

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:
<https://saskatoon.rasc.ca/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://saskatoon.rasc.ca/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 – 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 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.

SASKATOON CENTRE AGM

Ron Waldron

The October meeting of the Saskatoon Centre to be held on Monday evening, October 18, 2021, will be our Annual General Meeting (AGM).

It is important that we have a strong turnout. All currently serving members should let us know if they are planning on stepping down from any position they may be holding, and all other members need to consider running for any position that might interest them (see executive section on our website <https://saskatoon.rasc.ca/executive.html>).

The most urgent need we have and are aware of at the moment is Vice President, as I will be stepping down in October and Mike Dolan, the current VP, will be stepping into the presidency. I am also aware of a need for someone to fill the Telescope Rentals position with Ike Thiessen.

Please let us know if you have aspirations to serve in any position occupied or vacant prior to October 1, 2021.

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/>



Fireball cutting across Perseus during the Perseid meteor shower on August 12th taken by Tenho Tuomi. 30 second exp, f/3.5, 10mm lens. One of the 314 pictures taken to try to capture Perseid meteors.

RASC CALENDAR OF EVENTS & MEETING INFO

Sept 11	Observer's Group - Sleaford Observatory	Larry Scott
Sept 13	RASC General Meeting - 8:00pm (info below)	Ron Waldron
Sept 26	Sleaford Site Cleanup	

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>

September RASC General Meeting

for all members and guests

Join us on September 13th, 2021 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 - **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.

Warm-up Program - Rick Huziak "New Challenges in light pollution in Saskatoon"

8:30 - **Main Program - Les Dickson "SSSP in Pictures"**

Colin Chatfield & Tara Magee "What's up this month"

SPEAKERS FOR MEETINGS

Rick Huziak

The Centre always needs speakers for meetings - plain and simple. Email rickhuziak@shaw.ca to volunteer to give a short or long talk. We want to hear about what you are doing! Thanks in advance.

SSSP 2021 REPORT

Les Dickson



Photo by Alan Dyer

Another summer has come and gone and with it, another Saskatchewan Summer Star Party. This one, after a year off due to COVID-19, tapped some pent-up need to get out of the house as we attracted 290 attendees at a star party with a very limited daytime program. This was only twenty to thirty people less than our usual size, so we did alright. It turned out to be a great social event.

The weather and atmospheric conditions did not always cooperate. Most nights had significant overcast with only a few hours here and there of clear patches for visual observing and astrophotography. The wildfire smoke was a significant nuisance at times. One evening while using the projector for a talk I noticed a lot of smoke particles dancing in the bright beam of light.

As the photo above taken by Alan Dyer shows, we adapted to our new situation with an open-air venue for many of the activities that would usually have been held indoors, including 10-year and 20-year awards, Astro-photo, Sketching and Art Contest award winners, door prize draw and the Fr. Lucian Kemble Memorial Presentation by Dr. Samantha Lawler.

Dr. Lawler of the University of Regina gave a very good presentation titled "Mega constellations of satellites are about to ruin stargazing for everyone". Dr. Lawler and her collaborators have been studying the effects of the "mega-constellations" of communication satellites planned or being launched by SpaceX, OneWeb, Amazon and others. For example, simulations by Dr. Lawler and her collaborators have shown that from 52 degrees North latitude (that of Saskatoon) and northward, hundreds of SpaceX's Starlink satellites will be visible for a few hours before and after sunset and sunrise and many will be visible all night long. She also mentioned the problems of crowded orbits leading to more collisions between satellites and increased amounts of orbital debris. She was not all "doom and gloom" though as she did mention that SpaceX and Amazon are participating in discussions on ways to mitigate the negative effects of their satellites, such as using low-reflectivity coatings to reduce the brightness of the satellites.

As part of our limited program, Murray Paulson gave his usual high-quality BInocular Star Walk through the night sky (when the clouds permitted) and Sherry Campbell gave a well-received presentation in the Yurt on techniques for sketching at the eyepiece.

George Charpentier and Laura Eglar organized the Astro-photo, Sketching and Art Contest this year. Adapting to our altered circumstances, they placed all of the submissions on-line for viewing and judging. From all accounts, it worked out very well. Thanks to all of the submitters for their participation.

Darrell Chatfield organized the door prizes again this year with Les and Ellen Dickson drawing and presenting on-site. We thank our major donors for this year: Alan Dyer, All-Star Telescope, Celestron, Fervent Astronomy and Imaging Starlight.

We could not put one SSSP without the efforts and contributions of many people. I wish to thank the Staff past and present of the Cypress Hills Interprovincial Park for their valuable help and professionalism. The core organizing committee, volunteers all, include George Charpentier, Darrell Chatfield, Les and Ellen Dickson, Greg Fusick, Rick Huziak, Andrew Kostiuk, Donna-Lee May, Vance Petriew, Pierre Schierle and Ron Waldron. Les and Ellen Dickson and Terry Lesko designed the pin and Vance Petriew designed the logo for the shirts. We thank Donna-Lee May for running the Redlight Café this year. Our official photographers were George Charpentier and Mike Dolan. We appreciate the support and encouragement of the Executives of the Regina and Saskatoon Centres of the RASC. Many thanks also go to the on-site volunteers helping with set-up and take-down of the registration tent, Meadows entrance security, the Redlight Cafe, pin and patch sales and many other tasks.

We will be back next year August 24 to 29, so get involved!

OBSERVERS GROUP COORDINATOR(S) NEEDED

Larry Scott

The Saskatoon Centre of the RASC is seeking one or more volunteers to take over the Observers Group Coordinator/Yard Monkey position currently held by me (Larry Scott). This position has many perks - fresh air and exercise in beautiful surroundings; works in close proximity to many bird species, butterflies, racoons, deer and gophers; the appreciation of your fellow club members; free parking; and more! Below is a list of opportunities for energetic club members that need to be passed on or not as the club sees fit.

If possible I would continue doing this for years but I'm planning a move in a few years and simply won't be here. My hope is to give the club time to consider its options and that I can pass on some tips to whomever(?) comes next.

Observers Group Coordinator

- Set schedule for Observers Group based on dark skies(new moon) and not on a long weekend.

(Also Messier Marathon)

- Interpret weather reports to base a go/no go decision the day of Observers Group and notify club members.

Yard maintenance

- Mow grass or blow snow as required so yard is useful and combustibles near buildings are kept to a minimum.

- Care and feeding of snow blower and lawn mowers. ***Important***

Key Master

- Give tours of Sleaford to club members and hand out keys to the kingdom.

Sleaford Open House

- Set a date

- Nag George for posters.

- Distribute posters

- Nag everyone to show up.

Starting in 2006 I began hosting Observer's Group meetings and as the years went on I accumulated some other responsibilities as listed above. Not sure if everything will be picked up by the members but I am hoping someone will step up to host the Observers Group and assist with these other responsibilities. Cheers for now, hope to see some of you out at Sleaford before I'm gone.

PRESIDENT'S MESSAGE

Ron Waldron

It has been an interesting summer as we experienced record heat and smoke with very little rain. As a club, we successfully hosted over 200 people at the Saskatchewan Summer Star Party. Although the weather did not provide the clear skies most were looking for, the chance to meet and greet old friends and colleagues made it a lot of fun for all attendees. A big shout-out to the members of the Saskatoon Centre and Regina Centre who helped make this event happen.

Your executive has been looking ahead to the fall and winter season keeping in mind we have entered a fourth wave of the coronavirus. As an executive, we have made the following decisions regarding the direction of club activities and meetings from here on:

1. To continue with Zoom meetings and not return to in-person meetings until it is clear that the fourth wave of the Corona Virus is over.
2. To cancel the Sleaford Open House for yet another year as it is a dark environment where social distancing and observing/enforcing masks would be impossible. Daryl Janzen made it clear that he could not guarantee that the U of S would participate if we went ahead and that did not feel right. Add to that multiple eyes at eyepieces and this decision became very easy.
3. To go ahead with the fall cleanup at the Sleaford Site on **Sunday, September 26th in the afternoon**, the main goal being to cleanout unwanted/unused equipment from the shed to make room to store the recently prepared 16-inch scope until a decision can be made as to what its future should be.
4. To hold our September meeting one week early on **Monday, September 13th** to avoid any conflict with the expected Federal Election on the following Monday.

As your president, I am comfortable with these courses of action and I assume all of you will be too. I am looking forward to seeing all of you at our **Zoom meeting on Monday, September 13th at 8 PM**. Remember to mark your calendar for the Sleaford Clean-up on **Sunday afternoon, September 26th**. Looking forward to seeing many of you in person at the site.

BEHIND THE SCENES AT SSSP

Rick Huziak

While the Saskatchewan Summer Star Party rolls along, other things smolder in the background and many don't realize what the SSSP Committee has to handle beyond what we've planned over the many months it takes to organize the star party.

Part of the planning has to take into account that the park is a dark-sky preserve all year around and that there is great public interest directly or indirectly in this concept. Back in April, I got an email from Ottawa journalist Suzannah Showler who was interested in doing an article on the dark skies of Grasslands National Park Dark-sky Preserve. We had planned to meet up at Grasslands. She had her flight and accommodation at Val Marie booked when increased Covid-19 restrictions hit Ontario and she was forced to cancel. Just two weeks before SSSP was to start, she contacted me again but since I was tied up with SSSP start-up I couldn't get to Grasslands. So, I invited her to visit SSSP on her way to Grasslands. I had to scramble to get her accommodations. The resort was full, but she was happy to camp, so I got her a tent and all the accessories she'd need. She spent the better part of 3 days at SSSP interviewing people and learning about dark skies and amateur astronomers. She then drove down to Grasslands and saw what we've always talked about – pristine dark skies! She texted me later, stating, "The sky at Grasslands was life-changing!" That's what we want to hear!

Park manager Royce Pettyjohn had contacted us a month before the star party to brainstorm about issues with restarting programming at the observatory after Covid-19 is no longer an issue. In the 18-months since the observatory had last operated some changes were being made at Sask Parks which included reassigning interpreters to cover regional areas instead of specific parks, and Mark Walker's position at the observatory was terminated as a result. That left the park in a lurch since dedicated interpreters were no longer available to run programs on a regular basis. Royce and I had a telecon beforehand to discuss options, and we agreed to jointly provide a tour of the Cypress Observatory as part of SSSP clinics. It was great to see over 80 SSSPers attend the clinic, tour the observatory and yurt, and start thinking of ideas of how the observatory could be staffed and how to make the program sustainable without burning out the limited park staff.

We also always are concerned with long term issues of staying in the park for future SSSPs. This year, with Covid-19 questions, we at first didn't know if we could hold the star party at all and party planning went through several stages of lessening concern as Provincial regulations and recommendations were published. We sent out a poll to our past attendees and got a commitment that at least 180 people would show up. This allowed us to negotiate use of the main Meadows campground and not just the Dark-sky campground as the park

was more-or-less pushing us to use. With only a month left in planning, we scrambled to change our camping and to add outdoor presentations and speakers. In the end this worked out well with us filling 102 of 109 campsites allotted and having an attendance of 290, whereas our non-Covid attendance is around 325. Part of the compromise for using the main Meadows was to give up site M1 through M30 and take the “south loop” of bush sites. We still have to poll the south loop campers to see how they coped with bush sites. Future SSSP would be nice to include sites M1 though M30 as well, but to do that we have to attract another about 50 attendees, and we haven’t been able to do that to date.

Light pollution issues also always come up. This year almost everyone noticed a blue glare in the east horizon. Eventually Vance Petriew tracked down that this was a single ill-pointed blue 5000K LED floodlight at the park’s golf course parking lot. (See the Alan Dyer panoramic photo in the online SSSP 2021 Gallery). We approached Royce Pettyjohn to look into this light. It is apparent that often park lessees do not understand the concept of dark-sky preserve lighting. When I returned to the park for an August 28th presentation (see below), I could not identify which light was the offender, so it may have been a temporary light. The Park will continue to look for the errant light and will request the lessee to correct it as necessary.

In addition, Radio-Canada (CBC French language) picked up on the star party and requested an interview (in French) through park manager Royce Pettyjohn. Royce asked if we had anyone who could do the interview. Offhand, I had really no idea but lucky first-year attendee Sebastien Fillion agreed to do the interview for us. As a matter of fact, he was delighted to do so since he had already worked with the Radio-Canada interviewer in the past. We gave him a few days to check out the star party, and he did the interview for us. He reported that the interview went quite well. (Thanks Sebastien!)

Coming out of the star party and out year-round relationship was a request for an Aug 28 presentation at an all-day Park event. I returned to Cypress Hills on the 28th after an August 27th meeting at Grasslands with park managers (discussing their dark-sky lighting). The August 28th presentation was a talk entitled “The Importance of the Cypress Hills Dark-sky Preserve” and was done at the amphitheatre. Although I followed a kid’s magician on stage, I still had an audience of 77 people which included most of the park staff. It was a great opportunity to talk about the history of the Cypress Hills DSP and the effect of light pollution on the park. Following my talk, the park’s Cypress Observatory was opened. The tour featured looks through the observatory’s 16” telescope and two portable 10” & 12” Dobsonian scopes, both manned by super-interpreter Mimi Martin! Interpreter Chelsea also gave an excellent talk on the constellations and astronomical myths! I was very impressed by her knowledge of both the subject and sky! She had no problem roving around the sky constellation to constellation, being very well prepared! It was great to see how well-done this event was and equally great that all of the park management was there to see how popular (first-hand) the observatory is! This night attracted over 500 campers coming to

see the Milky Way, Jupiter and Saturn on a pristine Cypress Hills DSP night. It turned out to be the observatories busiest night ever!

There are always other unanticipated things we handle on the fly at SSSP. That's what makes SSSP even more fun and interesting! Most years are like this since SSSP is more popular and well-respected than we might think!



Photos on this page by George Charpentier

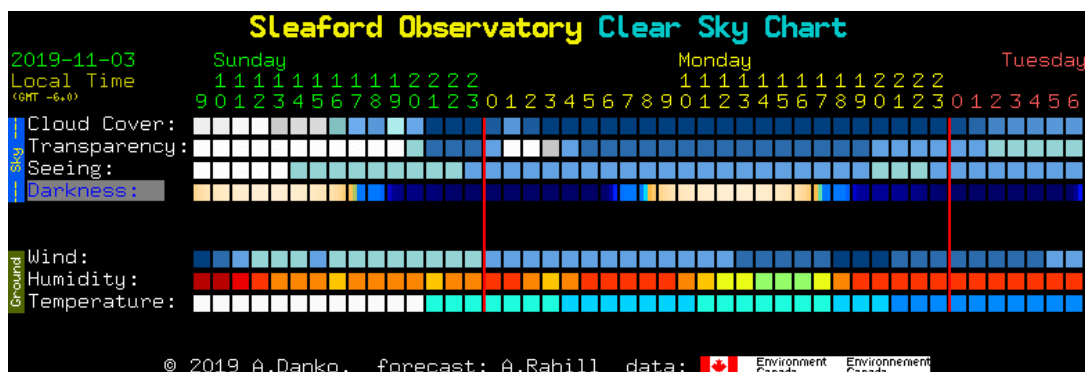


CLEAR SKY AND WEATHER INFO

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



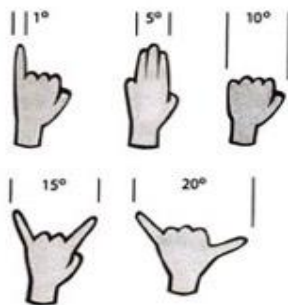
Aurora taken by Tara Magee in September 2016 with a Canon T6s and Sigma 17-70mm lens

SEPTEMBER NIGHT SKY EVENTS AND INFO

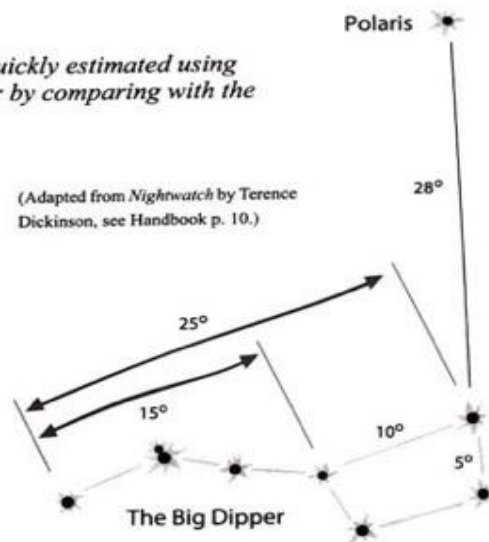
Images on the next few pages taken with permission from the 2021 Observer's Handbook. It can be obtained by joining the RASC here <http://rasc.ca/join> or ordered from <https://secure.rasc.ca/Portal/Shop/RASC/Store/StoreMain.aspx?Category=CURRPUB>

HANDY SKY MEASURES


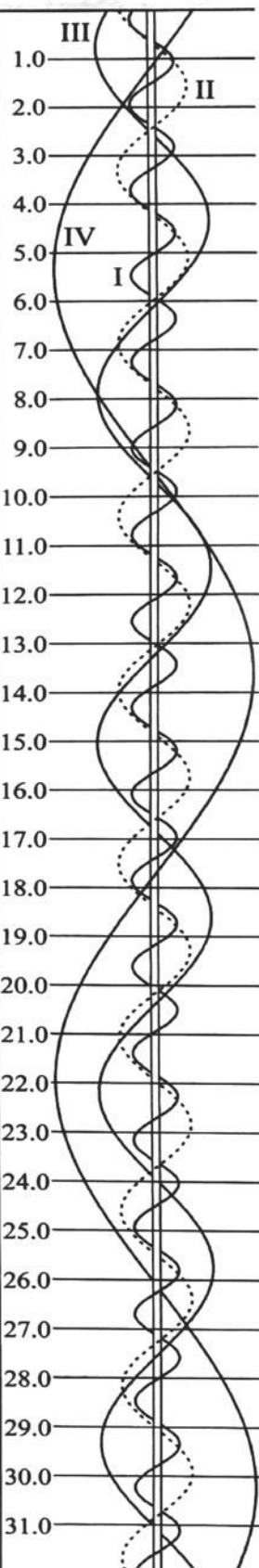

















Angular measure in the sky can be quickly estimated using the fingers of an outstretched arm, or by comparing with the star separations in the Big Dipper.

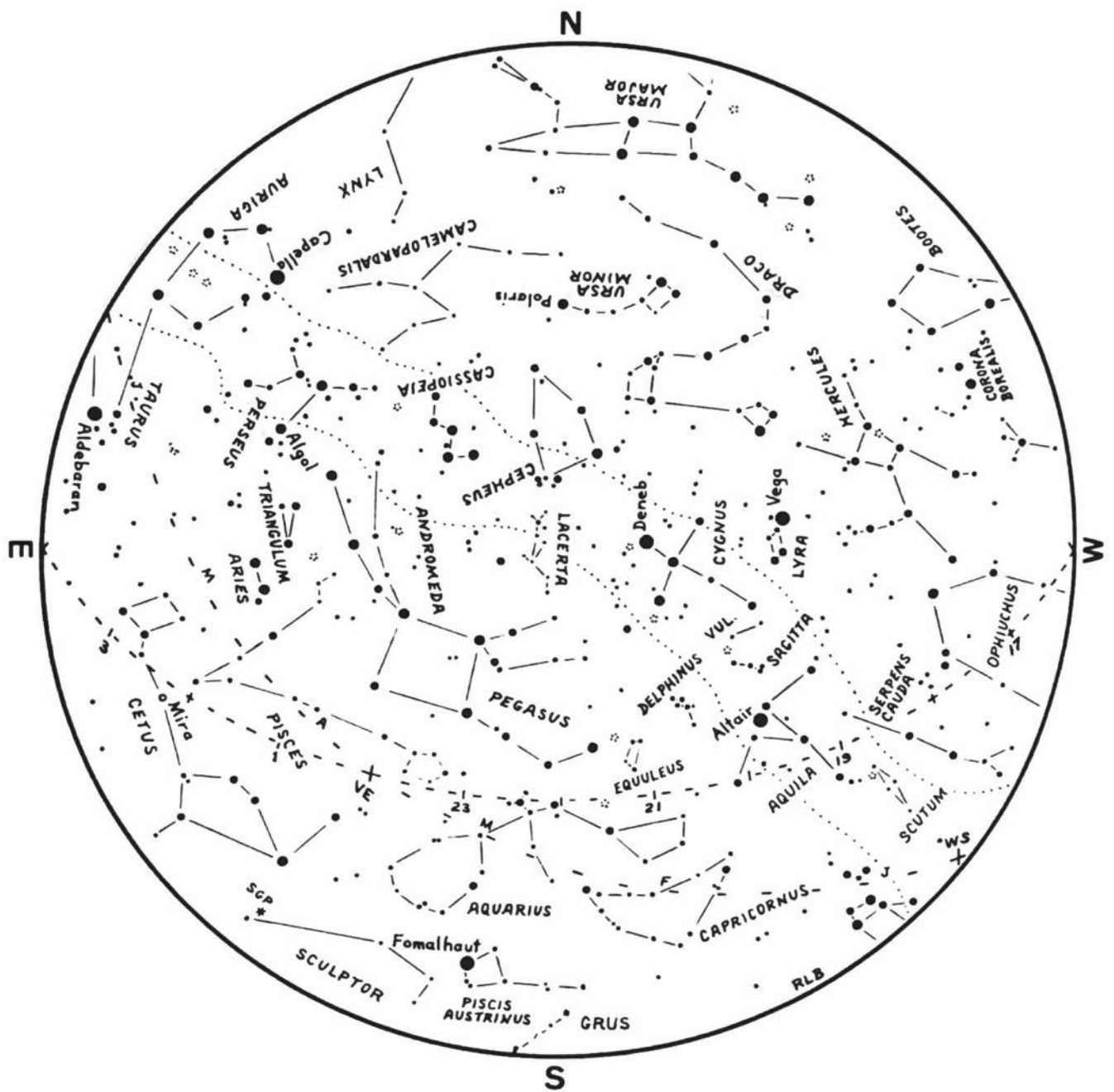


(Adapted from *Nightwatch* by Terence Dickinson, see Handbook p. 10.)



RASC OBSERVER'S HANDBOOK 2020

Time (UT)			SEPTEMBER EVENTS		Jupiter's Satellites	
d	h	m			West	East
Wed.	1	10	Moon 1.3° N of M35			
		17 35	Algol at minimum			1.0
Thu.	2					2.0
Fri.	3					3.0
Sat.	4	14 24	Algol at minimum			4.0
Sun.	5		Zodiacal Light vis. in N lat. in E before morning twilight for next two weeks			5.0
		6	Venus 1.7° N of Spica			6.0
Mon.	6		Mercury at aphelion			7.0
Tue.	7	0 51	New Moon (lunation 1221)			8.0
		11 13	Algol at minimum			9.0
Wed.	8					10.0
Thu.	9					11.0
Fri.	10	2	Venus 4° S of Moon			12.0
		8 02	Algol at minimum			13.0
Sat.	11	2	Pallas at opposition			14.0
		10	Moon at perigee (368 461 km)			15.0
Sun.	12					16.0
Mon.	13	4 51	Algol at minimum			17.0
		20 39	First quarter			18.0
Tue.	14	4	Mercury greatest elongation E (27°)			19.0
		9	Neptune at opposition			20.0
Wed.	15					21.0
Thu.	16	1 40	Algol at minimum			22.0
Fri.	17	3	Saturn 4° N of Moon			23.0
Sat.	18	7	Jupiter 4° N of Moon			24.0
		22 29	Algol at minimum			25.0
Sun.	19					26.0
Mon.	20	23 54	Full Moon			27.0
Tue.	21	19 18	Algol at minimum			28.0
Wed.	22	19 21	Equinox			29.0
Thu.	23	13	Mercury 1.7° S of Spica			30.0
Fri.	24	16	Uranus 1.3° N of Moon			31.0
		16 07	Algol at minimum			
Sat.	25					
Sun.	26		Mercury at greatest heliocentric lat. S			
		22	Moon at apogee (404 640 km)			
Mon.	27	4	Mercury stationary			
		12 56	Algol at minimum			
Tue.	28	18	Moon 1.6° N of M35			
Wed.	29	1 57	Last quarter			
Thu.	30	9 45	Algol at minimum			
		14	Mercury 1.7° S of Spica			



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 \$15.00
R. Morales			
“Observing the Constellations”	1989	J. Sanford	Color charts \$10.00

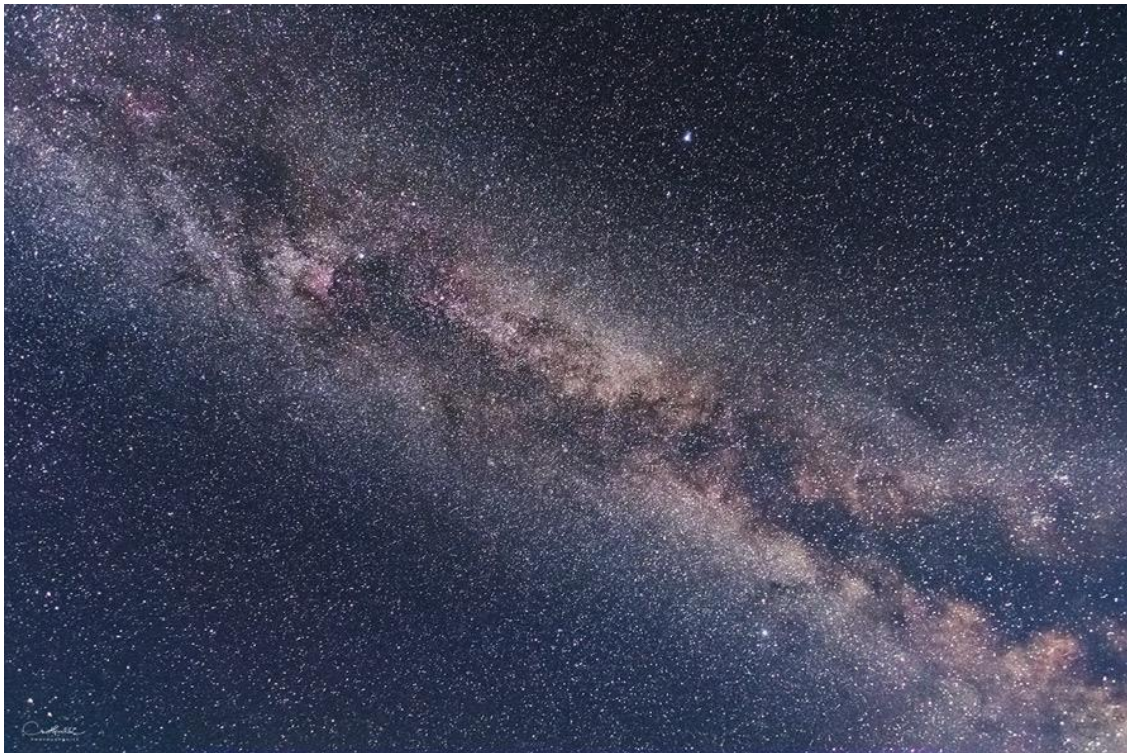
RASC 2022 CALENDARS

Donna-Lee May

Donna-Lee May is currently taking orders for the 2022 RASC Calendars. They are \$20 each. Email Donna-Lee at d1m3star@telus.net. See the RASC website for more info (please note the price on the website doesn't include the shipping cost, etc.):

<https://secure.rasc.ca/store/product/2022-observer-s-calendar>





Milky Way with the Summer Triangle overhead from July 2021 by Colin Chatfield. Taken with a Canon 7D MKII and Tokina 11-16mm f/2.8 lens at 16mm, ISO 6400, 10x20 second exposures

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.astroleague.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>