Saskatoon Skies

Volume 23, Number 9 | September, 1993

In This Issue:

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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 Saturday, October 2, 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. Electronic submissions are preferred as it saves me some typing. Mail or bring your submissions to:

Gordon Sarty
422 Edmund Park,
Saskatoon, Sask.
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OR

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Saskatoon Skies is a monthly publication of the Saskatoon Centre of the Royal Astronomical Society of Canada.

EDITOR'S NOTES

What a busy summer! We have a really active bunch of people in our Saskatoon RASC Centre. Here's a brief overview of what's been going on.

Al Hartridge, Jim Young and myself have been repairing the dome at the Rystrom observatory. I personally haven't worked it since mid August but I think it's pretty much finished except for a final gel-coat to be applied when all the bugs are gone (the present coat is absolutely furry with mosquitoes!). The job is an expensive one and we still need donations to pay for it. Please help out as much as you can.

I was to the Mount Kobau Star Party in B.C. this summer and was fortunate enough to have 3 clear nights out of 4. The skies there are superb. I was easily able to see 13th magnitude galaxies with my 8 inch telescope and the Helix nebula was a binocular object as were all of the Messier objects I took a look at. The Andromeda galaxy absolutely blew me away! It filled a full three degrees in my 2 inch finder and two dust lanes were easily visible in my 8 inch telescope. I could go on and on but Rick will have me do that at the September General Meeting anyway. Next years Mount Kobau Star Party is from Wednesday, August 10 until Sunday the 14th. While I was the only one from Saskatoon to go this year, a bunch of us are planning to go next year. Come with us if you can; better skies under the atmosphere are hard to find!

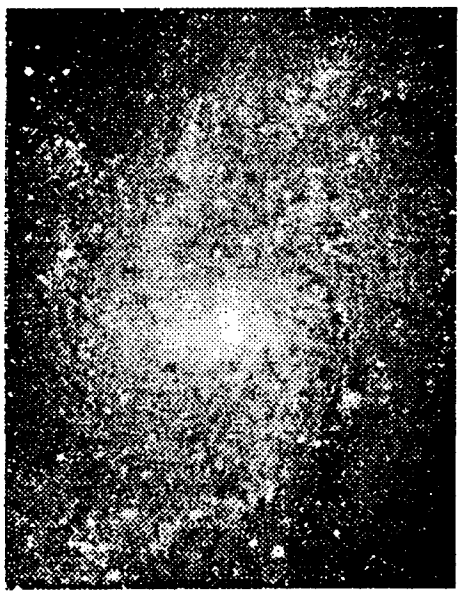
We had a very large turn out to the Perseid watch although most members ended up going to the Rystrom site instead of to Percy Crosthwaite's place. Rick Huziak was the only one to go to Percy's place where the skies are darker. Let's see, I remember Ed Kennedy and friends, the Rystroms, Jim Wood and friend, Al Hartridge, Jim Young, Bill Hydomako and kids and others that I can't presently recall – it was quite a gathering! For us who stayed late, we saw a doozy at about 12:18; a fireball that I estimated to be of magnitude -15. No kidding. It blazed through Andromeda (it was a Perseid) while I was looking at the globular cluster M92 in Hercules in the C-8 in the observatory. It lit up the sky so much that M92 was washed out!

Sandy Ferguson organized two major public starnights this summer. She has written about them later in this newsletter. Thanks Sandy.

And telescope making. Bill Hydomako tells me that he has purchased a 10 inch mirror from Al Walker so we can expect to see another "eye" in the Centre sometime soon. I'm half-way through my second home-built - a 6 inch f4 for my brother-in-law who lives in Boston and have ordered a 17.5 inch mirror for my third project. Finally, I plan on getting together with Mike Peters soon to see if we can finish the drawings for the Centre's 16 inch telescope. Phone me Mike if you see a free evening coming up.

Lastly, I need to mention that the Centre is trying to line up a presentation to City Council on October 12 at City Hall on light pollution. Come to the September General Meeting to find out more and plan on coming down to City Hall on October 12, the day after Thanksgiving.

Gord Sarty



Nearby Galaxy M33 in Triangulum was another object that showed much detail from the top of Mount Kobau. CCD image courtesy Pine Mountain Observatory, Oregon, USA.

OBSERVERS' GROUP MEETING

An Observers' Group observing session will be held on September 11 at Rystrom Observatory, weather permitting. Time: Anytime after 8:30 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.

SEPTEMBER PUBLIC STARNITE

Our second public starnight of the summer will be held on September 17 & 18. Saturn will be the best planet for this evening and some of the autumn objects will be available for viewing. Also the crescent Moon. The starnight is tentatively planned to be held at Diefenbaker Park, at the same location as the starnight we had in July. But note that there is a possibility that the starnight will be held at Beaver Creek instead. Contact Sandy Ferguson at 931-3184 on the week before the starnight to find out the final location.

SEPTEMBER EXECUTIVE MEETING

The September Executive meeting will take place at 7:00 p.m. on Monday evening, September 20 in room B-10, Health Sciences Building on campus. Note that this is a different from the usual meeting place at the observatory.

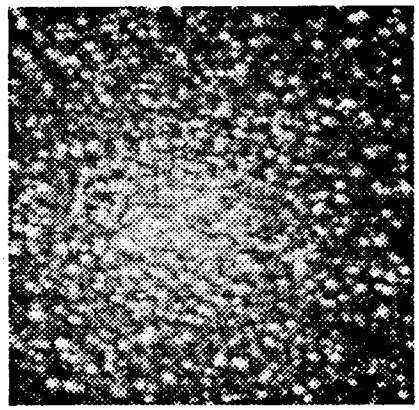
SEPTEMBER GENERAL MEETING

The monthly Centre meeting will be held on Monday evening, September 20 in room A-226, Health Sciences Building on campus, 8:00 p.m. Note that this is a change from the usual room B-111. The program will consist of presentations by Centre members on various the summer activities that they where involved in. Alot happened over the summer so be sure to come!

UNIVERSITY OBSERVATORY HOURS FOR SEPTEMBER AND OCTOBER

The U of S Observatory will be open to the public on Saturday evenings from 8:30 to 10:30 p.m. during September and from 7:30 to 9:30 p.m. in October. Visitors will be able to view Saturn, the Hercules star cluster, Alberio 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.

Globular cluster M13 in Hercules is a popular target for the telescopes at the RASC's summer public starnights. This CCD image from Pine Mountain Observatory, Oregon, USA shows the center of the cluster.



VARIABLE STAR NEWS

Some readers may have noticed in the past few months that one of the editor's favorite stars is the dwarf nova SS Cygni. Well, I have collected my observations of that star together along with some observations made by members of the Variable Star Observers' League of Japan (sent to me via e-mail). The result is the light curve plotted below which shows how unusually active SS Cygni has been this summer. My observations are represented by the tiny diamonds. For reference, Julian Day (JD) 2449109 is May 1, 1993; JD 2449140 is June 1; JD 2449170 is July 1; JD 2449201 is August 1 and; JD 2449232 is September 1, all at 6 a.m. CST.

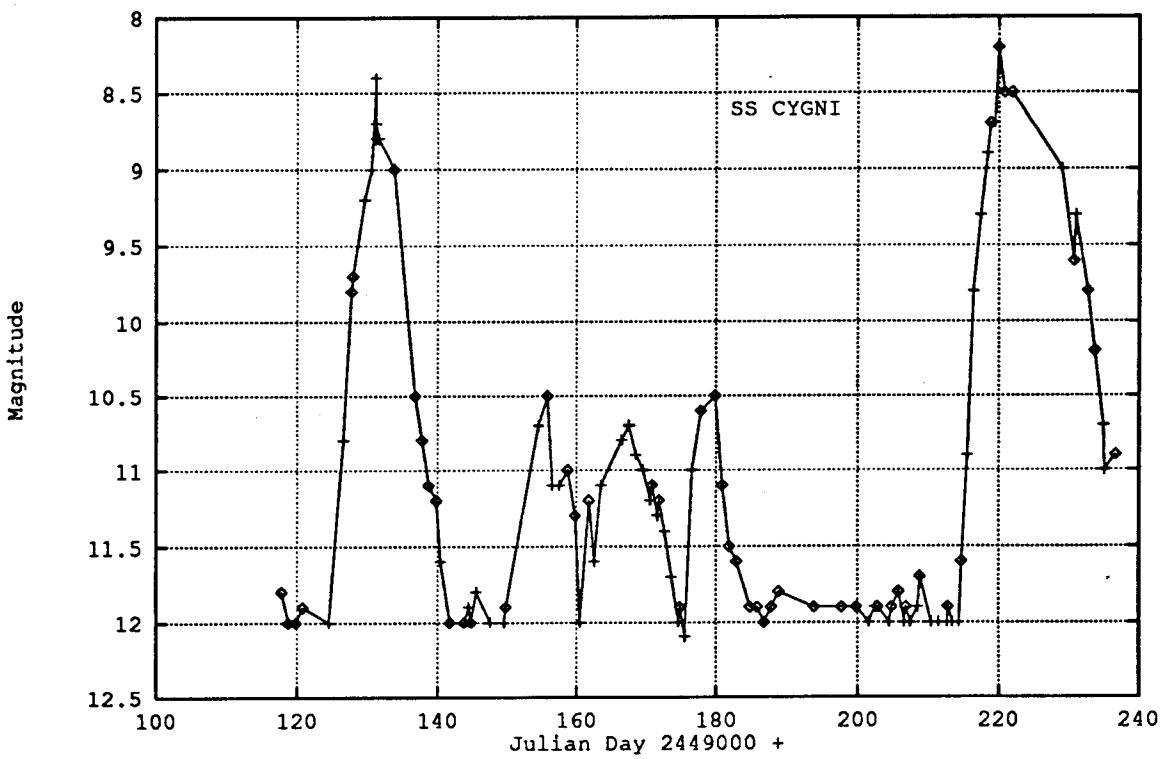
The three smaller peaks show very unusual activity for SS Cygni, which normally has outbursts to roughly magnitude 8.5 like the May and August outbursts. After the three bursts, the star system settled back to its normal quiescent behaviour between July 21 (JD 2449190) and August 10 (JD 2449210). The latest burst is, however, very long in duration compared to the norm so the star is worth looking at every chance you get.

Rick Huziak and I have noticed that R Coronae Borealis has started to fade from it's usual magnitude of 6.0. The last time Rick saw this happen was in July of 1988. The star will get quite faint, down to roughly 14th magnitude, in the next couple of months. This fading is believed to be caused by the star belching a cloud of "carbon soot".

Finally Rick wishes to mention that his predictions for the eclipses of β Lyrae as published in the July issue of *Saskatoon Skies* are off by a couple of days. Actually not bad considering that the predictions were based on some older observations of his. The *Observers' Handbook 1993* gives data in the Variable Stars section that allows a more accurate prediction of the eclipses. Here is what those numbers predict for the minima of β Lyrae (times are CST to the nearest half hour; daylight minima also listed):

β Lyrae - Aug 10, 18:00; 23, 16:00; Sep 5, 15:00; 18, 13:30; Oct 1, 12:00; 14, 10:30; 27, 9:00; Nov 9, 7:30; 22, 6:00; Dec 5, 4:30; 18, 3:00; 31, 1:30

Gord Sarty



COMET SHOEMAKER-LEVY/JUPITER COLLISION: SOME PREDICTIONS

There have been several postings to the internet computer news service (in sci.astro) that discuss the possible collision between Comet Shoemaker-Levy (1993e) and Jupiter next year. Presented here are some excerpts from those postings.

The following information was posted by Ross Smith (e-mail address: alien@acheron.amigans.gen.nz).

Comet P/Shoemaker-Levy passed very close to Jupiter earlier this year, and was broken into several pieces by tidal forces. Most of these pieces are now in a wide, highly eccentric orbit around Jupiter. Calculations of the orbit indicate that most of the pieces will impact the planet on their next perijove (closest approach), in July 1994.

Observations through several large telescopes, including the Hubble Space Telescope, indicate that there are about 20 large fragments. Most of these are probably on the order of a kilometre in diameter; the largest, according to HST, is about 15 kilometres in diameter. Presumably there are also a lot of smaller fragments.

Currently there is still some uncertainty in the orbital elements, but we can narrow down the time of collision to the week of 21 to 27 July, 1994. David Levy estimates that, by the end of this year, we should know the impact times for the visible pieces down to the second.

The details of what will be visible from the Earth depend very much on whether the fragments strike the visible face of Jupiter or the far side. Several people have made estimates of the visual magnitudes involved, based on varying assumptions about the mechanics of the collisions. A typical calculation assumes a fragment one kilometre in diameter, with a density comparable to that of ice (giving a mass of $5x10^{11}$ kilograms), impacting at a speed close to Jupiter's escape velocity (60 kilometres per second); this gives a kinetic energy of $9x10^{20}$ joules, or an explosion equivalent to 200,000 megatonnes of TNT. For comparison, the largest nuclear weapon ever exploded on Earth was about 60 megatonnes; the volcanic explosion of Krakatau, Indonesia, in 1883 was about 1500 megatonnes.

Assuming (fairly arbitrarily) that most of the energy is released on a time scale of about one second, and that about one percent of the energy is in the form of visible light (anyone want to comment on this?), the power in the visible spectrum is $9x10^{18}$ watts, equivalent (at Jupiter's distance of about five astronomical units) to an apparent visual magnitude of about -4, or about the same as Venus (which is visible to the naked eye in daylight). The big, 15 kilometre piece would of course produce much more energy, giving a magnitude (on the same assumptions) of about -13 (similar to the full moon). Obviously these figures should be taken with a large quantity of salt!

Of course all this assumes that the impacts are on the visible face of the planet. Unfortunately, it now appears likely that most of the fragments will strike the far side of the planet. We won't see anything directly, but it seems likely that at least some of the impact flashes will be visible by reflection off some of Jupiter's satellites.

We may get lucky, though. The cometary fragments are currently spread out roughly in a straight line, almost perpendicular to their orbital path. The length of this 'train' is greater than the diameter of Jupiter. If they are still in a similar formation when they reach the planet (orbital mechanics suggests that the formation will close up somewhat by then, though), the impacts could be scattered over a wide band on Jupiter's surface, and some may be on the visible face. We should know more over the next few months, as the orbital elements of the fragments are more accurately determined.

The Galileo probe will not have reached Jupiter by then but its instruments will probably be pointed at the planet anyway, and (since it will be approaching Jupiter from a different angle) may see some events invisible from Earth.

Nobody knows for sure what effect the collision will have on Jupiter. Almost certainly the effects of the collisions will still be visible when the impact sites rotate into view (assuming the events are on the far side, as seems likely). How long the effects might last is anyone's guess. Some suggestions range all the way up to creating another Great Red Spot.

The following is from an item submitted to internet news by Michael Richmond of Princeton University on June 22, 1993.

Bill Higgins has asked "Can we see the Comet Shoemaker-Levy/Jupiter collision by looking at the light reflected off the Jovian satellites?" since the collision may occur on a point of Jupiter which is hidden from the Earth. The input assumptions he used are:

- comet is made of ice, has radius 500 meters

- comet hits Jupiter at its escape velocity, 60 km/s
- 0.001 (= 0.1%) of the total impact energy is emitted in the optical region of the spectrum
- the energy is emitted in 0.3 seconds

Given these assumptions, the total power in the optical is P = 3 x 10^{18} watts. Bill made some nice calculations of the amount of light reflected from the Galilean satellites, and found that, in the best case (Io), an optical flux of roughly 7 x 10^{-10} watts per square meter of optical photons would reach the earth.

Fortunately, I just happen to have been working on absolute flux calibration (for 93J, what else?), and so I happen to have at my fingertips the absolute flux of Vega observed on Earth (well, above the atmosphere, actually, but that's not greatly different at small airmass). Through the Bessell V bandpass, Vega's flux is about 3.2 x 10^{-6} ergs/(sq.cm-sec). If I simply add up all the flux through the Bessell U, B, V, R and I filters (which is probably not far from the total a human would see, since humans can't see I but UBVR have gaps in between), I get

$$\text{Vega's flux} \sim 1.5 \times 10^{-5} \text{ ergs/(sq.cm-sec)}$$

Converting the estimate above of reflected energy from Io to the cgs units,

$$\text{reflected off} = 7 \times 10^{-10} \text{ watts/(sq.m)} = 7 \times 10^{-7} \text{ ergs/(sq.cm-sec)}$$

So, I find that under these assumptions, the "flash" reflected from Io will be about 20 times fainter than Vega, which means

$$\text{flash "mag"} \sim 3.3 \text{ (given 0.3 sec duration)}$$

On the other hand, Io's normal brightness, due to reflected sunlight, is around 5.

My conclusion: Under the assumptions listed above, if the "flash" really is of short duration, it will be EASILY visible as a large increase in the brightness of Io. The same should be true, to a somewhat smaller extent, for Europa and Ganymede. On the other hand, if the "flash" lasts for several seconds, it might get hard to spot.

Oh, someone asked whether the atmospheric disturbances caused by the impact might be visible as the impact site rotates into view some hours later. In a paper soon to appear in *Astronomy and Astrophysics*, Neil Tyson, Michael Woodhams, Luca Ciotti and myself calculate the energy contained in the Great Dark Spot of Neptune to be very roughly 10^{31} ergs. I would guess that this is somewhat smaller than that of Jupiter's Great Red Spot, but perhaps similar to the energy in some of the smaller white cyclonic storms on Jupiter. The total energy of the impact of the body mentioned above onto Jupiter, about 10^{21} Joules = 10^{28} ergs, is much smaller than this. I suspect, therefore, that atmospheric disturbances won't be TOO pronounced, since equivalent amounts of energy are already present in a number of places in the atmosphere. Still, I'd bet that we will see some sort of short-lived disturbance.

If Shoemaker-Levy hits Jupiter at all, of course :-)

Finally, Graeme Waddington of Oxford University writes about the orientation of the comet's "string-of-pearls" pieces (written July 13,1993).

The corotating jovicentric frame is defined as having the sun always on the negative x' axis, y' in Jupiter's orbital plane perpendicular to x' and in approx direction of motion of Jupiter, and z' out of Jupiter's orbital plane.

At the present time the comet is at apojove, 0.3315au from Jupiter and the centre of the train is around x', y', z' = -0.0186, -0.2413, -0.2265 au with a jovicentric velocity of u', v', w' = -0.00024, 0.00005, -0.00003 au/d. From my integrations the nuclear-train is roughly orientated along the x', y' ,z' direction -0.175, -0.743, -0.647. Hence the angle between this direction and the u', v', w', (velocity) direction is 84 degrees. But, this ignores the fact that the corotating coordinate frame is moving at approx 0.0079 au/d in v' (Jupiter's approx motion in J2000 inertial system). In terms of actual velocity, rather than velocity relative to Jupiter, the angle between the velocity and alignment vectors is around 43 degrees.

In March next year, when the comet will be 0.244 au from Jupiter, the angle between the jovicentric velocity and the train will be around 19 degrees whilst the angle between the J2000 velocity and the train direction will be around 36 degrees.

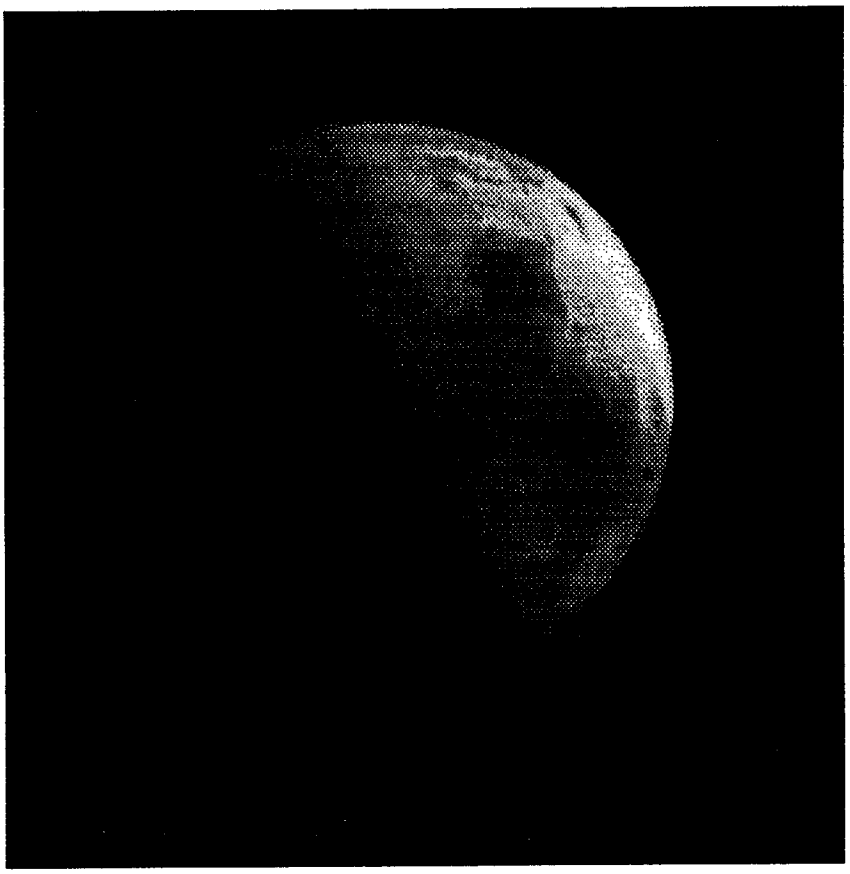
Hope that clears up what the situation is. For something like 1993e in a bound satellite orbit it makes sense to use planetocentric coordinates and relative velocities even though you do tend loose a certain amount of feel for the physics when using a rotating frame of reference.

FIRST MARS OBSERVER IMAGE

Photograph of the planet Mars taken at 8:52 p.m. Pacific Daylight Time on July 26 by the high resolution, narrow-angle telescope of the Mars Observer Camera. At that time, the Mars Observer spacecraft was 5.8 million kilometers (3.6 million miles) and 28 days from its encounter with Mars. The resolution in this image is approximately 21.5 km (13.4 mi) per picture element and Mars, roughly 6,800 km (4,200 miles) in diameter, is about 315 picture elements across. North is to the top of the image; the south pole is near the bottom but in shadow. The sunrise line (terminator) stretches across the morning hemisphere from lower right to upper left. At this distance from Mars, only bright and dark markings resulting from variations in the amount and thickness of dust and sand are visible. Toward the bottom of the picture is a bright, roughly circular area called Hellas, an impact basin 2,000 km (1,250 mi) across. The dark area in the center of the frame is Syrtis Major, a region of volcanic plains and dark sand dunes. At the top of the photograph is Nilosyrtis, an area of buttes, mesas and box canyons reminiscent of the deserts of the southwest United States. Launched on Sept. 25, 1992, Mars Observer will enter Mars orbit on Tuesday, Aug. 24, at about 1:30 p.m. PDT. In-orbit engineering checkout of the camera is scheduled to begin Sept. 16. The camera and six other investigations begin mapping operations from a circular orbit just 400 km (248 mi) above the surface on Nov. 22. The Mars Observer Camera was developed by and is operated under contract to Jet Propulsion Laboratory by an industry/university team led by Malin Space Science Systems, San Diego, Calif.

[Editor's note: Last communication with the Mars Observer was in late August. At "press" time communication had not been reestablished.]

PUBLIC INFORMATION OFFICE
JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PASADENA, CALIF. 91109. TELEPHONE (818) 354-5011



PUBLIC STARNIGHT - DIEFENBAKER PARK
JULY 23/24, 1993

Our latest public starnight was held on the above-noted dates and was a moderate success. I say moderate, because both nights were attended by far more mosquitoes than members of the public!

Members and scopes were out on both the Friday and Saturday nights. In the beginning, skies were mushy on both nights. However, they did clear up markedly after a couple of hours. The crescent moon and Jupiter were low in the west at dusk and we managed to get a very brief look at them before heavy cloud set in, in that part of the sky. Since we were only a month past Solstice, darkness wasn't upon us until quite late, so our observing was restricted to brighter objects, such as Saturn and Albireo, prior to midnight.

Once the skies cleared up, we were able to show the 20-25 visitors who braved mosquito attack a variety of the summer objects available. The standard starnight objects, such as M-11, M-13, M-27, M-57 and others were viewed through various scopes and binoculars. A couple of very bright meteors were also observed. The observing session for the most part broke up around 2:00 a.m. However, we left Rick Huziak and Gord Sarty in the middle of the field observing variables in the company of a few million buzzing, swarming, voracious Culicidae!

Thanks to Don Friesen and his buddy, who created a monster "Welcome to the Universe" sign, to direct everyone to our observing site at the Park; to Rick Huziak, who had the good sense to suggest spraying mosquito smog/fog around the telescopes and ourselves (it did help!) and to all the members who brought themselves and their scopes out for the event (YOU know who you are!)

Sandy Ferguson

WANUSKEWIN STARNIGHT

Earlier this year the Centre was approached by Vance McNab, Director of Visitor Services at Wanuskewin Heritage Park, asking if we would be interested in providing a slide presentation and starnight for approximately 20 native science camp students on the park grounds, during the week of August 9-13. Although this was the week of the Perseids, we jumped at the chance, always eager for the opportunity to "spread the word" about astronomy! Mr. McNab had hoped that we could be there the night of August 11th, the shower peak, but after some discussion it was agreed that the evening of Thursday, August 12 would be better, as most of our members would be observing the shower of the 11th and would not be available to do a starnight that night. The slide presentation did not present any problem as Rick Huziak had kindly agreed to give a talk to the students during the afternoon.

Everything seemed to be falling into place relatively well, until the morning of Tuesday, August 10th, when I received a call from Professor Kennedy, suggesting I take a quick look on page 2 of the Star Phoenix. I did. And Lo! There was a sizable ad by Wanuskewin advising that they were opening the park to the public for a meteor session and starnight the evening of the 12th. They even mentioned our presence there with telescopes! This, as well as the hype the media had been giving the Perseids that week gave the starnight a whole new dimension!

(At this point it might be mentioned that on seeing this ad, my blood froze. I suspect I still suffer from the after-effects of Halleymania in 1985/86, when, as a member of the Ottawa Centre, was organizer of a public Halley starnight. We anticipated approximately 200 people might show up to see the comet and had 10 telescopes available for observing. The media caught wind of it and we ended up with over 800 people stampeding over a local schoolyard, bearing down on the 10 telescopes and about 15 terrified Centre members, who, in addition to being responsible for running the 'scopes and providing information, were also responsible for traffic and crowd control! It was the stuff nightmare are made of! However, that's another story!)

Although 200 people at Wanuskewin would be excessive, we went looking for additional telescopes, just in case! However, as expected, most members who were to be part of the shower observing session on the 11th would be pretty beat on the 12th to be part of the Wanuskewin experience! However, Scott Alexander had sufficient energy to bring himself and his 14.5 Dobsonian in from the Elrose area to be at the Park that night. So, we ended up with Scott's scope and my 10".

We arrived at Wanuskewin at dusk and set up in the amphitheater to the north of the building. The floor of the amphitheater is wooden planks, and as the evening wore on we had to move the scopes to the

concrete area adjacent to the centre of the floor, as movement from people walking around caused the scopes to vibrate. This caused us to lose a bit of the horizon, but not enough to interfere with viewing by much.

A number of visitors to the park were already there for the public starnight when we arrived. The 20 science students came shortly after, bearing pillows and sleeping bags for Perseid watching. They were ages 10-13 years and came from all over North America – mostly Saskatchewan, Manitoba and Alberta, but a number that I spoke with came from the Dakotas and one was overheard to come from the Southwest United States. They were here with their teachers to spend a series of one-week seminars on different aspects of science, located at a variety of institutions, including the U of S colleges of Engineering and Agriculture, Sask Indian Federated College, SaskTel and SaskEnergy, City of Regina/Stats Canada and Wanuskewin, of course.

We started the session with a brief talk on meteors and what they could expect to see of the Perseids that night. They were an interested group of students, who asked thoughtful questions, and the teachers accompanying them encouraged then to contribute their own ideas and opinions. Later on, when they were lined up at the scopes, these questions continued, and there were a number of comments from individual students on their experiences with star-gazing, and information on the sky acquired through grandparents and other elderly family members. Native teaching by word of mouth is still evident in this generation.

The observing session for the students and the members of the public that followed kept us pretty busy. About 60 people attended, including a lot of families with young children. We had all the popular summer objects in the scopes, including Alberio, M-11, M-13, M-27, M-31 and, M-57. We caught a glimpse of Jupiter early in the evening, and Saturn impressed everyone later on. An auroral arc was evident in the north for most of the evening, although it never amounted to anything spectacular and didn't interfere with observing. As for the Perseids and sporadic meteors, if the number of "oohs and aahs" we heard were any indication, there must have been a good many still flying around!

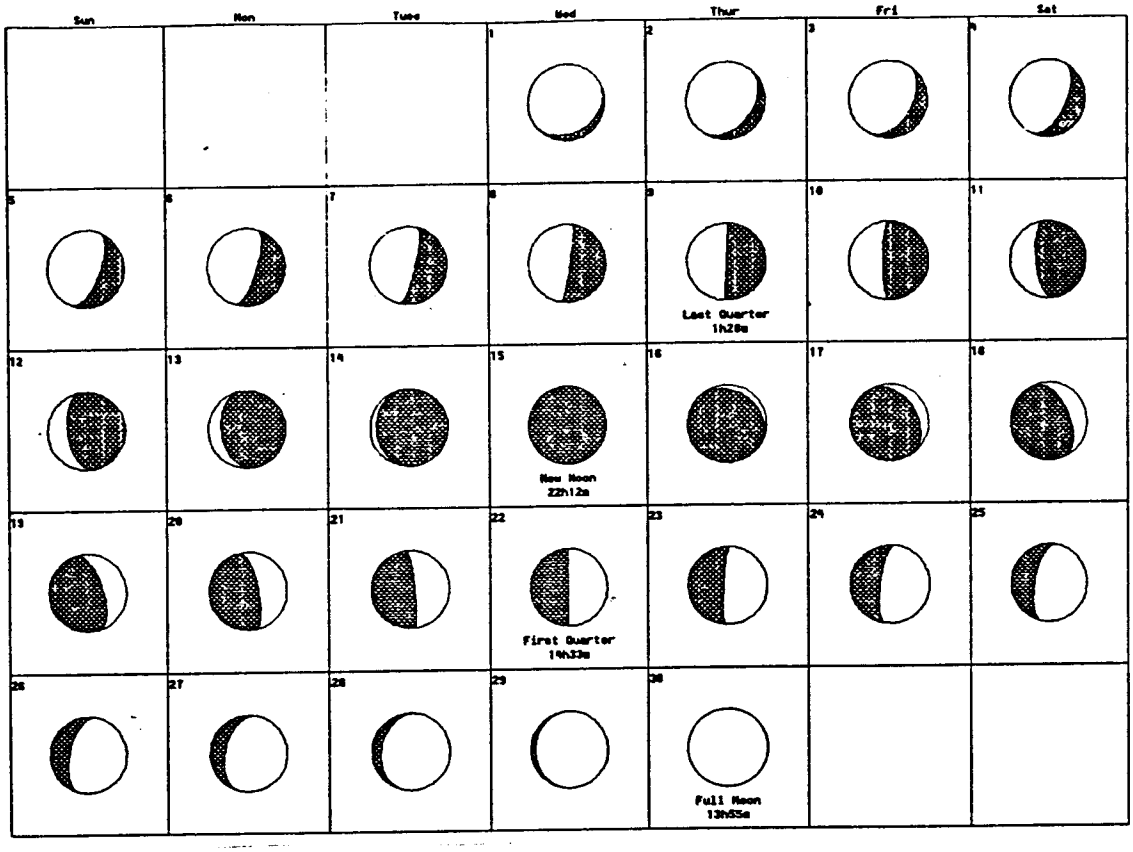
The sky at Wanuskewin isn't bad. Being north of the city would make for an impossible southern horizon, you would think. However, setting up where we did in the park, that is below ground level on the floor of the amphitheater, blocked out a good bit of the sky glow. Once twilight disappeared, the remainder of the horizon and sky was quite good. The Milky Way was certainly spectacular, and there was no problem seeing M-31 naked eye (not a tough object anyway, but it indicates a sky no worse than, say, Rystrom's).

This first starnight with Wanuskewin was very successful. The Heritage Park was appreciative of the Centre providing them with our services and gave us the opportunity to do some observing from a different location. It is hoped that Wanuskewin will invite us back for other events. Thanks to Rick Huziak for giving the daytime slide presentation to the students, during a very busy week for him, and to Scott Alexander for coming the distance at an equally busy time for him.

Sandy Ferguson

Faint galaxy M74 in Pisces is well placed for fall viewing from the Saskatoon Centre's Rystrom dark site. CCD image courtesy Pine Mountain Observatory, Oregon, USA.

THE MOON IN SEPTEMBER



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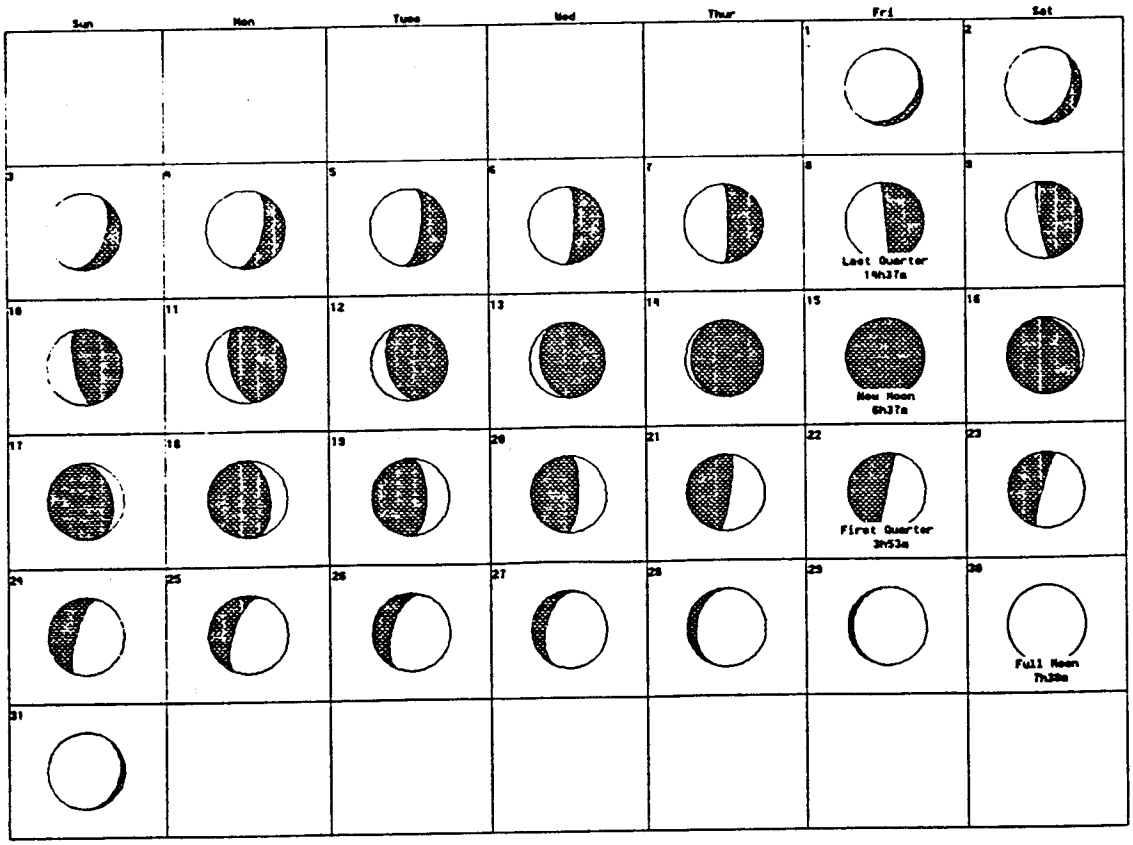
THE MOON IN OCTOBER



Courtesy Jim Young.

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