NOVA NOTES

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1979 Halifax Centre Executive

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Up Coming Events:

FRIDAY 16 November at 8:00 at the Nova Scotia Museum, Summer St., Halifax

Speaker: Bill Appleby, Meteorologist with Environment Canada will speak on astronomical seeing ie. the effect of atmospheric activity on the quality of a site for astronomical observations. He spent some time on Mount Kobau in the southern Okanagan Valley making observations with Staff of the Dominion Astrophysical Observatory assessing the suitability of the site for the long defunct Queen Elizabeth Telescope. What do astronomers look for besides a site with few interfering lights What conditions lead to a good area? Well, Bill will explain the not so simple problem of site evaluation from the meteorological stand point. You may be able to learn something which may aid your observing program even here under our cloud blankets. Having spent a summer on Kobau myself, I hope he shows some slides of the beautiful scenery from the top of this 7,000 foot mountain.

DECEMBER MEETING: NOTE THE DATE--FRIDAY 14 DECEMBER at the NOva Scotia Museum. Speaker;Dr. Norman Scrimger

HAVE YOU RENEWED YOUR MEMBERSHIP?

Give yourself a Christmas present every month next year! Fees are unchanged from last year and the life membership is a deal these days!

Minutes of the September and October Meetings

The regular monthly meeting of the Royal Astronomical Society of Canada, Halifax Centre was held on September 21 at the N.S. Museum. The topic was "the mechanical components of a telescope", and the speakers were John MacNeil, Randall Brooks, Mike Edwards and Jody LeBlanc.

Mike introduced the topic by discussing essential considerations such as mass, weight and strength of the components, the stress and stiffness involved in the structure, and vibrational damping which decreases those annoying shakes and vibrations. He cited as his reference the June 1976 issue of Sky and Telescope. After Mike gave an interesting demonstration of a stress meter, Randall took the floor to show his very inexpensive wooden mount constructed with clothes line and turnbuckle accessories. A more elegant mahogany mount was also on display. John MacNeil brought along his home-made f4 (wide field) telescope and his wooden tube for a 12½" mirror. He revealed the sources of his supplies and gave an itemized list of materials and costs. He also listed 10 points in favour of wooden tubes. Jody addressed his remarks to those who have never built a telescope mount before. With the aid of photographs, he outlined his painful experience of relying on expensive custom-machined sprinkler pipes to give him a workable fork mount. He found that it was heavy enough, but it vibrated like a tuning fork! He concluded that costly is not necessarily better. Each speaker was followed by questions and discussion.

Before refreshments were served, our President announced Dr. Percy's intention to visit our centre next spring. Mike also conveyed the invitation extended by Forest Fife of Dalhousie U. and Debbie Burleson of the N.S. Museum to learn how to use the old planetarium which is now housed at Dalhousie.

The October meeting, held on the 19th at the N.S. Museum, was members' night. Roy Bishop began the activities with a description of the I.A.U. meeting held this past August in Montreal. The triennial meeting was well attended by about 2200 astronomers (approximately half of the I.A.U.

membership). Numerous lectures were given over 10 days by 38 commissions, each dealing with an aspect of astronomy. One of the lighter moments occurred when Dr. Harvey André, the official representative from Ottawa, referred to DAO as the Dominion Astrological Observatory. Roy's talk was highlighted by slides of well-known astrophysicists and astronomers. In addition to attending the I.A.U. conference, he visited the Mount Megantic Observatory, and his slides showed the site under one of its less desireable meteorological conditions.

Mike Edwards showed several slides of Milford House, South Milford, the headquarters of a few members during the camping/observing week-end last summer. These were followed by Dale Ellis' slides of the observing week-end and Newfoundland's Twillingate Museum which houses antique telescopes. The slides were concluded by Randall Brooks who read the script for our absent observing chairman. Jody had captured the flora and fauna of Kejimkujik National Park, as well as the camping and observing aspects of our week-end last July.

A brief computer-animated film called, "Planetary Motion and Kepler's Laws" was shown. Peter Edwards then outlined the results of the National Council meeting of September 29. These included the change of dates for next year's G.A. to Friday, June 27 - Monday, June 30; the Tariff Board's proposed removal of the 17% customs charge on astronomical equipment; and National Council's acceptance for voting at the G.A., of our proposed ammendment to the by-law regarding election of National Representatives. After nominations were taken for next year's executive, coffee and cookies were served.

Diane Brooks
VP/Secretary

MIRROR ALUMINIZING SERVICE

Mike Boschat sends a note to the effect that Mr. Don Alexander, 403 Melrose Ave., Verdun, Quebec, H4H 1T2 can aluminize mirrors up 16". Charges are $1.00/inch (Al still on); $1.75/inch (Al removed) and $1.00 for diagonals. He has a 16" of his own. Send a money order and return postage with your mirror.

.... WAY BACK THEN....

Mike Edwards

Amoung information I received from The Sir Howard Grubb Parsons Co. Ltd., in a reply, two years ago was an interesting history of this English telescope manufacturing firm. Titled "Two Fathers and Two Sons", the story , by G.E. Manville, opens by relating a strange coincidence. Both fathers of the story were born in 1800, and both sons died in 1931. The fathers were William Parsons,born in New York, and Thomas Grubb, born at Kilkenny, Ireland.

In 1800 it is interesting to note that Fraunhofer was 13 years of age, Michael Faraday was 9, George Stephenson was a young engineer at 19 years of age. Also, that Sir William Herschell (52) had discovered "invisible rays" and Carl Friederich Gauss, the mathematical genius was 23 years of age.

Thomas Grubb showed an early leaning towards things mechanical and it was only natural when he grew up that he adopted engineering as his career. He became interested in optics at an early age and constructed a small observatory with a 9 inch reflecting telescope. Close to this observatory at Charlemont Bridge, he set up his own worhshop where in 1834 he made a 15-inch reflecting telescope. This was placed in the Armagh Observatory. Later he built a 12-inch refractor for the Dunsink Observatory. This insturment in still in working order and is in regular use.

In addition to making telescopes, he produced many other astronomical instruments, small tools and a side line of cast iron beds for billard tables. The originality of his designs and the ingenuity of his work were acknowledged and appreciated by his contempories. Several

of his instruments are still in use, though well over 100 years old.

The other farther of the story is William Parsons, the Third Earl of Rosse. He was born on th 17th of June 1800 at York and spent much of his life at the family home.

The professional telescope makers of the time guarded their methods of casting, grinding and polishing as a very close secret. William Parsons, the Lord Oxmantown disagreed with this and published a paper discribing his methods and giving results of his experiments.

During 1830 to 1840 he succeeded in making mirrors up to 36-inches in diameter. His paper to the Royal Society in 1840 described his method "in detail so that others may repeat them without difficulty.

The first of the sons of the story is Sir Howard Grubb, born at Leinster Square, Dublin in Ferruary 1844. He was educated at a private school and later studied Civil Engineering at Trinity College. At age 21 he left Trinity College without graduating so as to join his farther at the optical shop at Charlemont Bridge. One of his first assignments was the setting up of the larger premises at Rathmines in order that they could undertake the building of the Great Melbourne Telescope.

His reputation for skill in both mechanical and optical work became even higher than that of his father whom he had succeeded in 1868. Thomas Grubb died in 1878 by which time Howard had established himself as a competent maker of large telescopes. One of his telescopes is the 27-inch refractor in Venna, which remained for many years one of the most notable

telescopes all over the world.

The second son of the story is Sir Charles Parsons. He was born at No. 13 Connaught Place, Hyde Park, London on June 13th, 1854. He was the youngest of the six sons of William Parsons and was educated at Birr Castle by tutors, many of whom were scientists. They were also given the opportunity to use the giant six foot telescope.

In 1871 he entered Trinity College. In 1877 he became a premium apprentice with Sir W.G. Armstrong & Co., and set out on his career as an engineer.

With his interest in optics, in 1889 he founded his Works at Heaton, New-Castle upon Tyne. At the same time he became interested in making mirrors for search-lights. This prooved of great value during the WW-1.

During the 1920's Sir Charles took over the Derby Crown Glass Co. and the firm of Ross Limited, famous for camera lenses and binoculars. The connection between optical glass and optical instrumentation was further extended when, on retirement of Sir Howard Grubb in 1925 Sir Charles purchased the "goodwill, drawings and sundry machines " and set up at Walkergate near Heaton Works. The new company was called Sir Howard Grubb, Parsons and Company. For the remaining years of his life, Parsons took a very active interest in his new firm and lived to see the first large telescope made there.

The span of 165 years has seen changes which would have been dificult to imagine at the beginning. It seems like a different world when one thinks of Lord Rosse's polishing machine driven by steam in comparison to current technology.

WANTED: GOOD ASTRONOMICAL SLIDES

John R. Percy

The Royal Astronomical Society of Canada maintains a collection of 35mm astronomical slides as part of its National Library. These slides are available for loan to Centres and individual members. They also form a potentially valuable reference and archival collection of astronomical photographs. The slides are housed in convenient trays in a sturdy cabinet, and we have recently checked, sorted and catalogued the slides on computer cards so that the catalogue can be easily updated and reprinted. An accurate catalogue should be available to Centres and members in the fall of 1979.

Now is a very suitable time to add slides to the collection. We are asking you, therefore, to consider donating two or three of your best slides to the collection. The slides can be black and white or colour, mounted in cardboard, plastic or glass (though some projectors have trouble with the latter). We would especially like slides with a special significance to the Society, to the amateur and to Canadian Astronomy: amateur and professional telescopes and observatories; planetariums and museums; historical sites; Canadian astronomers, past and present, amateur and professional; Society and Centre activities; eclipses and similar events. We would also like good slides of astronomical objects.

We intend to be selective in what slides we accept, so send us your best! Include a brief caption, and the name of the photographer. The photographer retains the copyright; we will not allow your slide to be used for any commercial purpose without your prior permission. We are also willing to reimburse you $0.50 per slide for the cost of making the slide copy, if you specifically request it and if we accept the slide.

Please send your donations to: Slide Collection, Royal Astronomical Society of Canada, 124 Merton St., Toronto M4S 2Z2.

They Are All Gone into the World of Light!

They are all gone into the world of light!
And I alone sit lingering here;
Their very memory is fair and bright,
And my sad thoughts doth clear.

It glows and glitters in my cloudy breast
Like stars upon some gloomy grove,
Or those faint beams in which this hill is dressed
After the sun's remove.

I see them walking in an air of glory,
Whose light doth trample on my days;
My days, which are at best but dull and hoary,
Mere glimmering and decays.

O holy hope, and high humility,
High as the heavens above!
These are your walks, and you have showed them me
To kindle my cold love.

Dear, beauteous death! the jewel of the just,
Shining nowhere but in the dark;
What mysteries do lie beyond thy dust,
Could man outlook that mark!°

boundary

He that hath found some fledged bird's nest may know
At first sight if the bird be flown;
But what fair well or grove he sings in now,
That is to him unknown.

And yet, as angels in some brighter dreams
Call to the soul when man doth sleep,
So some strange thoughts transcend our wonted themes,
And into glory peep.

If a star were confined into a tomb,
Her captive flames must needs burn there;
But when the hand that locked her up gives room,
She'll shine through all the sphere.

O Father of eternal life, and all
Created glories under Thee!
Resume° Thy spirit from this world of thrall
Into true liberty!

take back

Either disperse these mists, which blot and fill
My perspective° still as they pass;
Or else remove me hence unto that hill
Where I shall need no glass.

telescope

Poem by Henry Vaughan;
From: The Norton Anthology of Poetry edited by A.W. Allison et al. Contributed by Glen Graham

DEVIL'S DICTIONARY DEFINITIONS

From: The Devil's Dictionary by Ambrose Bierce
Contributed by Diane Brooks

OBSERVATORY--a place where astronomers conjecture away the guesses of their predecessors

NEWTONIAN--pertaining to a philosophy of the universe, invented by Newton, who discovered that an apple will fall to the ground, but was unable to say why. His successors and disciples have advanced so far as to be able to say when.

GRAVITATION--the tendency of all bodies to approach one another with a strength proportional to the quantity of matter they contain being ascertained by the strength of their tendency to approach one another.

TELESCOPE--a device having a relation to the eye similar to that of the telephone to the ear, enabling distant objects to plague us with a multitude of needless details. Luckily it is unprovided with a bell summoning us to the sacrifice.

MAGNITUDE-SIZE--magnitude being purely relative, nothing is large and nothing is small. If everything in the universe were increased in bulk one thousand diameters nothing would be any larger than it was before, but if one thing remained unchanged all the others would be larger than they had been. To an understanding familiar with the relativity of magnitude and distance the spaces and masses of the astronomer would be no more impressive than those of the microscopist. For anything we know to the contrary, the visible universe may be a small part of an atom, with its component ions, floating in the life-fluid (luminiferous ether) of some animal. Possibly the wee creatures peopling the corpusles of our own blood are overcome with the proper emotion when contemplating the unthinkable distance from one of those to another.

ANTIQUARIAN ASTRONOMY BOOKS

Have you Any?

R. Brooks

In the last few months I have become increasingly interested in old astronomy books. In May, Dr. Bishop's report of the RASC Historical Committee mentioned a request made by Dr. Helen Hogg. The request was for a comprehensive list of all astronomy books published up to and including 1900 which are found in Canadian libaries --both public or private. The purpose is to assist historians of astronomy to locate books which might be useful in their researches. For public and university libraries this is not too much of a problem because if the title and/or author is known one may consult the Union Catalogue to find the nearest location. However, if one wants a list of books in a particular topic or period then one is out of luck and of course at present one has no idea what books might be held in private collections. To complete this project will require the efforts of many people over several years. However, as a start I have catalogued about 125 volumes in several libraries. The oldest is a volumn at King's College dated 1621. If you would be willing to help a little towards the goal of this project here's what you can do.

Most importantly, if you have any books published prior to 1901 (or any particularly interesting and important astronomy books published to about 1915), please send me the imformation required to fill out the form on the next page. If you do not have any books that fall into the category don't despair, you can still assist if you are near any of the following libraries in the Maritimes: Acadia University, Univ. of New Brunswick, Saint Thomas University, Memorial University, Université de Moncton, any museum's collections, town libraries or libraries of smaller colleges. The call numbers for astronomy books are QB (Library of Congress system) or 520 to 525 (Dewey Decimal system). It would also be wise to check Q and 500 (general science) classifications too. In most libraries it will only take a few minutes to run through the shelves but UNB's will take considerably longer because of the collections of William Brydon Jack--but then it is probably the most important in the Maritimes.

The information we require is:

Author: BECKETT, Sir Edmund

Title: ASTRONOMY - without Mathematics

Year Published: 1876 Edition: 6th

Publisher: Wm Clowes & Sons

Where Published: London

Owner/Library Name: R. Brooks

Location: 71 Woodlawn Rd. Dartmouth

Notes:

No. of pages in: 8 Intro; 397 Text; 15 Index

Is there a bibliography? No

Are there photographs, woodcuts or line drawings? yes (few)

Other notes: "Revised for the use of the Trustees of Dover"

Call No. None.

Condition: ✓ G; ____ F; ____ P.

The above is pretty well self explanatory. Under "Notes" list any characteristics which make it interesting e.g. autoghraphed by the author, particularly nice photos, etc.

If you know people who are not RASC members who have old astronomy books, please ask if they would allow their collection to be listed. Likewise if you are outside the Maritimes we still would like the information from libraries and we hope to expand the project within a year. The list will be filed on computer cards and will be available to any RASC member. Potential users will make their own arrangements for the use of books listed. The owners can dictate the terms of use.

Finally, if you check a library but do not find any books that fall into the category we are interested in, please let me know so I won't have to arrange a search again by someone else. Send information to (or ask for the above forms): R. Brooks, 71 Woodlawn Rd. Dartmouth, N.S., B2W 2S2

AURORAE FROM CALGARY

Steven Morris

The spectacular aurorae are now upon us. On August 26 I was at the Rothney Observatory, 40 miles south-west of Calgary, admiring the dark night sky this site provides. By 10:00 MDT a narrow but bright band of aurora stretched from the north-east to the north-west low to the horizon. By 11:45 MDT the band had brightened, and another had formed above it. The northern edges of both bands were distinctly red, and the bands had grown and fragmented. The clouds in the north, which originally appeared bright against the dark night sky, were now dark against the bright aurorae, and the Milky Way was completely blotted out.

After 11:45 MDT the activity picked up rapidly and spread over the entire northern half of the sky. The curtains of aurorae began pulsating rapidly and changing in shape. The maximum activity occurred at 12:00 MDT when a brilliant corona formed overhead, and began flickering rapidly. Unfortunately, clouds had moved over much of the sky making it difficult to monitor the auroral activity. By 12:30 MDT the display had faded, and by 1:00 MDT only a faint glow in the north remained.

Solar activity had been high that day, but I hadn't seen any one sunspot that was large and near the centre of the disc. These sort of sunspots are bound to occur in the near future, however, and the patient skywatcher is certain to be rewarded in the coming months with some more spectacular displays.

WANTED: Back issues of the JRASC

One of our members has had a couple of numbers of his RASC Journals disappear somewhere in transit during moves. If you do not intend to keep yours, please give or send them to the Editor (address on first page). The issues required are: Vol. 71 numbers 1 and 2, whole numbers 544 and 545. Thanks.

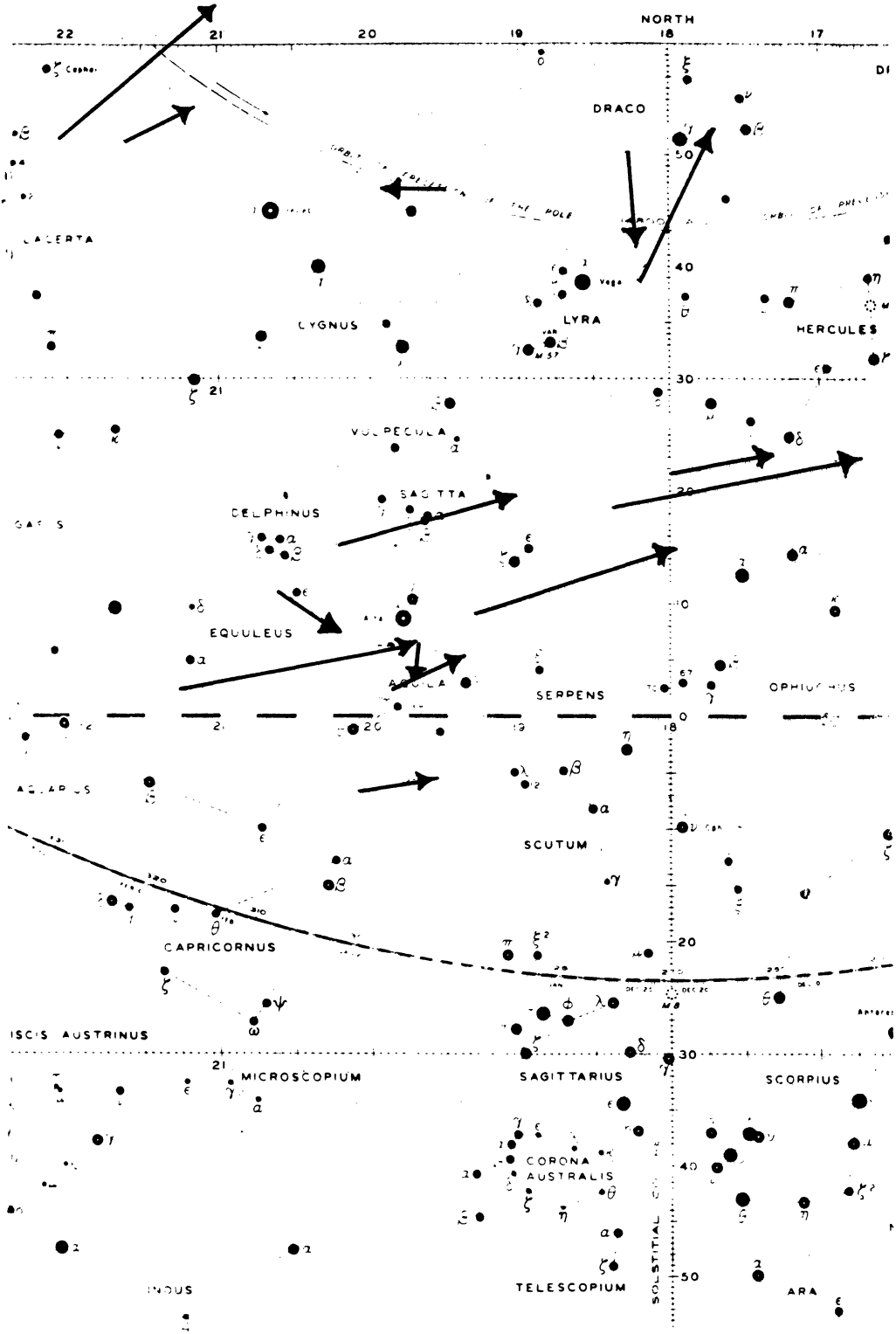
A LESSER METEOR SHOWER, AND ζ CEPHEI REVISTED

Steven Morris

The sky was dark, the stars were out in full force, and the only sounds that could be heard were the occasional squeaking of field mice in the grass, and the howl of coyotes in the nearby hills. What's this?! Coyotes? Well yes, over here in Alberta it is quite common to hear them. On September 13 I decided to head to the Rothney Observatory near Calgary to try a short project I had wanted to do for some time. The project was to find out how many meteors could be seen per hour by one observer when no major meteor showers were occuring. I had observed the Perseids on their night of maximum a few times, and had seen almost one meteor a minute, but how frequent are the sporadic meteors?

Figure 1 shows the fourteen meteors I saw in the two hours of observation. My field of view was centred on the Summer Triangle which was almost overhead, and there were doubtless many other meteors elsewhere in the sky that I missed. The figure shows, surprisingly, that only five sporadic meteors were observed, the rest coming from a shower near Pisces. Looking at the Observer's Handbook, which now includes a list of minor showers, the only possible candidate is the South Perseids, which occur between August 31 and November 2, with their maximum on September 20. I had never realized that even the minor showers, several days before maximum, could put on an impressive show. Meteor observing seems to be a generally neglected part of amateur astromony. Surely after seeing their 100th dim featureless NGC object, even the most dedicated deep-sky observers could stand a change.

Meanwhile, remember the ζ Cephei object the Halifax Centre undertook several months back? Some members observed ζ Cephei and pooled their observations to obtain a light curve. I'm starting a similar project on my own but welcome the observations of anyone else. Figure 2 shows the light curve for my September observations and I shall be adding to it over the coming months, observing


NORTH
22
21
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19
18
17
DRACO
LACERTA
CYGNUS
LYRA
Vega
HERCULES
VULPECULA
SAGITTA
DELPHINUS
EQUULEUS
AQUILA
SERPENS
OPHIUCHUS
AQUARIUS
SCUTUM
CAPRICORNUS
PISCIS AUSTRINUS
MICROSCOPIUM
SAGITTARIUS
SCORPIUS
CORONA AUSTRALIS
INDUS
TELESCOPIUM
ARA
SOLSTITIAL
40
30
20
10
0
50

once each night. To find the star, use the finder chart in the Observer's Handbook. At a magnitude near 4.0, the star is easy to see and measure with the naked eye, and I normally estimate its brightness by stepping outside my residence (in the city of Calgary) and spend half a minute finding the star and judging its brightness. What could be simpler? If you do make any observations, send them to me at:

Steven Morris
Dept. of Physics
University of Calgary
Calgary, Alberta
T2N 1N4

and they'll be included in the light curve. I'll publishthis graph again in the future issues including all the data as it comes in.

PS: Contrary to the last issue of Nova Notes, I am not a baritone, but a base. And in case Glen protests; Jody's right Glen, you do snore.

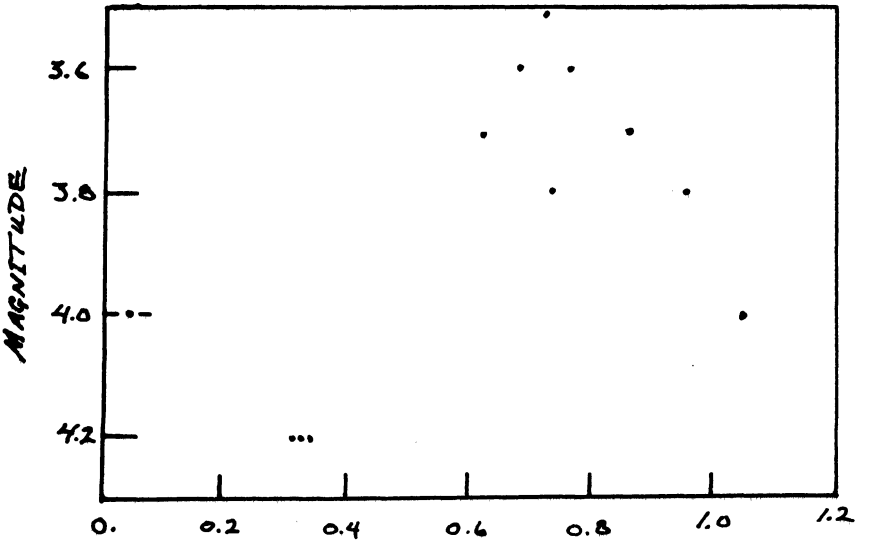


Fig. 2.

RELATIVELY INTERESTING

Walter Zukauskas

Astronomy is one of the last bastions of the amateur scientist. While other sciences have--by and large--become less accessible to amateurs, astronomy has provided added scope for the amateur.

Nowhere is this more evident than in the study of variable stars, particularly in the timing of brightness maxima and minima. Of the thousands of variables known, only a few can be followed regularly by professional observers. The rest--those that are not immediately of interest--would be neglected were it not for the amateur. Only continuous study of these objects will reveal if any are "interesting". John Percy, writing in Mercury, has highlighted the amateur involvement in this dynamic area of astronomy. Techniques for making such observations can be found in the Monthly Newsletter of the RASC over the past year or two.

Dr. Robert Koch of the University of Pennsylvania, has added to the list of possible amateur projects. This addition involves timing the minima of eclipsing variables with a view to checking their apsidal motion.

Binary stars often move in elliptical orbits about each other. The largest, or major, axis remains in the same position in space, provided the stars are spherical. This is simply in accord with Newton's laws. If the stars are not spherical, then the major axis itself rotates slowly in space, also in accordance with Newton's laws. See figure 1. For typical star systems with orbital periods of a few days, the time required for the major axis (=line of apsides) to rotate once is scores or hundreds of years.

Dr. Koch's contribution has been to investigate a group of binary stars that may experience apsidal motion due, not to Newtonian causes, but to effects of General Relativity. He has shown that for a number of binary stars, the apsidal motion caused by Newtonian causes may be much smaller than the motion caused by relativistic

effects. The stars he selected were all rather bright, of long period, and all north of dec= +20° (ie. all easily observable to Canadian and American observers). They are given in Table 1. He thus opened the possibility of amateurs doing useful work leading to a test of General Relativity.

TABLE 1

I.D.	Poaition	Period	Magnitudes Max.	Pri.	Sec.
EK Cep	2139 +69	4.43d	8.2	9.5	--
∝ CrB	1530 +27	17.4	2.21	2.32	--
V1143 Cyg	1936 +54	7.64	5.9	6.1	6.1
DI Her	1849 +24	10.6	8.3	9.0	8.9
RR Lyn	0617 +56	9.95	5.64	6.03	5.9

In a more recent paper, Dr. Koch has made some preliminary analyses of data he has secured. Of the 5 binaries considered, 2 have failed to show any significant apsidal motion. The remaining 3 have exhibited apsidal motion, but, as yet, the time required for an apsidal rotation cannot be fixed. He believes observations over the next five to ten years should clarify the situation. It seems a fine chance for amateurs to contribute to a new, exciting area of both astronomy and physics.

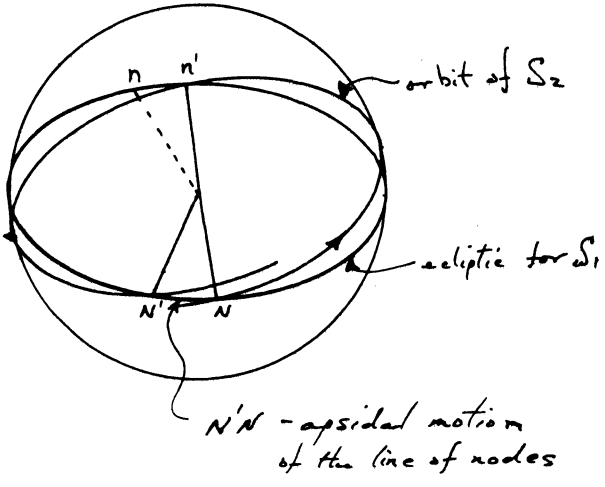


Fig. 1.

PROBLICOM SKY SURVEY--
Threshold to Discovery

Ben Mayer

Even professional astronomers will find it difficult, if not impossible to pinpoint a faint magnitude naked eye object among the few thousand stars visible to the unaided eye. For objects fainter than below magnitude 6, a very high familiarity with specific areas of the sky and a fine memory are required to pick out an object which does not "belong" in a particular telescopic field of view. That is why astro-photographs in combination with blink comparators are constantly being used at astronomical research centres. The PROBLICOM sky survey is based on simple tools which are readily available to the amateur. Any 35mm single-lens reflex camera can modestly take the place of the costly glass plate photographic monster which mounted in front of the lenses can effectively perform the same tasks as professional blink comparators costing thousands of dollars.

The principles involved are extremely simple to understand: if identical pictures are taken of the same area of the sky an hour, a week, a month or even a year apart, they may look completely alike. It is virtually impossible to find even a large magnitude asteroid and almost impossible to detect a new Nova in such photographs. Enter the blink comparator. By presenting to the eye, first the old picture and then the new, then back to the old and forth to the new, all this in very rapid succession with both pictures superimposed so that all images overlap each other, anything that is in one picture and not the other will draw attention to itself by "blinking". Objects which have moved and thus occupy different positions on the photographic images will seem to jump back and forth at the rate at which the shutter occults first one picture and then the other. What this can mean to the amateur is easy to grasp: the entire world of astronomical discovery has been opened up to him and all that is needed to survey the vast streches of the sky are a camera, transparencies taken on different dates and a slide projector together with a second shared with a friend.

The fact that the PROBLICOM method of picture comparison

involves projected images which can be viewed by many, rather than the single ocular instrument usable only by one astronomer at a time, lends a social dimension to projection blinking and can serve as an excellent teaching aid. Several pairs of eyes stand a better chance of seeing the unexpected pinpoint of light of a nova or the diffused image of a comet in a projected pair of slides. It is important that "before" and "after" photographs which are blinked together, have been taken with the same camera and lens and with identical exposure times. The basic requirement also applies to telelenses or telescopes. It is equally important, especially in the case of narrow field telescopic work, that the same area be photographed both times as nearly as possible so that matching pictures can be superimposed for comparison through the 2 projectors.

Everyone participating is assigned specific areas with coordinates of right ascention and declination being selected for maximum surveillance. Targets or target groups are separated in RA by six hours so that year-round research is maintained and observers have opportunities for meaningful photography at all times.

Areas are 10 degrees high in declination and 15 degrees (one hour) wide in right ascention. This is the area recorded in one shot of a standard 135mm telephoto for 35mm SLR cameras. The PROBLICOM Sky Survey is standarized to this format although any type of camera/lens combination may be used.

In addition to the basic 150 square-degree search, globular cluster and galaxy surveys are conducted where 35mm cameras are attached to regular telescopes. The basic 8 inch diameter instruments are ideal for this purpose.

Due to the fact that scientifically interesting events can occur at any time, a continuing program with a maximum number of participants is desirable. At this writing, PROBLICOM Sky Survery, which is designed to make meaningful contributions to astronomy, has approximately 150 participants, but needs many more to establish continuous surveillance.

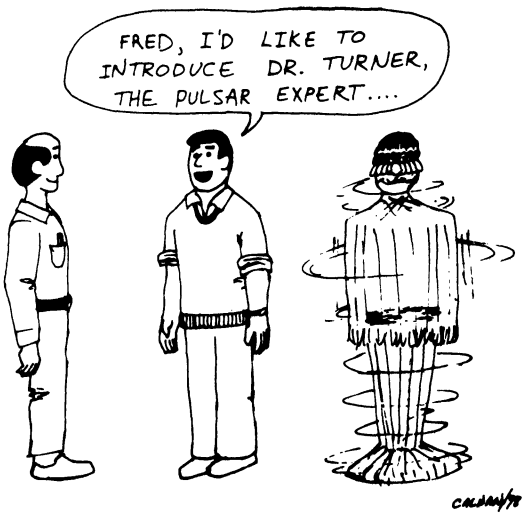
If you're interested in joining the free program, send a self addressed envelope to Ben Mayer, 1940 Cotner Ave. Los Angeles, CA 90025. (contributed by M. Boschat)

When the Sun's Not Shining

What do you do with a solar array designed to produce electrical energy when the Sun's not shining? One possibility is being investigated by David Fegan and Sean Donaher. They are using the 5500 mirrors of the Sandia Labs array in New Mexico for nocturnal studies--in particular they are looking for black hole explosions. The theory of these Irish astrophysicists predicts that the small black holes believed to have formed just after the Big Bang are now getting so hot that they may explode. The explosions would produce particles which would in turn produce gamma rays and these in turn would, if the black hole is not more than a few parsecs away, interact with the atmosphere producing a detectable cascade of photons. Such a cascade would be faint hence the need for the solar array. Fegan and Donaher have just completed initial experiments and are confident they can recognize the cascade of photons if they occur. The preliminary results will indicate if a prolonged search is desirable.

A Black Hole But Not A Pulsar

Thus far the only observed pulsars have been observed because of the pulsation of energy; and black holes can only be observed if they are part of a binary system with the secondary bright enough to be observed. Now JM Cordes and JM Dickey using the 91m radio telescope have found what they believe to be a black hole by use of a new principle. The source of the radio energy is Westerhout 66 which lies near the centre of a supernova remnant. The periods of pulsars range from 4 sec to 1/30 sec. but using the Greenbank W. Va. facility these two are looking for scintillations which are caused by the fluctuations of density of dust and gas in interstellar space. Optical astronomers are familiar with scintillation caused by the atmosphere and now a similar effect may have led to the discovery of a very compact object. The scintillations are of a fraction of a second duration and must come from a very small source because a larger source would not exhibit scintillation due to an averaging effect, with energy from different parts of the object reaching the observer at slightly different times. The



scintillations come from an object one ten-millionth of an arc second across(the width of a hair at the Sun's distance). Until now the short period fluctuations have only been detected in compact neutron stars (pulsars). In other respects the object is not pulsar like--it has no regular pulsation nor does the radio spectrum fit that of a typical neutron star. An alternative is a Black Hole which is part of a binary system but which as yet can not be visually observed. In such a case, the other star in the system would be loosing matter to the black hole giving rise to the observed radio emission as the mass spirals into the accretion disc of the black hole. Condes and Dickey estimate the object to be 8,000 light years distant and less than one tenth of the Sun's diameter.

PLUTO--late Neptunian Moon?

The idea that Pluto might be an escaped moon of Neptune has been around since 1936. Now Thomas van Flandern and RS Harrington of the US Naval Obs. have completed computer studies which show that this theory is possible. Pluto you will remember has an inclined orbit, is more elliptical and does not follow Bode's law. Ner d orbits Neptune in an elliptical orbit which is ten times longer than its width. Titan has high inclination and moves

with retrograde motion. Since Pluto crosses Neptune's orbit, the idea that some cataclysmic event disrupted an other wise normal planet/lunar system is obvious--but how to prove it? The experimenters tried computer simulations of thousands of combinations of systems and have found that a system, modeled on Jupiter and its Galilean moons, could result in the presently observed combination. They used for the successful trial, Neptune surrounded with four moons--Titan, Nereid, Pluto and a fourth which was dragged off with an intruding planet, which had a mass of 2 to 5 times that of the Earth, passing slowly through the orbits of Neptune's moons. Where did this intruder come from? They speculate that an object in a highly elliptical orbit about the Sun was responsible and that it is still in an even more highly elliptical orbit far from the Sun. This of course proves nothing but leaves this interesting possibility of solar system history open for further speculation. If you want to see some of their diagrams of various scenarios look up ICARUS, Vol 39 p.131 (available at SMU).

MUTUAL PHENOMENA IN 1979

Doug Welch

In the last three months of 1979, it will be possible to observe mutual phenomena for both Jupiter's and Saturn's satellites. Mutual phenomena are events in which satellites (of the same planet) appear to occult or eclipse each other as seen from the earth. For mutual eclipses to occur, the sun must be very nearly in the plane of the satellites' orbits, and similarly the earth must be near this plane for mutual occultations to be observed.

While the majority of Jovian mutual phenomena occur around the time of Jupiter's conjunction with the sun, there are half a dozen events which can be observed from Ottawa in a reasonably dark sky. The brightness of the Galilean satellites will allow the easy observation of these phenomena.

Saturn, as you all know, has rings, and it just so happens that the shadow of the rings will eclipse several of the brighter Saturnian moons. As the rings are very nearly edge on at this time, it is possible that a thin undiscovered outer ring may make its presence known during these eclipses. This will allow a very accurate determination of the state and extent of the ring system. Such information will of course be very useful in planning the final trajectories for Voyagers 1 and 2 when they encounter Saturn. Observations of mutual phenomena will help reduce the considerable uncertainty in our knowledge of the positions of the Saturnian moons. As this uncertainty affects the mutual phenomena predictions to a certain extent, a second set of event predictions has been produced in which the events which would occur if each satellite's radius was increased by 1000 km are listed. No events should be missed if both these sets of predictions are used. It should be noted that in Saturn's case it is only possible to observe mutual phenomena at 15-year intervals and at this apparition the planet is well-placed for their observation.

The predictions for the events are from Akenes and Franklin (ICARUS, 34, 188-207, 1978). Phenomena are listed if the planet is above the horizon and the sun is at least 13° below the horizon as seen from IRC. In the case of Saturn, events where Mimas, Enceladus, or Hyperion are eclipsed or occulted are not given due to the faintness of these moons. For the same reason, eclipses of satellites by Ring A are listed for Tethys, Dione, and

Rhea only. Titan does not undergo eclipses by Ring A.

The mutual phenomena tables should be interpreted as follows:

1) The EVENT column states that the first satellite occults (O) or eclipses (E) the second satellite, whose disk at mid-event is covered partially (P), annularly (A), or totally (T) by the disk, umbra, or penumbra of the first satellite.
2) The DL column gives the intensity loss on a scale of 0 to 1. For occultations only, DL is normalized to the combined light of both moons.
3) The DA column shows how large a fraction of the second satellite is covered.
4) The DIST column lists the distance from the planet at which the event occurs in units of that planet's radius.
5) The SDUR column lists the semiduration of the umbral phase in seconds. For occultations, the semiduration is listed in this column.
6) The SDURP column lists the semiduration of the penumbral phase of eclipse events.
7) The altitude of the sun and planet involved are given for the time of the event, as seen from IRO.

The last table lists the eclipses of satellites by the shadow of Ring A. The EVENT column lists the satellite involved and whether the event is a disappearance (D) or reappearance (R). The DIST column gives the location of the satellite east (E) or west (W) of Saturn in arc-seconds. Altitude information is listed as before.

Observations can be made visually, photographically, or photoelectrically. The most valuable visual record would be the accurate time of mid-event. Photographs made at short intervals (say 10 seconds) or trailed uniformly could provide valuable magnitude information if accurate time is kept. Photoelectric observations made with a chart recorder would produce similar and possibly more accurate results.

Regardless of what your equipment is, please make an attempt to observe some of these phenomena. A great deal of effort went into their prediction and tabling. Many more Saturnian mutual phenomena will occur in 1980 and predictions for those events will probably appear in the Observer's Handbook 1980 and/or Sky and Telescope.

Remember that observations of these phenomena and their interpretation would make a fine GA project. If you require further information, please write me at: 89 Charles St. W., Toronto, Ont. M5S 1K6.

TABLE I

Satellite Names and Magnitudes

#	JUPITER Name	m_v	#	SATURN Name	m_v
1	IO	5.0	1	MIMAS	12.9
2	EUROPA	5.3	2	ENCELADUS	11.8
3	GANYMEDE	4.6	3	TETHYS	10.3
4	CALLISTO	5.6	4	DIONE	10.4
			5	RHEA	9.7
			6	TITAN	8.4
			7	HYPERION	14.2

TABLE II

Jovian Mutual Phenomena Visible from IRO

DATE (EST)	TIME h m	EVENT	DL	DA	DIST	SDUR	SDURP	ALTITUDE sun	ALTITUDE obj
OCT. 13	3 12	2E3P	0.00	0.00	4.7	0	30	-34.6	+10.3
15	2 49	1E2A	0.92	0.62	4.4	160	230	-56.6	+ 7.3
22	5 09	1E2P	0.73	0.46	4.1	150	220	-14.6	+33.1
NOV. 3	3 34	2E1P	0.00	0.04	1.4	0	70	-33.8	+38.9
16	1 08	1E2P	0.07	0.25	3.2	0	130	-58.6	+ 7.2
23	3 23	1E2P	0.00	0.06	3.0	0	90	-39.8	+34.6

TABLE III

Saturnian Mutual Phenomena Visible from IRO (same headings)

OCT. 15	5 00	3O2P	0.16	0.69	2.1	40		-14.5	+15.6
21	4 03	3O1P	0.35	0.76	2.5	50		-25.8	+ 4.3
22	5 13	2O3P	0.11	0.14	3.8	190		-13.8	+19.9
DEC. 20	3 18	3E2P	0.98	0.84	3.7	70	100	-44.7	+34.6

TABLE IV

Additional Mutual Phenomena for Saturn's Satellites Using Radius of Satellite Increased by 1000 km for Prediction

OCT. 31	5 27	4O2			3.9	72		-13.3	+27.3
NOV. 3	4 46	4O5			5.9	122		-21.1	+22.2
15	4 55	2E3			4.1	37		-22.1	+20.4
26	2 23	3E2			3.3	502		-50.4	+11.4
26	3 28	3O2			3.7	302		-39.5	+22.5
DEC. 5	1 03	3E2			3.6	69		-63.1	+ 3.0
18	3 51	3E4			4.2	87		-38.7	+38.1
24	2 33	1E2			2.2	29		-52.6	+30.2
31	0 03	2O3			2.8	2242		-67.9	+ 9.6

TABLE V

Satellite Eclipses by Saturn's Ring A

DATE (EST)	TIME h	m	EVENT	DIST	ALTITUDE sun	ALTITUDE sat
NOV. 19	4	01	3D	15W	-32.4	23.9
DEC. 4	5	31	3D	21W	-19.3	43.6
6	2	45	3D	21W	-43.5	21.4
21	4	55	3D	24W	-27.3	45.7
23	2	14	3D	24W	-55.8	26.6

OBSERVATIONS FROM THE 23rd FLOOR

Jody LeBlanc, OC

Well, it's that time of year again; the time when somehow it's just not so much fun to go out and observe as it was in July. It's not just the ambient temperature that causes the cooling of our enthusiasm but the fact that for most people (students especially) more and more demands are being made on our time. Usually these commitments infringe on our evenings--prime observing time.

What I'm leading up to is a partial solution to this problem. Why not consider coming down to the B-G Obs. every 1st and 3rd Saturday of the month. As most members are aware, any RASC member is entitled to use the telescope after the tour but few do. In fact, excepting the occasional "dropper-in", it seems that Glenn and I are the only RASCals with an interest in the 16".

I think a lot of this is caused by the prevalent attitude that the 16", due to its poor location, is virtually unusable and is only suited for use by occasional tours of boy scouts. I am surprised that this attitude has survived the publication of my eminantly well written and persuasive article on in-town observing several NN's ago.

But seriously, observing with the 16" is a viable proposition. Its large aperture advantages are obvious for anyone interested in the planets and at a new Moon even dim objects are accessible, as long as they are located south or west. There are also other advantages held by the 16" over your faithful 6"; things such as a really steady mount (joy) an excellent clock drive; and best of all some really fun-to-operate electric slow motions --and you can take the last any way you like.

Whatever I say here can't be nearly as convincing as an evening spent at the Burke-Gaffney Observatory. The next first or third Saturday, why not come down and see for yourself? Glenn and I would be glad to see you there.

PS: We now have some 103-aF red sensitive film which we can give to you to try on some nebulae, or you can bring some colour film and see the more than adequate results you'll get---the Ed.

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