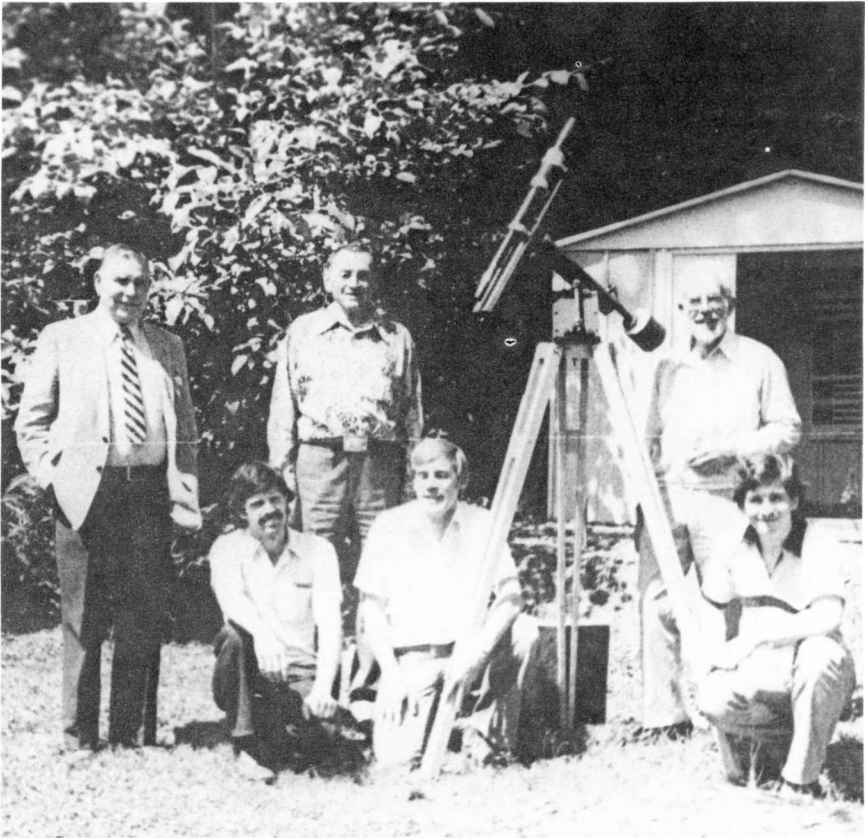


# NATIONAL NEWSLETTER

February, 1984

Supplement to the JOURNAL OF THE ROYAL ASTRONOMICAL SOCIETY  
OF CANADA

Vol. 78, No. 1



Some of the Mid-Island Astro Observers gathered before the Hale radio telescope shed. Standing, left to right: Donovan Fallows, Howard Stevens, Chris Horsfield. Kneeling, left to right: Bill Jackson organizer of the group, Mike Hale, Patrick Durrell. See article on page L3 of this issue. *Photo by B.F. Shinn.*

## NATIONAL NEWSLETTER

February, 1984

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### An Editorial: Concerns about Costs

by Leo Enright  
Kingston Centre

In spite of general acceptance and some outright praise for our centre's newsletter with its new format, the cost of its production and mailing has been a matter of considerable concern to us recently. Our centre, a small but active group which needs a frequent newsletter because of the many miles which separate us, is feeling what almost all other centres are currently experiencing: – that the cost of producing and mailing a newsletter in the way in which it should be done is putting a severe strain on the financial resources of the centre.

Few of us need to be reminded of how the cost of everything, especially postage, has increased. I have on file copies of our newsletter or its predecessor from less than a decade ago which were mailed to me at less than one-tenth the cost of mailing our last issue to some of our members. (Yes, the issues of late 1973 and early 1974 came with 6¢ stamps; a postal official demanded 64¢ to send some copies of our latest newsletter.) Membership fees have not increased tenfold over the same period; in fact, they have not even doubled.

Regrettably some centres have had to adopt rather drastic measures in the face of such costs. At least one centre is mailing monthly newsletters two at a time. In such situations, the centre's news is no longer "news" when it is read by some members. One centre has indicated that it cannot and will not publish a newsletter more than four times a year. A quarterly publication, in my opinion, almost ceases to be a newsletter. Was there not a saying at one time about things being "as stale as a day-old newspaper" or its news? Reading in late August about someone's observing program of last March is less than many an astronomer's idea of excitement. The editorial in the most recent issue of one centre's newsletter indicated that it could no longer publish at all and would cease doing so for an indefinite period of time.

Your editor has considered several alternatives in the face of our rising costs. None of them is

desirable but one of them may have to be adopted before long. A quarterly newsletter, a very short bi-monthly edition, an increase in the annual fees, or a return to a format which is inexpensive but less pleasant to read – these are some of the things which have been suggested. In the meantime, we will try to listen to the wishes of our readers – those for whom the newsletter exists in the first place.

Reprinted from *Regulus*

## Astronomy Intrigues “Bufs” on Vancouver Island

by Franklyn Shinn  
Victoria Centre

A group of enthusiastic amateur astronomers who have dubbed themselves “The Mid-Island Astro Observers” are becoming more and more active in the Nanaimo area. Some are members of the Victoria Centre or are unattached R.A.S.C. members but many have no affiliation with established societies, they just share our interest in things astronomical.

The moving spirit behind the group is Bill Jackson of the Cedar area, just south of Nanaimo. Bill started contacting people who shared his interest in astronomy in November of 1981. Since that time the membership has grown to about a dozen members. Most have telescopes ranging in size from 50 to about 400 mm, but the binding force of the group is interest in any aspect of the structure and behaviour of the Universe in which we live.

Meetings are generally called near new moon so that there will be dark skies. Light pollution is threatening this plan now, though some of the members live further “up island”, well away from city lights. From their location at Parksville the writer had a totally astonishing experience viewing the Beehive star cluster in Cancer one night. Having lived in cities ever since becoming interested in observing, I have never been sufficiently free from light scatter to pay any attention to it previous to that night.

One of the group lives on nearby Gabriola Island and has solved the problem of light pollution in another way – he’s a radio astronomer. Mike Hale, a member of the R.A.S.C., has built his own radio telescope to keep track of solar activity. The telescope consists of two antennae built from lengths of electrical conduit bent to a parabolic curve located about 100 metres apart. Signals are then fed into the observatory shed about 30 metres from the Hale house. Mike says that he can detect other radio sources and has used them to calibrate his instrument.

Behind his residence Mike has a magnificent hill, almost a cliff, where he hopes to build an observatory above the fog that occasionally rolls in from the Strait of Georgia. This will have to wait until the priorities of family are dealt with. The gang gathered at the Hales’ last spring and enjoyed a good gab-fest about various members’ activities. Patrick Durrell, a high school student with an interest in computers, hooked up his own computer to Mike’s television set to show some examples of how he had programmed it to draw charts of the moon and call up the celestial coordinates of various objects.

Last August the group organised a public observing night at Ivy Green Park, one of the provincial parks not far from Ladysmith. Members of the club set up exhibits of photos and charts and showed slides and films relating to space exploration. Over one hundred people attended this event.

Another member, Donovan Fallows of Ladysmith, an unattached member of the R.A.S.C., had brought his ham radio equipment to the park and had set up a net with another group to observe the Perseid meteor shower that night and compare their results. Unfortunately this project was defeated by Perseus who failed to deliver adequate source material and, to Don’s aggravation, failure of the reflective layers of the atmosphere to deliver adequate radio signals.

Vancouver Island being what it is, we have our share, or more than our share, of cloudy observing nights. Really the percentage of such is probably not much greater than elsewhere, it seeming to be a law of astronomical interest that the only legal observing nights are the cloudy ones! That is perhaps one reason why, when we had the privilege of visiting Chris Horsfield and Howard Stevens out west of Parksville (“up island”) I was so intrigued with the Beehive Cluster. That was *one clear night!*

## News Notes

The Queen Elizabeth Planetarium was recently incorporated into the Edmonton Space Sciences Centre organization as an extension facility. After 23 years and almost one million visitors, the Planetarium closed last December 31 for refurbishing. Planetarium programmes will resume at the new Edmonton Space Sciences Centre installation on 1 July 1984.

The Astronomical Society of the Pacific has issued its 1984 Selectory of Astronomical Materials. This annual catalogue of slides, prints, maps, posters, books, tapes, observing aids, and novelty items can be obtained free of charge by writing to the Astronomical Society of the Pacific, 1290 24th Ave., San Francisco, CA 94122, enclosing four international postage payment coupons for addresses outside the U.S., or two first class stamps for U.S. residents.

A major new installation for amateur astronomers is taking shape on Todmorden Moor in West Yorkshire, England. The Amateur Astronomy Centre, sponsored by Bedford Astronomical Supplies and Astro-Systems Ltd., will consist of an observatory housing a 40-inch reflector with f/4 Newtonian and f/16 Cassegrain foci, a planetarium, library and computing facility. A variety of smaller instruments will also be available for use by amateur astronomers and the public. Construction of the building and major instruments is well advanced at this time, and completion is expected in 1984. Information on the project and membership can be obtained by writing to the Project Manager, Mr. Peter R. Drew, at 111, Todmorden Road, Bacup, Lancs. OL13 7DU, England.

Life Member Terence Dickinson of Odessa, Ontario, has recently published a superb guide to the night sky, *Nightwatch*. The Equinox book was unveiled at a public lecture by Mr. Dickinson at the Ontario Science Centre in late November. Several members of our Society contributed photographs to this lavishly illustrated spiral-bound book. *Nightwatch* is Mr. Dickinson's fourth book, and is available through your local bookstore.

Last April the Scientific Instrument Society was formed in London, England, with Gerard I'E. Turner of the Oxford Museum for the History of Science as Chairman, and Carole Stott of the National Maritime Museum of Greenwich as Secretary. The Society is dedicated to the study and preservation of historical scientific instruments. The first issue of the Society's journal has already gone to press. Membership is open to anyone on payment of an annual fee of £10. For information, write to The Secretary, Scientific Instrument Society, c/o National Maritime Museum, Greenwich, England.

## International Astronomy Day – May 5, 1984

by Leo Enright  
Astronomy Day Coordinator

For the eighth year in a row, a specific date is being set aside this year as *International Astronomy Day*. This year it is Saturday, May 5th, 1984, and all the centres of the Society are urged to have their members join with fellow astronomers, both amateur and professional, throughout North America and other parts of the world, in order to mark this special annual occasion. (Some centres may even wish to make it a two-day event and call it Astronomy Weekend; at least one centre has done that in the past.)

Centres are encouraged to organize activities which have proven successful in the past, and even to experiment with new ventures. Shopping mall displays with their exhibits of projects, equipment, and astronomical art; evening "star nights" for the public; "open houses" at observatories and planetaria – these are all "tried and true" ways of promoting and sharing with the public our interest in astronomy. It is hoped that this year other ideas, too, will be attempted – all of them depending on the interests, resources, and expertise of the members of the individual centres.

More detailed information packages, with specific suggestions for planning observations for that night and with numerous other ideas, have been sent out to the presidents. National Council

Representatives, and secretaries of each centre. A suggested "Media Release" Form, as a means of informing the local media of planned activities, has also been sent to each centre. In return, reports of each centre's Astronomy Day activities should be sent to the National Office as soon as possible after May 5th so that they may be published in the *National Newsletter*.

Let us continue the tradition of the past few years, and make *International Astronomy Day 1984* both a memorable event for our centres and an exciting way of sharing our interest in the wonders of the sky.

## Cold Weather Observing

by Scott Chandwater  
Hamilton Centre

Cold weather is often used as an excuse not to go out observing. Yet many of the most beautiful objects in the sky can only be seen during the frigid winter months. If one follows simple precautions, winter observing can be easily carried out with a fair degree of comfort.

Proper clothing is essential if one is spending a lot of time at the telescope. As a rule one should always overdress for the occasion as conditions are usually worse than they seem. Temperatures fall very rapidly after sunset, especially on a crystal-clear night.

Layers of clothing are the rule since they form many layers of thermal insulation, much like a double- or triple-glazed window. Well-insulated boots with thermal socks should be worn to protect the feet against frostbite. For total body protection, a snowmobile suit can be worn. This one-piece arrangement lets less warm air escape, yet allows easy movement. "Semi" mittens (mittens with a separated index finger) are best for the hands, as they allow fine manipulation but have all the warmth of regular mittens. Most importantly, a good woolly toque should top off the cranium, as 40% of all body heat escapes from the head. If one plans to observe all night, the ultimate answer would be an electrically heated suit. Just plug yourself in and stay toasty all night long.

Your telescope should also be well-adapted to cold weather use. To start with, if you own a reflector, the tube should be left outside for an hour before starting your observing session. This gives the warm air trapped inside a chance to escape and allows the optics to reach thermal equilibrium. Eyepieces should be kept in a warm place before use. If they are allowed to cool, the warm moist air of your eye will fog them up immediately. If your telescope has to be put together out of doors, try to keep the number of parts to a minimum (2 or 3 major assemblies). There's nothing worse than trying to assemble fifty different little parts at -20°C with your gloves off! For a similar reason, large locking knobs are preferable to small nuts and bolts, which require fine manipulation with a screwdriver and pliers. After a few minutes with gloves off, one's fingers have great difficulty moving when they are supposed to.

If one does start to freeze up, it is advisable to find some source of warmth, but definitely not the liquid variety. A shot of 80 proof might feel warm going down but it actually thins the blood, which cools you down faster. Needless to say, if you do a lot of observing with Johnny Walker, you might start seeing rings around Saturn, Jupiter, Mars, Venus, the moon, and M31.

Finally, one should move around as much as possible. It is difficult to "run the mile" while observing Jupiter, but if one stands still for any length of time ... well, you've heard of cryogenic suspension. Someone will probably discover you during the spring thaw.

Reprinted from *Orbit*

## Calgary: Reach for the Stars

A gold star is in order for a citizens' group proposal to shift control of the Centennial Planetarium from the city's parks and recreation department to a society.

With city funding cutbacks and a decline in attendance over the last few years, the Planetarium needs a strong lobby to ensure that it can play an important role in science education, theatre and tourism in the community.

The move is not without precedent – the Calgary Zoo is run by a society with an elected board and city appointees.

The Planetarium has been caught in a Catch-22 situation: with cutbacks in programs and hours of operation, attendance has dropped from 110,000 visitors per year a couple of years ago to 85,000 a year at present. (School tours have been cut by 3,000 students from 22,000 in 1980.)

That overall decline has in turn made it difficult for department officials to argue that funds shouldn't be cut back further. A board of trustees elected from the Planetarium membership could carry a lot more clout with city council in pushing for continued support and for new directions in programming.

Of course, the city spends \$700,000 a year on the Planetarium so the society would have to be accountable. Under the proposal, appointed members would include an alderman and the city's parks director, as well as representatives from the school boards and the university.

Another good reason for turning the operation over to a society is that it could take advantage of provincial and federal funds that aren't available to municipalities. As well, a society could organize volunteers for fund-raising.

With the arms race now launched into space and satellite communications affecting daily life, stargazing is not just navel-gazing. A highly motivated group could make the Planetarium a greater community resource and possibly the core of a science centre on surrounding city lands.

Reprinted from *Calgary Herald*

Editor's Note: Just such a society has recently been formed. On 15 October 1983 the formation of the Centennial Planetarium and Pleiades Theatre Society was announced by James Conway, President of the Society, and Sig Wieser, Director of the Centennial Planetarium. We thank J.P. O'Callaghan, Publisher of the *Calgary Herald*, for permission to reprint this editorial.

## Across the R.A.S.C.

by Ian McGregor  
Associate Editor

To provide a broader view of the activities of our nation-wide organization, this regular feature reports on people and events which are in the "news". Most items are taken from Centre newsletters as we do not have a staff of roving reporters. We invite brief Centre news reports to be sent to either Peter Jedicke, 810-1297 Huron Street, London, Ontario N5Y 4L9, or to the Editor (see Masthead for address). If you don't see a report from your Centre perhaps it is because we have not received any news from you.

CALGARY: Last autumn the Centennial Planetarium and Pleiades Theatre Society was formed. The purpose of this Society is to seek an agreement with the City of Calgary to operate the Planetarium. Memberships in the new Society cost \$20.00 and provide free access to the Planetarium and price reductions on other shows. Centre President, Don Hladiuk, reports that the Calgary Centre has been offered a seat on the new Society's Board of Directors.

HAMILTON: In last October's *National Newsletter* it was reported that *Orbit* was searching for a new editor. Bob Speck has served as interim editor and the new editor is Rob Allen. *Orbit* will now be a bimonthly newsletter. The Centre is also planning a new 16-foot square observatory building to house four of the Centre's telescopes. It will have a roll-off roof design and construction will begin in the spring.

KINGSTON: *Regulus* reports that well-known Canadian amateur David Levy made an independent discovery of a new comet on the evening of November 29th-30th. Using his largest telescope, a new 16-inch instrument, David spotted the magnitude 12.5 object in the constellation of Aquarius. Unfortunately, it turned out the comet had already been identified a few days previously by the Infrared Astronomical Satellite (IRAS) and an astronomer named Hartley and will not carry David's name. Comet IRAS-Hartley was the fifth and last comet discovered by IRAS before it ceased operation in late November.

The Centre's new president is Martyn McConnell while past president Terry Hicks will be the new National Council representative. Leo Enright, editor of *Regulus*, is acting as National Coordinator for International Astronomy Day to be held on Saturday, May 5.

LONDON: The Centre will be hosting the next meeting of the N.F.C.A.A.A. (Niagara Frontier Council of Amateur Astronomical Associations) on April 28. The Association met for the first time four years before in London.

NIAGARA: A special fund has been set up to construct a Centre Observatory which could be used by both members and the public. Bob Winder is building a 26-inch telescope while Lawrence Redman is planning to purchase one of Coulter's 29-inch Dobsonian instruments.

OTTAWA: Gary Susick is the new chairman of the Centre's Observers Group. Congratulations to Sandy Thuesen who has won the Centre's Observer of the Year Award and Robin Molson who is the Merit Award winner. The awards were presented at the Centre's Dinner Meeting in November.

MONTREAL: Congratulations also go to Gary Boyle and Enrico Kindl who have been awarded the Messier certificate for observing 110 Messier objects. Over 250 copies of David Levy's popular booklet *The Joy of Gazing* had been sold by late autumn. Mrs Betty Pride is continuing as Editor of the bimonthly *Skyward* newsletter.

SASKATOON: *Saskatoon Skies* reports the Centre will celebrate Astronomy Day on Saturday April 28.

TORONTO: On January 29, the Toronto Centre held a joint meeting with the Royal Canadian Institute in Convocation Hall on the grounds of the University of Toronto. The guest speaker, Dr. Ian Halliday, spoke on "The Return of Halley's Comet".

Plans for observing the Geminid and Quadrantid meteor showers in December and January were wiped out by clouds. However, a star party (moon party?) was organized by Paul Markov for December's penumbral lunar eclipse. Clear skies (but  $-20^{\circ}\text{C}$  temperatures) encouraged observation by a group of dedicated observers. Another solar eclipse expedition is being planned by the Centre for next May's eclipse. The tentative observing site is in Virginia and two busloads of observers will be going down to it. If you are interested in participating, contact Michael Watson at (416) 366-8381 (b) or (416) 483-4664 (r) *as soon as possible*.

VANCOUVER: The Centre's quarterly newsletter *Nova* reports plans are underway for Astronomy Day which will be held at the H.R. MacMillan Planetarium in May. Telescope and mirror grinding demonstrations are being considered as well as an astro-trivia game and a computer demonstration. Mike Atkinson reports he observed the space shuttle Columbia passing over Vancouver on December 1 during the STS-9 mission. Using a 15-cm Newtonian telescope and 38 $\times$  magnification, Mike says the shuttle appeared as an ellipse containing "two bright circular images, close together but separated and oriented along the major axis of the ellipse." Has anyone else observed the Shuttle in the sky?

WINDSOR: The Centre has received a grant from the National Council for over \$300.00 for the purchase of eyepieces and filters for its telescopes. There are plans being discussed for a joint University of Windsor-Windsor Centre observatory to be built.

## The 1984 Toronto Centre Solar Eclipse Expedition

by Michael Watson  
Toronto Centre

On Wed., May 30, 1984, eastern North Americans will have the opportunity to witness an extremely rare and fascinating phenomenon: an annular solar eclipse that is very nearly total. A good deal of

discussion and conjecture about this event has already occupied the astronomical community and literature. See the November issue of *Sky and Telescope* and the February issue of the R.A.S.C. *Journal* for articles about this eclipse.

When the new moon is near perigee and passes centrally across the disk of the sun as seen from a point on the earth's surface, the moon will appear larger in size than the sun, and the resulting central eclipse will be total. However, when the moon is near apogee, it will be too small to cover completely the sun's surface. A narrow but dazzling ring (or annulus) of sun will be visible surrounding the moon's disk. During the annular phase, which can last up to 11 minutes, the brilliance of the remaining photosphere or bright surface of the sun renders the solar corona, chromosphere and prominences invisible.

On extremely rare occasions when the moon is between perigee and apogee, it will appear almost but not quite as large in size as the sun. In such cases the high mountains on the rugged limb of the moon break the thread-like annulus of the sun into many brilliant points at mid-eclipse. The resulting phenomenon, which few people are privileged to witness in their lifetimes, really amounts to a 360° "diamond necklace." For a few moments the dark lunar disk is surrounded by a dancing ring of brilliant points of light; the sky darkens, inner corona may be glimpsed, and bright pink chromosphere and prominences are seen.

Like other types, "nearly total" annular eclipses follow the 18-year Saros cycle. In May, 1966 observers saw the diamond necklace from Greece and Turkey. Next May, the annular lunar shadow starts in the Pacific Ocean, sweeps across Mexico and enters the United States near New Orleans. After passing directly over Atlanta, Georgia the noonday darkness crosses North Carolina and Virginia, where the shadow track is the narrowest (seven km). Finally, the lunar shadow moves into the Atlantic Ocean and off the earth.

Through the Solar Eclipse Committee, the Toronto Centre is organizing a two-day expedition by chartered bus to Petersburg, Virginia for R.A.S.C. members. Departure will be from Toronto early on the morning of Tues., May 29. A twelve-hour drive will bring us to our overnight accommodation in or near Petersburg. Mid-eclipse will occur at 12:43 EDT on Wednesday. Departure for Toronto will be directly from the eclipse site. Total cost, including accommodation, will be about \$150 each, a real bargain for such an event.

Either one or two (but not more) 47-passenger buses will be chartered. Based on the response for the 1979 Manitoba eclipse, the fact that other R.A.S.C. Centres are being invited to participate, and the very low cost, we expect the expedition to be fully subscribed quickly. Full eclipse information will be sent to participants and eclipse observation/photography meetings will be held. Reasonable amounts of equipment (including telescopes) can be accommodated on the buses.

I will be happy to answer to telephone enquiries about the eclipse and the expedition at: 366-8381 (bus) and 483-4664 (res). We look forward to another highly successful and exciting solar eclipse expedition!

Reprinted from *'Scope*

## The 1984 Opposition of Mars

by **Observational Activities Committee**  
**Toronto Centre**

On May 11, 1984 the planet Mars will come to opposition. An *opposition* is simply the time when the Sun, Earth, and Mars are aligned, in that order, in a straight line as viewed from a point far above the solar system. When Mars is at opposition, it is closer to the Earth than at any other time and will shine brighter than any other object in the night sky with the exception of Venus, Jupiter, and the Moon. Mars is very conspicuous at this time because of its noticeable ruby colour, and in fact when it is low in the sky it is frequently mistaken for the light of a "UFO" by some members of the public. This year Mars will reach opposition in the constellation of Libra the Scales. The adjacent constellation of Scorpius contains as its brightest star, the red giant Antares, a star whose name means "rival of Mars". The combination of the brightness and the motion of Mars will make this planet an interesting object to observe during the first half of 1984.

The average time between successive oppositions of Mars is 780 days – this is the planets' *synodic*



*period*, and should not be confused with the time it takes Mars to complete one revolution around the Sun (which is 687 earth-days). The synodic period is the longer of the two periods because both Mars and the Earth are in motion around the Sun and therefore opposition alignments occur less frequently. (Incidentally, the synodic period of Jupiter and Saturn are shorter than that for Mars, even though these planets are at a greater distance from Earth, because the two gas giants are moving so much slower compared to Earth that it takes a much shorter time for our planet to “catch up” and establish opposition.)

The synodic period of Mars, then, tells us that we can expect an opposition roughly at intervals of two years plus two months. But some oppositions are better than others. The orbit of Mars has an eccentricity of 0.093, which is higher than any other planet in our solar system except Mercury and Pluto. *Eccentricity* is a measure of how much a planet's orbit is non-circular, and what it means for Mars is that the distance between the red planet and Earth at opposition can vary from between 56 million kilometres (when opposition occurs close to Mars' perihelion – that is, Mars nearest approach to the Sun) to 100 million kilometres (when opposition occurs nears Mars' aphelion, or furthest approach to the Sun). The length of time between favourable oppositions (oppositions that coincide with Mars' perihelion) is between 15 and 17 years. The last favourable opposition was on August 10, 1971 when Mars passed 56.3 million kilometres away from the Earth, and shone with a maximum stellar magnitude of  $-2.6$ . The next favourable opposition will be on September 28, 1988 when Mars at closest approach to Earth will be 58.9 million kilometres away. The 1984 opposition will not be the best it could be, but neither will it be the worst. At close approach (Saturday, May 19) Mars will be 79.5 million kilometres from Earth and will have a maximum magnitude of  $-1.9$  and an apparent diameter of 17.6 arc seconds.

It will be the motion of Mars against the background stars that will be most interesting to observe. The normal motion of a planet like Mars is eastwards. This is its direct motion. However around the time of opposition *superior planets* (planets beyond the orbit of the Earth) perform what is called a *loop of retrogression*. As the Earth starts to overtake Mars, the planet's motion relative to the background stars will appear to slow down, then stop (stationary point), then speed up again but this time moving backwards (or *retrograding*). Some time while the planet is retrograding, opposition is reached. Then as the Earth leaves the planet behind, the planet will again slow down relative to the background stars, become stationary, and then resume its direct motion to the east again. Here are the important dates for these events.

Wednesday, April 4	Mars stationary
Friday, May 11	Mars at opposition
Saturday, May 19	Mars closest approach to Earth
Wednesday, June 20	Mars stationary

For modern amateur astronomers the retrograde motion of Mars affords an opportunity to chart this peculiar apparent movement over several weeks. Very little equipment is needed for this: with your eyes alone or with a pair of binoculars you can note the change in the position of Mars from week to week. One project might be to make a simple sketch of Mars and the surrounding bright stars each week between the beginning of March and the end of June. Such a collection of sketches would be a useful record of the motion of Mars and it is also an excellent way for the beginning amateur astronomer to become familiar with the night-time sky.

If you own a 35 mm SLR camera, you could easily obtain a series of photographs that would dramatically show the changing position of Mars. Each clear evening starting in the new year, mount your camera on a sturdy tripod or other platform, making sure that the position from which you take the pictures has a clear view to the south and remains the same from night to night. The 1984 loop of retrogression will be approximately  $18^\circ$  wide, so mount a lens on your camera that has a field of view wider than  $18^\circ$ . A 50 mm lens has a field of view of about  $35^\circ$ , so it would serve nicely. Over the course of the first half of the year you will observe Mars to go from its eastward direct motion to westward retrograde motion and back once again to direct motion. The loop of retrogression is in the constellation of Libra, so try to centre your camera a little to the left of the star Zebenelgenubi. If you are careful in taking your pictures, your photographs will show the same star background; only the position of Mars will have changed. Some photography hints: 1) Try taking 15 to 30 second exposures

with a high speed film such as Ektachrome 400, 2) To reduce vibrations it is best to use a cable release on your camera, 3) Have your lens at its widest aperture setting and focus on infinity, 4) Avoid taking pictures when the Moon is at or close to its full phase because its light will make a large contribution to the sky fog on your developed pictures, and 5) Do not take a picture if the Moon is in the same field of view as Mars because the time exposure would cause it to become greatly over exposed.

Owners of telescopes have a wide variety of potential projects open to them. The opposition will be a terrific time to practice photographic techniques through your telescope. Normally, with Mars having an angular diameter of less than 10 arc seconds, attempts at close-up photography are disappointing. But after March 9, Mars will be larger than this, increasing daily to a maximum size of 17.6 arc seconds. It would be possible to obtain some respectable images of Mars when it is near its closest approach to Earth. However, with a declination of between  $-16^\circ$  and  $-18^\circ$ , Mars' meridian altitude will not be very high from Toronto's latitude. As a result, the best you should expect from your pictures is a rather fuzzy disk with perhaps the polar ice caps and some dust clouds showing. Those with artistic talent might be able to discern more with their eyes alone, and could be rewarded with some very beautiful sketches. Don't be impatient: as you grow used to observing Mars night after night, your eyes will become accustomed to the low contrasts that characterize this planet. Through a 6-inch telescope or larger you will soon become familiar with some of the major surface features. For more information on the photography of Mars (film type, exposure information, etc.), see the article "Suggestions for a Photographic Patrol of Mars" in the December, 1975 issue of *Sky & Telescope*. See also the November, 1971 issue of *Sky & Telescope*.

Adapted from OAC Bulletin No. 1

## The 1983 General Assembly

by Rolf Meier  
Ottawa Centre

The 1983 General Assembly of the R.A.S.C. was held in Quebec City on May 20–23 at Laval University. This was not just an R.A.S.C. affair, but a joint meeting with two other organizations, the A.A.V.S.O. and the A.G.A.A. The latter is a union of Quebec's astronomy clubs which are not affiliated with the R.A.S.C.

The fun started at 7 p.m. on Friday night, with a wine and cheese party. This provided an opportunity for all attendees to meet each other and to renew old friendships. Later, a series of informal slide shows and movies was presented. Of particular interest was a 3-D spectacular presented by one of the Quebecers. It concluded with an impressive view of Comet IRAS-Araki-Alcock, which clearly showed the comet in front of the stellar background. Next came the song contest. The winner in the English category was Peter Jedicke of London Centre, with a child's black hole song. The festivities broke up into a series of informal gatherings which lasted into the early morning.

Next day, the first of three paper sessions was held. Attendees were thoughtfully provided with simultaneous translation receivers so that they could understand the talks not given in their native tongue. Papers were on a wide range of topics, with speakers from all three societies.

On Saturday afternoon a tour of Old Quebec was provided. Some members took the guided bus tour, but I and a few others chose a driving/walking tour of the old back streets. And what a beautiful historic city Quebec is. The old section is small enough to be explored on foot, and it was a nice warm day. Our walk was preceded by lunch at an outdoor restaurant.

The annual banquet was held on Saturday night. Awards were presented for various achievements, including a Service Award to Ottawa member Dr. Lloyd Higgs, and the Ken Chilton Prize to Chris Spratt of Victoria for his variable star work. The banquet was followed by a talk in French by Dr. Hubert Reeves of France. His theme was "The Arrow of Time in Astronomy", dealing with the ultimate fate of the universe through entropy. The direction of time can always be ascertained, since entropy always increases with time.

Sunday morning began bright and early with the second paper session. After lunch, the Annual Meeting of the R.A.S.C. was held, followed by a meeting of National Council. Two important items arose. First, the Society has purchased a new headquarters building in downtown Toronto. Second, the

locations of the 1984 and 1985 General Assemblies were announced: Hamilton and Edmonton respectively.

The third and final paper session was held on Sunday evening. It was followed by presentation of the display awards. (These were reported in the August 1983 *National Newsletter*. –Ed.)

Well, that was it, right? Not quite. Some informal gatherings followed, lasting into the morning. This was hard on some who had to get up early for a day-long tour to the Mont Megantic Observatory.

The Quebec GA was a lot of fun. Members should try to get some good displays together for next year by doing a lot of observing. Now is the time to start planning for Hamilton!

Reprinted from *AstroNotes*

## How Few Photons Per Second Can You See?

by Fred Lossing  
Ottawa Centre

*Burnham's Celestial Handbook* mentions that in experiments with faint artificial stars on a really black background an experienced observer could see a "star" of magnitude 8.5. This is about one magnitude fainter than is usually stated for real stars, probably because the sky is never really black, and the eye therefore never fully dark-adapted. From the primary light standard, and the unit of light intensity, the lumen, an equation can be derived which gives the intensity of light (in lumens) falling on an area (for instance the pupil of the eye, or the aperture of a telescope) from a star of a given magnitude. This equation is:

$$\log Q = -(22.4 + m - 5 \log A)/2.5$$

where Q is the number of lumens arriving, m is the stellar magnitude, and A is the aperture of the telescope or pupil of the eye in inches. From this equation we can calculate the minimum number of photons which corresponds to the artificial star of 8.5 magnitude. This will then be the smallest number of photons per second which can be seen by the eye.

So, put a new battery in your calculator, and let's go! We will need some other units: 1 lumen =  $1.5 \times 10^{-3}$  watt, 1 watt =  $10^7$  erg-sec<sup>-1</sup>. Thus 1 lumen =  $1.5 \times 10^4$  erg-sec<sup>-1</sup>. Take the diameter of the pupil of the eye as 0.28 inch (7 mm) and take m = 8.5, and solve for Q:

$$\log Q = -13.4657 \text{ or } \overline{14.5343}$$

$$Q = 3.42 \times 10^{14} \text{ lumen}$$

This is  $3.42 \times 10^{14} \times 1.5 \times 10^4 = 5.13 \times 10^{10}$  erg-sec<sup>-1</sup>.

Now, let us work out what this amount of light corresponds to in the number of photons per second, using photons of the wavelength to which the eye is most sensitive, 560 nanometres. From this we calculate the energy per photon, using the famous Planck's equation, energy  $E = hv$ , where h is Planck's constant,  $6.63 \times 10^{-27}$  erg-sec. We can get the frequency  $\nu$  from the relationship

$$\nu = \text{velocity of light (cm-sec}^{-1}\text{)}/\text{wavelength}$$

$$= 3 \times 10^{10} \text{ cm-sec}^{-1}/560 \times 10^{-9} \text{ cm}$$

$$= 5.36 \times 10^{14} \text{ sec}^{-1}$$

The energy of the photon is then

$$E = hv = 6.63 \times 10^{-27} \text{ erg-sec} \times 5.36 \times 10^{14} \text{ sec}^{-1}$$

$$= 3.55 \times 10^{-12} \text{ erg.}$$

So now we have the amount of light we can just see, and the amount of light energy per photon. To get the number of photons we can just divide:

$$\text{No. of photons per second} = 5.13 \times 10^{10} \text{ erg-sec}^{-1}/3.55 \times 10^{-12} \text{ erg} = 145 \text{ per second.}$$

This shows how amazingly sensitive the eye is. Just imagine: if the eye were only 10 times more sensitive, we would see a flutter effect at low light levels as individual photons arrived!

It is also interesting to compare the sensitivity of the unaided eye with the sensitivity of a photomultiplier tube (as used in the photocurrent mode). According to the specification sheet, the sensitivity of the 1P21 photomultiplier tube is  $1.2 \times 10^5$  amperes per watt. This decreases to  $3.6 \times 10^4$  amperes per watt at 560 nanometres. What will the current be for a flux of 145 photons per second? At a sensitivity of  $3.6 \times 10^4$  amperes per watt, the amplified photocurrent will be  $1.9 \times 10^{-12}$  ampere. This will have to be measured in the presence of a "dark current" of  $1 \times 10^{-9}$  ampere. This dark current is the current output of the 1P21 in the complete absence of light. It is not always constant, and it is dependent on the temperature. So, for a flux of 145 photons per second the problem would be to measure a signal current of  $1.9 \times 10^{-12}$  ampere in the presence of a somewhat variable dark current 500 times larger. Evidently the 1P21 will not be very useful for measuring photon arrival rates of a few hundred photons per second if it is operated in the "photocurrent" mode. In my 8-inch telescope my photometer could just cope with stars of magnitude 10 to 11.

However, the 1P21 can be used in a "photon counting" mode, in which the dark current does not interfere, and which can probably measure one photon per second with some accuracy. The difficulty in this mode will be for bright stars. Going back to our log Q equation and substituting magnitude  $m = 0$  and aperture  $A = 16$  inches, there will arrive at the focus  $7.6 \times 10^9$  photons per second, each photon giving a pulse of electrons at the anode of the 1P21. To count these pulses this rapidly one would need a really fast counting circuit. Alternatively, one can use filters of known transmission to reduce the counting rate to a more reasonable rate.

Reprinted from *AstroNotes*

## Astronomy on the Fenian Plan

by Mike McKay  
Halifax Centre

Remember the Fenians? Let me refresh your memory.

In the late 1860's, directly after the American Civil War, a motley, comical troupe of transplanted Irish patriots still spoiling for a fight assembled along the Maine–New Brunswick border. Their goal: the conquest of Canada. They weren't very successful. But what has all this to do with astronomy? Patience, friends.

I can safely say that the main centre for astronomical research in the Maritimes has to be St. Mary's University in Halifax. If you are familiar with the aforementioned establishment, you will know that the 0.4 m telescope of the Burke-Gaffney Observatory sits atop the 22-story Loyola building in the south end of Halifax. This would be fine if it weren't for the fact that the observatory is in relative proximity to a large, well-lit container pier. As well, the observatory has to contend with other sources of light pollution. Thousands of streetlights, house lights, donut shop neon signs and luminous wrist-watch dials contribute to the glow of the Halifax sky.

After personal reflection I have decided that there are two things that could greatly alter the plight of astronomy in Nova Scotia:

- 1 Stir up interest in a Fenian revival. Equip these green guerrillas of St. Pat's with an air force, and see Halifax plunged into blackout conditions for an indefinite period of time, or
- 2 Consider alternate observatory sites in Nova Scotia.

There are several sites where one could place an observatory in Nova Scotia. But first we must consider factors one has to be knowledgeable of before deciding on where to place an optical observatory.

Weather Factors: The best method by which to analyze the weather conditions of a site is to sift through meteorological reports for the area in the last twenty years. You're trying to build up a pattern of weather conditions for your specific area. Obviously you cannot expect any region in Nova Scotia to yield results similar to Arizona, but there are areas of differentiation. Even if it only amounts to a couple of extra nights viewing per year, it still makes it worth the effort.

**Physical Features:** There are a number of significant physical features which you should want to examine. Water plays a large part in your decision. Every local elementary school geography course teaches the fact that one cannot travel fifty miles in any direction in Nova Scotia without reaching the ocean. But logic dictates that the further you are away from water, the less water vapour you'll encounter in the surrounding air. This water will play minor havoc with images, distorting, refracting, and absorbing them. Therefore, you'll also want to avoid large lakes and swamps.

The height above sea level is another critical factor. By selecting a fairly lofty site you are ensuring better quality of seeing (seeing is the atmospheric phenomenon by which light is refracted as it passes through different air densities, causing the image to dance and twinkle). The shorter the column of air directly above your telescope, the less air there is to interact with your image.

A factor which seems at first rather innocuous, is the accessibility of your site. If your institution happens to own a helicopter, maybe you'll have no worries, but otherwise you must select a site to which there is easy access. If the site will require a bit of trail blazing and road building, make sure that it is kept within budgetary restraint. If the army corps of engineers regards your plans with incredulity, you should consider other locations.

**Miscellaneous Items:** Earthquakes occur in every part of the world almost daily. I'm not speaking of the tower tumbling, rift-ridden Hollywood variety, but rather I speak of low intensity rumbles which we never feel. Depending on the delicacy of your optical instrumentation, you may want to try to obtain seismological data for your proposed site.

Make sure you are removed as far as possible from all sources of light and air pollution. Airports, oil refineries and electrical generating plants do not top my list of areas to place a dog house, let alone an observatory.

The table lists five proposed observatory sites. These are all areas which best fit the rules outlined earlier in this article.

TABLE OF PROPOSED SITES

Site #	Map Series	Grid Ref.	Approx. Elev.*
1	National Topographic Series, "Cape Breton National Park"	†	1700
2	National Topographic Series, "Oxford", #11E/12	475425	1000
3	National Topographic Series, "Hopewell", #11 E/7	152268	750
4	National Topographic Series, "Mount Uniacke" #11 D/13	387762	650
5	National Topographic Series, "New Ross", #21 A/16	927606	850

\*Approximate elevation in feet above sea level.

† There are no grid references available on this map, but latitude and longitude are given instead. For this position: latitude  $46^{\circ} 47' 30''$ , longitude  $60^{\circ} 41' 45''$ .

In the course of this article I have concentrated solely on the province of Nova Scotia. This is by no means saying that New Brunswick, Prince Edward Island and Newfoundland could not be considered. One would think that Newfoundland could supply sites of superior elevation.

In closing I must also state that this article is by no means an exhaustive study – your author would be hard-pressed to find anything he exhaustively studies! However, I do sincerely believe that there is a future for astronomy in Nova Scotia, and if we are going to grow, we must prepare for it now.

Reprinted from *Nova Notes*

(Blarney!—Ed.)

## Exhibit Details for 1984 General Assembly in Hamilton

This is the list of exhibit classes for next year. Entries may or may not be based on observations, at the choice of the participants. All observational techniques can be used: visual, photographic, photometric, etc ...

1 Solar	7 Variable stars
2 Lunar	8 Radioastronomy
3 Comets, asteroid	9 Equipment and/or techniques
4 Planetary	10 Centre Group Display or Individual
5 Deep space	11 History of Canadian Astronomy
6 Atmospheric phenomena	12 Open

### *Rules*

- 1 Any member in good standing (or group of members) may enter. If a group wins, there will be only one prize for the group.
- 2 All work must be done with amateur equipment.
- 3 Entries must be presented for the first time and must have been done within the last two years.
- 4 Individuals may enter up to a maximum of three categories, with only one entry per category.

The judges may decide to withhold awarding a prize in any category if they consider the calibre of the entry does not warrant an award. Further, it is hoped to have a Grand Prize for the outstanding entry in the exhibit.

Entrants will not be required to appear in person, although this is desirable, but they will be required to make their own arrangements regarding shipment and return of the entry after the exhibit.

Start working right now and participate!

## Détails du concours pour l'assemblée générale de 1984 à Hamilton

Voici la liste des classes de travaux qui pourront être présentés à ce concours. Les entrées pourront être basées ou non sur l'observation, au choix des participants. Les diverses techniques d'observation: visuelles, photographiques, photométriques, etc ..., seront acceptées.

1 Soleil	7 Les étoiles variables
2 Lune	8 La radio-astronomie
3 Comètes, astéroïdes	9 Équipement et/ou procédure
4 Planètes	10 Exposition d'un centre ou groupe ou individuel
5 Objets lointains (Deep Sky)	11 Histoire sur l'Astronomie Canadienne
6 Phénomènes atmosphériques	12 Libre

### *Règlements*

- 1 Peut s'inscrire, tout membre en règle (ou groupe de membres) de l'une des Sociétés participantes. Dans le cas d'un groupe, il y aura seulement un prix remis pour tout le groupe.
- 2 Tout travail doit être fait avec de l'équipement d'amateur.
- 3 Les travaux présentés doivent être originaux, c'est-à-dire être présentés pour la première fois et avoir été complétés au cours des deux dernières années.
- 4 Un individu peut participer à un maximum de trois catégories, avec seulement une entrée par catégorie.

Les juges décerneront les prix dans les différentes catégories, à leur discrétion. Par exemple, ils peuvent omettre la distribution du prix pertinent à une catégorie, s'il n'y a pas d'entrée valable. Aussi, on espère avoir un Grand Prix pour souligner une contribution exceptionnelle.

Les participants ne seront pas tenus d'assister en personne, bien que ce soit préférable; mais ils devront faire leur propre arrangement concernant la livraison aller/retour de leur matériel.

Commencez à vous préparer dès maintenant et participer!

## Société Royale d'Astronomie du Canada Assemblée Générale 1984 29 juin–2 juillet

Pour marquer le 75<sup>e</sup> anniversaire du centre de Hamilton, l'Assemblée Générale sera caractérisée par deux grands banquets, une soirée chaque jour et des excursions en quantité. Et avec tout ceci les exposés, la réunion annuelle et l'occasion de renouer d'anciens liens d'amitié. Une visite au Jardin botanique royal fera partie des excursions de même qu'une visite à un château local et des excursions dans les environs du port. De plus, un jour entier sera consacré aux Chutes du Niagara, où nous pourrons admirer la tour Skylon, le téléphérique espagnol, les tunnels panoramiques etc., le tout couronné par un banquet. L'emploi du temps est agréable, aussi n'hésitez pas à venir.

Les membres sont invités à participer aux exposés. Des exposés d'une durée de 10 minutes sur tout aspect de l'astronomie seraient bienvenus. Les extraits de ces exposés doivent être envoyés avant le 15 avril à la S.R.A.C., au Président des exposés, C.P. 1223, Waterdown (Ontario) L0R 2H0.

D'autre part, nous vous demandons d'écrire à l'adresse ci-dessus pour obtenir des imprimés pour participer au concours d'expositions. Seules les expositions dûment inscrites pourront faire partie du concours de prix. Les inscriptions devront parvenir chez le juge en chef au plus tard le vendredi 29 juin 1984 à 22h. À noter que chaque exposition ne peut entrer que dans une seule classe (c.-à-d individuelle, groupe, centre) et dans une seule catégorie (c.-à-d. solaire, lunaire, étoile variable, etc.) et ne peut être combinée à une autre exposition, avec celle d'un centre par exemple. Les règlements de l'exposition sont énoncés ailleurs dans la présente publication.

Afin de faciliter l'organisation de ces diverses activités et l'hébergement des participants, nous vous prions de remplir le formulaire ci-dessous et de nous le renvoyer d'ici le 15 avril. L'envoi d'une enveloppe pré-affranchie à votre adresse nous permettra de vous renvoyer une formule d'inscription plus détaillée. Nous prévoyons que le prix par personne, en occupation double, sera moms de 250,00 \$ et comprendra l'hébergement, les repas, les deux banquets, les excursions et les frais de transport s'y rapportant, y compris ceux de l'excursion aux Chutes du Niagara.

Vous êtes priés de faire parvenir les renseignements ci-dessous (le 15 avril) au Secrétariat d'Accueil, soit: General Assembly 1984, P.O. Box 1223, Waterdown, Ontario, L0R 2H0

J'assisterai \_\_\_\_\_  
J'assisterai peut-être \_\_\_\_\_ Nombre de personnes \_\_\_\_\_

Je demande au Comité d'Accueil de s'occuper de mon hébergement

Type de logement souhaite:

Résidence universitaire \_\_\_\_\_ motel \_\_\_\_\_

Je m'occuperai moi-même de mon logement \_\_\_\_\_

Indiquer vos dates probables d'arrivée et de départ: juin 27, 28, 29, 30, juillet 1, 2, 3, 4

Nom \_\_\_\_\_

Adresse \_\_\_\_\_

\_\_\_\_\_

Centre local ou club \_\_\_\_\_

## Royal Astronomical Society of Canada 1984 General Assembly June 29–July 2

As a special feature of the 75th Anniversary of the Hamilton Centre, the General Assembly will have two major banquets, a party every night and excursions galore. All this and the Papers Sessions, annual meeting and the opportunity to renew old friendships. The excursions will include the Royal Botanical Gardens, a local Castle and trips around the Harbour. Further a complete day will be spent in Niagara Falls, where we will enjoy seeing the Skylon Tower, Spanish Aerial Car, Scenic Tunnels etc., along with one of the Banquets. This will be a fun filled time, so do come.

Members are invited to participate in the Paper Sessions. Papers of ten minutes duration on any aspect of astronomy are welcome. Abstracts must be sent before April 15, to R.A.S.C. – Papers Chairman, P.O. Box 1223, Waterdown, Ontario, L0R 2H0.

Further we would ask you to write to the above address to obtain application forms for the Display Competition. Only Pre-Registered Displays will be allowed to compete for prizes. These must be in to the Chief Judge by 10pm, Friday June 29, 1984. Further it should be noted that each display can only be entered in one Class (ie. – Individual, Group, Centre) and Category, (ie. solar, lunar, variable star, etc.) and cannot be mixed-in with another display such as a centre display. The display rules are listed elsewhere in this issue.

To assist in planning for the various events and accommodations, please fill out the form below and return by April 15. By enclosing a stamped self-addressed envelope, we will then forward a more detailed registration form. It is currently projected that the cost for a single person based on double occupancy will be less than \$250.00 and that includes all accommodations, meals, 2 banquets, trips and their attended transportation charges including those to Niagara Falls.

Would you please send the following information before April 15, to: General Assembly 1984, P.O. Box 1223, Waterdown, Ontario, L0R 2H0

I plan to attend \_\_\_\_\_ Number in party \_\_\_\_\_  
I may attend \_\_\_\_\_

I wish the Organizing Committee to make arrangements for me.

Accommodation desired:    on campus \_\_\_\_\_    motel \_\_\_\_\_

I will make my own arrangements \_\_\_\_\_

Circle expected dates of arrival and departure: June 27, 28, 29, 30, July 1, 2, 3, 4

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Centre or affiliation \_\_\_\_\_