

NOVA NOTES

Volume 24 Number 2 April 1993

THE NEWSLETTER OF THE HALIFAX CENTRE OF THE RASC
c/o 1747 Summer Street, Halifax, N.S., Canada B3H 3A6



NOVA NOTES, the newsletter of the *Halifax Centre of the Royal Astronomical Society of Canada*, is published bi-monthly in February, April, June, August, October, and December. The opinions expressed herein are not necessarily those of the *Halifax Centre*. Material for the next issue should reach the editor by **May 3, 1993**. Articles on any aspect of astronomy will be considered for publication. "Letters to the Editor" or to our resident expert: *GAZER* are also most welcome. The editor can be reached at:

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President's Report: by Patrick Kelly

By the time you get this copy of *NOVA NOTES* before you, the March meeting will have come and gone and the following information can now be safely divulged after having been kept, hopefully secret, for almost two months. At the last national council meeting of the RASC in Toronto, two national awards for *Halifax Centre* members were approved, based on requests by the *Halifax Centre* executive.

David Tindall, who will be stepping down as the society's national secretary at the G.A. was awarded the **Service Award Medal**. Also, **Mary Lou Whitehorne** was awarded the **Chant Medal** for her work on Be stars. While the official presentations will be

Editor's Report

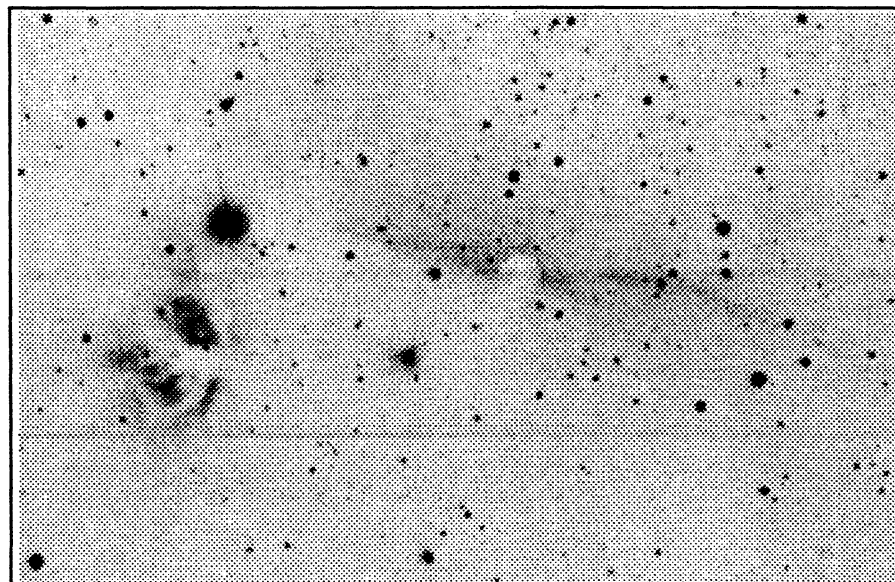
With this issue, our meeting reports begin. You will notice two quite different styles. Pat's style concentrates on the content of the main speaker's talk and David's on the activities of the entire meeting. I favour the latter, but that's only my opinion. I hope that you enjoy this issue. Ω

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"Astrophoto of the Month"

The Horsehead Nebula Region

Dave Lane took this 30 minute exposure (negative image) with a Televue Genesis 4" f/5 refractor using Fuji HG400 film. It was taken at the *Winter Star Party* in the Florida Keys in February. Just to "rub it in further", no gloves were required during the exposure! ☺

made at the awards banquet during the G.A., I felt that it would be a nice touch to have Peter Broughton, our society president break the news while he was here to give us talk. As a result, the official letters of notification were presented by Peter at the meeting instead of having been sent in the mail. Since I am writing this before the meeting actually takes place, I am going to predict that all went as outlined above. If not, I won't give up my day job to become a soothsayer!

On another topic, it was mentioned at one of the executive meetings in the fall that we should try to give a summary of the speakers at the meetings for the benefit of those members who couldn't attend. This had been done in the past and seemed like a good idea, provided we could find someone willing to make the notes and do the write-ups. Well, guess who ended up doing it! Yes, that's right, yours truly. Unfortunately, I did take notes for the October and November meetings, but by the time I got around to doing the write-ups, our editor informed me that he would have no room for them and that I should put it off for a bit. Thus, you should find in this issue the write-ups of those meetings. I hope to try and make this a regular occurrence, although there will obviously be some talks which are given that will rely heavily on slides, etc. and which would obviously be either very difficult to turn into a text-only article. Time will tell.

The finishing touches are being put on plans for this year's *NOVA EAST*. As a result of input from last year, there will be some fine-tuning. In particular, the two New Brunswick groups (Saint John and Hampton) wanted to take a bigger role, so Doug Pitcairn, our *NOVA EAST* coordinator, has assigned some of the public talks to be filled by members of those groups. Lastly, registrations are starting to come in for the G.A. There seems to be a lot of interest in the "reach for the stars" trivia contest, judging by what has come in so far. Also concerned with the G.A., there will be a special centre meeting in May instead of the usual centre banquet. This will be a final organizing meeting

to get as many people assigned to specific tasks as we can. So far, Mary Lou has been doing most of the work to get the G.A. set up properly, and I am counting on a lot of support from the "back benchers" to put in a few hours here and there so that the rest of us don't end up in staightjackets after the G.A. The meeting will be at the usual time of 8:00 but on the night of Friday, May 14th, which is the **SECOND** Friday, and not the third. I hope to see you all there! Please come to help us out, not to be entertained. Ω

Scheduled Observing

Friday, April 23 - Beaverbank Site

Friday, May 21 - Beaverbank Site

The cloud dates are April 24 and May 22

See the map on page 9

For information call Paul Gray (864-2145)
or Dave Lane (443-5989)

Letter to the Editor

Dear Editor:

For some time now, I have stood afar from the activities of the *Halifax Centre* and observed the evolution of this intrepid gang of astronomy enthusiasts. The centre has become a mature entity in the RASC, and has contributed to the national cause beyond proportion to its size. However, these are difficult times, and in particular, there is potential difficulty brewing in the near future.

There has always been a suggestion that astronomers fall fundamentally into two categories. Those who prefer to gaze through a telescope, and those who prefer to sit with a good book. As this applies to an astronomy club, these can be further refined to those who would rather go observing (the so-called observers) and those who are content to come and hear a nice lecture by someone who has collected data, and has some interesting stories to tell us about it (the so-called armchair astronomers). I do not know if this duality holds much ground in reality; I suspect most members are actually a bit of both. But let's polarize the membership by suggesting that most members would lean one way or the other, and allow ourselves to overlook

the evenly balanced types (that's allowing for the questionable situation of an evenly balanced astronomer!).

This duality is quite likely enhanced by several factors. First, there is the age difference. I find that the median age of the observers is considerably less than that of the armchairists. The young keeners who get into the club want support for their observing interests. Those who are more "middlin'" in years prefer a bit of entertainment. The pessimists would argue that the two do not belong together, the optimist might counter that both members have a great deal to contribute to the society; indeed that they complement each other.

Another indication of polarization might be support for the *Journal*. At least in the *Halifax Centre*, it appears that with a few notable exceptions, the opposition to the *Journal* runs much higher among the observing group.

At the current time, the *Halifax Centre's* executive is dominated by the observers. Now don't get me wrong. I do not think this is a bad thing. Indeed I would agree, albeit conditionally, with the statements of several of the more dominant members of the centre that "we are fortunate to have a group of keen observers currently running the *Halifax Centre*". Why conditionally? Simply this: The RASC is not an observing club, it never was, it never will be. The majority of most centre's members are armchairists. The national executive is most likely to be dominated by the armchairists. Yet, observers tend to dominate the executive of more and more centres. I feel that the Society as a whole has been ignoring this contrast. This is not wise. I suspect the roots of some recent troubles (i.e., the *Journal* debate and the fee increase) lie embedded in this division. Now, if this is truly a democratic society, things should even out as the more active observers shift the overall direction of the RASC more towards the observing direction. But this does not appear to be happening. The observers are growing increasingly dissatisfied doing Benjamin's portion of the work and getting a lesser share of the rewards. The National Council

seem more content, maintaining a broader, more historical perspective, which definitely favours the "status quo".

Of immediate concern for the *Halifax Centre* is this: There is approaching an event which will result in even more work for the current executive. Some of these people are showing signs of fatigue already. The immediate danger is that the observers will decide that the output is not worth the input, and break away to start a separate observers club. Could the *Halifax Centre* survive such a split? In some other Centres, the observing group has already split, and in one case has formed a separate club. The two function side by side, or do they? Do we want this to happen here? What can we do about it? Something to think about.

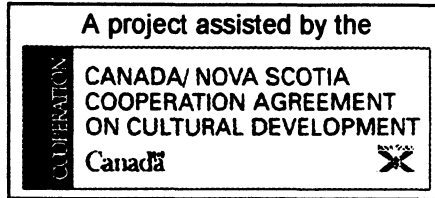
Anthony Amateur

Editor's Note: This letter was received as a letter to GAZER (in anonymous form, as usual), but I felt it would be better to be presented as a "Letter to the Editor". I welcome receiving your comments regarding this letter for the next issue of Nova Notes.

One Small Step for NSPAC, One Giant Leap for Nova Scotia
by Mary Lou Whitehome

As reported in the last issue (*Editor's Note: See "NSPAC Update", page 2*), the *Nova Scotia Planetarium Advisory Committee* (NSPAC) is on the road to establishing and overseeing the operation of a major planetarium for Nova Scotia. I am pleased to announce that we have received funding from "The Canada/Nova Scotia Cooperation Agreement on Cultural Development". So, with their funding of about \$25,000 plus the \$3000 very generously donated by members of the *Halifax Centre*, NSPAC can proceed with Phase I of our feasibility study. The study is to be conducted by the firm *Price Waterhouse* and should be underway

by the time you read this and be completed in early June.



Phase I of the study is the most important aspect of the study. It will look at themes, content, programming, operational status, and the location for the facility. Also included will be an analysis to determine the likely market penetration, capital and operating costs, revenue generation, sources of support for the planetarium, and will study the planetarium as a stand alone facility and as part of a multi-venue complex.

Now that we have some government support, we should be able to procure additional funding from some private corporations that have expressed an interest in our project. This will allow us to proceed with Phase II and III, which will involve preliminary architectural design for the planetarium and the final, finished

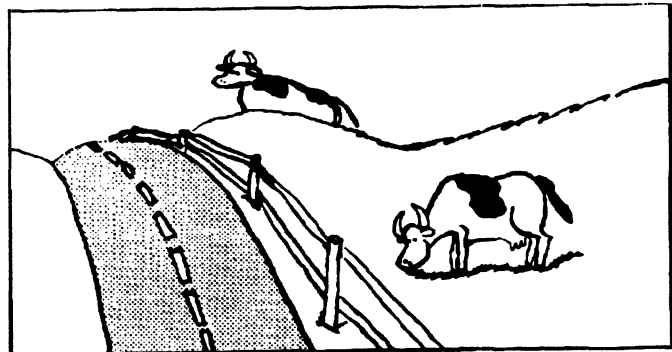
report.

At the same time we will also be working on broadening our base of operations and extending our contacts within the local business community. Public relations is fast becoming a priority as the need becomes ever greater to raise awareness and support from the educational, tourism, and public sectors of the province.

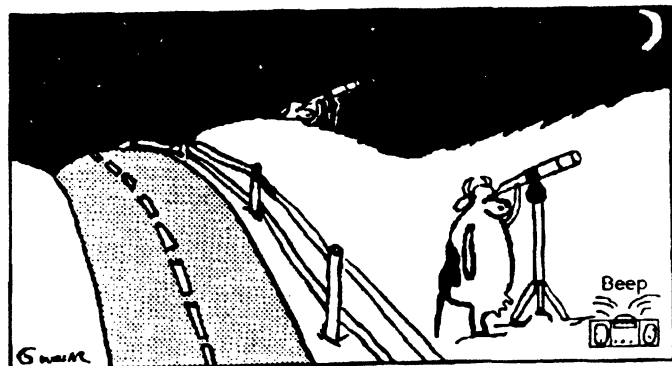
For the moment we are gleefully becoming knowledgeable in projection equipment; the pros and cons of one versus another, the costs and capabilities of each as we picture what each would do in our proposed planetarium. We have a dream; a beautiful vision of what a planetarium could mean for the people of Nova Scotia. We are determined to sell this vision and bring our dream to life for the benefit of everyone.

Obviously, we have our work cut out for us, but we think our project has a lot of merit. It is our belief that a planetarium (and possibly a science centre, IMAX, whatever) will be a tremendous asset to Nova Scotia. It will most certainly make a wonderful meeting place for the *Halifax Centre*!

We feel that our study will come



Cows grazing.



Cows observing a graze.

back positively and then we'll really have to get to work to raise the millions necessary to build a first class planetarium for Nova Scotia. Preliminary results should be ready in time for the upcoming General Assembly. Expect an update there! Ω

The Sky is Falling

by F. Graham Miller

"The sky is falling," said Henny-Penny, "and a piece of it fell on my head!"

Traditional nursery story.

"We fear no one, unless it be that the sky fall on us."

The Adriatic Celts, when Alexander the Great asked what they feared most.

The above quotations reflect the ancient fear of the sky falling. The celestial pole moves. Around 11,000 BC Vega was the pole star; the Ancient Egyptians knew it. Today it has "fallen" to a polar distance of 51° , and Polaris has become the pole star. The name, Vega, is from the Arabic *wagis*, "falling." A verse of the Bible, Isa. 14:12, may refer to the fall.

The polestar, Vega, was the divine Judge of Heaven, where he had the highest seat. (Allen, Richard Hinckley, *Star Names*, pp. 284-5). He may have been the Hindu Varuna, god of the air, who had unnumbered spies, saw all that men did, and rewarded or punished them as they deserved. His cult has died out. However, the point to be made is that the prehistoric wise men may have regarded this star as the Supreme Deity who supported the roof of the universe.

The departure of Vega from the pole, causing stone age man to fear that the sky was falling, was an effect of *the precession*. What is that? A familiar phenomenon is the way the axis of a gyroscope traces out a cone; the motion is called the precession. The Earth behaves as a gigantic top, having a precession period of 25,800 years. In this time the pole of the heavens traces a circle of radius 23.4° on the celestial sphere. An arc of the

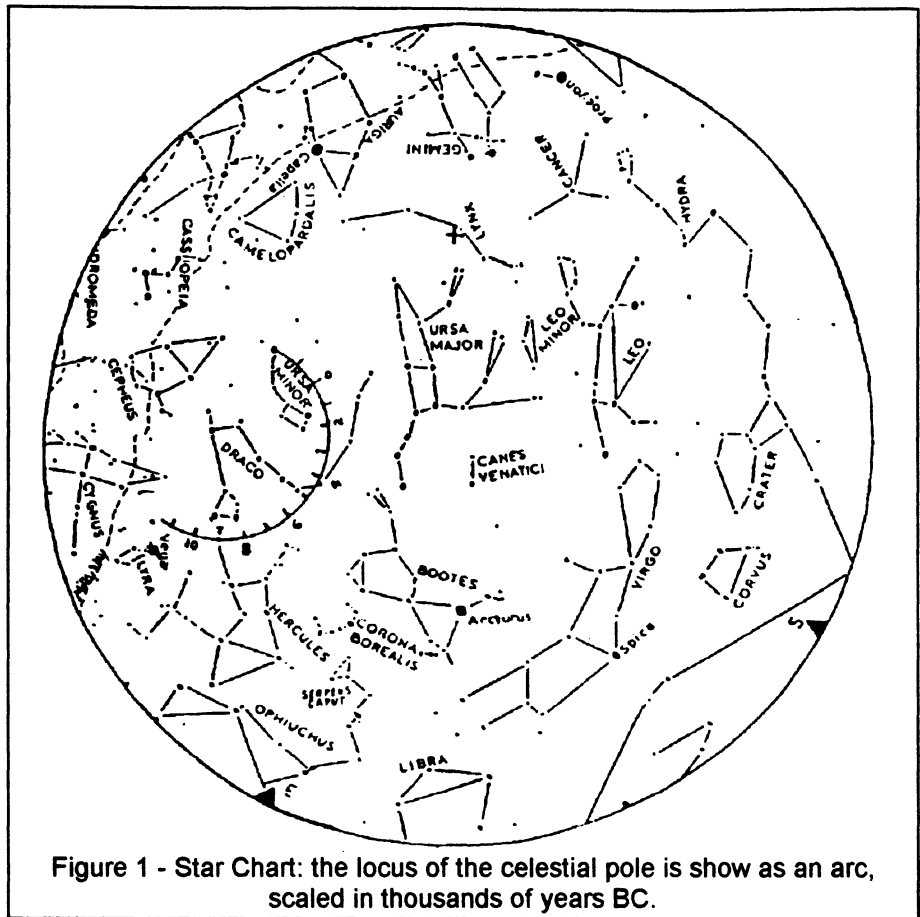


Figure 1 - Star Chart: the locus of the celestial pole is shown as an arc, scaled in thousands of years BC.

circle is shown on the star chart Figure 1. It has been calibrated in thousands of years BC, so one may see where the pole was at any epoch.

Let us now consider how the ancients enlisted the power of the gods to hold up the sky. Joe Yurchesyn, in his article on the constellation Hercules (*Nova Notes*, July 1992) remarked that, oddly enough, Hercules was head down. It was not always so. A rock carving in Camonica, Italy, Figure 2 (on the following page), depicts a heroic figure with antlers on his head, with arms raised in the weight lifter's pose. He must have been an early form of the Celtic god, Cernunnos, "The Horned One." On comparing the figure with the star chart, one sees that he was a combination of the constellations Hercules and Ophiuchus. Serpens Caput is correctly located beside him. The combined constellation is to be identified with the lost ancient constellation of Menat (Allen, loc. cit., pp. 20, 100, 273, 290, 309n, 366). As depicted in the rock carving, the sky god was rightside up. The pole at

8000 BC stood between his fists, and his upraised arms supported the sky.

I venture to suggest that the antlers also had the function of sustaining the sky. Further, allowing for artistic license in the rock carving, the antlers may have been an interpretation of Draco, especially its head portion.

I am working on a manuscript, too long for *Nova Notes*, in which I show that, as the precession continued, the *persona* of The Horned One moved on into Boötes; that was somewhere around 5000 BC. As the theology of the ancients flowered into a luxuriant overbloom, they would replicate the gods. Among the many names of Boötes was Lugh, the nature god of the Celts, who was sometimes depicted with antlers. More than a few places in western Europe were named for him, including London and Lourdes.

The shifting of the residence of a major god into the neighbouring constellation was one of the ways by which the sages of prehistory adjusted their philosophy and cosmology to the movement of the pole. Ω



Figure 2 - Rock Carving from Camonica in northern Italy. Mac Cana, *Celtic Mythology*, p. 49.

Meeting Report

October 92:

The Case of the Missing Solar Neutrinos

by Pat Kelly

At our October meeting, Terry Craig, a Ph.D. graduate student at Dalhousie gave a presentation to the centre on the current state of the search for the missing solar neutrinos. I have attempted to summarize his talk for the benefit of those who were not able to attend the meeting.

Neutrinos were first postulated by the physicist Wolfgang Pauli in the 1930's in an attempt to avoid having to throw out the laws of conservation of energy and momentum. This was a result of several experiments in nuclear physics in which the net amount of energy and momentum after the reaction was less than the amount before. The neutrino was thought to be an extremely "tiny" particle, in the sense that it would not easily react with regular matter, and thus could carry the missing energy away "invisibly".

The universe is composed of elementary particles which can be divided into two groups, quarks and leptons. Quarks combine to produce protons, neutrons, etc., while leptons

consist of particles such as the electron and the neutrino.

All of the forces in nature can be explained by exchanges of energy between these particles. The neutrino is only affected by the weak nuclear force, which is involved in some of the nuclear reactions that power the Sun. For example, the proton-proton chain of reactions should produce a flux of neutrinos at the Earth's distance from the Sun, of 100,000,000,000 neutrinos per square centimetre per second!

The first attempt to detect these neutrinos took place in the Homestead Mine, where a detector composed of 615 tons of cleaning fluid was placed deep in an abandoned mine. This was to minimize the effect of cosmic rays on the experiment. Every now and then a neutrino would react with a chlorine atom in the fluid and convert it to argon. The argon atoms could later be collected to give an indication of how many neutrinos had passed through the detector.

The results from this experiment were well short of the numbers predicted by the mathematical models. Several explanations were put forward to explain the discrepancy. Some, such as possible experimental errors, were quickly ruled out, while others, such as changes to the solar model to reduce the number of neutrinos failed because they introduced other discrepancies. Several more elaborate proposals include the introduction of WIMPs (Weakly Interacting Massive Particles), proposing that neutrinos are not massless, and the idea of neutrino oscillations, whereby the neutrinos oscillate back and forth between the electron neutrino and the muon neutrino, the latter of which is not detectable by the experiment.

The Japanese built a detector from 680 tons of water, which, through the use of photomultiplier tubes, would actually be able to determine the direction from which the neutrinos that it detected came from. This experiment also produced a much lower count than expected, although based on the energy levels that it was capable of detecting, the oscillation theory predicted that no neutrinos at all should have been detected!

Since the oscillating theory also predicted a fairly narrow range of possible masses, etc. two gallium detectors were constructed by different teams to look for neutrinos in lower energy windows. A result in the order of 100 solar neutrino units (SNU's) was expected for lower energy cutoffs. One detector registered a value that was somewhat over eighty, while the other detected essentially no events. Thus, once again, there are disagreements between the experiments and the theoretical predictions.

The most sensitive neutrino detector to date is currently under construction in a mine near Sudbury, Ontario. The detector is to consist of 1,000 tons of heavy water (*Editor's Note: You can guess where that came from!*), and will be placed over two kilometres below the Earth's surface. The detectors will consist of photomultiplier tubes that should allow researchers to determine not only the direction from which the neutrinos are coming, but also their energies. The experiment is due to go on line in 1995. Hopefully, the results from this experiment will help shed some light on what has become an ongoing mystery to both physicists and astronomers. Ω

Meeting Report

November 92:

Gravitational Lenses

by Pat Kelly

At our November 1992 meeting, Dr. Michael de Robertis of York University was our guest speaker. Dr. de Robertis is a specialist in the area of active galactic nuclei and is a regular observer at the Canada-France-Hawaii Telescope. The following is a summary of the presentation that he gave us on gravitational lenses.

The idea of gravity being able to bend light was first predicted in 1916 by Albert Einstein and arose as a consequence of his theory of general relativity. This prediction was verified by an observation made in 1919 during a total eclipse. It wasn't until 1936, though, that Einstein predicted that a

distribution of mass could actually act as a lens and focus light. Zwicky took this one step further the following year when he predicted that the distribution of mass in a galaxy should be able to act like a lens and that this effect could be used as a new tool to probe the universe.

The idea of gravitational lenses was essentially ignored until the discovery of a "double quasar" in 1979. The object, 0957+561, consists of two components separated by about 6.1 arc-seconds, and has an estimated distance of 9.3 billion light-years. Both components had identical red shifts and spectra. Since the odds of finding two such quasars that close together were "astronomically small", it was declared to be the possible result of a gravitational lens.

Soon thereafter, a lensing galaxy was discovered with an estimated distance of 4.0 billion light-years. The method used to discover the galaxy was interesting. It was observed that the "B" component was not the same shape as the "A" component. When an identical image of the "A" quasar was subtracted from the light distribution of the "B" quasar, the image of the galaxy was left behind.

There are currently about fifteen known gravitational lenses caused by galaxies, most of which are only "split" by one or two arc-seconds. (It is unlikely that images produced by single stars will be observed with current technology since the separations produced are on the order of a microarc-second!) Examples of such images were presented showing how the relative brightnesses of the components varied.

Because the interaction between light and gravity is different than that between light and glass, a gravitational lens focuses light to a line, and not a point. In addition, because of this non-linear behavior, a gravitational lens does have a "focal length", although it is used for determining whether you are at the right distance to see the effect of the lensing.

At this point, Dr. de Robertis showed a series of images to demonstrate the effect of a point mass and a galaxy on a series of parallel

light rays. For a point mass, depending on where you are located, you will either see nothing, two objects of differing relative brightness, or if you are exactly on the centre of symmetry you will see the lensed object appear as a ring. In the case of galaxy acting like a lens, if you see an image you will always see an odd number, although due to changes in the relative brightness, some may not be bright enough to see. Readers may find it useful to try and sketch these configurations in two dimensions and to try and produce these results for themselves.

An image of a galaxy with multiple lensed images was shown. The quasar 2237+030 forms an object known as Einstein's Cross, with four visible images of the quasar arranged in a cross around the nucleus of the fifteenth magnitude galaxy that is causing the lensing.

In addition, galaxies can also focus light from another galaxy. If the two are lined up on the axis of symmetry, the lensed galaxy appears as an "Einstein ring", a donut shaped region of brightness. The only way to verify such a case is through a detailed study of the spectra of the two images. One of the other interesting consequences of this arrangement is that short term changes in brightness are caused when individual stars in the lensed galaxy occasionally line up on the exact line of symmetry.

Dr. de Robertis showed a short video presentation that was made by Drs. Charles Dyer and Rob Roeder, who used plastic disks, a light source,

and a TV camera to show the effect of various gravitational lenses. The effect on image brightness was very evident and the demonstration of the Einstein Ring was spectacular.

Lenses can also be formed by clusters of galaxies, which would produce separations in the range of one arc-minute. Some radio galaxies that have been observed show this effect. The cluster Abell 370 appeared to contain an odd arc which was later found to be the lensed image of a distant galaxy being imaged by the entire cluster.

Gravitational lenses should enable us to learn a lot about the universe in several manners. By determining the mass required in order to produce the observed effect, the total mass, including any "missing mass" can be calculated. By measuring the time delays between changes in brightness in different components, one can compute a value for the Hubble Constant. Lastly, it may even be possible to use enough lensed images to try and construct a model of the large-scale structure of the universe. Ω

Meeting Report February 93: by David Turner

Following hard on the heels of Nova Scotia's third severe winter storm in less than a week, and with no media notices to prod members' memories, the February 19th meeting of the Centre had all of the makings of an RASC meeting-from-hell. However,

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roughly 30 avid souls braved the elements and mid-winter blahs to listen to Paul Gray's talk on Meteors. Actually, they got to listen to Paul twice, since he began the evening with his Observing Chairman's report, which ended with an impromptu membership discussion of the great Russian space mirror fiasco. Following some news from the National Office by President Pat Kelly (who neglected to mention the sad news of the death of Helen Hogg — an event overlooked by the local news media as well), Bill Thurlow took the floor to extend an invitation to the membership (read potential Messier fodder) to attend an all-night Messier Marathon on P.E.I. on the weekend of the March meeting.

Mary Lou Whitehorne then took the floor to report on the efforts of the Dark Sky Association, to provide information on Dave Lane's proposal for a Lighting Design award, to forewarn members of the plans being made for this summer's GA, and to give the latest news on NSPAC and the proposed planetarium project — namely the exciting news of a verbal guarantee of funding for part of the feasibility study and the progress being made on making the planetarium a reality. Pat then introduced Paul Gray (fully dressed in parka, etc.) to talk about Meteor Shower Observations, and, in particular, about his group's observations of the Quadrantid shower on January 3/4 1992 and January 2/3 1993 (one of the coldest nights on record locally, as confirmed by this reporter during a Burke-Gaffney Observatory tour).

Paul gave a detailed account of Halifax Centre members' observations over the last two years of what has proven to be a rewarding (although bone-numbing) exercise for those interested in making a useful contribution to the study of meteor showers. It seems likely that the efforts of Paul and the other members of his group may lead to some amendments to the particulars for this shower, which is apparently not well-studied. He concluded with a push for observations of the 1993 Perseid shower on the evening of August 11th.

The ensuing discussion generated several interesting comments about the most effective ways of keeping warm at -30 to -40°C. ☺

Register for the 1993 Halifax GA Today!

Registration packages for the 1993 General Assembly of the RASC were sent out to each member with last the last issue of *Nova Notes*. To date, we have received virtually no registrations from our own membership! Please register as soon as possible if you are attending. If not, you'll be missing out on lots of fun!

Constellation of the Month: Leo

by Joe Yurchesyn

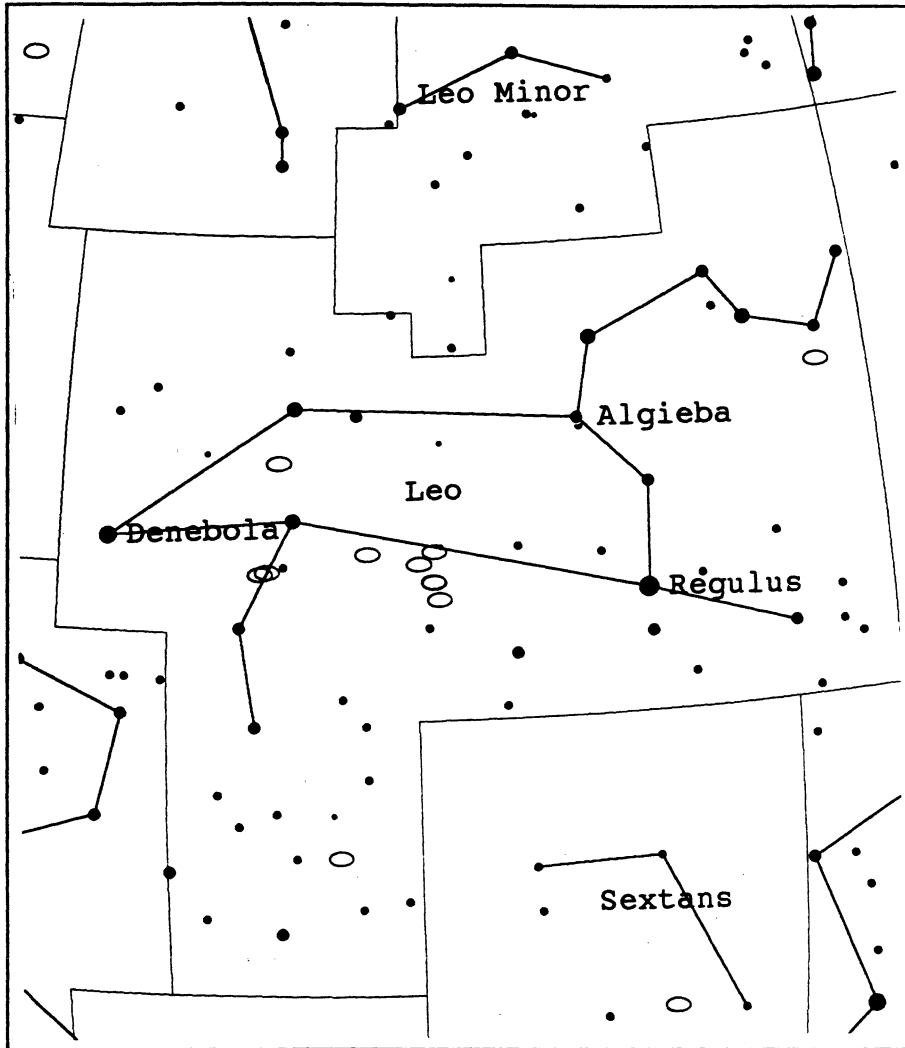
The most dominant asterism in the constellation Leo is the "Sickle of Leo", a pattern formed by the stars Alpha, Eta, Gamma, Zeta, Mu, and Epsilon, and resembling a large reversed question-mark some 16° high. In ancient China, this configuration was the *Yellow Dragon*, but it was also shown as a horse or a *Great Chariot of Heaven* on other oriental star maps. To modern sky watchers, the Sickle outlines the majestic head and mane of a westward-facing lion, crouched in the regal pose of the enigmatic Egyptian Sphinx. The tail and hind quarters of the lion are made up of a triangular grouping of the stars Beta, Delta and Theta. Beta is named Denebola, from the Arabic *Al Dhanab al Asad*, "The Lion's Tail".

The origin of the zodiacal lion is somewhat obscure. To the ancient Egyptians, Leo was worshipped as the *House of the Sun*, because the rise of the Nile coincided with the sun's entrance into Leo. The Greeks identified it as the famous Nemaean Lion who originated in the moon, and whose conquest constituted one of the twelve labours of Hercules. To the early Hebrews, the Lion was the traditional tribal sign of Judah (Genesis, 49th Chap.), while to Medieval Christians, Leo was regarded as a symbol of the *Lion's Den*, of the book of Daniel.

Lying just north of the ecliptic, Leo is one of the twelve zodiacal constellations. Its distance from the Milky Way precludes the presence of many open clusters or nebulae, in fact none are present. However, being just west of the Virgo cluster, galaxies abound. The best offerings being the groupings NGC-3623, 27 (M65/66) & NGC-3628, NGC-3351, 68, 79 (M95/96/105), and NGC-3190,93, as well as the single galaxies NGC-2903 and 3521. Alpha Leonis is the brightest star in Leo and the 21st brightest star in the sky. It is a double star, whose companion is, itself, a difficult double in amateur telescopes.

Regulus has been almost universally associated in ancient cultures with the concept of royalty and kingly power. In Arabia the star was *Malikiyy*, the "Kingly One"; in classical times it was "The Star of the King", or *Regia*, "The Royal One". In ancient Babylonia, it was *Sharru*, "The King", and to the more ancient Akkadians of Mesopotamia it represented *Amil-gal-ur*, a legendary "King of the Celestial Sphere" who ruled prior to the Great Flood. The Hindu name was *Magha* meaning the "Mighty" or the "Great One", while the Persian name was *Miyan*, meaning the "Central One" or "The Star of the Centre". The Persians regarded it as one of the four "Royal Stars" of Heaven, the others being Aldebaran, Fomalhaut, and Antares. The star is also sometimes called by the Latin name *Cor Leonis*, "The Lion's Heart". The name *Regulus*, is a diminutive form of the Latin *Rex*, or "King", and so translates "The Little King". It was given by Copernicus, and probably has no connection to the Roman general Regulus, hero of the first of the three Punic Wars with Carthage.

Babylonian tablets record observations of Regulus dating from 2100 BC, and it was through the study of these records, and those of Spica, that Hipparchus detected the *Precession of the Equinoxes* around about 130 BC. The longitude of Regulus had changed some 28¼° (nearly 2hr of RA) in the intervening 2,000 years that were recorded on the clay tablets.



Regulus lies only about $\frac{1}{2}^\circ$ north of the ecliptic, and so it is common for the moon to occult it, and in fact, on Tuesday July 7, 1959, it was even occulted by Venus! Venus will not occult another 1st magnitude star again for several centuries, so that was indeed a rare event.

[I was at the tender age of 22 months, but still vividly recall that Venus was a morning star with an elongation of about 45° . On the day in question, it rose at about 9:30 AM and set around 11:15 PM. The occultation lasted 11 minutes and mid occultation occurred at 11:22 AM, ADT, making for an easy daytime observation. Needless to say, Nova Scotia lived up to its notorious weather reputation, when the two previous days of sunshine and record breaking warm temperatures were broken by 2" of rain which began very early on Tuesday morning. The clouds broke Wednesday afternoon and were followed by two more days of sunshine.

To cap it off, the weather office, which had predicted showers for Tuesday and rain on Wednesday, blamed the inaccurate forecast on the errant behaviour of a low pressure system off of Cape Hatteras. How much progress has weather forecasting really made in the intervening 34 years!? Details of the event can be found in Sky & Telescope 1959, June page 475, July pp. 483, 507, and Sept. pp. 606-609.]

Just 20' north of Regulus is the dwarf elliptical galaxy *Leo I*, a member of the Local Group of Galaxies, and among the smallest and faintest galaxies known. It was discovered photographically from a 48" Schmidt plates in 1950, and has been calculated to be some 750,000 ly's distant using RR Lyrae variable stars. The *Leo II* system, a "Little Brother" to this system and a similar distance away, is smaller and fainter and located 97' north of Delta Leonis.

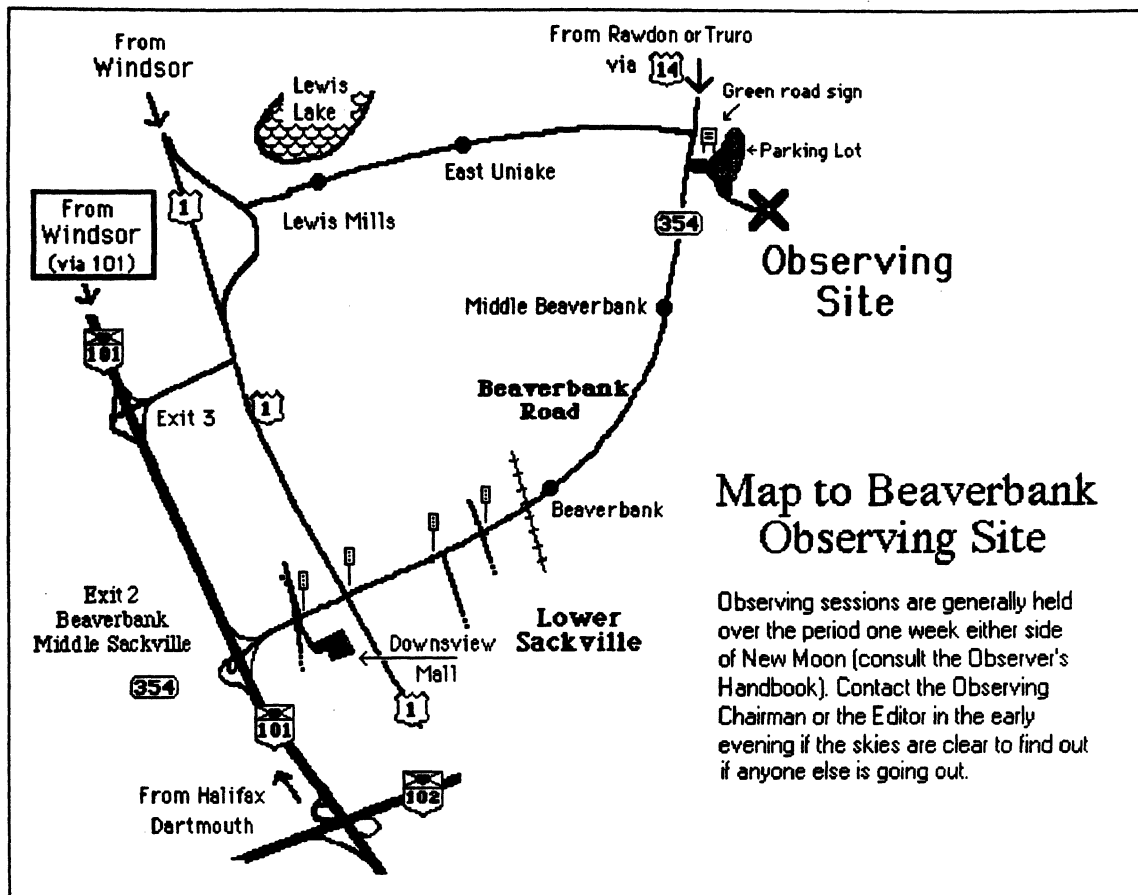
Lying 5° west of Regulus, near 18 & 19 Leonis and 600 ly's distant, is the variable star R Leonis. It is a pulsating red giant of the Mira class with a period of 312 days. It ranges from 5th to 10th magnitude, and lies in an easy star field for both location and brightness estimates.

Relative to Regulus, Gamma is the second star of the sickle. Its name, Al Geiba, is from the Arabic *Al Jabbah*, the "Lion's Mane". It is one of the finest double stars in the sky, having been discovered by William Herschel in 1782. The separation is presently widening to an expected maximum of 5" in 2100. Some 2° NW of Gamma is the radiant for the famous Leonid Meteors, which currently peak on November 17th. Spectacular showers, called storms, occur approximately every 33 years - the next storm being expected in 1999. Just east ($50'$) of Gamma is a close pair of 13th and 12th magnitude galaxies, NGC-3226,27.

Another pair of galaxies lying about 9° east of Regulus are the 11th and 10th magnitude galaxies M95 & M96. On high resolution photos, M95, the more western of the pair, is a beautiful barred spiral with circular arms. About $48'$ to northeast of M96 is the 11th magnitude M105 and its two companions, the 11th and 12th magnitude NGC-3384,89, forming a triangle about 8' on a side. These fainter galaxies are members of the M95/96 group, being some 400,000 ly's from the previous pair.

Located between Gamma and Zeta is the NGC-3190 galaxy grouping, which includes the 13th and 12th magnitude galaxies NGC-3185,87,90,&93. In addition to the previously described galaxy pairings are two 10th magnitude multi-armed spiral galaxies, NGC-3521 located east southeast of the star 62 Leonis, and the NGC-2903 located south of Lambda (just east of the top of the sickle).

The constellation's finest pair of galaxies lies midway between Theta and Iota Leonis. They are M65 & M66, shining at 10th magnitude and separated by 21'. Along with NGC-3628, also 10th magnitude and 37' to the north, they make a fine sight in a



Map to Beaverbank Observing Site

Observing sessions are generally held over the period one week either side of New Moon (consult the Observer's Handbook). Contact the Observing Chairman or the Editor in the early evening if the skies are clear to find out if anyone else is going out.

low power eyepiece. The M65/M66 pair was discovered by P. Mechain in March 1780, but it would appear that Messier's comet of 1773 passed directly through the field on November 2, 1773, when, surprisingly, the diligent observer failed to notice them! Perhaps he was too captivated with observations of the comet, or the comet was too bright. Both galaxies may be outlying members of the Virgo Cluster, which is centred some 15° to the east. However, their distance of 30 million ly's, as deduced from red shift measurements, is only $\frac{1}{2}$ of the average value for true members of the Virgo cluster. This suggests that these and other associated galaxies (including the M95/96/105 grouping) may constitute a small independent cluster, called the *Leo Galaxy Group*, rather than a sub-cluster of the Virgo cluster.

Lastly, the third nearest star, Wolf 359, is located near 59 Leonis, lying 7.75 ly's distant. It is a red dwarf with 10% of the sun's mass and diameter. At magnitude 13.66, it shines with a luminosity of $1/63,000$ suns, but is also known to be a flare star.

Just a little something to ponder, when you next gaze in the direction of Leo. Now!... If I could just figure out a way to observe the next occultation of Regulus by Venus? Ω

Nova Scotia Penpal Wanted: by Mary Lou Whitehorne

I got a letter from a guy in Arizona looking for a pen pal in Nova Scotia; he got my name out of the Astronomy club listings or some such place. I do not want a pen pal but somebody might, so would you please put this note in *Nova Notes* with his name and address and maybe one of our members would be interested.

TERRY L. HUAN
3511 W. ROVEY AVE. #3
PHOENIX, ARIZONA
85019-1700 USA

He is interested in supernovae, pulsars, neutron stars, black holes, and such. Ω

Helen Sawyer Hogg Dies David Tindall, National Secretary

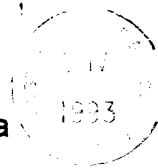
I regret to inform you that Dr. Helen Sawyer Hogg died on Thursday, January 28, 1993. I understand that she was admitted to hospital in Richmond Hill on Thursday morning after suffering a heart attack. Dr. Hogg will be sorely missed by the Astronomical community, particularly by our Society (of which she was an Honorary Member), for which she did so much over her long and distinguished career. The funeral was held on Monday Feb 1st. Ω

Centre Telescopes for Loan

The Centre owns several telescopes whose sole purpose are to be loaned to members. All you need to do in order to borrow a telescope is to be a member in good standing and come to an observing session to be checked out in the telescope's use. We currently have a C8, a 4" RFT, a 3.5" Questar, and a 10" newtonian for loan.



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Notice of Meetings

Date: Regular Meeting - Friday, April 16th: 8:00pm; 7:00pm for the executive meeting (all welcome).

Place: Lower Theatre, Nova Scotia Museum, Summer Street, Halifax. Access is from the museum parking lot.

Topic: "Astrophotography Extravaganza" by Brian Segal and Dave Lane. A variety of amateur astrophotography will be shown. Astrophotography apparatus, film types, and techniques will be discussed. Bring your own astrophotos! "The Winter Star Party" Roy Bishop and Dave Lane will report about their recent trip to the sunny south.

Date: Regular Meeting - Friday, May 14th: 8:00pm; 7:00pm for the executive meeting (all welcome).

Place: Lower Theatre, Nova Scotia Museum, Summer Street, Halifax. Access is from the museum parking lot.

Topic: "General Assembly Organizing Meeting" Please support your Centre by attending this important meeting. Do not expect a regular speaker at this meeting. Please note that this is the **SECOND FRIDAY** of the month.

topics are listed below. Contact the *Nova Scotia Museum* at 424-7391 for details.

Date	Show Title
Apr 8	The Sky is Full of Colour! (Doug Pitcairn)
Apr 15	Big Stars Blow Up, Small Ones ... (Joe Yurchesyn)
Apr 22	Audience Night, or The Planets (Pat Kelly)
Apr 29	The Sky of the Month (Dave Lane)
May 6	Monsters in the Sky! (Mary Lou Whitehome)
May 13	Big Stars Blow Up, Small Ones ... (Doug Pitcairn)
May 20	The Seasons (Joe Yurchesyn)
May 27	The Planets (Pat Kelly)

1993 Halifax Centre Executive

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Councillors	Dr. David Turner	435-2733
	Doug Pitcairn	463-7196
	Mary Lou Whitehome	865-0235

Halifax Planetarium Shows

The Halifax Planetarium, located in the Dunn Building at Dalhousie University, provides shows each week on Thursday evenings at 7pm. Upcoming show dates and