

Saskatoon Skies

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

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

WEBSITE: <http://www.usask.ca/rasc/>

E-MAIL: sk_centre@rasc.ca

FACEBOOK: [RASC Saskatoon Centre](https://www.facebook.com/RASC.SaskatoonCentre)

INSTAGRAM: [@RASCYXE](https://www.instagram.com/RASCYXE)

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)
- SkyNews Magazine (bimonthly)
- 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

SASKATOON CENTRE'S MAIN OFFICERS:

President – Daryl Janzen

Vice-President – Jim Goodridge

Secretary – Rina Rast

Treasurer – Norma Jensen

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@sasktel.net 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@sasktel.net for rates. Members can advertise non-commercial items for free.



"On Sept 20, 2012 I was setting up for some imaging and I happened to look up to the SW and was surprised to see bright aurora"- Dick Kirk

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/>



Saskatchewan Light Abatement Committee -

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



www.darksky.org

RASC CALENDAR OF EVENTS

Oct 17	Observer's Group (weather permitting)	Larry Scott
Oct 19	RASC General Meeting - 8:00pm (info below)	Daryl Janzen

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>

SPEAKERS FOR MEETINGS

Rick Huziak

Getting speakers for each general meeting is harder than pulling teeth - plain and simple. Going forward, we have only a few speakers lined up until the end of the season, with Gord Sarty talking about his Space MRI coming up. But with three other main talks and three minor talks to fill the agenda with, it is highly likely that you will be listening to talks about my favourite variable stars or the latest light pollution crisis ... again. So, please volunteer to give a talk about your favourite astronomy topic or experience. It doesn't have to be long and everyone has some sort of interest in the sky. As a matter of fact, there is an entire universe out there to talk about! So, be it 5 minutes or 55 minutes. I'd love to hear from you.

ANNUAL GENERAL ELECTION AND MEETING INFO

Our annual election has been called for the October meeting, and this year the following positions are open:

President
Vice President
Secretary

Please consider putting your name forward to help out your club. Thank you to those who have already agreed to continue volunteering in their positions for another year.

October RASC General Meeting

for all members and guests

Join us on October 19, 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 as well, but is included here:

Executive meeting (will discuss nominees):

<https://us02web.zoom.us/j/86940395798>

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, but is included here:

Members meeting (elections, plus Ron Waldron talk):

<https://us02web.zoom.us/j/81809555294>

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:

- **Ron Waldron - “Chasing the Northern Lights”** Ron Waldron has been a member in good standing since 2003. A retired educator, he spends much of his time doing astronomy outreach in Saskatoon Schools, particularly with the Starlab Portable Planetarium and at school camps where he does star talks and walks. More recently he has been travelling to Churchill, Mb and Bergen, Norway to teach about and show the northern lights. His talk will centre around those experiences and will include many of his photographs.

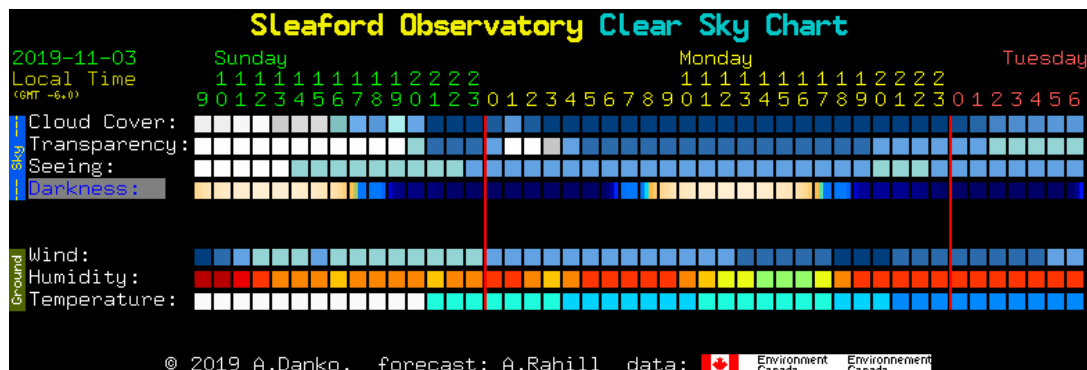


CLEAR SKY AND WEATHER INFO

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

RUMINATIONS FROM THE UNORTHODOX ASTRONOMER

Mike Dolan

This is a great time of year for most people. Farmers should be finished with Harvest or close to it. The kids are back in school, sort of. The NFL is on Sundays and the skies are beginning to liven up with the change from summer to autumn. Orion, Taurus and Gemini, my favorites, are starting to show up in the early mornings boasting their star treasures for those adventurous enough to wake at 3:00 am. But, that's not what this story is about, oh no, this story has deeper more philosophical meaning than just staring at M35 or gazing in wonder at the beauty M42.

That's right...this story is all about "What **not** to do when trying to look like you **know** what you're doing".

So it starts with one evening when Ron Waldron and I meet up at my house to do some observing in the park. I decided to use my new 8SE and show Ron how "simple and quick" it is to setup and get a "precise" alignment. That's what I thought I was going to do. Let's discuss what not to do:

1. Set up your equipment in the only place in a 20 acre park a where a street light shines directly in your face.
2. Don't bother to check if the mount is level, heck-it was level on the deck last night - should be ok in the park.
3. I'll save time and not attach the spreader/eyepiece holder – the tripod legs look like they're completely opened.
4. Go for the famous SkyAlign – just point and center three objects and presto - not even close!!

An hour later and doing everything I should've done to begin with, I get an alignment and see some sights. One good thing, the brownies and coffee tasted good after we shut down and packed up. Lucky for me only Ron and I will ever know about this episode of stargazing. Let's move on...

Ron and I go out to Sleaford. It's a great evening. Perfectly clear, no bugs, it's warm so all you need is a hoodie, can you ask for anything more.

1. Set everything up – correctly.
2. Make sure that date and time are correct in the AVX mount when aligning.
3. Align. Perfect!!

4. Confirm Alignment – what? Why am I so far off – how can that be? Align try #2 same results – try #3 wait a minute!! Did you hear it - Quick Draw McGraw “Hold on thar Bubba Louie – I’ll do the thinnin’ around har”
5. Date – 9/18/20 – Check! Time 22:45 Check!

Not quite - 8:45pm is not 22:45 it’s 20:45. After the mild ribbing I had to endure about how to tell military time, and rightfully so, I entered in the correct date and time and Voila – a perfect All Star Polar Alignment – as advertised. I’m glad Ron and I were the only ones out there so nobody else would know about this faux pas.

Lastly, there’s “The Big Experiment”...did you just hear the “Law and Order” doinky doink?

Yup! I decided I’m going to attempt a 20 frame stacked image of M42. Should be easy enough, I have a good telescope; I have an excellent CGEM mount, a pretty good DSLR, and a couple of Freeware computer programs that just can’t fail – what can go wrong? I prep everything I need the night before – I’m up at 2:30am – “pitter patter lets git-at-er”...

1. Contrary to popular beliefs, things do get stiff and hard when it’s cold e.g. my focuser (what did you think I meant?)
2. Freeware that offers astrophotography and stacking capabilities probably did not think about shooting prime. I discovered a bit too late that the stacking process works but works better when a camera lens is attached – all of the options appear in the software menus.
3. 80 photos at different ISO and exposure settings – and everyone about 1/8 turn out of focus (see point 1)

Thank goodness for digital photography, I just have to delete the files and nobody will ever know that I took 80 pictures of the Orion nebula just a touch out of focus or that I attempted to stack all of those photos to create a giant mess. Disaster averted all files deleted nobody will ever know.

I’m beginning to think that maybe being just a visual observer and enjoying what I see through the eyepiece in the telescope might be reward enough. Until the next time – wishing you all clear skies.



Ursa Major and aurora taken by Mike Dolan



M42 in Orion taken by Mike Dolan

TOUCH THE SKY: THE STORY OF AVRO CANADA

This exhibit is closed temporarily, but I'll leave the info in case it opens again.

A pioneer in aircraft manufacturing, Avro Canada Ltd. was most recognized for its Avro Arrow aircraft—a model intended to serve the Royal Canadian Air Forces. Highly debated in government for its cost and national defence implications, Prime Minister Diefenbaker abruptly cancelled the production of the Avro Arrow in 1959. Curated by the Diefenbaker Canada Centre, this exhibit tells the story of Avro Canada's creation and its impact in the world of aeronautics and technology.

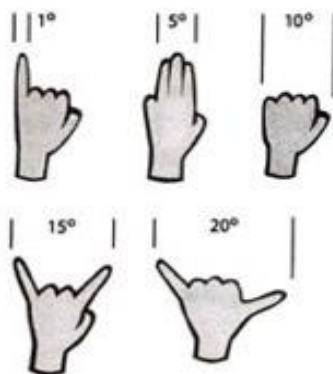
<https://diefenbaker.usask.ca/exhibits/Current-exhibits.php#TouchtheSkyTheStoryofAvroCanada>

OCTOBER NIGHT SKY EVENTS AND INFO

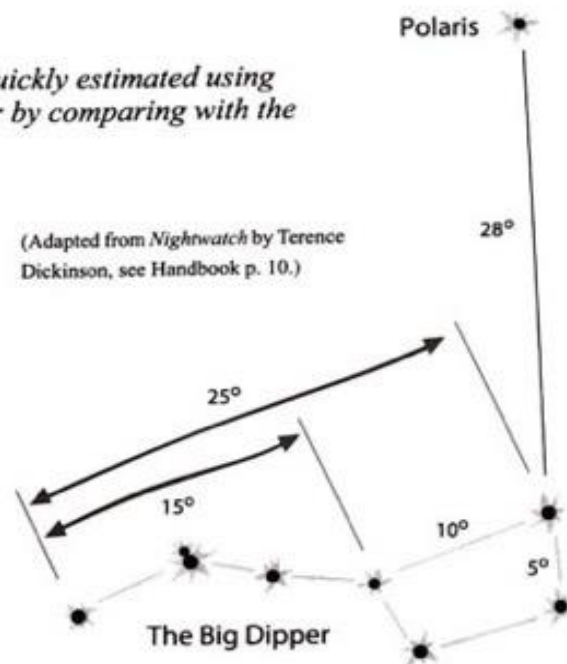
Images on the next few pages taken with permission from the 2020 Observer's Handbook. It can be obtained by joining the RASC here <http://rasc.ca/join> or ordered from <https://secure.rasc.ca/Portal/Shop/RASC/Store/StoreMain.aspx?Category=CURRPUB>

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 OCTOBER

		Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune	Sun
RA	1	14h 02m	9h 59m	1h 37m	19h 17m	19h 48m	2h 29m	23h 20m	12h 29m
	11	14h 29m	10h 45m	1h 25m	19h 20m	19h 49m	2h 28m	23h 19m	13h 06m
	21	14h 20m	11h 30m	1h 13m	19h 24m	19h 50m	2h 26m	23h 19m	13h 43m
Dec	1	-15° 21'	+12° 34'	+6° 08'	-22° 42'	-21° 26'	+14° 14'	-5° 29'	-3° 10'
	11	-18° 18'	+8° 52'	+5° 31'	-22° 37'	-21° 25'	+14° 07'	-5° 35'	-7° 00'
	21	-16° 25'	+4° 40'	+4° 58'	-22° 29'	-21° 22'	+14° 00'	-5° 39'	-10° 41'
Dist	1	1.00	1.07	0.42	4.86	9.66	18.92	28.98	1.001
	11	0.83	1.14	0.42	5.02	9.82	18.85	29.05	0.998
	21	0.68	1.20	0.43	5.17	9.99	18.80	29.15	0.996
Mag	1	-0.0	-4.1	-2.5	-2.4	0.5	5.7	7.8	
	11	0.3	-4.1	-2.6	-2.3	0.5	5.7	7.8	
	21	2.8	-4.0	-2.5	-2.2	0.6	5.7	7.8	
Size	1	6.7"	15.5"	22.4"	40.5"	17.2"	3.7"	2.3"	31' 57"
	11	8.1"	14.6"	22.5"	39.3"	16.9"	3.7"	2.3"	32' 02"
	21	9.8"	13.8"	21.7"	38.1"	16.6"	3.7"	2.3"	32' 08"

Moon: On October 0 at 0h UT*, Sun's selenographic longitude is 65.19° and increases 12.2° each day thereafter.

Greatest N declination on the 10th (+24.5°)

Greatest S declination on the 22nd (-24.7°)

Libration in longitude: E limb most exposed on the 23rd (+7.7°)

W limb most exposed on the 11th (-7.7°)

Libration in latitude: N limb most exposed on the 1st (+6.6°) and 28th (+6.7°)

S limb most exposed on the 15th (-6.6°)

Large tides in the days following new Moon (Oct. 16)

Mercury: Begins the month at greatest eastern elongation (GEE), some 26° from the Sun at mag. 0.0 and well placed for S. Hemisphere observers. By the 15th it will have faded by a full magnitude and its elongation reduced to 18°, after which it fades more rapidly and dives toward inferior conjunction on the 25th.

Venus: Begins the month close to Regulus and undergoes an achingly close appulse with that star at 0h UT on the 3rd, when the two will be separated by just 5'. For N. American viewers the bright planet will appear about half a degree to either side of the star in morning twilight on the 2nd and 3rd. The waning crescent Moon passes 4° to the north on the 13-14.

Mars: As October begins, Mars outshines even mighty Jupiter. It achieves its closest approach to Earth until 2035 on the 6th, when it will shine at magnitude -2.6 with a 22.6" disk, just 3.5 light-minutes away. Opposition doesn't occur until a week later on the 13th, with the asymmetric nature of this apparition being explained by the fact Mars achieved its perihelion in early August and is gradually receding from the Sun throughout the prime viewing window. Its position 5.5° N of the celestial equator places it fully 30° higher in Northern Hemisphere skies than the marginally closer opposition of July 2018. In retrograde motion throughout the month among the stars of southern Pisces, Mars has two October conjunctions with the nearly full Moon, on the 3rd (evening of the 2nd in the Western Hemisphere) and the 29th. The first of these is particularly close with a separation of less than 1°; the latter features a wider gap of 3°. Meridian transit times at Greenwich on the 1st, 11th, 21st—00:57, 00:06, 23:09 UT*.




















Jupiter: Prominent in the evening sky throughout the month, far outshining the background constellation of Sagittarius. Now setting in the evening hours. The waxing crescent Moon passes nearby on the 21-22. Meridian transit times at Greenwich on the 1st, 11th, 21st—18:34, 17:58, 17:23 UT*.

Saturn: Now in prograde motion in the evening sky, and setting before local midnight. Its relatively slow nightly motion against the stars can be compared to that of Jupiter, which is beginning to overtake Saturn from the west. The first-quarter Moon passes 3° to the S on the evening of the 22nd in the Western Hemisphere. Meridian transit times at Greenwich on the 1st, 11th, 21st—19:06, 18:27, 17:49 UT*.

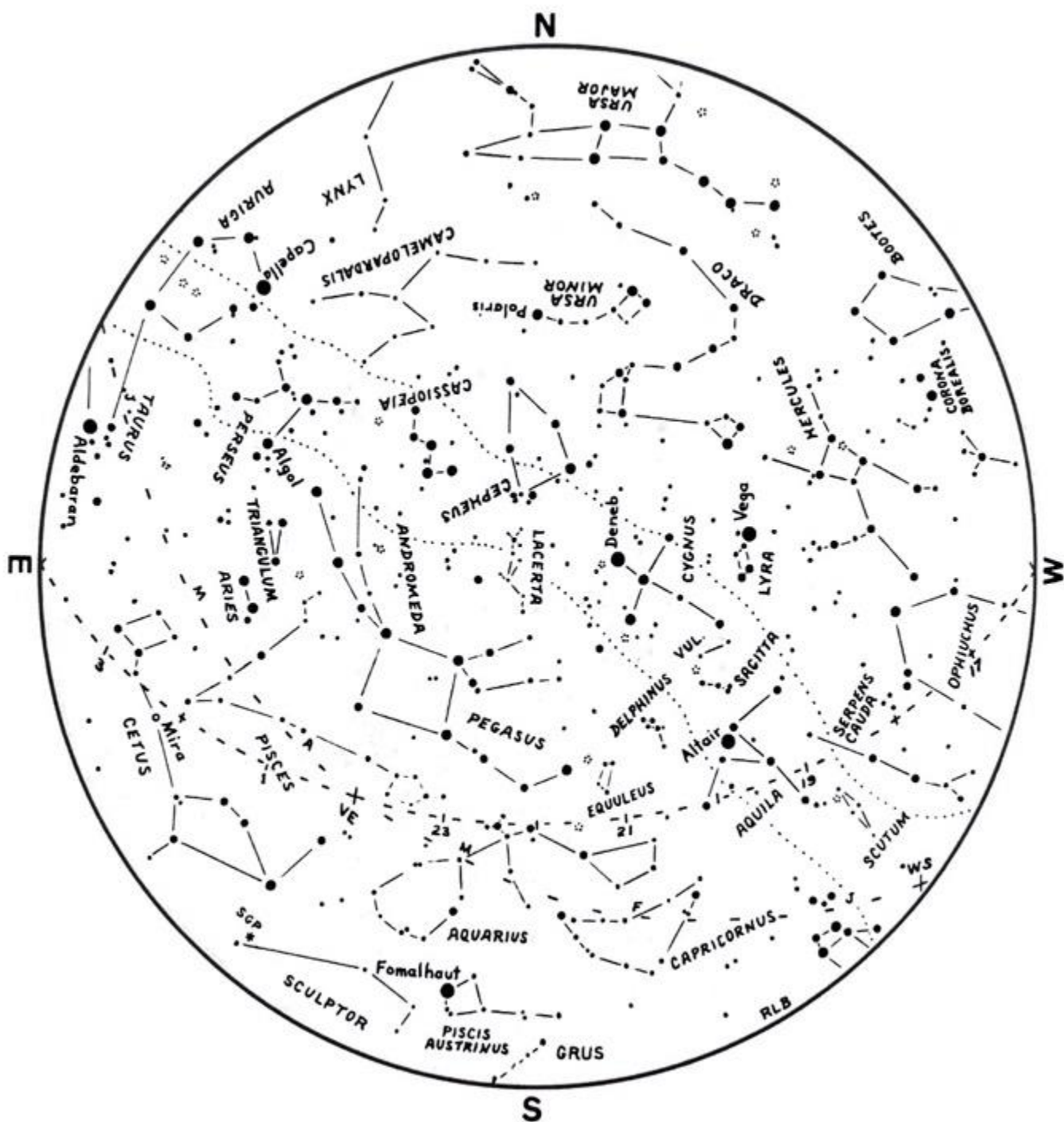
Uranus: Reaches opposition on the 31st, 2.6 light-hours (18.8 au) from Earth, mag. +5.7 with a 3.75" disk. Visible throughout the month, it can be discerned with the unaided eye from dark locations on moonless nights. Meridian transit times at Greenwich on the 1st, 11th, 21st—01:49, 01:09, 00:28 UT*.

Neptune: Visible most of the night in Aquarius, just past opposition. Meridian transit times at Greenwich on the 1st, 11th, 21st—22:37, 21:57, 21:17 UT*.

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

Time (UT)			OCTOBER EVENTS		Jupiter's Satellites	
d	h	m			West	East
Thu.	1	6 02	Algol at minimum			
		16	Mercury greatest elongation E (26°)		1.0	II
		21 05	Full Moon			
Fri.	2				2.0	
Sat.	3	0	Venus 0.09° S of Regulus		3.0	IV I III
		3	Mars 0.7° N of Moon, occultation†			
		17	Moon at apogee (406 322 km)		4.0	
Sun.	4	2 51	Algol at minimum		5.0	
		9	Uranus 3° N of Moon		6.0	
Mon.	5				7.0	
Tue.	6	14	Mars at closest approach		8.0	
		23 40	Algol at minimum		9.0	
Wed.	7				10.0	
Thu.	8	3	Draconid meteors peak		11.0	
		20	Moon 0.02° S of M35		12.0	
Fri.	9		Mercury at greatest heliocentric lat. S		13.0	
		20 29	Algol at minimum		14.0	
Sat.	10	0 39	Last quarter		15.0	
Sun.	11				16.0	
Mon.	12	17 18	Algol at minimum		17.0	
Tue.	13	23	Mars at opposition		18.0	
Wed.	14		Zodiacal Light vis. in N lat. in E before morning twilight for next two weeks		19.0	
		0	Venus 4° S of Moon		20.0	
		4	Mercury stationary		21.0	
Thu.	15	14 07	Algol at minimum		22.0	
Fri.	16	19 31	New Moon (lunation 1210)		23.0	
Sat.	17	0	Moon at perigee (356 912 km) Large tides		24.0	
		21 26	Double shadow transit on Jupiter		25.0	
Sun.	18	10 56	Algol at minimum		26.0	
Mon.	19				27.0	
Tue.	20				28.0	
Wed.	21	7 45	Algol at minimum		29.0	
		17	Orionid meteors peak		30.0	
Thu.	22	17	Jupiter 2° N of Moon		31.0	
Fri.	23	3	Ceres stationary			
		4	Saturn 3° N of Moon			
		13 23	First quarter			
Sat.	24	4 34	Algol at minimum			
Sun.	25	18	Mercury in inferior conjunction			
Mon.	26					
Tue.	27	1 23	Algol at minimum			
Wed.	28		Mercury at ascending node			
Thu.	29	16	Mars 3° N of Moon			
		22 12	Algol at minimum			
Fri.	30	19	Moon at apogee (406 394 km)			
Sat.	31		Venus at perihelion			
		13	Uranus 3° N of Moon			
		14 49	Full Moon (smallest in 2020)			
		16	Uranus at opposition			

†S & SE South America, most of W Antarctica, Ascension Is., SW Africa



MINUTES OF SEPTEMBER MEETING

Rina Rast

Minutes of the Executive Meeting, September 21, 2020

Attendees: Tim Yaworski, Rina Rast, Les Dickson, Daryl Janzen, Patricia Gakis, Rick Huziak, Donna-Lee May, Grant Ursaki, Scott Rosendahl, Ron Waldron

Meeting called to order by Daryl Janzen at 7:01 PM.

Motion to adopt agenda by Les Dickson, seconded by Rina Rast, passed as all in favour.

Reports:

National Council Representative Report:

The roles and guidelines for the National Council have been updated. In short, representatives of the National Council are conduits to the National Council, which is a conduit to the Board of Directors.

A point of clarification: if a member is expelled from the National Council, they will be automatically expelled from their centre as well.

So far this fiscal year, \$270,000 have been fundraised, in part to cover the costs of having paid staff. The budget for the RASC is available from CRA.

Green Laser Pointer Clarification:

The RASC has authorization for the use of green laser pointers for public outreach and education ONLY, subject to conditions including:

- Hand-held lasers are only used outside of a 10km radius of airports and never pointed in the direction of an aircraft
- The lasers will only be used for identifying stars, constellations and celestial objects
- A minimum of 1 trained spotter is necessary during the use of the laser
- The Centre is responsible for documented training of anyone using the laser or spotting
- Any member using the laser must have ID from the center, as well as a copy of the letter of authorization from Transport Canada
- Members can download a printable membership card from their account on the RASC and the letter of authorization from Transport Canada can be obtained from the president of the Saskatoon Center

- Anyone wishing to hold an event and use a laser must warn National **before the event** that the laser will be used on a specified date
- All authorizations for the entire Society across Canada will be revoked if there is any breach of conditions from any member
- More details regarding the use of green laser pointers will be posted in the October newsletter, and more information/clarification can be sought from Phil Groff

Update on Proposed Sleaford Robotic Telescope:

The plan is to investigate what it will cost to fix the optical tube and current mount, move forward with fixing them and set the telescope up over the next year so that it can be used remotely. After that, if members are using it and are interested in fundraising for a robotic mount, then the center will move forward with that.

Call to adjourn at 7:55 PM by Les Dickson and Donna-Lee May, passed as all in favour.

Minutes of the General Meeting, June 21, 2020

Meeting called to order by Daryl Janzen at 8:01 PM.

Motion to adopt the General Meeting minutes as published in the July 2020 newsletter by Les, seconded by Tim. Passed as all in favour.

Summary of the executive meeting by Daryl Janzen.

Upcoming events: Observe the Moon Night on September 26.

Presentation by Rielly Castle and Alexander Magnus: A Photometric Analysis of RR Lyrae V413 CrA.

Call to adjourn at 9:08 PM from Tim Yaworski, seconded by Rina Rast, passed as all in favour.

BOOK DRIVE

Astronomy-related book donations are being accepted to the RASC Saskatoon Centre Library at the U of S Observatory during its regular Saturday evening open house (please note that the observatory is currently closed indefinitely due to COVID-19).



Aurora taken by Tara Magee on September 29, 2020 east of Saskatoon

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

Meade EXT60AT GoTo telescope. A nice starter refractor for the budding astronomer on your Christmas list. \$150.00

Contact Tim Yaworski tim@timkip.com or 306-880-0720

Brand: Meade

★★★★★ 3

Meade ETX60AT Telescope (Discontinued by Manufacturer)





Moon and Mars taken by Tara Magee October 2 with a Canon 90D, 70-200mm lens, 1.4x teleconverter

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>