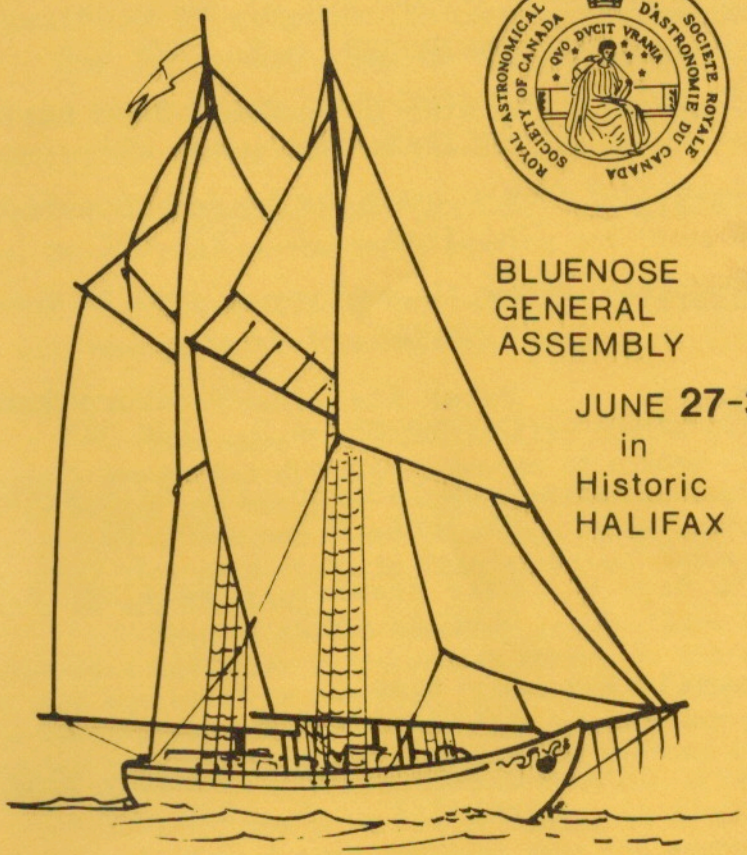

BLUENOSE
GENERAL
ASSEMBLY

JUNE 27-30
in
Historic
HALIFAX

# NOVA NOTES

BI-MONTHLY JOURNAL OF THE HALIFAX CENTRE

MAY - JUNE 1980, VOLUME 11, NUMBER 3

## 1980 Halifax Center Executive

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V' President - Walter Zukauskas, 2436 Harvard
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Secretary - Murray Cunningham, 6299 Payzant
HALIFAX, N.S., B3H 2B2

Treasurer - Sherman Williams,
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Editor - Peter Steffin, 8 Auburn Drive,
DARTMOUTH, N.S., B2W 3S6

Ass't Editor - Jody LeBlanc, 196 Main Avenue,
HALIFAX, N.S., B3M 1B5

Nat'l Rep. - Mike Edwards, 8 Sullivan's Hill,
BEDFORD, N.S.

Alternate Rep.-Roy Bishop,
WOLFVILLE, N.S.

Observ. Ch'man-Glenn Graham, 99 Sunny Brae
HALIFAX, N.S., B3N 2G8

### SUBSCRIPTION RATES FOR 1980

NOVA NOTES is available to non-members of the HALIFAX center R.A.S.C. at the rate of 35¢ per single issue or $2.00 for six issues per annum. We can still fill orders for the complete 1980 subscription year. Contact the editor for more information.

## Minutes of the March, 1980 Meeting

The important item in the March meeting was the presentation, distribution and reading of the CONSTITUTION AND BY LAWS of the Halifax Centre. This had been studied and was drawn up with full legal advice. It was read at the March meeting and there were a number of minor corrections. It passed unanimously. It will now go before the National Council at the Gen. Assembly this June.

Then came THE GREAT HALIFAX CENTRE QUIZ. Randall Brooks led off with a series of slides of the solar system but not your everyday pictures- such a collection of far out views. The moon by infra red light, an arial view of a river in Uganda, Io and Venus. I think we all did badly.

Then he showed us a series of slides of telescopes and other astronomical items. We did better on this but could we remember Flamsteed? Or Airy? The whole group was divided up into six smaller groups andeven then our fast consultations on history was of little avail.

Next came a series of slides of Messier objects. Some were better at this and even gave the approx, R.A. and Dec. for them thus earning bonus points. Our group got 20 out of 60. Some were far better but others were worse so it was an excellent exercise. Now for YOUR bonus point--Who discovered Messier 106 and when? answer below.

Then we all watched the short movie on Jupiter by NASA/JPL. There was time lapse photography showing the remarkable turbulance of the ?clouds ?gasses or surface features. Then there were simulation footage of the moons. A short (10min) but worthwhile film.

Now don't peek but it was our own Helen S. Hogg in 1943. She will be our guest speaker at the Bluenose General Assembly here June 27 to 30.

## Minutes of the April, 1980 Meeting

The April 18, 1980 meeting of the Halifax Centre was held at the Nova Scotia Museum. Our speaker, Mr. "Mac" Fyfe of the Dalhousie Physics Department, gave us some glimpses of the arcane art of "Optical Design".

He began simply by showing us how to trace rays through a simple, plano-convex lens using a protractor, straight-edge and calculator. The lack of perfect focus was evident. Sperical aberration had crept into even this simple picture. However "Mac" drew out some of the optical designer's weapons--extra lenses added to the system, each with its own power and a wide variety of glass materials.

Since there are a number of aberrations, reducing their effects to an acceptable level is a compromise solution between competing influences. Special attention was then given to chromatic aberration and to coma, two problems of astronomical interest. Some neat, clear demonstrations accompanied the talk.

It was announced that Bill Calnen, for the second consecutive year, is the recipient of the Burke-Gaffney Award for his contribution on helical antenna design.

Coffee, biscuits and conversation rounded out the evening.

Murray Cunningham
Secretary,
Halifax Centre

## NN's NEWS MONITOR

The moons of Jupiter and Saturn continue to increase in number. No one is sure how many have been observed for sure. In the case of Jupiter the Voyager 2 photos revealed a new moon just at the outer edge of the ring. This becomes the 14th confirmed moon, as the one observed in Nov. 1977 has never been seen again. The new one is thought to be about 40 km in diameter with low albedo of 0.05 or less. The latter fact would point to a composition of carbonaceous material similar to "C" type asteroids. The moon is only 129,000 km above the surface and orbits Jupiter faster than any other satellite in the solar system. Saturn has anywhere from 12 to 18 moons as of this writing. Because we are passing through the plane of the rings this year, dim moons are more easily detectable. The last time this occurred was in 1966 when Janus was found by Dollfus. The Pioneer 11 observations of particle densities infer two new moons which lie in the new ring discovered beyond the F-ring. Earth based photos have detected a number of moon images but the problem of deciphering the possible orbits, periods etc. has not been completed. With present available data, the most likely number of Saturnian satellites is 13. The Voyager by-pass later in the year will make that a worthless number to remember I suspect.

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What's the heaviest known star? Most would say Plaskett's star (Plaskett was the founder and first director at DAO in Victoria). HD93250, Plaskett's Star, is just 120 times as massive as the Sun. The new heavy weight(or the contender at any rate) is the star at the centre of Tarantula Nebula in the Large Magellanic Cloud. Astronomers at the European Southern Obs. at La Silla, Chile have obtained observations with the 3.6 m telescope which indicate that this huge (900 ly diameter) nebula is being excited by a single star instead of the compact cluster that was previously thought to exist at the centre. The light comes from a region only 3 ly in diameter which is too small a volume to contain the 50-100 stars of the cluster. Present indications are that the object is 200-1000 solar masses. Speckle interferometer measurements are planned which should confirm or destroy the conjectures. The star, if it is single, has a surface temperature of 55,000°K and is Mag.-12.5 ($M_v$).

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Using a speckle interferometer on the 5 m Hale telescope direct measures of the diameter of Pluto have been made. They show the distant planet to be 3000 to 3600 km across which compares to the Moon's 3476 km diameter. Faint bodies like Pluto could not previously have been observed by this technique. However, a new image photon counting system which replaces the photographic plate extends the usefulness of SI. They have also found a mottled surface or abnormally bright centre acting something like a polished ball bearing. Their observations confirm earlier spectroscopic ones which show a bright surface (albedo 0.25). The density can be determined for the first time using Pluto's moon, Charon. The moon's orbit and the new diameter yield a density of only 0.3 to 0.8 times that of water!

Randall Brooks

CAMPING/OBSERVING WEEKEND

The forth annual camping/observing weekend is planned for July 18, 19 and 20. We are going again to the vicinity of Kedji which will allow plenty of daytime activities in the park. Only a 2½ hour drive from Halifax, the locale enjoys beautifully dark skies for astronomical persuits. The nights are warm and the company friendly. And as any camper will tell you, the food's fantastic when made outside. But if you're not the camping type, there are cabins or motels within easy driving distance.

Why not plan to join us for a fun weekend of fresh air, fun and observing. Save the July 18-20 weekend. Want more details? Phone

Glenn Graham, (443-8349)
99 Sunnybrae Ave.
Halifax, N.S.
B3N 2G8

## UNIVERSAL GLUE

Recently a group of scientists has discovered that there exists a force that holds atomic nuclei together, thereby keeping all matter in the Universe from coming apart. This "universal glue" we are now told, may very well be a particle more commonly called a gluon (what else).

As mentioned on page twenty of the Mar.-April issue of NOVA NOTES there are four known forces that exist in the Universe all of which, it is believed, are really one and the same, the most basic form of all.

These scientists believe that in every case the push or pull which we call a force is actually the action of tiny particles that are bouncing back and forth between objects, carrying messages from one to the other to tell it that it should move closer or further away.

Of the four forces, the weakest is gravity and the particle responsible for it, if found, will be called a graviton.

Then we have the next strength that is more commonly known as the "weak force" and its particle, when found, will be referred to as the W.

Next, and approximately a trillion times as strong as the previous force is the elec - tromagnetic force. This particular force is responsible for holding the electron and the nucleus together to form the atom and holding atoms together to form everything else. If you are a Star Trek "Treckie" you will be able to recognize that the particle that is associated with this force is the photon.

The strongest of all the forces and about one hundred times as strong as even the electromagnetic force, is the "strong", or nuclear force. This force is the one that holds together the quarks, which is the most basic particle of all. Getting back to our title, we can consider this most basic particle of all to be the force that can then "glue-on" one quark to another.

Recent experiments seem to indicate that gluons do in fact exist. These experiments, carried out, at the Hamburg accelerator in Hamburg, West Germany have shown that electrons and positrons can be made to collide head-on with a tremendous force.

The magazine SCIENCE DIGEST (Spring 1980) says that Physicist Charles Nelson of the State University of New York at Binghamton believes that if gluons have really been found, confirming the theory that predicted their existence, the problem of the nucleus is almost solved.

Peter Steffin

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Did you know that about one hundred tons of dust from outer space settles on the surface of the earth every day. This is debris from the two hundred million meteors that pepper our planet every twenty-four hours. Most of these meteors are about the size of a grain of sand and fly about thirty-two kms. a second. They would strike the earth with the force of a .45 caliber bullet if atmospheric friction didn't burn them up first.

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## GUIDELINES FOR DISPLAY ENTRIES TO THE 1980 BLUENOSE GENERAL ASSEMBLY

Categories:

1) Centre Display
2) Individual Display
3) Radio Observing Project
4) Optical Observing Project
5) Atmospheric Phenomena
6) Design Project (completed)
7) Open Category

Rules:

1) This competition is open to all RASC members in good standing.
2) All entries must never have been entered before in any G.A. Displays Competition.
3) All work must be original and remains the property of and responsibility of owner.
4) All audio-visual entries must be "self - contained" in the Displays Room; no judging will be done outside the Displays Room or outside the time alotted for judging.
5) Exhibits must be entered in one category only.
6) Members may enter as many categories as they wish.
7) Any entrant may designate another member to take the exhibit to the G.A. Display Competition.
8) Prizes will be alocated by the judges; if any category is deemed not worthy of an award by the judges, then none shall be given.
9) All Entrants must have submitted a Display Competition registration form, post marked not later than May 31, 1980.

10) Entry forms may be obtained from and should be returned to:

Bluenose General Assembly,
c/o Peter J. Edwards, Displays Chairman,
8 Sullivan's Hill,
Bedford, N.S.; B4A 1N8

11) Cheaters should NOT get caught!

Peter J. Edwards,
Chairman, Displays Committee,
Bluenose General Assembly,

HALIFAX CENTRE

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ANNUAL CENTRE DINNER, FRIDAY 16 MAY,

The annual centre dinner will take place on the date above at the Chinatown restaurant. The special speaker for the event will be Dr. John Percy, the National President of the RASC. The price will be $8:00 and tickets must be obtained in advance. The menu will include a number of chinese dishes and with Chinatown's reputation you can expect a tasty meal. Tickets may be obtained at the April meeting or if you can't make it, mail a cheque (made out to Halifax Centre, RASC) to:

Sherman Williams,
Horton Bluff Rd.,
Avonport, N.S.,
B0P 1B0

## CANADA-FRANCE-HAWAII TELESCOPE UPDATE:

The Canada-France-Hawaii Telescope Corp. (CFHT) is a joint organization of the National Research Council of Canada (NRC), the Centre National de la Recherche Scientifique of France (CNRS), and the University of Hawaii.

### The Last Twelve Months

The tasks of the past year have been concentrated on the reassembly of the tele - scope at the site and manufacturing of the nine instruments subcontracted to various observatories or astronomical institutes. The telescope arrived in the "Big Island" in the harbour of Kawaihae, on September 12, 1978, onboard the vessel "Lift-off", after a journey of 45 days from La Rochelle. The valuable cargo, 46 crates weighing almost 500 tons, was trucked up Mauna Kea, piece by piece, passing by the office of CFHT in Weimea to reach the summit usually the same night.

The reassembly started in November of 1978 and most of the structure was in place at the beginning of March, 1979. The primary mirror arrived on the 15th. of March from Victoria and was placed in the aluminizing room, where it took six weeks to bond the 24 radial pads around the mirror.

The first motion of the telescope took place on March 8. Many fine mechanical adjust- ments were necessary, in particular the po - sition of the hydrostatic bearings was slightly modified during the tests.

An important problem in the control system of the telescope (destructive insta - bility in the power amplifiers) was solved just before the first tests of the telescope with its mirror.

The cabling of the telescope proved to be much more difficult and longer than was expected. However, the instruments ready at this date are the prime focus guiding head and the photographic equipment used at the prime focus.

The data aquisition system, composed of a Hewlett Packard 21 MX computer with 64,000, 16-bit words memory and CAMAC interface is now at the Corporation headquarters in Waimea. The system software is about 70% complete. Several instruments have reached the 75% level of completion: the faint object spectrograph, the infra-red photometer, the visible photometer, the Fourier transform spectrometer and the Cassegrain polarimeter.

The other instruments now under fabrication are the high dispersion coude spectrograph, a focal reducer for the cassegrain focus, a photon-counting t.v. camera and Reticon and CCD camera.

Reprinted with permission by the CFHT Corp.

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FOR SALE :

Homemade 8 inch f/6 mirror,
Newly aluminized to 1/10 th. wave,
Includes mirror mount, spider and
a new diagonal.

Price: $ 50:00

For more information contact;

Michael E. Boschat,
Telephone 455 - 7527

## PROJECT - METEOR

At last the warmer weather has arrived, now it is time to start observations on the meteor showers. By the way, next year the parent comet of the Perseids arrives, hope - fully to replenish the stream.

Summer Project:

June Lyrids, 12 per hour, maximum on June 17; Bluish and swift.

Alpha Capricornids, 10 per hour, maximum on July 15; Yellow with some fireballs. This shower has another radiant, it occurs July 24.

Delta Aquarids, 30 per hour, maximum on July 29; Some fireballs with trains. Observe from July 28 to July 31.

Perseids, 60 per hour, maximum on August 11, observe from July 25 to August 24; Swift, fireballs, some leave trains.

Kappa Cygnids, 10 per hour, maximum on August 18; Bright, some flare up.

Pegasids, 8 per hour, maximum on August 10; This is a newly discovered stream. Radiant in square of Pegasus. Yellow with some bright meteors.

Draconids, 10 per hour, maximum on October 9; This is a variable shower with over 1000 in 1946.

Orionids, 20 per hour, the maximum occurs on October 21 but it is variable.

Try getting some photos in the city. I use Tri-X with twenty second exposures (expensive!) but I caught some so it is not impossible.

Those who go to the country areas can try an hour exposure. Let the stars trail or use your clock drive. In meteor work a stationary camera is used. Don't forget to plot them on your star atlas and record their R.A.'s and Dec.'s later on. Always note the time in Universal time (U.T.).

If anyone is interested in trying some baseline work call me up at least a week before the shower. This way we will be able to determine their heights and see if the solar cycle has an effect on them.

My telephone number is 455-7527.

Michael E. Boschat

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## FOR SALE

OUTLINES OF ASTRONOMY by:

Sir John Herschel

I now have three copies of this classic set of books including a first edition. The edition I wish to sell is dated 1902 and published by P.F. Collier & Son, New York. Originally published in 1849, it went through many updated editions and was one of the most popular astronomy books of the 19th century. The covers are slightly rubbed and age browned but it's otherwise in very good condition.

2 volume set: pp. 926 with index and 8 plates

price: $7.00

R.C. Brooks, (434-7274)
71 Woodlawn Rd.
Dartmouth, N.S., B2W 2S2

# A HISTORY OF THE HELICAL ANTENNA

The history of the helical antenna dates back to November of 1946 at Columbus, Ohio. Dr. Paul Raines an employee from a large Eastern United States laboratory gave a lecture at Ohio State University. Dr. Raines was demonstrating the use of a helical shaped conductor in tubes, for amplifying very short wavelengths. Dr. John Kraus a professor at the university became interested in the theory of the helical shaped conductor. When Kraus left the university in the afternoon, he took home a 12cm wave oscillator. Every evening for several weeks in his basement, Kraus began winding conductors in a helical shape. Kraus made several helices of various diameters and turn spacings. He connected the output of the oscillator to the driven element of the helix and used a dipole as a receiving antenna. Kraus found that the helix radiated a strong circular polarized beam on the open-end and very little radiation on the sides. He was amazed at the results of the helix and began preparing several papers on his new discovery.

During the same period, Harold A. Wheeler an inventive radio engineer had published a paper describing a mathematical model of a helix, but never constructed one. Wheeler found that the helix radiated on the broadside, but did not describe the strong beam on the open-end.

John Kraus started constructing a helical antenna farm on the university campus, while becoming interested in radio astronomy. By the summer of 1954, Kraus and his students had completed an array of 96 helicals.

The helical later played an important role in the Apollo Space Program. Today the helix is employed in satellite communications and amateur radio. Recently in Canada, a professor at a university has employed a pair of 6-turn helical antennas on an east-west baseline. There are perhaps others who have constructed these antennas for radio astronomical observations and found the helical to be a worthwhile project.

I would like to describe the design formulas of a helical antenna for the use of radio astronomical studies.

Cosmic sources emit random electromagnetic waves that are both plane and circular polarized. These polarized waves are generally found on all frequencies within a very broad bandwidth. Radio sources transmit billions of watts in r-f energy, that vary in random amplitude caused by disturbances in magnetic and electric field variations. Plane polarization occurs when the magnetic and electric field vectors are at right angles to the direction of propagation. Circular polarized waves are rotating electric and magnetic field vectors spiralling through space. Since radio sources emit frequencies randomly, the circular polarization may be either left-handed or right-handed in nature. This phenomena is dependent on the cosmic source's direction of rotation.

The helical beam or axial mode operates as a non-resonant antenna and its gain is almost constant over a two to one range in frequency. The helix is capable of generating or receiving left-handed or right-handed circular polarized waves.

William J. Calnen

## A SURVEY ON MODERN TELESCOPE DESIGN

(continued from vol 11 no. 2)

In the last issue of Nova Notes the advances in the knowledge in the science of astronomy were shown to have been paced by what technology could offer. Refinement and the resulting developments in optical materials was also mentioned. This refinement in materials was shown, together with modern technology, was seen to produce important advantages to the observing astronomer. And therefore lightweight optical components were seen to be one of the major considerations in modern telescope design.

Another important consideration is the design of bearing assemblies. These assemblies must assure precise alignment of the instrument package at the Cassegrain focus as well as in other areas of the telescope. One of the latest major optical telescopes to become operational is the 158-inch Mayall instrument at Kitt Peak National Observatory in Arizona. The main bearing in this telescope is fairly large with a high degree of accuracy of macnining required. The outside diameter of the bearing is 46 inches and the inside diameter is more than 39 inches.

The diameter of the balls in the bearing is 0.5 inches.

One unique design in telescopes is that of the University of Arizona. This is the MMT project, which has received much publicity. As you recall the MMT consists ofsix 72 inch Cassegrain telescopes combined to form one large instrument. One of the necessities of such a design is that each of the six mirrors be identical. The curves of the mirrors were frequently tested with a combination of knife edge and interferometer tests. Tests were conducted in batches so as to provide similar test conditions for each mirror relative to the others.

In Italy a 54 inch reflector style of telescope of unusual design has been put into use. The instrument's insensitivity to thermal changes is due to the choice of materials. Its primary mirror is made of 99.999% pure aluminium and the 8 tubular struts supporting the optical system are made of an aluminum with silicon, manganese and magnesium alloy. The high thermal conductivity of aluminium prevents any concentration of heat which could cause the shape of the mirror to distort. The

material of which the struts are made has good mechanical strength, and at the same time the approximate coefficient of expansion as aluminum. Therefore the mirror and tube structure expand or contract at the same rate and manner. This assures maintenance of focal position when the temperature changes. The 54 inch telescope is driven by 100 volt, 500 watt D.C. motors. By varying the voltages, a continuous speed range is available, without shocks or vibrations during accelerations. Different speeds are thus more constant for tracking.

Technology has given us another type of telescope. No-longer are we restricted to earth based observations. Illusion is made to the balloon, and orbital telescopes. Stratoscope II is the name given to an unmanned balloon telescope. The balloon and telescope is radio-controlled from the ground, while the telescope's pointing and focusing can be monitored by television. Stratoscope II is a 36 inch, 4 ton telescope and is as tall as a three-story building. The telescope has been lifted to 80,000

feet by its tandem balloon containing 5.5 million cu.ft. of helium. When the system is complete, with balloon inflated, the complex stands 660 feet.

A balloon- borne solar telescope has been developed by Zeiss for the Fraunhofer Institute. It should provide more detailed information of the sun, which would be vital to future space travellers and possibly to supersonic air passengers.

Not only are the telescopes themselves dependant upon technology, but so are the various guidence and open or closed loop control systems which constantly sample data which provides the signals which track and guide the delicate instruments.

Another astronomical system which became operational in 1973 is the Airborne Infrared Observatory (AIRO). It is an aircraft that has been fitted with a 36 inch telescope. The aircraft, a C141 StarLifter, carries a 10 ton payload and is able to provide 4 hours of observing time at 40,000 feet, which is above 99% of the earth's water vapor.

Yet there are other types of telescopes. Two telescopes have also been put into earth orbit. Such instruments are the Orbital Solar Observatory (OSO) and the Orbital Astronomical Observatory (OAO). Using the experience gained from these projects, plans are formed for a space telescope of 120 inches in aperture. The Large Space Telescope (LST) will be fitted with a docking adapter through which instrumentation may be replaced for specific experiments.

It can be seen that technology has greatly advanced since the days of Lord Rosse's telescope with the 6 foot speculum providing us the modern designs discussed briefly above.

Mike Edwards

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## DONATIONS

The Halifax Centre of the RASC would like to receive, from members, any donations they would like to make toward the centre library to allow it to expand. Any donation, either in books or monies, should go to our librarian, Brian Guest or any member of the executive. THANKS!

## A Few Words From The Observing Chairman :

My official title is "Observing Chairman". I understand that a chairman is one who presides over an assembly of people; in this case observers. The two or three people I've seen at observing sessions could hardly be called an assembly.

I am asking for advice, suggestions and ideas to make future observing sessions more enjoyable and successful. I am your observing chairman and a member of your executive and as such the best chance to approach me with your ideas is during the coffee and cookies period at the end of the monthly meetings.

What I would like to impress on everyone in the centre, professionals as well as amateurs, is that observing can be fun, especially now that summer will soon be upon us once more. If possible, join me at one of the monthly scheduled observing sessions. There are a number of good reasons for observing in a group.

1/ You won't feel so odd doing something which most of our neighbours consider bonkers.

2/ You get to benefit from the experience of others or you can help someone less experienced

3/ You get to share some unique experiences with people like yourself (isn't that what this is all about).

I realize that observing sessions are usually not scheduled for the summer months so I hereby declare every clear night to be an official observing session. If you require any more help or information then give me a call at 443-8349.

Glenn Graham

# WILLIAM HERSCHEL SOCIETY

## An Appeal

RC Brooks

The William Herschel Society was formed about a year ago to acquire, restore and maintain Sir William's house and workshop at 19 King St., Bath, England. The discovery of Uranus was made in the backyard. The Society wishes to further research into the life and work of the famous astronomer and his sister, Caroline by bringing together materials for displays in the house and for a library.

Benefits: Scientific Research--The collection of instruments and other materials in the displays and library will be made available to researchers interested in assessing the Herschels' contributions.

Musical research--will be encouraged by the acquisition of suitable collections of Herschel's instruments and musical compositions.

Heritage preservation--an important part of the heritage of Bath in the form of the house which has architectural interest as well will result from the preservation.

To assist in these objectives the William Herschel Society has made an appeal for £30,000 (apx. $75,000) to help in the acquisition, preservation and improvement of the house. About £6,000 will be required to provide the beginnings of the museum and library from the £30,000.

If you would like to support this effort you may do so by joining the William Herschel Society or simply by giving a donation. Membership fees are:

ordinary member-- £1 p.a.
benefactor --£10 p.a.
patron --£1000

Direct enquires, donations or membership fees to:

The Hon. Treasurer
The William Herschel Society
290 High Street
Batheaston
Bath, ENGLAND
BA1 7RA

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