THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

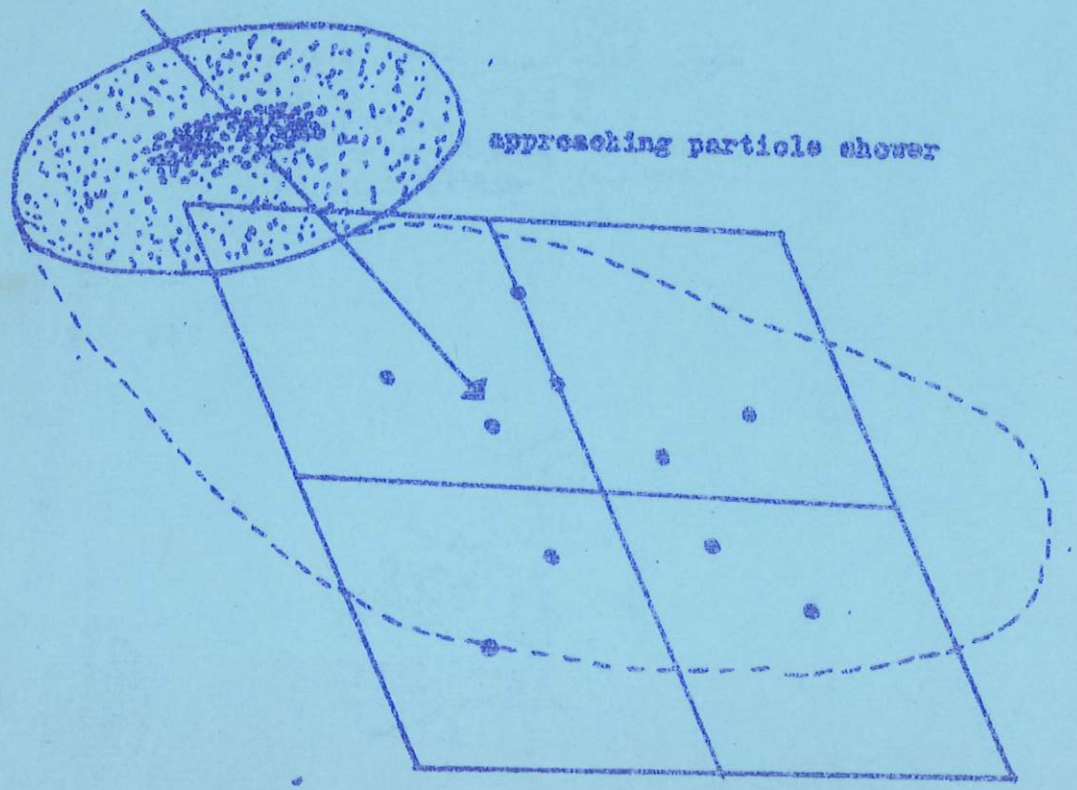
SASKATOON CENTRE

PRESIDENT: Wendel Frenzel
EDITOR: Halyna Korniuta
Published by the Saskatoon Centre, R.A.S.C.

P.O. BOX 317, SUB S,
SASKATOON, SASK.
Vol. 5 - No. 1
February 1974

News Letter

COSMIC RAYS



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COSMIC RAYS

Greg Towstego

You may wonder where cosmic rays originate and where they get such incredible energy. A good choice might be the Sun, but it was almost immediately eliminated as a main cosmic ray source since cosmic rays come from all directions. They come from the direction of the Sun atbthe same rate as they come from the direction opposite the Sun. If the Sun was the main source, the Earth's magnetic field would deflect some around to the other side of the Earth but the Earth's magnetic field could not be responsible for how evenly theyaare spread around the Earth's surface. The source had to be from outside the Solar Syatem but the Sun must not be forgotten entirely. The Sun's surface is not at all smooth; it breaks into sunspots and each sunspot has its own magnetic field in which great energies are enhanced, and when the energies are released, violent solar flares erupt on the Sun. It was found that when a solar flare occured the aurora borealis brightened up and compasses flittered. In 1942 an extremely big flare occured and shortly after there was a short increase in the cosmic ray influx. These solar cosmic rays are only about 0.5 to 2.0 Bev, but the principle of the Sun being a source holds.

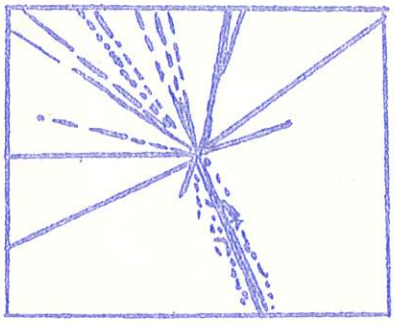
If stars do produce cosmic rays as a result of flares or other occurences of the rays may be deflected by other galaxies and stars because of their magnetic field. This would account for the generalization of the directions from which they come. This explanation is not sufficient in some ways because if all stars produced cosmic rays at relatively the same number, the Sun would drown out the rest of the stars, like it does in the production of light.

Some stars must be richer producers of cosmic rays than others. Supernovas and certain variable stars could probably drown out the rest of the ordinary stars like out Sun. There still remains the problem of the energies of the radiation. Since the Sun can produce 1 Bev particles in is not surprising to think than a supernova could produce particles with much larger energies. But no nuclear reaction in even the fiercest supernova could produce cosmic ray energies.

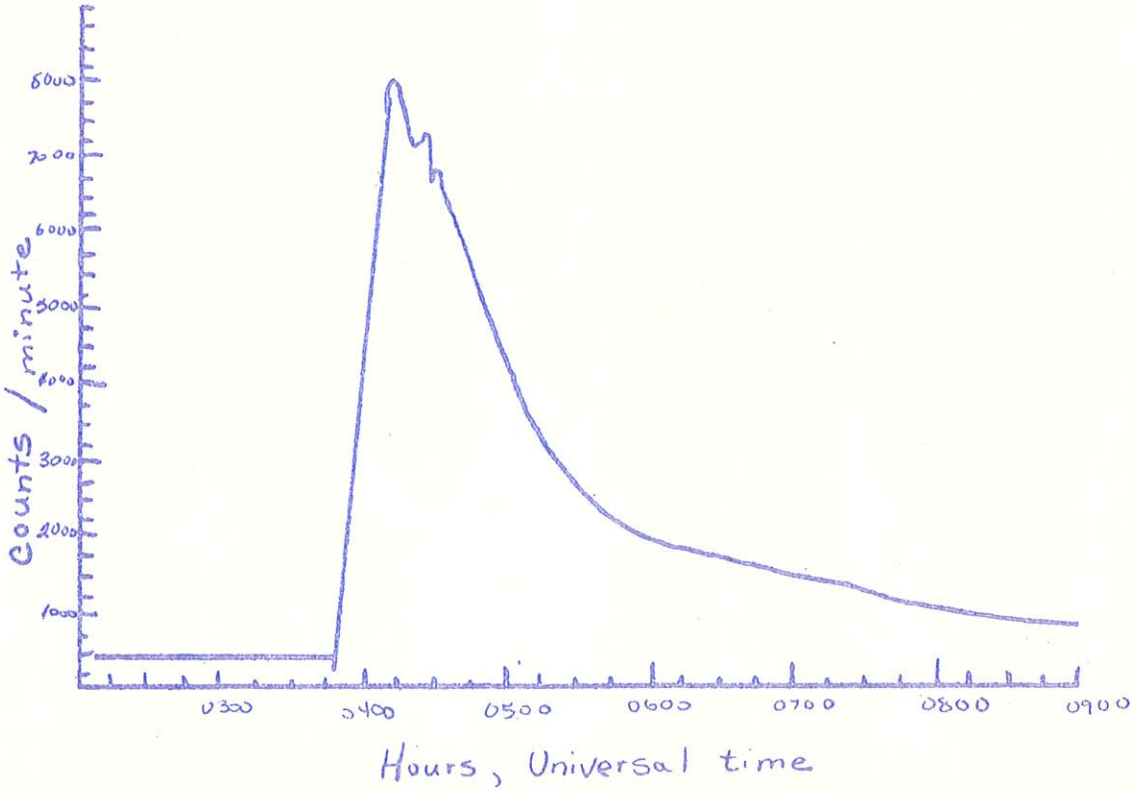
In 1951, the Italian-American physicist Enrico Fermi (1901-1954) suggested that the energy does not have to originate in a star. He said that perhaps some particles were produced at a few Bev and the magnetic field of a galaxy accelerated the particle to increase its energy. The process is similar to that of a man made cyclotron, a machine which whirls particles round and round between two large electromagnets, giving additional energy to them every time. As they gain energy the fixed magnetic field can no longer hold them within the confines of the cyclotron so they shoot out. The magnets on a cyclotron are much stronger than a galaxy's magnetic field but in eons of time the particles would reach fantastic energies and shoot out of the galactic cyclotron. During the flight of the particles, they may crash into the earth and we would

therefore receive particles of a wide range of energies. It is thought that the cosmic rays of 100,000,000 Bev and greater originate in other galaxies than our own with stronger magnetic fields.

In New Mexico, Dr. Bruno Rossi of M.I.T. set up an array of scintillation counters over a grassy plain a mile and a third wide. In 1960 Dr. Rossi announced that his detectors had counted a cosmic ray shower of 10 billion particles all from one primary particle (cover figure). The original primary ray had an amazing energy of 2×10^{19} electron volts (about 20 billion billion ev). The figure below illustrates the result of a heavey primary cosmic ray striking the nucleus of silver or bromine in a photographic emulsion on a plate.



On February 26, 1956 a very spectacular solar flare took place. A few minutes later the counting rates of all cosmic ray detectors all over the earth began to increase rapidly.



In fifteen to twenty minutes the counting rates had come to a maximum and were starting to decrease. In a few hours the event was over and the rates went back to normal. Detectors around the Earth gave different results, but the largest effects were recorded by detectors at fairly high latitudes, which were designed to detect secondary neutrons produced by cosmic radiation. Some of the neutron detectors had increased between 25 and 50 times normal. On the other hand μ-meson detectors near the equator had recorded increases of only a few percent. The above graph shows the increase in the counting rate of a neutron detector following the 1956 flare.

Because of cosmic ray research many useful discoveries have been made. Many subatomic particles including the meson have been discovered, and Dr. James A. Van Allen discovered the Van Allen radiation belts as a result of searching for solar cosmic rays. Even if the mysteriesof cosmic rays are not solved, the investigation will have been well worth it.

For more information on cosmic rays I would suggest:

1. Cosmic Rays by Bruno Rossi, available at the Main Branch, Saskatoon Public Library.
2. The Universe by Isaac Asimov, page 244.
3. Solar Research by Giorgio Abetti, available in the Observatory Library.

"GENERAL MEETING"

DATE: Tuesday, February 19, 1974

TIME: 8:00 p.m.

PLACE: Room B110, Health Sciences Building
(across from Observatory)

PROGRAM: Regular Business
Film: Cosmic Zoom

OBSERVATORY ATTENDANCE 1973

The following summary of attendance at the University Observatory for the year 1973 was obtained from a count of the total number of signatures in the guest books. Since it is seldom possible to obtain the signatures of everyone visiting or using the Observatory facilities, it may be assumed that the figures represented are somewhat lower than the actual amount.

The figures become meaningful when compared with the figures from previous years. This years figures show a relative levelling off of activity in most areas of use in contrast to the near doubling of figures in the two years previous. The absence of Special Events (Solar and lunar eclipses, comets, conjunctions, etc.) resulted in a decrease in Open House attendance by approximately 1000.

OPEN HOUSE ACTIVITIES	1971	1972	1973
Wednesday Evenings	1085	1765	1927
Sunday Afternoons & Evenings	1029	2629	2471
Special Events - Lunar Eclipse February 1971	53		
- Mars Opposition August 10, 1971	93		
- Lunar Eclipse January 29, 1972		139	
- Planetary Configuration April 16, 1972		323	
- Solar Eclipse July 10, 1972		442	
- Lunar Eclipse July 25, 1972 (Cloudy)		14	
Total Open House Attendance	2323	5312	4398
GROUP TOURS (Friday Evenings)			
Total Tour Attendance	959	763	900
Number of Tours	34	31	37
Average Number of People Per Tour	28	25	24
R.A.S.C. FUNCTIONS	774	998	832
ASTRONOMY 110 STUDENTS	40	33	26
TOTAL SIGNATURES (from all functions)	4096	7106	6156

Ron Waldron
Observatory Assistant

SASKATOON CENTRE 1974

SURNAME	ADDRESS (Saskatoon)	PHONE
ANDREWS, Melodie	419 Mount Allison Cres.	374-0360
AUPPEREE, Milton	2763 Preston Ave.	374-9368
BANDURKA, Robert	Box 757, Humboldt, Sask.	
BEALL, Frank	University Hoppital	
BECK, Doug	812 31st Street W.	242-4585
BELSEY, Debra	1902 Park Ave.	374-8930
BEVERIDGE, Evan	Box 114, Porcupine Plain, Sask.	
BLACKWELL, Alan	233 Simon Fraser Crescent	373-1499
CARUK, Harry	916 7th Street E.	244-8379
CHYNOWETH, C.H.	Coleville, Sask.	
CURRIE, B.W.	416 Bate Cres.	373-0292
DUCHALARD, David	2101 Albert Ave.	343-1748
EAGER, R.L.	46 Weir Cres.	374-9298
FORD, Win	307 Arthur Ave.	653-0247
FRENZEL, Wendel	418 Clarence Ave. S.	652-0973
FULTON, Bruce	32 Byers Crescent	382-7310
GILLESPIE, Ralph	1920 Lorne Ave.	652-8298
GOLONKO, John	929 Ave. "L" South	242-5282
HAGEN, Marlin	Hagen, Sask.	
HANCOCK, Dennis	2608 33rd Street W.	382-4028
HEDLIN, Michael	1139 11th Street E.	343-6994
HELSTROM, C.T.	General Delivery	
HOLDEN, F.A.	1805 Morgan Ave.	374-2695
HOLMES, Ian	53 Red River Drive	652-5347
HUNTER, Hugh	217 32nd Street	242-5977
KORNUTA, Halyna	2314 St. Andrew Ave.	244-2064
MACDONALD, Bill	3310 Caen Street	382-1378
McCLEAN, Danny	528 1st Street E.	653-3641
MELBY, Merlyn	1614 Argyle Ave.	374-3765
MINERS, Arthur	509 5th St. E.	242-8048
NASHBAR, A.W.	217 Queen's Hotel	244-1101
PATTERSON, Gordon	79 Baldwin Cres.	374-2511
PATTERSON, James	79 Baldwin Cres.	374-2511
PATTERSON, Paul	53 Tupper Cres.	382-2420
PHENNEGER, Milton	1109 Temperance St.	242-7706
PRISTUPA, Dave	3437 Ortona Street	382-0773
SHOOK, Kevin	306 Albert Ave.	242-3317
SMITH, Linton	141 Leopold Cres., Regina	

SURNAME	ADDRESS (Saskatoon)	PHONE
TOEWS, Johan	Box 366, Regina, Sask.	
TOWSTEGO, Greg	3418 Dieppe Street	382-4142
TURPLE, Len	921 6th Ave.	242-3827
VEDRESS, Emil	Box 116, Muenster, Sask.	
VONBUDLOFF, Robert	507 Albert Ave.	652-9488
WAIT, F.E.	1104-620 Spadina Cres.	244-7889
WALDRON, Ron	501-101 Cumberland Ave. S.	373-0023
WARNER, Lee	117 31st St. W.	653-3793
WELSH, Leslie	308 Ross st., Moose Jaw	
WIEBE, Jacob	813 Ave. "U" N.	382-3984
YING, Eddie	54 Riel Crescent	373-3808
YOUNG, Jim	2513 Melrose Ave.	242-4661

SASKATOON CENTRE REPORT 1973

The Saskatoon Centre has been very busy during 1973. General and Executive meetings were held monthly and the minutes of all meetings were published in this Centre's Newsletter.

Speakers for General Meetings included Dr. Iwanowska speaking on Copernicus; Dr. Skinner on Cosmology; Jacob Wiebe presented slides of a Solar Eclipse; Dr. Holden and Gordon Patterson spoke on their trip to the General Assembly in Ottawa; Dr. Ian Halliday spoke on Comets.

Classes in Fundamentals of Astronomy were held on Tuesdays, alternating theory with optional topics. The Astrophotography and Observer's Groups were held on Saturdays.

Wednesdays and Sundays were reserved for Open House Activities throughout the year. Group tours were given on Friday Nights with visitors from around the province visiting the Observatory.

In July, the Saskatoon Centre's First Annual Wiener Roast Picnic was held. Following a game of baseball which lasted until sundown, members set up telescopes to view the clear sky. After a midnight snack the evening wound up.

Elections were held in October bringing in the new Executive and changing the executive position of the Vice-President to Vice-President/Public Relations.

In November and December three Centre members gave lectures at the Saskatoon Public Library: Alan Blackwell--Meteorites; Ron Waldron--The Christmas Star; Gordon Patterson--The Comet Kohoutek.

In all, it was a very busy year for everyone at the Saskatoon Centre.

Melodie Andrews, Secretary

MINUTES OF THE EXECUTIVE MEETING
Saskatoon Centre, R.A.S.C.
Held in the Observatory, 7:30 p.m., January 7, 1974

Present:
Wendel Frenzel, President
Ron Waldron, VP/PR
Melodie Andrews, Secretary
Hugh Hunter, Librarian
Gordon Patterson, Activities
Halyna Kornuta, Editor
Milton Phenneger, Programming

Absent:
Alan Blackwell, Treasurer

Item	Detail	Action
1.	The meeting was opened at 7:30 p.m.	
2.	Old Business: The membership fees for this Centre's Honarary President Dr. Currie will be paid by the Society.	
3.	Membership to date is 45 members.	
4.	Motion for the Fundamentals of Astronomy Class to be held as was last year, on the second and fourth Tuesday of the month. Talks by members will be on the first and fifth Tuesday of the month. Members who have received the certificate in the Fundamentals course are encouraged to also join the Observer's Group or other Activity Groups. G. Patterson, R. Waldron. CARRIED	
5.	The 1973 edition of Sky and Telescope is being bound.	
6.	Motion for adjournment. CARRIED	W. Frenzel M. Phenneger

NOTE TO MEMBERS:

1. Anyone interested in Telescope Making is to see Doug Beck at this month's General Meeting.

2. The Observer's Group will meetion February 16 at 8:00 p.m. Anyone interested is encouraged to attend. If clear, Messier object observing will take place, if cloudy a class will be conducted.

3. The 1974 General Assembly will be held from June 28 to July 1 in Winnipeg. Any ideas you may have for possible exhibits or papers (on all aspects of observational, theoretical or instrumental astronomy) would make a contribution by this Centre possible. Further discussion at the General Meeting.

MINUTES OF THE GENERAL MEETING
Saskatoon Centre, R.A.S.C.
HELD IN THE HEALTH SCIENCE BUILDING
January 15, 1974, 8:00 p.m.

Present:

Wendel Frenzel, President	Ron Waldron, VP/PR
Melodie Andrews, Secretary	Hugh Hunter, Library
Gordon Patterson, Activities	Halyna Kornuta, Editor
Milton Phenneger, Programming	

Absent:
Alan Blackwell, Treasurer

Members Present: Approximately 25

Item	Detail	Action
7.	The meeting was opened at 8:00 p.m.	
8.	Old Business: Ron Waldron presented the 1973 Observatory Attendance figures.	Published in February Newsletter
9.	Motion for the adoption of the December Minutes as published. R. Waldron, M. Phenneger. CARRIED	
10.	Dr. Phenneger presented a lecture on Cosmic Rays.	
11.	Motion for adjournment.	

Minutes prepared by
Melodie Andrews
Secretary

Approved by
Wendel Frenzel
President