NOVA NOTES

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THE NEWSLETTER OF THE HALIFAX CENTRE OF THE RASC
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SUPERNOVA!!!

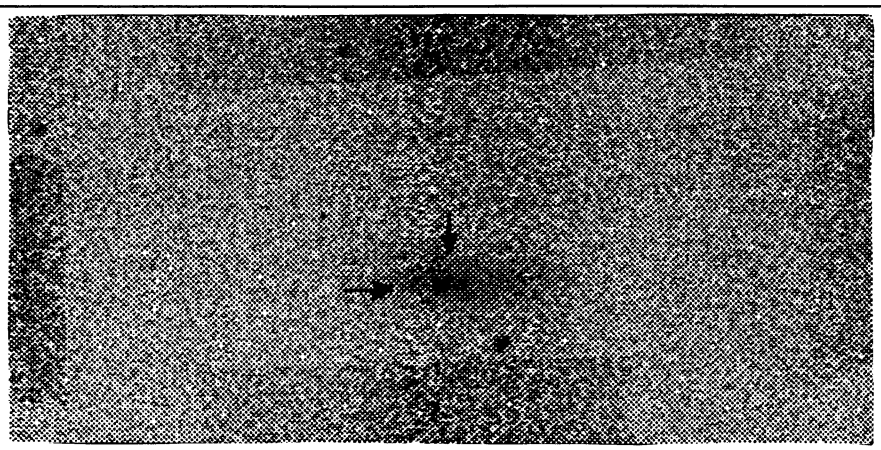
EDITOR/PRESIDENT'S REPORT

The Centre Executive remains busy with several projects including the observatory project. A lease has been received from Minas Basin Pulp and Power for the "peninsula" site at St. Croix at the favourable rate of $1 per year. A few of us have studied the lease and don't see any problem with it, however, as a formality, we are going to have a lawyer take look at it before signing it. The signing will likely take place in late March after we have met with the planning department in the Hants West Municipality.

In the meantime, we found out that the *Halifax Centre* was not a "registered society" in Nova Scotia, so the forms had to be filled out (and of course, the fee paid) and delivered to the Registry of Joint Stocks. This was done in February and before long we will actually "exist" in the eyes of the law and will be able to execute the lease.

On the national front, I travelled to Toronto in February to act as the Centre representative at the National Council Meeting. The most significant accomplishment is the "first stage" passage of the proposal to replace the "Journal" and "Bulletin" with a new publication "Astronomy Canada" which you can read about in the August 94 Bulletin. There will be a ballot going out this spring regarding necessary changes to the National Constitution. Also, the entire membership will be mailed a sample issue of "Astronomy Canada" in late summer with a ballot allowing to membership to approve (or reject?) the new publication.

Since I am the chair of the committee which is spear-heading this proposal, please give me a call if you have any questions. Ω



ASTROPHOTO OF THE MONTH - SUPERNOVA!!!!!

This CCD image, taken by a raft of RASC members and Astronomy Grad students at SMU's Burke-Gaffney Observatory, is of galaxy NGC 2726. The star just left of the centre of the "haze" (which is the faint galaxy in Ursa Major) is a Supernova which was imagined on February 10th as part of the RASC Halifax Centre's Supernova Search Program underway since August 94. After some hesitation, on February 16th, the possible discovery was reported to the Dan Green at the Central Bureau for Astronomical Telegrams (the clearing house for astronomical discoveries). Literally as I was writing this caption for the "suspected, but yet unconfirmed" supernova, I decided to check my e-mail and here is what was waiting to be read from Alex Filippenko — *"The SN candidate discovered in NGC 2726 (and reported) by David Lane and Paul Gray is a live one! Here is the info. A. V. Filippenko and A. J. Barth, University of California at Berkeley, report that the preliminary inspection of uncalibrated CCD spectra (range 310-1050 nm, resolution 0.7-1.5 nm) obtained on February 24 with the 3-m Shane reflector at Lick Observatory reveals that the object is a supernova, most likely of type Ic (but possibly Ib) roughly 2-3 weeks past maximum brightness."* Ironically, on February 13, while, among other things, attempting to confirm this supernova, we missed (through a comedy of errors!) another one in NGC 2441. After it was announced as SN1995E on February 22, we inspected our images from February 13, and low and behold it was there albeit very faintly! What a last couple of weeks!

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 **March 30, 1995**. 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. Contact the editor at:

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MEETING REPORT: JANUARY 95 by Doug Pitcairn

Now, what have we here, ah yes, another RASC meeting report. Greetings all you members who for whatever reason were unable to make our January meeting. Here's what you missed.

The meeting started promptly at 8:00 PM, with the usual announcements from our esteemed president, David Lane. There were 44 people present. The first presentation was "What's up in the sky these evenings, besides clouds" given by Observing Chair, Paul Gray. Paul reported on some of the observing activities of the last month, including a 7 member group observing session of the Quadrantids, brrrrr!, then Paul listed off the events in the sky for the upcoming four weeks, including the beautiful conjunction of Venus and the crescent moon on the 27th of the month. (The weather actually cooperated for that one, and many observers were treated to a spectacular view, reminding many of the symbol in the Turkish flag.)

Next Dr. Roy Bishop introduced the main speaker for the night, Dr. George Stevens.

Formerly a structural geologist from Acadia University, Dr. Stevens earned his Bachelors, Masters and Doctorate from Johns Hopkins University in Baltimore, and worked at Acadia for some 26 years before recently retiring. His topic was an examination of the evidence of an impact structure on the south mountain of the Annapolis Valley, just south of Bridgetown. The oval depression, some 0.5 km. on the long axis, was first observed by Dr. Stevens some years ago while studying aerial photographs of the region. Before he was able to go and study the feature, the Nova Scotia Power Corporation built a damn at the site, and flooded the entire crater underwater!

This unfortunate turn of events actually turned out to have some advantages, as the smooth ice surface allowed Dr. Stevens and some volunteer student assistants to pull sensitive instrument packages back and forth across the frozen lake, scanning the rock strata underneath. It did, however, necessitate the use of divers for sample collections.

There are three types of evidence to support the hypothesis for a meteoric origin;

1) Radar sections indicate the correct fracture zones underneath the rim of the depression.

2) Magnetic scans of the rock strata plainly show the expected anomaly,

3) Micro sections of rocks from the area show the telltale micro ripples and fractures associated with severely shocked rock.

Dr. Stevens also suggested that the most probable explanation for the oval crater was that there were two impacts side by side. Apparently, meteorites, like artillery shells, tend to produce circular craters regardless of the angle of incidence (except for very low angle impacts). He also related that the data suggested that the meteorites penetrated about 90-210 feet, then exploded with the power of ten Hiroshima bombs each! Hard evidence will have to wait until drilling extracts core samples.

Afterwards, Shawn Mitchell spoke briefly regarding a promising new site for an observatory. Its a point of land in St. Croix, on the property of Minas Basin Pulp and Power. There was some humorous discussion regarding the site, and comments about what would happen if the up-river dam broke. But kidding aside, it appears that we might be finally approaching the goal of a permanent observatory for the centre. Welcome news to those of us who have long sought this elusive goal.

Next, Dr. David Turner spoke about recent media boobs regarding the absence of gravity in space! It seems many media, and some who should know better, insist on saying that there is no gravity in near-Earth orbit. Good grief — it seems we all have a bit of educating to do yet.

Finally, Mary Lou Whitehorne presented Roy Bishop with an official Mexican eclipse kit. A kit which the Mexican government mass produced for the 1991 solar eclipse, was based on information found in the Handbook. Ω

MEETING REPORT: FEBRUARY 96 by Nat Cohen

Dr. David Guenther spoke to us at our meeting of February 17th — the subject: Solar (and Stellar) Seismology Through the Ages. This was pure delight. Not only did Dr. Guenther deliver a talk that was absorbingly interesting, but did so in a wickedly humorous manner which is going to be hard to top.

Further, he did so sans the usual overheads in such a manner that exhibited his flair for reaching out to

everyone in his audience. If this is the way he tutors in academe, then I really envy his students.

Please, may we have him back on another occasion? Ω

VISUAL OBSERVATIONS OF ASTEROIDS USING "GUIDE":

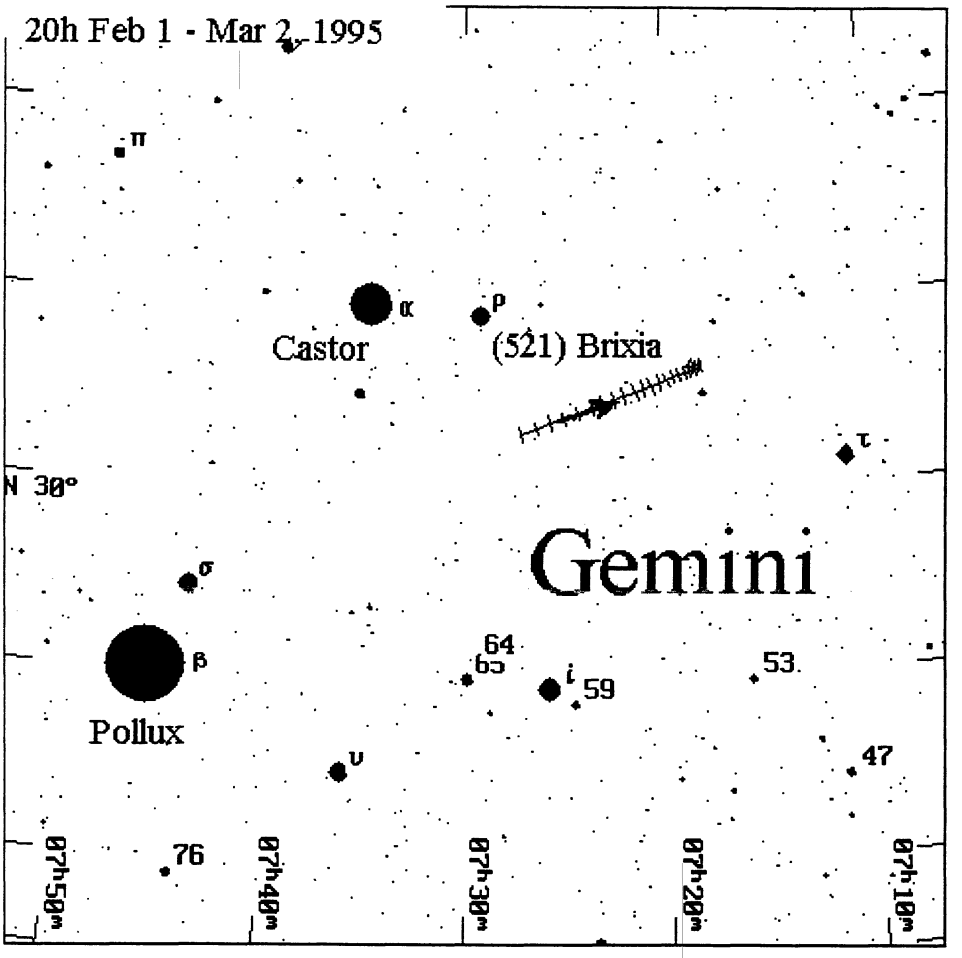
by Larry Bogan

Asteroid observing seems to have become more popular in recent years. I would imagine that part of it is due to the interest in NEA's (Near Earth Asteroids) such as (4179) Toutatis which passed the Earth in 1991-2. It represented a genre of objects that could collide with the Earth and repeat the episode of the extinction of the dinosaurs.

The close pass of Toutatis simulated my interest in studying asteroids while I was visiting the University of Victoria. I continued to observe them but not successfully until I was able to make star charts containing stars down to 15th magnitude. This was made possible by my acquisition of the program GUIDE developed by Pluto Project of Bowdoinham, Maine.

Bright asteroids such as (1) Ceres and (4) Vesta are presently at about 7th magnitude. The ephemerides of the bright asteroids such as these two are listed in the Observer's Handbook. The path of Ceres is plotted in the February 1995 issue of Sky and Telescope. They are easy to locate after plotting their positions on a star chart such as Sky Atlas 2000, or ones made with programs such as the Earth Centered Universe (ECU) or Voyager. If you have the SAO star catalog option for ECU, you can plot 8th to 9th magnitude stars equivalent to Sky Atlas 2000.

You must have the osculating orbital elements for each asteroid for an epoch near the date of interest in order to get accurate positions of the asteroids plotted with the star charts produced by ECU or Voyager.



OSCULATING ORBITAL ELEMENTS

As mentioned in an earlier article in Nova Notes (Principles of Orbit Determination, Nova Notes, Vol. 25 No. 3), the value of six parameters are needed to determine the location of a solar system object. They are (for a given time called the Epoch):

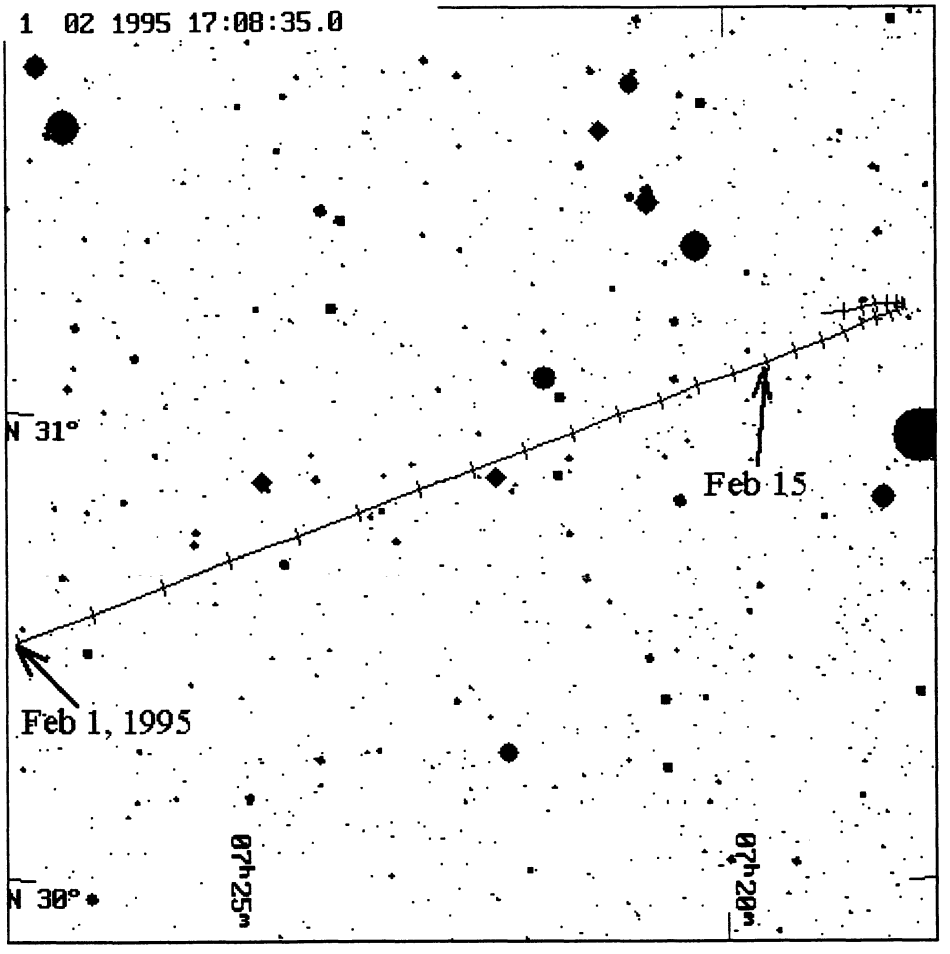
a = mean distance from the Sun
e = eccentricity of the orbit
i = inclination of the orbit
M = mean anomaly of the object at the Epoch (this is essentially the fraction of a period past perihelion)
ω = argument of the perihelion of the orbit
Ω = longitude of the ascending node

The values of these parameters are continually changing due to disturbances from the planets in the solar system. They change slowly and any one set of numbers is sufficiently accurate for a few months. At the University of Victoria, new elements are calculated every 200 days. In order to get new elements, old positions are projected forward to the new epoch using all the gravitational disturbances of the planets and major asteroids and satellites. I used to get the new elements from Dave Balam at U. Vic. but now I have my own source of elements and 15th magnitude charts — GUIDE by Project Pluto.

GUIDE

This program runs on IBM compatible computers under DOS and comes on a CD-ROM. This marvel of data storage contains the Hubble Guide Star Catalog (HGSC), other star and deep sky catalogs along with the sky program, GUIDE. The operation of GUIDE is not as intuitive as ECU which runs under Microsoft Windows — but is quite functional.

I purchased GUIDE in order to get the HGSC. The program costs only $69US and compares favourably to the HGSC on CD-ROM available from the Astronomical Society of the



Pacific for $70US. I was delighted when I discovered that GUIDE includes the osculating elements of 5790 asteroids from 1975 through 2022. Now, with the program, I get the asteroid-of-interest plotted on my star chart (with trails for several days if need be).

The osculating elements have been calculated by the people at Project Pluto for epochs 25 days apart. These are included in the information on the asteroid available at the click of a mouse button.

The charts created by GUIDE closely match the abilities of my 33 cm Dobsonian. A chart showing stars down to 15th magnitude gives all the stars I can see in my 25 mm eyepiece (60 power) on a typical night. I have seen asteroids at 14th magnitude located among 15th magnitude stars.

I have been enjoying finding asteroids and have tried to observe occultations of dim stars by asteroids. For example, on November 25th, I checked for an occultation of the 10.6 mag star, PPM 117739, by asteroid (514) (~14 m) Armida. The path of occultation was predicted for southern Georgia, but due to uncertainty in its orbit, there was a possibility of it could cross here. Alas, no occultation occurred here.

Ephemerides and Elements

I have selected (521) Brixia from many asteroids near opposition at the present time as an example of the use of GUIDE. You might want to try to follow its motion during February 1995. Brixia will be approaching its stationary point just east of Castor in Gemini. The figure on the previous page shows its path relative to that constellation over a 30 day period starting February 1, 1995.

GUIDE plots the path from the orbital elements updated for February 2, 1995. In case you wish to use them in ECU or Voyager, they are:

(521) BRIXIA Orbital elements

Epoch:	*2 Feb 1995 0:00*
Semimajor axis:	*2.7412737AU*
Eccentricity:	*0.2805768*
Inclination of orbit:	*10.5683 degree*
Argument of perihelion:	*315.3006°*
Long. ascending node:	*90.1143°*
Mean anomaly:	*44.9292°*

Other data that GUIDE provides for Brixia is:

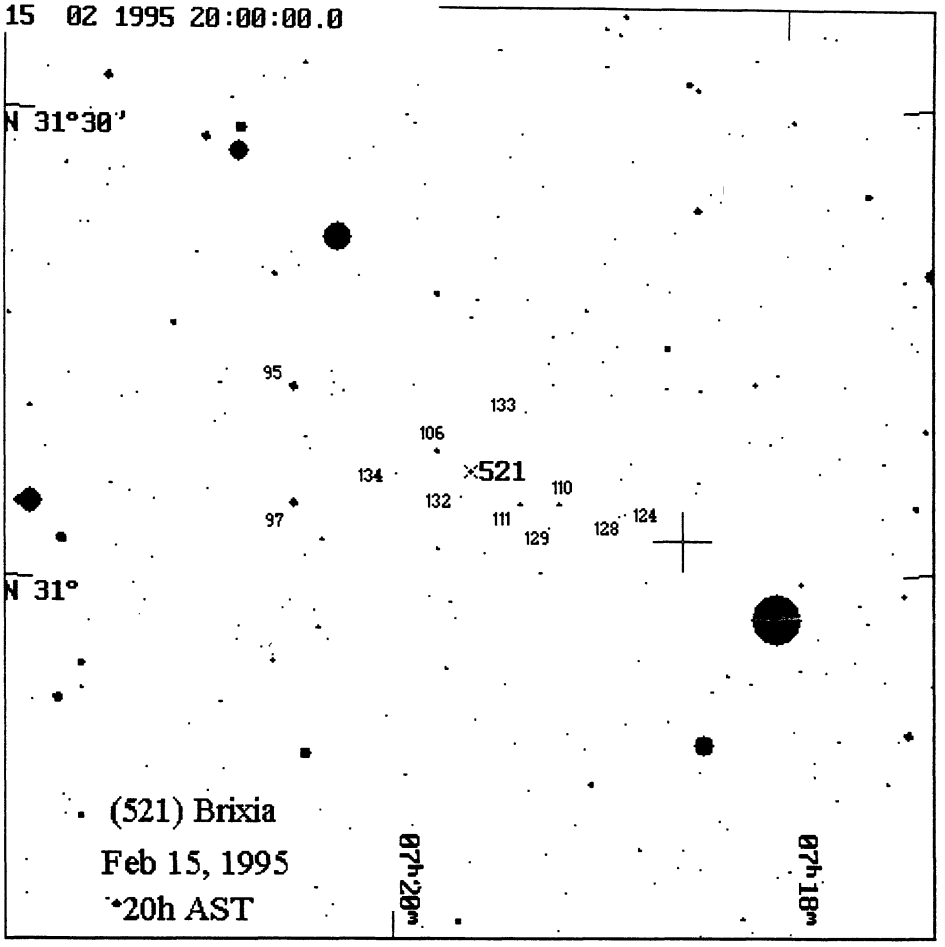
Period:	*4.54 years (1657.8 days)*
Perihelion distance:	*1.97 AU*
Aphelion distance:	*3.51 AU*
Asteroid diameter:	*121. +/- 3 km*
Albedo:	*0.036 +/- .002*
Rotation period:	*approx. 24 hours*

Note that the rotation period is only poorly known. If you have the appropriate photometry equipment, you may want to try to measure the light curve of Brixia, determine a better rotation period and add to what is already known about this asteroid.

At the beginning of February, Brixia is 2.34 AU from the Sun, 1.41 AU from the Earth and has a magnitude of 11.8. It is past opposition and heading away from both the Sun and the Earth. Because of this it will dim by 0.9 magnitudes during February.

The figure on the previous page enables the observer to star-hop to the region where Brixia is located but the figure at left is necessary to show the stars in the region it moves through in more detail. Brixia is just east of tau Gemini. Neither of these charts shows stars dim enough to locate Brixia among the many 12th magnitude stars surrounding it. GUIDE can zoom in and provide locations of all the stars in one telescope field down to 15th magnitude (if necessary). The figure on the next page covers a 1 degree field around the location of Brixia on February 15 at 0hr UT. With this chart you would be able to pick it out from the stars in the region. I have added the magnitudes of the near-by-stars written in the standard notation of full integer 0.1 magnitude values; eg. 12.8 mag = 128. Brixia is a 12.3 mag on this date.

I usually make a 1 degree or 1/2 degree square chart for the night I



will be observing and take it to the telescope with me to positively identify the asteroid of interest.

GUIDE will also create an ephemeris of the positions of the asteroid. Below is the ephemeris for (521) Brixia for February 1995. This table could be used to plot the asteroid's position on a photographic atlas. An atlas such Sky Atlas 2000 would not be detailed enough to positively identify the asteroid. If you are willing to wait the asteroid will move slowly through the sky and reveal that it is not a star. A typical rate for a main belt asteroid is 30" arc/hour.

Other sky programs, such as MegaStar, are starting to include the Hubble Guide Star Catalog on CD-ROM with the program and some are including the means to get the positions of the named asteroids. ECU in its version 2.0 will be able to use the HGSC as will the next version of Voyager II. With better and better software available, amateurs are capable of following more and more of the moving objects in our solar system.

If you would like me to make you a series of finder charts for an asteroid on a particular date, I will be willing gladly provide them provided I can get them to you via the Internet. I can send GIF files of the charts which you can then print on your printer. I am LBOGAN@ACADIAU.CA. Ω

Editor's Note: I would like to apologize to Larry regarding the lateness of publishing the time dated material in this article. Perhaps when interesting asteroids come by, Larry will provide me charts to publish in a future Nova Notes.

Date	Right Asc.	Declination	r(AU)	delta	mag
2 02 1995	07h 27.145m	N30ø30.284'	2.34	1.412	11.8
4 02 1995	07h 25.691m	N30ø37.666'	2.34	1.428	11.8
6 02 1995	07h 24.355m	N30ø44.290'	2.35	1.445	11.9
8 02 1995	07h 23.143m	N30ø50.178'	2.35	1.463	12.0
10 02 1995	07h 22.060m	N30ø55.354'	2.36	1.482	12.1
12 02 1995	07h 21.108m	N30ø59.846'	2.37	1.502	12.1
14 02 1995	07h 20.290m	N31ø03.679'	2.37	1.522	12.2
16 02 1995	07h 19.607m	N31ø06.884'	2.38	1.544	12.3
18 02 1995	07h 19.061m	N31ø09.486'	2.38	1.566	12.3
20 02 1995	07h 18.652m	N31ø11.513'	2.39	1.588	12.4
22 02 1995	07h 18.379m	N31ø12.990'	2.40	1.612	12.4
24 02 1995	07h 18.241m	N31ø13.940'	2.40	1.636	12.5
26 02 1995	07h 18.239m	N31ø14.387'	2.41	1.660	12.6
28 02 1995	07h 18.370m	N31ø14.354'	2.41	1.686	12.6
2 03 1995	07h 18.633m	N31ø13.863'	2.42	1.711	12.7
4 03 1995	07h 19.026m	N31ø12.936'	2.43	1.738	12.7

OBSERVING JUPITER — RADIO STYLE:

by Wayne Barkhouse, Grad Student
Saint Mary's University

In July 1994, the astronomical community around the world (including both professional and amateur astronomers) were excitedly observing Jupiter as Comet P/Shoemaker-Levy 9 (SL9) collided with our solar system's largest planet. One of the factors that made this occasion one of the most successfully observed astronomical events of all time was the approximately fifteen month notice of the imminent impact of the comet.

Several months prior to the comet impact, I had decided to construct a simple radio telescope that I had read about in a science magazine (Science Probe!, July 1991). Articles describing similar systems have also appeared in two popular astronomy magazines (*S & T*, December 1989, and *Astronomy*, March 1983).

The advantage gained by observing Jupiter with a radio telescope (as opposed to an optical telescope) is that a radio telescope can be used during daylight hours. This fact alone would potentially allow one to observe twice as many cometary impacts from Nova Scotia,

with the only restriction being that Jupiter would have to be above the horizon.

The radio telescope that I decided to build is designed to operate at a low frequency of 18-25 Mega-Hertz (MHz). Radio emissions from Jupiter, at these frequencies, were first detected in 1955 (at 22 MHz) from an observatory in Australia. Subsequent observations have shown that this radiation is synchrotron in origin (radiation emitted by charged particles as they spiral around magnetic field lines). The discovery of active volcanoes on Jupiter's moon Io, as well as the presence of a large Jovian magnetic field, provides the necessary ingredients to produce synchrotron radiation (Io's volcanoes are powerful enough to eject material in orbit around Jupiter).

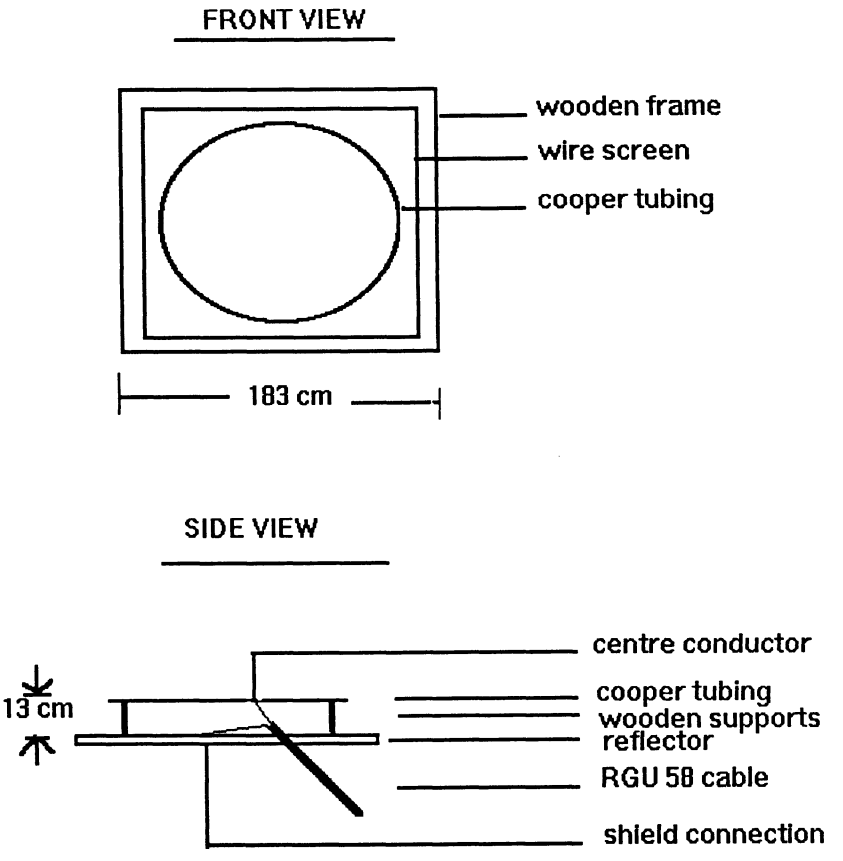
The low frequency radio emissions from Jupiter are not observed continuously but are found to be emitted sporadically in what is referred to as radio storms. These storms are observed to last from one to several hours and found to be triggered by the relative positions of several of the Galilean satellites (the exact details of this process is still unknown).

Prior to the impact of SL9, predictions were made on what effect the impacts would have on the low frequency radio emissions. These predictions ranged from a tremendous increase in radio flux to a complete shutdown of the synchrotron emission. Thus, valuable information could be acquired if radio observations were made during the week of impact.

The radio telescope system that I constructed consisted of three basic components: a receiver, an antenna, and a recording device.

The antenna design is known as a Directional Discontinuity Ring Radiator (DDRR) which was originally designed by F. W. Hyde (Radio Astronomy Techniques, Part 10, 1972). The DDRR consists of an antenna element, which was constructed from soft copper tubing (1.27cm in diameter) bent in the shape of a circle having a diameter of approximately 137cm (see figure 1).

FIGURE.1

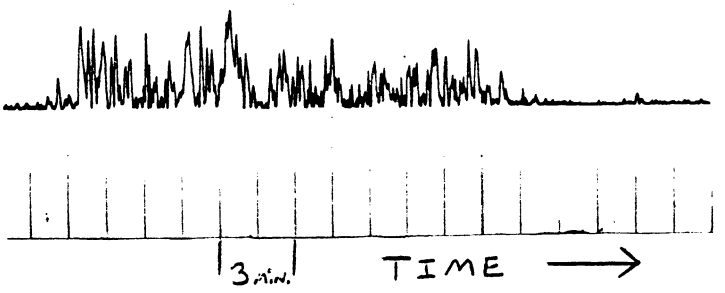


The antenna element was placed 13cm above a reflector consisting of a square wooden frame, 183cm in size, covered by a wire screen. Four wooden supports were used to keep the antenna element above the reflector at the appropriate distance. The completed antenna was connected to a short wave receiver with RG58 coaxial cable. The centre conductor of the cable was connected to one end of the copper tubing and the shield was connected to the wire screen. The entire antenna was supported by two wooden stands which allowed the antenna to be moved in altitude and azimuth.

The receiver was a short wave receiver capable of receiving radio signals from 18 to 25 MHz. The automatic gain control (AGC) was disabled in order to aid the receiver in detecting Jovian emissions. The output of the AGC control circuit was connected to a chart recorder (the receiver and chart recorder were kindly provided by Dr. William Lonc of the Department of Astronomy and Physics at Saint Mary's University where I am a MSc student in Astronomy).

During the week of the impact, the radio telescope was placed in a rural area of Nova Scotia (South Shore) in the hope of minimizing interference from local sources.

Jovian radio emissions were detected at approximately 23:50UT, July 12, 1994, at a frequency of 19.5MHz. The emissions lasted until approximately 2:40UT, July 13, 1994, at which time Jupiter was approaching the horizon and was no longer visible because of foreground obstacles. Jupiter was re-acquired at approximately 19:27UT, July 13, and the emissions subsided to background levels at about 19:43UT, July 13.



The sound emitted by the short wave receiver during the detection of Jovian radio emissions was recorded on a cassette tape and a chart recording was also produced (see figure 2). The sound recorded has the characteristic noise of ocean waves breaking on a beach.

Jupiter was monitored throughout the week of impact (July 16 to July 22) from about 4:30pm to 12:30am local time (ADT) each day. No definitive acquisition of Jovian emissions were observed throughout the week in the frequency range of 18 - 25 MHz.

The unsuccessful detection of radio emissions from Jupiter during the impact did not come as a total surprise. The amount of radio traffic in the 18 - 25Mhz range is considerable. Also, the amount of blockage (the opacity) of Jovian radio emissions through the Earth's atmosphere is highly dependent on the transparency of the ionosphere, which varies in opacity from night to day and is highly dependent upon solar activity. The best time to observe Jupiter would be from about 1 to 6 am, local time, when the ionosphere is more transparent than during the daylight hours. Unfortunately, during July 1994, Jupiter (as viewed from Nova Scotia), was only above the horizon from about 2:30pm to 12:30am local time, thus atmospheric conditions were not at their premium during the observing window. Some observers, however, have reported detection of low frequency radio emissions from Jupiter during July 1994 (*S & T*, November 1994).

Although SL9 has come and gone, the monitoring of Jupiter at low radio frequencies is worthwhile to continue. Since the exact trigger mechanism for the Jovian radio storms is not known, worthwhile observations can still be made with radio telescopes built and operated by amateur astronomers. Ω

CONSTELLATION OF THE MONTH: AURIGA
by Joseph Yurchesyn

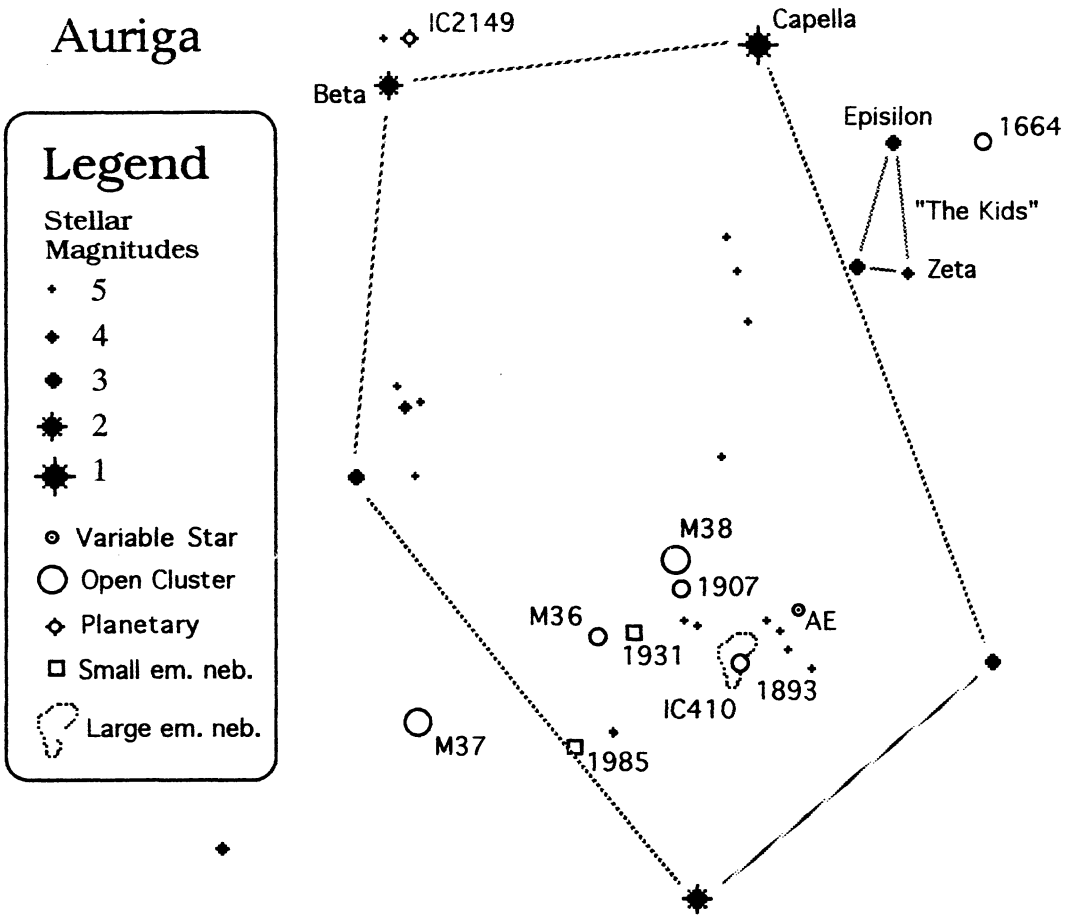
Capella (the Goat Star), the brightest star in the pentagon-shaped constellation Auriga the Charioteer, just skirts the northern horizon in Nova Scotia at midnight during late August. This means that Auriga is well placed in the eastern sky by early winter for evening observing. Due to the fact that it straddles the winter Milky Way just Northwest of Gemini, it is known primarily for its brilliant star clusters, the brightest of which include M-36, M-37 & M-38, but Auriga also contains other interesting nebulae and some most unusual stars that lie relatively near to us.

Capella, the closest 1st magnitude star to the north celestial pole, is circumpolar for most of Canada and therefore visible year round. It's motion closely matches that of the Taurus moving group, associated with the Hyades cluster, and it may be an outlying member of that group. It is 45 ly's distant and has a total luminosity of 160 suns. It has been described by ancient and medieval writers as red, but its yellow or orange colour may appear red to some eyes.

The star was observed to be a spectroscopic binary in 1899 and was measured with an interferometer on the 100" Mt. Wilson telescope in 1919. With an apparent separation of 0.05", a G and F star circle each with a separation of 100 million kilometres in 104.022 days. The G star has a luminosity of 90 suns and the F star 70 suns. In addition, Capella also has a magnitude 10 red dwarf companion (designated "Capella H") 12' distant toward the SE, with which it shares the same proper motion. This red dwarf star is a real physical binary pair of 2.7" separation. Thus, Capella is a multiple star system of at least four components. A scale model would show Capella A and B as globes 33 cm and 17.5 cm in diameter, separated by 3 meters. The components of H would be 1.7 cm in diameter, separated by 126 m, and 34 km distant from A & B!

Beta Aurigae is another double star of total luminosity 110 suns and 90 ly's distant. With an orbital period of 3.96 days and an inclination of 13° from edge-on, Beta is a small amplitude eclipsing binary made up of nearly identical stars. Beta Aurigae shows nearly the same space motion as Sirius and appears to be a member of a widely scattered moving stream of at least 70 members, including other bright stars, such as Alpha Ophiuchi and Delta Leonis. The motion of this stream is similar to the Ursa Major cluster, but a connection between the two groups is uncertain.

Epsilon Aurigae, one of the stars forming the flattened triangular group known as "the Kids", is one of the most remarkable and puzzling of all known eclipsing binaries. The two stars revolve with a period of 9,883 days (27.06 yrs), with the eclipses (lasting 2 years) having irregular light curves due to a rather long



"atmospheric eclipse" that precedes the actual hiding of the more distant star. Other known stars of this class are VV Cephei, Zeta Aurigae and 31 Cygni. Zeta Aurigae is another of the three stars that make up "the Kids", and consists of a K-type giant star and a small B-type blue-hot main sequence star revolving with a period of 2.66 years. Observations of the blue star's spectra as it passes through successively deeper layers of the giant's atmosphere, reveals irregularities in the giant's chromosphere (perhaps similar to solar prominences) as well as chemical stratification of the giant's atmosphere. There are several theories about the exact nature of the Zeta Aurigae system and it still may not be clearly understood.

About 3½° east and slightly north of M-36 is the unusual star AE Aurigae, a bright O-type star that shines at 6th magnitude, but which displays irregular and unusual flares and drops in brightness. At a distance of 1,800 ly's, it shines with the light output of 900 suns. AE Aurigae is the illuminating source for the nebula IC-405, often called the "Flaming Star Nebula". The nebula is 18' in apparent size and 9 ly's in real extent. However, the association of the star with the nebula appears to be a chance encounter. Radial velocity measurements reveal receding speeds of 58 km/s and 21 km/s for the star and nebula respectively. In addition, the nebula is composed of dust and ionized gas. The presence of dust clouds so close to an O-type star indicate that the star and nebula have been associated for only a short time. Also, about 1° SW of the star is a faint nebula (S126) that shows a sharp eastern boundary parallel to the northward motion of the star. This boundary may be the edge of a zone which has been swept clear of nebulosity by the star's northward motion.

The motion of AE Aurigae indicates that it is moving directly outward from the region of the Orion Nebula, suggesting that the star is an escaped member of the huge Orion association of O & B type stars. Assuming a constant space motion at the present speed, the separation occurred 2.7 million years ago. This unusual motion is shared by two other stars, 53 Arietis and Mu Columbae. These three are referred to as "Runaway Stars". Assuming space motions of constant speed, the separation of 53 Arietis occurred 5 million years ago and Mu Columbae occurred 2 million years ago. The chief difficulty of the "escape theory" is an accelerating process to explain the high velocities of these three stars.

Lying just outside the eastern edge of the pentagon is the brightest and richest of the three Messier objects, M-37, with 150 stars brighter than 12th magnitude and a total population that may exceed 500 stars. At a distance of 4,600 ly's, the cluster is 25 ly's in diameter and it may be only a little older than 200 million years.

Moving along the Milky Way to a point 3° NW of M-37 and inside the pentagon is M-36 with about 60 stars

between 9th and 14th magnitude. It lies 4,100 ly's away and is 14 ly's in diameter.

Moving along the Milky Way to a point a further 2° NW of M-36, but still inside the pentagon, is the larger and brighter M-38. A total of about 100 stars, the brightest ones being arranged into an upside down Greek letter Pi, are in a diameter of 20', making it about the diameter of the moon. Lying 4,200 ly's distant and being 25 ly's in diameter, it is comparable to M-37. A yellow G0 giant in M-38, with a luminosity of 900 suns shines at 8th magnitude. Our sun, a G2 main sequence star, would have an apparent brightness of magnitude 15.3, if it were a member of M-38.

A short distance SW of M-38 lies NGC-1907. It is a diminutive cluster of 40 stars shining at 10th magnitude and fainter. Appearing 5' in diameter, it is a curious contrast to M-38. Lying 2° further away toward the SW is NGC-1893, an irregularly shaped group of 20 stars between 9th and 12th magnitude. This cluster, however, is pervaded by the faint emission nebula IC-410, which can be glimpsed in an 8" telescope on a very dark night.

The open cluster NGC-1664 lies 2° east of Epsilon Aurigae. It has 40 stars of magnitude 11 and fainter and is visible in binoculars. Being 15' in diameter, it is a fine cluster to examine in any instrument.

Lying 1½° SE of M-38 and 1° east of M-36 is the peanut shaped emission nebula NGC-1931. It is a faint object, requiring at least an 8" telescope. Lying 2° further toward the SE is the faint emission nebula NGC-1985, which offers a challenge to the owners of large telescopes who are also blessed with dark skies.

Finally, Auriga's lone planetary nebula IC-2149 lies 3° north of Beta Aurigae. The 10th magnitude disk is 10" in diameter, with a 14th magnitude central star.

Just a little something to ponder, when you next gaze in the direction of Auriga. Now, if Capella is the most northerly 1st magnitude star, I wonder which one is the second closest?... Ω

ASK *GAZER*:
by *GAZER*

Dear *GAZER*:

The other night, in a ten-minute interval, I saw two meteors that appeared to come from the same point low in the twilight sky. Taking into account the Limiting Visual Magnitude and the Radiant Altitude, I calculate a Zenith Hourly Rate of 236.7. Have I discovered a new meteor shower?

Zelda H. Refractor

Dear ZHR:

By all rights, you probably have! But in order to be perfectly sure, you must use the scientific method before this shower is named and added to the already long list of "obscure and unobservable meteor showers" maintained by the IMO.

First I suggest you more accurately determine your limiting magnitude — could you in fact see any stars at all! Then go out every year for the next five years on the same date and observe all night and report your results to Paul Gray, alias "Meteor Man". He will be sure to do the appropriate statistics (hmm, let me see, how does that go — there are lies, damn lies, then statistics) on your numbers to make them sound as unreasonable as possible so that they will be quite at home in the IAU's list right next to the Ursids.

Keep your glasses fog free,
GAZER

Dear *GAZER*:

Now that you have returned all bleary eyed and bushy faced from the wilds of Nova East perhaps you could grant me the boon of your great wisdom in dealing with an omission which I spotted in *October Nova Notes*. As I am sure you are aware Dave Lane is both the "President for Life" of the local RASC chapter as well as the Editor of Nova Notes.

In the aforementioned *Nova Notes* Mr. Lane deleted a reference to himself as "President for Life" in an article most generously contributed by Blair MacDonald which I had the great privilege to read before its submission.

Oh Great *GAZER* how do we get Dave to overcome his modesty and accept the mantle of honour which we wish to bestow on him.

Yours most humbly,
GAZER Hazer

Dear *GAZER* Hazer:

I will try to answer your question, however, how do you know it won't get edited before you read it!

Having been a member of this Centre for quite some time and having read the constitution (not all at once, I fell asleep three times — its as exciting as watching a long period variable star vary in real-time), the term "President for Life" is an oxymoron since there is a limit of two years for the president's position. And having observed several presidents come and go, usually by that time the president has completed his/her mandate (read — about had enough) or the membership is ready for a new face (read however you want).

The real problem in the Halifax Centre is that presidents, once their term in completed, in some cases outright vanish from sight. Dare I mention past presidents Norm Scriniger (although he made an appearance at the GA), Cathy Oakley, and Darrin Parker (he shows up at the oddest of places!).....

Regarding the "editing" issue, I suspect that if you saw all the articles and items as submitted, you would be glad to have the editor "do his job" before the printing of Nova Notes!

Perhaps, in this case, the editor felt that 10 copies of "president for life" in that issue was quite enough to make the point!

Clear skies and dew free eyepieces,

GAZER

NOTICE OF MEETINGS AND EVENTS

Date: **Regular Meeting - Friday, March 17th at 8pm**; 7pm for the council meeting (all are welcome)

Place: Lower Theatre, Nova Scotia Museum of Natural History, Summer Street, Halifax. Access from the parking lot.

Topic: Dr. Christopher J. Corbally, S.J., Vatican Observatory. His talk title is: **"Vatican Astronomy: Gregory to Gregorian Chance."** Chris is a Jesuit priest of the British Province, delighting in a Canadian-connection through a Ph.D. in astronomy from the University of Toronto. He has been a staff member of the Vatican Observatory since finishing that doctorate in 1983 and has responsibility for the Vatican Observatory's Research Group in Tucson (as Vice Director) and for the Vatican Advanced Technology Telescope (as Project Scientist). His research interests revolve around stellar spectral classification.

NOTE CHANGE IN DATE AND PLACE FOR THE APRIL MEETING

Date: **Regular Meeting - Tuesday, April 25th at 8pm**; 7pm for the council meeting (all are welcome)

Place: TBA (see the April Nova Notes)

Topic: This month our National President, **Doug Hube** will be visiting us. The change in date was necessary to accommodate his travel schedule and his visit to the St. John's Centre the night before. The title of his talk will be: **"Science, Non-Science, and Nonsense: Knowing the Diiference"**.

ANNUAL BANQUET

Our annual banquet this year will be held in place of the May meeting on May 19. The speaker will be Dr. Michael West of Saint Mary's University.

Nat Cohen has arranged to use the facilities of the Waverly Legion. The cost is expected to be under $20 per person inclusive of all taxes and gratuity. There will be complete details in the next issue of *Nova Notes.*

TELESCOPES FOR LOAN

The Halifax Center has several telescopes for loan to members. These include a Celestron C8 equipped for photography, a Questar 3.5", a 4" rich-field telescope, a 4" Maksutov-Cassegrain, and a 10" Dobsonian. Contact the Observing Chairman, Paul Gray, for further information.

PUBLIC HALIFAX PLANETARIUM SHOWS

The Halifax Planetarium, located in the Dunn Building at Dalhousie University, provides shows each week on Thursday evenings at 7pm. Contact the *Nova Scotia Museum of Natural History* at 424-7353 for show information.

ASTRO-ADS

4.5" f/8 OMCON 811S Newtonian Telescope
Alt-Az mount on sturdy tripod with slo-mo controls, 5 x 24 finder, eyepieces

Asking $300

Contact: Christine Williams
2A Aurora Avenue
Halifax, N. S. B3P 1H4
Phone: 479-3141

T-SHIRTS

We have a large supply of new Centre T-Shirts. These T-Shirts are a 3 colour design which incorporates our new centre logo along with a smaller national logo printed onto high-quality 100% cotton shirts.

These will be available at meetings. For information about mail-orders call Shawn Mitchell.

1995 HALIFAX CENTRE EXECUTIVE

Honorary President	Dr. Murray Cunningham	
President	David Lane	443-5989
1st Vice-President	Blair MacDonald	445-5672
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