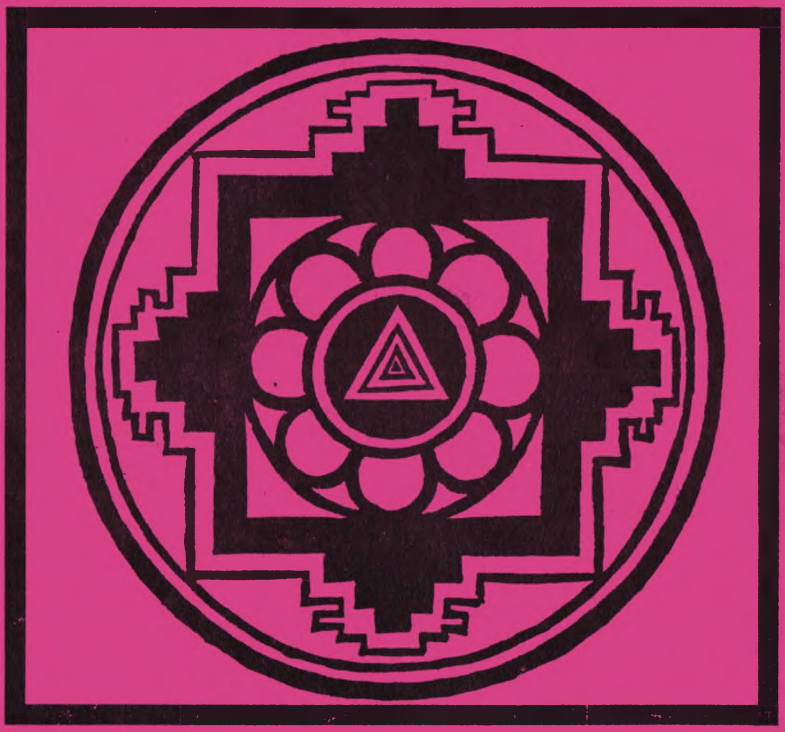
NOVA NOTES



Halifax Centre

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1989 Halifax Centre Executive

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Notice of Meetings

Date: Saturday, August **12th: 9:00 P.M. (weather permitting)**
Place: Oakfield Provincial Park, off of the old #2 highway between Waverly and Elmsdale. Do not confuse it with Laurie park which is to the south (closer to Halifax) than Oakfield
Topic: **PERSEID METEOR WATCH !** Consider bringing any of the following: a reclining lawn chair, a blanket, a thermos and snacks, a telescope, friends and neighbours. For further

Date: Friday, August **25th** - Monday August **28th**
Place: Fundy National Park, New Brunswick
Topic: **NOVA EAST 1989**
More detailed information including maps will be found elsewhere in this issue.

Date: Friday, September **15th: 7:00 P.M.** for the early presentation; **8:00 P.M.** for the regular meeting
Place: Nova Scotia Museum. Access from the parking lot and side entrance. Meeting to be held in the lower theatre.
Topic: The topic for the early presentation has not been finalized yet. For the main meeting, we will be having reports on the G.A. and NOVA EAST '89

Date: Friday, September **22nd: 7:30 P.M.**
Place: David Lane's apartment: **26 Randall Avenue Apt. 4**
Randall Avenue is in Fairview (Halifax). Turn north off Main Avenue onto Gerhart Street (about halfway between Willett Street and Titus Avenue. Randall intersect Gerhart Street. You can call Dave at 443-5989 for further details
Topic: September Members' Night. Topic for discussion: Astronomical Accessories

Halifax Planetarium Public Shows:
There are no public shows in July and August

Note: The above list is tentative and subject to change.

About the cover: .The cover shows a mandala, a geometric shape that represents many things, one of them being the heavenly boundary of the horizon.

Editor's Report
Patrick Kelly

It seems that every time I sit down to pound out this column on the old keyboard, the list of things to include seems to grow at the same speed at which I finish items off. It is not unlike the feeling one gets heading down the road to the Tormentine ferry! Let's see what is new... At the January National Council meeting, a proposal to organize a national R.A.S.C. eclipse expedition was approved. The expedition will go to Baja California for the total eclipse of July 11th, 1991. The expedition will have room for 245 people and the cost per person will be under $1,000 including air fare, accommodations for one night and meals. There should be more details in the National Newsletter.

This year's banquet was different to say the least. The food was quite good and the talk by Walter Zukauskas was both humorous and informative. Unfortunately, we had a bit of trouble when it came to pay the bill. When Joe and Mary Lou had originally arranged things, they told the restaurant that we would be expecting about 40 people. They were also told that if fewer people showed up, there would be no problem. Later, when it became obvious that we would not get that many, Joe called the restaurant to inform them that no more than 30 people would be coming. Once again, he was told that that would be no problem. However, when it came time to pay the restaurant wanted to charge us for 40 people even though we had only 26 people show up! They also did not have any record of Joe calling to change the number to 30. Needless to say, we were not amused! We owe a good deal of thanks to Nat Cohen who volunteered to take up our argument with the restaurant management. (As Doug has told me reminded me many times while playing Panzerkrieg: Never send in a light scout to do the job of a mainline battle tank!) Nat finally convinced them of the error of their ways and we ended up paying for only 30 meals. However, I still have a large brick in my backyard with the restaurant's name on it and they do have such a large front window.....

The centre's planetarium committee is making good progress in its plans to get a major planetarium for the metro area. It appears that we are going to be able to get the site that was the committee's first choice, which is the Dartmouth waterfront. Because of a rather fortunate coincidence in timing, the committee started it work at the same time that the City of Dartmouth's planning department was starting a comprehensive review of the land use for the waterfront area. As a result, things are probably going to move faster than was expected and as a result, we are going to need more people to help out with this

committee sooner than we had thought. We have already identified several areas for which subcommittees will be needed, such as equipment, property, publicity and financing. We would like to have as many members as possible get involved in this project. If you feel that you could contribute please contact **Randall Brooks** at 434-7567.

In April the executive decided to reinstate a try a second monthly meeting. but for a trial period and under a new format. It was decided to call them member's nights. Based on a suggestion by **David Chapman** we are following the astronomy club in Southampton, England, which held its meetings at a different member's house each month. David even volunteered to have the first one at his place in May. Unfortunately, due to an error on my part the notices about the first two of these meetings did not make it into NOVA NOTES although they were announced at the regular meetings. We had a good turnout (as well as a great time) at the first one. and as it was clear, a lot of the newer member's had a first hand chance to learn some constellations when it got dark. To finish off the evening there was also a nice auroral display. The second one was held at **Mary Lou Whitehorne's** but you can read about it elsewhere in this issue. We have one lined up for the fall, and I remembered to include it in the Notice of Meetings!

I have been asked by our president to let you know that he is interested to hear from any members who have a particular topic on which that they would like to see a talk given. He is currently lining up talks for the fall (and beyond) so drop him a note or give him a call if you have any ideas.

In an effort to encourage those of you who do not feel up to the task of observing the entire Messier list, **Dave Chapman** and **Mary Lou Whitehorne** have come up with a "mini-Messier" list. It consists of twenty objects, all of which should be visible in binoculars. Those who complete the form and return it will receive a certificate. If you would like to get a copy, please drop us a letter or call the observing chairman.

By now, you should have received your copy of the *Journal* which contains the new national bylaws which will be voted on at the G.A. in Sydney. If these are approved, we will have to make come corrections and additions to our own centre constitution in order to conform to the new national bylaws. As a result, we have formed a constitution committee to see what has to be done. I suspect that a major rewrite will be in order, and that we will be voting on it at the Annual Meeting in the fall.

Someone sent me a rather interesting article from the *Chronicle-Herald* concerning a fellow by the name of Chap Haynes who lives in Colchester County. He is a professional bladesmith and has begun making knives from meteorites. He uses iron from the remains of the meteorite that formed Meteor

Crater in Arizona. The iron sells for $120 per kilogram and a typical knife costs over $1000. It suppose one would make a unique stocking stuffer for the astronomer who has everything!

For the second year running, we put on an astronomy weekend for the Maple Grove Astronomy Club in Hebron. They had several talks on various aspects of astronomy, a show in the Halifax Planetarium and a trip to the Burke-Gaffney Observatory. Unfortunately, due to the weather, we were unable to have an observing session that night, but all of the students seemed to have enjoyed themselves despite the drizzle. A short while later I received a note from **Rob MacConnell** who is the science and math teacher in charge of the club. He thanked us on behalf of the club and included a club history, which you will find elsewhere in this issue. We hope that they will come back next year and maybe the weather will be a bit better!

It is always sad to see a good friend leave Nova Scotia, especially one who has contributed so much to the centre. Our librarian, **Hugh Thompson** will be heading of to Vancouver to start his physics degree at the University of British Columbia. Hugh has done an excellent job in getting new books for the library as well as spending a lot of time updating the list of the library's holding. He was also an avid observer and showed up regularly for observing sessions. I must admit that both Doug and I extracted quite a few laughs at Hugh's expense but it was always in good fun. In fact, Hugh was often able to turn the tables by challenging us to find particular objects and then beating everyone to it! His homemade telescope produced some of the best views I've ever seen in a telescope of that aperture. In addition, we all learned a lot from him. I'll always be thankful to him for showing me several of the dark nebulæ that are not on any of the regular charts. We wish him all the best and hope that he will be able to make it back from time to time.

I have just received the results from the trivia contest that was held at last week's meeting! The group prize went to row #1 who had the highest average score. Row #1 consisted of **Bill Thurlow, Mary Lou Whitehorne, Jim MacGuigan, Carol Clark, David King, Paul Gray, Brian Segal** and yours truly. The individual prizes went to **Dr. Bill Thurlow** in the expert category, **Paul Gray** in the intermediate group and **Larry Parker** in the beginner category. All of the winners will receive certificates in the mail. Any comments, etc. can be passed on to Dave Lane.

Lastly, I would like to thank all of you who have written articles for NOVA NOTES over the last little while. I have had to add extra pages to this issue in order to get a lot of excellent articles included. Although I still have a large file of articles that I have collected from other sources that I had been saving for a rainy day, it has not seen much use lately. Ω

Daylight Savings Time

Joe Yurchesyn

The invention of daylight Savings Time (DST) is attributed to Benjamin Franklin of kite in a lightning storm fame. Contrary to what the name implies, daylight is not saved, but rather it is prevented from being wasted! To provide longer evening light, daylight savings time makes us start the day earlier and prevents sleeping through (and thus wasting) the morning daylight hours of summer. Of course, I don't understand why anyone would want longer evenings; after all, it takes forever for the stars to come out!

daylight savings time does not work in the tropics where the length of night and day are almost equal throughout the year. At temperate latitudes, daylight hours increase in summer and decrease in winter. This effect becomes more pronounced the further you are from the equator. It is this varying length of the day during the year which makes daylight savings time work.

The period of the year best suited for daylight savings time varies with latitude. For 40° N (or S), it works best between the first week of April and the last week of August. The day must be long enough to allow unencumbered shifting of daylight activities one hour earlier. Because the seasons have thermal lag, DST can be stretched to the last week of September. Of course, this one hour shift is true only for local (or sun) time on the standard time meridians. Communities at the edge of a time zone will have their local time shifted one half hour (earlier or later) relative to their standard time. This affects the standard time of sunrise and sunset, and thus brightness in the morning and the length of the evening. Communities on the western edge of a time zone effectively get only half an hour of extra morning daylight while those on the eastern edge get one and a half hours. Obviously, to our modern society, time is what a clock says it is!

[Editor's note: Before everyone in Cape Breton starts sticking out their tongues at the people in Yarmouth keep in mind that this effect happens during standard time as well. The "extra" daylight that you get in the morning if you are on the eastern edge of a time zone is balanced by an equal loss of daylight in the evening. The only real advantage to living on the eastern edge of a time zone is that if you get up in the morning at the same time as someone on the other side of the time zone ***and*** *that time happens to be when the sun has just come up for you, they will have to wait another hour for sunrise. This gives you an extra hour of daylight, but only if you both go to bed after the sun has set. Around the June solstice this means that you would have to get up around 3:00 A.M. and not go to bed until after 11:00 P.M. in order*

to benefit. Although I do enjoy sunlight, personally, I don't think it's worth it!!!]

Government legislation has, in the past, disregarded the basic solar limits of DST. Remember the energy crisis of 1975? The Unites States began daylight savings time in late February! People began their day in the dark and ended in the dark, trading cold March evenings for even colder March mornings. Ironically, this policy probably resulted in a negative energy savings.

Look at last year's experimental two hour daylight savings time in Newfoundland. Although its more northerly latitude makes for longer days in June and July where the two hours can be effectively used, everybody was rising and bedding down in the dark at the extremes of the DST period and going to bed in broad daylight during the middle! Also, since the meridian for Newfoundland Standard Time almost passes through Saint John's, the western extremes of the province had the equivalent of two and a half **less** hours of morning daylight! (I'll leave my opinion of Newfoundland Standard Time to another article.)

We cannot manufacture daylight. Daylight savings time must coincide with the limits imposed by Earth-Sun geometry. It presently begins more or less on schedule but ends in late October - a month too late (corresponding with beginning DST at the end of February!) At this extreme date, an extra half hour of evening daylight comes at the expense of a full hour of morning darkness - and I hate to get up in the dark! Ω

The Occultation of Regulus

Dave Chapman

Scramble! It was 10:00 P.M. A.S.T. on Monday, January 23 1989, and Dale Ellis was on the phone asking, "Are you going out to observe the occultation of Regulus in 17 minutes time?"

"What!" I replied, "That's tomorrow, the 24th!"

"Sure," said Dale, "oh-two-seventeen, January 24th, Universal Time. It's already tomorrow in England."

So that's how it started; I had 15 minutes to get ready. Dale and I decided to observe from our respective driveways in Dartmouth, he with his C8 and me with my C90. This would be very nearly a grazing occultation in Halifax - although the map in Sky and Telescope did not extend that far - so we thought it would be fun to see how our observations compared.

I synchronized a small portable digital timer with the WWV time signal to take time measurements. The Moon was bright, being two days past Full, but the 1.3 magnitude Regulus could clearly be seen. There was no time to polar-align the telescope. I observed at 200x for the disappearance, but changed to a lower

power for the reappearance, as I wasn't sure from where Regulus would appear behind the Moon.

Dale used his wrist-watch to time the occultation and we corrected his times by comparing with my watch the next day: his watch was 46 seconds ahead of my watch and my watch was 4 seconds ahead of WWV. Dale observed at 80x throughout with his telescope roughly polar-aligned for ease in tracking Regulus.

Mike Boschat, an experienced occultation observer, also observed the event and kindly passed on his own measurements. They are included with ours.in the following summary table.

In the table, the predicted time is for the Halifax station (N44°.600 W63°.600) used in the Observer's Handbook. Dale (N44°.672 W63°.573) and I (N44°.680 W63°.563) live a few miles from Halifax in Dartmouth, less than a mile from each other. Our observations have estimated errors of about 5 seconds, maybe larger on the reappearance. Mike Boschat (N44°.654 W63°.608) lives in Halifax, closer to the Halifax standard station; he estimates his observational error at 0.5 seconds.

OBSERVER	T_d	T_r	Duration	Midpoint
predicted	2:17:36	2:40:00	22.5 min.	2:28:55
Mike	2:18:11	2:41:31	23.3 min,	2:29:51
Dale	2:17:50	2:39:45	21.9 min.	2:28:48
Dave	2:18:24	2:38:56	20.5 min.	2:28:42

Despite our half-hearted attempt at timing this occultation - speaking now only for Dale and myself - note the following facts: (a) the observed midpoints agree with the predicted midpoint within a few seconds; (b) our duration times are shorter than predicted, but we live a little north of Halifax and the graze line ran roughly West-East.

Suggestions for would-be occultationists:

- leave plenty of time to set up your gear
- have a convenient timer handy that is synchronized to a time signal
- try to polar-align you scope, even roughly.
- use a high power to reduce the Moon's glare

Attempting to time an occultation as we did is a useful test of one's equipment and observational skill. It also provides an opportunity to make quantitative measurements and to explore the concepts of experimental error and data interpretation. Everyone should give this a try, even if they don't plan to undertake a serious programme of occultation timings. Ω

Astronomy at the Beach

Joe Yurchesyn

People generally associate astronomy with nighttime and the visible light emissions of distant stars and nebulæ; not with the Sun. Actually, visible light represents only a small part of the electromagnetic spectrum, and the Sun happens to be a not so distant star. The Earth's atmosphere has several windows which pass electromagnetic radiation of different frequencies, one range of which is responsible for suntans (and sunburns).

The Sun's light, so eagerly sought by millions of people each summer, contains a light of which is known collectively as ultraviolet light. This broad range is divided into three smaller wavelength ranges. The light with wavelengths from 280 to 320 nm is called ultraviolet-B (or UV-B, for short). It is this range which is responsible for suntans. UV-A, which ranges in wavelength from 320 nm to 400 nm are 1,000 times less burning than UV-B, while the shorter wavelength UV-C (wavelengths less than 280 nm), although more destructive, are very strongly absorbed by the atmosphere.

The Sun,. being a relatively cool star, radiates only 0.7% of its total energy output as UV-B light. While the Sun's output is almost constant, the amounts reaching the ground vary considerably. This is due primarily to atmospheric absorption as the Sun changes altitude in the sky. This absorption is due almost entirely (98.9%) due to the ozone molecule, O_3. It takes only a trace of ozone to do the job. If all of the stratospheric ozone were collected at sea level, it would form a layer only 3 mm thick! The amount of ozone in the atmosphere varies with the season (least in autumn), the latitude (least over the tropics) and atmospheric pollutants (reduced by volcanic eruptions and atmospheric nuclear tests). Any change in the effective thickness of the ozone layer changes the amount of absorption proportionally.

Other factors reducing the intensity of UV-B rays are scattering by air molecules which amounts to 1% (remember why the sky is blue) and scattering and absorption by dust particles (0.1%). All totaled up, the sun is six magnitudes fainter at 300 nm when viewed at the zenith from sea level than when viewed from space. Compare this with 0.3 magnitudes for visible light. When viewed at an altitude of 30° above the horizon, it is six magnitudes fainter still, since the effective path length through the air is double the straight up distance. Clearly, the sky is quite opaque in UV-B light, where even at the zenith only 0.4% makes it to ground level.

As the Sun declines from an altitude of 60° to 30° over your favorite beach, its burning power drops by a factor of about 100 times, even though its light and heat diminish hardly enough to

notice. This explains why you cannot tan in the early morning or late afternoon in the summer, and at noontime in the winter if you live at temperate latitudes. In Halifax, for instance, the noon Sun is 21° above the horizon at midwinter, but reaches 68° during midsummer. It would take almost nine days of noon sunning in December to have the same effect of just one minute in June!

This dependence on solar altitude explains why visitors to the tropics sometimes get badly burned unexpectedly. The Sun spends more of the day near the zenith all year round. Another factor is the smaller amount of ozone over the tropics - typically 25% less, thereby boosting the the ground level UV intensity by one third.

Thin clouds merely scatter the UV light and have little effect on its intensity. In fact, visible light is dimmed much more. At the beach, sand and water reflect about 15% of the incident UV light, so it is possible to burn slowly in the shade. Also, don't expect to do looking for faint galaxies after a day at the beach. Exposure to all of the UV light desensitizes your eyes, which then require time to recover.

What about sun tanning in space? From Earth orbit, the sun worshipping astronaut would tan (or burn) 400 times faster than on a Halifax beach in June, or in about 10 seconds. On Sun drenched Mercury it would take about one second! On distant Pluto, under a Sun the brightness of the Full Moon, the amount of UV-B received is about 0.6% of what we get at the Earth. However, since Pluto has no ozone layer, all of the UV-B would get through and as a result the sunbather would tan at about the same rate as under average conditions on Earth, that it if he or she didn't mind spreading their beach blanket on a methane snow bank. But what the heck, it must be the off-season! Ω

Audio-Visual Star Hopping

Brian Segal

So, you're out there all set up. You're eagerly awaiting astronomical twilight armed with telescope, accessories, warm clothes, a thermos of your favorite anti-cold elixir and – let's not forget them – your charts, guide books, atlases, little bits of paper with cryptic notes, logbook and a pencil. The sky is wonderfully transparent. The four stars of the Big Dipper's bowl stand out like beacons. A fabulous evening of observing lies ahead.

Chances are you've spent some time preparing for your evening's tour. Appropriate atlas pages have been tagged; perhaps some pages of the *Uranometria* are xeroxed and annotated. Your pockets are full of stuff including a red flashlight, pencils and various gizmos that you think you will need out there. Your evenings directions become a celestial road map to the splendor of the sky – find this star, move south to another one, drift a minute or two until that little triangle comes into view, and so on.

All of this literature can prove to be cumbersome at times. No matter how calm it is, there's always just enough breeze to snatch a piece of paper from your cold-stiffened hands, or flip the pages of your charts or guide book. Then you have to haul out the flashlight. I have finally identified the ideal flashlight (plastic body mandatory) which can be comfortably clenched between the teeth while you use your hands to hold down the pages of a star chart or a sheet of loose leaf and quickly memorize the reverse of the patterns on the page. (I am convinced that Schmidt-Cassegrain users develop a habit of seeing everything backwards though right side up – which can lead to interesting situations!)

Then, of course, one does want to record the results of the evening's proceedings while the impressions are fresh. Keeping the location, image quality and other details of a bunch of NGC or Messier objects (or mystery galaxies that you swear you've never seen before and how did Burnham miss them) in your head while doing a bunch of other things presents an unwelcome challenge. There must be, one surmises, a better way.

One year my understanding wife presented me with one of those nifty and useful mini-cassette recorders for Christmas. Of course, it was really meant to help keep me organized. We run a fairly demanding business and have lots of other involvements. For a while there, I actually used the thing for its intended purpose! Well, one day, as I eagerly planned an observing session, it occurred to me that the little recorder could serve as the perfect scopeside logbook. That night I hauled out all of my stuff as usual (charts and bits of paper included) and spent the rest of the evening telling the Sony what I saw. No more cryptic, barely

legible notes for me! Now I could allow the full range of my descriptive powers to flow!

I began to do this on a regular basis at each observing session. I soon realized that I had created a monster! The choice was clear. I would either resign myself to building up a substantial tape library complete with many archival drawbacks, or I would have to get into a regimen of recording, then editing and transcribing onto paper. After listening critically to some of my monologues, I easily chose to edit and transcribe! As a control factor, I refuse to buy any more cassettes until the current one is worn out!

I still had a lot of paper to contend with, but at least I could now dispense with the act of writing in the dark. In addition, I could come back to the tape within a reasonable time period for transcription purposes. Further contemplation, however, led me to another variation. I decided to use the recorder as an audio guide book. I would, using the charts and sources, dictate the evenings tour onto tape ahead of time and simply respond to the directions in the field. In theory, this sounded very elegant. So, one night I headed out, literature in the house, optics and audio in the back yard.

Well, it worked out fairly well. I soon discovered, however, that there are times when hearsay is inadequate. Too often, the magnitude limits of the charts leave you wondering just WHICH little triangle that looks sort of like Leo's behind it is! A quick check in Vehrenberg's atlas or comparable reference is unavoidably. Thus, audio has its limits. As well, for recording, sketching has no substitute.

So now the Sony has joined the throng of stuff that I cart out to the backyard. Like so many other "labor saving" devices it creates its own imperatives and needs. It does, however, greatly enhance my observing log. Some of the passages are quite lucid - amazingly enough - and can serve as a fairly reliable guide for return visits to a given place. I also find it perfect for recording the unexpected such as meteors and passing satellites. During photo sessions the Sony is an excellent recording tool.

Give the idea a try. Perhaps you think you'll feel silly talking to yourself in the dark - but you probably do it already. You might as well get it down on tape! Needless to say it's a technique that offers some advantages over searching around in the snow or grass for your pencil! Ω

It suddenly struck me that that tiny pea, pretty and blue, was the Earth. I put up my thumb and shut one eye, and my thumb blotted out the planet Earth. I didn't feel like a giant. I felt very, very small. - Neil Armstrong

Book Review: Exploring the Sky by Richard Moeschl

David Griffith

There are various categories within that group that identifies itself as amateur astronomers; the "armchair astronomers" revel in the literature, the "casual observers" dabble with Messier objects, and the "seasoned observers" feast regularly on the more elusive NGC objects. But how many of us have ever had the opportunity to venture into the realm of real "nuts and bolts" astronomy? How many of us were ever challenged to not only look up, but understand what we saw and how we know about it? This is the challenge offered by Richard Moeschl in **Exploring the Sky: 100 Projects for Beginning Astronomers.**

Essentially a workbook designed for teachers and students, Moeschl's book offers some excellent material for educating children (and adults) about the universe and our place in it. The author, in his introduction, laments the woefully inadequate treatment of astronomy in the school system and offers this book as his own personal crusade to do something about it.

The format of this book is based largely on the scientific method: some background is provided followed by a list of easily obtainable materials, procedures and observations. The scope of the one hundred projects is quite broad, ranging from simpler projects such as a tennis ball sky dome to more challenging enterprises like making a spectroscope. In addition to a collection of traditional observing projects (examining sunspots, observing the constellations, etc.) the book abounds with projects of a more technical, even exotic nature. Among these are models of black holes and space-time curvature, cosmic ray detectors and calculating the brightness of Cepheid variables. You can even make a magnitude measuring device from cellophane and cardboard.

In addition to the projects are numerous references to mathematics, the arts, philosophy and earth sciences. Moesechl's anecdotes are well placed and useful. In addition, a very helpful appendix contains various tabular data, diagrams, charts and a glossary.

This workbook's understandable language makes it an ideal resource for teachers, students, parents and indeed anybody interested in the science of astronomy. **Exploring the Sky** not only deals with "what's up there" but also how we have found out about what's up there. It's $14.95 (U.S.) price tag is a bargain that I would hope every school or public library should take advantage of. Ω

Astronomy Programs for the Library

Larry Bogan

Computer programs have become very popular with amateur astronomers. Both *Sky & Telescope* and *Astronomy* frequently include articles with computer programs and both contain many advertisements for commercial astronomy programs. I enjoy programming the computer to simulate sky and some of you may as well. Your programs may be useful and/or enjoyable so I suggest that we share the programs with each other and other R.A.S.C. members. I have begun this process by submitting a couple of IBM compatible disks to the Halifax Centre library. They contain an assortment of astronomical programs along with a listing of the BASIC programs for those who might want to transfer the programs to non-IBM compatible computers. On the disk is a text file that describes each program. I will outline the programs below to help you decide if you wish to borrow the disk. Feel free to copy the programs for your own use.

PHOTO.BAS - calculates astronomical photographic exposures.

MOONPOS.BAS - computes the Moon's position & phase for a given date.

JULIAN.BAS - gives the Julian date for any date.

PLANETS.BAS - determines heliocentric latitudes and longitudes of the planets and plots the orbits on the screen.

SATURN-5.BAS and SATURN-5.EXE - shows the configuration of Saturn's four brightest satellites for any given date.

SUNDIAL.BAS - calculates the angles of the marks for a sundial.

TELEDRIV.BAS - calculates the drive rates in altitude and azimuth for diurnal motion with an alt-azimuth drive.

ALTITUDE.BAS - calculates the celestial co-ordinates of the horizon and lines of constant altitude to draw a "flat star globe'.

SUNTIMES.BAS - calculates sunrise and sunset times for any date or series of dates.

ORBITINT.GWB - calculates the orbits of two interacting satellites of a third body and plots them on the screen.

ORBITPLT.GAS - plots the elliptical orbit of a binary star given its orbital parameters and stellar masses.

SUNSPOTS.BAS - calculates the heliographic co-ordinates of the center of the solar disk for any date and determines the co-ordinates of sunspots from measurements on the disk.

GALAXY.EXE - A program to simulate graphically the collision of two galaxies .(from *Astronomy* magazine)

ALT-AZIM.BAS - calculates the altitude and azimuth of a file of celestial objects for any date and plots them on a map of the sky relative to the horizon.

STARLUM.BAS - calculates the intensities of blackbody radiation for two stars given their temperatures and sizes.

ECLIPSE.BAS - determines the times and situations of solar or lunar eclipses for any year. (from *Astronomy* magazine. Ω

NOVA EAST '89
Schedule of Events
Doug Pitcairn

This year's star party has had some changes made to its schedule as a result of suggestions made after last year's event.

-All the official events will occur on Saturday to allow everybody who must leave early Sunday to participate.

-We have attempted to increase the time allotted for getting to meet fellow amateurs.

-The public are only invited to one observing session. This should increase our private observing time.

-The public observing session has been relocated to the higher site at the Chignecto Campground to minimize moisture problems and help preserve quiet at the Micmac Campsite. We will be using the overflow area which is on the south side of the highway opposite from the main campground. If this spot proves to be better than the Micmac campground, we may move all observing to it. (Except, of course for those with non-portable scopes!)

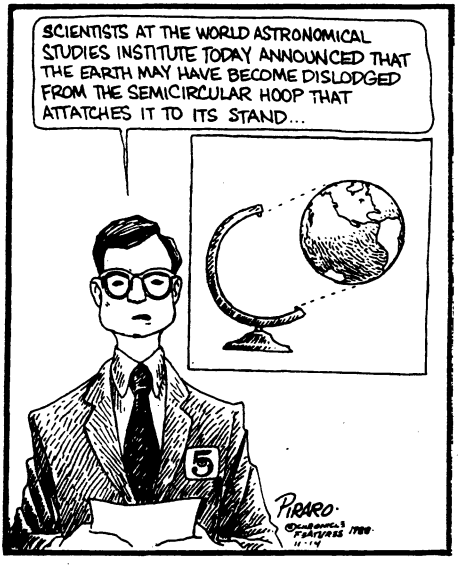
-We will be having at least one francophone talk by Dr. Soler of the University of Moncton.

There are two kinds of accommodations available. For those who prefer camping, we have a large site in the Micmac Group Campground. There will be enough room to accommodate all who wish to come. For those who prefer to be a bit more civilized, there are two inns in the park. One is **Fundy Park Chalets** which has 29 housekeeping units. It features a licensed dining room and lounge, coffee shop, shower, B&W TV and heated pool. Rates are from $30 - $45 per night (1987 prices) Phone: (506) 887-2808 or (506) 433-2084. The other is **Caledonia Highlands Inn and Chalets** which has 44 units,showers and color TV. Rates are $45 - $47.50 (1987 prices). Phone: (506) 887-2930. In addition, there are several motels in the small village of Alma, right beside the park. Additional information can be obtained from the New Brunswick Tourism Dept.

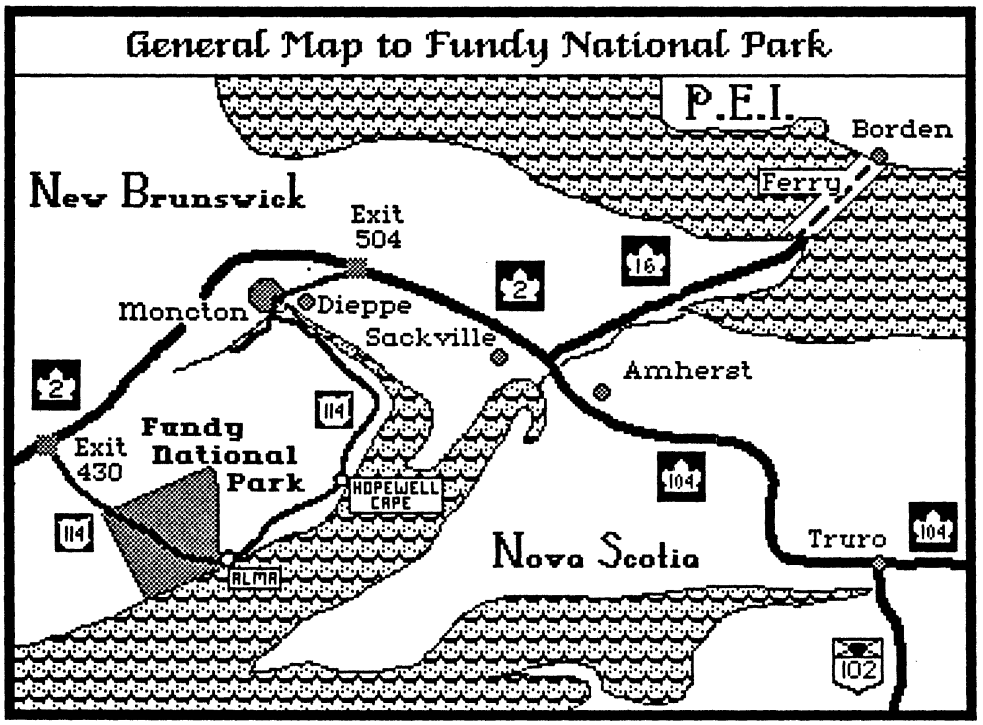
We have also updated the maps to include several of the sites that will be used for the first time this year.

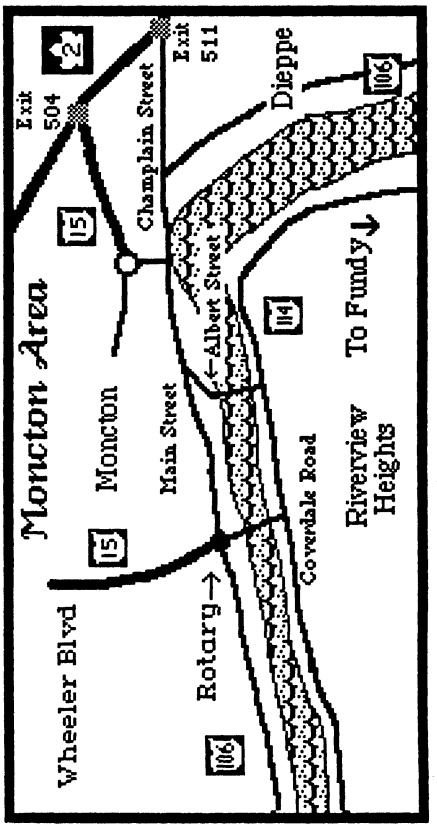
As with any star party, the more who attend, the better it is. We are having some new NOVA EAST '89 T-shirts made up and will have them for sale again this year. I am currently answering info requests from others as far away as New Jersey who have read of the event in *Astronomy* and *Sky&T*. I hope to see you there. Clear Skies. Ω

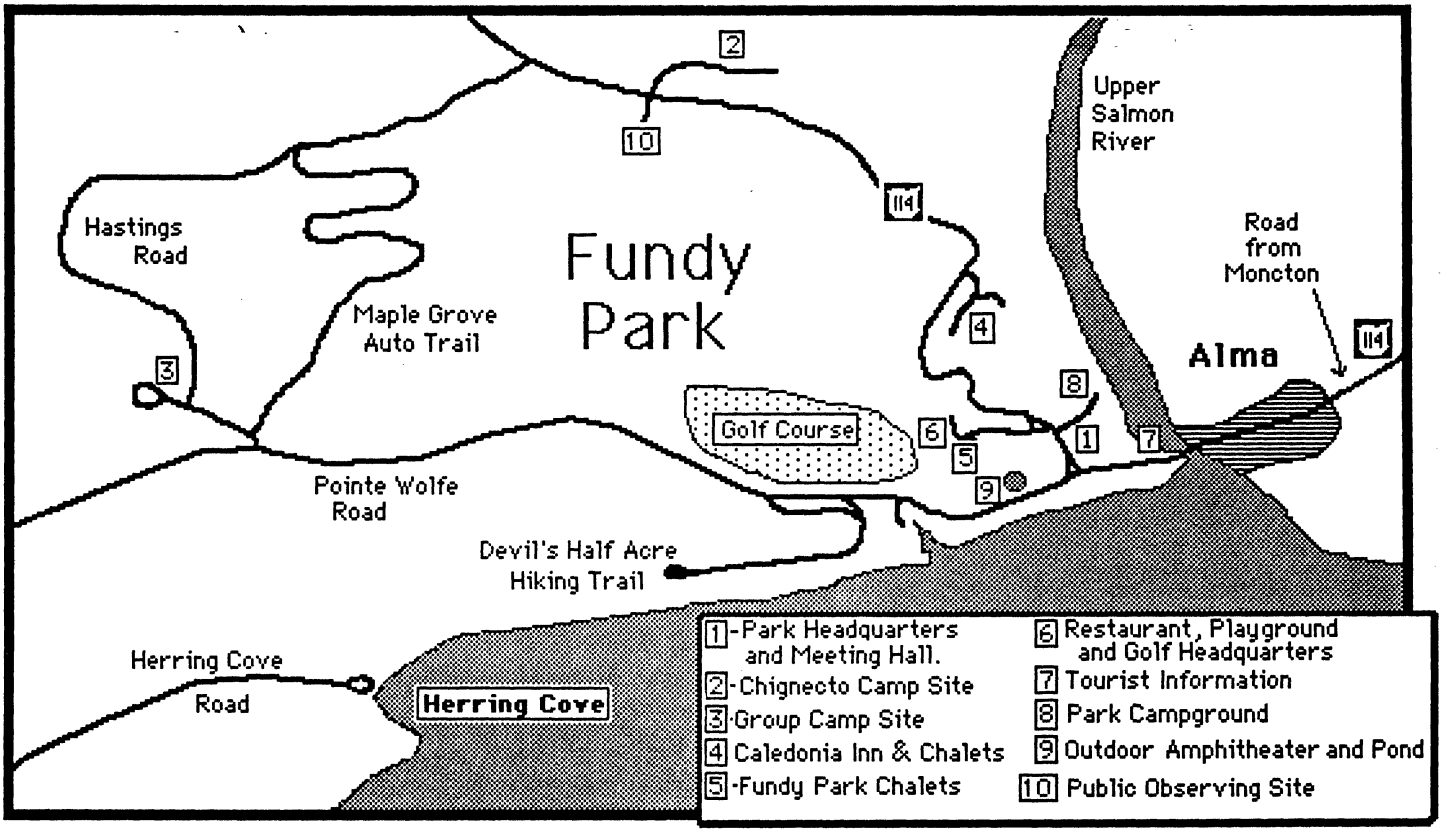
Date	Time	Event	Location
Friday August 25th	All day	Arrival and camp setup	Various locations
	22:00 - 24:00	Private viewing	Micmac Campsite
Saturday August 26th	Morning	Free time	Anywhere
	12:00 - 14:00	Corn boil and weiner roast	Micmac Campsite
	14:00 - 17:00	Scope setup/show & tell Group photo session Swap shop & gab session Scope show and tell	Micmac Campsite
	17:00 - 19:00	Private suppers	Wherever
	19:00 - 20:30	Public talks If clear, 4 talks followed by observing If cloudy, 6 talks followed by telescope display	Assembly hall
	21:00 - 24:00	Public viewing (if clear)	Chignecto campsite
Sunday August 27th	All day	Free time	Anywhere
	21:00 - ??	Private observing	Micmac campsite
Monday August 28th	All day	Departures and farewells	Various



Fundy Park Maps







Following Sunspots

Larry Bogan

The Large March Sunspot

During the second week of March there appeared on the face of Old Sol one of the more interesting spot complexes to appear in a while. This was the one that was probably associated with the flare that received some publicity the previous week and was likely responsible for the fantastic auroral display on the night of the 14th of March. (They could not be called "Northern Lights" because the bright parts were in the southern part of the sky!). I hope many of you were able to see them; I did and can frankly say that it was the most brilliant and colorful aurora I've ever seen.

A sunspot group will stay at the same latitude but drift a small amount in longitude as the Sun rotates. If they are stable enough to survive for over two weeks, you can pick them up on the next rotation of the Sun. I sketched the position of the large sunspot from the 10th of March until it moved to the back side of the Sun on the 17th of March. I was able to relocate it when it reappeared on about April 6th by determining the heliocentric longitude and latitude of all large spots. March 13th and April 9th had nearly the same heliocentric longitude of the center of the solar disk. In figure 1, I show the solar disk for these dates with the solar equator and poles added. The large spot is obvious in the first sketch but it is shifted in longitude and smaller in the second. (It is the only spot in the northern hemisphere.) The shift in longitude is exactly that which would be expected for the differential rotation of the Sun. At 30° latitude the solar rotation is 28.3 days rather than the 27.3 days at the equator and hence the spots slowly fall behind the co-ordinates fixed at the equator.

Solar Co-ordinates

The Sun shows the same face to the Earth about every 27.28 days but the Sun is fluid and hence its rotation is non-uniform. The Sun does not have any permanent markings on its surface to which co-ordinates can be referred. In order to establish a co-ordinate system for the surface of the Sun, a sidereal rotational period of 25.38 days is accepted as a standard. The heliocentric co-ordinates were determined from a lengthy study of sunspot movements by Richard Carrington at his private observatory in Redhill, south of London, from November 1853 to March 1861. Even today the rotations of the Sun are counted by Carrington Rotation Numbers (CRN) starting with the first one on November 9th, 1853. He established the zero of heliocentric longitude as the point where the solar equator crossed the ecliptic (ascending node) at noon on January 1st, 1854. The longitude is

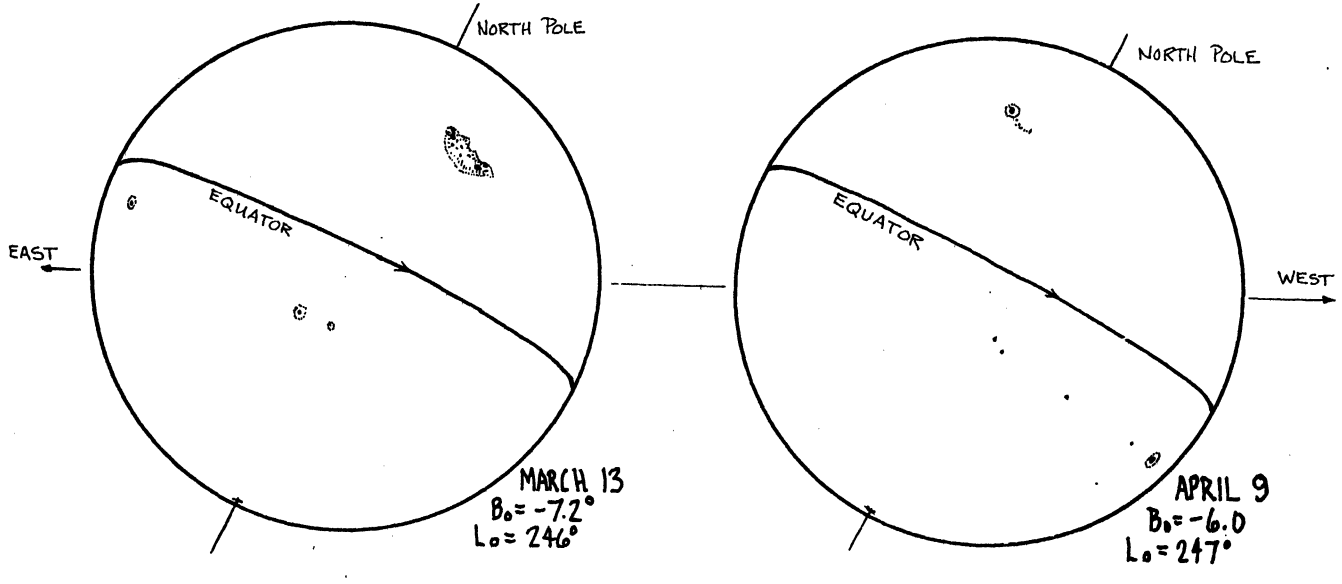

NORTH POLE
EQUATOR
EAST
MARCH 13
$B_o = -7.2°$
$L_o = 246°$
NORTH POLE
EQUATOR
WEST
APRIL 9
$B_o = -6.0$
$L_o = 247°$

Figure 1

measured eastward in the direction of rotation of the Sun and ranges from 0° to 360°. Positive latitude is measured northward from the equator and negative latitude is measured southward giving a range from +90° to -90°.

I will assume that you all know how to observe the Sun safely, and if you don't, you can get that information from one of the many articles that have been written on partial solar eclipse observations (see the attached bibliography). I used the eyepiece projection method with my 80 mm f/8 refractor and a homemade sunscreen. This method produces images on the screen which are mirror images of the solar disk as it appears in the sky. The type of optics that you use will determine the orientation of the image that you get.

Graphical Method

The Observer's Handbook provides the information necessary to get the heliocentric longitude (L_0) and latitude (B_0) of the center of the solar disk, but it does not show you how to get the co-ordinates of the spots. The set of 12 drawings of the solar disk in figure 2 leads you through a graphical method for determining the heliocentric latitude and longitude of any sunspot. The drawings read from left to right and from top to bottom.

If you plan to do a series of sunspot observations, I suggest that you draw circles with the same diameter with a compass on all of your sheets before starting the observations. The compass puncture hole locates the center of the circle and will be the center of the Sun's image. I used 120 mm diameter circles but your best size will depend on the magnification of your optics and your physical setup.

The following is a step by step explanation of a method for sketching sunspots and determining their heliocentric co-ordinates.

1. Trace the positions and shapes of the sunspots with the solar disk fit snugly in the drawn circle. If you do not have a clock drive (as is my case), then you have to keep shifting the paper to keep the Sun centered. When finished, note the time and date on your sheet. Note also which direction is north on your sheet.

2. Hold the paper perfectly still (use a stand) and allow the image of the Sun to drift across the paper as the earth rotates. Periodically mark the position of one spot. This will give you the east to west (E-W) direction on your sheet.

3. Draw a line parallel to the E-W direction through the center of the circle.

4. Construct a perpendicular line to the E-W line, through the center to give a north to south (N-S) line.

5. Use *The Observer's Handbook* with the date and time of your sketch to determine the values of B_0, L_0 and P. You will have

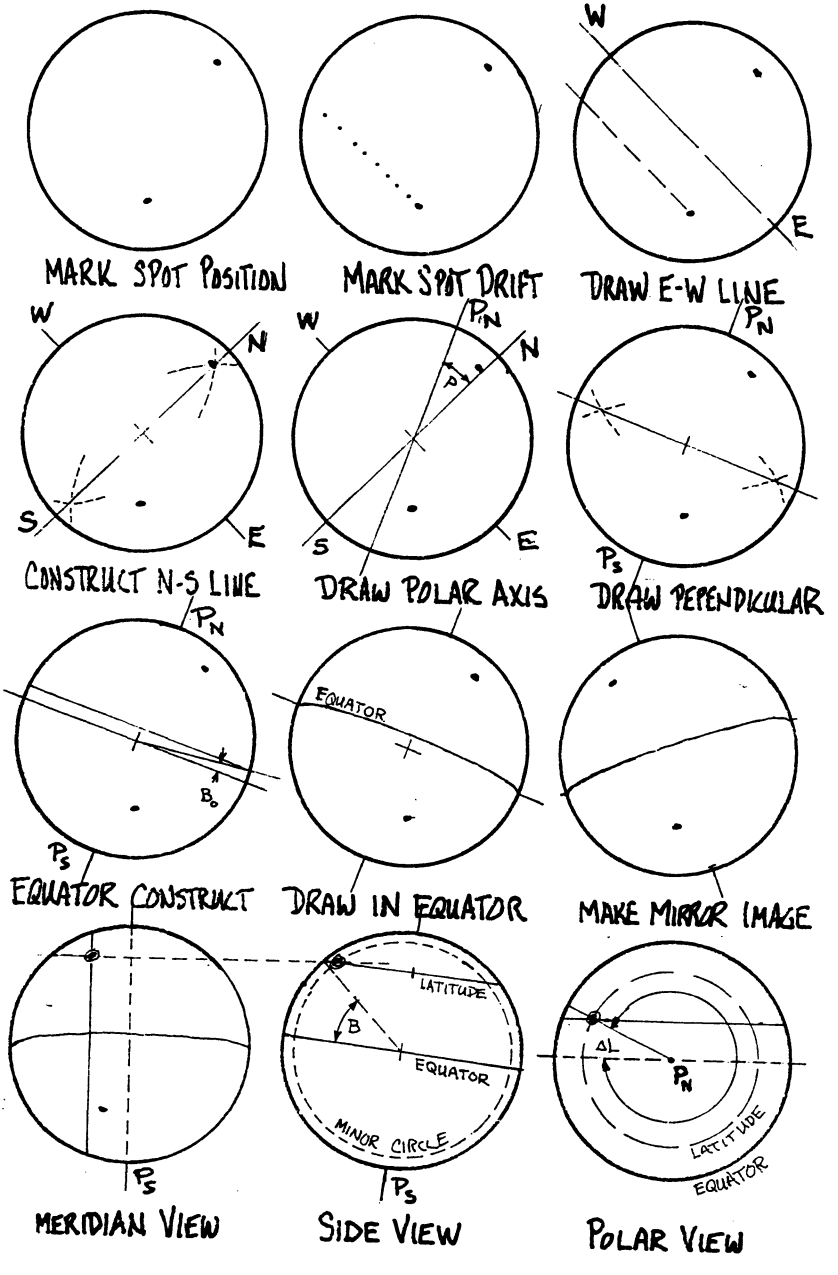

MARK SPOT POSITION
MARK SPOT DRIFT
W
E
DRAW E-W LINE
W
N
S
E
CONSTRUCT N-S LINE
W
P_N
N
P
S
E
DRAW POLAR AXIS
P_N
P_S
DRAW PERPENDICULAR
P_N
B_o
P_S
EQUATOR CONSTRUCT
EQUATOR
DRAW IN EQUATOR
MAKE MIRROR IMAGE
P_S
MERIDIAN VIEW
LATITUDE
B
EQUATOR
MINOR CIRCLE
P_S
SIDE VIEW
ΔL
P_N
LATITUDE
EQUATOR
POLAR VIEW

Figure 2

to interpolate between the numbers given in the tables on pages 56 and 57 of the handbook. Note the direction of positive angles given in the sketch on page 58. Draw a line at an angle P from the N-S line to be the polar axis of the Sun. Note that in my example, the angle P is negative and the north pole of the Sun is **west** of the north direction. A positive value for P would place the north pole **east** of the north direction.

6. Now draw a line perpendicular to the rotation axis and through the center of the Sun. Since the Sun can be tipped as much as 7.2° towards or away from the Earth, this line is **not** the Sun's equator.

7. Use the angle B_0 to establish a guide line to sketch the position of the equator. If B_0 is positive, the center of the Sun will be north of the equator. In this example, B_0 is negative and the center is below the equator, hence, I have drawn the angle B_0 up from the line made in step 6. Draw a line through where the line from the center touches the circle and parallel to the line through the center.

8. Sketch a half ellipse to represent the tilted equator utilizing the line drawn in step 7.

9. If your drawing is arranged with N-E-S-W in the clockwise direction as shown here, then you have a mirror image of the Sun. Make a mirror image to get the correct orientation. One method is to trace your drawing through the back side of the paper.

You may want to stop at this point if you only want to see the relationship of the sunspots to the equator and rotational axis of the Sun. The three last sketches of the Sun include many steps and show a graphical method of determining the heliocentric latitude and longitude. This method used three views of the Sun in different directions.

MERIDIAN VIEW: This view is as seen from the Earth and is the sketch that was made in step 9 with the polar axis oriented vertically.

SIDE VIEW: This is the view of the Sun seen from one side and in a direction perpendicular to the plane of the rotational axis of the Sun and the line of sight from the Earth. The line between the centers of the side view and the meridian view should be perpendicular to the polar axis of the meridian view.

POLAR VIEW: This is the view of the Sun looking down on its north pole.

a) In the meridian view, draw a line parallel to the polar axis through the sunspot of interest. On the sphere of the Sun's surface this is a minor circle through the spot.

b) On the side view, draw in the minor circle using the radius as determined from the meridian view.

c) Project the position of the spot in the meridian view to the minor circle of the side view.

d) Draw the latitude line through the sunspot in the side view and parallel to the equator.

e) The heliocentric latitude is the angle, B, of the latitude line from the equator.

f) Draw the meridian of the Sun on the polar view.

g) Draw the minor circle line through the sunspot parallel to the meridian. The perpendicular distance between the two is the same as in the meridian view.

h) Draw the latitude circle of the sunspot on the polar view using the radius measured from the side view.

i) The location of the sunspot in the polar view is at the intersection of the latitude circle and the minor circle line.

j) In the polar view, measure the angle from the meridian (in the direction of the Earth) eastward to the sunspot. This is just the difference in the longitude of the center of the solar disk and that of the sunspot (ΔL). Measure this in the counterclockwise direction.

k) the heliocentric longitude of the sunspot is just the longitude of the center of the disk (L_0) plus the angle measured in step j. That is, $L = L_0 + \Delta L$.

This finishes the graphical determination of the heliocentric co-ordinates of one sunspot. The projection procedure on the three views can be repeated for the other sunspots.

Roth's book referred to in the bibliography has another graphical method to determine the co-ordinates of the sunspots, if you would like to try that method. I have a feeling that it is equivalent to my method, but I have not proven that.

Trigonometric Method

If you are more mathematically oriented than graphical, you can measure the spot position on the sketch and then calculate the heliocentric co-ordinates. You still have to go through the steps to get the location of the rotational axis of the Sun disk (the first six steps). The measurements needed are:

i) the radius of the circle representing the solar disk (R)

ii) the radial distance of the spot from the center of the solar disk (r)

iii) the angle between the north polar direction and the line from the center of the disk to the sunspot (θ). As usual, positive angles are measured eastward.

The formulæ to use are:

$$r_0 = \arcsin\left(\frac{r_1 * r}{R}\right) - r_1$$

where $r_1 = 4.625 \times 10^{-3}$ radians

$$B = \arcsin\left(\sin(B_0) * \cos(r_0) + \cos(B_0) * \sin(r_0) * \cos(\theta)\right)$$

$$L = \arcsin\left(\sin(r_0) * \sin(\theta) / \cos(B)\right)$$

Computer Program

To save myself time with the calculations, I have written a computer program in BASIC that does the calculations. The program also eliminates the need to interpolate between values in *The Observer's Handbook* and calculates B_0 , L_0 and P from the date and time. I have called the program "sunspot.bas". I am making a listing of the program available to the R.A.S.C. through our Halifax Centre library. For those with an IBM-compatible computer, you can get the program on disk from a disk which is also in our library. (see my list of astronomy computer programs elsewhere in this issue.) Ω

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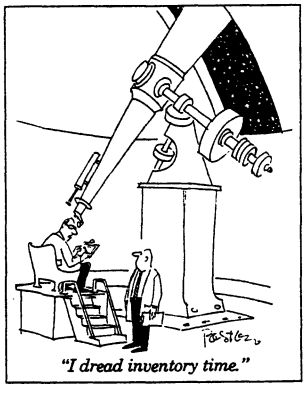


"I dread inventory time."

The Maple Grove Astronomy Club

Rob MacConnell

The Maple Grove Astronomy Club was started under my direction in 1987. At that time, we obtained a provincial grant to purchase a suitable observing telescope and thus acquired a 200 mm (8") catadioptric with an equatorial mount with clock drive. In addition to this telescope, the club constructed a handsome 250 mm (10") reflector, which is currently loaned out to club members. Once a month, after school meetings are held to familiarize members with upcoming celestial events, observing tips, computer work, films and videos. During the 1988-89 year, the club has held observing sessions at the Maple Grove Educational Centre playing field and during the winter, at my house. Club members have observed Jupiter, Saturn, Mars and Venus plus many other galaxies, nebulæ and clusters.

Last fall, our club was honored to help in organizing a talk and observing session with Dr. Roy Bishop, a physics professor at Acadia University and editor of the Observer's handbook. As well, members visited Digby surgeon, Dr. Bill Thurlow who is an avid amateur and the proud owner of a 450 mm (17.5") reflector.

This spring we planned two main events. We co-hosted a talk by Harry Taylor, a retired NASA scientist, on the subject of "The Exploration of Venus". In addition, we visited the Halifax Centre for an astronomy weekend with visits to the planetarium and observatory at Saint Mary's. This was the highlight of the year for these young and enthusiastic amateur observers.

We are in the process of building three rich field refractors telescopes for the club members to borrow and during the summer the club is planning to attend NOVA EAST '89. Ω

Astro Ads

WANTED: One working slide projector

The Halifax Centre is looking to purchase a second hand slide projector to loan out to centre members who are giving public astronomy talks. If you have a projector that will take standard Kodak carousels, please call Joe Yurchesyn at 422-8030

The sky starts at your feet. Think how brave you are to walk around. - Anne Herbert

Are You an All-Season Sky Gazer?

David Griffith

A friend recently remarked that winter is what differentiates between the men and the boys (women and the girls) when it comes to dedicated skygazing. Initially I agreed with him. There are just too many disincentives associated with winter-numb fingers and toes, frosted objectives, snow drifts up to your chin and so on.

After I reflected on this a while, I came to a different conclusion. I said to my friend, "Yes, frozen digits, etc. are excellent excuses for mothballing our scopes from November to March, but there are equally good excuses for not going outside during the other seasons as well.

Consider spring. Yes, it is warming up, though I suggest that our Maritime springs do not send me rooting through the closet for shorts and T-shirts. Aside from somewhat warmer temperatures, however, the spring atmosphere offers little else that is positive as far as astronomy goes. Cloudy nights dominate, the air is often so laden with moisture that you need a wet suit and tanks to prevent drowning and many of the celestial showpieces of winter are bidding farewell.

Summer? Sure, it's warm. I would offer, however, that the same warmth that lures us out to feast upon the globulars and nebulæ of Sagittarius, Cygnus and company also lures the myriad black flies, mosquitos, etc. to tap into our blood supply. Did you ever try to center Saturn in your high power ocular and slap the back of your neck at the same time? Fly dope, you say? Fine, so long as you don't inadvertently rub it into your eye (it has a noticeable effect on your night vision!) or smear it onto your eyepiece (it is not recommended as one of the premium anti-reflective coatings).

All right, you say, what's wrong with fall? It's warm enough and the atmosphere isn't as soupy as spring's offering. Well, I must concede this. Keep in mind, however, that for at least part of this season, the bugs still consider it open season for blood cells. Also, fall is probably the most star-poor of all the seasons lacking the clusters of summer and winter and the galaxies of spring. (It's great if you are into dark matter, I suppose.)

The point of all of this is that there really is no excuse for not using our equipment throughout the entire year, regardless of the season. If you are an enthusiastic skygazer, neither frost bite nor mosquito bite will keep you from the eyepiece. It really does not matter what the conditions are - only how dedicated and enthusiastic an amateur astronomer you are. Astronomer, know thyself! Ω

How to Observe and Photograph The Observatory Streetlight

Clive Gibbons - reprinted from **Orbit** - Hamilton Centre

Ever since the Hamilton Centre involuntarily acquired a streetlight at the corner of 7th Concession and Burlington Town Line, observers and astrophotographers have been cursing the noisome glare it makes. Security conscious citizens, however, appreciate the heart-warming island of light that pushes back all the nasties that inhabit the darkness of our observatory area. Indeed, our hyperluminous beacon is certainly necessary for the protection and motoring safety of East Flamborough, so we should not slur its existence or make a mockery of the good intentions it represents. NAY, we should see the bright side and exploit our friendly mercury-vapour neighbour! It is in this spirit of optimism that I make the following suggestions for observing and photographing our local streetlight.

As anyone knows who has seen it, our streetlight is very BRIGHT. Therefore, for naked eye observing it is recommended that sunglasses be used at all times. On slightly hazy nights, the lamp is surrounded by a diffuse nebula whose size is largely dependent on the humidity of the air and how far away you are from it. In fact, because the light is only 25 feet above the ground, it can be clearly seen even on overcast nights. Binoculars add a completely new perspective to viewing. With 7 to 10 power glasses, the prominent frosted ribbing of the lamp's lens can be clearly seen, but remember to keep your sunglasses on.

With a telescope, no equatorial mount or drive is needed because the lamp certainly isn't going anywhere! At powers between 75 and 150, dirt specks and dried up insect carcasses can be glimpsed during moments of good seeing. Look carefully to observe the "GE" label imprinted near the base of the bulb. No filter will dim the image to a comfortable intensity, but 6 nebular filters stacked on top of each other do help reduce the glare.

Astrophotographers surely have endless opportunities to capture creative images! Fast lenses and high speed film are entirely unnecessary to record its prodigious output. By using some ingenuity you can photograph the streetlight amongst any constellation you desire and can even shoot polar star trails rotating around it. For detailed close-ups, use a 1000 mm lens at f/32, ISO 25 film and a 1/1000 of a second exposure.

So, let's stop moaning about a problem we have no control over. Get out and have fun observing the brightest "star" in our night sky! In an upcoming issue: "Light Pollution, Firearms and You or How to Shoot Out a Streetlight and Make It Look like an Accident" Ω

Notes from the Chair

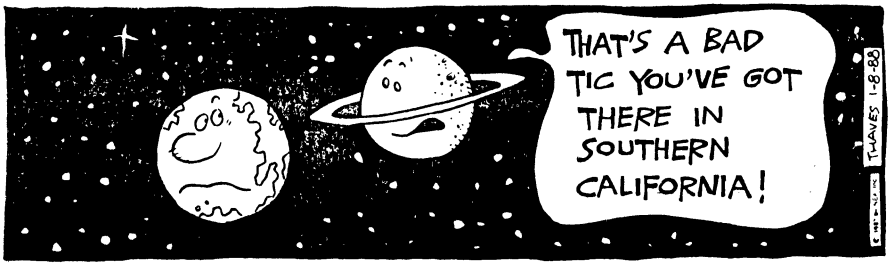
Doug Pitcairn

Well, it's obvious from the layer of dust on the Odyssey's dust cover that it is springtime in the Maritimes! Every year I think it's worse, sigh. I did manage to make one observing session on the 29th of May , and I was too tired to attend the session on the 3rd of June. See the Gawker's Report for details.

We held our second Member's Meeting at Mary Lou's house on the 2nd. of June, and it was an unqualified success. The feature of the meeting was the viewing of some excellent slides by our two resident photographic authorities (MLW & JA) We also saw the proud displays of two new Meade Schmidt-Cassegrains, Nat Cohen's LX3 and Mary Lou's LX5. It was most interesting to observe these two scopes side by side and compare features. The LX5 has more whistles and bells, but it is also more expensive. Most people present seemed to be in agreement that the LX5 was worth the extra bills, it is a **nice** scope! Also, since that meeting, Dave Lane has acquired a 250 mm (10") Meade Schmidt-Cassegrain. I can see that there will be lots of photographs available at upcoming meetings.

We are still patiently waiting for the next bright sporadic comet to come by. The handbook mentions that Brorsen/Metcalf is expected to be the best comet of the year, and this month's *Astronomy* magazine has an ephemeris for it, even though its current magnitude is 15.5! Good grief. This comet is expected to reach magnitude five late in the summer so we should keep our fingers crossed.

Also don't forget the occultation of 28 Sagittarii by Saturn at the end of this month. If I am conscious I hope to see this event from Sydney where many of us will be attending the GA. Ω



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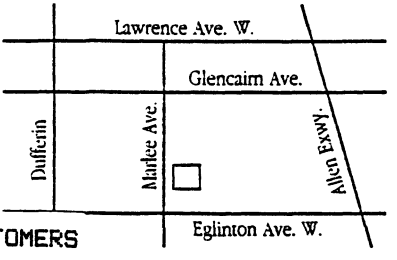

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Gawker's Report

compiled by Pat Kelly

Time: Friday, April 7th, 1989
Place: Charleston, Queens County
Observer(s): David Griffith
Equipment: 8x40 binoculars, Meade MTS SC8
MVM: 6.0
Seeing: Fair to begin with but not quite good as the night wore on (and my body heat wore out!)
Comments: Ah, spring! I always welcome it, not so much for the warmer temperatures, but for the promise of nearby foliage that will soon effectively blot out my neighbour's yard light! - D.G.

Objects Observed:

Planets: Mars, Jupiter
Open Clusters: M41, M44, Mel 111
Galaxies: M49, M51, M63, M64, M65, M66, M81, M82, M84, M86, M87, M89, M90, M94, M98, M101, M106, M108, M109, NGC 2093, NGC 3338, NGC 3367, NGC 3377, NGC 3628, NGC 4088, NGC 4157, NGC 4242, NGC 4251, NGC 4448, NGC 4449, NGC 4490, NGC 4494, NGC 4559, NGC 4565, NGC 4618, NGC 4725, NGC 5005, NGC 5033, NGC 5195
Meteors: Five glimpsed over a 5.5 hour session; most quite short in duration and located in the Coma-Leo-Virgo area.

◊◊

Time: Saturday, May 20th, 1989
Place: Zinck Avenue, Lower Sackville
Observer(s): Pat Kelly, Mary Lou Whitehorne
Equipment: Mary Lou's new Meade LX5 with the Hα filter
Weather conditions: Clear and sunny
Comments: What a gorgeous telescope! We had a great time observing the sun. There were several large sunspot groups, pores, coronal rain and we even got to watch a flare. The amount of detail is amazing and you can actually watch things change and move around! I think Mary Lou has discovered the joys of using the remote control hand box for adjusting the telescope's direction.... I believe here words were "I could get used to this!" - PMK

◊◊

Time: Monday, May 29th, 1989
Place: Beaverbank Observing Site
Observer(s): Paul Gray, Pat Kelly, Dave Lane, Jim MacGuigan, Doug Pitcairn

Equipment: 2 Odysseys at least
Weather conditions: Clear warm and no insects! The evening was brough to an end when a thickening haze but the kaibosh on proceedings. As Doug and I were unable to see a lot of objects that we should have been capable of there was probably a thin haze not visible to the eye
Comments:

Objects Observed:

Stars: α Cancri (very yellow, almost orange!)
Galaxies: NGC 2859, NGC 3344, NGC 3414, NGC 3486, NGC 4756, NGC 4856, NGC 4899, NGC 4984, NGC 5017, NGC 5054, NGC 5077

◊◊

Time: Saturday, June 3rd, 1989
Place: Beaverbank Observing Site
Observer(s): Jason Adams, Nat Cohen, Mary Fraser, Phyllis Kennedy & friend, Jim MacGuigan, Ian and Cindy Stark (ages 8 & 12 respectively!), Joe Yurchesyn
Equipment: 150 mm refractor, 250 mm Newtonian, 200 mm Schmidt-Cassegrain
Seeing: very poor
Comments: a nice display of the Northern Lights as well

Objects Observed:

Planets: Saturn
Planetary Nebulae: M57 (Ring Nebula)
Globular Clusters: M13
Double Stars: Polaris

◊◊

Time: Wednesday, June 14th, 1989
Place: Beaverbank Observing Site
Observer(s): Dave Lane, Doug Pitcairn
Equipment: Meade 250 mm (10") LX5
Weather conditions: Lousy, could only see stars to about mag. 4
Comments: Wouldn't have bothered except it was the first clear (?) night in two weeks to try out my new scope.

◊◊

The dates of the best observing periods can be obtained from the "Calendar of Events" inside the back cover. Any clear night in this period is likely to find people at Beaverbank. If you wish to double check to see if anyone is going out, please call the Observing Chairman or the Second Vice President .Members are invited to submit their observations to the Editor for inclusion in "Gawker's Report". In order to make the compiler's job easier, please list all information in a format similar to that used for the column. Thanks and clear skies. Ω

NOVA NOTES INDEX

July-August 1989 **Volume 20, Number 4**

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HALIFAX CENTRE - R. A. S. C.
1989 CALENDAR OF EVENTS

June 1989

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	**24**
25	26	27	28	29	**30**	

July 1989

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	**12**	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	**28**	**29**
30	31					

August 1989

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	**12**
13	14	15	**16**	17	18	19
20	21	22	23	24	**25**	26
27	**28**	29	30	31		

September 1989

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Key to calendar:

Regular Meetings: **shadowed and outlined**
Special days: **bold**
Possible observing sessions: **underlined**

Special Days:

June 30 - July 3 - **General Assembly - Sydney**
July 3 - (2:55 **A.M.**) Occultation of 28 Sagitarii by Saturn
July 2 - Mercury 0.6° S of Jupiter
July 12 - Venus 0.5° N of Mars
July 28/29 - South Delta Aquarid Meteors
August 12 - Perseid Meteors
August 16 - TOTAL LUNAR ECLIPSE!
August 25/28 - **NOVA EAST '89**

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