Newsletter of the Royal Astronomical Society of Canada Winnipeg Centre July / August 2022

Winnicentrics

The Royal Astronomical Society of Canada - Winnipeg Centre

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.

As of our August 2022 meeting we will resume in-person meetings at St. John's college. We look forward to seeing you!

Upcoming Events

RASC Winnipeg Centre Monthly Meetings

July 8, 2022 (BBQ)
August 12, 2022

Members' Observing Nights

July 9, 2022
August 13, 2022

Oak Hammock Marsh Astronomy Night

Cancelled for telescopes

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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

Quick Notes

The Glenlea Observatory LX200 / Dome is CLOSED FOR REPAIRS AFTER FLOODING. Please contact **observatory@winnipeg.rasc.ca** for current info, assistance, or to request training on the telescope and dome. Glenlea Warm Room and Pad are OPEN but please observe any Public Health requirements in effect.

Members Observing Nights are held the Saturday night after the Monthly meeting (weather permitting) at the observatory.

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
Visit our Facebook group at:
www.facebook.com/groups/rascwinnipeg

President's Corner

By Dennis Lyons, RASC Winnipeg Centre President

Well, it looks like summer has sort of arrived and that means short nights and long days.

However, that also means the Annual RASC Winnipeg Bar B Q is just around the corner. The plan at this moment is to gather at Glenlea on July 9th if a few more details can be worked out. Watch the website for more updates.

Speaking of Glenlea it did receive some water this year and a big thanks to the members who have begun the process of cleanup and documenting the damage. Until the full extend of the damage is know we are asking that members not use the dome for now.

Great news, in August our next meeting will be in person at the University of Manitoba. Please note that there will be no treats at this time. We will also be discussing the Revised Bylaws at this meeting. The Council is investigating alternate locations to have our monthly meetings at.

We are also looking at how to provide an online experience for those members who prefer that method. At the last AGM of the Society it was announced that membership next year would be increasing by $15. If you have any questions please contact one of the Council members.

In our efforts to work more closely with like minded organizations, I am pleased to remind you that volunteering at the Manitoba Museum for First Fridays is a great way to show support. If you have any questions please let myself or Scott know. Well that's all for now.

Clear Skies,
Dennis Lyons

Editor's Message

By Gord Tulloch, RASC Winnipeg Centre

Once again, we enter that period where twilight meets dawn and deep-sky observing is hampered by bright skies, but we have some great planets in the morning sky to enjoy, plus the moon is always a great target to enjoy!

Last time I challenged the membership to contribute their stories to the newsletter to publish a feature called "My Astronomy Journey". Unfortunately, not a single response was received.

My last newsletter as Editor will be the November/December 2022 issue. If you think you might be interested in taking on the newsletter, please email president@winnipeg.rasc.ca.

I wish you clear skies and happy observing!

Upcoming Meetings

July 8 2022 Meeting

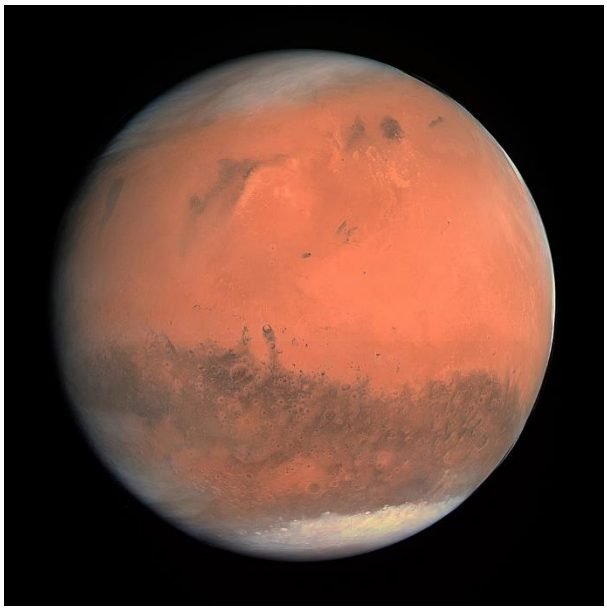
- Annual members BBQ at Glenlea

August 12, 2022 Meeting (Zoom)

- gAIL Wise, Beginner's Session
- Bryan Stach, RASC Winnipeg Centre "Whats Up?"
- Dr. Danielle Pahud, University of Manitoba "What's New?"
- Main Speaker: Jay Anderson, Eclipse Planning for 2023-2024

Dr. Tapping's Corner: Focusing on Mars

By Ken Tapping, NRC-CNRC



True color image of Mars taken by the OSIRIS instrument on the ESA *Rosetta* spacecraft during its February 2007 flyby of the planet. The image was generated using the OSIRIS orange (red), green, and blue filters. Alternative description: The first true-colour image generated using the OSIRIS orange (red), green and blue colour filters. The image was acquired on 24 February 2007 at 19:28 CET from a distance of about 240 000 km; image resolution is about 5 km/pixel. Courtesy of ESA & MPS for OSIRIS Team under Creative Commons

The latest flotilla of spacecraft to arrive at Mars must make that world the most-visited planet in the Solar System. There are two reasons for this "group visit". The missions were timed to be when Mars was particularly close to us. A shorter trip and an easier rendezvous means a given launcher can accommodate a bigger and more capable spacecraft. Since our current method for travelling between planets involves a big shove followed by "falling all the way there", the laws of orbital dynamics apply, which requires the launches to fall within a restricted window of time. It is like throwing a baseball into the air and then throwing another one so that it gently nudges it. We want to arrive at Mars with a low enough relative velocity to require just a small rocket shove to enter orbit or to dive into the atmosphere at the right angle.

The second reason is that Mars is currently a candidate for being the most fascinating object in the Solar System. Even today, as a cold desert world with a thin atmosphere, out of all the planets in the Solar System it is the one most like ours, and one we could live on for long periods, with a lot of technical help of course. Then there is the discovery that Mars was once a warmer, wetter world, with a thick atmosphere. There are dry watercourses, canyons, lakes and seas over most of the surface. The dry riverbeds are floored with water worn pebbles and little round pellets of salts precipitated as the water disappeared. Actually, today there is a lot of water on Mars, as layers of ice below the surface. On a really warm, summer day, close to the equator, temperatures may reach 20 C. This melts some of the underground ice, causing short-lived water flows down sandy slopes. Even on those summer days, the temperature dives to far below zero at night. This raises the next fascinating issue; billions of years ago, when Mars was warmer and wetter, was there life? We know that life appeared on our world very early, around 3.5 billion years ago, more or less as soon as our world had cooled enough for liquid water to accumulate on its surface. Why could it not have been the same for Mars too? We are looking hard for traces of that ancient life, or even better, some it its hard-bitten descendants eking out a tough

existence somewhere below soil level. Thanks to our robot explorers, we are learning about Martian geology and weather, and are piecing together what happened to Mars, and just as important, why it didn't happen here.

In addition to our scientific curiosity, we have a special cultural attachment to the Red Planet. Ever since Percival Lowell mapped the canals, which were actually a combination of wishful thinking and poor observing conditions, and launched the idea of the Martians working hard to sustain life on a dying planet, we got the idea that the Martians might just want to come here. This launched a stream of novels, movies and radio plays. We were usually saved by sheer luck. In "War of the Worlds", it was our bacteria, to which the Martians were not immune. In "Mars Attacks", it was the lucky discovery that Martians could not tolerate yodelling country music. Actually, it is unlikely that Martian life had a chance to evolve to the point of achieving interplanetary travel. Until around 500 million years ago, life here was single-celled bacteria and algae. Then things started to happen, with complex life forms appearing. It looks as though Mars became the hostile place it is today, more than a billion years ago. Since Earth and Mars formed at the same time, it is reasonable that if life appeared on Mars, it happened at the same time as it did here, but never had time to get past the bacterial and algal stage. We could be wrong! These videos of Mars are well worth watching:

https://www.youtube.com/watch?v=7zpojhD4hpI

https://www.youtube.com/watch?v=0NRFk_jNhek

RASC Winnipeg Centre Certificate Recipients

New recipients in **bold**.

Explore the Universe

Gail Wise, Mike Stephens, Janet Pollock, Janice Low, F. Lindsay Price, Ralph Croning, Terra Jentsch, Corey LeBerge, Corrine Robinson, Kevin Dromereski, Robin Clarke

Explore the Moon - Telescopic

Corrine Robinson, Kevin Dromereski, Margaret Childs

Messier Catalogue

Grant Gussie, Kevin Black, Richard Turenne, John Smith, Alan Sherlock, Timothy Zacharias, Gail Wise, Raymond Andrejowich, Stan Runge, Bernie Plett, Michael Karakas, Sean Ceaser, Gilbert Raineault

Finest NGC

Kevin Black, Gail Wise, Stan Runge, Mike Stephens, Gilbert Raineault, Sean Ceaser

Isabel Williamson Lunar

Mike Stephens

Herschel 400

Gilbert Raineault, Mike Stephens

Astroimaging - Deep Sky

Sheila Wiwchar

Astroimaging - Wide Field

Sheila Wiwchar

DIY Spectroheliograph Now Available

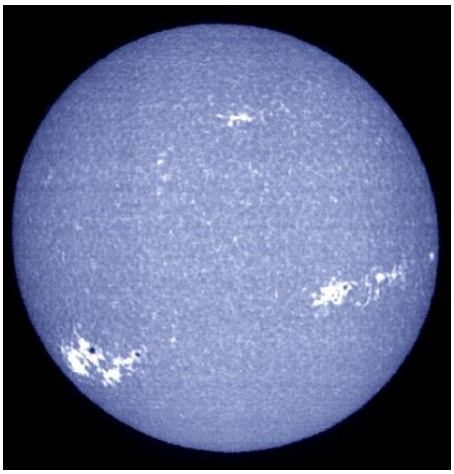
By Gord Tulloch, RASC Winnipeg Centre

Christian Buil is a wonder. This diminutive Frenchman has been a driving force behind several excellent amateur spectroscopy projects and products such as the instruments sold by Shelyak Instruments in France as well as new 3D printed projects like UVEX and software for spectroscopy like IRIS (image processing) and ISIS (spectral analysis). His web site at http://www.astrosurf.com/buil is a mecca for amateur astronomers interested in spectroscopy, the science of analysing the light of stars (including the Sun of course) through dispersing the light through a prism or grating to split it into its component colors.

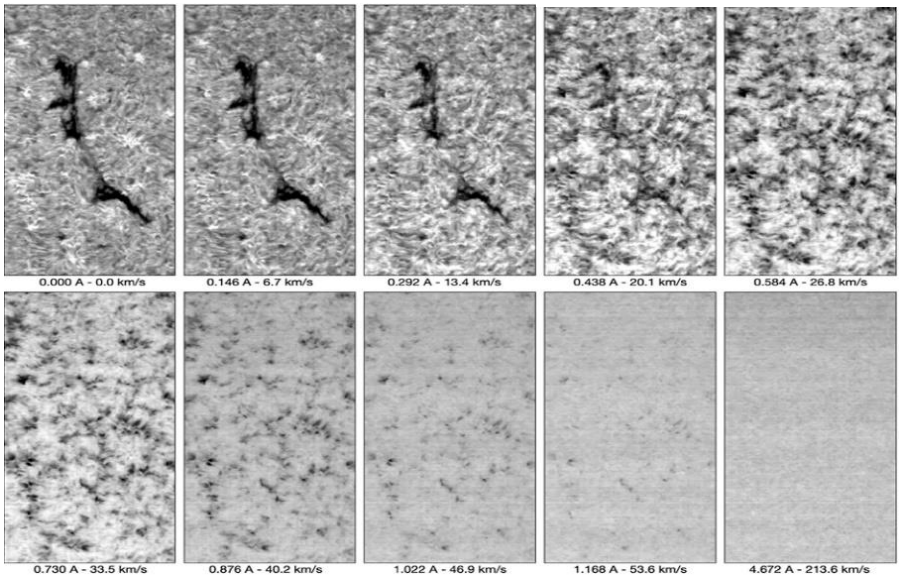
Now Mr. Buil has released plans for a new spectroheliograph that also (with some minor component additions for guiding) doubles as a spectrograph for nigh time use. The results have been amazing! All images in this article courtesy of Mr. Buil's website at http://www.astrosurf.com/solex.

Most of our members are familiar with viewing the Sun through a Hydrogen Alpha (Hα) filtered telescope to not only see sunspots like a white light filter but also to see surface features and prominences at the edge of the solar disk. A spectroheliograph is an instrument that allows you "tune" to a specific wavelength, say Hα, but also in Hβ, Ca-IIK, Mg-I, He-I, and pretty much any wavelength within the bounds of the instrument.

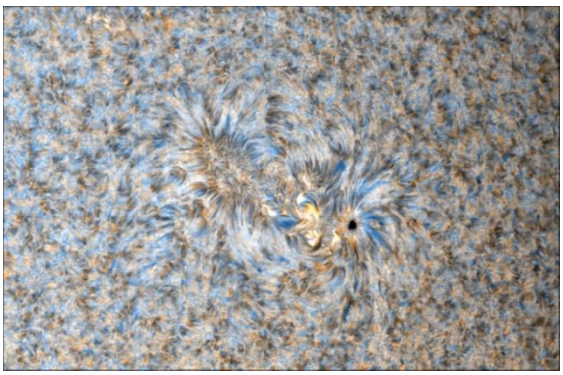
By "tuning" the spectroheliograph to varying wavelengths it's possible to traverse the solar layers to get a 3D appreciation of features on the solar disk and how they interact (see below).



Solar disk in Calcium wavelength



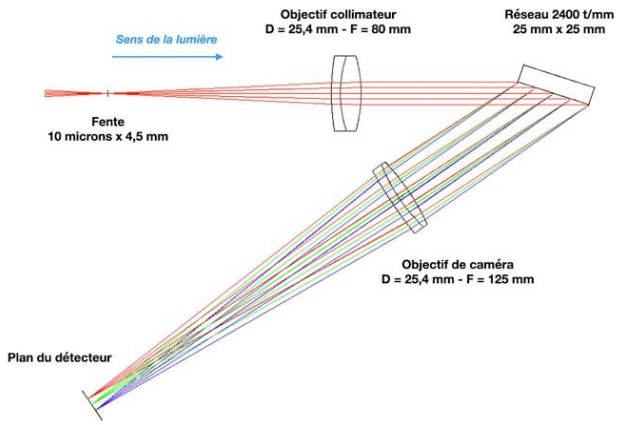
DIY Spectroheliograph Now Available (cont.)



As well by taking images with specific wavelengths such as Hα, we can observe the actual motion of the features on the solar disk. For example, if a feature is moving away from us, it's light will be slightly shifted towards the red end of the spectrum. If the feature is moving towards us the Hα line will be slightly blue shifted. By tuning the instrument slightly to the red, taking an image, shifting slightly blue and taking an image, we can construct a false color image like the one at left which show the motion of the gas on the Sun.

The Sol'Ex is a fairly simple device with a number of 3D printed parts pairs with commercial camera to provide the images and specialized software to combine the images produced by the camera into a final solar image.

Spectroheliographs work by imaging the Sun through a slit, which means to take an image of the entire solar disk, it needs to be "scanned" in small slices, and the slices then need to be combined through software to produce a final image. Conveniently if the user aligns the slit to be perpendicular to the motion of the Sun in Right Ascension, by turning tracking off the Sun will pass across the slit of the spectroheliograph and product images.

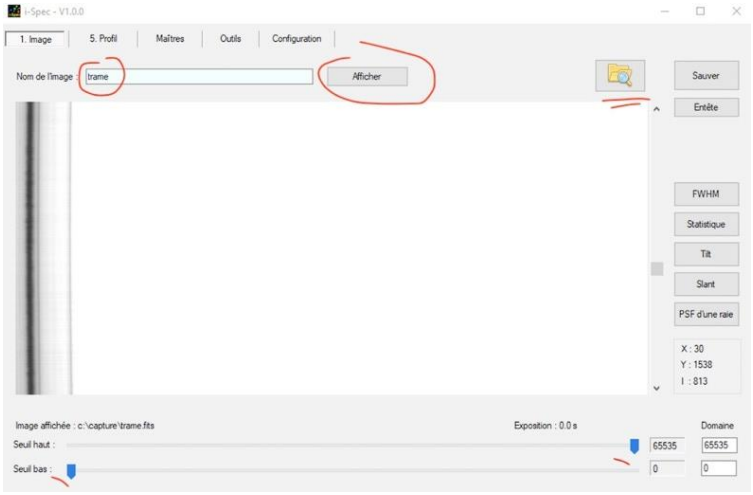


Optically spectroheliographs are relatively simple – light is collected through a telescope or lens and is then collimated (aligned) by a pair of simple lenses, bounced off of a grating that causes the light to be diffracted and "smeared out" into a spectrum, then is focused by another set of lenses onto a sensor. The tilt needed to reflect off the grating gives the devices a characteristic folded shape. The optical components of the Sol'Ex are widely available off the shelf or are available as a kit from Shelyak Instruments (https://www.shelyak.com/) as a kit

DIY Spectroheliograph Now Available (cont.)

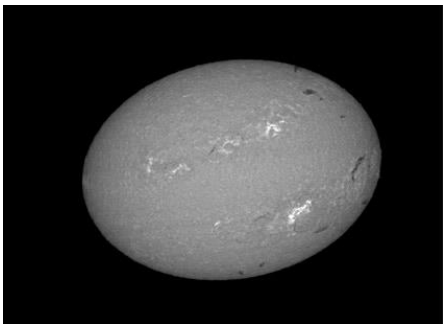
for about €400 or about $550CDN. The kit includes a reflecting slit, 2400 gr/mm diffraction grating, and two doublet lenses. As well two lenses are available to expand the Sol'Ex into Star'Ex, which adds the ability to add a guide camera to the Sol'Ex for nighttime use as a spectrograph. Guiding for a slit spectrograph is critical to keep the star centered in the very narrow slit.

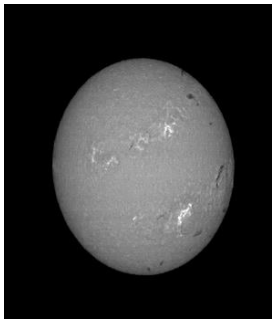
When observing the Sun through the Sol'Ex the result is a SER format file that contains a series of "slices" of the solar disk in the wavelength selected on the Sol'Ex. The software used to combine the slices was developed in Python by Valérie Desnoux (another luminary in the French spectroscopy world, author of the VSPEC spectral analysis software) which is free and easy to install and operate. Below is an image of the software displaying a single "slice" of the solar disk (the curve of the line is an artifact of the optics and is also corrected by the software). The software can be switched to English if your French is rusty!

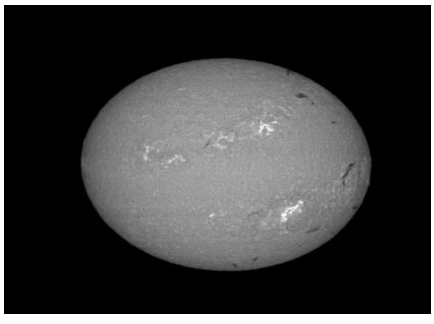


Valérie Desnoux's INTI software

Another function of the INTI software is to remove distortions introduced by the Sun's image being scanned at too high or low a frequency (producing a rugby ball shaped image) or the slit not being aligned with the RA axis. These distortions (prior to correction) can be seen below.







DIY Spectroheliograph Now Available (cont.)

A variety of cameras and imaging software can be used with the Sol'Ex and INTI provided they can produce the required SER image. A Sony IMX178 based camera such as the ZWO ASI178MM or QHY-5III-178 is optimal (the latter particularly due to its small size) as they offer the optimal sensor and small pixel size. However, most cameras such as my own ASI183MM Pro will work fine but will have black edges where the image of the slit has not covered the entire sensor, but these are ignored by the software. The Pelletier cooling offered by the ASI183MM Pro is particularly useful when using the Star'Ex configuration. Obviously as the observations are in a single wavelength (color) a color camera is not useful with Sol'Ex.

The telescope used should be between 200 and 1200mm focal length to get a reasonable disk size (under 200mm the solar disk would be too small to see much detail) where over 1200mm the image size would be very detailed but the exposure time would need to be reduced introducing noise into the images. An instrument of about 420-450mm is needed to capture the entire solar disk in a single "scan". You can of course arrange multiple scans into a single image.

Mirror based telescopes are not recommended as their aperture is too large to attenuate the Sun's light sufficiently, causing overheating that can destroy the device so optimally a small refractor is needed. Obviously aperture directly increases resolution as it increases so the largest aperture possible is still desirable. However with larger apertures such as 100mm+ a neutral density filter is required. For example a filter for a camera lens can be used with some widely available 3D printed adapters.

A discussion group focusing on the Sol'Ex is available on Groups.Io at:

https://groups.io/g/Solex-project

Is Starship A Carbon Disaster?

By Gord Tulloch, RASC Winnipeg Centre

During a presentation I recently made to RASC Winnipeg Centre an interesting question was asked: how much greenhouse gas emissions comes from a launch of Starship including the Super Heavy booster?

After some research the answer is: LOTS. The Raptor engines powering Starship use liquid methane (CH4) and liquid oxygen (O2). Methane is the main component of what is known as natural gas. A single launch to orbit of a Starship with 100 tonnes of cargo and passengers will consume about 1000 tonnes of methane in the form of LNG (liquified natural gas). As the methane is burned with oxygen it will produce a staggering 2,683 tons of C02 per launch. When adjusted for payload, it produces about the same as the current Falcon 9 rocket used by SpaceX: 27 tons of carbon dioxide per ton to low-Earth orbit.

SpaceX eventually plans to fly an average of three flights per day, totalling over 1000 flights per year. This works out to about 150 billion cu ft (or 150 BCFD) of methane per year for a projected fleet of 1000 rockets. Current US consumption of LNG is 82 BCFD with worldwide consumption at 380 BCFD. So SpaceX would considerably increase the consumption of LNG overall if it were to use current sources.

Most methane (otherwise known as natural gas) is produced as a fossil fuel. It is a growing factor in climate change as it is a potent greenhouse gas when released into the atmosphere, and when burned creates carbon dioxide, another greenhouse gas. Worse, releasing natural gas from the porous rock that

it is contained in is increasingly accomplished by hydraulic fracturing or “fracking”, acknowledged to be an environmentally negative practice.

So, is this a total environmental disaster? It would seem so, except for the following:

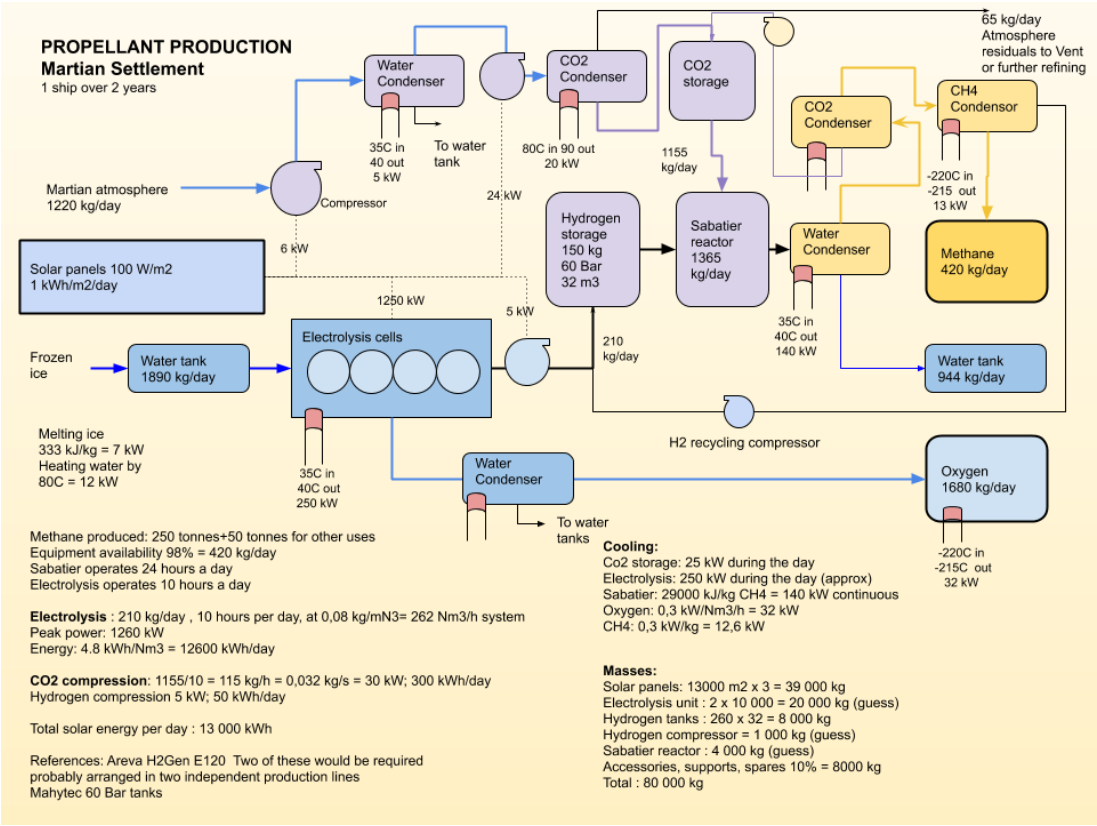
- Many of those 1000 flights are intended to displace existing airplane flights. A Starship that makes a run between New York and Shanghai in 40 minutes will displace many jets that normally ply those routes in 20+ hours which produce 4 tons of CO_2 per round trip flight.
- Methane production can be produced in a renewable way. There is an emerging Renewable Natural Gas (RNG) industry that converts bio-waste (landfill, sewage, animal manure, agricultural by-products, food waste) into biogas that can be refined into methane.
- Methane can also be produced on Earth the same way it is to be produced on Mars, via the Sabatier process, using atmospheric CO_2 and water. This offers the possibility of producing methane from the atmosphere by removing CO2 which would then simply be replaced by burning the methane, to be recycled into more rocket fuel ad infinitum.

The Sabatier process is a method to convert Carbon Dioxide ($C0_2$) to Methane (CH_4) using Hydrogen (H_2) as a catalyst. The chemical reaction looks like the following:

$$2H_2O + \text{electricity} \rightarrow 2H_2 + O2$$

$$CO_2 + 4H_2 + \text{ruthenium catalyst} \rightarrow CH_4 + 2H_2O$$

So the entire process would look like this:



Sebatier Process. Source: https://marspedia.org/User:Michel_Lamontagne

Clearly, this is a superior renewable way to produce methane and in fact, is one way SpaceX intends on producing methane for Starship launches. Solar power would be used to power the electrolysis of water into hydrogen and oxygen, which would feed a Sabatier plant to produce methane.

The net result would be the removal of CO2 from the atmosphere at the same rate it would be produced, rendering the whole process largely carbon neutral. There are companies such as Prometheus Fuels (https://www.prometheusfuels.com/) working on large-scale Sabatier process products – it might be quickest for Musk to acquire one of these companies. Alternative Elon Musk recently posted on Twitter:

Through displacement of carbon-producing transportation modalities such as air travel, which is a significant producer of carbon, any small releases of methane during fueling etc. would be offset.

In January 2022, Musk announced a $100 million prize for carbon removal. The four-year XPrize competition, which will conclude by Earth Day 2025, invites teams to demonstrate a cost-effective solution for removing gigatons of carbon per year. UPDATE April 22, 2022: XPrize and Musk Foundation recently awarded $15M in preliminary milestone prizes to 15 teams working on carbon removal solutions, including $1M to a Nova Scotia company experimenting with using cleaned mine tailings to reduce ocean acidity so it accelerates the process of sequestering carbon from the atmosphere.

Obviously, the idea that Starship will be carbon neutral depends on whether SpaceX follows through with the idea that they can produce methane through sequestering carbon rather than simply making the problem worse (much worse!) but amping up the fossil fuel industry to unprecedented levels.

However, given that Musk already has a few of the pieces in place (Musk's Tesla is a leader in large scale solar energy production for example) and Sabatier reactors are critical to the Mars effort, SpaceX is probably in the best possible position to ramp up the extreme amount of methane production needed to power Starships to Mars in the next decade.

References:

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GLP-TRAINED USERS AND SPOTTERS

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

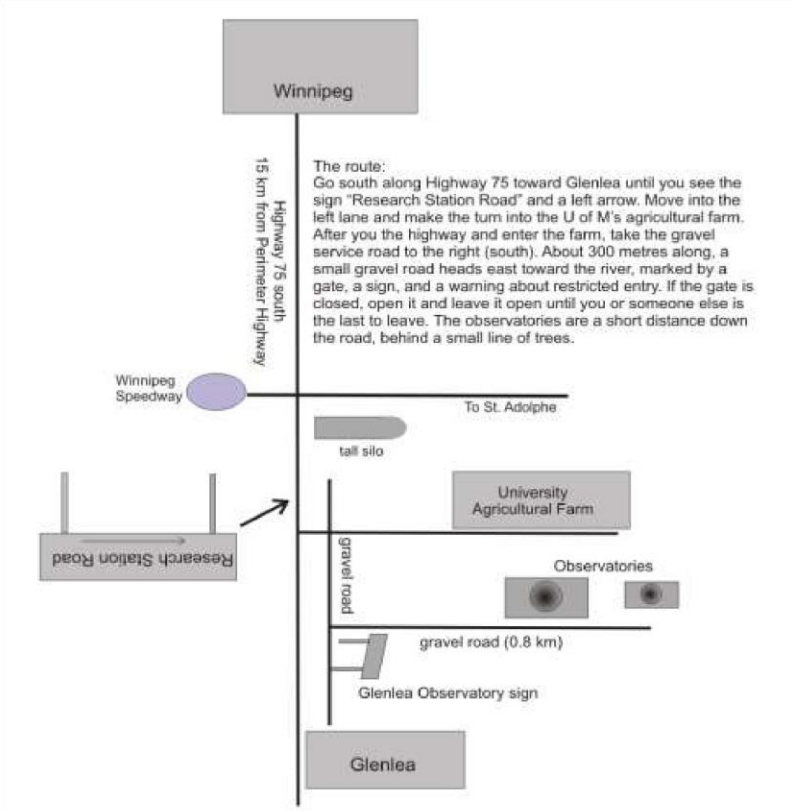
11 August 2019 (Expires 10 August 2022)

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		

Glenlea Observatory Information



The Winnipeg Centre maintains a working observatory, pad, and warm room at the University of Manitoba's Research Farm. The observatory contains a 30 cm Meade LX200 telescope on a fork mounting. Members of the Centre may sign up to use this telescope by emailing: observatory@winnipeg.rasc.ca

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 also 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. A computer is available as well.

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 turn off all lights, make sure doors are locked, and close the gate if you are the last one to leave!