

Saskatoon Skies

**The Newsletter of the Saskatoon Centre
of the Royal Astronomical Society of Canada**

Volume 32, Number 01

January 2001



With Venus getting higher in the evening sky, beautiful conjunctions with the moon will become more noticeable over the next few months. This photo-graph of the 4-day old moon passing Venus

was shot on Dec 29, 2000 by Murray Paulson of the Edmonton Centre. See his planetary article on page 5.

RASC Calendar Happenings

Date (2001)	Event	Contact	Telephone
Jan 15	Executive Meeting - Room 8313 - 6:30 pm	Les Dickson	249-1091
Jan 15	General Meeting - Room 8313 - 7:30 pm - Rick Huziak - <i>Discovering New Variables</i>	Les Dickson	249-1091
Jan. 19	Youth Group Meeting -Nutana - 7:30 p.m.	Andrew Krochko	955-1543
Feb. 2	Youth Group Meeting -Nutana - 7:30 p.m.	Andrew Krochko	955-1543
Feb. 11 - 25	Zodiacal Light in W after evening twilight	Rick Huziak	665-3392
Feb. 19	Executive Meeting - Room 8313 - 6:30 pm	Les Dickson	249-1091
Feb. 19	General Meeting - Room 8313 - 7:30 pm - UofS Students Explain Sleaford Science	Les Dickson	249-1091
Mar 19	Executive Meeting - Room 8313 - 6:30 pm	Les Dickson	249-1091
Mar 19	General Meeting - Room 8313 - 7:30 pm - Paul Campbell, Edmonton Centre	Les Dickson	249-1091

Sky Buys and Mirror Sells - Recycle Your Old Stuff!

The Saskatoon Centre's Swap and Sale Page!



For Sale: Brass lined trunk for SC-8 or SC-10: 9 mm Kellner eyepiece; 7X35 Marksman binoculars with case: and some very good astro books: *Skywatching* and *Advanced Skywatching*, by David Levy, *Nightwatch* by T. Dickinson, National Audubon Society *Field Guide to the Night Sky*, *the Pocket Guide to Astronomy* by I. Ridpath. All books are in excellent shape. Call Darrell Chatfield for prices at 374-9278.

For Sale: Nearly new Meade 10" LX200 with accessories. Hardly used. Includes 2 power supplies, 3 eyepieces, carrying bag, Meade dew shield. \$3000.00 OBO. Call Richard Allen at 665-5769.

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Notes from the Lunatic Fringe

by Daphne Lowden

"Houston, this is Tranquility Base. The Eagle has landed." Words that shook the world and made us heave a collective sigh of relief. The sighs would have been even heavier if the world had been privy to some of the background information to the programme that set the first man on the moon. The early American space programme was full of mistakes and accidents, careless workmanship and sloppy thinking. The scientists involved in the programme were not always on the right track when it came to how things were going to get done, and sometimes it took an "outsider" to point them in the right direction.

Take, for instance, the idea of how to actually land a man on the moon, and then get him home again. Dr. Maxine Faget and the other scientists in the *Space Task Group* at the Langley Research Centre decided that there were two options. The first was the "direct ascent mode"; the second was the "earth-orbit rendezvous". Direct ascent was just what it sounds like - one rocket, about half as big again as the Statue of Liberty, was supposed to launch from the earth, go to the moon, land there, launch off, and return to the earth. The second one involved two rockets being launched, one to go to the moon, and one holding the fuel that the lunar rocket required to get there and home again. The lunar rocket was supposed to rendezvous with the fuel rocket in earth orbit, transfer the fuel over, then get to the moon, land, launch off, and return to earth.

It might not be obvious from the descriptions, but the idea was that the same rocket that launched from the earth would be the one landing on the moon. There was to be no lunar excursion vehicle, no lunar-schooner, just the original rocket minus a few stages that drop off when their fuel was depleted. Dr. Faget and the other scientists were going to have a 75-foot rocket land on the moon backwards (or upside-down, if you prefer), and take off again, unassisted. The Saturn rocket (smaller than the Nova rocket that these first two options required) took approximately 3000 people to launch successfully, plus all the launch facilities. If the holding arms on the Saturn rocket didn't let go within 15 milliseconds of each other when the proper lift off thrust was attained, the Saturn would fall over. Faget and NASA were going to have the three astronauts who were going to the moon land and re-launch on their own. Seriously, what do you think their chances of success would have been?

Luckily, Dr. John Houbolt, who was never associated with NASA, was willing to risk his career, because he was sure that he was right and that Faget and his team of scientists were wrong. He lobbied for two years (16 meetings in total), through several levels of bureaucracy and management, and got absolutely nowhere. Finally, in 1961, he wrote a letter directly to NASA's Associate Administrator, Richard Seamans, and suggested the Lunar Orbit Rendezvous. Within a month and a half, the scientists at NASA, including Dr. Faget, who had originally disliked LOR so much that he had had a shouting match with Dr. Houbolt over the concept, was touting it as *the only way to go!*

So where, exactly, is Tranquility Base? 0.7°N, 23.5°E. Have at 'er.

For those of us who do not own telescopes, and have to make due with binoculars, I include this general description. It is also useful if you want to explain to someone else, who is not familiar with the site, the location of the Apollo 11 lunar landing. It is especially helpful with individuals who are not familiar with astronomy. I originally used this with a university professor, except that I used the phrase "dark spots" instead of Mare.

Go outside when the moon is at least 8 days old. You notice at about 3 o'clock there is a Mare, and beside it there is a string of three Maria that are piled on top of each other. That middle Mare (the Sea of Tranquility) looks like it is being squeezed and is dripping into a smaller Mare that is directly below it. Go to the area that is being squeezed, on the upper left-hand corner. Move a little to your left, so that you are about a third of the way from the drip's corner and the northward curve of the Mare, and just a little inside the Mare itself. That is where Apollo 11 landed.

[Ed - Try out Daphne's way of finding the Apollo 11 landing site. We'll publish a map of the location in next month's Saskatoon Skies?]

The Planets This Month

By Murray D. Paulson

Mercury will be at greatest eastern elongation on Jan. 28 where it will under go dichotomy - half phase. The planet will shine at magnitude -0.5 and show a 7.09" disk. Two days later it will be at perihelion, 0.31 AU from the sun. Imagine the sun 3 times as big in the sky and 9 times as bright! It has swung around from superior conjunction behind the sun on Christmas Eve in just over a month and is headed to lapping us in another 2 weeks time! This evening elongation is a favorable one. The ecliptic rises steeply from the sun, and on the 28th, Mercury sets an hour and 47 minutes after the sun. This apparition is similar to last year's and you should be able to see Mercury shining brightly in the twilight. On the 12th of February, it will again be in conjunction with the sun; this time in inferior conjunction. Mercury will be between us and the sun and due to it's orbital inclination will be 3.7 degrees above the sun. Unlike Venus, Mercury is not a good target at inferior conjunction. Venus's atmosphere enhances its brightness at conjunction, but airless Mercury dims to magnitude 4.5, totally lost in the sun's glare.

At the beginning of January, Venus shines at magnitude -4.4 at a slightly gibbous 22.34" disk. Venus crosses the ecliptic on January 18th and is at the Vernal Equinox on February 2. Dichotomy occurs on the night of January 18th, where Venus will show a 24.8" disk

from 0.673 au distance. This is a favorable dichotomy to observe, well placed in the early evening sky where the gentle breezes of January will keep the mosquitoes at bay. The moon joins Venus on the evening of the 28th where it sits only 7 degrees below Venus. By early next month, Venus swells to 34" at mag -4.6 and a phase of 0.345.

In early January, Mars shines at magnitude 1.3 and shows a 5.47" disk. On the morning of the 19th, Mars passes less than a degree from magnitude 5.2 Zubenelgenubi - Alpha Libra, adding a first magnitude star to this dim constellation. The Earth is catching up on Mars and by early next month, Mars will have expanded to 6.8" and will have brightened to magnitude 0.8. It is considered worth observing when it expands to larger than 6", but at this size, only major features will be visible. On the good side, it will transit the meridian at 6:50 am, where it will sit 17-1/2 degrees above the horizon.

I am getting used to stepping outside after work and looking up to see brilliant Jupiter and Saturn in the evening sky, then as I turn to the south west, brilliant Venus. It is sort of reassuring to see them as my evening companions. At the beginning of the month Jupiter shines at magnitude -2.7 with a 45.5" disk and in one month's time it will dim slightly to magnitude -2.5 and shrink slightly to 41.38". Last month I mentioned a few interesting Jovian moon events, and I was lucky enough to catch a few of them. The first one was the simultaneous transit and shadow transit of Io just after opposition. You could see a dark crescent of shadow highlighting Io nestled in the South Equatorial Belt. In the second event, I was impressed as to how far south the Ganymede transits occur. I caught one event just days after opposition and could see both the moon and its shadow on the planet at the same time. The transit actually happened in the polar hood. It is also interesting to note that the shadow is lower in latitude than the moon itself. This is a result of the slight tilt of the Galilean moon's orbital plane relative to the plane of

Jupiter's orbit. It is really interesting to see where the different moons' shadows fall on Jupiter. The tilt of their orbital plane projects their shadow at successively higher southerly latitudes as you travel out from Jupiter. Callisto misses altogether. The Great Red Spot is still reasonably easy to see and there is always something happening in the equatorial zone or on the Northern Equatorial Belt.

I have listed some Galilean moon events at the end of this article - all times are Universal Time (UT). For example the event at 4:32 on the 12th is visible in Saskatoon at 10:32 pm on the eve of the 11th. Remember, midnight UT on the 11th = 0 hrs UT on the 12th, occurs on the 11th at 6 pm local time here in Saskatchewan.

I never tire of Saturn - those marvelous rings full of details and a handful of little jewel moons sprinkled about. The play of the planet's shadow on the rings is quite distinct now, and I keep wondering how much more those rings can tilt open. Saturn shines at

magnitude 2.0 with a 19.3" disk from its lofty 8.57 AU distance. By early February, it will shine at magnitude 2.2 and show a 18.3" disk. The moon will join Saturn and then Jupiter on the first and second of February. This is not quite as nice a grouping as last month where the moon formed the vertex of a 45-degree right triangle.

Until next month, clear skies and a plethora of planets. I can be reached for comment or feedback at mpaulson@ecn.ab.ca

Jovian Satellite Phenomena (all dates & times are UT. Subtract 6 hrs for CST)

Jan. 12

4:32 II.Tr.I.

6:33 II.Sh.I.

7:07 II.Tr.E.

9:10 II.Sh.E.

Jan. 15

2:20 III.Tr.I.

4:04 I.Tr.I.

4:25 III.Tr.E.

5:08 I.Sh.I.

6:15 I.Tr.E.

6:36 III.Sh.I.

7:19 I.Sh.E.

8:46 III.Sh.E.

Jan. 17

0:42 I.Tr.E.

1:48 I.Sh.E.

Jan. 21

1:05 II.Oc.D.

6:02 II.Ec.R.

Jan. 22

5:54 I.Tr.I.

5:58 III.Tr.I.

7:04 I.Sh.I.

8:05 I.Tr.E.

Jan. 23

1: 4 II.Sh.E.

3:14 I.Oc.D.

6:34 I.Ec.R.

Jan. 24

0:21 I.Tr.I.

1:32 I.Sh.I.

2:33 I.Tr.E.

3:44 I.Sh.E.

Jan. 26

0:35 III.Ec.D.

2:47 III.Ec.R.

Jan. 28

3:33 II.Oc.D.

8:40 II.Ec.R.

Jan. 30

1: 4 II.Sh.I.

1:13 II.Tr.E.

3:40 II.Sh.E.

5: 5 I.Oc.D.

Jan. 31

2:13 I.Tr.I.

3:28 I.Sh.I.

4:24 I.Tr.E.

5:40 I.Sh.E.

Feb. 2

0:09 I.Sh.E.

1:42 III.Oc.R.

4:36 III.Ec.D.

6:49 III.Ec.R.

Feb. 6

1:07 II.Tr.I.

3:40 II.Sh.I.

3:43 II.Tr.E.

6:17 II.Sh.E.

6:57 I.Oc.D.

Feb. 7

4:06 I.Tr.I.

5:24 I.Sh.I.

6:17 I.Tr.E.

7:36 I.Sh.E.

Feb. 8

0:39 II.Ec.R.

1:25 I.Oc.D.

4:54 I.Ec.R.

Feb. 9

0:46 I.Tr.E.

2:05 I.Sh.E.

3:20 III.Oc.D.

5:34 III.Oc.R.

Membership List is not included in the HTML version of this newsletter.

Notice of the General Meeting of the Saskatoon Centre

Monday, January 15, 2001 at 7:30 p.m.

Room 8313 City Hospital

Presenting

Rick Huziak - "*Discovering New Variable Stars*"

(A presentation given in Edmonton on January 8th)

U of S Observatory Hours

The U of S Observatory is open to the general public every Saturday from January through February from 7:30 p.m. to 9:30 p.m.. Admission is free. The observatory is located on campus, one block north of the Wiggins Avenue and College Drive entrance. On clear evenings visitors may look through the 6-inch refractor to the moon, star clusters, Jupiter, Saturn and other exciting astronomical objects. For further information, phone the recorded Astronomy Information Line at 966-6429.

Executive Members

Please remember that if you are on the executive council, we meet one hour prior to the General Meeting (6:30 p.m.) in Room 8313, in order to discuss Centre business. If you cannot make these times for some reason, please contact President Les Dickson early enough that he may brief others on matters you may be working on in your absence.

Interested in

Saskatoon RASC

Membership?

Regular - was \$48.00 per year

Youth - was \$26.00 per year

It's never too late to join!

The Saskatoon Centre operates on a one-year revolving membership. You will now be a member for the next 12 months no matter when in the year you join.

Benefits of Membership in the Saskatoon Centre

- knowledgeable & friendly amateur astronomers
- use of the Sleaford Observatory
- use of the UofS Observatory (after training)
- Saskatoon Skies Newsletter
- Observer's Handbook 2001
- The Journal of the RASC (bimonthly)
- SkyNews Magazine (bimonthly)
- use of the Centre library
- discounts to Sky & Telescope Magazine
- discounts of Sky Publishing merchandise
- discounts to Firefly Books
- free, no cost, no obligation, 3-month temporary membership if you don't want to join right now!

Saskatoon Centre Books for Sale

Books For Sale: The Saskatoon Centre has a number of Firefly Books left over from SSSP sales, and these are now available to general members to purchase at discount rates! There are only one or two copies remaining of the following titles. Contact Debbie Anderson at 242-8854.



Astronomy Quiz Book - \$10.00

Big Bang to Planet X - \$10.00

Exploring the Night Sky - \$8.00

Exploring the Sky by Day - \$8.00

Other Worlds - \$8.00

The Universe and Beyond - \$20.00

Cosmic Phenomenon - \$25.00

Extraterrestrials - \$8.00

The Christmas Eclipse

by Rick Huziak

With presents already opened and played with, that else would there be to do on Christmas morning? Watch a partial eclipse of the sun, of course! The University of Saskatchewan campus observatory decided to open their doors to the public for this eclipse, and invited members of the RASC to help with crowd control (remembering the hundreds of general public who attended the total lunar eclipse a year ago).

The observatory opened at 9:30 a.m., with U of S lab assistant Carmen and Astronomy 212 student Megan Hargrove at the helm. Les and Ellen Dickson showed up to help, as did I. The sky looked wonderfully clear as I was driving up, but within minutes of the start of the eclipse, a thick fog developed.

The first eclipse-viewers started to arrive at about 9:30 a.m. with the sky still sopped in. But with a bit of luck, by about 10:15 a.m., with the sun by now about 1/4 covered, I noticed a small break in the clouds, through which the developing crescent was showing at a very comfortable filtered level. (Even if it had been clear, one problem that was not fully anticipated was that the rising sun was not actually visible from the observatory for the first one and one half hours due to inconveniently placed trees and buildings). I lead a group of about 25 people out to the parking lot near the Student's Union Building where we all got the occasional glimpse through the thinning cloud.

Near mid-eclipse, just before 11:00 a.m., the sun had finally cleared the roof of St. Thomas Moore and the clouds thinned to form a perfect filter for safe naked eye viewing. It couldn't have been better! An what a time to forget my camera! Actually - it was more of a conscious decision. "Why would I want yet another picture of a partially eclipsed sun?" I thought as I was packing the car that morning. So I left my camera at home and missed the opportunity to photograph the eclipsed sun and the observatory in what would have been a beautiful picture and an easy exposure!

By the time the eclipse was done at just after 12:00 p.m., seventy-five people had come to the observatory and witnessed a spectacular celestial event on Christmas Day.

Messier, FNGC, H-400 & Binoc Club

MESSIER CLUB

Certified at 110 Objects: R. Huziak, G. Sarty, S. Alexander, S. Ferguson, D. Jeffrey, D. Chatfield, R. Christie, K. Noesgaard

Wade Selvig 71

Mike Stephens 68

Erich Keser 51

Andrew Krochko 42

Brent Gratias 39

Stan Noble 28

Mike Oosterlaken 28

Lorne Jensen 25

Les & Ellen Dickson 20

Debbie Anderson 17

Brian Friesen 15

FINEST NGC CLUB

Certified at 110 Objects: R. Huziak, D. Jeffrey , G. Sarty, D. Chatfield

Scott Alexander 89

Ken Noesgaard 24

Sandy Ferguson 23

Mike Stephens 7

Mike Oosterlaken 1

HERSCHEL 400 CLUB

Certified at 400 Objects:

Dale Jeffrey WOW- COMPLETED 400

Rick Huziak 376

Darrell Chatfield 305

Gord Sarty 147

Scott Alexander 98

Ken Noesgaard 44

Sandy Ferguson 18

Mike Oosterlaken 7

Chatfield BINOCULAR CERTIFICATE

Mike Stephens 42

Join the Messier, Finest NGC, H-400 & Binocular Club!

Observe all 110 Messier, 100 FNGC or 400 H-400, or 80 Binocular objects and earn your

CERTIFICATES!

The first 2 lists can be found in *the Observer's Handbook*. The Binocular List & Herschel 400 list will be available at each general meeting for 50 cents (covers photocopying) or **can be mailed out on request to distant members**. Each month I'll be posting updates.

Saskatoon's Herschel Certification

Darrell has now attained official approval to begin certifying observers for the Herschel 400 certificate. He and Jim Young will be Saskatoon's reps, and can now certify by reviewing a copy of the observing notes of the member making the claim. Dale Jeffrey has now been reviewed and will be awarded a certificate when it arrives from Florida!

Darrell has also reduced the number of Binocular List objects to 40 as to promote observing these objects in shorter time frame.

There has been little movement in the number on this list lately - please get out and observe. Ellen Kaye-Cheveldayoff, no longer a member, has been removed from the list!!

Send observing numbers to <huziak@SEDSsystems.ca>

MINUTES OF EXECUTIVE MEETING

for December 18, 2000, Room 8313, City Hospital

recorded by Darrell Chatfield <novachat@sk.sympatico.ca>

1. Minutes of Nov. 20/00 approved by Jim Y. Seconded by Les D.
1. Agenda approved by Darrell C. Seconded by Ellen D.
1. Les has not had time to contact Ken N. regarding the position of observer coordinator. He will attend to this soon.
1. Financial report given by Jim and Barb Y. Bank balance is \$11,870.91. Telescope fund is \$2222.32. SSSP deposit has been sent to the Cypress Hills Resort for 2001. Barb was working on the year end report to be sent to the National Office.
1. Rick H. has taken over membership while Bob Christie is away. He will update the membership list as soon as possible.
1. Andrew K. said that his youth group is doing well. There are about 6 main attendees. They went to the Campus Observatory for one of their activities in Dec./00
1. Rick gave a Sleaford report. He and Bill H. did more wiring in the warm up shelter, and did some paneling. The hand dryer needs to be hard-wired in. The U. of S. computer is gone. Darrell has volunteered to build some counters for the top of the metal lockers, and also build a bookshelf.

New Business

1. Andrew wondered if our Centre could buy some star atlases to be kept at our library as loaners. Edmonton has 10 copies of certain types. Jim mentioned the potential problems with this situation.
1. Darrell C. talked about revising his Binocular list from 55 down to a more manageable 40 items.
1. Daphne L. presented an idea for fundraising: selling tickets to the next solar eclipse in Africa in 2001. Jim Y. said due to the narrow spectrum of interest in the city, the idea would be hard to sell.
1. Rick mentioned about the partial solar eclipse on Dec. 25/00. The Campus Observatory will be opened at 9:30 a.m.
1. Les reminded us of the Gastronomy Night to be held on Dec. 21/00 at the Harvest Buffet on Circle Dr.

Minutes of the General Meeting

Room 8313, City Hospital, December 18, 2000, 7:30 p.m.

recorded by Al Hartridge, Secretary

1. Presentations:
 - Rick Huziak - Tripod Astrophotography
 - Les Dickson - The Edge of the Solar System
 - Andrew Krochko- Appropriate welder's filters for the Solar Eclipse
1. Approval of minutes of previous meeting- moved by Darrell Chatfield and seconded by Jim Young and carried.
1. Open Positions on the Executive for 2000 - 2001: Ken Noesgaard has yet to decide to be the Observing Coordinator.
1. Gastronomy: will be held on Thursday at 6:30 p.m. at Prairie Harvest Buffet.
1. Treasurer's Report: the present Bank balance is \$11,870.91.
1. Membership: at present there are 50 paid up members. We are now on the revolving membership format.
1. Youth Group: Andrew stated that presently there are 6 quite interested members. The last meeting was held at the U of S campus observatory.
1. Sleaford Site: Bill and Rick have all most all of the wiring. The electrical should be finished by the new-year. Still need to install locker counters and finish the floor. Please follow the instructions for the new toilet. AC power is now in the dome. The C8 will not be operable until the spring. The outhouse has an upgraded seat.
1. Herschel and binocular lists: notes for the Herschel list must be seen and certified by two members and then be sent to the States. Darrell has reduced the number of objects on the binocular list from 65 down to 40.
1. Fund raising: Daphne Lowden has been added to the Fundraising Committee.
1. Speaking Engagements: without advertising, just by word of mouth, Rick and Sandy could be giving talks every day of the week. They need help. If you are interested please volunteer to take on some of the load.

1. Items for the Newsletter: anecdotes from members have been suggested as an interesting addition to the newsletter. If you have any to offer please contact Mike Stephens.
1. Meeting adjourned at 9:18 p.m.

Roger Tuthill: Amateur Astronomer Par Excellence

Submitted by Scott Alexander

We [recently] received notice, from his wife Nancy, that Roger W. Tuthill passed [this December] after being ill for several weeks. Roger was a long-time member and supporter for many years of Amateur Astronomer's, Inc., Stellafane, as well as the United Astronomy Clubs of NJ, and many other astronomy organizations and endeavors. He is well known for his eclipse chasing from the early 1970s where he had seen first-hand about 18 total solar eclipses. He was also well known worldwide for his innovative astronomical products. He was an "Astronomical", as well as a good, friend to so many of us.

Mr. Tuthill was also a supporter of the Astronomical League. Roger was always ready to help out a fellow amateur astronomer. He did everything he could to promote amateur astronomy. He will be missed.

Astronomical Events Calendar for Jan 16 through Feb 23, 2001

Jan 16 3d Quarter Moon

Jan 17 Venus At Its Greatest Eastern Elongation of 47°

Mars 4° S of Moon

Jan 22 Mercury 0.4° S of Uranus

Jan 24 New Moon

Jan 25 Jupiter, Saturn Stationary

Jan 26 Mercury 3° N of Moon

Jan 27 Vesta 0.8° S of Moon

Jan 28 Mercury at its Greatest Eastern Elongation of 18°

Venus 6° N of Moon

Feb 1 1st Quarter Moon

Feb 2 Saturn 2° N of Moon

Jupiter 3° N of Moon

Feb 3 Mercury Stationary

Feb 7 Clyde Tombaugh's 95th Birthday (1906)

Feb 8 Full Moon (Largest of 2001)

Feb 9 Uranus in Conjunction with Sun

Feb 10 Mercury in Inferior Conjunction

Feb 11 Start of Zodiacal Light Visibility in W after Twilight; for 2 Weeks

Feb 15 3d Quarter Moon

Mars 3° S of Moon

Feb 15 Mercury Passes 4.3 Degrees From Uranus

Feb 23 New Moon

International Space Station and Mir Visible Evening Passes

Jan 15 to Feb 19, 2001

International Space Station

Date	Mag.	Start Time	Alt.	Az.	End Time
08 Feb	1.8	20:28:47	10 SW	20:29:32	15 SSW

09 Feb 1.3 19:21:36 10 S 19:24:18 14 SE
10 Feb 0.3 19:47:30 10 SW 19:50:32 30 SE
11 Feb -0.2 20:14:02 10 WSW 20:16:36 51 SSW
12 Feb 0.3 19:05:49 10 SW 19:10:53 13 E
12 Feb 1.0 20:40:45 10 W 20:42:30 32 WSW
13 Feb -0.6 19:32:11 10 WSW 19:36:39 25 E
13 Feb 2.3 21:07:26 10 W 21:08:15 17 W
14 Feb -0.8 19:58:42 10 W 20:02:17 53 E
15 Feb -0.5 18:49:55 10 WSW 18:55:51 10 E
15 Feb -0.4 20:25:10 10 W 20:27:48 64 WSW
16 Feb -0.8 19:16:13 10 W 19:21:37 15 E
16 Feb 1.3 20:51:32 10 W 20:53:12 29 W
17 Feb -0.8 19:42:28 10 W 19:46:57 27 ESE
18 Feb -0.2 20:08:37 10 W 20:12:12 42 SSE
19 Feb -0.6 18:59:21 10 W 19:05:20 10 ESE
19 Feb 0.8 20:34:46 10 W 20:37:25 29 SSW

Mir Evening Passes - Jan 15 to Feb 19, 2001

None Visible

Astronomical Events Calendar and ISS / MIR Passes are prepared by Les Dickson.

[Data taken from "Heavens-Above" website (<http://heavens-above.com>) for location Saskatoon (52.133N, 106.667W)]

Circumstances are local to Saskatoon and immediate area. Times, altitude and azimuth

will vary for other locations in Saskatchewan.