, married Sir John Fiennes. For almost two hundred years the Fiennes family prospered at Herstmonceux. Roger Fiennes became a favourite of King Henry V for distinguished war service in France including the recruitment of men-at-arms and archers from Herstmonceux. Later Henry VI appointed him Treasurer of the Household. He became rich. In 1441 he applied to the King and received license to build a castle -- the present one -- on the site of the old manor. Built of pink brick in medieval style, sixty meters square, with battlements, drawbridge and moat, it was however never defensible but was intended as a luxurious country house. Sir Roger entertained extravagantly there. The last Monceux descendant to live in the castle was Sir Thomas Leonard,

Lord Dacre, who had to sell it to a George Naylor to settle his gambling debts. The final inhabitant was Francis Hare, Bishop of Chichester, who entertained lavishly. He died in 1740, and the building began falling into disrepair. George's nephew, Francis Naylor, died in 1775. His half-brother, Francis Hare, finding the castle now beyond repair, sold off the contents. A succession of Owners held the ivied relic, and in the 1890s a tearoom was located in it. In the early 20th century a succession of wealthy gentlemen owned the place, each undertaking to restore it and fit it with period furnishings, the last being Sir Paul Latham, M.P. By 1935 he had virtually completed the work; then, during the war, he joined the forces. Herstmonceux was a radar site, and was machine-gunned and bombed from the air, although without being significantly damaged.

In 1946 the Royal Greenwich Observatory (RGO), finding the light pollution from spreading London intolerable, bought the estate from Latham, and fitted out a suite of offices in the castle. Over a period of ten years, RGO built a group of astronomical domes on a low hill near the castle, which are still there. The largest housed the new Isaac Newton five-meter telescope. However, light pollution from nearby growing towns again forced a move, this time, in 1978, to Las Palmas, the westernmost of the Canary Islands. A developer bought the estate, but the locals vetoed his proposals. Herstmonceux was again for sale, but it would not be until 1992 that a white knight would ride up and assure it a glorious future.

Part Three,

THE GRATEFUL QUEEN'S ALUMNUS

IN MIDSUMMER 1992, aboard a train in southern England, Alfred

Bader turned to his wife Isobel, and asked, "How would you like to buy a castle?" As a boy of 14, Alfred Bader of Vienna had been among the many Jewish children given refuge in England in 1938. He was billeted with a Mrs. Wolff, of Hove near Herstmonceux, who often spoke of her married son in Montreal. In 1940 Alfred was deported to Canada as an enemy alien, and was interned, along with prisoners of war, in a camp near Montreal. Some academics detained there set up a school, and Alfred achieved his matriculation. One day, on a piece of newspaper blown by the wind, he read that a Mrs. Martin Wolff of Montreal had died. Feeling sure she must have been his foster mother's daughter-in-law, he wrote to Martin, but the censor would not allow the letter to pass. He told a social worker sent to the camp by the Jewish community of Montreal, and -she was Martin Wolff's next-door neighbor! She put him in touch with Martin, who secured his release.

Bader immediately applied to two universities for admission, but was refused. One of Martin's daughters had been to Queen's; she wrote to the registrar on Alfred's behalf, while her father wrote to a professor friend there. So Queen's accepted Alfred, and he enrolled in engineering chemistry. With his heavy German accent he had few friends, but a professor advised him to join the debating club, and in time he won a scholarship for public speaking and became a national debating champion.

In summers Bader worked for the Murphy Paint Company in Montreal. They saw he was a gifted chemist, and gave him a scholarship

on which he took his M.Sc. at Queen's. He went on to take a doctorate at Harvard, and by 1946 had completed an extramural B.A. in history at Queen's. Meanwhile Pittsburgh Glass had bought Murphy Paint, and moved Bader to Milwaukee.

He was much interested in supplying research chemicals, in which Pittsburgh had no interest. Therefore he and a friend started a small company, Aldrich, to serve this market. The company did well, and in 1954 he decided to work for it full time. Aldrich grew, and in 1975 merged with Sigma, and the combined company became a world leader in providing research chemicals; Alfred Bader became very wealthy.

While still at Harvard he had begun an art collection, and his

interest expanded until he became a connoisseur of international stature on the Dutch School. He donated over a hundred Old Masters to Queen's. To return to his surprising question to his wife aboard the train: Bader had conceived the plan of buying Herstmonceux and donating it to Queen's for an International Study Centre (ISC). After much bureaucratic arranging, the donation was approved. Queen's has obtained the participation of four other universities, Western, Toronto, McGill and Dalhousie, and the ISC has already become a first-class educational and conferencing facility.

In the words of Alfred Bader, "My heart is at Queen's. In Vienna there were signs like, 'Jews and dogs prohibited.' Queen's took me in, and for the first time in my life I was treated as an equal human being; they didn't care if I was a Jew; they didn't care if I was an 'enemy alien.'"

THE MAGNIFICENT sundial mentioned in the introduction has been prominently sited in the middle of the central walk of the Rose Garden immediately behind the Castle. It commemorates the tercentennial of the founding of the Royal Greenwich Observatory which, for a period after the war of 1939, made its observations at Herstmonceux. More than three centuries ago, King Charles established the RGO to discover a method of determining longitude, dependent upon knowing the Universal Time. TIME: that is the symbolism of the dial.

As may be seen in Fig. 1, a photograph of the dial, the gnomon is vertical; this is



Figure 1 The Tercentennial Sundial at Herstmonceux Castle. Photo by Queen's alumnus Richard F. Brown.

interest expanded until he became a connoisseur of international stature

the gnomon is vertical; this is

astronomically wrong, since the gnomon should point to the north pole of the heavens. As the administration of the ISC are aware, the dial, if correctly mounted, could indicate the solar time quite accurately. However, they do not plan to remount it because it was placed in position mainly for its historical interest.

Acknowledgment: Queen's University and the ISC are thanked for sending the author a wealth of material on Herstmonceux. Ω

TOTAL ECLIPSE OF THE MOON:
BY BILL THURLOW

Athena Community Astronomy Club
Summerside, PEI
January 20-21, 2000

The Athena Community Astronomy Club held a total eclipse of the Moon observing session at the home of club member Derek Hughes in Summerside. Club members Derek, Ron (& Caroline) Perry, Rolly Chiasson, & Bill Thurlow were present. Hazel Hughes provided good, hot refreshments during the session, and had a look at the eclipsed Moon, too. Several other club members observed from their homes or other close-by sites. Mostly by unaided vision, but with some binoculars and a 4.25" Astroscan telescope, a cloudless night made for perfect viewing. The Moon was very dark during totality, with a lot of gray during the early partial phases. Color during totality included a lot of deep reddening. The brighter area of reddening could be followed from west to east as the Moon traveled through Earth's umbra. As a bonus, many binocular Messier objects were visible during and near totality, including M-41, 50, 46, 47, 93, 458, 35, 37, 36, 38,

44, 67, 52. Only M42 and M103 were binocular visible at the beginning of the partial phase. The sky showed only the brightest 4th magnitude stars at the beginning; however, most 5th magnitude stars were visible during totality. Temp = -14C, wind = 2 km/hr. We could not have asked for better winter observing. Our luck was especially appreciated as we knew that a blizzard was only a few hours away (and had previously been predicted to visit us in time to make all eclipse observing impossible).Ω

WHAT'S UP:
BY PAUL EVANS

March

Fri 10 - 8th magnitude asteroid 2 Pallas is near Alpha Monocerotis. Second best weekend to try for a Messier Marathon.

Thu 16 - Mercury and Venus approach in the morning (close as 2 and 1/4°).

Fri 17 - Regulus 1.5° to right of Moon at 8pm.

Mon 20 - Full Moon. Spring Equinox.

Thu 23 - Zodiacal light visible in west at end of evening twilight over the next two weeks.

Fri 31 - Best weekend to try for a Messier Marathon.

April

Sun 2 - Daylight Savings Time begins.

Tue 4 - New Moon (observing at St. Croix?).

Thu 6 - Mars 1.1°N of Jupiter at 8pm.

Sun 16 - Mars 2.4°N of Saturn at 8pm.

Tue 18 - Full Moon.

Fri 21 - Lyrid meteor shower (zenithal hourly rate of 15).

Sun 30 - Texas Star Part, Ft. Davis, TX (through May 7). Ω

SIMULATING THE SOLAR SYSTEM ON YOUR HOME COMPUTER:

BY MICHAEL WATSON

The combination of modern high-speed personal computers and high-accuracy planetarium programs makes it possible for the amateur astronomer to recreate, in graphically striking form, the motions of solar system objects, as well as ephemeral events such as eclipses and occultation's. Watching the day-to-day and month-to-month motions of planets and comets at high speed on the computer monitor helps us understand and appreciate the orbital movements of these objects much better than observing them in real time in the sky. In this computer presentation, which is based on a presentation made at the 1999 General Assembly in Toronto. Michael Watson demonstrates orbital motions of the inner planets, planetary conjunctions, occultation's of planets by the moon, and the movements of comets through the night sky, using his two favorite astronomical computer programs, The Earth-Centered Universe and RedShift 2.

Bio: Michael Watson is the national Treasurer of the RASC, and for many years has been the Society's legal counsel and Chair of the Constitution Committee. He is past recipient of the RASC Service Award and Simon Newcomb Award. Michael's astronomical interests centre on solar eclipses and astrophotography. In recent years he has delved into the world of astronomical computing, and regularly visits to RASC Centres to present talks on various astronomical subjects. Ω

NOTICE OF MEETINGS AND EVENTS

REGULAR MEETINGS

Date: **Regular Meeting — Friday, Mar 17 at 8pm;**
7pm for the council meeting.

Place: Lower Theater, Nova Scotia Museum of
Natural History, Summer Street, Halifax.
Access is from the parking lot.

Topic: **Tidbits from Textbooks**
Speaker: Walter Zukaskas

Date: **Regular Meeting — Friday, Apr 14 at 8pm;**
7pm for the council meeting.

Place: Lower Theater, Nova Scotia Museum of
Natural History, Summer Street, Halifax.
Access is from the parking lot.

Topic: **Simulating the Solar System on Your
Home Computer**
Main Speaker: Michael Watson

BECOME A ST. CROIX OBSERVATORY 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 centre's new Observatory, which is nearing completion. To become a key holder, contact Observatory Committee Chair, Shawn Mitchell.

JUST WHERE IS THE ST. CROIX OBSERVATORY?

The Centre's Observatory is located in the community of St. Croix, Nova Scotia. To get there from Halifax (Bayers Road Shopping Centre), follow these simple instructions.

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 1.5km until you cross the St. Croix River Bridge. You will see a power dam on your left.*
5. *Drive about 0.2km past the bridge and take the first left (Salmon Hole Dam Road).*
6. *Drive about 1km until the pavement ends.*
7. *Drive another 1km on the dirt road to the site.*
8. *You will recognize the site by the two small white buildings on the left.*

ASTRO ADS:

Celestron C90 Spotting Scope (black tube), Case, Manual, erect image diagonal, finder scope, one eyepiece, and camera adaptor. Asking \$400

Call: Margaret Cox 422-4646.

11x70 omcon binos and case 250\$
2.5 x televue barlow 175\$
18 mm omcon ortho 48\$
40mm televue plossl 130\$
celestron lpr#a filter 60\$
50 mm celestron right angle finder and dovetail bracket (no crosshairs) 75\$.

Call: Peter Haverstock 876-8568.

MEADE MODEL 2045
4" SCHMIDT-CASSEGRAIN TELESCOPE
STANDARD EQUIPMENT 4" Schmidt-Cassegrain optical tube/Fork Mount with Motor Drive system MA25mm 1-1/4" O.D. diagonal prism assembly
5x24mm viewfinder
3 thread-in tripod legs
battery pack with cord
1 Meade T-Adapter
ALSO INCLUDES
1-Meade 9.5mm, 1.25" Plossl eyepiece
1-Meade #126 2x Barlow Lens 1.25"
Both are brand new from Perceptor

Telescope has been used maybe 10x's. Considered as Mint Condition Asking \$600, and \$140 for eyepiece and Barlow
Please contact Tony Marissink at tonym@ns.sympatico.ca

1999 HALIFAX CENTRE EXECUTIVE

Honorary President	Dr. Roy Bishop	
President	Dr. David Tindal	4557456
1st vice-president	Pat Kelly	798-3329
2nd vice-president	Ian Anderson	542-0772
Secretary	Steve Tancock	465-4092
Treasurer	David Lane	826-7956
Nova Notes Editor	Shawn Mitchell	865-7026
National Representative	David Lane	826-7956
Librarian	Dr. Michael Falk	422-5173
Observing Chairman	Paul Evans	
Councilors	Clint Shannon	889-2426
	Dave Chapman	463-9103
	John Jarvo	897-0529