

Saskatoon Skies

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

Volume 54, Number 02

February 2023



Royal Astronomical Society of Canada
Saskatoon Centre Incorporated
Box 31086, RPO Broadway
Saskatoon, SK S7H 5S8

WEBSITE: <https://saskatoon.rasc.ca/>
E-MAIL: sk_centre@rasc.ca
FACEBOOK: [RASC Saskatoon Centre](#)
INSTAGRAM: [@RASCYXE](#)

To view *Saskatoon Skies* digitally, see our website:
<https://saskatoon.rasc.ca/newsletters.html>

In This Issue:	
Membership Information / Officers of the Centre	2
Newsletter Info / U of S Observatory Info	3
Calendar of Events & Meeting Info	4
Minutes of December Meetings	5-7
Speakers for Meetings / February Night Sky Events & Info	8-10
Reimbursement for Centre Expenses	10
Clear Sky Chart / Weather Info / Light Abatement Info	11
Books For Sale / Aurora Workshops	12-13
Astro Photos	14
January/February Light Pollution News / Observing at Sleaford	15-16
Observing Certificates & Clubs	17-18

MEMBERSHIP? JOIN TODAY!

Regular: \$111.00 /year

Youth: \$61.10 /year

Family: \$105.50 + \$42.90/additional adult + \$22.20/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://saskatoon.rasc.ca/telescopes.html>
- use of the Centre library
- SkyNews Magazine (bimonthly)

SASKATOON CENTRE'S MAIN OFFICERS:

President – *vacant* (Donna-Lee May interim president)

Vice-President – Brent Berlingham

Secretary – Rick Huziak

Treasurer – Donna-Lee May

National Council Rep – Les Dickson

Canadian Tire money - Darrell Chatfield

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

NEWSLETTER INFO

Newsletter Editor – Colin Chatfield

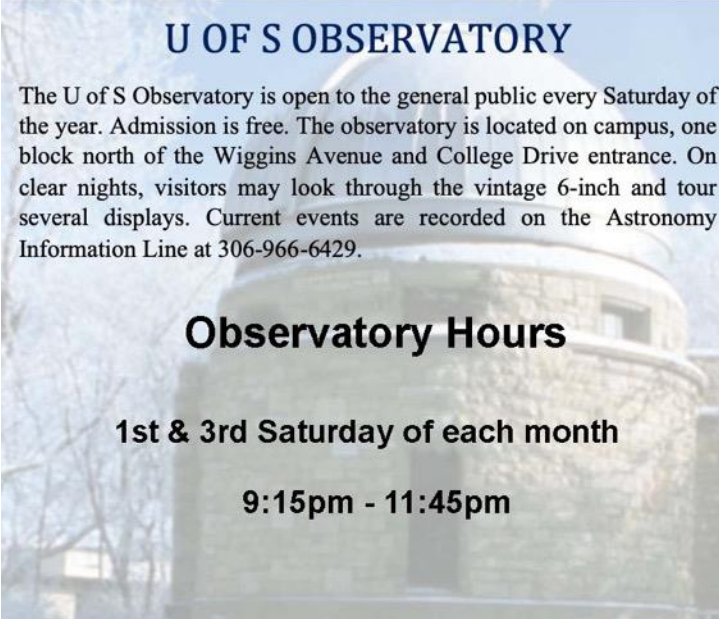
Copy & Collate – Les & Ellen Dickson

Labels & Temps – Mark de Jong

Web Posting/Content Editor – Gord Sarty/Tenho Tuomi

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.

A graphic with a background image of the U of S Observatory building. The text is centered and reads: "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", "1st & 3rd Saturday of each month", "9:15pm - 11:45pm".

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

1st & 3rd Saturday of each month

9:15pm - 11:45pm

Hours subject to change, so check below for more info -

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

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

RASC CALENDAR OF EVENTS & MEETING INFO

Feb 11	Observer's Group - Sleaford Observatory	Brent Gratias
Feb 13	RASC Saskatoon Centre General Meeting	Brent Burlingham

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: <https://saskatoon.rasc.ca/activities.html>

February RASC General Meeting

for all members and guests

Join us on February 13th, 2023 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).

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.

8:15pm - **Main Program** -
“*What's Up This Month?*” – Colin Chatfield, Tara Magee

To be determined

MINUTES OF JANUARY MEETINGS

Rick Huziak

Minutes of the Monthly Executive Meeting RASC Saskatoon Centre Monday, January 16, 2023 - 8:00 pm Online (ZOOM)

Attending: Donna-Lee May, Les Dickson, Rick Huziak, Brent Gratias, Mike Dolan, Colin Chatfield, Mark de Jong, Brent Burlingham (late).

1. **Call to order** 7:12 pm – Rick Huziak
2. **Approval of the December Executive meeting minutes** as circulated in the January newsletter. **Moved:** Les Dickson. **Seconded:** Darrell Chatfield. **CARRIED.**
3. **Call for additional announcements/items** to add to agenda – Rick Huziak. (None added.)

OLD BUSINESS

4. **Loaner Scope Report** – Ike Thiessen. **Deferred.** Ike not present.
5. **Treasurer's Report** - Donna-Lee May. **Report on Centre 2021 – 22 Financial Report – Receipts still to come in.** Report will be done for February meeting. Summary of expenses/revenues provided verbally. Membership revenues are down from last year. The club is running at a deficit if SSSP income is excluded. The club should look at funding for operations costs.
 - The National Annual Report (by Secretary) and Financial Statement (by Treasurer) are due by Jan. 22, submitted to Robin Foret for RASC. Gov of Sask report is due by end of April.
6. **February General Meeting will be in-person** in Room 175 Physics.
 - clear with U of S Physics; will try to do a hybrid in-person / on-line meeting.
 - Brent Burlingham and Daryl Janzen have looked into the AV issues. Instructions will be sent to members before the meeting.
 - Due to concerns of the new COVID strain; **we will defer in-person meetings until at least March.**

Brent Burlingham now chairing the meeting.

7. **Sleaford Report** – Darrell Chatfield
 - Larry Scott & Brent Gratias has been out and cleared snow.
 - Darrell Chatfield will buy spare keys for snowblower. (2@~\$20 ea.)
 - Riding mower has keys. We need a master key set.
 - Please put keys into “key box” in the warm-up shelter. One key to our master filing cabinet with Donna-Lee.

- Training for maintenance & use of the snowblower. – Darrell Chatfield will develop a short manual.
- 8. An Inventory of Centre Assets** is being made by Rick Huziak. Darrell Chatfield has done a more accurate inventory of Sleaford. Les Dickson has sent the list of items he has at his house. Other members who have club assets at their houses should let Rick Huziak know what they have.
- 9. Nominating Committee** update:
- We are still looking for a permanent president, activities coordinator, and speaker coordinator.
- 10. The Sleaford Joint Management Committee** – Darrell Chatfield
- Yannis Pahatoroglou. has accepted the second RASC SJMC Committee position.
 - Security cameras – Daryl Janzen is looking into cameras.
 - We need a friendly amendment to the Sleaford Agreement to change the RASC address.
- 11. Membership Survey** – Brent Burlingham will choose a platform and create a survey to explore the direction of the Centre and participation in activities.
- 12. National Council Report** (Dec. 4 meeting) – Les Dickson
- National financial position (loss) discussed. National will begin discussions with centres beginning in January in townhall sessions. Minutes of the National financial meeting have been received (Jan 16) for review. Requests for the National minute summary can made to Les Dickson for members of the executive, including councilors.

Remainder of the Agenda deferred to a future meeting due to time.

13. Activities Report – Rick Huziak – Deferred.

14. Centre Library - James Wood – Deferred.

15. Review of Committees & Committee Mandates & Budgets – Brent Burlingham – Deferred

NEW BUSINESS

16. None

17. Motion to adjourn – Moved: Les Dickson. 8:06 PM. **CARRIED.**

**Minutes of the Monthly General Meeting RASC Saskatoon Centre
Monday, January 16, 2023 - 8:00 pm Online (ZOOM)**

11 members on-line at beginning of meeting.

1. **Sharing / Networking Time** 8:00 PM – all members
2. **Call to order** – 8:23 PM – Brent Burlingham (VP)
3. **Call for additional items or changes to the agenda** – Brent Burlingham. None added.
4. **Call out to new members/guests:** No new members in attendance.
5. **Adoption of the December General Meeting minutes** as circulated in the January newsletter. **Moved:** Les Dickson. **Seconded:** Darrell Chatfield. **CARRIED.**
6. **Executive Meeting summary** – Brent Burlingham
 - See Executive Meeting.
 - **The following positions remain unfilled:**
 - President** – (2-year term) – vacant
 - Activities Coordinator** – vacant
 - Speaker Coordinator** – vacant
 - Sleaford Joint Management Committee rep** (now filled) – Yannis Pahatouroglou
7. **March meeting will return to an In-person Meetings (Feb. is too soon.)**
 - Will be in-person hybrid/Zoom meetings at U of S Room 175 Physics if we can figure out how to do this. Will try to open general meeting up on-line beyond only Centre members.

NEW BUSINESS

8. Donna-Lee May suggests we buy a better **medicine cabinet** for Sleaford. She will get pricing for the next meeting. Yannis Pahatoroglou suggests the U of S could supply as part of their building policy and through the Sleaford Agreement. A wall-mounted smaller kit already exists at Sleaford – we will look at it.
9. **Program:**
 - *What's Up This Month* – Colin Chatfield
 - *Main Speaker – AAVSO Alerts - Recent Variable Star Campaigns* – Rick Huziak
10. **Call to adjourn** – 9:37 PM. **Moved:** Yannis Pahatouroglou. **CARRIED.**

SPEAKERS FOR MEETINGS

Rick Huziak

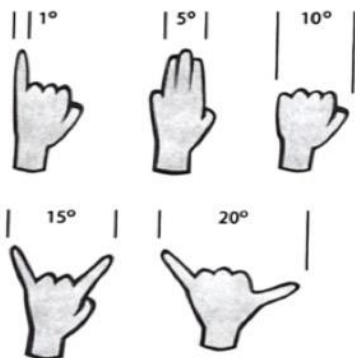
We are always looking for both short-subject and main-subject speakers for our General meeting. If you can't volunteer to speak, then please make suggestions for speakers or topics you'd like to see covered. As of this writing, we do not have speakers for February, March, April, and June, though we will find something for February. Speakers may be in-person (as we may be returning to in-person meetings soon) or on-line. Topics can be 5- to 15-minutes in length for short topics and 30- to 45-minutes for main feature talks. We continue to look for a new Speaker Coordinator. In the meantime, send suggestions to Rick Huziak rickhuziak@shaw.ca or better yet, volunteer as a speaker!

FEBRUARY NIGHT SKY EVENTS AND INFO

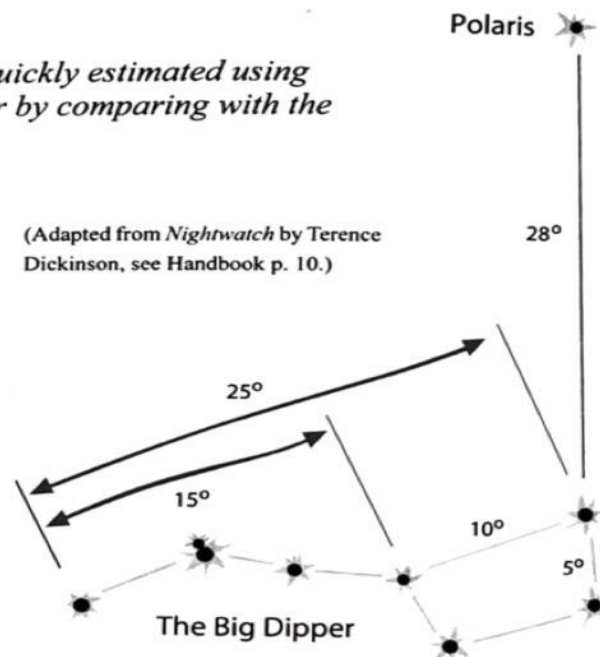
Images on the next few pages taken, with permission, from the 2023 Observer's Handbook. It can be obtained by joining the RASC here <http://rasc.ca/join> or ordered from <https://secure.rasc.ca/Portal/Shop/RASC/Store/StoreMain.aspx?Category=CURRPUB>

HANDY SKY MEASURES

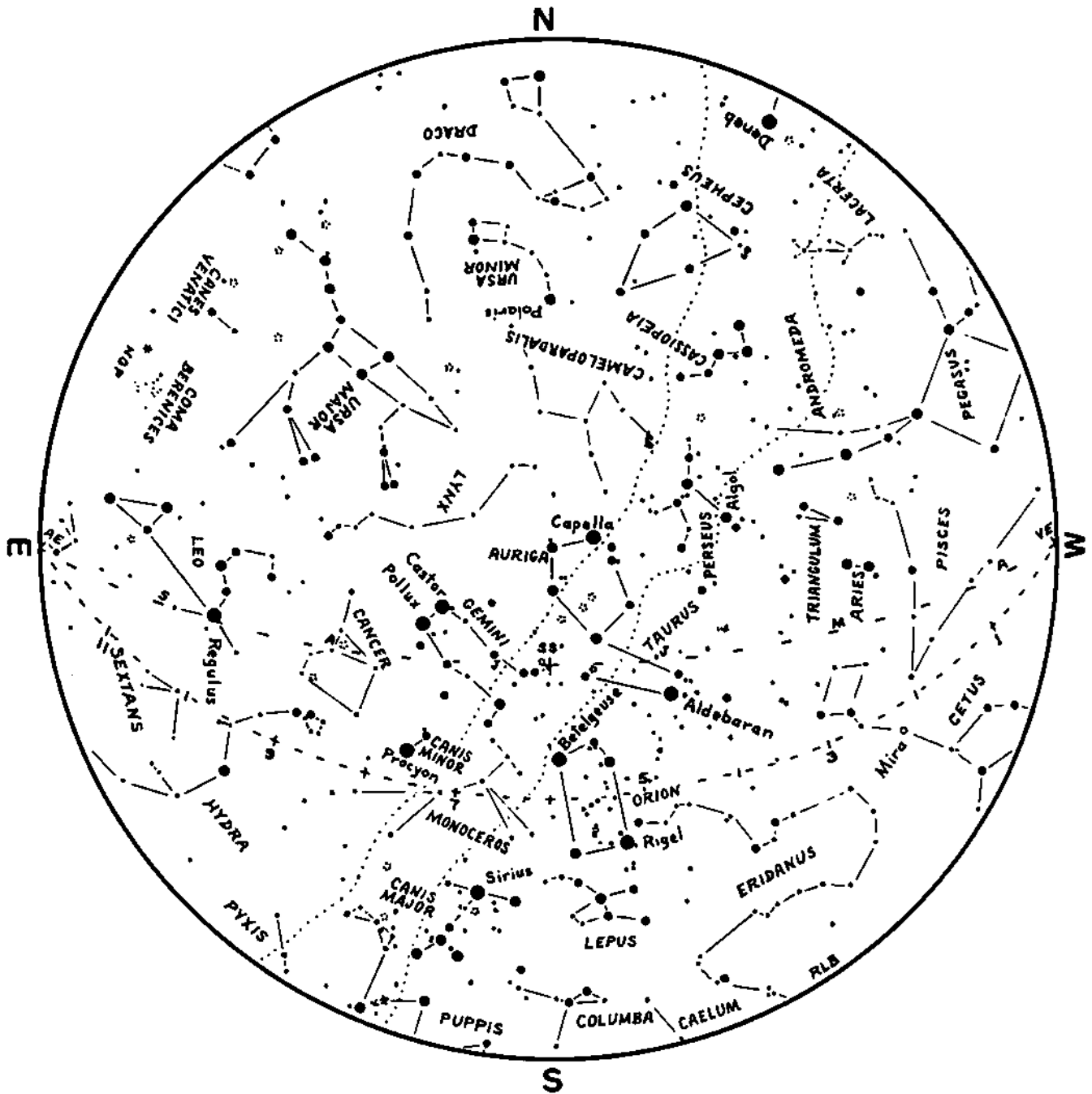
Angular measure in the sky can be quickly estimated using the fingers of an outstretched arm, or by comparing with the star separations in the Big Dipper.



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



Time (UT)		FEBRUARY EVENTS		Jupiter's Satellites	
d	h m			West	East
Wed.	1				
Thu.	2	16 35	Algol at minimum		1.0
Fri.	3	20	Pollux 1.9° N of Moon		2.0
Sat.	4	9	Moon at apogee (406476 km)		3.0
Sun.	5		Mercury at descending node		4.0
		13 24	Algol at minimum		5.0
		18 28	full Moon (smallest in 2023)		6.0
Mon.	6				7.0
Tue.	7		Zodiacal light vis. in N lat. in W after evening twilight for next two weeks		8.0
Wed.	8	10 13	Algol at minimum		9.0
		20	Ceres stationary		10.0
Thu.	9				11.0
Fri.	10				12.0
Sat.	11	7 02	Algol at minimum		13.0
Sun.	12	7 31	Moon at descending node		14.0
		20	Pallas stationary		15.0
Mon.	13	16 01	last quarter		16.0
Tue.	14	3 51	Algol at minimum		17.0
		19	Antares 1.8° S of Moon		18.0
Wed.	15		Mercury at aphelion		19.0
		12	Venus 0.01° S of Neptune		20.0
Thu.	16	17	Saturn in conjunction with the Sun		21.0
Fri.	17	0 39	Algol at minimum		22.0
Sat.	18	21	Mercury 4° N of Moon		23.0
Sun.	19	9	Moon at perigee (358267 km) Large tides		24.0
		21 29	Algol at minimum		25.0
Mon.	20	7 06	new Moon (lunation 1239)		26.0
Tue.	21	18	Neptune 2° N of Moon		27.0
Wed.	22	8	Venus 2° N of Moon		28.0
		18 18	Algol at minimum		29.0
		22	Jupiter 1.2° N of Moon, occultation†		30.0
Thu.	23				31.0
Fri.	24	18 56	Moon at ascending node		
Sat.	25	13	Uranus 1.3° S of Moon, occultation‡		
		15 07	Algol at minimum		
Sun.	26				
Mon.	27	8 06	first quarter		
Tue.	28	5	Mars 1.1° S of Moon, occultation††		
		11 56	Algol at minimum		



REIMBURSEMENT FOR CENTRE EXPENSES

The Centre has a reimbursement procedure on submission of expense claims. A writeable pdf claim form can be found on the Centre webpage under the Executive tab. The expense form **must** be submitted *along with original receipts* to the Treasurer within 30 days of the transaction. All expenditures must be preapproved by the Executive or be within allocated budgets.

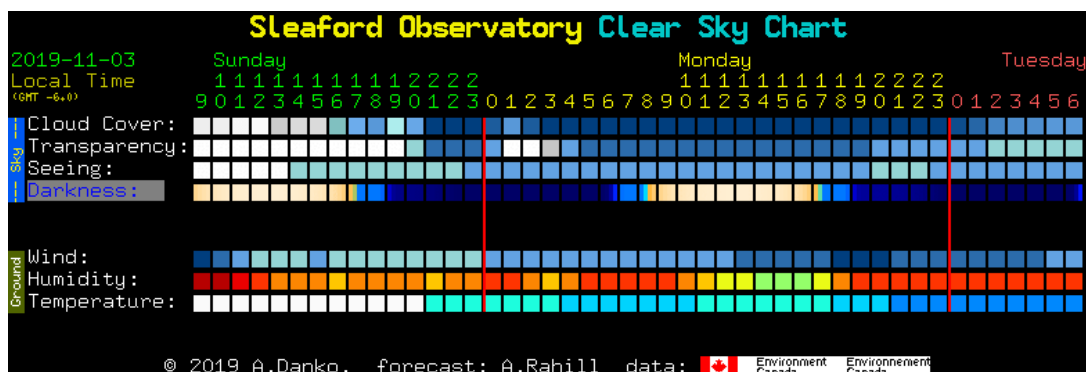
Please contact the Treasurer, Donna-Lee May, with any inquiries: d1m3star@telus.net.

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 Pollution Abatement Committee -

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



www.darksky.org

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

AURORA WORKSHOPS

Jeanine Holowatuik

New Aurora Workshop Series in Sask!

Aurora Boreal: Northern Lights Photography Workshop Series is a hybrid workshop that teaches you about the science of the northern lights & how to capture them! Hosted by Jeanine Holowatuik, an avid aurora chaser and Astro photographer, in her hometown of Hudson Bay Saskatchewan. Although aurora is completely unpredictable and there are no guarantees, the dates have been carefully selected to try to increase your chances of seeing the sky dance. Prices available for both photographers and aurora enthusiasts wanting to learn more. Space is limited!

Two dates to pick from: March 24-26, 2023 (only 1 spot left!) & Sept 15-17, 2023

Full workshop details available at -

<https://northernescapephotography.com/workshops/aurora-boreal-saskatchewan-northern-lights-photography-workshops/>



Photos by Jeanine Holowatuik

ASTRO PHOTOS BY TENHO TUOMI



Here is a picture of comet C/2022 E3 (ZTF) with its three tails taken January 21 with my Canon T5i camera through a F/5 80mm telescope.



My pictures of the occultation of Mars by the Moon on December 7. Taken with a Canon T5i camera, 1/60 sec exposure at ISO 800, on a 12" Newtonian using 10mm eyepiece projection for 6x magnification giving an effective focal length of 9000mm. Picture cropped to half size.

JANUARY/FEBRUARY LIGHT POLLUTION NEWS

Rick Huziak

You don't have to look far to find issues with our local, national or international deteriorating skies!

Local Nuisance: I received an email from a Saskatoon resident who had a problem with a neighbour who has erected a floodlight to light up the backyard skating rink that he had made for his kids. However, the floodlight was bolted to his house and shone horizontally into the windows of the neighbour, keeping him up at night. The suggestion that the light should be repositioned fell on deaf ears, but a call to the Saskatoon Bylaw Officer (by the resident) resulted in a discussion based on the poor, but enforceable *Saskatoon Zoning Bylaw 8770, Para. 5.4 Lighting of Sites*, which states, "Outdoor lighting for all developments shall be located and arranged so that no direct rays of light are pointed at nearby properties, or interfere with the safe operation of nearby roadways or traffic control devices." The call did result in a bylaw inspection. I have yet to follow up on results, but that an inspection was done is encouraging.

In Newfoundland, a very similar circumstance made *CBC National News* in January. See the video: <https://www.youtube.com/watch?v=vZl5eQ3yYcQ>. A "bad neighbour" intentionally installed floodlighting pointed at his neighbours' houses and taunted council to stop him. Council felt they had no recourse and have refused to stop the nuisance. The province, however, is looking into violations of the *Environmental Protection Act*. It is rather amazing that councils don't enact proper (light) nuisance bylaws as preventative measures *in advance* of idiot neighbours. A Google search will show many stories related to this incident, one of which is here: <https://www.cbc.ca/news/canada/newfoundland-labrador/bright-lights-shining-on-outer-battery-1.6669991>.

Brighter, Faster, Worser (... or is it More Worser?): A new study by Chris Kyba et al. in *Science* magazine on the *Globe at Night* <https://www.globeatnight.org/> citizen science project comes as no surprise to astronomers. The *Globe at Night* project asked citizens to count how many stars they could see from their location against sky maps on their website. The result of the (continuing) 10-year study is that the night sky *worldwide* is brightening at 10% per year. Earlier, a 2017 study using NASA/Suomi NPP satellite photometric data showed that after significant LED streetlight replacements the sky continued to brighten at 2.2% per year, and that there was no detectable decrease in light pollution from the retrofit. (This also implies that there is little or no actual overall power saving from the retrofit). The *Globe at Night* results showed that the satellite measurements are *understated* (due to spectral sensitivity limitations of the satellite) and that light pollution is far worse than we had imagined. I know from personal experience of observing from my backyard in the city that despite streetlights being better shielded and shifting to the yellow part of the spectrum, that my sky 10"-scope limit has decreased from 14th to 12th magnitude – a reduction of at

least 5-times in depth over the same period. See Toronto RASC member & CBC reporter Nicole Mortillaro's excellent article: <https://www.cbc.ca/news/science/light-pollution-increasing-1.6719034> and consider observing for the *Globe at Night* project.

A second study by Fabio Falchi et al. published in the *Monthly Notices of the Royal Astronomical Society* (popular summary here: <https://www.space.com/major-observatories-suffering-light-pollution>) has reported that 100% of observatories on mainland USA now experience light pollution over much of their sky and that the worst-polluted observatory has a sky brightness *135 times* the dark-sky baseline brightness.

We are rapidly losing the night sky through “progress” – urban sprawl, and the constant increase in the quantity of lights and their brightness without even basic regard for preservation of the natural environment. Regulation sorely lags far behind “progress” even though the evidence of the destructive nature of light pollution is widely known. *If you have a chance to complain about light pollution, don't let the chance go by.* Say something and write a letter. The more voices we have in the conversation, the better the chance that we can slow the growth of light pollution, even if we can't convince society, government and commerce to fully eliminate the waste they produce. The other options are simply to find another hobby and to stop caring.

OBSERVING AT SLEAFORD - JAN 20, 2023

Norma Jensen

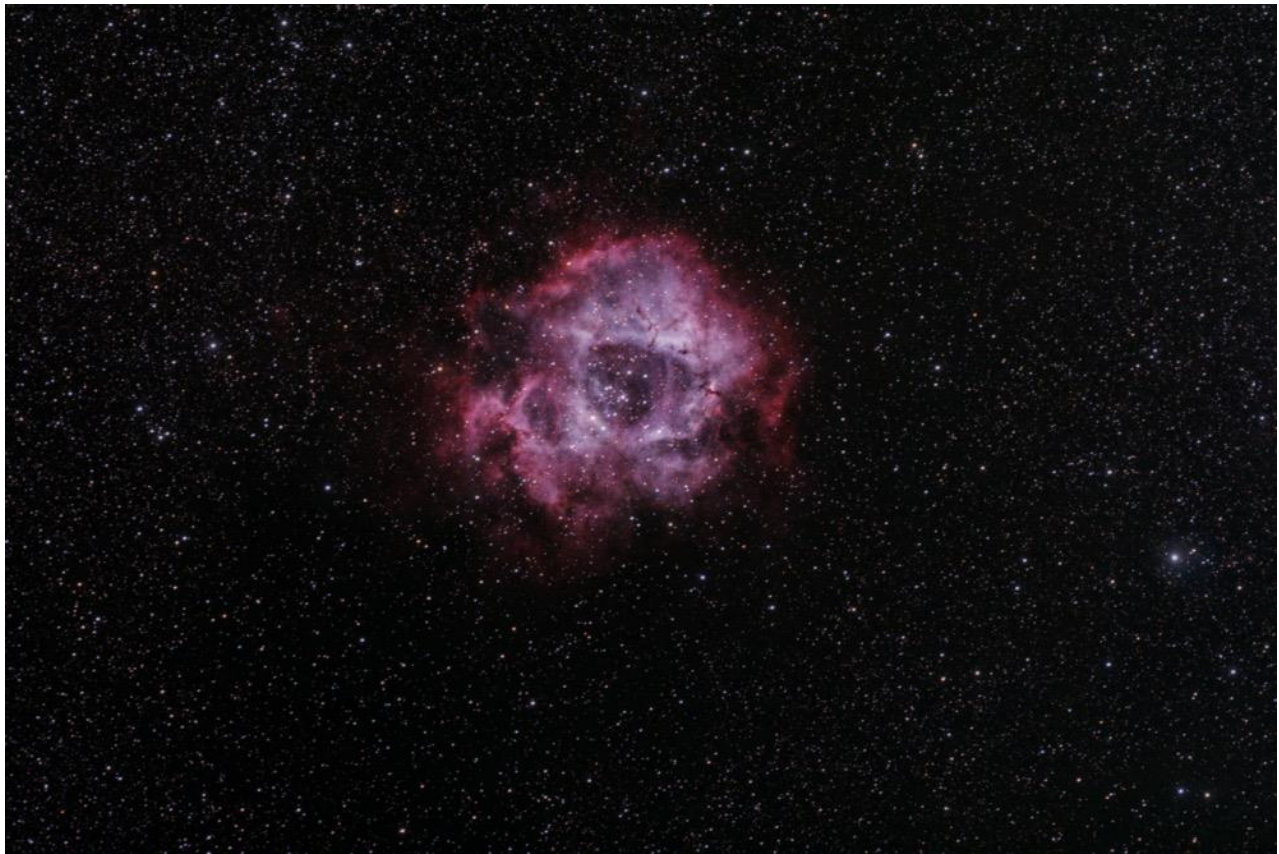
Night before New Moon. The clear sky chart beckons a good night. Drive out and am happy to see the snow clearing has been done. Thank you! Set up on the hill. Here we go!

Night descends. Venus setting in the west, followed later by Jupiter. The skies are clear. It cools quickly. There are steady winds throughout the observing time.

Humidity and cooling temperatures bite. Glad for the warm- up shelter - it's warmth and the regular use of the dryer to warm fingers, gloves, and body.

Time passes. Observing favourites and searching for the new. Larry is tracking comet C/2022 E3 (ZTF) low in the north. Orion is full-on in the south swinging toward the west. Leo rises in the east, paws raised to stand. Looking to the north, aurora rises - green dances. There goes comet observing. Chairs up and watch.

Finally time to pack up and go home. Another great night at Sleaford. Thanks again for this home away from home.



Rosette Nebula taken by Justin Lukan

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. 312)
- THE FINEST NGC OBJECTS (p. 316),
- THE DEEP-SKY CHALLENGE OBJECTS (p. 320),
- DEEP-SKY GEMS (p. 322).

See 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** and the **Double Stars Observing Certificate** for intermediate to advanced members. In addition, **Astroimaging certificates** are available for those members with a photographic bent. See rasc.ca/astro-imaging-certificate

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
Brent Gratias	96
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
---------------	----

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, B. Gratias*

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

Brent Gratias	37
---------------	----

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

Messier, Finest NGC, and David Levy's Deep-Sky lists in the *Observer's Handbook*.

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

Messier and Finest NGC lists, charts and logbooks: <http://www.rasc.ca/observing>

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>