

Saskatoon Skies

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

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To view *Saskatoon Skies* digitally, see our website:

<http://www.usask.ca/rasc/newsletters.html>

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MEMBERSHIP? JOIN TODAY!

Regular: \$96.00 /year

Youth: \$52.00 /year

Family: \$90.50 + \$41/additional adult + \$21.10/additional youth

The Saskatoon Centre operates on a one-year revolving membership. You will be a member for the next 12 months no matter when in the year you join. Members are encouraged to renew early to avoid disruption in publications. Renew through the National Office at <http://www.rasc.ca/join>.

Benefits of Membership in the Saskatoon Centre

- knowledgeable & friendly amateur astronomers
- use of the Sleaford Observatory
- use of the U of S Observatory (after training)
- Saskatoon Skies Newsletter
- Observer's Handbook
- Journal of the RASC (electronic format)
- borrow the Centre's projector to give astronomy outreach presentations – contact Les Dickson at astrochem@sasktel.net
- rent the Centre's Telescopes <https://www.usask.ca/rasc/telescopes.html>
- use of the Centre library
- SkyNews Magazine (bimonthly)

SASKATOON CENTRE'S MAIN OFFICERS:

President – Ron Waldron

Vice-President – Mike Dolan

Secretary – Rick Huziak

Treasurer – Norma Jensen (until Jan. 2021)/Donna-Lee May (Jan. 2021 onward)

National Council Rep – Les Dickson

Canadian Tire money - Darrell Chatfield

If you cannot attend a meeting but would like to donate your Canadian Tire money please email Darrell at novachat@sasktel.net.

NEWSLETTER INFO

Newsletter Editor – Colin Chatfield

Copy & Collate – Les & Ellen Dickson

Labels & Temps – Mark de Jong

Web Posting – Gord Sarty

Saskatoon Skies is published monthly by the Saskatoon Centre of the RASC. Distribution is approximately 100 copies per issue. Saskatoon Skies welcomes unsolicited articles, sketches, photographs, cartoons, and other astronomy or space science material. Submissions should be sent by e-mail to the editor at colcha@gmail.com in MS Word or text format. Images (new or old): any format, less than 30MB, sent by e-mail as attached files. Send any articles of interest to the night sky or astronomy. **Deadline for submission of all articles for an upcoming issue is the first Friday of each month!**

Saskatoon Skies is also posted on our Saskatoon Centre homepage as a .pdf file and can be downloaded free-of-charge. Members may choose to receive the newsletter by regular mail or via the Internet. Articles may be reprinted from Saskatoon Skies without expressed permission (unless otherwise indicated), provided that proper source credit is given. Saskatoon Skies accepts commercial advertising. Please email the editor at colcha@gmail.com for rates. Members can advertise non-commercial items for free.



Two days before the “Great Conjunction” of December 21, Tim Yaworski was able to capture this image of Saturn and Jupiter (with its Galilean moons) with a telephoto lens from his front yard in Saskatoon

U OF S OBSERVATORY

The U of S Observatory is open to the general public every Saturday of the year. Admission is free. The observatory is located on campus, one block north of the Wiggins Avenue and College Drive entrance. On clear nights, visitors may look through the vintage 6-inch and tour several displays. Current events are recorded on the Astronomy Information Line at 306-966-6429.

Observatory Hours.

January – February	7:00 – 9:30 pm
March	8:00 – 10:30 pm
April – August	9:15 – 11:45 pm
September	8:30 – 11:00 pm
October – December	7:00 – 9:30 pm

Temporarily Closed.
Check the website for updates!

Website - <https://artsandscience.usask.ca/physics/facilities/observatory.php>

Facebook - <https://www.facebook.com/usaskobservatory/>



During a recent trip to Porter Lake to try out a new mount Tim Yaworski had a brief visit from the Aurora Borealis

RASC CALENDAR OF EVENTS & MEETING INFO

Jan 9	Observer's Group (weather permitting)	Larry Scott
Jan 18	RASC General Meeting - 7:00pm (info below)	Ron Waldron

Observer's group viewing starts at dusk at the Sleaford Observatory dark site. Get there early and set up for a great night of observing! Members and their guests only.

For a complete list of club events, please visit: <http://www.usask.ca/rasc/activities.html>

January RASC General Meeting

for all members and guests

Join us on January 18, 2020 at 8:00PM (Executive meeting at 7:00pm)

Webinar (info below)

7:00pm - **RASC Executive Meeting** (Members may attend the executive meeting as observers if they wish)

A Zoom registration link and phone-in numbers will be emailed to Members.

After that, the procedure to register and join the meeting is the same as for the webinar (explained below).

8:00pm - **Main Program**

NOTE: links to register to attend the webinar will be emailed out as well so we know who is planning to attend. After registering, an email invitation will be sent with a link to join via computer or a number to phone in. When joining via computer, participants will have to first download and install the Zoom app, if they have not done so already.

Speaker:

- **Murray Paulson "Mars 2020 - The Great Mars Apparition"**

More info below

MARS 2020 - THE GREAT MARS APPARITION

Murray Paulson

Our last great apparition of Mars was in 2005. Don't get me wrong, Mars was closer in 2003, but it was down in Aquarius, well below the ecliptic at -16 declination. It would cross the meridian at 20 degrees altitude, just barely skirting the houses and trees in my neighborhood. In 2005, it was slightly smaller but considerably higher in the sky. I was armed with a Web cam set up for planetary imaging and I was ready to go! I imaged Mars every clear night with the Phillips TouUcam on my 130 mm refractor and was quite satisfied with my results. But they could be better.

In 2018 we had an all Mars dust storm. Funny how that happens! It turns out that Mars would only be 2 arc seconds smaller in the 2020 apparition. This time I was armed with the latest Planetary camera and a 10" Takahashi Mewlon. What could possibly go wrong? Murray will present some tips on planetary imaging and the results of his 2020 imaging campaign.



SPEAKERS FOR MEETINGS

Rick Huziak

I'd like to thank everyone for the response to the call for meeting speakers, and now have main speakers lined up until March. I can, however, accommodate short 5-minute talks in February and March if you have something you want to talk about. I still need speakers for April, May and June, so let me know if you can help out. I can always go to speakers from National or other resources, but I'd really like to hear more about our own members. But if you do have suggestions for speakers from other organizations let me know and I'll see what I can do to set up those talks.



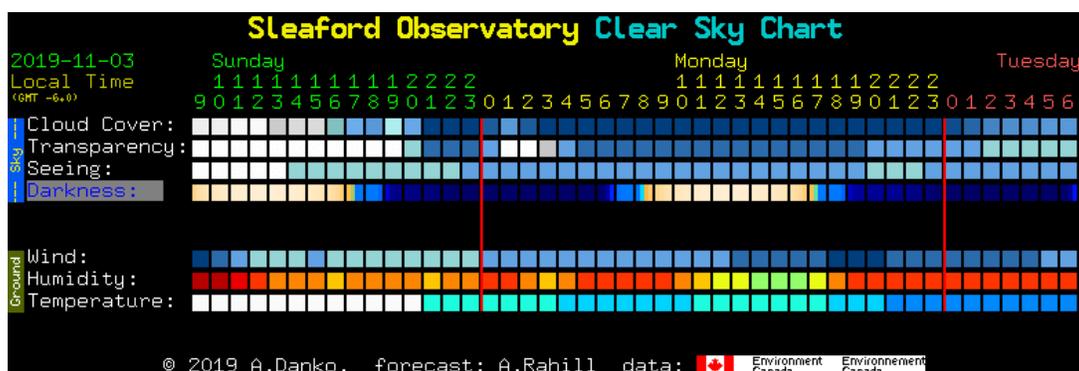
This image by Tim Yaworski of the Pleiades is a stack of 30 images taken with a Fujifilm X-H1 camera on the back of a William Optics Zenithstar 61mm refractor mounted on an iOptron ZEQ25 mount

CLEAR SKY AND WEATHER INFO

To find clear skies, visit the Clear Dark Sky website -

<https://www.cleardarksky.com/csk/>

Once there, one can enter your location to find clear skies. The chart will appear as follows:



Environment Canada provides weather information for astronomy -

www.weather.gc.ca/astro



Saskatchewan Light Abatement Committee -

<http://myotherlife.net/slpac/>



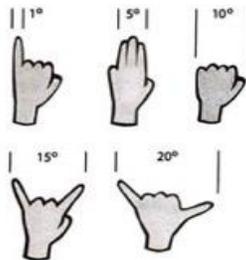
www.darksky.org

JANUARY NIGHT SKY EVENTS AND INFO

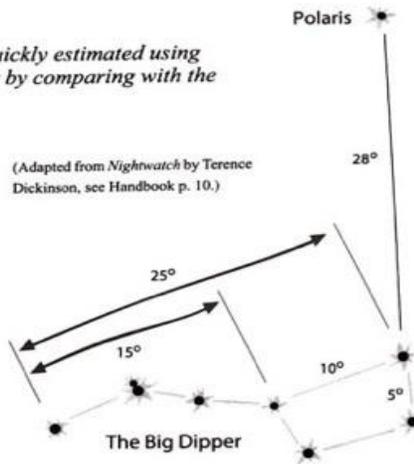
Images on the next few pages taken with permission from the 2020 Observer's Handbook. It can be obtained by joining the RASC here <http://rasc.ca/join> or ordered from <https://secure.rasc.ca/Portal/Shop/RASC/Store/StoreMain.aspx?Category=CURRPUB>

HANDY SKY MEASURES

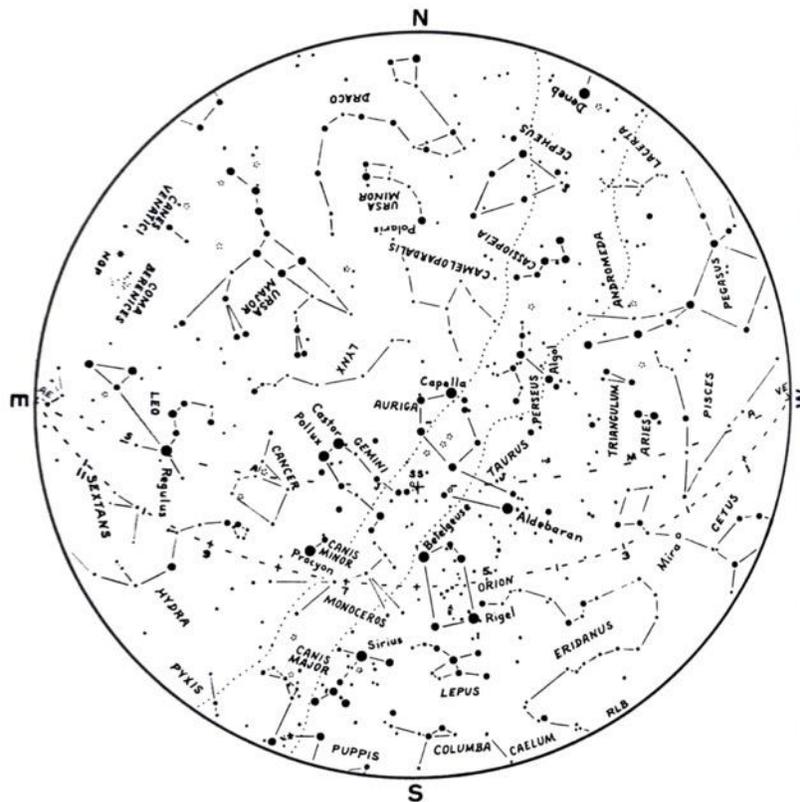
Angular measure in the sky can be quickly estimated using the fingers of an outstretched arm, or by comparing with the star separations in the Big Dipper.



(Adapted from *Nightwatch* by Terence Dickinson, see Handbook p. 10.)



RASC OBSERVER'S HANDBOOK 2020



THE SKY FOR JANUARY

		Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune	Sun
RA	1	19h 17m	17h 17m	1h 39m	20h 20m	20h 15m	2h 17m	23h 18m	18h 46m
	11	20h 26m	18h 12m	1h 56m	20h 29m	20h 19m	2h 17m	23h 19m	19h 29m
	21	21h 27m	19h 06m	2h 15m	20h 39m	20h 24m	2h 17m	23h 20m	20h 12m
Dec	1	-24° 23'	-22° 25'	+11° 14'	-20° 05'	-20° 14'	+13° 16'	-5° 40'	-23° 01'
	11	-21° 12'	-23° 11'	+13° 01'	-19° 33'	-19° 59'	+13° 15'	-5° 35'	-21° 51'
	21	-15° 51'	-22° 46'	+14° 48'	-18° 59'	-19° 44'	+13° 15'	-5° 29'	-19° 58'
Dist	1	1.39	1.56	0.90	5.99	10.90	19.32	30.29	0.983
	11	1.26	1.59	0.99	6.04	10.95	19.48	30.44	0.983
	21	1.05	1.62	1.09	6.07	10.97	19.65	30.58	0.984
Mag	1	-1.0	-3.9	-0.2	-2.0	0.6	5.7	7.9	
	11	-0.9	-3.9	0.0	-1.9	0.6	5.7	7.9	
	21	-0.8	-3.9	0.2	-1.9	0.6	5.8	7.9	
Size	1	4.8"	10.7"	10.4"	32.9"	15.3"	3.6"	2.2"	32' 32"
	11	5.3"	10.5"	9.4"	32.6"	15.2"	3.6"	2.2"	32' 32"
	21	6.4"	10.3"	8.6"	32.5"	15.2"	3.6"	2.2"	32' 30"

Moon: On January 0 at 0h UT*, the Sun's selenographic colongitude is 104.92° and increases 12.2° each day thereafter.

Greatest N declination on the 27th (+24.8°)

Greatest S declination on the 12th (-24.8°)

Libration in longitude: E limb most exposed on the 16th (+5.4°)

W limb most exposed on the 1st (-5.2°) and 28th (-5.3°)

Libration in latitude: N limb most exposed on the 17th (+6.7°)

S limb most exposed on the 4th (-6.7°)

Mercury: Emerging from superior conjunction into the evening sky as 2021 begins. May be observed with difficulty in early evening twilight on the 10th/11th when it is in conjunction with Jupiter, 1.5° to the south of the giant planet with both at just 13° elongation from the Sun. At mag. -0.9, Mercury will be 1 mag. fainter than Jupiter. Achieves greatest eastern elongation on the 24th (evening of the 23rd in North America), just 5 days before the perihelion of its orbit and 18.6° from the Sun, still at mag. -0.7. It fades rapidly thereafter as its phase diminishes, even as it continues to approach Earth.

Venus: After superb evening and morning apparitions in 2020, the second planet begins what will be a relatively inconspicuous year for Northern Hemisphere observers. It is just 20° removed from the Sun on the 1st, diminishing to 13° by the 31st. Will make a pretty pair with the thin, waning crescent Moon on the morning of the 11th, the two separated by just 1.5° in the brightening twilight low above the southeastern horizon for Northern Hemisphere observers.

Mars: The red planet is at its best for all of 2021 as the year begins. It has already lost about half of its angular size and 90% of its lustre from its splendid opposition of 2020 Oct. 13, beginning the year at 10.4" and mag. -0.2 respectively. By month's end those measures will further diminish to 7.9" and mag. +0.4. For northern observers it is visible high in the southern sky at the onset of darkness, passing from Pisces into Aries early in the month. The first-quarter Moon passes 5° to its south on Jan. 20-21. Passes 1.7° north of Uranus on the 21st-22nd. Meridian transit times at Greenwich on the 1st, 11th, 21st-18:55, 18:33, 18:12 UT*.

Jupiter: Begins the year in the early evening sky in the constellation of Capricornus, just 2° east of Saturn after their exceptionally close conjunction of 2020 Dec. 21. Begins the year about 20° from the Sun and is quickly lost in the solar glare. Passes 1.5° south of Mercury on the 10th, though a very difficult observation at just 14° elongation. In conjunction with the Sun on the 29th.

Saturn: 2021 begins with the two gas giants, Jupiter and Saturn, still paired in early evening twilight after their exceptionally close conjunction of 2020 Dec. 21. By now Saturn, just 10% as bright as its companion, is just 20° from the Sun and a challenge to sweep up in binoculars. It quickly fades into the sunset, officially reaching solar conjunction on the 24th.

Uranus: Located among the stars of south-central Aries throughout 2021. Begins the year in the evening sky, reaching its second stationary point on the 14th. Mars is useful as a pointer to the general area of the sky to find Uranus, with the red planet reaching conjunction just 1.7° north of the blue-green Uranus on Jan. 21st-22nd, both at 93° elongation from the Sun. The duo will be in the same standard binocular field for a week or so to either side of the conjunction, Mars outshining its more distant counterpart by a factor of nearly 200x. The first-quarter Moon passes south of the pair on the 20th-21st.

Meridian transit times at Greenwich on the 1st, 11th, 21st-19:32, 18:52, 18:13 UT*.

Neptune: Can be found with optical aid among the stars of northeastern Aquarius, where it will spend the entirety of 2021.

*See p. 94, the **bold-faced** sentences of the first paragraph.

Time (UT)		JANUARY EVENTS	Jupiter's Satellites	
d	h m		West	East
Fri.	1 0 10	Algol at minimum		
Sat.	2 14	Earth at perihelion (147 093 162 km)		
Sun.	3 15	Quadrantid meteors peak		
	20 59	Algol at minimum		
Mon.	4			
Tue.	5	Mercury at greatest heliocentric lat. S		
Wed.	6 9 37	Last quarter		
	17 48	Algol at minimum		
Thu.	7			
Fri.	8			
Sat.	9 14 37	Algol at minimum		
	16	Moon at perigee (367 387 km)		
	21	Mercury 1.7° S of Saturn		
Sun.	10 12	JUPITER, SATURN, & MERCURY IN 2.3° CIRCLE		
Mon.	11 11	Mercury 1.5° S of Jupiter		
	20	Venus 1.5° N of Moon		
Tue.	12 11 26	Algol at minimum		
Wed.	13 5 00	New Moon (lunation 1213)		
Thu.	14 1	Jupiter 3° N of Moon		
	8	Mercury 2° N of Moon		
	14	Uranus stationary		
Fri.	15 8 15	Algol at minimum		
Sat.	16	Venus at descending node		
Sun.	17			
Mon.	18 5 04	Algol at minimum		
Tue.	19			
Wed.	20 21 01	First quarter		
Thu.	21 1 53	Algol at minimum		
	6	Mars 5° N of Moon		
	6	Uranus 3° N of Moon		
	13	Moon at apogee (404 360 km)		
Fri.	22 0	Mars 1.7° N of Uranus		
Sat.	23 22	Vesta stationary		
	22 42	Algol at minimum		
Sun.	24	Mercury at ascending node		
	2	Mercury greatest elongation E (19°)		
	3	Saturn in conjunction with the Sun		
Mon.	25 23	Moon 0.3° N of M35		
Tue.	26 19 31	Algol at minimum		
Wed.	27			
Thu.	28 19 16	Full Moon		
Fri.	29	Mercury at perihelion		
	2	Jupiter in conjunction with the Sun		
	16 20	Algol at minimum		
Sat.	30 2	Mercury stationary		
Sun.	31			

MINUTES OF DECEMBER MEETING

Rick Huziak

Minutes of the General Meeting of the RASC Saskatoon Centre, December 14, 7:00 pm* Online (ZOOM)

(*Early start time than usual. There was no Executive meeting on Dec. 14.)

12 members on-line at beginning of meeting

1. Call to order by meeting: 7:04 PM.
2. **Motion to adopt the November 2020 Executive meeting minutes** as published in the December 2020 newsletter – **Moved:** Ron Waldron. **Seconded:** Daryl Janzen. **CARRIED.**
3. **Motion to adopt the November 2020 General meeting minutes** as published in the December 2020 newsletter. **Moved:** Ron Waldron. **Seconded:** Daryl Janzen. **CARRIED.**
4. **Report on SSSP 2021 Planning:** Ron Waldron read the report sent by Les Dickson. SSSP is organizing the star party for August 2021. Due to Covid-19, the exact amount of public interaction (speakers/food services) at the star party is still unknown.
5. **Motion:** Notice to Membership published in November newsletter:

At a meeting of the Saskatoon Centre Executive held on October 19th, it was decided to change the term of president and vice-president to one-year terms each from the traditional two-year terms. The intent is to attract more members to serve on these important positions. This change will be voted upon at the December meeting on December 14th, 2020.

Moved: Ron Waldron. **Seconded:** Donna-Lee May. Discussion ensued; Ron Waldron recommended to defeat the motion as two years appears to be the norm for most centres and any president or vice president unable to continue their full term is permitted to resign. **Call for vote:** Vote: For the amendment: 1. Against the amendment: 10. **AMENDMENT IS DEFEATED.**

6. **Announcements** - Ron Waldron (unless otherwise stated):

- Treasurer will change in January from Norma Jensen to Donna-Lee May.
- Rick Huziak (Secretary) will submit National Annual reports in January.
- Daryl Janzen comments that Sleaford crew Larry Scott & Cam McLelland are doing a great job at maintenance of the site and would like to thank them.
- Darrell Chatfield has volunteered for position of Librarian. **Moved** by Ron Waldron to accept. **Seconded:** Mike Dolan. **CARRIED**

7. **Motion to Adjourn General meeting: Moved: Ron Waldron. Seconded:** Daryl Janzen. **CARRIED.**

8. **Main Program: Member Forum: Virtual Christmas Meeting.** Speakers relayed stories of how they got into astronomy. Speakers included: Donna-Lee May, Rick Huziak, Mike Dolan, Darrell Chatfield, Tammy Vallee, Ron Waldron, Colin Chatfield, Tara Magee, Tim Yaworski, Mark de Jong, Daryl Janzen, Tenho Tuomi, Velma Tuomi and Yannis Pahatouroglou.

Motion to adjourn at 9:35 PM. Ron Waldron. **CARRIED.**

BOOKS FOR SALE

All books are in either new, or like new condition. Retail price in brackets. Please email at novachat@sasktel.net or text/call 306-222-0515 if you want a particular book to make arrangements. All books being sold by Darrell Chatfield.

“Deep-Sky Observers Handbook” Volume 1-5	Enslow-Lutterworth	\$40.00
“International Encyclopedia of Astronomy” 1987	Patrick Moore Color	\$10.00
“Backyard Astronomers Guide” T. Dickinson & Alan Dyer	2008 Color	\$25.00
“Atlas of Deep Sky Splendors” 1978	H. Verhenberg (50.00) B & W	\$22.00
“Amateur Astronomers Catalog of 500 Deep Sky Objects” Vol 1	1980 B & W	
R. Morales		\$15.00
“Observing the Constellations” 1989	J. Sanford Color charts	\$10.00

EQUIPMENT FOR SALE

1. Meade AR 5 achromatic refractor. It is the version you can collimate, and has a GSO focuser. This is a good traditional visual scope. Surely somebody could use it! \$100 OBO.

The following is from Stargazers Lounge website:

“Hi John here is my uptake on the AR5. I love it for lunar and planetary views and images. (stunning in my book). I also don't have a problem with the CA on this scope as I judge it for what it is. The build quality on the AR5 is reasonable I would say. The dew shield is a little short for my liking The 2" focuser could do with an upgrade but I can live with it as it stands. I have a habit of changing scopes from time to time but I will try to hang on to the AR5 for as long as I can.”

2. Meade SN 8 Schmidt Newtonian. Has been flocked, has a primary mirror clips removed, has a GSO focuser and focusing motor. Would need collimation as I never got round to it. \$100 OBO

From Equipment Reviews:

“The Newtonian design uses a primary mirror and a second, “diagonal” mirror to send the image out the side of the tube. The innovation is the Schmidt corrector plate that permits this telescope to be fast - f/4 - while providing pinpoint star images across a widefield of view. This has great value for visual observers, especially for wide-field observations and images of deep-sky objects. This is not a telescope designed for high-magnification observations of planets or double stars.”

3. Bushnell binoculars 15x70. Need a tripod - not practical for handheld use. \$50 OBO

Email nigel.west@usask.ca for any of the above

4.5 inch Meade Model 4550 f/8 Reflecting Telescope on Equatorial Mount – Good condition with two quality eyepieces (9mm and 25mm) and a 2X Barlow lens. This telescope has a 910 mm focal length. A great starter scope. \$300 obo.

Contact Dwayne at dwayne2013@sasktel.net



The first 6 days of December were very productive, it's been a very long time since I've had that many clear nights in a row, I averaged around 11 hours a night. I spent most of the time shooting narrowband on the Heart & Fishhead nebulas. I used the WO RedCat, ZWO 183MM Pro & Antila 3.5Nm filters, there is 50.2 hours of total data with, 7.5 hours Ha, 21 hours SII & 21.7 hours of OIII, all shot from "Far Point Station Observatory" in Aneroid, SK, and processed in SHO Hubble palette, my most ambitious project yet

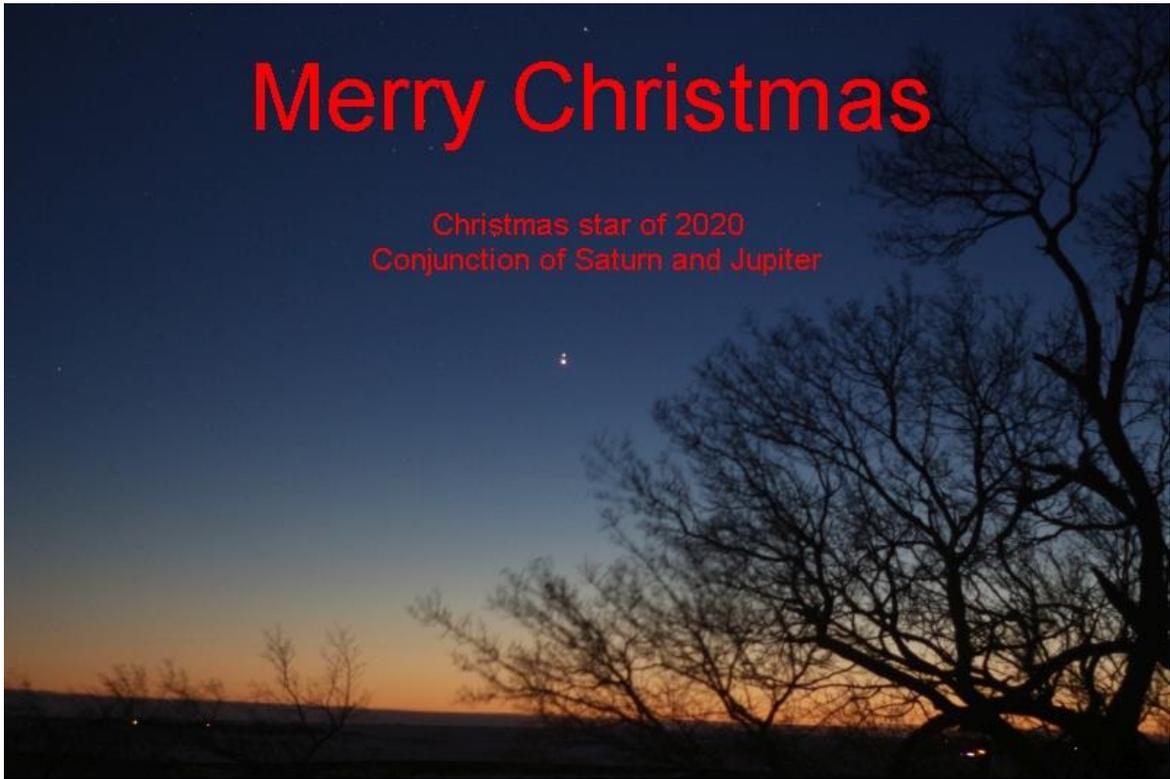
DECEMBER PICTURES

Tenho Tuomi

Well, here's another picture. Would you believe I took 37 pictures of the approaching conjunction, and missed the actual conjunction due to clouds. I would have thought that people in the city would have been photographing it for it is one thing that should have shown well from a city.

This is about the last picture that I took of Jupiter and Saturn on December 20 the night before the conjunction, one second exposure at ISO 1600 with a Canon T5i camera and a F/1.8 50mm Super-Takumar lens from a film camera stopped down to F/2.

On November 13 there was a nice triangle in the morning sky made by the Moon, Venus and Spica.



Saturn and Jupiter taken December 17, four days before the conjunction, with a Canon T5i camera through a 12" reflector and a 2x teleconverter for a focal length of 3000mm, 6 second exposure at ISO 1600.



SSSP 2021 PLANNING REPORT

Les Dickson

Update on planning for the Saskatchewan Summer Star Party 2021

Les Dickson, Chair, SSSP Organizing Committee

Our SSSP 2020 may not have come off as planned due to COVID-19 restrictions, but no rest for the weary; we are planning for next year. The SSSP committee met by video conference on December 3 to start planning for 2021.

First order of business was a review of our financial situation. In brief:

- Net income (total minus website fees) from sales of shirts, pins and patches: \$3913.65
- Expenses for production of shirts, pins, patches and shipping: \$3745.83
- Net profit: \$167.82
- Profit split equally between Saskatoon and Regina Centres: \$83.91 each
- We have a deposit with Resort at Cypress Hills of \$1800 for 2021 and \$800 for 2022.

The committee for SSSP 2021 was reconstituted with the following people and duties:

- Les Dickson will continue as Chair, Program Coordinator and Resort Liaison
- Ellen Dickson with Les will design and coordinate production of the SSSP pins
- Rick Huziak will continue as Registrar, Park Liaison and Camping Coordinator
- Donna-Lee May has joined the committee as Treasurer and organizer of the Red-Light Café; she will also coordinate our presence on the Web
- Darrell Chatfield will be coordinating Door Prizes
- Greg Fusick will be coordinating our Volunteers
- Andrew Kostiuk will continue as our Webmaster
- George Charpentier will continue as our Photographer
- Vance Petriew will coordinate design and production of SSSP shirts
- Pierre Schierle will be the Meadows and Service Centre Coordinator
- Volunteers to help with planning and on-site activities are always welcome

Some of the items that were discussed:

- It was unfortunate that we could not hold SSSP this year but an unofficial mini-star party was held at CHIPP on the same weekend with a hand-full of people. Apparently the skies were great.

- We will not know how much of a star party, if any, we can hold next year until the progress of the pandemic becomes clearer, especially with the new vaccines becoming available.
- Important date is the opening of reservations for CHIPP. We would hope to have a good idea of the situation regarding camping and other activities at the park and Resort before that.
- It was considered prudent to revisit our list of invited speakers and avoid guests that would have to cross the US-Canada border. We will look for an alternative to Dr. Fran Bagenal who is from the US.
- It was noted that there appear to be several websites on different platforms that are presenting themselves as representing SSSP and/or the Saskatoon Centre. Only sites run and sanctioned by the SSSP committee or the Saskatoon Centre should exist.

The next meeting will be January 14th at 7:30 pm by video conference

OBSERVING CERTIFICATES AND CLUBS

RASC OBSERVING PROGRAMS AND CERTIFICATES

The RASC offers four observing certificates for **members** who observe all objects in each of the following observing lists in this chapter:

THE MESSIER CATALOGUE (p. 314)

THE FINEST NGC OBJECTS (p. 318),

THE DEEP-SKY CHALLENGE OBJECTS (p. 322),

DEEP-SKY GEMS (p. 324).

See www.rasc.ca/certificate-programs for details and contact the RASC Observing Committee Chair at rasc.ca/contact/observing for further information.



The RASC also offers the **Explore the Universe Certificate** for novice observers (who do not have to be RASC members), the **Explore the Moon Certificate** for beginning members, and the **Isabel Williamson Lunar Observing Certificate** for intermediate to advanced members. In addition, **Astroimaging certificates** are available for those members with a photographic bent. See www.rasc.ca/astro-imaging-certificate

RASC OBSERVER'S HANDBOOK 2020

Join the Club! Observe all 110 Messier, 110 Finest NGC, 400 Herschel I or II, 140 Lunar, 154 Sky Gems or 35 Binocular objects, or Explore the Universe and earn great OBSERVING CERTIFICATES!

MESSIER CLUB

Certified at 110 Objects:

*R. Huziak, G. Sarty,
S. Alexander, S. Ferguson,
D. Chatfield, T. Tuomi, L.
Scott, G. Charpentier, B.
Johnson, L. Dickson,
B. Burlingham, Norma Jensen,
Donna-Lee May*

Ron Waldron	108
Marcel Müller-Goldkuhle	94
Wade Selvig	75
Wayne Schlapkohl	43
Ellen Dickson	34
Graham Hartridge	9

CHATFIELD BINOCULAR CERTIFICATE

Certified at 35 to 40 Objects:

T. Tuomi, R. Huziak

Jim Goodridge	12
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FINEST NGC CLUB

Certified at 110 Objects:

*R. Huziak, G. Sarty,
D. Chatfield, T. Tuomi*

Larry Scott	110
Scott Alexander	97
Norma Jensen	83
Sandy Ferguson	23
George Charpentier	13

EXPLORE THE UNIVERSE

Certified at 55 to 110

Objects: *T. Tuomi,*

Wayne Schlapkohl	55
Jim Goodridge	35

ISABEL WILLIAMSON LUNAR OBSERVING CERTIFICATE

Certified at 140 Objects:

T. Tuomi, N. Jensen

EXPLORE THE MOON CERTIFICATE

T. Yaworski

HERSCHEL 400 CLUB

Certified at 400 Objects:

*R. Huziak, D. Chatfield,
T. Tuomi*

Gordon Sarty	251
Scott Alexander	117
Larry Scott	45
Sandy Ferguson	18

HERSCHEL 400-II CLUB

Darrell Chatfield	400
Tenho Tuomi	378
Rick Huziak	246

LEVY DEEP-SKY GEMS

Certified at 154 Objects:

Tenho Tuomi	150
Darrell Chatfield	70

The Messier, Finest NGC and David Levy's Deep-Sky Gems lists can be found in the *Observer's Handbook*.

The Explore the Universe list is available here <http://www.rasc.ca/explore-universe>

On-line Messier and Finest NGC lists, charts and logbooks:

<http://www.rasc.ca/observing>

On-line Herschel 400 List:

<http://www.astroloague.org/al/obsclubs/herschel/hers400.html>

Binocular List is at: https://www.usask.ca/rasc/Chatfield_Binocular_List.pdf

"Isabel Williamson Lunar Observing Program Guide:

<http://www.rasc.ca/sites/default/files/IWLOP2015.pdf>

Program details can be found at: <http://www.rasc.ca/williamson/index.shtm>