Newsletter of the Royal Astronomical Society of Canada Winnipeg Centre September/October 2021

Winnicentrics

The Royal Astronomical Society of Canada - Winnipeg Centre

Upcoming Events

RASC Winnipeg Centre Monthly Meetings (via Zoom)

Sept 10, 2021

Members' Observing Nights ARE BACK!

Sept 11. 2021 at Glenlea

Oak Hammock Marsh Astronomy Night

Cancelled for telescopes

Regular meetings of the Winnipeg Centre are normally held in the Robert B. Schultz Lecture Theatre in St. John's College at the University of Manitoba, 92 Dysart Road. Free parking is available in the lot across the street. The theatre is on the lower (basement) floor of the College. Meetings are usually held on the second Friday of each month from 7 p.m. to 10 p.m. After the meetings, members who wish to do so usually retire for pizza and more conversation about astronomical subjects.

However, due to the current restrictions imposed by Manitoba Health for the COVID-19 Pandemic all meetings are being held via Zoom at 7:30 PM on regular meeting nights as above. Regular meetings will resume once restrictions are eliminated and our members can meet in safety. We miss you!

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YouTube https://bit.ly/2FrcZJZ

https://bit.ly/3iSmFed

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Gord Tulloch
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Gord Tulloch

Observatory Director:
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Winnicentrics is published six times or more each year by the Winnipeg Centre, RASC. Winnicentrics is produced by and for the members of the Winnipeg Centre.
Any opinions expressed are those of the author. Any questions or comments please email:
newsletter@winnipeg.rasc.ca
Or contact one of your Councillors above

Notices:

The Glenlea Observatory LX200 / Dome is OPEN. Please contact Bryan Stach at bstach@mymts.net or phone 204-295-8506 to make arrangements for using it.

Glenlea Warm Room and Pad are OPEN but please observe any Public Health requirements in effect.

Members Observing Nights are now being conducted Saturday nights after our meetings!

Member Meetings continue to be virtual due to COVID restrictions, please see your email or the RASC Winnipeg Forums for Zoom information.

Boston Pizza after-meeting social events continue to be virtual due to COVID restrictions, please see your email or the RASC Winnipeg Forums for Zoom information.

Visit our web site at:
www.winnipeg.rasc.ca

President's Corner

By Dennis Lyons, RASC Winnipeg Centre President

Welcome everyone,

The Council has been making progress on the Strategic Plan and it will soon be released. Thank you to everyone who participated and provided valuable insight into what The RASC Winnipeg Centre should do over the next 5 years. The final touches on the Bylaws are being reviewed and are available for review on the website in the member's section. The Mission, Vision and Values are there as well. The following is what the draft looks like:

- **Mission** – The Mission of The RASC Winnipeg Centre is to share our learning, expertise, and enjoyment of astronomy with each other and the public to stimulate interest in astronomy and the related sciences.
- **Vision** – The Vision of The RASC Winnipeg Centre is to create a community that shares astronomy as a common experience of everyday life and learning.
- **Values**
    - We value integrity, honesty, and transparency in all our activities to create an atmosphere of trust and fairness.
    - We endeavour to communicate meaningful information to our members and the public in a respectful, effective and timely manner.
    - We value and recognize the contribution of our volunteers.
    - We value the diversity and strive to create an inclusive environment for anyone with an interest in astronomy.
    - We are inclusive of all experience levels in astronomy and related sciences, form the novice to the professional.

Want to help The RASC Winnipeg Centre? Perhaps you might like to work on the Financial or Observatory committee. Just let me or one of the Council members know.

The Council is pleased to announce that Glenlea is open to everyone again and that the Spruce Woods Star Party is on for the long weekend. Expect to see more events happening at Glenlea and other sites in the future.

Well, the skies may be getting darker sooner, but the life of the Centre is getting brighter.

Clear Skies,
Dennis Lyons
president@rasc.winnipeg.ca

Editor's Message

By Gord Tulloch, RASC Winnipeg Centre

I hope you've had a great summer despite the smoke and cloud we experienced! September and October are my absolute favorite times of the year to do astronomy – temperatures are moderate, bugs are generally non-existent, and skies are clear every night! Well, perhaps I'm being overly optimistic on that last, but hope springs eternal, especially after the weather we've had lately.

This is an exciting time for the Winnipeg Centre, with lots of activity happening on a variety of fronts and the pace accelerating with the delivery of the Strategic Plan for 2021-2025. Now is also the time for you to get involved. If you're interested in helping to get the Centre's financial systems set up for long term sustainability, there's the Finance Committee forming. If you're interested in helping to revitalize the observatory at Glenlea and look at possible dark sky options, you may be interested in the Observatory Committee. Email president@winnipeg.rasc.ca or talk to anyone on Council.

But beyond the Committees we need help with newsletter articles, web site content, and posts on our Social Media platforms (right now Facebook but plans are to expand to other platforms.) You might notice in the past few issues of the newsletter very few contributors of articles. This is not sustainable! If you have interests in astronomy, then you can write about them. If you had a great night out under the stars, then send newsletter@winnipeg.rasc.ca an email with an observing report. Got some great pictures? Send them in to the newsletter for our Members Gallery rather than have the Editor sort through posts on Facebook. It takes a lot of effort to put together an informative and interesting collection of information on our various channels, and we need your help to keep them vital.

Make sure you get a chance to go look at some gas giants! As an aid I've published both Great Red Spot transit times and a table of moon events over September and October. Are they useful? Let me know! Clear skies!

GLP-TRAINED USERS AND SPOTTERS
RASC WINNIPEG CENTRE

The following Members have received training in the proper use of Green Laser Pointers and may apply to receive a permit to conduct an astronomy outreach session in accordance with applicable law and RASC policies respecting green laser pointers.

6 February 2021 (expires 5 February 2024)

Paul Paradis

9 August 2019 (Expires 8 August 2022)

Abdul al Manni	Patrick Curry	Kaeren Anderson	Kevin Davis
SHR Bannister	Michael Fry	Michelle Boyce	Darren Hennig
Sean Ceaser	LLoyel Hull	Ralph A. Croning	Paul Karlowsky
Clifford Levi	Dennis Lyons	Alan Macklem	Jim Mcdowal
Krzysztof Keller	Daemon Nightshade	Gail Wise	Brian Renaud
Stan Runge	Bryan Stach	Gordon Sharr	Ed Wright
Ed Rajfur			

11 August 2019 (Expires 10 August 2022)

Jay Anderson Judy Anderson

13 December 2019 (Expires 12 December 2022)

Trevor Bryant	Stephen Altstadt	Ed Johnson	Robin Clarke
Adelle Kennedy	Lucille Eustache	Timothy Kennedy	William McDonald
Kevin McGregor	Michelle Paquette		

RASC Winnipeg Centre Strategic Plan Summary

By Judy Anderson, RASC Winnipeg Centre

Currently, the Centre coordinates 9 programs with varying levels of organization and effectiveness: monthly public membership meetings, Winnicentrics newsletter, Glenlea observatory, Spruce Woods Star Party, public outreach, website, mentorship, social media, and telescope loans.

Mission, Vision, and Values of the Centre

These guide the what, why, and how of what we do.

1. Our mission is to share our learning, expertise, and enjoyment of astronomy with each other and the public to build lasting relationships and to stimulate interest in astronomy and related sciences.
2. Our vision is to create a community that shares astronomy as a common experience of everyday life and learning.
3. Our values are:
   - We value integrity, honesty, and transparency in all our activities to create an atmosphere of trust and fairness.
   - We endeavour to communicate meaningful information to our members and the public in a respectful, effective, and timely manner.
   - We value and recognize the contribution of our volunteers.
   - We value diversity and strive to create an inclusive environment for anyone with an interest in astronomy.
   - We strive to remove barriers for our community so it can access our services.
   - We accept a wide range of experience levels in astronomy from beginner to advanced.

Centre Needs

There are three main areas of need that directly affect our capacity for effective program delivery:

1. We need to improve the Centre as an organization so we know our goals and can track our progress.
2. Amateur astronomers need a place to share learning, expertise, and enjoyment of astronomy.
3. The public needs a better appreciation and understanding of astronomy.

Addressing our Needs

The Strategic Plan is to directly address those areas of need to improve how we work and what we do:

1. Help the Centre mature as an organization – new Bylaws with bigger Council; incorporate as a non-profit (more funding avenues available); strike Finance, Nominating, and Observatory committees for better planning; recruit coordinators to manage and reward volunteers and do fundraising; share key jobs of newsletter editor and web-master; organize and deliver mentorship program; and develop a Centre store for merchandise. Volunteers are key to everything; the Centre IS volunteers, and everyone who volunteers helps build our organization, and create opportunities for fellowship under the stars, learning, and enjoying astronomy with other members and the public.

2. Upgrade and modernize Glenlea facility – members have indicated a desire to enhance the dome/observatory with Wifi and remote access, bigger pad with WiFi and more power, better warm room and toilet facilities. This will need volunteers to design and help build the new facilities, just the way it happened to build Glenlea in the first place, and rebuild it after the floods.
3. Mentor members who want to learn from others with more experience, and also train members to use Centre equipment (including Loaner Scopes) and facilities. Consider developing a private, dark-sky site for a second observatory.
4. Engage Centre members in observing activities and outreach – coordinate outreach and education, communicate across platforms (Winnicentrics newsletter, RASC-WPG list, email, Facebook, Twitter, forums); outreach via Zoom to engage others outside Winnipeg in learning basic astronomy; use remote capability to build connections in Manitoba, Canada, and internationally.
5. Evaluate progress in organizing and volunteer activities – if there are insufficient volunteers to do what we'd like to do, we'll simply have to pare down the goals so essential programs can continue.

For more information and the complete Strategic Plan text log onto the web site and see the document on this page:

https://winnipeg.rasc.ca/bylaws-and-regulations/

Again, you need to be logged into the site to see this page.

Sheila Wiwchar - Perseids Meteor Shower

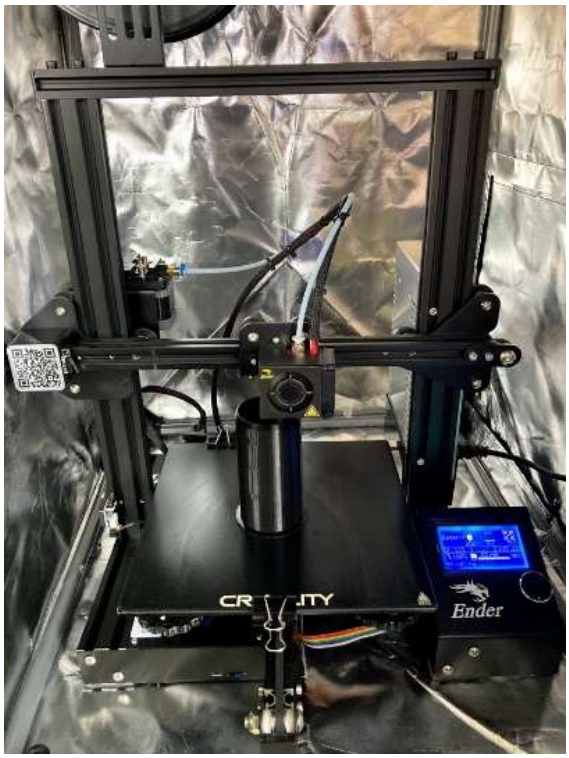
From the Winnipeg Centre Workshops - Basic 3D Printing For Astronomers

By Gord Tulloch, RASC Winnipeg Centre

I have to say 3D printing is a mind blower. If you can envision it, work some easily learned 3D design software, or find something on the internet, you can create virtually anything. For astronomy, that means items that used to be special orders for items like dovetails, rings, and adapters from somewhere like ScopeStuff at exorbitant costs can now be simply printed out at home.

In case you haven't gotten a close look at these marvels of technology, they consist of a framework where a print head can be moved in three dimensions instead of the normal 2 like in an inkjet printed. Instead of spraying ink onto paper, a 3D print head heats up a plastic filament of various materials, and deposits the plastic onto a heated bed, slowly building up layers until the piece is completed. And when I say slowly, I mean it – many 3D printed parts I've printed have taken 8-16 hours to print. So, a large 3D printed project is a long-term project requiring a bit of patience!

My 3D printed experience began even before I got a printer, when I discovered someone had created 3D printable motor brackets[1] for my CG5 mount to mount NEMA 17 stepper motors on the mount. Since I didn't have a printer, I had a problem – how can I get the brackets printed? Google to the rescue – many services exist where you upload a 3D CAD file of the item you would like, specify the material you would like the item printed as (ABS, Acrylonitrile Butadiene Styrene, the same plastic used to make Lego, in my case) and they quote a figure. I ordered the parts for $40 on December 27 and received the order on Jan 4! The image on the right shows the RA axis of my CG5 with the motor mounted on the grey ABS bracket with aluminum GT2 gears and belt (readily available on Amazon or eBay) used as a 4:1 gear reduction before transferring the motor rotation to the 144:1 internal gearing on the mount.

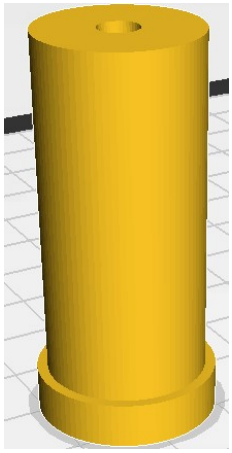


Since then I have purchased a very low cost 3D printer, an Ender 3 Pro for about $300 from Amazon. It's pictured at right. Filament comes in 1KG rolls for about $27.99 in a wide range of colors (some more expensive printers allow two or more colors but mine is monochrome) which lasts quite a while, given most pieces printed are a few 10s of grams worth of filament.

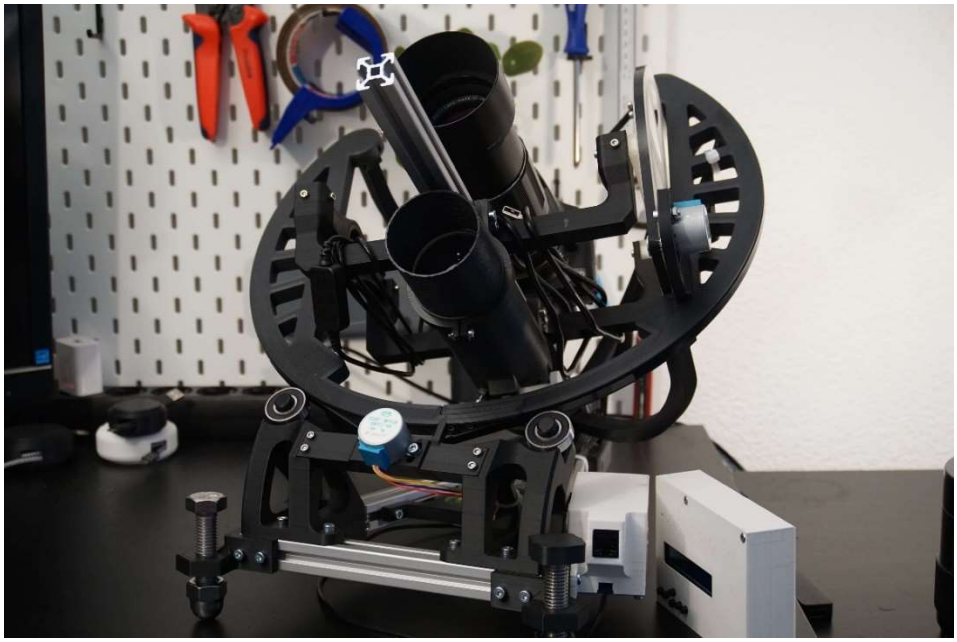
[1] https://www.thingiverse.com/thing:1833860

My printer can print both PLA (Polylactic Acid) and ABS (Acrylonitrile butadiene styrene) although ABS is a bit more problematic since it needs higher heat and an enclosure to keep it from cooling too fast and lifting off the print bed before it's finished. A cheap enclosure keeps the heat in so ABS prints can be successful, but PLA printing is vastly easier and forms the bulk of my printing. The only problem with PLA is it's melting point is quite low, and it can become soft when left out in the sun, for example. I bought an enclosure for my printer for about $100 that allows perfect ABS prints when needed.

At left you can see the business end of the 3D print head (printing a guide scope tube) which is fed filament from the spool via a friction mechanism as the head moves over the work piece, depositing a thin layer of plastic as it goes. Instead of printing solid parts and using a lot of filament, 3D printing software creates frameworks within solid pieces that make them mostly empty air but with strong lattices that give it excellent strength. The amount of infill is controllable from the software – parts that need to be quite strong (for example, the pictured PLA tube "plugs" I printed for my 16" telescope strut tubes) can be printed at 100% infill while most parts are usually 20%.



I'm now working on a freely available 3D printed GOTO AstroTracker[2] for DSLR cameras (pictured below from the web site) and a guide scope to go with it. A 3D printed spectrograph[3] is also in the project queue. Stay tuned!



[2] https://openastrotech.com/
[3] https://www.thingiverse.com/thing:2455390

RASC Winnipeg Centre Annual BBQ

Despite the promise of searing temperatures, the annual RASC Winnipeg Centre BBQ was a very successful event at our Glenlea Observatory complex. Temperatures were mitigated by a pleasant wind, and taking advantage of the shade of the Warm Room made a huge difference in comfort.

After the events of the last year and a half seeing friends old and new was an absolute pleasure.

Spruce Wood Public Observing Event 2021

Once again Winnipeg Centre members made the trip out to Spruce Woods Provincial Park to participate in the annual Spruce Woods Public Observing Event, where the Centre provides programming at the Interpretive Centre to thank the Park for being such great hosts for our Spruce Woods Star Party to be held Sept 3-6 2021 at the Park.

In the afternoon solar observing was conducted for Park visitors for an hour, then we adjourned til evening when Silvia and Gerry conducted an engaging and informative presentation to about 60 attendees including a lot of kids, who were quite entertained with the solar system modelling part of the program.

In the group photo above Mike Karakas, Bryan Stach, Daemon Nightshade, Gail Wise, Gerry Smerchanski, Guest with Trevor Bryant, Silvia Graca, Stan Runge (with guest), Jay Anderson, Gord Tulloch, Judy Anderson, and Marie Tulloch.

After the presentation and an astronomy themed movie, visitors headed to a set of telescopes set up behind the interpretive centre. Although the evening started out with some high cloud and smoke, things cleared up enough that visitors who waited around a bit were rewarded with some excellent views of the skies. Thanks Silvia for arranging this excellent event once again!

Photos by Bryan Stach (top and bottom) and Marie Tulloch (middle.)

The Perseid Meteor Shower

An outburst of words about the one in the sky!

By Judy Anderson, RASC Winnipeg Centre

2021 was going to be a good year to see the Perseid meteor shower, coming during a small or new Moon. The big question for us in southern Manitoba, was whether the forest-fire smoke and dust from dry fields would be a problem. The forecast was for clear skies an "only" 26-32C. On the 11th, Jay loaded the van with cameras, tripods, a few clothes including long-johns, the usual box of tools for daytime work on observatory, and the down jackets – even at 8-12 C, standing still all night is cold. I joined him on the 12th in Kaleida, at a dark location on the lip of the Pembina Valley.

On the night of 11-12 August, Jay had set up a tracker and viewed overhead, into the Milky Way, until 4 AM. He saw 20-25 meteors and captured some good ones with the full-frame Canon RA, despite the sky glow. Thursday, I brought another camera and some groceries, and we visited, ate dinner, and set up in the yard. With 3 cameras on tripods, one was pointed south into the big dark lanes of the Milky Way, one was low in the field, looking southwest, and one was pointed north. We watched tilted way back on those "zero-gravity" chairs, under a sleeping bag, and made oohs and ahhs when we saw a good one. It seemed the best meteors, the brightest ones with the longest tails, were visible toward Jupiter and into the Milky Way, although a few really bright ones were in the north and northwest. One came toward us right from the radiant and was really bright, like an old-time flashbulb. Alas, the dew was pretty heavy and the sky glow was quite bright. Still, we enjoyed the shower and went to bed happy at 4:30 AM.

The next day passed in activities in the countryside and the observatory before we relaxed for a few hours before dinner; with prospects of another late night, a nap was highly recommended! Astronomical darkness was late, so we arranged to meet up with a few people and go to a farm in the Pembina valley, hoping the hillside would block the light domes from Morden, Winkler, and Manitou if we were a little further south. With permission from the owner, we set up around a farm yard, careful to avoid badger holes (thanks Yuri!). From the moment we got out of the car, it was a good night: the view of the Milky Way was stunning all the way down to the south horizon by 11 PM and it stretched across a very dark sky. There were pretty views of an old barn, some fencing, the outbuildings and some trees on the property, and each of us found one or more places to set up cameras with timelapse functions going. Lots of possibilities, and no mosquitoes at all!

My setup was a Canon 80D set at 6400 ISO with an f1.8 Sigma 14mm lens. Initially I pointed it north with Polaris viewed over the barn. Then I walked through the yard (I hope the uneven yard was only old hay and dried manure) to a bit of a rise above the barn and turned to look south toward the Milky Way. The back of the barn was now low in the foreground. It takes me a while to "get into the night", especially after having already been up all night, so I often find myself working alone, just to collect the feel of a place and the sky. I'm always trying to decide which area to photograph – do I centre the camera on the radiant or off to one side, or point it in the other direction toward the opposite side of the sky? That internal debate takes a while, and plays out with me moving the camera more than once through an evening (probably too often). But this night, the imaging showed meteors in nearly every quadrant of the sky. Some were so bright, along or beside the Milky Way in its full extent across the sky, and also again streaking toward Jupiter. The hillside really did darken that part of the sky, so the Big Dipper, Ursa Major, was positioned above the hill with some trees silhouetted on the stars. I moved again, further up

The Perseid Meteor Shower (cont.)

the hillside, and did a time-lapse for an hour or more, of the southwest view as the Milky Way moved across that camera field – images of meteors from our views to the south, overhead, or southwest in the Milky Way haven't yet been compiled. There were lots, but I had started to feel a little tired of standing, and was sitting on the bone-dry ground, as I imaged in the southwest and looked north toward the nearly horizontal Dipper. By this time, the radiant had moved higher into the sky off toward the northeast, with Cassiopeia above it, and Andromeda off to the east northeast a little. There were 2 or 3 bright long streaks through the Dipper in short order, so I swung the camera about when Sheila joined me on the hillside. She also has some beautiful meteor images too, as there were some spectacular long streaks just to the east of the Dipper that didn't fit in my camera field.

Not only was it dark, but oddly, there seemed to be so many more meteors. Not only that, but they were falling in every direction in short order: northward from the radiant toward the hillside, streaking westward through the Dipper or south through the Milky Way across the zenith, or southeast toward Jupiter. Sometimes they were easily visible as multiple streaks in different directions, all at once! When that happened, I was glad I'd already picked a direction to image and could just let myself watch – it's too special to be fiddling with equipment! It was warm enough to sit on the ground without freezing, like I had for the Leonids last winter, when it frankly, too cold for living beings. I really enjoyed this collective experience too, as the oohs, ahhs, and WOWs could be heard from across the whole yard! It was such fun to be together and able to see so many meteors – we hadn't known if we'd make it past 2 AM, and here it was already almost 4 again! The frequency of bright meteors seemed to lessen, and we slowly packed up. I scrolled through images on the camera and was pleased to have captured quite a few meteors. Even on the drive back to Kaleida, we saw more and probably should have stayed in position on that hillside until dawn.

Next afternoon, Sheila found a report of an "unexpected outburst" on the International Meteor Organization website (https://www.imo.net). It seemed we had lucked out on the timing of the outburst had coincided with the last hour or two of our observations. Now, a few days later, the https://www.meteornews.net/2021/08/15/perseid-meteor-outburst-2021/ report on the Perseids has the timelapse images that Jay compiled (*see below* – *Ed*.) from my view toward the Big Dipper, coinciding within a few minutes of the peak recorded at solar longitude 141.474 ± 0.005 degrees.

It was such a marvellous experience, truly feeling like a shower of meteors! And to have a photograph that really captures that feeling, is pretty neat! Usually, when I think my photos should be good, I end up disappointed in faint streaks or none at all. Using a fast wide-angle lens with a high ISO, works! To have captured 3, and even 4 meteors in one 10-second image is pretty special. It was our best-ever Perseid meteor shower. And, this one was second only to a Leonid meteor shower we watched from Ayers Rock (Uluru) in Australia in 2001. That year, the Leonids peaked in a "storm" and we were in just the right position; and it was warm in November from that location, so I could sit outside in one position looking at the radiant – I counted meteors in 5-minute intervals, all night! We didn't even set up a camera (sigh), and likely there were scorpions and redback spiders around us -- but the meteors were spectacular: they had long, long tails and left trails that glowed fluorescent green for many minutes, at the edges of my visual field. Jay got to watch all those long streaks – and while I counted, he recorded the numbers, so we could plot a nice graph of that peak. It's published somewhere I can never find.

The Perseid Meteor Shower (cont.)

The Leonids return this November, so charge up your personal "batteries" and plan to don your best winter clothing – it seems crazy to say that in August, but that time will come. And, we'll see you there, or at the Perseids, next summer! You can only observe when you're actually out under the stars!

Judy Anderson, August 18, 2021.

Perseids Image

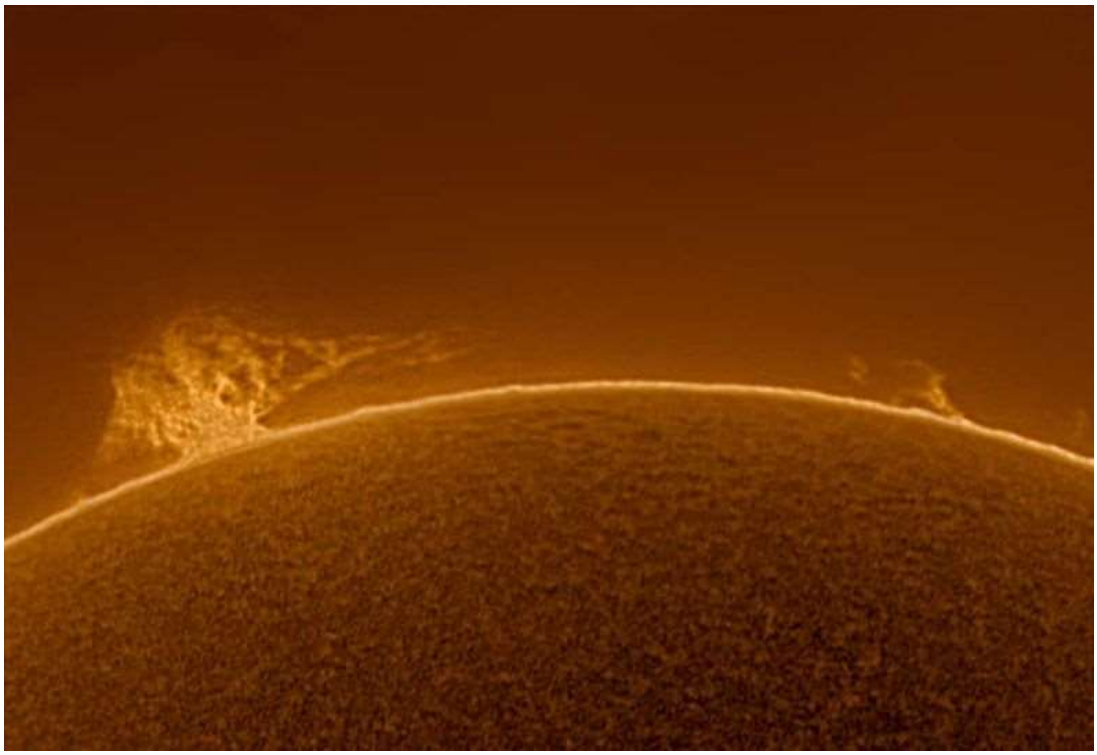
By Jay Anderson, RASC Winnipeg Centre

The Perseids meteor shower on Sunday morning Aug 15 2021 exploded into a major storm in the early morning hours. Judy pointed her camera at the Dipper and shot 602 exposures of 10 seconds each between 0247 and 0349 a.m. 62 of those images contained at least one meteor and one had four.

She used a Canon 80D and a Sigma 14-mm lens at f/1.8 and ISO 6400. I have extracted each meteor and placed them on a background map that has been slightly enhanced for contrast. There are over 80 meteors in this image. Not a bad night for Perseids!

Members Image Gallery

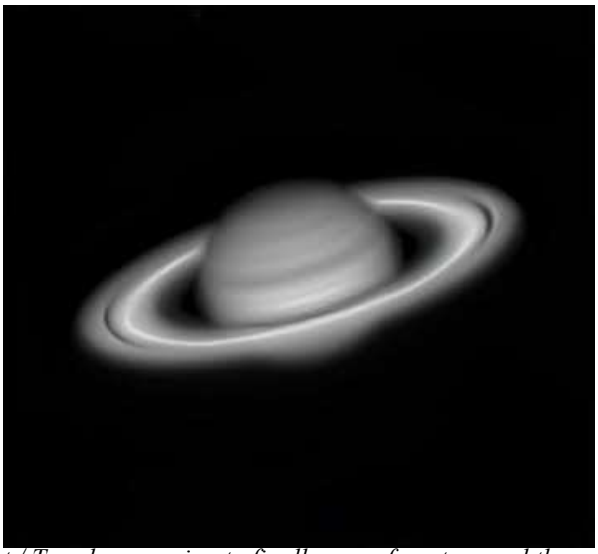
Jim Macgregor - Milky Way from Twin Lakes Beach, Manitoba



Sheila Wiwchar – Prominences August 15

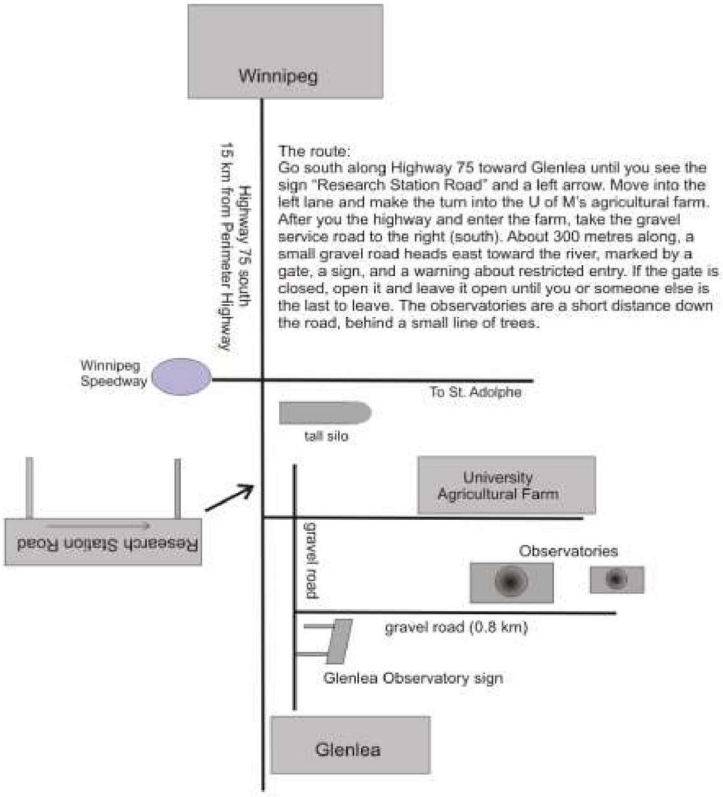
Members Image Gallery (cont.)

Scott Young - M57 The Dumbell Nebula



Mike Karakas – The smoke cleared somewhat Monday night / Tuesday morning to finally see a few stars and the forecasted seeing was good enough to give Jupiter and Saturn a chance. I was pleased to see that the seeing improved as they rose to their max. elevation around 2am. For Jupiter, the image was taken using a ADC (atmospheric dispersion corrector) and a IR blocking filter. Saturn proved to be a more challenging target with it being about 6 degrees lower that Jupiter, which made it more susceptible to the lingering smoke and atmospheric turbulence. It was quite dim too as a result. Under those conditions, using an IR filter to cut through the atmospheric conditions gave the better result by far. All were taken with my C11.

Finding the Observatory



The Winnipeg Centre maintains a working observatory and warm room at the University of

Manitoba's Research Farm. The observatory contains a 30 cm Meade telescope on a fork mounting. Members of the Centre may sign out the use of this telescope provided they have first taken a short instruction course on its use.

The Meade provides outstanding views of the night sky. Its large aperture collects more than 1800 times as much light as the human eye. It is capable of magnifying more than 500 times under favourable conditions.

The warm room provides a convenient place for members to take refuge from winter temperatures and summer mosquitoes, or to wait out a passing cloud. The building also provides desk space and lighting for planning a night's observing session. A concrete pad in front of the warm room and observatory provides a convenient space to place members' telescopes while conducting personal observing programs.

Etiquette requires that you approach the observing site with your headlights off if that's possible on your model of car. Headlights should remain off, but you can still use your parking lights to drive. Proceed slowly, and be careful about parked cars along the road, or people walking. If you cannot turn off your headlights, make a cardboard or garbage bag mask to dim the lights or, raise the parking brake lever one click-stop. This usually turns the headlights off on most, if not all, cars. You might wish to turn around at the end of the road so that you are facing the direction back toward the highway at the end of the evening.

Remember to close the gate if you are the last one to leave.

Comets in September and October

This section lists all of the comets that are prominent in the sky, the visual magnitude and the declination of the comet. Brighter comets (lower magnitude) at higher declinations (higher h) are the best candidates to observe.

Month	Evening			Midnight			Morning		
	Comet	Mag	h	Comet	Mag	h	Comet	Mag	h
2021 Sep	**6P/d'Arrest**	**10**	**36**	**4P/Faye**	**10**	**16**	**4P/Faye**	**10**	**68**
	C/2020 T2 (Palomar)	**11**	**20**	**67P/Churyumov-Gerasimenko**	**10**	**32**	**67P/Churyumov-Gerasimenko**	**10**	**76**
	252P/LINEAR	11	9	C/2019 L3 (ATLAS)	11	14	**15P/Finlay**	**11**	**50**
	C/2017 K2 (PanSTARRS)	**11**	**68**	**C/2017 K2 (PanSTARRS)**	**11**	**20**	**C/2019 L3 (ATLAS)**	**11**	**61**
	C/2021 A1 (Leonard)	13	2	7P/Pons- Winnecke	13	5	**C/2021 A1 (Leonard)**	**13**	**18**
				29P/Schwassmann-Wachmann 1	**13**	**36**	**29P/Schwassmann-Wachmann 1**	**13**	**87**
2021 Oct	**6P/d'Arrest**	**9**	**25**	**67P/Churyumov-Gerasimenko**	**9**	**32**	**67P/Churyumov-Gerasimenko**	**9**	**81**
	C/2017 K2 (PanSTARRS)	**11**	**52**	**4P/Faye**	**10**	**28**	**4P/Faye**	**10**	**69**
	19P/Borrelly	11	3	**C/2019 L3 (ATLAS)**	**10**	**30**	**C/2019 L3 (ATLAS)**	**10**	**83**
	C/2020 T2 (Palomar)	11	12	**29P/Schwassmann-Wachmann 1**	**13**	**61**	**C/2021 A1 (Leonard)**	**11**	**37**
	104P/Kowal 2	**13**	**47**	**104P/Kowal 2**	**13**	**19**	C/2019 T4 (ATLAS)	13	9
	132P/Helin- Roman-Alu 2	**13**	**52**	15P/Finlay	13	2	**15P/Finlay**	**13**	**57**
				132P/Helin- Roman- Alu 2	**13**	**54**	**29P/Schwassmann-Wachmann 1**	**13**	**87**
							132P/Helin- Roman- Alu 2	13	10

Data courtesy of Seiichi Yoshida (http://www.aerith.net/comet/future-n.html)

Jupiter Great Red Spot Transit Times (Sept/Oct)

Courtesy of Project Pluto https://www.projectpluto.com/ - All times Universal Time.

2021 Sep 1 1:17
2021 Sep 1 11:13
2021 Sep 1 21:09
2021 Sep 2 7:04
2021 Sep 2 17:00
2021 Sep 3 2:56
2021 Sep 3 12:51
2021 Sep 3 22:47
2021 Sep 4 8:43
2021 Sep 4 18:38
2021 Sep 5 4:34
2021 Sep 5 14:29
2021 Sep 6 0:25
2021 Sep 6 10:21
2021 Sep 6 20:16
2021 Sep 7 6:12
2021 Sep 7 16:08
2021 Sep 8 2:03
2021 Sep 8 11:59
2021 Sep 8 21:55
2021 Sep 9 7:50
2021 Sep 9 17:46
2021 Sep 10 3:42
2021 Sep 10 13:37
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2021 Sep 11 9:29
2021 Sep 11 19:24
2021 Sep 12 5:20
2021 Sep 12 15:16
2021 Sep 13 1:11
2021 Sep 13 11:07
2021 Sep 13 21:03
2021 Sep 14 6:58
2021 Sep 14 16:54
2021 Sep 15 2:50
2021 Sep 15 12:46
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2021 Sep 16 18:33
2021 Sep 17 4:28
2021 Sep 17 14:24
2021 Sep 18 0:20
2021 Sep 18 10:15
2021 Sep 18 20:11
2021 Sep 19 6:07
2021 Sep 19 16:02
2021 Sep 20 1:58
2021 Sep 20 11:54
2021 Sep 20 21:49
2021 Sep 21 7:45
2021 Sep 21 17:41
2021 Sep 22 3:37
2021 Sep 22 13:32
2021 Sep 22 23:28
2021 Sep 23 9:24
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2021 Sep 24 5:15
2021 Sep 24 15:11
2021 Sep 25 1:06
2021 Sep 25 11:02
2021 Sep 25 20:58
2021 Sep 26 6:54
2021 Sep 26 16:49
2021 Sep 27 2:45
2021 Sep 27 12:41
2021 Sep 27 22:36
2021 Sep 28 8:32
2021 Sep 28 18:28
2021 Sep 29 4:24
2021 Sep 29 14:19
2021 Sep 30 0:15
2021 Sep 30 10:11
2021 Sep 30 20:06
2021 Oct 1 6:02
2021 Oct 1 15:58
2021 Oct 2 1:54
2021 Oct 2 11:49
2021 Oct 2 21:45
2021 Oct 3 7:41
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2021 Oct 24 20:00
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2021 Oct 26 1:47
2021 Oct 26 11:43
2021 Oct 26 21:39
2021 Oct 27 7:35
2021 Oct 27 17:31
2021 Oct 28 3:26
2021 Oct 28 13:22
2021 Oct 28 23:18
2021 Oct 29 9:14
2021 Oct 29 19:10
2021 Oct 30 5:05
2021 Oct 30 15:01
2021 Oct 31 0:57
2021 Oct 31 10:53
2021 Oct 31 20:49

Jupiter satellite events for Sept/Oct

Following are times for the shadow, transit, occultation, and eclipse events for Jupiter's four major satellites over the above time period. All times are in Universal Time (UT). Courtesy of Project Pluto https://www.projectpluto.com/

I = Io = innermost satellite II = Europa III = Ganymede IV = Callisto = outermost satellite

I : Ecl end : 1 Sep 2020 1:52
II : Tra start: 1 Sep 2020 5:28
II : Sha start: 1 Sep 2020 7:32
II : Tra end : 1 Sep 2020 8:16
II : Sha end : 1 Sep 2020 10:22
I : Tra start: 1 Sep 2020 19:53
III: Occ start: 1 Sep 2020 20:20
I : Sha start: 1 Sep 2020 20:56
I : Tra end : 1 Sep 2020 22:09
I : Sha end : 1 Sep 2020 23:13
III: Occ end : 1 Sep 2020 23:41
III: Ecl start: 2 Sep 2020 0:33
III: Ecl end : 2 Sep 2020 3:59
I : Occ start: 2 Sep 2020 17:01
I : Ecl end : 2 Sep 2020 20:21
II : Occ start: 3 Sep 2020 0:31
II : Ecl end : 3 Sep 2020 5:31
I : Tra start: 3 Sep 2020 14:20
I : Sha start: 3 Sep 2020 15:25
I : Tra end : 3 Sep 2020 16:37
I : Sha end : 3 Sep 2020 17:42
I : Occ start: 4 Sep 2020 11:28
I : Ecl end : 4 Sep 2020 14:50
II : Tra start: 4 Sep 2020 18:40
II : Sha start: 4 Sep 2020 20:50
II : Tra end : 4 Sep 2020 21:28
II : Sha end : 4 Sep 2020 23:40
I : Tra start: 5 Sep 2020 8:48
I : Sha start: 5 Sep 2020 9:54
III: Tra start: 5 Sep 2020 10:04
I : Tra end : 5 Sep 2020 11:04
I : Sha end : 5 Sep 2020 12:11
IV : Occ start: 5 Sep 2020 13:20
III: Tra end : 5 Sep 2020 13:26
III: Sha start: 5 Sep 2020 14:31
IV : Occ end : 5 Sep 2020 17:25
III: Sha end : 5 Sep 2020 17:57
IV : Ecl start: 5 Sep 2020 23:38
IV : Ecl end : 6 Sep 2020 3:59
I : Occ start: 6 Sep 2020 5:56
I : Ecl end : 6 Sep 2020 9:19
II : Occ start: 6 Sep 2020 13:44
II : Ecl end : 6 Sep 2020 18:50
I : Tra start: 7 Sep 2020 3:15
I : Sha start: 7 Sep 2020 4:23
I : Tra end : 7 Sep 2020 5:32
I : Sha end : 7 Sep 2020 6:40
I : Occ start: 8 Sep 2020 0:23
I : Ecl end : 8 Sep 2020 3:47
II : Tra start: 8 Sep 2020 7:53
II : Sha start: 8 Sep 2020 10:08
II : Tra end : 8 Sep 2020 10:41
II : Sha end : 8 Sep 2020 12:58
I : Tra start: 8 Sep 2020 21:43
I : Sha start: 8 Sep 2020 22:51
III: Occ start: 8 Sep 2020 23:59
I : Tra end : 8 Sep 2020 23:59
I : Sha end : 9 Sep 2020 1:08
III: Occ end : 9 Sep 2020 3:19
III: Ecl start: 9 Sep 2020 4:34
III: Ecl end : 9 Sep 2020 8:00
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I : Ecl end : 9 Sep 2020 22:16
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II : Sha end : 12 Sep 2020 2:17
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III: Ecl end : 23 Sep 2020 16:02
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I : Tra end : 24 Sep 2020 22:11
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I : Occ start: 25 Sep 2020 17:02
I : Ecl end : 25 Sep 2020 20:36
II : Tra start: 26 Sep 2020 2:06
II : Sha start: 26 Sep 2020 4:40
II : Tra end : 26 Sep 2020 4:54
II : Sha end : 26 Sep 2020 7:31
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III: Occ end : 30 Sep 2020 14:43
III: Ecl start: 30 Sep 2020 16:35
IV : Tra end : 30 Sep 2020 16:57
III: Ecl end : 30 Sep 2020 20:03
I : Occ start: 1 Oct 2020 0:27
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