

# SASKATOON SKIES

Volume 23, Number 1

January 1993

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**Saskatoon Skies Information**

Next month's deadline is Saturday, January 30, 1993. Please have any submissions in to me by then in order to be included in the next issue. Submissions may be in typewritten form or on a floppy diskette (3.5 or 5 inch size and formatted for MSDOS) preferably as ASCII files. I prefer electronic submissions as it saves me some typing. Mail or bring your submissions to:

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OR  
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E-mail submissions to [sarty@math.usask](mailto:sarty@math.usask) will also be accepted. Saskatoon Skies is a monthly publication of the Saskatoon Centre of the Royal Astronomical Society of Canada.

**Minutes of the December Executive Meeting**  
 Room B-111, Health Sciences Building  
 December 21, 1992

Attendees: Darryl Rybotycki, Mike Williams, Al Hartridge, Gordon Sarty,  
 Rick Huziak, Bill Hydomako

ITEM	DETAIL	ACTION
1.	Meeting called to order, 7:15 p.m.	R. Huziak
2.	Next Observers Group Meeting: Saturday Jan. 23.	R. Huziak
3.	Corrections to Minutes of the October Executive Meeting as published in last months newsletter: in item 1 Doug Hueb should be Doug Hube and in item 7 Ken Holland should be Ken Howland.	R. Huziak
4.	Bill Hydomako and Rick Huziak will not be here for the Jan. meeting. Darryl Rybotycki to handle preparations for the presentations.	R. Huziak
5.	Calendars are still available. The rest will be returned to the Vancouver Centre soon.	R. Huziak
6.	Review of the financial statements for 1992 and 1991.	M. Williams
7.	The Saskatoon Centre is to respond to an article in the "Saskatoon Sun" about lighting for public safety and crime prevention.	G. Sarty
8.	Discussion on the donation to the Herzberg Fund. Motion to donate \$25.00 to this fund. Motion carried by show of hands.	M. Williams G. Sarty
9.	Discussion on funding for travel to the National Council Meeting and the G.A.	M. Williams
10.	Discussion on advertising in the newsletter. The Editor has recommended \$50.00 per page for advertising.	G. Sarty
11.	Discussion on renewing the Sky & Telescope subscription. Motion to renew. Second.	R. Huziak R. Huziak G. Sarty
12.	Meeting adjourned 7:56 p.m.	R. Huziak

**Minutes of the December General Meeting**  
 Room B-111, Health Sciences Building  
 December 21, 1992

ITEM	DETAIL	ACTION
1.	Called to order. 8:03 p.m.	R. Huziak
2.	Tonight's presentation by Dr. George Sokfo: "Thar She Blows! Solar Eruptions and the Northern Lights. "	Dr. Ed Kennedy
3.	Review of items discussed in the general meeting.	R. Huziak
4.	Meeting adjourned 9:35 p.m.	D. Rybotycki

## EDITOR'S NOTES

Happy New Year! And hello to planet Mars, a mere 0.63 Astronomical Units away this month. Mars was closest on the 3rd and at opposition on the 7th. This is not the closest opposition possible but it is one of the highest for us Saskatonians. Definitely worth bundling up and stepping out into the deep freeze to take a look through a telescope or even to just look up. If you watch night after night using only your eyes, it is easy to see the motion of Mars relative to the stars Castor and Pollux. The bright red planet is also easy to point out to your friends.

The other terrestrial planet, Venus, is also prominent this month as the brightest "star" in the south in the early evening. It is presently swinging around in its orbit coming from behind the Sun as seen by us. On January 21 it will be at greatest elongation which means that the Earth, Sun and Venus form a right angle. It also means that the planet will be exactly half lit as seen through a telescope. After January 21 it will be crescent shaped in telescopes. During the months of February and March it will grow larger in diameter and thinner as a crescent as it catches up to the Earth to pass between the Sun and the Earth at the end of March. More information on Venus can be found on page 127 of your 1993 *Observer's Handbook*.

If you get up early in the morning, Jupiter can be seen shining brightly in Virgo. It is also coming out from behind the Sun but on the opposite side because the Earth is moving faster than Jupiter and the Earth is catching up to Jupiter as both orbit the Sun. Jupiter will start its retrograde motion on the 29th as the Earth begins to pass Jupiter in its orbit. Being in Virgo this year, Jupiter will probably demand a look from galaxy hunters this spring as they roam through the Coma-Virgo galaxy cluster - an area I've been roaming through myself lately in the wee cold hours of the morning.

With the passing of Comet Swift-Tuttle, everyone has again become aware of the possibility of comets or asteroids crashing into the Earth with catastrophic results. Now that we understand that there is a real possibility of a comet hitting the Earth, it seems that the ancient people's fear of comets has some basis in fact after all. After listening to Dr. Richard Grieve's talk called, "Large Scale Meteorite Impact and its Consequences - Impact Craters, Death of the Dinosaurs, etc.", last spring at one of our General Meetings, I've become convinced that the dinosaurs were wiped out by such an impact. But more people seem to be jumping on the impact bandwagon. An article in the December 10, 1992 issue of the Saskatoon *Star Phoenix* entitled, "Scientists say huge asteroid led to formation of continents", announces another impact theory that was presented at the American Geophysical Union's fall meeting. According to that article, Michael Rampino of New York University and Verne Oberbeck of NASA's Ames Research Centre presented a theory in which a large asteroid smashed into the supercontinent called Gondwanaland (which actually existed) 250 million years ago and caused it to split up and eventually form Africa, Antarctica, Australia, South America and the Indian subcontinent. Their theory, co-authored with John Marshall and Hans Aggarwal, is to be published in this month's issue of the *Journal of Geology*.

Mike Wesolowski is probably wondering how he managed to co-author the article on this year's lunar occultations since he didn't actually submit anything. Well, Mike, I just cribbed your article from last year's January newsletter and substituted my reduction of this year's data. Note that there is a possibility of observing an occultation of Venus on the morning of April 19 this year.

Finally, I would like to briefly call note to a couple of items mentioned in the Minutes of the December Executive Meeting. The first is to item number 3. Our apologies to Doug Hube and Ken Howland for misspelling their names. The second is item number 10 about advertising in the "Saskatoon Skies". We have decided to allow commercial vendor to advertise their goods in our newsletter for a fee. The rates are published elsewhere in this newsletter as a separate item. This information will be incorporated into the Saskatoon Skies Information on the cover in future issues. Members are still allowed to advertise for free as are others at our discretion.

Gordon Sarty

## NOTICE OF OBSERVERS GROUP MEETING

The next Observer's Group meeting will be at the Rystrom Observatory at 7 P.M. on Saturday, January 23, 1993, weather permitting. To find the Observatory, drive south on hiway #11 to the Grasswood Esso station and drive-in, turn left past the KOA campground and head down the road approximately 1.5 miles to the last mailbox on the right before the railway tracks. The mailbox is the Rystrom's. Go down the driveway past two homes and around the large equipment building to the right. Be sure to dim your lights.

Phone Sandy Ferguson at 382-0898 if you need further information.

In addition to the observers group meeting, members are welcome to visit the Rystrom site at any time provided you phone ahead. The number to call is 955-2370, ask for Nelson or Gloria. If you do not have a key, find a member who does and talk them into a trip to the dome. After you have been checked out on the equipment there you are entitled to a key of your own.

## UNIVERSITY OBSERVATORY HOURS FOR PUBLIC VIEWING

The university observatory will be open to the public on Saturday evenings from 7:30 - 9:30 p.m. during the period of October through February.

Visitors will be able to view: the Andromeda Galaxy, the Albireo Double Star System and other celestial objects.

Observatory assistants will be present to answer questions about astronomy and to assist the public in viewing through the telescope. The observatory is located on campus, one block north of the corner of Wiggins Ave. & College Drive.

Stan Shadick  
Astronomy Instructor  
966-6434

[ Editor's Note: The university telescope is also made available for viewing through after our monthly General Meeting - if the weather cooperates! ]

## NOTICE TO EXECUTIVE MEMBERS

Please note that Executive Meetings were to have resumed at their normal time and place as of the December meeting. Note that the Executive meets in the University of Saskatchewan Observatory at 7:00 PM, one hour prior to the General Meeting.

Next Executive Meeting:  
January 18, 1993, 7:00PM

Rick Huziak

## NOTICE OF JANUARY'S GENERAL MEETING

The January General Meeting will take place on Monday Evening, January 18, 1993 at 8:00 P.M. in Room B-111 of the Health Sciences Building. A presentation will be a video by Charles Scovil (of AAVSO fame) called "Buying your First Telescope". It is an excellent presentation for the beginning or advanced amateur.

## ADVERTISING RATES FOR COMMERCIAL VENDORS

Commercial vendors wishing to advertise in the "Saskatoon Skies" may do so at the following rates: \$50.00 per page, \$25.00 per half page and \$12.50 for business card ads. Individual RASC members and other parties (at our discretion) may advertise items and events for free.

## LUNAR OCCULTATIONS IN 1993

Mike Wesolowski  
Gordon Sarty

For the convenience of observers in Saskatoon, the information presented in the occultation section, pages 112-113, of the *Observer's Handbook 1993* has been reduced to circumstances specific to Saskatoon. This information is presented in the table below. From left to right, the columns give the date of the occultation, the name of the occulted star, the magnitude of the occulted star, (note that the data in the *Observer's Handbook* is limited to stars of magnitude 5.0 or brighter), the circumstances (DD means the star disappears at the dark limb of the moon, DB means the star disappears at the bright edge of the moon, RD means that the star reappears at the dark edge of the moon), the elongation of the moon from the sun in degrees (where 90 indicates first quarter, 180 is full moon, etc.), the Central Standard Time of the occultation to the nearest minute, and the position angle of the event (the point on the moon's circumference at which the star will appear or disappear, measured from the north point eastward around the limb of the moon).

Only events visible from both Edmonton and Winnipeg are included in the list with the exception of the occultation of Venus which is visible in Winnipeg but not in Edmonton. The Venus occultation is probably a borderline case for Saskatoon (note that it happens in daylight). All times are calculated using Winnipeg data and the position angle is the average of *Handbook* values given for Winnipeg and Edmonton (with the exception of the Venus event where the position angle for Winnipeg is used). The brevity of the list below is due to the relatively bright limiting magnitude used; the number of occultations visible from a given location increases rapidly as the limiting magnitude is lowered. As the list stands, binoculars should be adequate to see these occultations well.

For additional information about observing occultations, refer to the *Observer's Handbook 1993*, pages 107-109. Addresses for further information or for reporting observations to are given there as well.

Date	Name	$M_v$	Circumstances	Elongation	Time	Position Angle
January 5	37 Tau	4.5	DD	139	2:34 a.m.	40
February 1	$\kappa$ Tau	4.4	DD	114	7:30 p.m.	75
March 13	$\delta$ Sco	2.5	DB	249	5:02 a.m.	71
March 13	$\delta$ Sco	2.5	RD	249	6:09 a.m.	307
April 19	Venus	-4.4	DB	334	10:02 a.m.	24
April 19	Venus	-4.4	RD	334	10:51 a.m.	272
April 26	$\nu$ Gem	4.1	DD	60	9:48 p.m.	159
May 7	$\delta$ Sco	2.5	DB	195	12:44 a.m.	140
May 7	$\delta$ Sco	2.5	RD	195	1:43 a.m.	240
June 12	$\kappa$ Psc	4.9	RD	271	2:46 a.m.	268
August 14	$\nu$ Gem	4.1	RD	315	4:04 a.m.	251
September 13	$\alpha$ Cnc	4.3	RD	322	4:41 a.m.	307
November 3	$\zeta$ Tau	3.0	DB	223	4:06 a.m.	29
November 3	$\zeta$ Tau	3.0	RD	224	4:46 a.m.	342
November 22	$\kappa$ Psc	4.9	DD	112	7:58 p.m.	41

## WOLF-RAYET STARS

At one extreme in the spectral classification of stars live very hot and very poorly understood stars known as Wolf-Rayet stars. The usual spectral sequence consists of the types O, B, A, F, G, K, M which can be remembered by the phrase "Oh Be A Fine Girl Kiss Me" (a phrase to be used with discretion!). The classification corresponds to both temperature and color. The O stars are hot and blue, B stars are blue-white, A are white, F and G are yellow followed by the coolest, K and M, which are red. Each type is cooler than the preceding type. Also each type of star is less massive than the previous type. The Wolf-Rayet stars (WR stars) are hotter than the O stars but not necessarily more massive. They tend to be fairly dim in the sky to our eyes because they are so hot that most of their light is ultraviolet. The thing that makes the Wolf-Rayet stars stand out is that they have *emission* spectra. That is, when their light is spread out by a prism, the spectrum consists mostly of bright colored lines on a dark background whereas the spectrum of most other stars consists of a rainbow of colors with dark *absorption* lines missing.

There is more than one theory about what Wolf-Rayet stars are and what their life history is. It is thought by some that these stars are the precursors to supernova but the 1987 supernova in the Large Magellanic Cloud is known to come from a B star. Also many Wolf-Rayet stars are found in binary systems, usually with O type stars, and there are theories that depend on the dynamics of a binary system to explain the features seen in the spectra of these stars. There are actually three broad classes of Wolf-Rayet stars. Some show strong nitrogen emission lines (lines caused by glowing nitrogen) and are classed as WN stars (N for nitrogen). Others show strong carbon lines and are called WC stars. A further, but more rare, type show strong oxygen lines - the WO stars. The cartoon on the next page shows a theory in which the different types of WR stars evolve from one type to another. In that theory each kind of WR star represents the exposure of more and more of the core of an original O type supergiant star.

The emission lines in the spectra of a Wolf-Rayet star don't come from the star itself but are caused by glowing gas clouds surrounding the star. These gas clouds are known to be very hot - 30,000 to 50,000 degrees Celsius. The stars themselves have a surface temperature of around 20,000 degrees Celsius (the surface of the Sun is around 5000 Celsius). The Doppler shifts of the emission lines also indicate that the gas comes from a stellar wind blowing from the star at speeds of 2000 to 3000 kilometers per second. These gas clouds have been seen directly at infrared and radio wavelengths and some larger clouds can be seen at visible wavelengths. The faint Crescent Nebula in Cygnus, NGC 6888, is known to be such a gas cloud. It might be possible to see the Crescent Nebula next summer in an 8 inch or larger telescope if Mount Pinatubo's ashes clear from the air. It lies between  $\gamma$  Cygni and  $\eta$  Cygni about  $3^\circ$  from the star cluster M29.

The high stellar wind means that the Wolf-Rayet stars are losing mass at a tremendous rate. Some estimate the mass-loss rate to be  $10^{-5}$  solar masses a year. This is a billion times more mass than what the Sun loses through its Solar Wind. Supposedly this high rate of mass-loss occurs because the stars are so massive. In the cartoon model the star begins life as an O type supergiant star having a mass of more than 40 solar masses. Such a large star might indeed be a candidate for a supernova but the high stellar winds basically cause the star to evaporate and lose weight before that can happen. The WR stars themselves are known to be between 10 and 50 solar masses.

The original O type supergiant is technically an Of star (the f means there are some emission lines in addition to the usual absorption lines in the star's spectrum). In the southern hemisphere, the 2nd magnitude star  $\zeta$  Puppis is such a star. The multiple star  $\gamma$  Velorum, which is supposed to be a nice sight in an amateur telescope, contains an unresolved WR star in orbit about an O type star. Both  $\zeta$  Puppis and  $\gamma$  Velorum lie within  $10^\circ$  of the Gum Nebula. But if you're stuck in the northern hemisphere and you want to see some Wolf-Rayet stuff, wait for warmer weather and then look for the Crescent Nebula instead.

Gordon Sarty

### References

1. *Stars and their Spectra: An Introduction to the Spectral Sequence* by James B. Kaler, published by Cambridge University Press, 1989.
2. *Interpretation of Wolf-Rayet Stars: C.S. Beals' Contribution* by Randall C. Brooks and Mary Lou Whitehorne in the Journal of the RASC, #86, pp 228-245, 1992.

Stellar winds

Hydrogen rich radiative surface layer.

Convective core rich in Helium and Nitrogen.

O Star of mass greater than 40 suns.

Gas cloud with glowing Helium and Nitrogen.

Surface layer rich in Helium and Nitrogen.

Stellar winds

Core rich in Carbon.

WN Star

Gas cloud with glowing Helium, and cool non-glowing Nitrogen.

Glowing Carbon gas cloud.

Glowing Oxygen gas cloud.

Surface layer rich in Carbon with some Oxygen.

Stellar winds

Core rich in Oxygen.

WC Star

Helium and Nitrogen cloud too cool to glow.

Glowing Carbon gas cloud.

Glowing Oxygen gas cloud.

Only the Oxygen core remains.

WO Star

Stellar winds

The Royal Astronomical Society of Canada  
Saskatoon Centre Incorporated  
Balance Sheets  
September 30, 1992 and 1991

	<u>1992</u>	<u>1991</u>
<b>Assets :</b>		
<b>Current Assets;</b>		
Cash	\$ 688	720
Savings (Telescope Fund)	140	1,439
Short Term Investments	4,000	3,000
Accrued Interest Receivable	152	190
Prepaid Expenses (obs guide)	97	-
Input Tax Credit Receivable	-	<u>11</u>
<b>Total Current Assets</b>	<u>5,077</u>	<u>5,360</u>
<b>Fixed Assets @ cost;</b>		
Rystrom Observatory	4,642	4,642
Warmup Shelter	4,773	4,773
Underground Wiring	3,015	3,015
Storage Shed	<u>653</u>	<u>653</u>
	13,083	13,083
less accumulated amortization	<u>7,788</u>	<u>7,190</u>
	5,295	5,893
Library	1	1
Equipment	<u>5,265</u>	<u>4,475</u>
<b>Total Fixed Assets &amp; Equipment</b>	<u>10,561</u>	<u>10,369</u>
	\$ 15,638	15,729
	=====	=====
 <b>Liabilities and Equity :</b>		
<b>Current Liabilities;</b>		
Prepaid Membership	\$ 32	32
Prepaid Newsletter	<u>16</u>	<u>3</u>
<b>Total Current Liabilities</b>	48	35
<b>Equity;</b>		
(per accompanying statement)	<u>15,590</u>	<u>15,694</u>
	\$ 15,638	15,729
	=====	=====

On behalf of the Executive :

Richard H. H. H. ----- President

W. Williams ----- Treasurer

L. Williams ----- Auditor

See accompanying notes to financial statements.



The Royal Astronomical Society of Canada  
Saskatoon Centre Incorporated  
Income Statement  
Years Ended, September 30, 1992 and 1991

	<u>1992</u>	<u>1991</u>
<b>Income :</b>		
Membership Fees	\$ 948	1,172
Life Member Grants	51	40
Donations	385	2,301
Newsletter Subscriptions	101	114
Sale of Handbook	-	14
Observing Guide	117	-
Interest	292	377
Travel Grant - G.A.	-	118
Miscellaneous -	35	35
	\$ 1,929	4,171
<b>Expenses :</b>		
Educational Activities	\$ 32	35
Observing Guide	117	-
Fees to National Office	588	731
Office Administration	77	96
Newsletter & Postage	323	384
Subscriptions	36	34
Insurance	262	260
Travel Grant	-	118
	<u>1,435</u>	<u>1,658</u>
Surplus before amortization	494	2,513
Amortization - Buildings 20 years	(598)	(598)
Net Income for year	\$ (104)	1,915
Equity beginning of year	<u>15,694</u>	<u>13,779</u>
Equity end of year	\$ 15,590	15,694
	=====	=====

See accompanying notes to financial statements.

The Royal Astronomical Society of Canada  
Saskatoon Centre Incorporated  
Notes to Financial Statements  
September 30, 1992

Significant Accounting Policies

1. Observatory and buildings are recorded at cost and are amortized using the straight-line method over 20 years.
2. Equipment is recorded at cost and is not amortized.
3. Library items are carried in the accounts at a nominal value of \$1, new additions are expensed during the current period.
4. Interest on short term investments is recorded on the accrual basis.
5. Short term investments - Roymor Certificate 366 days @ 6.50 %, maturing March 1, 1993.