Newsletter of the Royal Astronomical Society of Canada Winnipeg Centre July/ August 2021

Winnicentrics

The Royal Astronomical Society of Canada - Winnipeg Centre

Upcoming Events

RASC Winnipeg Centre Monthly Meetings (via Zoom)

June 11, 2021
BBQ July 17
August 13, 2021

Members' Observing Nights

TBA

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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Finding the Observatory
Comets in March and April

YouTube https://bit.ly/2FrcZJZ

https://bit.ly/3iSmFed

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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 CLOSED. Please contact Bryan Stach at bstach@mymts.net or phone 204-295-8506 for current info.

Glenlea Warm Room is CLOSED but the Pad is OPEN but please observe any Public Health requirements in effect. Subject to change without notice.

Members Observing Nights are CANCELLED due to COVID restrictions.

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,
Looks like this fall the Council will be able to present to the membership a new set of Bylaws. The draft has been completed and approved by the Council. It has been sent to National to let them have a once over. During the next few monthly meetings, I will share the relevant points to prime you for when it is distributed.

The other work that is going on is the development of the strategic plan. The Draft Vision, Goals and Mission Statement are done and once Council has reviewed them, they will come out. A big thank you to everyone who has participated in the workshops on the strategic plan. Your feedback will guide the Council in providing the services the members need and want to share with the public.

By now you may have seen a form to apply to be a mentor or someone who would like to have a mentor. This is exciting as we believe even if the restrictions do not open two people can get together over zoom. The first phase is this pairing of people to meet the needs of the members. This program is not just for beginners but anyone who wants to try something new or get to the next level.

Calling all Bar B Q fans. If the Health Order allows there will be a picnic at Glenlea Saturday July 17. This date should allow our members to take advantage of the clear skies the weekend before. An alternate facility at St. Vital Park is booked in case of rain.

Finally, a quick reminder that Council still hopes that the Spruce Woods Star Party (at Manitoba's first dark sky preserve) will take place in September. So, keep your eye on the website for registration announcements coming soon from Silvia and her band of merry astronomers!

In closing things are looking up, and hopefully we will soon be together to share the wonders of the universe.

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

Editor's Message

By Gord Tulloch, RASC Winnipeg Centre

Summertime has brought bright nights and warm temps, and an opportunity for me to spend some quality time in my garage on amateur telescope making activities like building scopes and grinding mirrors! It's amazing how much nicer it is to work in the garage when it's not -35C outside!

I hope everyone is enjoying the warmer weather, although we're still not out of the woods yet on the pandemic, unfortunately. However with the increasing number of people in the province that are vaccinated the light is indeed visible at the end of the tunnel. And we're still ready to gear up for a great fall observing season, highlighted by the Spruce Woods Star Party 2021!

Silvia Graca has kindly provided this reporter some details on the Star Party so check out the article in this month's issue on the details. As well, we're making sure everyone knows how to be a good Star Party participant with an article on the subject.

The Gas Giants are starting to be observable at a reasonable time of night so it's time to think about planets and filters! I'm pleased to provide both a synopsis of the upcoming apparitions as well as an article about filters, originally published by the British Astronomical Association but reprinted here with the author's kind permission.

Any questions or comments please contact me at newsletter@winnipeg.rasc.ca. 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)

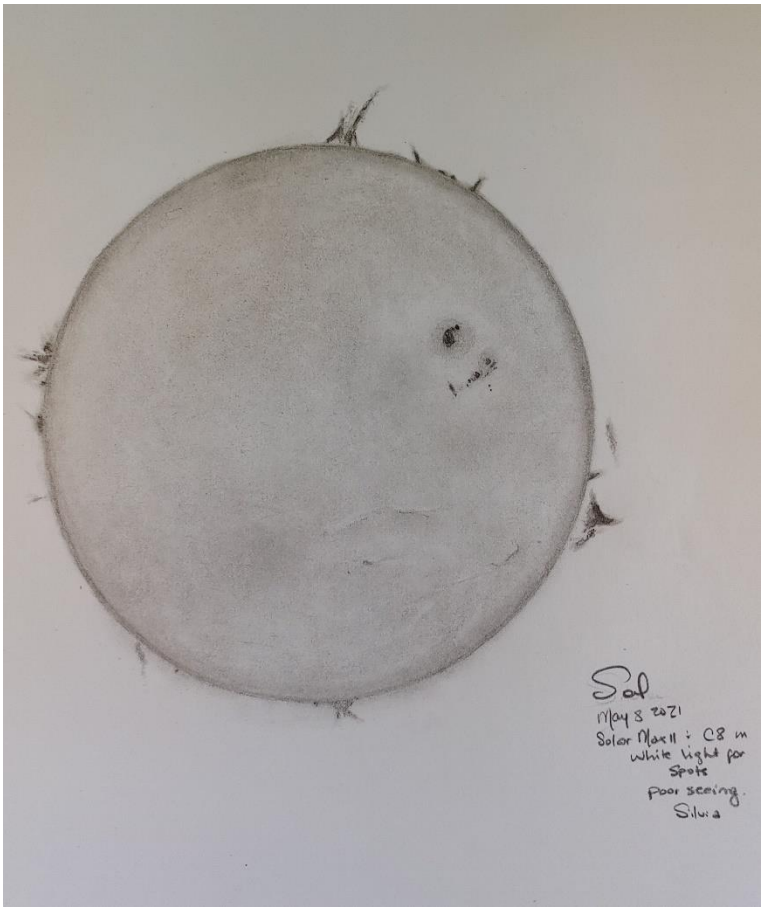
Jay Anderson	Judy Anderson

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		

Sketcher's Corner - Sol

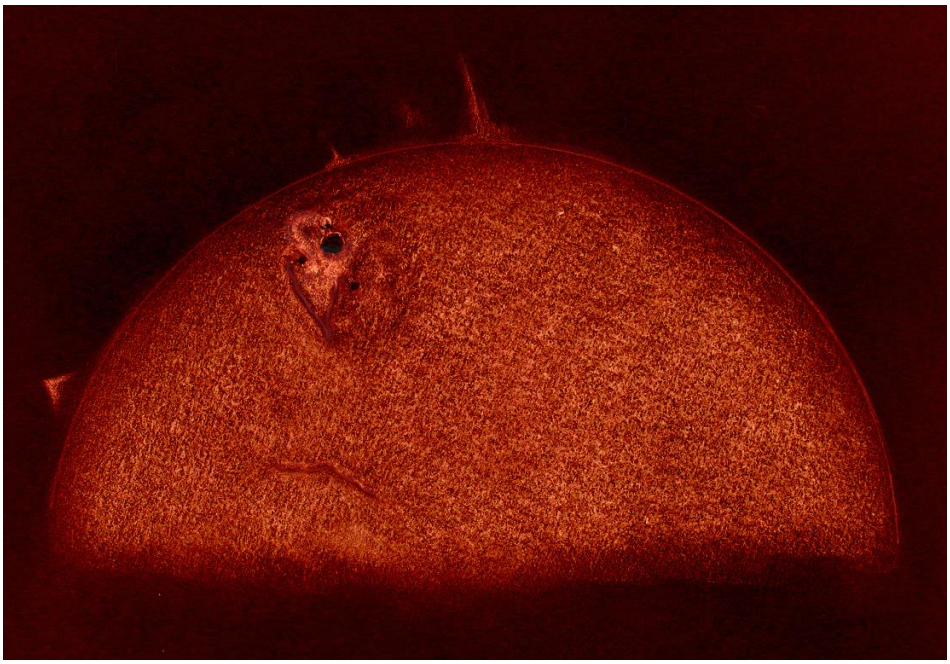
By Silvia Graca and Gerry Smerchanski, RASC Winnipeg



Silvia - The Sun was very interesting today… Prominences, spots, filaments! I used my 8″ SCT with a white light solar filter, bino-viewers and 20mm eps. Seeing was pretty shaky but once in a while a second of deep clarity came in and out and ohhhh…. Amazing area! I also set up my HA scope. Little solar max II with a 8mm ep to get the prominences and filaments… There was a lot going on in our home star!

Sketched on plain white paper… There was more detail all over the surface I was hoping to catch but couldn't get the right texture going. I used a B and B5 pencils and blending stump and eraser for surface detail. Then I inverted the colours on the computer.

Gerry Smerchanski – This sketch made the same day was made with graphite pencils on white paper then the colors were inverted using Windows Paint. I was very mindful during the sketch that I was really drawing a negative so I resisted the temptation to make filaments dark which would be so easy to do. But when



Sketcher's Corner – Sol (cont.)

inverted they would turn out light so filaments are 'drawn' with an eraser. This works out well as filaments have that blurred wispiness to them. This mindfulness also extends to the Sun's limb which looks darker so you must remember to keep it lighter in your negative sketch.

The same holds for making sunspots. I draw them in for size and location and then later use "Whiteout" to make bright white spots that, when inverted, have that solid black look to them. The tricky thing is to get the penumbral part that surrounds the spot to be that medium grey look which is still darker than the rest of the sun. Sharp harder pencils seem to work best for this once you erase the area right around the spot. Best to do the erasing before you use the whiteout as it tends to mar the bright white spot and make it look messy. Oh and make sure you wipe all eraser dust from the image before you take an image of it or you end up with some odd tiny white flecks when you invert the image.

The mottled look to the Sun's surface was just a matter of using a relatively soft pencil (I like a really large pencil with a large lead in it) on that regular paper that had a small amount of roughness to it. This "tooth" of the paper -as they call it- makes it easy to just color in the Sun's surface and let the graphite spread unevenly over the paper and the effect is a good rendition of what you see.

One thing to keep in mind is just how dark you have to make the Sun's surface so that when you invert the colors it looks quite bright. I still am not making it dark enough in my negative sketch for my liking and then I have to use the brightness and contrast features in my ancient iPhoto image manipulation program to get closer to the visual experience.

So make a sketch, invert it and see what you find fails to capture what you saw. Go back and 'reprocess' your sketch to make it darker or lighter as needed. There are no regulations on how we do all of this. This ain't the AAVSO…

The 2021 Spruce Woods Star Party

By Silvia Graca, RASC Winnipeg

Once again the Spruce Woods Star Party Committee is gearing up to produce an amazing event for members of the Winnipeg Centre! While we may have to adjust things to conform to public health requirements and any requirements from the Park, we're hoping to a bit of a return to normalcy.

Entry to the Park is from Highway #5 from either the North (off Hwy #1 at Carberry) or the South (off Hwy #2 at Glenboro). The observing site is at latitude 49.6687913N longitude 99.249839W. Once in the park (you will need a park pass) proceed North as indicated on the facing page past the Winter Recreation Area to the Star Party field.

Please see the detailed schedule of events below!

Friday Sep 3

3:00 PM: Star party opens

- Upon arrival to the star party grounds, follow signage and instructions on where to set up.
- Big campers to be set up at the North end of the observing field.
- If you have a generator let the star party coordinator guide you to where you can set up.

8:00 PM: Announcements
9:00 PM till dawn: Observing/astrophotography

The observing circle will be open for those that wish to observe as a group!

Saturday Sep 4

10:00 AM - 8 PM: Registration meet and greet
1:00 PM - 1:10 PM: Welcome remarks and announcements
1:10 PM: Telescope and equipment tour - Join us for a guided tour of astronomical set ups around the observing field.
3:30 PM: Swap table opens - Bring your astronomical items for swap, trade, or sell! Be on time... don't miss out on a deal!
9:00 PM till dawn: Observing/astrophotography

9:00 PM; Gerry Smerchanski's bino tour - Arrive a few minutes early to get comfy... bring your lounger, a blanket, binoculars if you have as Gerry takes us for a guided tour of the night sky!

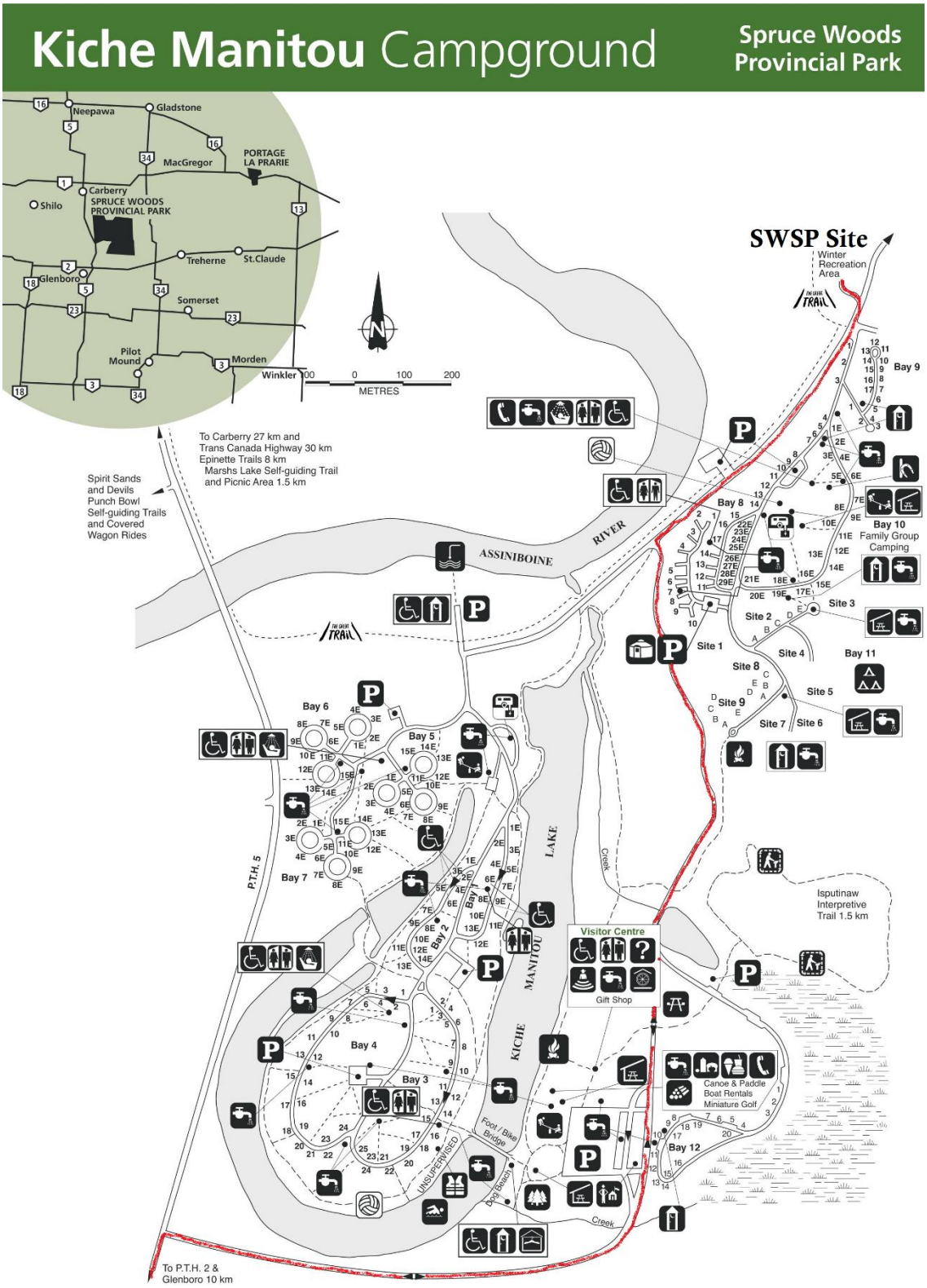
Sunday Sep 5

1:00 PM - 4:00 PM outdoor talks and outdoor workshops - subjects to be announced.
8:30 PM outdoor workshop under the stars, meet at the observing circle.
9:00 PM till dawn: Observing/astrophotography

Monday September 6

9:00 - 10:00 AM Continental breakfast at hospitality tent.
10:30 AM: Closing remarks followed by group photo - be there!
10:30 AM - 3:00 PM: Tear down and clean up

The 2021 Spruce Woods Star Party (cont.)



Star Party Etiquette

The Spruce Wood Star Party is held so that we can share our telescopes and astronomy with our fellow members of the Centre as well as invited guests. We try to eliminate the presence of even small amounts of white light. Maintaining dark adapted night vision is essential for visual observing and thus minimizing ambient light is an important aspect of maximizing observing potential.

Bring warm clothing, it does get cold late at night even in the middle of summer. In addition, other common courtesies and precautions will enhance the experience for all.

You are asked to practice the following Star Party Etiquette at star parties and confer with the Event Coordinator if you have any questions, or related issue or problem arises.

Arrival and Departure

Please drive very slowly and carefully after dark in the parking area.

1. If arriving after dark, make sure to turn off your headlights and use only parking lights in the parking lot and mask all other lights that can't be turned off like dome lights, etc . prior to driving into the parking area.
2. If you do bring a telescope and set it up, be sure to put it a couple of yards away from your closest neighbor. Many people need room for star chart tables, chairs, power supplies, and cables.
3. If you will be leaving before the event is over,
   - Park with your vehicle's headlights pointing away from the observing field and use only parking lights until you are out of the parking area, and cover all vehicle lighting that can't be turned off.
   - Drive away with headlights off and parking lights only. Only turn on your lights after leaving the observing area.
   - If you feel it is too dark to safely drive yourself out of the observing field, ask someone to guide you.

Lights

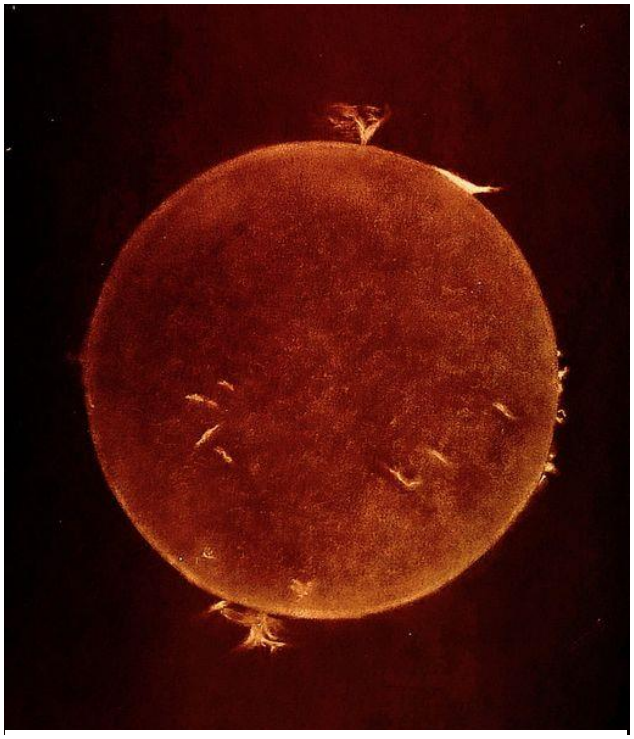
1. After dark all vehicle lights that can be turned off (headlights, parking lights, tail lights, brake lights, interior dome lights, etc.) should remain off or be taped to reduce/eliminate their light.
   NOTE: On the newer cars it may be possible to turn off the "always-on" headlights by clicking on the parking brake ONE click. This is often enough to turn off the headlights, but not enough to actually engage the parking brake. Don't forget to release the parking brake when leaving.
2. Avoid locking your car if locking/unlocking causes your lights to flash or horn to honk and put your keys someplace where you won't inadvertently activate the locks or set off your car alarm.
3. You may use red flashlights dimmed as much as possible while still being able to see. Even red light can be objectionable if too bright. It is easy to modify a regular flashlight by covering the lens with a red filter. Red construction paper, red fabric, red cellophane (thick layers), or red tail-light repair tape works great to make red filters.

Star Party Etiquette (cont.)

4. Computer screens, cell phones and any other light-emitting device should be dimmed, masked and shielded to block obtrusive light (low brightness, night mode and red plastic work best but even red light can be objectionable if too bright). If you wish to take any pictures with a camera or cellphone, be sure to turn off the flash first.
5. In the event you must give off some light, give a yell so folks can cover their eyes or turn off a camera.

Miscellaneous

1. Astronomy is a quiet, peaceful activity. Avoid loud and boisterous behavior.
2. Green laser pointers are not allowed, except by permission of the event coordinator.
3. Please ask for permission before touching anyone's equipment.
4. Bring your kids. However, many kids get cold and tired early, so you will want to bring warm clothes and maybe even a sleeping bag for them. Do not let them run around unsupervised as there are lots of expensive telescopes, tables, cables and equipment to run into in the dark.
5. Pets are best left at home, but if you must bring your pet please make sure they are on a leash, under control and quiet at all times. Also, make sure that they do their business away from the observing field and that you clean up after your pet.
6. Smoking and alcohol are not allowed during observing hours in the observing area, or around any telescope equipment at any time. Be aware that alcohol may adversely affect your night vision, body temperature and ability to drive safely.



Silvia Graca – Sol June 12, 2021

The Coming Oppositions of Jupiter

By Gord Tulloch, RASC Winnipeg Centre

The planet Jupiter is emerging into the dawn in Capricorn, heading for opposition this summer. These next two oppositions are particularly favorable, both perihelic oppositions of Jupiter so the planet will appear largest in angular diameter. This means the planet is almost as large as it can get - the disk of the planet will appear larger in even modest telescopes.

In 2021 the opposition is on August 19, on the border of Aqr and Cap. At opposition the magnitude of Jupiter will be -2.9, as bright as it gets. The disk of the planet will be 49.1 arcsecs in size, massive even for small telescopes. In 2022 the opposition, similarly advantageous, will be September 26 and will be even closer, 49.8 arcsecs

As far as where it appears in our skies, opposition in 2021 occurs at declination of -13º so as was the case in 2020 this opposition will be most favorable for the Southern Hemisphere. Rising at 8:36PM, Jupiter will transit at 1:30AM the next morning only 26º above the horizon.

In addition to the large angular size of Jupiter, the Earth will be positioned on the orbital plane of Jupiter's moons in 2021. During times such as these, we get neutral phenomena of the Jovian Moons, where moons both occult and eclipse each other as well as actually cast shadows on each other. I highly suggest the program Winjupos as well as tables I will publish in this newsletter to see when events will occur. These events are fun to watch and worth catching – if you don't, you'll have to wait until 2027.

The 2022 opposition will be at 0º Declination and the 2023 will be +13º, becoming better for northern observers than the southern. This means that the 2022 apparition will be an amazing opportunity for Jupiter watchers to get some amazing views, and take some excellent pictures.

(Thanks to Damien Peach for providing a video describing this information to his Patreon sponsors)

From the Winnipeg Centre Workshops - My Experiences with the Allsky Camera System

By Brian Renaud, RASC Winnipeg Centre

The Beginning

I often thought it would be interesting to be able to record images or video of the entire night sky from sunset to sunrise. Any astronomer can tell you that a lot of interesting things happen up there all the time, but when we are not at the eyepiece or standing out there looking up, we miss so much of that. An Allsky camera system recording all night would certainly show what we miss.

I tried a few different combinations of astronomy cameras with various lenses but got back dismal results that were often out of focus, lacked resolution and were not automated in any sense of the word. SBIG and Orion sold some very nice systems over the years but their systems were high cost and are no longer available.

About two years ago I discovered the Allsky Camera System that is the creation of a fellow named Thomas Jacquin who lives in the Yukon Territory. He came up with a system that is easy to make at home, mostly uses off the shelf parts for the assembly, and is automated by use of a tiny on-board computer. He also developed a comprehensive software package to make it all work which he graciously offers free of charge via a software development and collection site called GitHub. His goal was to capture the northern lights that danced over his home but he missed while he was sleeping. In my opinion, he met his goal and went beyond it. "Easily home made" and "free" caught my attention right away! His instructions are available at: Wireless All Sky Camera : 6 Steps (with Pictures) - Instructables.

www.gimliwestobs.ca - my home page

My Experiences with the Allsky Camera System (cont.)

Construction and Hardware

If you build an Allsky system as shown on the Instructables pages you will have a nice compact and very robust camera. It won't be the prettiest piece of gear in your astronomy tool box but it will stand up to a lot of wear and tear while providing you nice images of your sky that you usually miss out on. Ideal for something that you will leave outside year-round in our Manitoba climate.

First off you will really need to get past the idea of buying a relatively expensive bunch of gear such as the ZWO ASI camera, fisheye lens, and mini computer and then just leaving it all outside, up a pole, inside a piece of toilet plumbing pipe. Once you get beyond that I am certain that you will have a lot of fun with this system. In fact, I promise that you will.

The brain of the Allsky System is the Raspberry Pi computer (RPi) that is a very powerful and compact computer that you can easily hold in the palm of your hand. It uses Linux based programming and that scared me away right from the start. I am not a computer code guy and the idea of computer code programming seemed well over my head. Fortunately, Gord Tulloch gave me some great advice about the RPi computer and offered to help me along the way. That little push was all I needed. Before long Gord's patience and guidance rewarded me with my first operating Allsky camera in June 2020.

You will want to mount your camera high enough to have a nice view of the horizon all around your area. There is a trade off between height/clear view and ability to access your camera. My Allsky is mounted 11 feet off the ground in the middle of the backyard. The mounting is a wooden post designed such so I can pivot the entire post down to allow access to camera, clean the lens, or adjust something. You'd be surprised how many times birds leave me a smeared present on the dome or a spider thinks the dome is a good anchor for his web. You could hang it off the side of your roof or side of a tall building but ease of year-round access should be considered. Climbing up a ladder in January to adjust something might not be your idea of fun.

Allsky Ver-1.0

Wood mount with pivot for camera access

My Experiences with the Allsky Camera System (cont.)

The simplest method to power the camera and computer is to run household 120-volt up the pole via an outdoor rated extension cord. There is an option to carry power along an Ethernet computer cable should you desire to communicate with your camera and power the system by that method.

Ensure all the plumbing tube pieces fit well and don't be scared to use good silicone sealant and add waterproof tape around all the tube joints. I use black electrical tape. Keeping water and moisture out has proven to be very important to keep the inside of the dome clear of moisture. The internal camera system must be sealed from the elements or it will bite you later, probably in January and you might need that ladder. Oh, the fun!

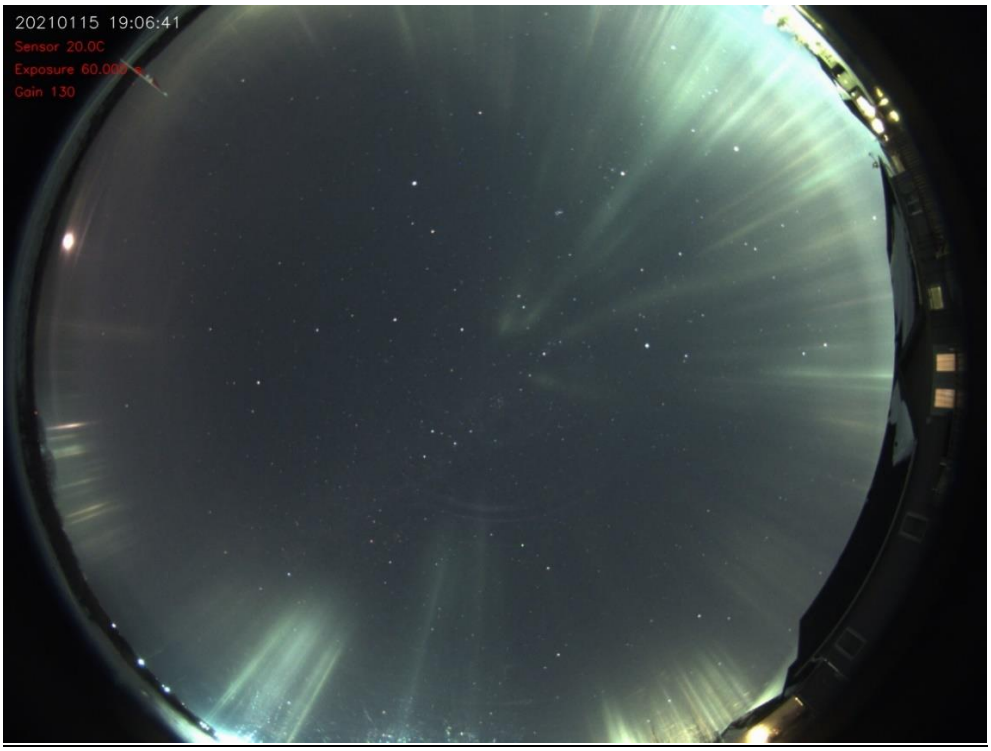
Dew, frost and snow proved to be problems that I solved by placing a 1.25 inch dew strap loosely around the camera body. A search on the net shows there are many people out there who built all kinds of fancy gizmos, resistor blocks, coils and added in fancy temperature probes and circuit boards. You really just need some heat to rise up inside the clear dome and keep most moisture at bay. Using the KISS principle, I chose the dew heater strap. During snow and ice storms my dew strap heater system needs about 24 hours to clean off the outside of the dome. It is usually overcast during and after such storms so you are not missing anything while the heat slowly melts off the snow or ice. Initially I used an automotive block heater timer to control the power on and off but have now moved to a yard light sensor built into the bottom cap of the tube that turns the dew strap on at night. Heat from the RPi computer and related power adapter inside the tube tend to keep the inside of the tube about +17C. So even at about an outside temperature of -17C the inside of the tube is near 0C. The dew strap adds in another +10C so things stay nice and toasty inside the tube during winter. Summer temps require the dew heater to be shut down when we get our heat waves but August dew has proven to be a big issue that needs the heater on many a night.

Allsky ver 3.0 and Ver 1.0

dew strap installed

bottom cap - power and sensor

My Experiences with the Allsky Camera System (cont.)



Ice crystal light pillars - January 2021

Using the Allsky Camera System

The Allsky computer program is user friendly and I was surprised how easy it is to use. The main page of the Raspberry Pi computer actually looks much like any computer screen (*i.e. in Windows or Mac – Ed*) we use all the time. The Allsky program has a nice graphical user interface that allows simple point and click selection where you can choose camera settings such as exposure time, gain, or most any other control function you might desire for your Allsky camera system. When it is set up and working the Allsky program just plugs along and needs no input from me. Allsky captures images during hours of dark and it waits quietly all day until the next night when it starts imaging all over again. Images are saved on the Raspberry Pi computer inside the tube up the pole. Every morning it builds a star-trails image and stitches together a video from all the images captured over the previous night. After 14 days the images are overwritten with new images so you have 14 days to save anything you want to keep on another computer or memory device.

Communication with the Allsky system is most easy by using the built-in wireless capability of the RPi computer. If you have any kind of home internet router that lets computer devices or cell phones use your home WIFI then you are good to go. Allsky links in to your home WIFI the same as any device does. I monitor Allsky from my home computer or my smart phone. If you have a website, you can even publish your real time live view, images and videos automatically for the public to see anytime. See my web site at www.gimliwestobs.ca for examples.

My Experiences with the Allsky Camera System (cont.)

A simple program called VNC Viewer allows you to control all aspects of the RPi computer and Allsky camera by remote control from a computer in the house. I adjust camera gain as the Moon phases change to prevent glare in the images that blur out sky details. Exposure time is left on auto and the software figures that out for itself as conditions change. It is just a quick log in to the Allsky system and then a few points and clicks of the mouse and it is done. It could not be simpler.

A Year of Images

I have operated my Allsky system for just over one year. It has proven very reliable, robust, and capable to give some really nice images of the full night sky. Here is a list of the more interesting images captured during the past year - Clouds, precipitation, lightning, and weather; northern lights and STEVE; Comet F3 Neowise; satellites, airplanes; Space X rocket booster fuel vent in orbit (that was cool!); Meteors and fireballs; and Starlink satellites, as well.

ISS pass and a meteor zip

My Experiences with the Allsky Camera System (cont.)

Conclusion and next steps

The images of large meteors and fireballs has re-kindled my interest to attempt to determine landfall sites for meteorite hunting. I have now built three Allsky camera systems for myself and a few friends. We have started a Fireball Watch Network with the cameras. The network shows great promise as a tool to provide accurate imagery of fireball inbounds. The project is working out better than hoped.

If anyone wants more information or some help building your own Allsky send me an email anytime. Happy to discuss and answer your questions. The Allsky program can do a lot more than I had time to discuss here. I think you get the idea of what Allsky is all about and how it worked out for me. Love to welcome more cameras to the Fireball Watch Network.

Next time I will discuss the Fireball Watch Network in better detail.
Until then, clear skies everyone!
Brian Renaud brenaud@mymts.net

Judy Anderson - An image from the thin crescent Moon setting at 10:28 CDT on June 12, 2021, a 38.5 hour moon after the partial solar eclipse that was clouded out in Manitoba. I love the way the walls of Mare Crisium protrude into the darkness of the shadow beyond the terminator, just high enough to catch the reflected light of the Sun, and also the mountains at the thin point of the crescent where it tails off into nothing. A tiny crater named Picard is barely visible on the terminator inside that Mare. Another slightly larger, called Apollonius, is just below the Mare. Two large craters further down the crescent have "rebound" mountains in the centre (after being hit by a large impact), Langrenus and then Petavius. Clouds were building quickly all around the moon, but we caught sight of Venus nearby. Best of all was being able to be outside under the sky with friends, the first evening of slightly loosened restrictions. Imaged with a tripod-mounted Canon 80D at 800 ISO at 600mm.

Filters for visual observing of the Moon and planets

By Martin Griffiths, British Astronomical Society

Introduction

If you are new to astronomy and wish to see as much detail as possible on the planets of the solar system, or even if one has been observing solar system objects for some time, it may come as a surprise to find that coloured filters can make a world of difference to your observing clarity. Using filters can revolutionize your observing as coloured filters bring out additional detail from the subtle shadings found on solar system objects. This tutorial builds on the excellent tutorial by Paul G. Abel, and looks in more depth at the filters most commonly used by visual observers of solar system objects.

Many astronomical suppliers provide these filters, and all filters are identified firstly by their colour, and secondly by particular numbers or a # which are known as Wratten numbers. These allow the observer to choose which parts of the spectrum they are going to enhance in order to make planetary and lunar definition stand out. The principle of the filters come from black and white photography in which complementary or "opposite" colours enhance the contrast visible. When juxtaposed, complementary colours make each colour seem more vivid and defined, enabling particular coloured features to stand out against the background hues. So, a red or orange filter will enhance blue features and a blue filter will enhance red features.

The Wratten system was developed in Britain in the early 20th century by Frederick Wratten and Kenneth Mees who founded a company in 1906 that produced gelatin solutions for photography. Mees then developed gelatin filters dyed with tartrazine to produce a yellow filter, but soon developed other colours and a panchromatic process of photography. In 1912 they sold the company to the American company Kodak, with their British offices at Harrow in England and Mees moved to New York to found the Eastman-Kodak laboratories there. In honour of his partner and mentor, Kenneth Mees named the burgeoning number of coloured filters "Wratten" and introduced the complex numbering system that is still in use today. Not all the Wratten filters are suitable for astronomical use, but the main colours are still widely used in visual astronomy and are detailed in this tutorial.

Figure 1. Lunar and planetary filters. A typical set.

These coloured filters are known as broadband or “longpass” in that they allow a wide range of wavelengths through but block wavelengths above or below a certain point in the electromagnetic spectrum. As the spectrum of visible light lies between 390 and 700 nanometers (nm), with the blue wavelengths being the shortest (~400nm) and the red being the longest (~700nm). Anything with a wavelength range above or below a particular filter will be blocked and increased contrast in compensating colours will be noticed.

Most astronomical suppliers sell complete sets of filters for solar system observing and naturally such sets are known as lunar and planetary filters. They generally have a range from red to blue across the spectrum and cover the broad bandwidths associated with such colours. A typical set will include a neutral density filter for lunar observing and a No. 25 red, No.12 yellow and No. 80A blue for as full coverage as possible. A typical filter set is shown here in figure 1. A more extensive set of astronomical filters with typical Wratten numbers can be seen here in figure 2.

Figure 2. Wratten filters for visual astronomy.

This tutorial will introduce each filter and instruct the reader on which targets in the solar system each filter can be used and what features the filters will enhance Keep in mind that visual acuity does vary from observer to observer and that in the dark the sensitivity of the human eye shifts to the blue end of the spectrum. This is due to a phenomenon known as the Purkinje effect, named after the Czech doctor who discovered that the spectral sensitivity of the human eye does not enable red light to be seen clearly in the dark, but shorter blue wavelengths are detected.

Technical aspects of Filters

Filters can be separated into a few main groups that enable enhancement, lessened contrast or can be used for colour shift or balance. Colour subtraction filters work by absorbing certain colours of light, letting the remaining colours through. They can be used to demonstrate the primary colours that make up an image or can be seen in the features of our planetary neighbours. A colour correction filter makes a scene appear more natural by simulating the mix of colour temperatures that occur naturally, and subtly enhancing the middle ranges of the spectrum.
In addition to these filters, there are also colour temperature filters. Some filters change the correlated colour temperature of a light source. They can change the appearance of light from a bright white

source so that it looks more yellow and natural to the eye. The term colour temperature comes from the natural phenomenon of coloured light emitted by warm objects. Warm objects, such as a flame from a fire, emit deep red and orange light. The temperature of such flames are roughly 1500K. If you increase that temperature the light emitted begins to look more blue as its wavelength changes to the shorter (hotter) or blue end of the spectrum.

Of course, optical filters don't really change the temperature of the object emitting the light. Colour temperature filters simply remove some of the light of wavelengths of our choosing so we can absorb or reflect away some of the orange and red light emitted by the planets. This makes the remaining light look more blue and therefore has a higher colour temperature. Conversely, some filters can remove some of the blue light emitted by a planet, making the remaining light look more orange and thus apparently emitting a lower colour temperature.

Wratten filters and their uses

In the following tutorial, I have grouped the filters under their colour designation rather than put them in number order, as the colour of each filter is their most obvious feature when using them. All of these filters are available to purchase in 37.1mm (1.25") or 50mm (2") fittings and are commonly available from astronomical suppliers. For a fuller description of Wratten filters, please follow this link: https://en.wikipedia.org/wiki/Wratten_number. In this tutorial, only those filters useful to astronomers will be described.

One question commonly asked is "do filters block out too much light and make observing more difficult or less enjoyable?" It is true that filters do block out some light, but I hope you will see from this tutorial that by selectively blocking out certain wavelengths of light, and by altering the contrast of any surface features, the observer is often able to resolve finer or more subtle detail. In fact, in the case of bright objects the reduction in light transmission is an advantage. Let us examine this a little more technically. The difference in contrast between the belts and zones on an object such as Jupiter can be so small that the human eye and brain just smear the whole and it can be difficult to discern details without a filtered system. Because Jupiter is a very bright object seen against a dark background, the differences in intensity of reflected light from light/dark zones on such planets is not really seen to advantage by the human eye.

Contrast in any system can be measured using the formula:

$$C = (b2 - b1) \div b2$$

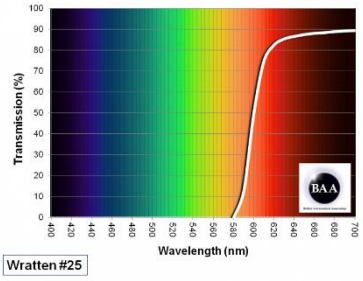
Where C is the contrast and b1 and b2 are different areas of brightness on the surface of a planet. Bright areas on Jupiter have an intensity of 6 lumens m-2 and the intensity of the darker zones have an intensity of 3 lumens m-2. This would give:

$$(6 - 3) \div 6 = 0.5$$

or a visual contrast 50% lower in the darker zones than in the brighter zones. A filter will enhance the contrast by permitting wavelengths representative of the redder or darker zones through whilst

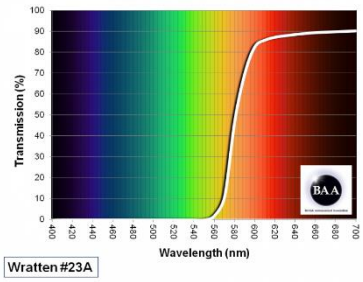
diminishing the blue contrast on the brighter zones. Surely a filter that would aid in the perception of subtle features is going to be a bonus to any observer?

This tutorial will convincingly show that the use of filters, despite their decrease in light transmission is actually very useful in visual astronomy. The use of filters assists primarily in enhancing contrast initially and although the reduction in light transmission is generally not favoured in astronomy, this is one area in which this general rule need not apply.



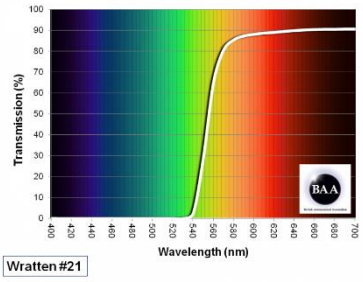
Wratten #25

No. 25 Red - The No. 25 filter reduces blue and green wavelengths, which when used on Jupiter or Saturn, result in well-defined contrast between some cloud formations and the lighter surface features of these gas giants. However, it needs to be used judiciously as the light transmission is only 15% but for such bright planets this filter will enhance the observed detail even when used with small telescopes. This filter blocks light shorter than 580nm wavelength. This filter is also sometimes referred to as a Wratten 25A



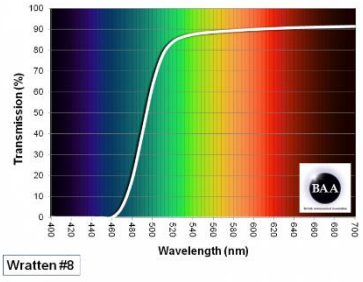
Wratten #23A

No. 23A Light Red - This is a good filter for use on Mars, Jupiter, and Saturn, and has proved useful for daylight observations of Venus as it has a 25% light transmission. The light red is an "opposite" colour to blue and therefore darkens the sky very effectively in daylight. Some astronomers report that it also works well on Mercury, but I would not recommend viewing this planet in general during daylight due to its proximity to the Sun. This filter blocks wavelengths of light shorter than 550nm.



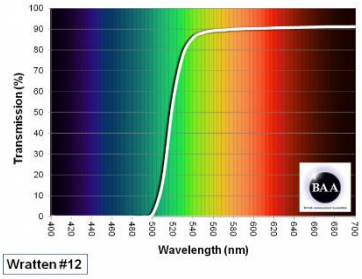
Wratten #21

No. 21 Orange - This orange filter reduces the transmission of blue and green wavelengths and increases contrast between red, yellow and orange areas on planets such as Jupiter, Saturn and Mars. It brings out the glories of the Great Red Spot on Jupiter very well under conditions of good seeing with a medium magnification (e.g. x100). It also blocks some glare from the bright planet and provides less of a contrast between a planet and the black background of space. A good all round planetary filter as it transmits about 50% of the light and blocks wavelengths short of 530nm.



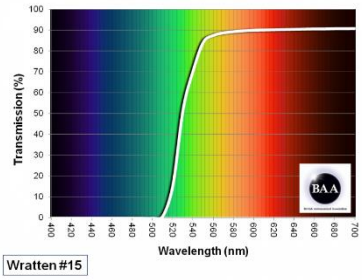
Wratten #8

No. 8 Light Yellow - This filter can be used for enhancing details in red and orange features in the belts of Jupiter. It is also useful in increasing the contrast on the surface of Mars, and can under good sky conditions aid the visual resolution on Uranus and Neptune in telescopes of 250mm of aperture or larger. The No. 8 cuts down glare from the Moon and works much better than the "moon filters" included with some cheaper telescopes. This filter allows 80% of the light through but blocks light short of 465nm.



Wratten #12

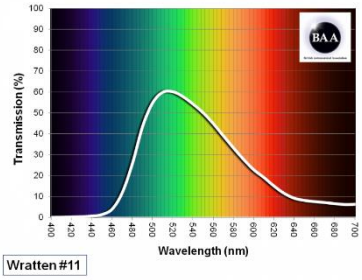
No. 12 Yellow - This filter works on the principle of opposites described above, blocking the light in the blue and green region and making red and orange features on Jupiter and Saturn stand out clearly. Deeper in colour than the No. 8 filter, it is the filter most astronomers recommend for visual work on the gas giants. It has a 70% light transmission and cancels some of the glare on Jupiter when seen against a dark background sky. It blocks visible wavelengths short of 500nm.



Wratten #15

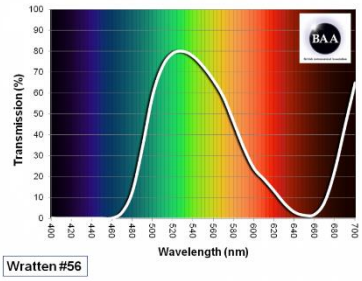
No. 15 Deep Yellow - This filter can be used to bring out Martian surface features, especially the polar caps and can be used to bring out detail in the red areas of Jupiter and Saturn. Some astronomers also have reported some success using this filter to see low-contrast detail on Venus. I have used this filter on Venus during the day to add more contrast to the image and it generally works well. This filter is particularly useful for visual observations of Venus as it is a very bright object and the filter can considerably reduce the glare of this very bright planet in evening or morning apparitions despite its 65% light transmission. The No 15 blocks light short of 500nm.

Although at this point it may feel like every filter suits Jupiter and Saturn, the variegated nature of their surfaces and their extreme brightness at opposition or during favourable apparitions enables a wide range of filters to bring out different details. Some of the details may be subtle, but can be explored better by an experienced observer equipped with a range of filters.



Wratten #11

No. 11 Yellow-Green - This darker filter is a good choice to enable the observer to directly see surface details on Jupiter and Saturn. It can also be useful on Mars if you are using a large aperture telescope in the 250mm range. At times of steady atmospheric seeing, this filter darkens the surface features and makes areas such as Acidalia and Syrtis Major stand out and the polar caps and occasional features such as clouds appear quite marked. The No. 11 filter allows 75% light transmission can be used to darken some features on the Moon.

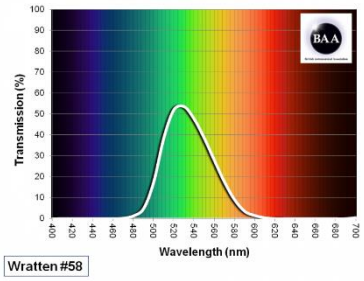


Wratten #56

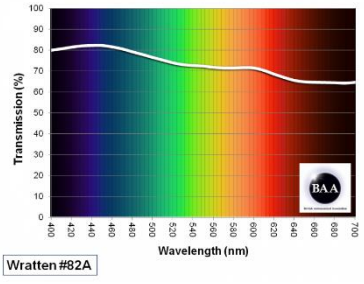
No. 56 Light Green - I have used this filter for observing the ice caps of Mars during its close encounter in 2003 and found that despite the low altitude of Mars from the UK during that apparition the filter worked well in bringing out these features and even hinted at rocky features on the planet's surface during periods of clear seeing. I have to admit that the orange No 21 filter did work surprisingly well in rendering colour and detail on the red planet, but the contrast with the No 56 filter was quite good. This filter allows most wavelengths through but does have a peak around 500nm.

Figure 3. The Moon through a number 56 filter.

With its 50% light transmission this filter is a favourite of lunar observers as it increases the contrast while reducing the glare. It is also a filter that is well tuned to the wavelengths of the human eye and the greenish cast can almost be ignored during visual observation. This is a colour correction filter with all wavelengths equally affected. The effect can be seen on the first quarter moon in figure 3 photographed here in ordinary white light and then through the Wratten No 56 filter.

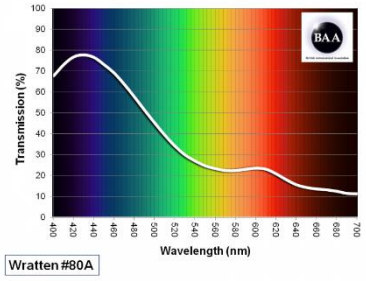


No. 58 Green - This filter blocks red and blue wavelengths of light and many observers find that it slightly increases contrast on the lighter parts of the surface of Jupiter. I have also used it on Venus where it does add to the contrast and reduces glare a little but it must be admitted that it is not easy to visualize any detail in the clouds.
The No 58 filter has a 25% light transmission, and it is a colour correction filter rather than a longpass. Such filters alter the colour temperature of the incoming light, enhancing contrasting colours in the object by allowing specific wavelengths through that correspond to the temperature of the light. This is a complex subject but to put it simply, the colour of light not only corresponds to particular wavelengths but also to particular colours where blue is cooler and red is hotter. Note that this is more of a perception than anything else as in reality blue light is “hotter” (has a higher frequency and shorter wavelength) than red light.

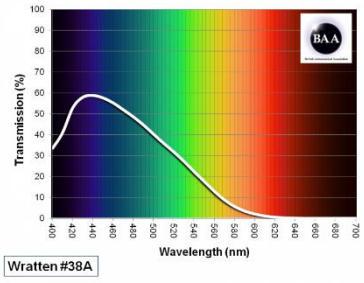


No. 82A Light Blue This is almost a multipurpose filter as it does enhance some features on Jupiter, Mars and Saturn and also works very well in enhancing some features on the Moon (figure 4). It is commonly referred to as a “warming” filter that increases the colour temperature slightly and allows the red wavelengths through due to the complementary colours that we discussed above. With a light transmission of 75% it can be used on any aperture telescope and can even make some difference to deep sky objects such as M42 and M8 though the effects can be quite subtle.

Figure 4. Number 82A blue filter. Note the contrast between Mare Serenitatis and Mare Tranquilitatis.

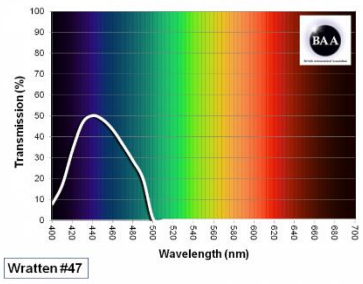


No. 80A Blue - Although this is quite a dark filter, it is as versatile as the No 82A in that it enhances features in the red on planets such as Jupiter, Saturn and Mars. It is also good for lunar observation as it reduces the glare and provides good contrast for some features such as ejecta blankets, ray systems and lava fronts. Some astronomers report success in its use on binary star systems with red components such as Antares and α Herculis as the contrast enables the observer to split the two components well. The No. 80A filter has a 30% light transmission and also acts as a colour conversion filter enhancing wavelengths around 500nm.



No. 38A Dark Blue - Again, a good filter to use on a planet such as Jupiter because it blocks red and orange wavelengths in such features as the belts and in the Great Red Spot. Some astronomers report that it also adds contrast to Martian surface phenomena, such as dust storms, and makes a better contrast for observing the rings of Saturn. Try using it for observations of Venus as some report that using this filter increases the contrast, leading to the visual observation of some dusky cloud features. This filter has about a 15% light transmission. It absorbs red, green and UV light and is commonly referred to as a minus green, plus blue filter. The difference can be gauged in figure 5.

Figure 5. Jupiter with a number 38A filter. Note the banding.

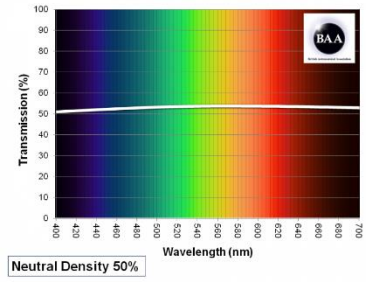


No. 47 Violet - A very dark filter which strongly blocks the red, yellow, and green wavelengths. I would highly recommend it for Venus observation due to its low light transmission of about 5% providing great contrast and enhancing cloud features. Try using it on the Moon to decrease the glare when observing features at a 10-12 day old phase. Some observers report that features in the Schroeter Valley and Aristarchus crater are clearer due to the lack of glare. Recommended for the Moon, especially if you are using a large aperture telescope! This is another colour separation filter that enhances the blue or shorter wavelengths of the spectrum at 450nm.

Non Wratten Filters

Additional filters that also are helpful in visual observing are the polarizing filter and the neutral density filter. Both are longpass filters that usually transmit all wavelengths of light but can cut down on glare and contrast.

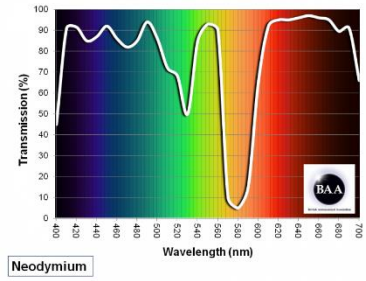
Neutral Density Filters



A neutral density (ND) filter transmits light uniformly across the entire visible spectrum and is an excellent filter to use to reduce glare in such objects as the Moon and planets, but especially the Moon. Due to its bright glare many lunar and planetary astronomers keep an ND filter on their favourite eyepiece and add on other filters as necessary. Neutral density filters come in a variety of densities that reduce the glare in the image based upon the amount of light transmission each ND filter allows. Commonly they come in numbers such as 50, 25 and 13 that signify the amount of light they transmit; 50%, 25% or 13%.

Polarizing filters

Although it does not work at any specific wavelength, the polarizing filter allows light of any wavelength through but blocks those with random scattering patterns allowing only light waves in a flat “plane” through, which has the effect of increasing the contrast, reducing glare and slightly enhancing the saturation of colour in an object. Such filters are very useful on bright objects such as the Moon and some planets.



Neodymium Filter

The Neodymium filter is an interesting addition to the filter armoury as it filters the yellow light of the spectrum, rendering most objects a faint blue colour. It is useful for observations of Venus and for Jupiter and Saturn too. Some astronomers report that this is a useful filter for observing in light polluted areas as it cuts through sodium light pollution somewhat, although it is not as effective as a Light Pollution Reduction filter.

Summary

Many planetary observers rely on filters and they report that they really do make a difference in seeing faint details. Filters also reduce the glare of objects like Jupiter, Saturn and the Moon and render a better contrast between their sunlit surface and the dark background sky.

Observers can also be affected by a phenomenon known as prismatic or atmospheric dispersion. This is most evident when a star or planet is seen near the horizon. It results from atmospheric refraction occurring less for the longer wavelength red light where the red appears clearer nearer the horizon and the light shifts to the violet toward the zenith. This is the reason that most astronomers prefer to observe an object when it is near or at culmination (the highest point in the sky as seen from an observers latitude) so that this effect is lessened. Use of red or blue filters on an ascending object may make the difference between seeing details such as the Great Red Spot for example.

I hope that this tutorial shows that coloured filters are a very useful tool in visual astronomy. Using such, I hope that this tutorial gives the reader some tips on which filters to use to observe any of the planets of the solar system and our moon. Most features on planetary surfaces may be quite subtle and filters can make a great difference between seeing or recording a feature or missing it completely in the sky background. For more information on using filters for visual observing or for astrophotography, please see my book Choosing and Using Astronomical Filters.

Martin is the Director of the Brecon Beacons Observatory and an astronomer at Dark Sky Wales.
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Sheila Wiwchar – Sol June 1

Explorations in EAA Pt. 1 – Setting the Stage

By Gord Tulloch, RASC Winnipeg

One of the pieces of advice we often give beginners is "The view at the eyepiece will be really different than the pictures on the box!" We are used to viewing subtle features at the eyepiece, even with large scopes and dark skies. But many amateur astronomers want to go beyond the faint fuzzies yet retain the flexibility of visual astronomer rather than go completely towards astrophotography.

Electronically Assisted Astronomy (EAA, also known as Electronically Assisted Visual Astronomy EEVA) is a way to get a near real-time view of the heavens that is enhanced through electronic means. This tool is particularly useful for public outreach since the public expects something like the "picture on the box" and is often disappointed and unable to see any details in the eyepiece.

In addition, EAA allows you to observe in less-than-ideal conditions, especially under badly light polluted skies or when a bright moon is present. Using live stacking in EAA software, objects that are virtually invisible in these skies can be observed in the virtual eyepiece and enjoyed immediately, instead of later after astrophotography tools are used to process the images. The objective for me is to provide anyone within range of a wifi connection to the telescope a view through the scope that rivals a good astrophoto, except built up in real time.

In this series of articles I'll explore my own journey with EAA and how it has changed the way I observe. I'll also discuss equipment considerations, initially with my observatory C8 along with some customizations I'm undertaking on my 16" dob that will prototype the final design for the 24" dedicated EAA telescope I'll be building over the next few years (see the design below I'll be following – an equatorial mount means no image rotation so superior to a Dob mount.) Finally, I'll contrast what we can do with EAA on our own telescopes compared to the slick new integrated (but expensive!) EAA systems like the Unistellar EVScope (https://unistellaroptics.com/).

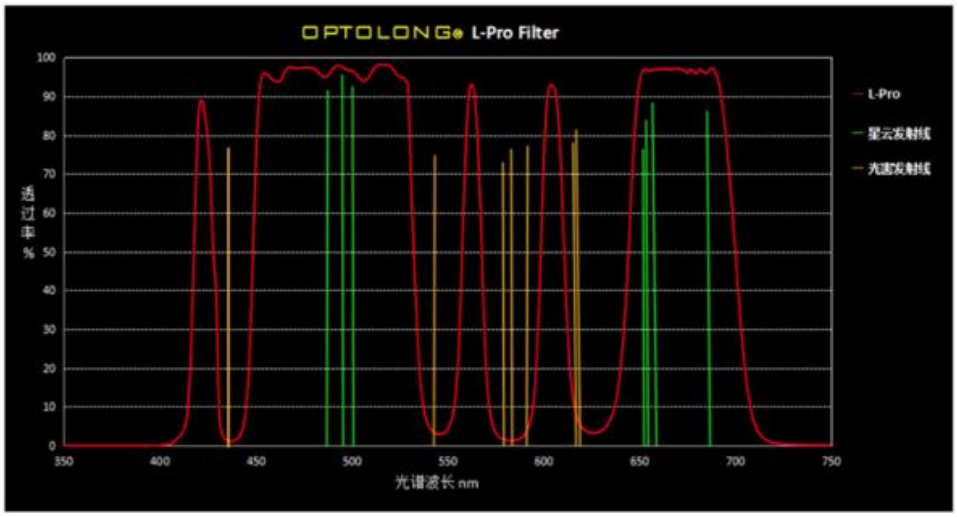
Design I'll be following for my planned 24" EEA telescope (Frederic Amiryan (https://arp83.fr/)

Explorations in EAA Pt. 1 – Setting the Stage (cont.)

Equipment for EAA

Original EAA proponents used night vision cameras to effectively amplify the view in the eyepiece and provide real time views of astronomical objects. However, these rigs tend to be expensive, and single purpose – they cannot be used for more traditional astrophotography. The advent of CMOS cameras with very low read noise (the electronic noise generated when an image is read from the pixels of a camera) means that it becomes very efficient to use relatively low-cost CMOS cameras (for example the ZWO ASI224MC is a favorite, which is also an excellent planetary imager) to take many short duration images that can then be stacked.

To use a One-Shot Color (OSC) camera like the ASI224MC in light polluted skies like my back yard requires filtering to maximise the contrast of objects by filtering out as many wavelengths of light pollution as possible. To this end I ordered an Optolong L-Pro filter from Ontario Telescopes ($199CDN) on the recommendations on several folks online who use this filter with the ASI224MC and similar cameras. This filter selectively reduces the wavelengths of specific light pollutants, primarily artificial lighting including mercury vapour, both low- and high-pressure sodium vapour and the unwanted natural light caused by neutral oxygen emissions in our atmosphere (skyglow).



At the same time the filter is very transparent to main nebula emission lines at OIII(496nm and 500nm), H-beta (486nm), NII(654nm and 658nm). As can be seen above the spectral transmission for the L-Pro is much wider than other Optolong filters such as the L-Extreme and L-Enhance filters (provided for comparison) The benefit of these wide windows in the spectral transmission of this filter is that colors of

Explorations in EAA Pt. 1 – Setting the Stage (cont.)

objects and particularly stars are more balanced and more easily adjusted to reflect the view without a filter.

Not long after I started playing around with EAA my venerable old Canon 1100D broke (an errant slew put too much pressure on the USB connector which broke off the motherboard) so I was looking for a new camera. After much research into what people were using for EAA as well as general purpose astrophotography, I ordered a ZWO ASI294MC OSC CMOS camera, capable of 4k images. Between this camera and the ASI224MC I already own for planetary targets, I am in pretty good shape for both larger and smaller objects. Unfortunately the ASI294MC arrived at the end of May so it won't see much use until we come out of summer solstice when what little real darkness we experience is in the wee hours.

Software Considerations

My first few outings with EAA with the DSLR using the ALS (https://als-app.org/) software on the Raspberry Pi made it clear while the ALS software really works well, there's a missing piece in simply stacking images raw from the camera on most telescopes, although it does support dark frames. Most astrophotographers will know that to get a result that mimics an enhanced visual system, there are artifacts that need to be removed from the final image that would detract from the final result. These include bright and dark pixels as well as field defects like dust motes and vignetting. Fortunately, we know how to remove those with dark, bias, and flat frames. This is referred to as "calibration" and is usually done prior to stacking and other processing. But how do we remove these defects in real time?

For example, a live stack of the Dumbbell Nebula on my 8" Celestron SCT with a Canon 1100D DSLR resulted in the image at right after stacking 8 x 60s frames. Normally we would use even shorter exposures, but this is data I had already captured and rejected for traditional astrophotos. You will note considerable need for flat fielding in this image as my camera was pretty dirty and the field is vignetted.

Explorations in EAA Pt. 1 – Setting the Stage (cont.)

While the image is starting to come together and show some detail in the object, defects are obvious also. If we look at a flat taken with the camera earlier, it's clear what we need to remove.

I know it just looks like a grey box but look closely! While I would not use a DSLR for live stacking after initial testing on my C8 (and of course the camera is busted anyway) the issue remains. In fact, the stacking process, since we're stacking uncalibrated data, is amplifying the subtle defects on the flat frame so they're more readily apparent on the final image.

Clearly a more pleasing image would have these defects removed before stacking. After hunting around for an application to do this for me, I considered writing a python script that used some of the excellent python tools for astronomical image processing that would calibrate the image right after capture before the stacker picked it up. However this was a rabbit hole that would slow the whole process down so I decided that, although I have a very marked preference for using LINUX software on my Raspberry Pi computer attached to the telescopes, in this instance I was swimming upstream against a very substantial current.

I decided to use the Windows application that is the standard for live stacking, Sharpcap Pro. There is a free version of this software but given the Pro version is only £10 per year and includes flat fielding and many other helpful features, I went for the commercial version.

One other thing that caused issues on my C8 was alignment of images during the stack. With ALS it was very finicky about too much drifting of the target, refusing to stack images that were not very close to the original. On my C8 this required me to use an off-axis guider to guide the exposures. It'll be interesting to see if Sharpcap Pro has the same issues.

Explorations in EAA Pt. 1 – Setting the Stage (cont.)

Viewing "Live" Images

The only problem with EAA is viewing images requires you to look at a computer or TV screen, which is disruptive in star party environments since it pretty much blasts your night vision. To keep people from getting annoyed at the white light at observing events like Spruce Woods Star Party, I'm interested in exploring other ways in which the images can be displayed for users "at the eyepiece" (perhaps with a small shrouded screen mounted where the eyepiece would normally be) or even using virtual reality headgear that you can insert a cell phone into and show images arising from the live stack. With integrated headphones, these devices are available for around $50 from Amazon, so cost isn't prohibitive. I'm liking the idea of viewing live images from my future 24" telescope in 4k while listening to my favorite Spotify "music to observe by" playlist (lots of Bach and Mozart!) Just hand me a drink once in a while and my evening will be complete!

Example VR headset

It is easy on the Raspberry Pi to create a small Wifi network associated with the telescope that not only runs the phone in the headset, but any bystanders can connect to and view images on their phones and tablets, so this might be a good option as well. To make things easy, this QR code (generated from https://www.qr-code-generator.com/solutions/wifi-qr-code/) will prompt you to join the "stellarmate" wifi network (which my Raspberry Pi emits as a wifi router) and can be set up to autoload load a web page on demand with the current live stack that the telescope is working on. Sharpcap Pro can export a current image of the live stack to a folder that's web accessible. Simply print the QR code out on a sheet of paper and post it on the telescope.

SCAN ME

I know some will view this whole scenario as absolute heresy! While some part of me is saddened by the concept of a bunch of people standing around a big telescope looking at their phones, this is the wave of the future as shown by the level of interest in devices like the EVScope and Celestron Starsense Explorer telescopes. It also means that a user can capture a memento of the occasion just by snapping a screenshot. One wonders if that will have more impact on the average person at a public star party than a quick look through an eyepiece at a faint fuzzy.

So I have my initial toolset, and something like a vision, so time to get some live stacks done! Next time I'll go through some of my results and experiences with using SharpCap Pro for live stacking on my C8, 102mm refractor and 16" f/4.5 telescopes.

Members Image Gallery

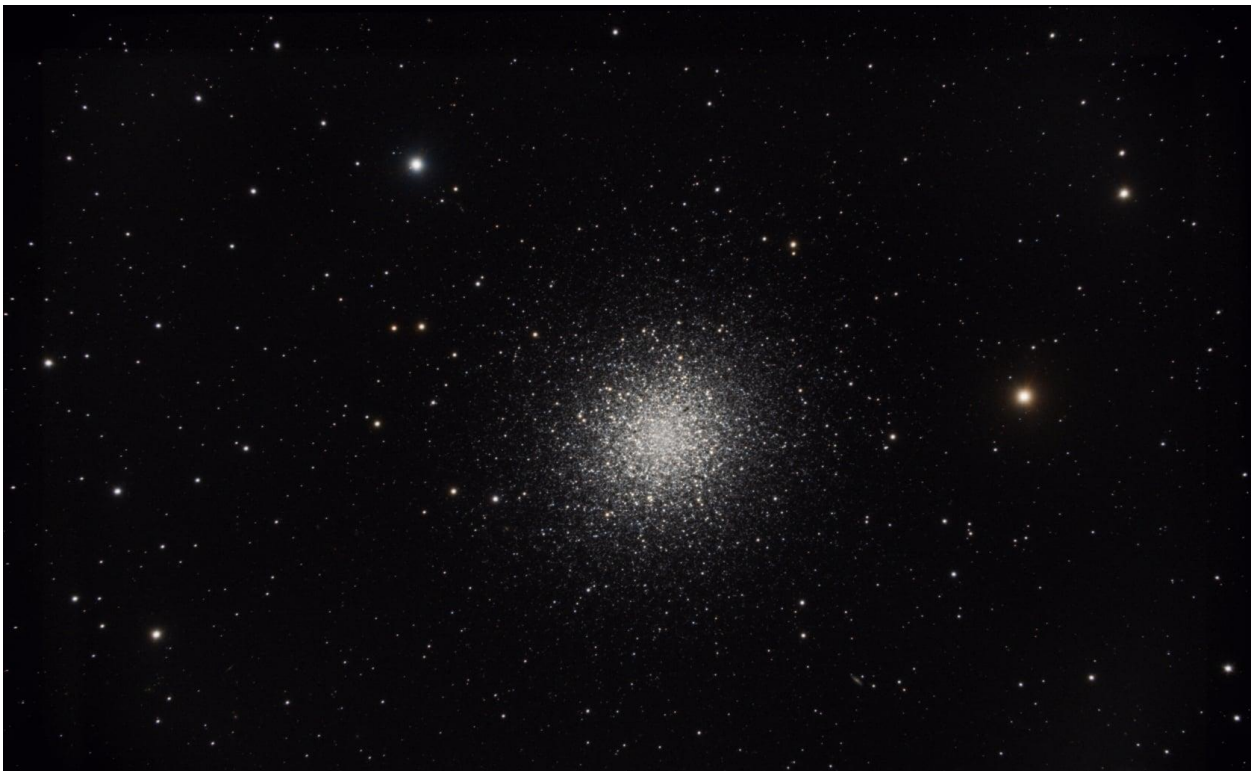
Richard Konrad - Here's my go on the Elephant Trunk Nebula. It was taken via iTelescope in New Mexico on a Takahashi Epsilon 250 reflector and SBIG ST-10XME (link not intended). The camera is older and non-blooming but turned out not too bad. I hope to get RGB stars on this soon.

Members Image Gallery [Cont.]

Kevin Galka - NGC 6888 - I tried imaging the crescent nebula the other night with a DSLR and l-enhance filter. While it didn't turn out too bad I thought I'd take a look to see how much time I actually have on this nebula over the past 12 months. This is a total of 5 hours and 20 minutes. Taken with various telescopes (Astrotech 6"RC, Astrotech 10"RCF & Celestron C6R), ASI533 camera and the l-enhance filter.

Sheila Wiwchar – Milky Way

Members Image Gallery [Cont.]

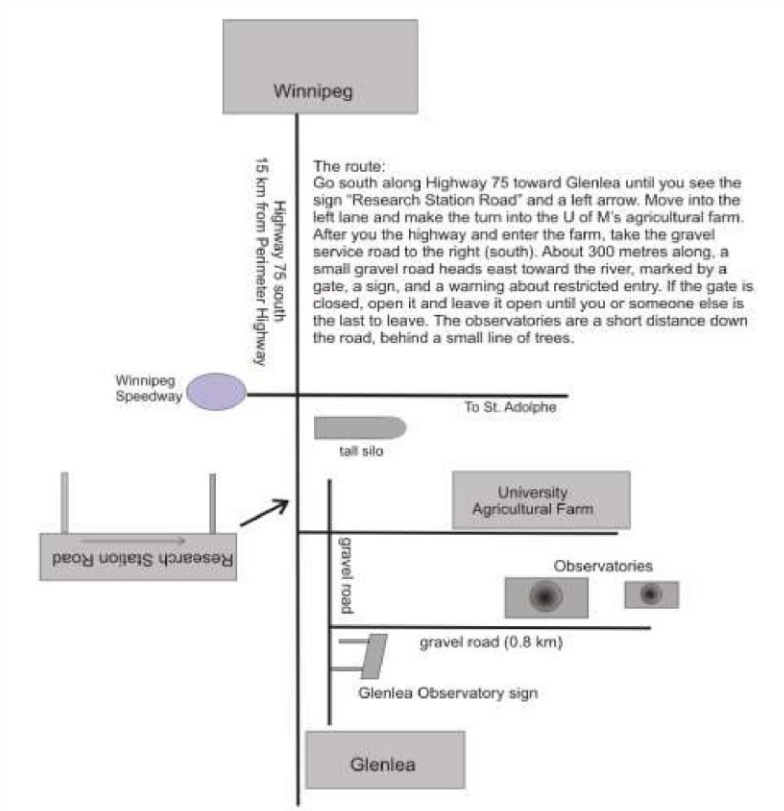


Ian Dixon - M13 - built to last. How nice would it be to have a 13 billion year warranty? Here is one of the nicest (in my opinion) globs in the our skies. I went out to the dark site at the farm, between the towns of St. Pierre and Aubigny, its around 60 km south of my home in the suburb, so the Bortle index is quite good. This image is my first of M13, and my first of any globular cluster. Visually, I have always found this to be a spectacular treat, a real favourite of mine too. I have about 2 hours integration into it, dodging the clouds on last Friday night. I began imaging at about midnight with some trouble shooting until 3:30 am. Lots of wildlife with Leopard frogs making huge noise in an adjacent pond, and a couple of coyotes on their nightly prowls with their shockingly close and eerie calls while on their hunting foray.

Lifted and quoted directly from Skysafari, "Unlike open clusters, such as the Pleiades, globular clusters are tightly bound together by gravity, and contain very old, mostly red stars. The age of M 13 has been revised to 12 billion years - nearly as old as the Milky Way galaxy itself."

Gord Tulloch - M82 – 25x60s ASI224MC - Despite my main camera (Canon 1100D) being down I've managed to give my new Optolong L-Pro light pollution filter a workout with my planetary camera, it's probably going to give my heavily light polluted back yard a new lease on life! It's rough trying to get good frames on the 2000mm focal length Celestron 8" SCT even with a F/6.3 focal reducer with such a tiny sensor

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. Currently closed due to Public Health restrictions.

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 July and August

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 Jul	**C/2020 T2 (Palomar)**	**11**	**54**	**C/2020 T2 (Palomar)**	**11**	**21**	**15P/Finlay**	**9**	**27**
	C/2017 K2 (PanSTARRS)	**12**	**86**	4P/Faye	11	1	8P/Tuttle	10	5
	C/2020 J1 (SONEAR)	**13**	**36**	**C/2017 K2 (PanSTARRS)**	**12**	**83**	**4P/Faye**	**11**	**44**
	246P/NEAT	**13**	**17**	C/2020 J1 (SONEAR)	13	9	**7P/Pons- Winnecke**	**11**	**19**
				246P/NEAT	**13**	**22**	**C/2019 L3 (ATLAS)**	**12**	**25**
				67P/Churyumov- Gerasimenko	**13**	**15**	**C/2017 K2 (PanSTARRS)**	**12**	**42**
							10P/Tempel 2	**13**	**31**
							246P/NEAT	13	14
							29P/Schwassmann- Wachmann 1	**13**	**34**
							67P/Churyumov- Gerasimenko	**13**	**54**
2021 Aug	**C/2020 T2 (Palomar)**	**11**	**33**	4P/Faye	10	8	**15P/Finlay**	**9**	**36**
	C/2017 K2 (PanSTARRS)	**12**	**85**	C/2019 L3 (ATLAS)	11	4	8P/Tuttle	9	2
	6P/d'Arrest	**12**	**49**	**C/2017 K2 (PanSTARRS)**	**12**	**47**	**4P/Faye**	**10**	**57**
	246P/NEAT	**13**	**17**	**67P/Churyumov- Gerasimenko**	**12**	**27**	**C/2019 L3 (ATLAS)**	**11**	**41**
				6P/d'Arrest	**12**	**15**	7P/Pons- Winnecke	11	8
				7P/Pons- Winnecke	12	3	C/2017 K2 (PanSTARRS)	12	9
				29P/Schwassmann- Wachmann 1	13	14	**67P/Churyumov- Gerasimenko**	**12**	**67**
				246P/NEAT	**13**	**20**	**29P/Schwassmann- Wachmann 1**	**13**	**61**
							10P/Tempel 2	**13**	**35**

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