SASKATOON SKIES

Volume 24, Number 5 May, 1994

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In This Issue

Minutes of the April Executive Meeting
7:00 p.m., April 18, 1994
Room B-10, Health Sciences Building, U of S Campus

Present: Ed Kennedy, Richard Huziak, Sandy Ferguson, Gord Sarty, Al Hartridge, Gary Brett, and David Cornish.

1. Meeting called to order 7:05 p.m.
2. Apologies for non attendance from B. Hydomako. R. Huziak will probably be unable to attend the May meeting. He will be away for the first two weeks in May. A secretary will be required for the Executive and General Meetings.
3. Gary Brett and David Cornish were introduced to the Executive. Gary has taken on the Membership Promotion Position and David has taken on the Librarian position. Mr. Mike Williams will report the changes to the National office.
4. Light Pollution Committee: an I.D.A. membership committee has been purchased. Gord Sarty suggested that the Light Pollution Committee should meet to discuss recent literature and for further organization.
5. Telescope Committee Report: the machining of the mirror cell has been contracted to A.J. Machine. Assembly of forks are being quoted by A.J.

   A cheque has been sent to Minnesota for the purchase of the 14 foot observatory dome.
6. University of Saskatchewan Observatory Display Status: Sandy Ferguson reports that this is done and will be set up in the near future.
7. Observers Group Report. It was stated that the attendance at the Observer Group nights has not been that good lately but we will carry on as previously.
8. Sky and Telescope Subscriptions: if people are interested in obtaining a subscription to Sky and Telescope through the Saskatoon Centre, then they should contact Richard Huziak or Mike Williams.
9. Promotional Materials: 250 Sky and Telescope reprints have been received. The solar glasses have not arrived. A vote was taken on whether or not to provide solar glasses to the public. The motion to do so was defeated and the glasses, if they arrive, will only be used for club members.
10. Astronomy Day and Star Night Report: thanks goes out to Sandy Ferguson for her excellent organization of the Astronomy Day Display at Market Mall and for arranging the Star Night. There was a good group of telescopes out for the Star Night in the range of 40-70 of the public that attended. Alcor and Mizar in Ursa Major was observed as well as Comet McNaught-Russell, the Moon and Jupiter.
11. The G.A. package has arrived for the meeting in St. John's. Copies are available from Rick Huziak.
12. Five hundred copies of the R.A.S.C brochure were printed for Astro Day and Star Night. Rick Huziak needs reimbursement.
13. Observatory repairs still required: a doorknob needs to be fixed and there are still some leakage from the dome.
14. May Eclipse: the date of the eclipse is May 10, 1994. Sandy Ferguson will try to organize a downtown demonstration between the hours of 10 a.m. and 12 noon.
15. The June Saskatchewan Star Night: Rick Huziak wants to know if there is anyone interested in organizing this. At the present time there appears to be no one but Jim Young will contact Regina and inquire about a possible observing weekend at Diefenbaker Park with the Regina club.
16. 100TH Anniversary of Lowell Observatory. This is brought up by Ed Kennedy. Mr. Kennedy also mentioned that there are color posters available from the R.A.S. in London. These are of the Trifid, Eta Carina, and the Orion Nebula. These are available for $20.00 per set. It was felt these would be useful to have for Astronomy Day displays.
17. Temporary Memberships: David Cornish suggested that we provide a three month free membership to new prospective members along with information in the form of a newsletter and a visit to the Observatory with an astro buddy. Dave Cornish will develop an outline of his ideas for the next meeting.
18. A Letter for Corporate Funding: David Cornish will look into approaching some corporations for donations to the Saskatoon Section of the Royal Astronomical Society of Canada.
19. Site Selection: Rick Huziak will try to start a search for a new sight selection for the new observatory before he goes away.
20. Semi-Permanent Building for Eetook: Gord Sarty suggested that we make a simple semi-permanent collapsible building for storage of Eetook.
21. The meeting was adjourned at 8:00 p.m.

Minutes of the April General Meeting

8:00 p.m., April 18, 1994
Room A-226, Health Sciences Building, U of S Campus

1. Meeting called to order at 8:00 p.m.
2. A motion that the April minutes be adopted as published was made by Mr. Jim Young and seconded by Mr. Gord Sarty. Carried.
3. Light Pollution Committee: An I.D.A membership has been purchased.
4. Telescope Committee: Rick Huziak described the stage of construction of the new 16 inch telescope. It appears that the mirror cell and fork mounts will be built in the very near future.
5. Observers Group Report: The next Observers Group meeting will be May 14th.
6. Sky and Telescope Subscriptions: Reductions are available. People are encouraged to sign up through the club since this would mean a substantial saving in the subscription rate.
7. Astronomy Day and Star Night Report: The display at Market Mall went quite well. There was a light to moderate attendance partly due to the good weather outside.
   The Star Night also went well and there were 40-70 people present at the Star Night.
8. G.A. Package: This has arrived and copies are available from Rick Huziak.
9. The May Eclipse: We will organize some sort of public event between the hours of 10 a.m. and 12 noon.
10. The Librarian position is now filled by Dave Cornish. Dave was nominated for this position by Rick Huziak, this was seconded by Jim Young and carried.
11. Presentation by Mr. Gord Sarty and Mr. Richard Huziak on Comets. This turned out to be a very interesting and informative discussion about comets. Rick and Gord related their past experiences which go back 20 years. The presentation ended with the description of Comet Shoemaker-Levy 9 which is now orbiting Jupiter and will crash into the far side sometime in July.
12. The Meteorite Search: This will probably take place on the 14th of May which is a Saturday afternoon at a site not too far from Saskatoon with a possible more ambitious search in the Fall. There appeared to be a good show of interest in the club members. It appears we will get a good turnout for this event. It might be possible also that some of the geology students are interested in helping with this search.
13. The meeting was adjourned at 10:00 p.m.

May Observers' Group Meeting

The next Observers' Group observing session will be held on May 14 at Rystrom Observatory, with a "rain date" of May 21. Time: After 9:00 p.m. 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.

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.

MAY GENERAL MEETING

The May General Meeting will be held on Monday, May 16, 1994, in Room A-226, Health Sciences Building, U of S Campus, at 8:00 p.m.

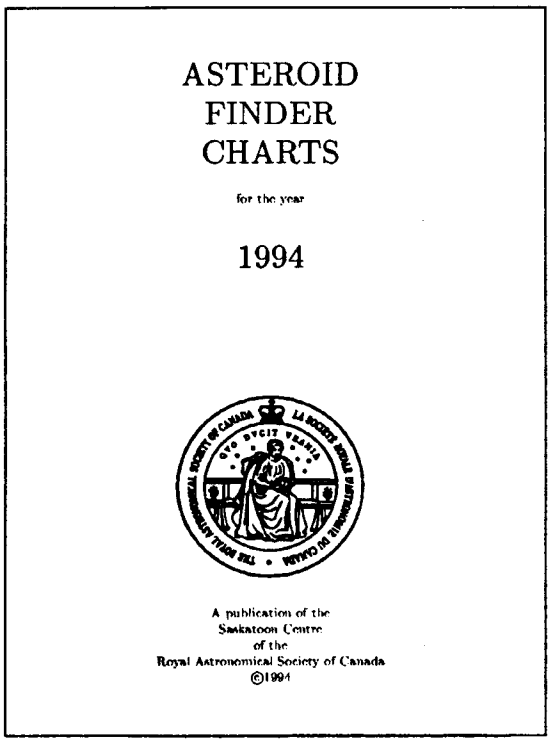
EXECUTIVE MEMBERS

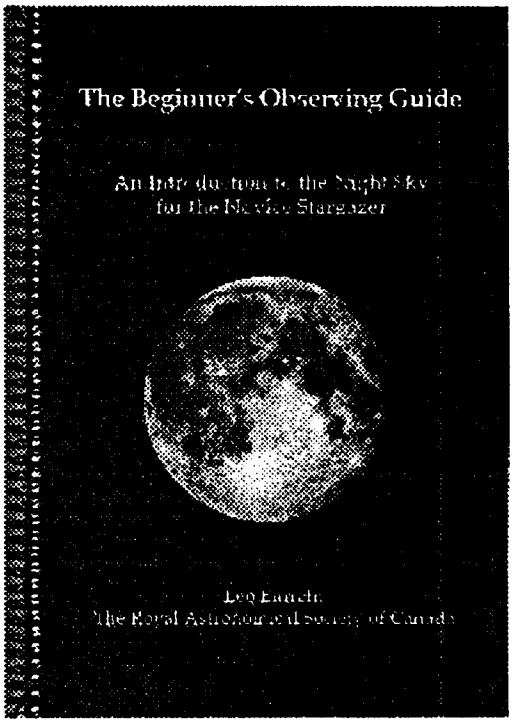
There will be a regular meeting of the executive at 7:00 p.m. in Room B-10 on May 16.

FOR SALE

Bausch & Lomb "Criterion 8000" Schmidt-Cassegrain telescope with 5 eyepieces, a clock-drive with tripod, a 40mm finder and the book *Nightwatch* by Dickinson. $2100. Phone Ray McCrea at 384-6279.

1994 RASC Publications for Sale





A limited supply of 1994 RASC Calendars (1) are still available to purchase. These calendars are excellent quality, professionally done and feature super pictures of the sky by Canadian RASC astrophotographers. At only $6.50 each, they are a steal.

The new 1994 *Asteroid Finder Charts* are now available for $5.00 each. These charts, prepared by our our Saskatoon member, Gord Sarty, make asteroid hunting very easy. They are designed to be easy to use at the telescope, being Cerlox bound with a stiff, clear cover. The charts are similar to the Comet Takamizawa-Levy finder chart printed on the last page of this newsletter.

For deep sky hunters, Rick Huziak has prepared a booklet of observing forms called *My Messier Album*. It is useful for collecting your observations of Messier objects together and is being sold for $1.00.

Finally, the *Beginning Observer's Guides*, 1994 edition (45 copies available) are being sold for $9.50 each. These excellent guides are for the rank beginner or for those who instruct rank beginners. They are packed with loads of information on how to get started and what to see. They are excellent for beginning adults, school-age kids, Cubs, Guides, Brownies, and make excellent presents for up and coming amateurs. Written by a Canadian amateur, Leo Enright, for the Canadian audience. An excellent buy.

You can pick any of these up at the next General Meeting or, if you'd like any of these mailed out to you, please add $2.00 for postage, or I'll deliver them for free anywhere in town, if you give me a call: Rick Huziak, 665-3392. All proceeds go to the Saskatoon Centre.

University Observatory Hours

The U of S Observatory will be open to the public on Saturday evenings from 10:00 to 11:30 p.m. during May, June and July. Visitors will be able to view Jupiter, the Ring Nebula, the Hercules Globular Cluster 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. and College Drive. For more information, call Stan Shadick at 966-6434.

Astronomy Day 1994

Saturday, April 16th turned out to be a glorious spring day with summer temperatures! It was such a great day, in fact, that many potential visitors to our set-up at the Market Mall may have decided to remain outdoors, rather than spend their day shopping indoors, therefore, missing the opportunity to catch our Society's presence in the Mall.

On Monday, April 11th, Carol Blenkin invited us to promote Astronomy Day and the Centre on her morning show *On the Air*, on CFQC-TV.

Our display panels and tables were set up next to the food court in the Mall, where we exhibited some of Al Hartridge's excellent astrophotography, photos of our Centre's activities, and other astronomy information for examination by anyone who dropped by. We had plenty of information on the group available to hand out, together with a number of free giveaways, compliments of *Sky and Telescope* (pamphlets on getting started in astronomy; catalogues) and Energy Mines and Resources Canada (meteorite posters). Popular astronomy books, periodicals and other astronomical items (planispheres, charts) were also available for inspection. We ran a free draw for two planispheres and two books entitled "The Astronomers", the companion book to the PBS television series. Amy Huziak kindly agreed to draw the winners' names for the four items. The planispheres were won by Megan Archer and Eldeen Borys, both of Saskatoon, and the books by Michael Kurozaba of Martinsville and K. Jantzen of Duck Lake. We also had a slide presentation showing throughout the day, which got a lot of interest and questions. Slides were of solar system objects, deep sky objects, telescopes and observatories (both professional and amateur) and of Centre activities, with a good number of slides showing RASC activities geared to astronomy education and children.

Adjacent to the display tables, Al Hartridge had set up his Schmidt Camera equipment. Scott Alexander and his 14.5″ Dobsonian attracted many people, as it always does, and a couple of smaller scopes were available as examples of good first scopes. There was also a sundial that intrigued some.

Outside in the parking lot, Rick Huziak and Don Friesen took turns operating Rick's solar scope and Don's mounted binoculars (with SolarScreen filters). The sun had one small spot on its surface, which drew some interest from passersby.

Throughout the day there was lots of discussion with educators, interpreters from municipal agencies, students and many others who dropped by to talk about the RASC and astronomy in general. We always hope this interest will lead to some new members.

In the evening the planned starnight in Diefenbaker Park was relatively successful. Those who attended were treated to views of the (almost) first quarter moon, Jupiter, the Beehive and Comet McNaught-Russell. A rather active, colourful aurora also turned up and put an end to much of the observing of dimmer objects. As for the scopes, there was a very good variety in design and aperture: 14.5″ Dobsonian; two 4″ reflectors; a 6″ reflector; Eetook, the Centre's "Big Eye"; 10″ reflector; a C-11 and the Centre"s 4-1/4″ Astroscan, plus binoculars. Between 50-75 people turned up to tour the sky and everyone packed it in about 11:30 p.m., when the aurora took over!

Many thanks go out to the following members, who helped make Astronomy Day a success: Rick Huziak, Don Friesen, Al Hartridge, Scott Alexander, Jim Young, Scott McGibney, Kim Mysyk, Garry Brett, Les Dickson, Bill Hydomako, David Cornish and our two junior astronomers, who operated the slide projector briefly, Amy Huziak and Brianna Kantor. Thanks, too, to Carol Blenkin for her continued support.

See everyone again next year!

Sandy Ferguson

More Fireballs, Please!

Between the time I got involved with MIAC in October 1993 until February of this year, there have been a lot of fireballs reported. Through this period, the number averaged almost one per week. However, throughout the last part of February and all of March, I did not hear a sniff about fireballs. Somehow, I just can't believe they just stopped falling down! Thus, here is once more a request for fireball reports. If you have seen a fireball (or heard of someone else who saw a fireball), please report it to Gordon Sarty or myself ASAP. We are still very interested in collecting data on all fireballs brighter than -4 magnitude.

Rick Huziak

Comet Shoemaker-Levy 9 Impact Predictions

For those who are planning to observe the effects of this summer's collision between comet Shoemaker-Levy 9 and Jupiter, I've collected some predictions together below.

Below is some information that was posted to the internet by an astronomer at the Space Telescope Science Institute on March 16, 1994.

The following are some quick notes from this afternoon's session on the Shoemaker-Levy impact with Jupiter at the Lunar and Planetary Science Conference in Houston. These notes are from presentations by B. A. Ivanov, W. Benz, D. A. Crawford, T. Takata, T. Ahrens, R. Wichman, and J. Melosh, among others. If I have misrepresented anything they said, it is my fault and not theirs.

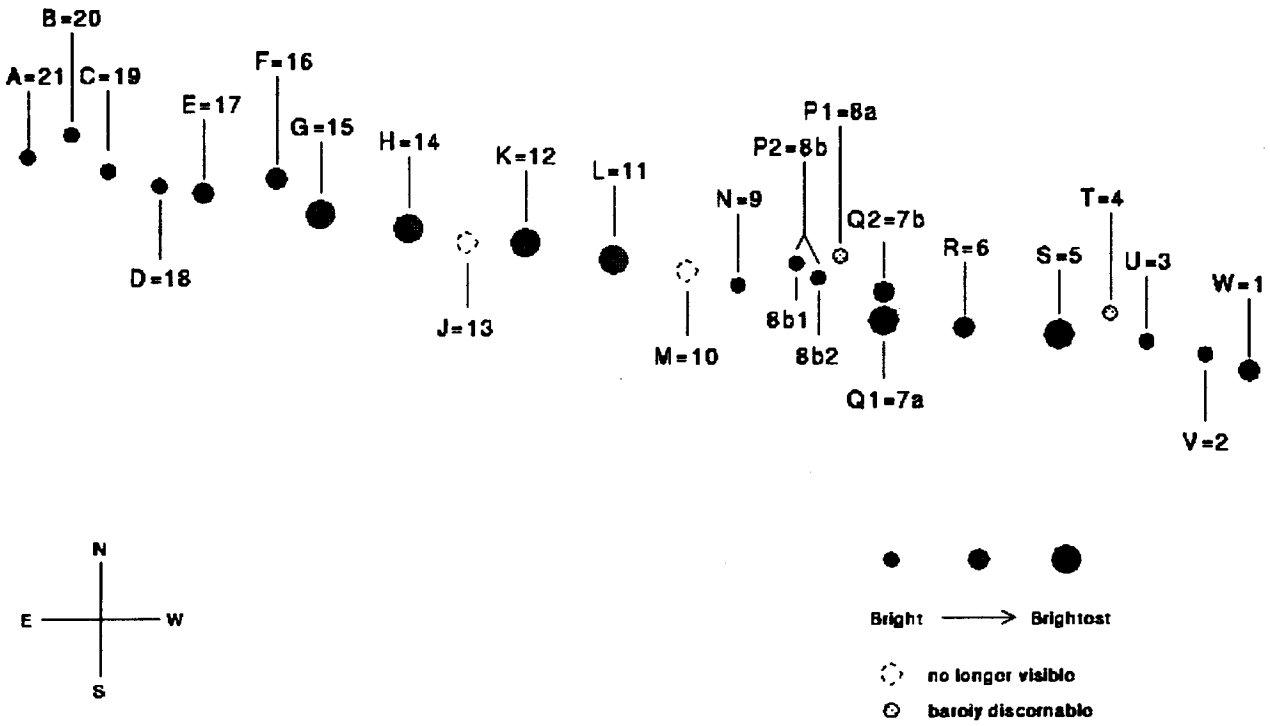
A couple of teams presented the results of detailed modeling of the impact of a 2-km to 4-km icy body into the Jovian atmosphere. They agree that such a body will penetrate to a depth of around 300 km below the visible cloud-deck before final breakup, with maximum energy deposition around 200 km. The resulting fireball will rise to the surface in about one minute and will continue to expand to an altitude (and width) of several hundred km. When it breaks the surface the fireball will have a temperature of around 2000 degrees Kelvin and may briefly exceed the entire luminosity of Jupiter. Galileo will have an excellent view. As seen from earth the fireball should also be visible "above" the (dark) limb of Jupiter once it reaches a height of about 400 km. However most of the energy will be in the near-infrared, not in visible light.

However all of that depends on the existence of a consolidated (though not necessarily strong) impactor at least 2 km in diameter. I briefly mentioned results from recent Space Telescope images, namely that we have a firm upper limit of 4 km, but no lower limit, on the size of any solid body in any of the present coma condensations of Shoemaker-Levy. In fact there is no hard evidence of any solid cores larger than gravel-sized. Of course small bodies will only burn up in the upper Jovian atmosphere; anything smaller than 100 meters in size won't even make it to the visible cloud deck.

Incidentally, current estimates are that the impact site will rotate into earth visibilty 8 to 16 minutes after impact. However the plume could be visible around the limb of Jupiter less that one minute after impact.

Let me add a personal note here, lest too many people are tempted to rush out and buy a telescope from K-Mart: The plumes that we are talking about will be sub-arcsecond in size as seen from earth. They may be detectable in the infrared by sophisticated professional equipment, or directly by Space Telescope; but they will hardly be visible with amateur equipment. There remains some possibility of long-lasting albedo features at the Jovian latitude of the impacts, but that wasn't addressed at this meeting so far as I heard.

Also W. Benz gave a nice talk on the breakup mechanism and possible pre-breakup state of Shoemaker-Levy that resulted in the present > 21 pieces. He says that a homogeneous body cannot break up that way under tidal forces: "No snowball breaks into 21 pieces!" He, and also some others, feel strongly that the



Schematic diagram of Shoemaker-Levy 9 showing positions of fragments (from March HST images).

comet must have been a "basket of eggs" before the breakup, there being possibly several hundred "eggs" of sub-kilometer size. After breakup the pieces could have re-formed into 21 clumps under their self-gravity. An essential point is that the re-formed clumps would all come out about the same size, which is as observed for the comet at present, and also for old crater-chains reported on Ganymede and Callisto by Melosh et al. and attributed to similar cometary breakup events in the distant past.

Benz had one caveat for his model: It depends upon breakup under tidal forces only. However on its most recent close approach to Jupiter the comet actually went inside the Jovian ring system. If it hit something of meter-size or larger in that passage it could have suffered catastrophic collisional breakup, for which the dynamics are very different.

Some predictions as posted by the University of Arizona:

The following table gives the latest impact predictions as of 1994 February 23 by P.W. Chodas, D.K. Yeomans and Z. Sekanina of JPL/Caltech. The 21 major fragments are denoted A through W in order of impact, with letters I and O not used. Fragments J and M have been deleted from the table because they have disappeared: they are not visible in the HST image taken in late January.

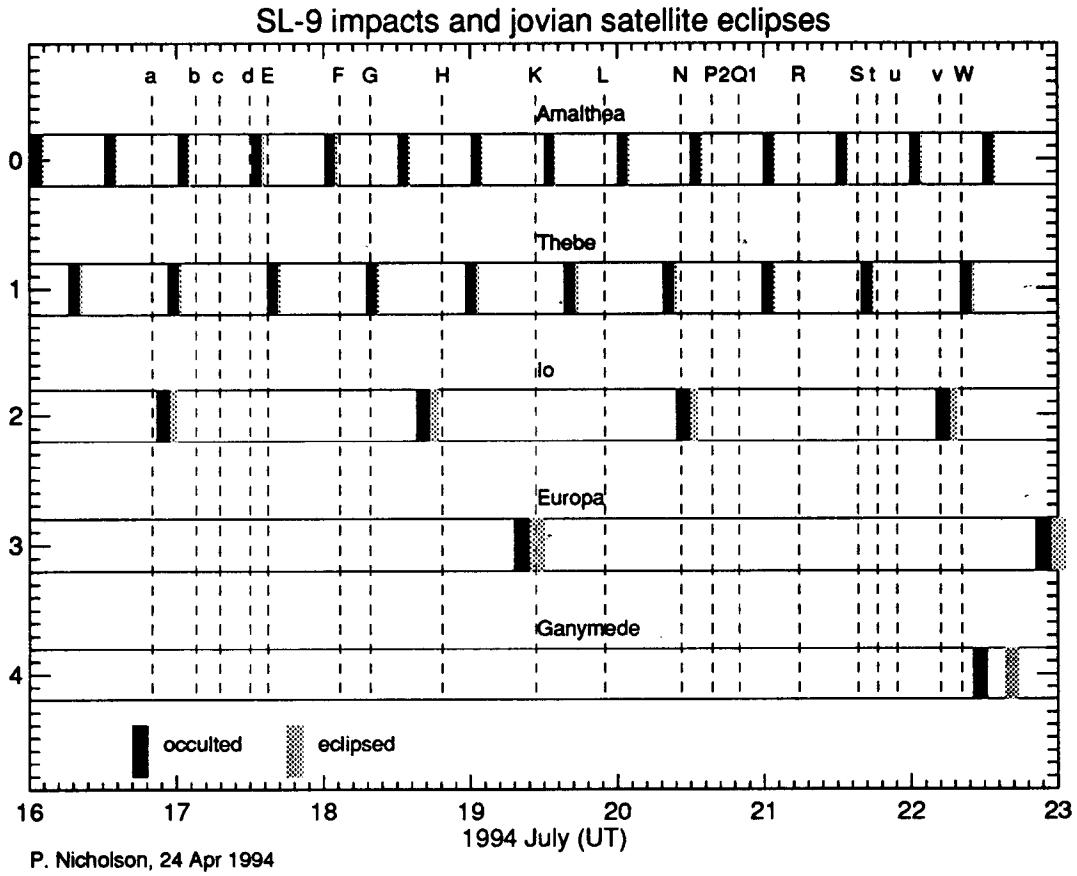
SHOEMAKER-LEVY — PROJECTED IMPACT TIMES
JULY 16-21, 1994, CENTRAL STANDARD TIME

NUCLEUS	UNIVERSAL TIME	UNIV. HOURS	CST DAY	LOCAL TIME (CST)	Probability of viewing impact			
					Io	Eu	Ga	Ca
A = 21	16.81	19.44	16	1:26 PM	0	3	3	3
B = 20	17.11	2.64	16	8:38 PM	3	3	3	3
C = 19	17.27	6.48	16	12:29 AM	3	2	3	3
D = 18	17.48	11.52	17	5:31 AM	3	0	3	3
E = 17	17.61	14.64	17	8:38 AM	1	0	3	3
F = 16	18.02	0.48	17	6:29 PM	0	0	3	3
G = 15	18.30	7.20	18	1:12 AM	0	0	3	3
H = 14	18.78	18.72	18	12:43 PM	3	0	0	3
K = 12	19.42	10.08	19	4:05 AM	0	3	0	3
L = 11	19.89	21.36	19	3:22 PM	0	3	0	3
N = 9	20.41	9.84	20	3:50 AM	0	3	0	3
P = 8	20.61	14.64	20	8:38 AM	3	3	0	3
Q = 7	20.80	19.20	21	1:12 PM	3	3	0	3
R = 6	21.28	6.72	20	12:43 AM	1	0	0	3
S = 5	21.61	14.64	21	8:38 AM	0	0	0	3
T = 4	21.75	18.00	21	12:00 PM	0	0	0	3
U = 3	21.88	21.12	21	3:07 PM	0	0	0	3
V = 2	22.18	4.32	21	10:19 PM	0	0	0	3
W = 1	22.32	7.68	22	1:41 AM	2	0	0	3

Table Notes:

1. The 1-Sigma uncertainty is 0.03 days, approximately 43 minutes.
2. Two fragment designations are given: the letter designation is that used in a preprint (Sekanina, Chodas, and Yeomans); the numerical designation is that used by Jewitt. Q=7 is the brightest. Fragments J=13 and M=10 have been deleted from the table because they are absent from the Hubble Space Telescope image taken in late January. It is also now apparent from the HST image that P and Q each consist of two components. In the above table, P refers to component P2=8b, the brighter and more easterly of the two P fragments, and Q refers to Q1=7a, the brighter and more southerly of the two Q fragments.
3. The predictions for fragments E and R are more uncertain than those for G, H, K, L, Q, S, and W, because the orbits are less well-determined.
4. The impact times above include the light time to the Earth (Approximately 43 minutes).
5. The probability that a given Galilean satellite will be in view of an impact is given in terms of sigmas: 0 indicates a probability of less than 68%, 1 indicates 69-95%, 2 indicates 96-99%, and 3 indicates a probability greater than 99%. For example, the probabilities that Io, Europa, and Callisto will be in view of the fragment Q impact are all greater than 99%.

The following chart and information was posted to the internet by Phil Nicholson.



This figure shows the times of occultation (black bars) and eclipse (grey stipple) for Amalthea, Thebe, Io, Europa and Ganymede between July 16.0 and 23.0, 1994, based on my own calculations. Overplotted as dashed lines are the predicted impact times for the comet nuclei. Lower case letters = faint nuclei, upper case letters = bright nuclei.

At the Library

Several books have been recently donated to our library. Some of these are listed below.

From Mike Wesolowski:

Atlas of the Heavens II Catalogue 1950.0, Antonin Becvar
Photoelectric Photometry of Variable Stars, D. Hall & R. Genet

From Dennis Duncan:

The Stars Belong to Everyone, H. S. Hogg
A House in Space, H. Cooper, Jr.
Messages from the Stars, I. Ridpath
Space Physics, H. Massey
The Space Enterprise, G. H. Stine
The Cosmic Connection, C. Sagan
Black Holes and Warped Spacetime, W. Kaufmann, III
The Galactic Club, Intelligent Life in Outer Space, R. Bracewell

Members can get access to the library after General Meetings or on Saturday nights when the U of S Observatory is open to the general public. Just identify yourself as an RASC member and ask the observing assistant to let you in.

Meteorite Search Trip

Kim Mysyk is organizing a meteorite search day trip for Saturday, May 14. The area to be searched will either be near Allan or near Kenaston. Either of which is less than an hours drive from Saskatoon.

The trip will be a day trip. Anyone who is interested in participating is asked to meet in front of the Health Sciences Building on the U of S campus (where the monthly General Meetings are held) at 8 a.m. on Saturday, May 14. We will leave from there (probably all in Kim's van) and spend the day searching for meteorites, returning to Saskatoon around 5 p.m.

Bring a lunch (so we won't have to interrupt the search), hiking boots, and if you have one, a geological hammer or a shovel or a pick. For more information on the meteorites being searched for, see the article "Detailed Records of Many Unrecovered Meteorites in Western Canada for which Further Searches are Recommended" by Halliday et al in the April 1989 issue of the *Journal of the Royal Astronomical Society of Canada*. For more information on this particular trip, please call Kim at 374-2485. Hope to see you there!

May 10th Solar Eclipse

Don't forget about the partial eclipse of the Sun on the morning of May 10 (if you get this newsletter by then!). Complete information about the eclipse can be found in the *1994 Observer's Handbook* beginning on page 91. Saskatoon skies will see about 55% of the Sun covered by the Moon. The eclipse is predicted to begin at 9:31 a.m. CST. The Sun should be maximumally covered by the Moon around 10:50 a.m. and the eclipse is predicted to end at approximately 12:15 p.m. Please call Sandy Ferguson at 931-3184 if you can help us out with the public viewing event that we are planning to have downtown that morning.

Astro-Buddies

Last month we described a new program the Centre has introduced where members and newcomers to astronomy are paired up with experienced observers, who would help the novice become more familiar with the sky. There is quite a bit of interest in this program and we have now paired up the following members. Feel free to contact each other directly and make your arrangements to get together to do a bit of skygazing.

- Rick Huziak (665-3392) is teamed with David Cornish (242-7125), Ted Firman (477-0314) and Terry Prentice (384-5258).
- Gord Sarty (374-8803) is teamed with Joseph O'Shea (343-1730), Trevor Brooks (phone unknown) and Paula Blush (phone unknown).
- Jim Young (343-0971) is teamed with Lloyd Zyla (244-0589) and Kevin Huot (934-2003).
- Al Hartridge (373-0034) is teamed with Les Dickson (249-1091) and Garry Brett (384-1807).

If any other members, who I have not been successful in contacting, are interested in being part of this program, please give me a call at 931-3184.

Sandy Ferguson

Cover Photo - NGC 4565

This months front cover shows the famous edge-on galaxy NGC 4565 in a photograph taken by Saskatoon member Al Hartridge. One of the many galaxies visible in amateur telescopes in the spring, NGC 4565 is located in the hairy constellation of Coma Berenices. At a rough distance of 20 million light years away, this galaxy may be an outlying member of the Virgo Cluster of galaxies.

Saskatoon Skies Information

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.
Next months deadline is Friday, June 3, 1994. 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. Electronic submissions are preferred as it saves me some typing. Mail or bring your submissions to:

Gordon Sarty
422 Edmund Park,
Saskatoon, Sask.
S7H 0Z4
phone: 374-8803

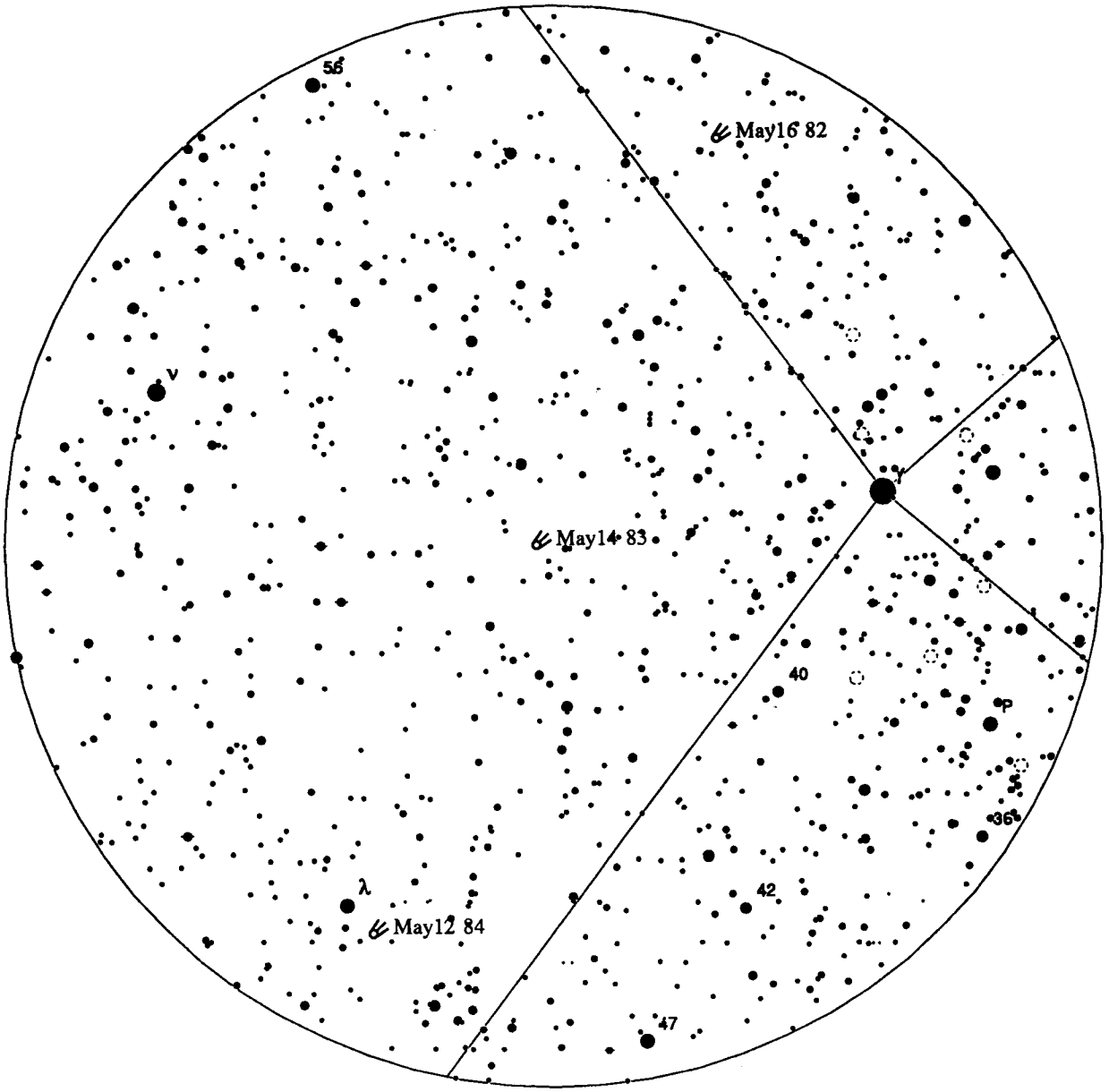
OR

Saskatoon Centre RASC
Box 317, RPO University
Saskatoon, Sask.
S7N 4J8

E-mail submissions to sarty@math.usask will also be accepted. Saskatoon Skies is a monthly publication of the Saskatoon Centre of the Royal Astronomical Society of Canada.

Comet Takamizawa-Levy Finder Chart

The latest co-find by comet-sleuth David Levy is currently visible in early morning Saskatoon Skies. Below is a finder chart centered on on the night of our Observers' Group gathering. Charts for other days can be found at the Rystrom Observatory. The dates at 0h UT are shown along with a predicted magnitude.



Comet Takamizawa-Levy (1994f)

(20h38m,+39d50m lim: 13.0)

1 2 3
4 5 6
7 8 9
10

double variable
Planet Asteroid Comet
Cluster Globular Open
Nebula Planetary Diffuse
Galaxy Elliptical Spiral
? Unknown Other Quasar