Skyward

March - April 2025 Edition

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In this Issue

Visit our website at http://www.rascmontreal.org/

Visit our YouTube channel RASC Montreal

Visit our Facebook page RASC Montreal Centre

Visit our Facebook discussion group RASC Montreal Centre Group

Check out our X feed RASC Montreal Centre

Cover Image: Luca D'Aliesio, *one of our youngest RASCals, was recently awarded the RASC Explore the Universe Certificate. Photo by .Luigi D'Aliesio, Luca's Father. See a photo of the certificate and the presentation later in this issue.*

Skyward

Newsletter of the
Royal Astronomical Society of Canada
Montreal Centre

SKYWARD is published by *Publications Skyward Enr.* for the Royal Astronomical Society of Canada, Montreal Centre. The Montreal Centre was founded in 1918 and is one of 29 centres across Canada dedicated to the advancement of astronomy. Anyone can become a member by applying on our website at https://rascmontreal.org/join-us/.

Note from the Editor

Hi fellow RASCals.

Spring is sprung and things astronomical are really heating up! Activities galore, including a lunar eclipse, almost a solar eclipse and maybe a meteor shower. Our astrophotographers have been busy. If you don't see enough images here, zip over to our Facebook group RASC Montreal Centre Group where you can give a "like" or even leave a comment to our hard working imagers.

This issue we bring you some images of the Blood Moon Eclipse. This event lasted most of the night, so kudos to our observers and public guests. Again on the Moon, Nicole discusses observing Hercules and Atlas, the craters, not the Gods. And even more on the Moon, David Levi waxes poetic about another eclipse observed. And even again about the Moon, Véronique Djomou explains the physics of eclipses.

Well there's more than the Moon... Nader Daou explains that Saturn's rings are disappearing. But don't worry too much. Marc Ricard shows us where to find Ursa Major's Messier galaxies. Russell Fralich talks about his aurora excursion to Churchill Manitoba. But closer to home, our aurora hunter Alexei Weins captured the aurora from Mont Mégantic And if all this hasn't convinced you that the cosmos is in motion, Gilbert St-Onge shows us proof that a star is moving in the Crab Nebula.

I also have to mention that at a recent Library Night Nicole Laporte awarded the RASC *Observe the Universe Certificate* to Luca D'Aliesio. See the photos on the cover and later. Luca is one of our youngest members. By completing 20 observing programs before December 1st, you too could earn this certificate. Challenge, anyone!

Did you enjoy this issue? Our contributors appreciate feedback at editor@rascmontreal.org.

Ed.

Word from the President

By Morrie Portnoff

Greetings fellow RASCals,

How time flies by… it is “technically” spring which means the observing season is here or at least around the corner. We had a wonderful turn out for the lunar eclipse. Many brave souls spent the better part of the evening into the early morning hours at the Arboretum. Unfortunately, the next major observing event, the partial solar eclipse was a no-go due to the infamous Montreal Nebula, aka clouds. However, that did not stop many hardy RASC members from venturing out on their own and sharing some amazing astrophotos over many evenings under the stars. Some of us live vicariously through your dedication and we thank you.

This past Saturday, March 29th, David and Paul organized another fun movie night. They outdid themselves with the “movie snacks”. The feature film of the evening (can we still say film in the digital age?) was Mel Brook’s classic, 1987 classic *Space Balls*. If you have not attended one of these movie nights you are missing a great time. These movies are pure fun… no serious astronomy documentaries. Although, as we say, “some of the movies are so bad that they are great”.

Over the many decades (over 100 years) that the Montreal Centre has been around, our former members are still with us in spirit. Every so often we get an email with an update of their activities and a wish to make a donation to the Centre. Sometimes the best donation is not monetary but an object that had brought them fond memories of their time as a member and to which they wish to give a good home. In the past we had Victor Bush’s telescopes that were donated to the JAC Space Club. More recently Ariele Wagner donated an autographed postcard entitled “Terraforming Mars” that he had won. The postcard will be on display in our library where it can be shared by all. The postcard, front and back can be seen at the end of this article with more information.

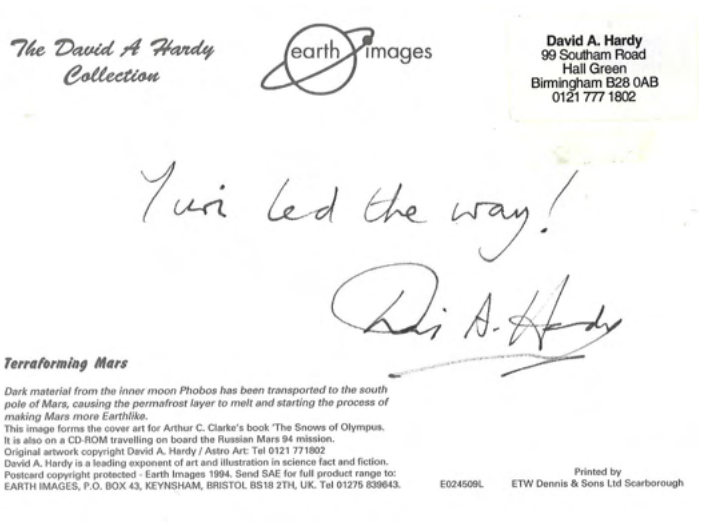
Keep an eye out for more announcements of upcoming events over the next weeks and months. I hope to see you at these events. Feel free to introduce yourself if you are new to the Centre. Don’t be shy and you will quickly find out that we are a very welcoming group of friends.

For any member that wishes to help the Board or Executive without the “commitment” you can choose a specific project or event and simply help with one. We always need volunteers for events and special projects. **WARNING:** Volunteering and helping can become habit forming that brings you new friendships and skills. There is no known cure for this ailment.

If anyone has ideas or comments, I am always available. Just send me an email at president@rascmontreal.org or approach me at an event.

As always, I look forward to seeing you at our upcoming events.

Clear Skies as always,



M81 by Karl Petruch. *Discovered by the German astronomer Johann Elert Bode in 1774, M81 is one of the brightest galaxies in the night sky. It is located 11.6 million light-years from Earth in the constellation Ursa Major and has an apparent magnitude of 6.9. Through a pair of binoculars, the galaxy appears as a faint patch of light in the same field of view as M82. A small telescope will resolve M81's core. The galaxy is best observed during April.*

Vice-President's Corner

An update on projects and events

By David Shuman, Vice-President

We continued with the Astrophotography Processing series this winter featuring two talks that I presented with Paul Simard. We looked at the processing workflow using only free-ware programs that are easily available, to process planetary and lunar photos. This is the famous "lucky imaging" process. Thanks also to Karim Jaffer and John Abbott College (JAC) for providing files and established workflows, and working files and Detlev Schmallhaus for help with technical instructions and suggestions. We detailed the use of PIPP, Registax5, Autostakkert!3 and a brief intro to WinJupos in a co-modal (on Zoom) format. Files were given ahead of time so that members could follow along, or experiment afterwards at their own pace.

Many thanks go out to all of the volunteers to make these events a wonderful experience for all. By using JAC's "OWL" webcam device, we can have these events shared simultaneously with many of our members who simply can't make it to the library in person. Many thanks to Karim for arranging these setups and to Morrie Portnoff, Nicole Laporte, Russell Fralich and Earl Wyllie for helping with the snacks!

Our Movie Nights continued this March, despite a postponement due to a snowstorm on March 1st. We had a highly successful and fun March 29th Movie Night. More fun Movie Nights to come in the fall, including that long-promised 3D Movie and retro shorts on 16mm film!

I wanted to thank everyone involved in set ups, helping make Movie Night easier.

Karl Petruch is successfully continuing to work on connecting his ZWO cameras to our new mini-pc for live views through our scopes for this summer. An excellent tool both for the public and member observing activities. Many thanks Karl!

For this spring, our annual Swap-Table and Pot-Luck dinner is back! Saturday May 10th 18:30, Arbo Clubhouse.

Congratulations to Luca D'Aliesio, one of our youngest members for achieving the Explore the Universe Certificate presented by Nicole Laporte. You only need to do 20 observations before December 1st to qualify. Challenge anyone? Photos by Morrie Portnoff and Luigi D'Aliesio.

Public Events, Outreach, Inreach

***Karim Jaffer**, Coordinator - Public Events*
***Nader Daou**, Director of Outreach*

Recent Events

February 5th

RASC Montreal Outreach Coordinator Nader Daou co-hosted this year's annual event with the Great Orbax from Guelph Physics, welcoming Bryan Delodder from TenTelescopes.com who created a set of 3D telescope designs to make observing more accessible and has setup a loaning library of equipment in the Guelph region. After the talk Bryan joined many of our Centre executive and attendees in the RASC Montreal Zoom Clubhouse to talk more about his work. The LiveStream has generated over 550 views combined between the two host YouTube channels.

https://www.youtube.com/watch?v=d9y0_VAnu_w

February 21st

On **Fri, Feb 21st** Trevor Kjorlien from Plateau Astro brought his mobile planetarium to the West Island to give our audience of over 60 people a peek into the distant future of our night sky. At the same time our RASC Montreal Citizen Science team hosted an activity to determine the distance to a bright star based on apparent size measurements of bright planets. We also had fortunate skies in the early part of the night, allowing for telescope viewing outside.

March 13th

Weeknight events can be tough but with a Total Lunar Eclipse opportunity your RASC Montreal Public Events and Outreach teams jumped into action with an all-night observing event at the Morgan Arboretum. With attendees coming and going through the night we had over 70 at the maximum eclipse phase: a Blood Red Moon that lasted for just over 1 hour! Huge thanks to all our volunteers for sharing their passion and love of astronomy with a grateful public and student audience.

March 29th

At sunrise on Sat, March 29th a partial solar eclipse was seen from all of Eastern Canada where the clouds parted for view – which wasn't the case for Montreal. That said, the up-shot is after several months of discussions we now have a potential observing location with a reasonable eastern horizon and our Public Events and Outreach team will work to cultivate this new relationship with Vaudreuil-Dorion.

If you want to see the sunrise partial solar eclipse (which was one "year" after our 2024 Total Solar Eclipse), our friends at the *Sunday Night Astronomy Show* and *Astronomy By the Bay* partnered with timeanddate.com to provide a live view of the event from New Brunswick.

https://www.timeanddate.com/live/eclipse-solar-2025-march-29

Current Events

Saturday March 29th

Dawson College

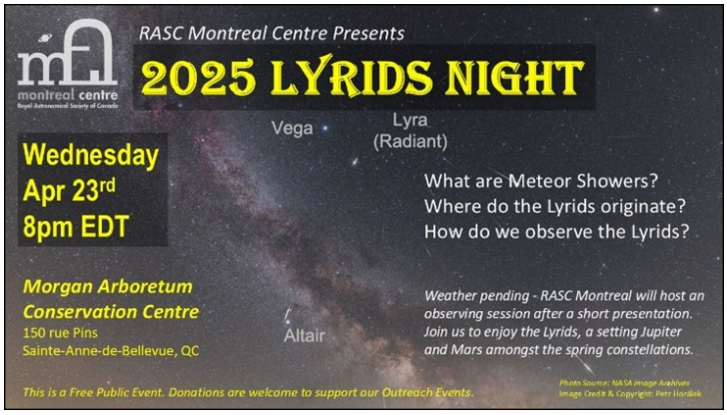
Brown Dwarfs - The Missing Link of Astronomy with Dre. Clémence Fontanive

We have at least one Public Event happening before this Skyward is published, held in a new venue for us: Dawson College. Join us to support a new student space club in Montreal as RASC Montreal and the Dawson Astronomical Society host a talk on **Brown Dwarfs** by Dr. Clémence Fontanive (Trottier Institute for Research on Exoplanets) on Friday, April 11 at 7pm EDT.

Join us at Dawson College, Room 5B.16 – the venue is accessible from Atwater Metro. If weather permits, we will enjoy a short observing session after the talk.

Wednesday April 23rd

Morgan Arboretum
2025 Lyrids Night



We're going to try another weeknight event as RASC Montreal hosts a night for the Lyrids Meteor Shower on Wed, April 23rd starting at 8pm at the Morgan Arboretum.

Enjoy a short presentation in the clubhouse about the Lyrids Meteor Shower and if weather permits we will enjoy nature's fireworks on the field that evening.

Let's enjoy the spring season with some meteor observing with your fellow RASCals and other astronomy enthusiasts.

Saturday May 3rd

Morgan Arboretum
International Astronomy Day and Star Party
Montreal Centre, Canada and beyond!

RASC Montreal celebrates International Astronomy Day with a talk by our Centre member Dr. Russell Fralich, who will share his travel to Churchill Manitoba to enjoy the Northern Lights.

If weather permits we will have a star party after the talk with views from the Bellevue Observatory and telescopes on the field beside it.

Our event will also be part of a National LiveStream by the RASC EPO Committee and our friends at Explore Scientific - an **International Astronomy Day Global Star Party**. If you can't join us in-person, watch online from 7pm-11pm EDT that day: at:

https://www.explorescientific.com/RASCAstronomyDay

RASC Montreal is looking for Public Events volunteers to help coordinate events and identify future speakers and topics.

If you're interested, please email:
***publicevents@rascmontreal.org* or**
***outreach@rascmontreal.org*.**

Upcoming Events

June 7-8
Rio Tinto Planetarium
RASC at AstroFest

Save the date!

Join the Royal Astronomical Society of Canada Montreal Centre for two days of celestial exploration at AstroFest 2025, taking place June 7–8! As proud partners of this annual celebration of astronomy, RASC members will be on-site offering guided safe solar observation, telescope viewings, and hands-on demonstrations for all ages. Learn about the night sky, current astronomical events, and how to get involved in amateur and professional observing. Whether you're a seasoned observer or just beginning your journey through the stars, RASC is here to inspire and inform.

Consult the website at https://rascmontreal.org/our-calendar/ and watch your email for the following events. Some may be weather dependant.

- Saturday ***April 26th***,19:30, Members Observing at Wooly Woods,
- Wednesday ***May 7th***, 20:00, Morgan Arboretum, Moongazing with Nicole Laporte,
- Saturday ***May 10th***, 18:30, Morgan Arboretum, SWAP sale & Pot Luck Supper,
- Wednesday ***May 14th***, 20:00, John Abbott College - H-355, May Library Night,
- Saturday ***May 24th***, 19:30, Members Observing at Wooly Woods,
- Saturday ***May 31st***, 20:00, Members Observing at Thompson Park,
- Wednesday ***June 4th***, 20:00, Morgan Arboretum, Moongazing with Nicole Laporte,
- Wednesday ***June 11th***, 20:00, John Abbott College - H-355, June Library Night,
- Saturday ***June 14th***, 19:00, Morgan Arboretum, Members' Clubhouse,
- Saturday ***June 21st***, 19:30, Members Observing at Wooly Woods,
- Saturday ***June 28th***, 19:30, Members Observing at Wooly Woods,
- Wednesday ***July 2nd***, 20:00, Morgan Arboretum, Moongazing with Nicole Laporte,

David Shuman giving an Astrophotography session at the Library. Photo by Daniel Biron.

Russell Fralich explaining his astrophotography processing workflow. Photo by Daniel Biron.

Event Photos

Ever popular Astrophotography Session.Photo by Frank Tomaras.

Citizen Science. Russell Fralich explains how we can estimate the distance to Sirius. Photo by Daniel Biron.

Group waiting to enter Trevor Kjorlien's (aka Plateau Astro) portable planetarium set up in the Agora at John Abbott College. Photo by Daniel Biron.

New Members

Please join us in welcoming these new members:

Richelle Nancy Smith

Alden Robert Shaw

Arthur Kilma

Lina Wangue

Eamonn Lye

Carpooling, Anyone?

By Nader Daou, VP Outreach

Did you know that RASC Montreal members have access to a “Members Only” section on the website? Did you know that this section, among many other valuable tools and Skywards archives dating back to the early years of the Centre, also houses the Members Forums?

https://rascmontreal.org/members-area-forum/

An important forum I want to highlight today is the Carpooling Requests & Offers. This forum is pinned just under the Forum Rules and allows members to seek or offer a lift to and from a Centre event.

To request a ride, you are required to include a few key details:

1. Name and date of the event (you can check the centre's calendar or keep track of the emails we send regularly to announce the events)
2. Your location/address/public place where you can be picked up
3. Your preferred means of communication

Also please note that RASC Montreal Centre does not organize or oversee individual ride shares. Each member is responsible for their own personal safety when arranging or accepting rides through this forum.

Next Issue

Got something to publish in the next issue of Skyward? We welcome contributions from Montreal Centre members. Send them to editor@rascmontreal.org before June 1st. A reminder will be mailed May 20th. Publication will be in the last week of June.

We are always looking for:

- **Articles**
- **Pictures of recent events**
- **Reviews of Books, equipment, videos, etc.**
- **Astro-images or drawings**
- **Observation logs**
- **Items for sale/wanted**

Guidelines:

- **Text should preferably be in Word with images shown where they go. However, send separate copies of images since Word tends to reduce resolution.**
- **Aim for image resolution of at least 300dpi at the size the image will be used on the letter sized page.**
- **Send a head shot to include with your article.**
- **Original work only. Do not infringe copyrights.**
- **If you include images that are freely usable, such as SkySafari or NASA, cite the references.**
- **Unless you instruct me otherwise, I will use images posted on our Facebook Group.**

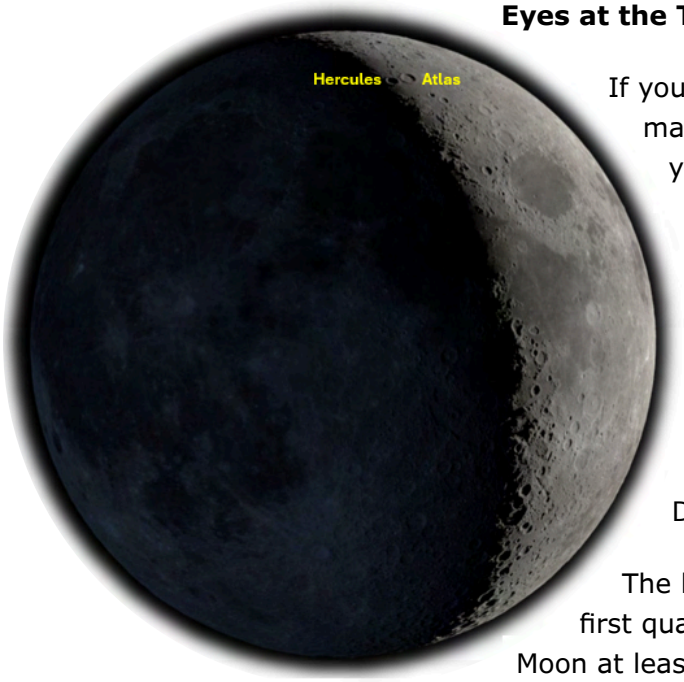
IC405 By Khoa Tran. With the RASC Calendar submission deadline fast approaching, this gave me the push to reprocess this image from last year.
Reprocessed: IC405, the Flaming Star Nebula, in Auriga
Total Integration time: 390 x 180s @ISO400 (Baader UHC-L) and 116 x 30s @ISO400
Imaged over nine separate nights from December 2023 to March 2024 from my very, very Bortle 9 balcony in The Plateau.
Camera: Olympus Pen-F Digital
Telescope: Takahashi FS60CB with 1.04x Multi-Flattener
Filter: Baader UHC-L, Baader Neodymium Moon and Skyglow
Mount: Vixen Advanced Polaris
Guiding: Sky-Watcher SynGuider II with Askar FMA180
Stacked and processed in Siril. Additional processing with GraXpert denoise, StarNet V2, and GIMP.

Moongazing with Binoculars - Hercules and Atlas

***By Nicole Laporte**, Director membership liaison*

As the warmth of spring arrives, the night sky invites us to step outside and look up. One of the many ways to enjoy the night sky is moongazing with binoculars and observing the interesting features along the terminator (separation between light and dark portions of the moon).

Eyes at the Terminator



Three days before the first quarter Moon
Image source: Daily Moon Guide - NASA
https://www.nasa.gov/stem-content/daily-moon-guide/

If you observe three days before the first quarter moon you may notice what appears to be two eyes staring back at you in the northern portion of the Moon.

Those eyes are the impact craters Hercules and Atlas, named after heroes of Roman and Greek mythology that represent strength and endurance.

The craters stand out since they are surrounded by relatively flat terrain east of Mare Frigoris (Sea of Cold). The craters are flanked by Lacus Mortis (Lake of Death) and Lacus Temporis (Lake of Time).

The best time to view the pair are three days before the first quarter moon after sunset or three days after the full Moon at least two hours after sunset.

The RASC Observers' Handbook contains useful resources including a moon map with features such as marias (seas), craters and mountains. The moon phase dates and times of moonrise and moonset are also provided to help plan lunar observing.

Hercules

The crater Hercules has a diameter of 68 km with a depth of 3 km. The height of the crater walls relative to the diameter of the crater can be observed by the shadows they cast when the crater is near the terminator.

A small 13 km crater (Hercules G) is visible with binoculars during the full moon as a bright dot in the middle of the eye.

Atlas

The crater Atlas has a diameter of 87 km with a depth of 2 km. Atlas is located approximately 30 km from Hercules. The shadows cast by Atlas' walls are less pronounce that those of Hercules, because Atlas is larger and shallower than Hercules.

Hercules G during the Full Moon
Image Source: Daily Moon Guide - Nasa

Waning Moon

Hercules and Atlas are a beautiful sight in binoculars and the illusion of a pair of eyes staring back toward Earth appears to be more pronounced in the waning Moon (after the full Moon) due the patterns of the shadows.

Explore the Moon

If you enjoy observing the Moon with binoculars or a telescope, Explore the Moon | RASC Observing Program[1] is an excellent resource for planning your moongazing sessions.

RASC Montreal has Moongazing sessions at the Morgan Arboretum on Wednesdays nearest to the first quarter Moon during the observing season. The next session will be held on May 7th, 2025.

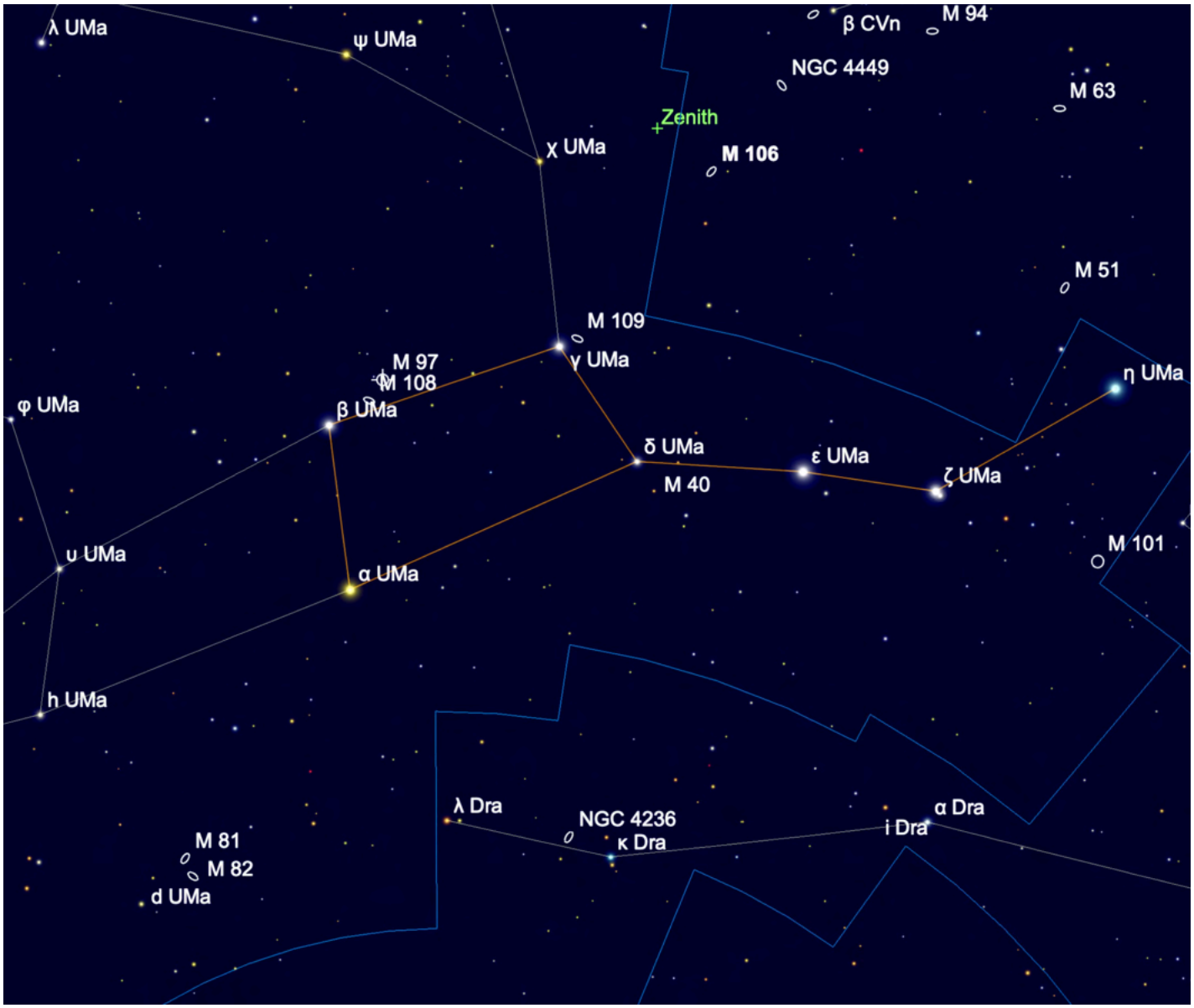
[1] https://rasc.ca/observing/explore-the-moon-observing-certificate

Hercules and Atlas three days after the Full Moon
Image Source: Daily Moon Guide - Nasa

Tour of Ursa Major's Messier Galaxies

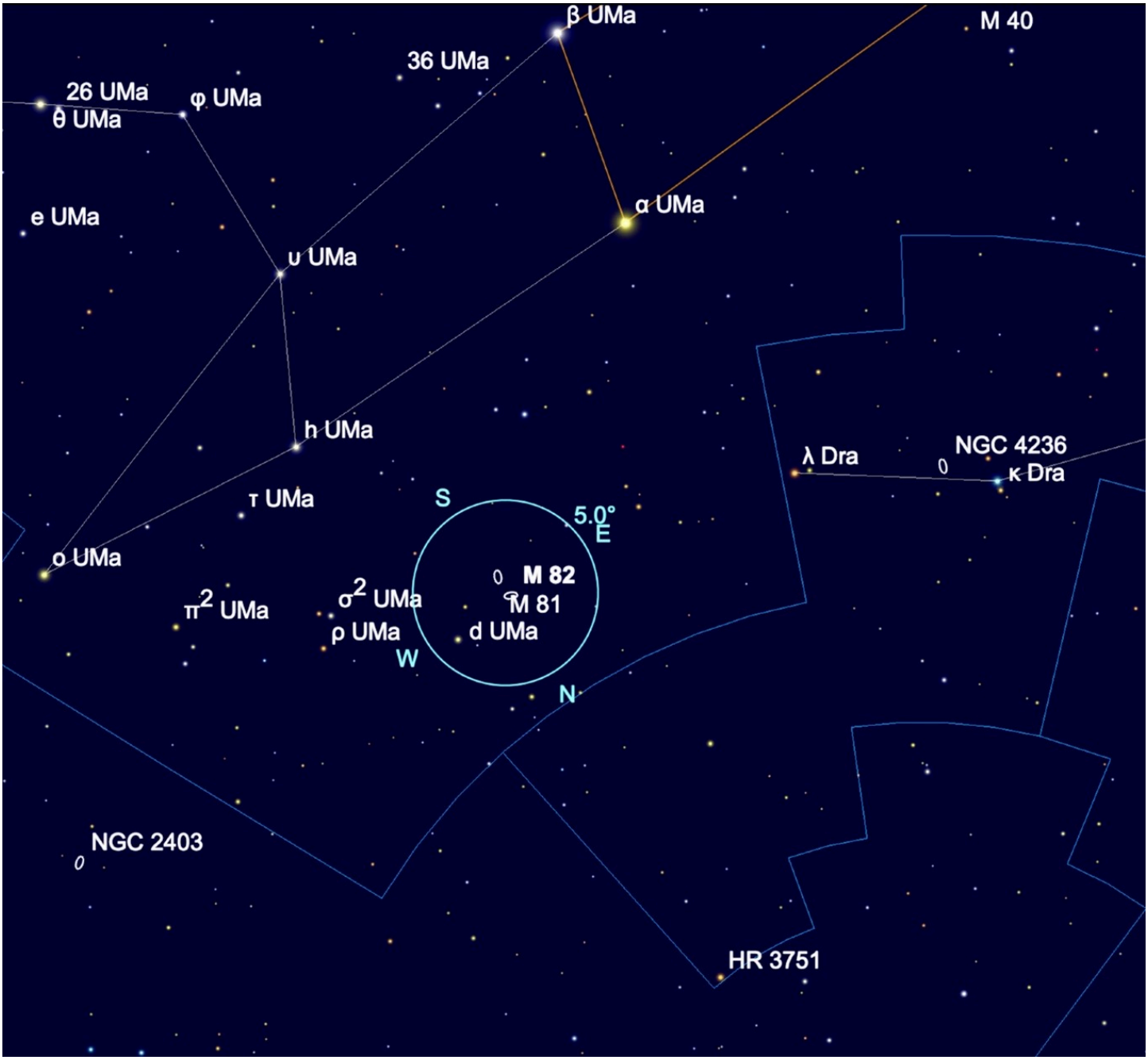
By: Marc Ricard

Spring skies are filled with galaxies. Thousands are scattered within the confines of Leo, Virgo, Coma Berenices and Canes Venatici. But, Ursa Major holds several that you can see in your binoculars or through a small telescope if you know where to look. Here's a quick guide to help you find them.



Finder chart courtesy of Sky Safari Pro.

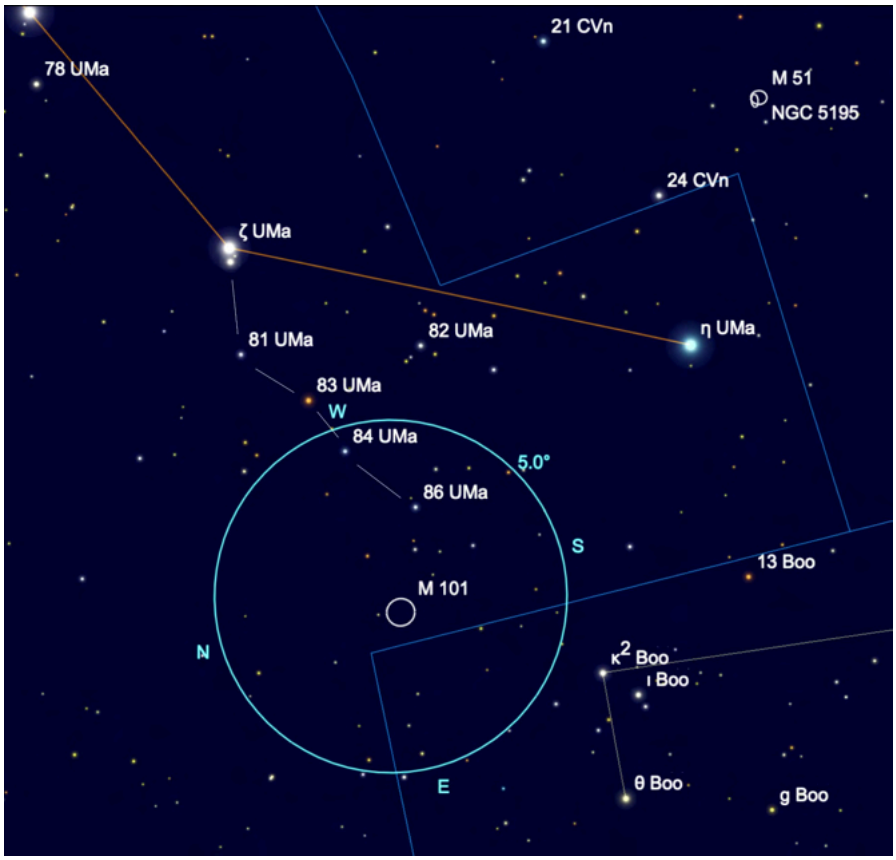
M81 and M82 are Ursa Major's brightest galaxies. To locate the galactic duo, follow υ (upsilon) and h Ursa Majoris northward to the 4th magnitude stars: σ1, σ2 and ρ. *(Sigma 1 is the star just left of σ2 in the chart. Ed.)* Then nudge your binoculars or the finder of your telescope eastward past the magnitude 4.5 star d Ursa Majoris. My zero-gravity chair allows me to hold my 10x50mm binoculars steady enough to see both galaxies with direct vision from my home in the Laurentians. M81 is brighter and larger than its neighbour, whereas M82 is slightly elongated east-west.



M81 and M82 finder chart courtesy of Sky Safari Pro.

Images of M82 (left) and M81 (below) captured with my QSI 683 camera and FSQ 106 telescope from Pointe-Claire over 9 nights in 2019.

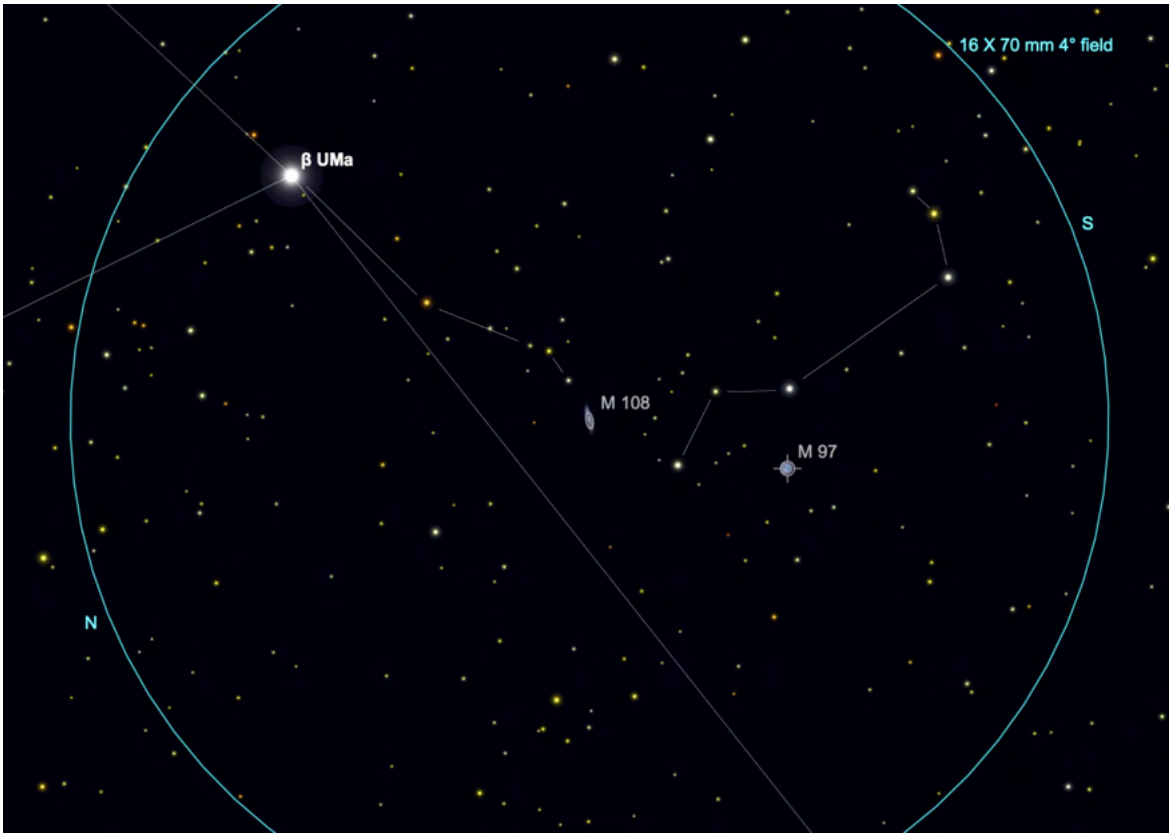
Through my mounted 16x70mm M81's bright core is obvious, and its surrounding oval-shaped envelope extends roughly 20’, the distance separating the unresolved 9th mag doubles Struve 1386 and 1387 lying near its western edge. The northern edge of M82's edge-on envelope is dark, while the southern edge is diffuse. Look for a 9th mag star near its western tip. My 15-inch reveals three dark bands criss-crossing this star-burst galaxy at 189x. But long exposures taken with a hydrogen alpha filter are required to capture the finer details seen in the image on the next page.



M101 finder chart courtesy of Sky Safari Pro.

To locate M101, start by centring your binoculars or your finder telescope on Alcor & Mizar (ζ), then follow the 5th mag chain of stars 81, 83, 84, and 86 Ursa Majoris eastward. My 10x50 mm reveals only a faint mist blending into the background sky. Softly jiggling the binoculars from side to side makes this dim face-on spiral easier to spot. It gradually brightens toward the middle in my mounted 16x70mm, but the core is strangely offset to the northeast. My 15-inch reveals many of M101's star-forming HII regions seen in the spiral arms of the image below.

M101 image captured with my RC8 and QSI camera from Oak Heights, ON.



M108 and M97 finder chart courtesy of Sky Safari Pro.

To locate M108, centre your binoculars or finder telescope on β and follow the L-shaped asterism of 7th magnitude stars lying to the southeast. The galaxy's minuscule east-west streak is best seen when I gently rock my 16x70mm back and forth.

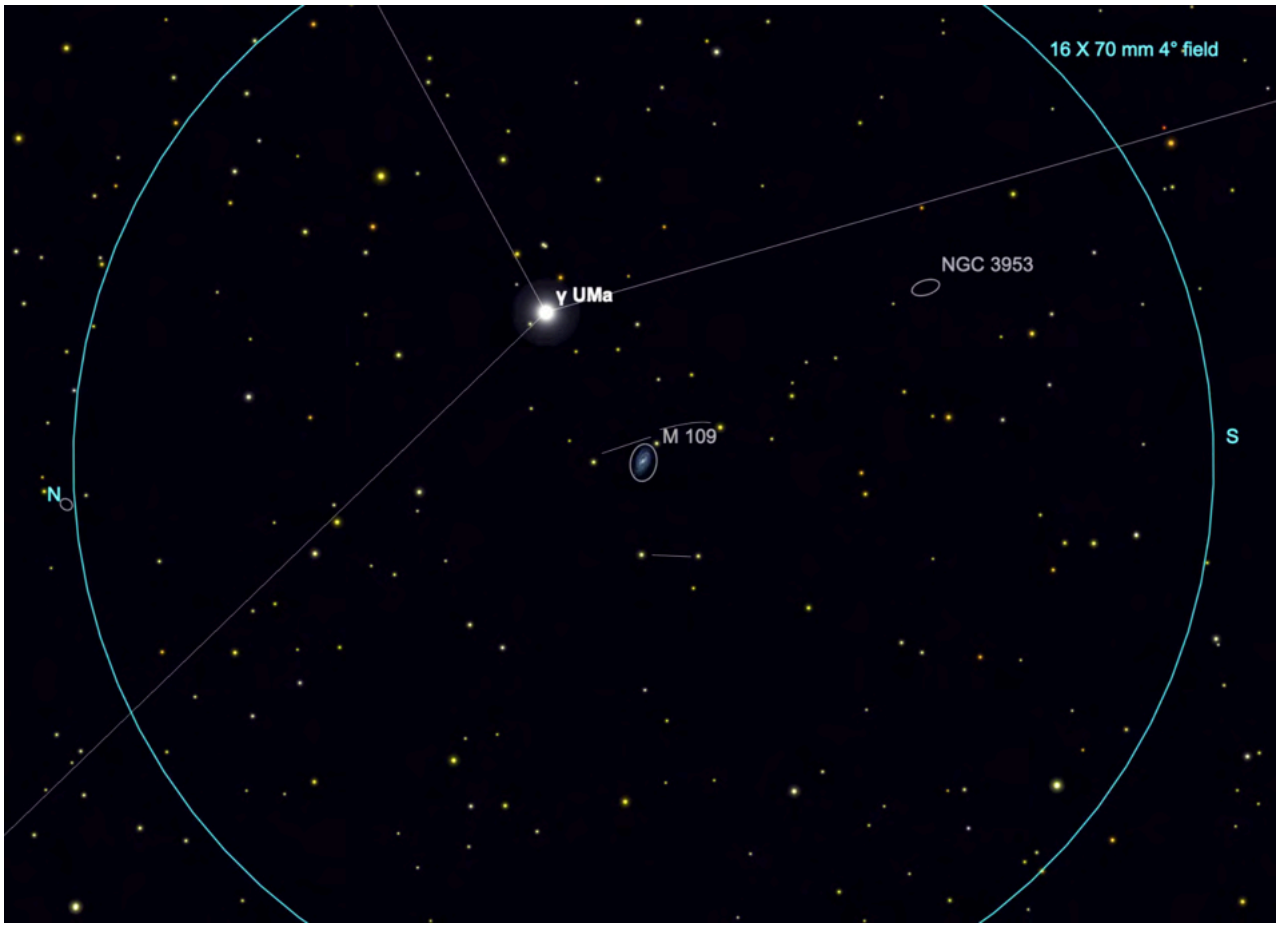
In my 15-inch, it's big and bright at 128x. At 217x, its mottled envelope fills half the field of view, and a dust lane is visible along its northern edge. Several dark and bright patches are resolved when I increase the magnification to 362x.

M108 captured by Gerald and Dominique MacKenzie

M97 captured by Gerald and Dominique MacKenzie

The Owl Nebula is a small, round, soft-edged cloud in my 16x70mm lying below an arc of three mag 7-8 stars, less than a degree southeast of M108. It's easier to spot when I gently rock my binoculars back and forth.

Through my 15-inch, I see a large, mottled cloud with soft edges at 128x. It looks patchy with my OIII filter. The western edge dims slightly at 362x unfiltered.



M109 finder chart courtesy of Sky Safari Pro.

M109 captured by Gerald and Dominique MacKenzie

M109 lies half a degree eastward of γ. The galaxy's faint nucleus is discernible near the middle of a short row of three 9th mag stars in my 16x70mm. The 15-inch reveals a bright core surrounded by a large oval envelope.

Clear skies!

mfl

See a table of Marc's targets in below. Like this article? Send us feedback at editor@rascmontreal.org. Ed.

Marc's targets in Ursa Major

Object	Type	Magnitude	Size, separation, period	Position angle	Distance Light-years	Right Ascension	Declination
M81	Galaxy	6.77	21.6 x 11.2 arc min	13.2	12,000,000	$9^h\ 58^m$	68° 57′
M82	Galaxy	8.02	11 x 5.1 arc min	12.5	12,000,000	$9^h\ 58^m$	69° 33′
M101	Galaxy	7.77	24 x 23 arc min	14.9	23,000,000	$6^h\ 42^m$	09° 52′
M108	Galaxy	9.96	4 x 1.7 arc min	13.1	32,000,000	$11^h\ 13^m$	55° 32′
M97	Nebula	9.8	3.4 arc min		1,700	$11^h\ 16^m$	54 53′
M109	Galaxy	9.62	8.1 x 5.6 arc min	13.5	82,000,000	$11^h\ 59^m$	53° 14′

Aurora Trip to Churchill Manitoba

Our patriotic Canadian winter beach vacation

By Russell Fralich

Negotiations were brief. I wanted a mid-winter beach vacation. My wife insisted we stay in Canada for obvious reasons. But we had already discounted visiting the Atlantic and Pacific coasts. We used to live in Halifax, and we had toured Haida Gwaii in British Columbia last summer.

Fortunately, our country has a third coast!

We spent four days and three nights in Churchill, Manitoba on the frozen shore of Hudson Bay at almost 59 degrees North latitude. Our objective was to see aurora borealis, and with some luck, maybe polar bears, too. We flew to Winnipeg, stayed one night, and then took the VIA train almost two full days northward to the end of the line, Churchill.

Churchill exists at the frontier, where the boreal forest gives way to arctic tundra. I assumed I could walk outside of town at night, set up my camera and tripod, and capture some aurora. But the town's official welcome video warns not to do that. And to always walk in the middle of the roads and in groups. It's because of the polar bears.

We booked one of the local tour companies for a day trip exploring the area. We did see a polar bear mom and her cub. The night tour picked us up in a toasty warm van and took us a few kilometres from town. The aurora forecast was for a Kp of only 1, a worryingly wimpy intensity level of solar wind. But the guide said that Churchill was located exactly under the minimum aurora arc for the northern hemisphere. If there was going to be any aurora, it would happen here.

And it did.

We spent almost two hours in -23 to -30 °C skies with only a few scattered clouds. When we stopped moving, there was total silence. I was surprised how fast the arc moved. The bands shifted like electric snakes.

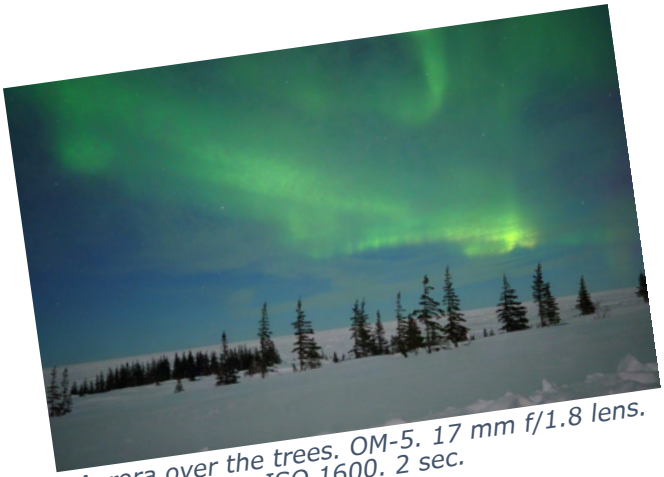
Unforgettable.

See the pics on the next page.

Polar Bear Warning Sign. OM-5. 12-45 mm f/4 lens.

Polar Bear mum on the ice. OM-5 40-150 mm f/4 lens.

Amazed. Taken by Discover Churchill tour company. Nikon Z8. Viltrox 16m f/1.8 lens. ISO 5000. 1.6 sec.



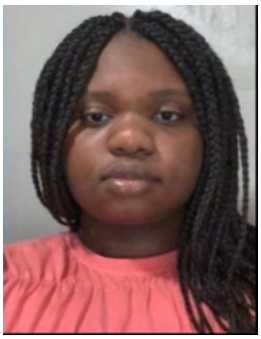
Aurora over the trees. OM-5. 17 mm f/1.8 lens. ISO 1600. 2 sec.

Aurora over the tour company vans. OM-5. 17 mm f/1.8 lens. ISO 1600. 5 sec.

Aurora Hunter strikes again!

March 22nd, Alexei Weins, *our Aurora Hunter managed to capture some fascinating images from Mont Mégantic.*

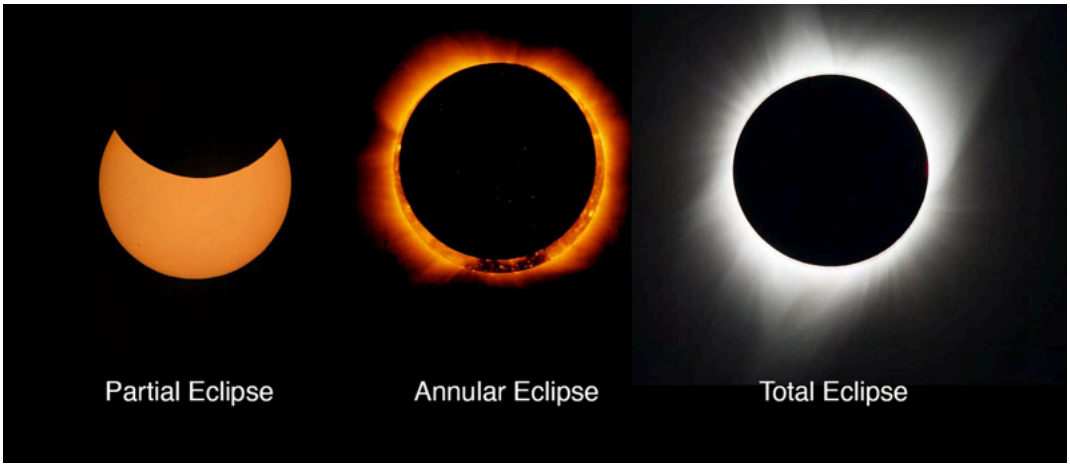
Exploring the World of Eclipses



By Véronique Djomou

In the past two weeks, we had the opportunity to observe both a lunar and a solar eclipse. But what is an eclipse? What physically happens? What does it mean when it is partial, total, or annular? What is the difference between a lunar and solar eclipse? What is a Hybride eclipse? Well, this is the right place to get answers to those questions.

Oregon State University defines an eclipse as "[the]obscuring of one celestial body by another". Essentially, an eclipse is when a celestial object, like a planet or a moon, passes through the shadow of another object in space. When only a portion of the celestial object is covered, we call it a partial eclipse. It takes on a crescent shape, much like a croissant! If it fully covers the body, then, we call it a total eclipse. Depending on the distance where you see the eclipse, if the passing object is smaller than the object it passes through and the outer edges are not covered, it will be annular. The uncovered circle in a solar annular eclipse is famously known as the "ring of fire."



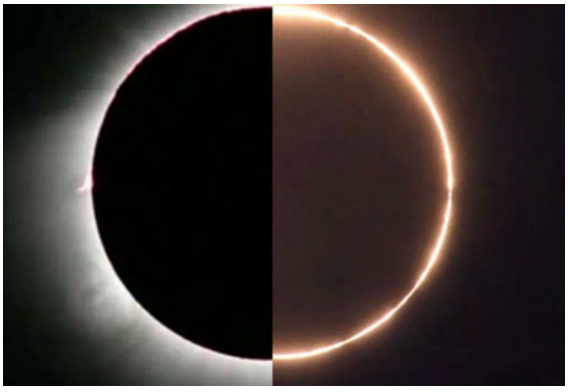
Picture from: NASA Jet Propulsion Laboratory. (2024, October 9). The science of solar eclipses and how to watch with NASA – Teachable moment. Retrieved from https://www.jpl.nasa.gov/edu/resources/teachable-moment/the-science-of-solar-eclipses-and-how-to-watch-with-nasa/

A lunar eclipse occurs when the Moon passes through the Earth's shadow. According to the National Weather Service (www.weather.gov), a lunar eclipse occurs zero to three times a year. Most are partial eclipses since there are no annular lunar eclipses due to the Earth being bigger than the Moon. On the other hand, total eclipses occur on average every 2.5 years. On March 14th, we had the chance to experience a total lunar eclipse, also known as the Blood Moon. The next lunar eclipse visible in Montreal will be on March 2-3, 2026. Do not forget your binoculars and telescope.

Total Lunar Eclipse (Blood Moon) of March 14th by Taara Jaffer

A solar eclipse occurs when the Moon covers the Sun's disk. This occurs somewhere on Earth twice a year. Most are partial eclipses, while a total one occurs on average every 18 months. North America had the chance to see one last year on April 8th. The next total solar eclipse is on August 12, 2026, and it will be visible over Greenland, Iceland, and Spain. Since the Moon is much smaller than the Sun, there is a possibility of having an annular solar eclipse. This occurs every one to two years. The most recent annular solar eclipse occurred on October 14, 2023. It was visible across parts of North, Central, and South America. The next one is on September 21, 2025. Do not forget your binoculars and telescope.

A hybrid eclipse is a rare type of eclipse that blends both total and annular appearances. This happens because the curvature of the Earth affects the perspective of the observer. Some will see a total eclipse where the Moon completely obscures the Sun, while others will witness just the "ring of fire." Your location is key. The last hybrid eclipse that took place was on April 20, 2023. It was visible from parts of Australia, Indonesia, and several islands in the Pacific. The next hybrid eclipse will be on November 14, 2031, in North America.



Hybride solar eclipse. Pic from: Big Think. (2013, November 3). A rare hybrid solar eclipse. Retrieved from https://bigthink.com/articles/a-rare-hybrid-solar-eclipse/

Now you know what an eclipse is and the different types! Eclipses are a truly fascinating and beautiful phenomena. However, don’t forget that the sky is full of beauty beyond eclipses, just waiting for you to discover.

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M46 By Khoa Tran. *This was really hard: big moon, not great seeing conditions, and target really low to the horizon. I had to extend my tripod to "giraffe mode" to clear my roofline to the south.*
But I got it! M46, with a foreground planetary nebula NGC 2348, in the constellation of Puppis, from my balcony in the Plateau.
52 x 60s @ISO800
Camera: Olympus Pen-F Digital
Telescope: Takahashi FS-60Q
Filter: Baader Neodymium Moon & Skyglow
Mount: Vixen Advanced Polaris
Autoguiding: Orion Thin OAG / Lacerta MGEN2
Stacked and processed in Siril. Additional processing with GraXpert denoise and GIMP.

Blood Moon Eclipse

March 14th saw a Blood Moon (total) Eclipse and several of our members stayed up late to observe the event. Some hosted the public at the Clubhouse where camaraderie and coffee were offered to a group of as many as 70 persons.

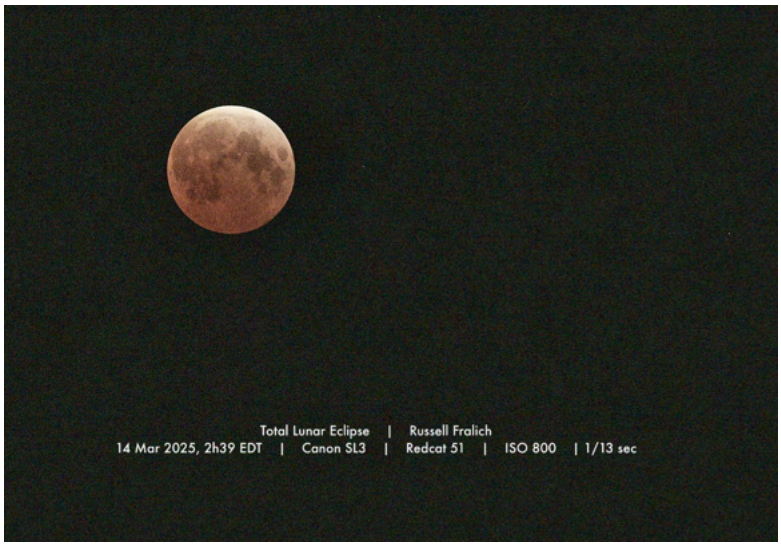
Alex Stefanescu in Dorval

Group at the Arbo, by Karim Jaffer

Khoa Tran, From my balcony in the Plateau at 03h11. Single shot, 4s at ISO400. Olympus Pen-F, Takahashi FS-60Q

Frank Tomaras in Chomedey Laval

Andrew Maenz



By Russell Fralich. *Jeez, I am pretty late to the party...and I got up for the 2.30 am show! Taken from my street under a bright streetlamp (typical!).*

While the Moon her Watch is Keeping

By David H. Levy,

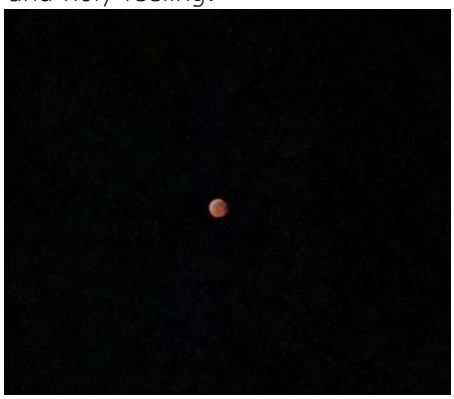
Sleep, my child, and peace attend thee
All through the night;
Guardian angels God will send thee
All through the night.
Soft the drowsy hours are creeping,
Hill and vale in slumber sleeping,
I my loving vigil keeping,
All through the night.

While the moon her watch is keeping
All through the night;
While the weary world is sleeping
All through the night.
Over thy spirit gently stealing,
Visions of delight revealing,
Breathes a pure and holy feeling,
All through the night.

Ar Hyd y Nos (All Through the Night), Edward Jones'[1] *Musical and Poetical Relics of the Welsh Bards* (1784).

I learned about this gorgeous hymn at Twin Lake Camp during the Summer of 1956. I was 8 years old. During one of the three summers I spent at Twin Lake I sang that hymn at least once at a camp assembly. The older campers were extraordinarily patient with my unfortunate voice. My favourite line, "While the moon her watch is keeping" surfaced more recently. There is a singular magic to being out of doors on a clear night and looking at the Moon. There is a sense of delight, and the result for me is indeed "a pure and holy feeling."

The idea of the Moon keeping a watch follows from the idea that the Moon rises at a specific time, and sets at a specific time. And when a lunar eclipse begins at a specific time and ends at another time, the Moon fits the concept of a timepiece well. On the night of March 13/14, 2025, Jean Mueller and I enjoyed a spectacular total eclipse of the Moon. In the days ahead of the event the weather forecast steadily deteriorated, and until the event was actually starting we had no idea whether we would see anything at all. Our first check of the condition of the sky changed everything. With large breaks in the clouds we saw the Moon with a subtle darkening on its lower side. More than an hour later, the dark, reddish-brown central shadow of the Earth



The weather said there'd be clouds. Instead we got to see this! Picture credit: David Levy.

made its obvious first bite of the Moon. By the time the Moon was completely embalmed in the Earth's central shadow, the umbra, the sky had darkened considerably and we were treated to one of Nature's most stunning displays. As beautiful and artistic as the Moon appeared that night, the event followed the calculated times precisely.

"This is the most amazing, beautiful eclipse I have ever seen," Jean said of her experience. It was electrifying for me too. Eclipses are not just events in the sky. They are awe-inspiring ruses of Nature. They do not just occur; they are inspiring, poetic. Eclipses prove that the sky is not just there; it happens. The shadow of the Earth darkens the entire face of the Moon pointed toward Earth. While an eclipse of the Sun is visible over a small area on Earth, the Moon's eclipse can be seen over the entire side of the Earth that is going through night.

Jean was also moved by the idea of the Moon as a watch, that the starting and ending times of an eclipse can be accurately predicted. Decades ago, my Dad was also exhilarated when the solar eclipse of July 20, 1963 began, to the second, on time. Fascinated with history, he said that the ancient Greeks in Aristotle's time could predict the time, almost to the second, that an eclipse would happen millennia into the future. Dad was overwhelmed with this happy thought.

The always welcome eclipses will continue; another will be visible from my home, and from San Diego, on March 3, 2026. It will be a joyful event to which I can really look forward. If the sky be cloudy that night, we will still detect a noticeable darkening around us. If it is clear, Nature will again demonstrate that just as planets form and stars die over billions of years, the eclipses start and end in periods of time measured by a few seconds.

In Tucson it was going to rain. Instead we got this!
Picture credit: Tim Hunter.

[1] https://en.wikipedia.org/wiki/Edward_Jones_(harpist)

By Andrew Maenz, April 4th

Saturn's Rings are Disappearing

and it's not an illusion.

By Nader Daou, RASC Montreal Centre

Saturn has always been a special planet. It never ceases to amaze. The first time anyone sees Saturn through the eyepiece of a telescope at a star party, they gasp, or giggle, or just freeze. It looks like nothing else we are familiar with in the night sky. Those rings!

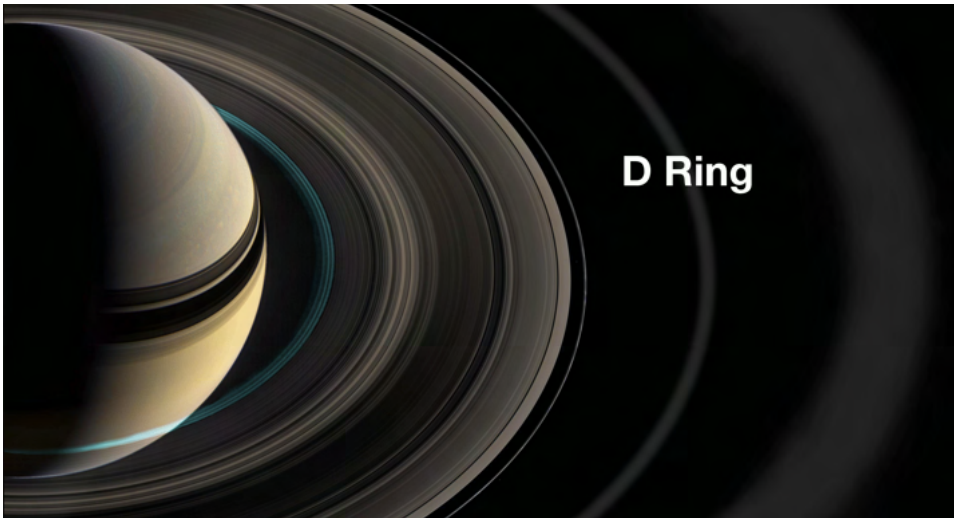
Those rings weren't always that easily recognized. Back in 1610, the first time Galileo peered through his tiny telescope, he recorded that the planet had "ears"!! I mean, Galileo was brilliant, but the telescopes of his period weren't doing him any favours. It wasn't until 1655 when Huygens correctly identified the "weird" smudge around Saturn as rings.

Since then, Saturn was always identified as the *Planet with the Rings*… but it wont be for long, at least not long on the cosmological scale!

The iconic planet is losing its iconic feature

In 1997, a Titan rocket carried the spacecraft Cassini into space. A collaborative mission among NASA, ESA (the European Space Agency), and ASI (the Italian Space Agency). The mission's primary objective was to study Saturn, its rings, atmosphere, magnetosphere, and its numerous moons, especially Titan, the only body in the outer solar system to have a man-made object landed on its surface. The lander was very deservedly named *Huygens*.

Cassini's mission ended in 2017, but before it was intentionally deorbited into Saturn, during its "Grand Finale" mission, Cassini made a stunning discovery about Saturn's rings.



Saturn's D ring highlighted. Image from https://science.nasa.gov/resource/saturns-rings/

Between April and September 2017, Cassini made several passes between Saturn and its innermost ring, dubbed the D ring. During these passes, the INMS (Ion and Neutral Mass Spectrometer) and the RPWS (Radio and Plasma Wave Science) instruments were able to detect streams of charged particles, water ice, and organic molecules falling into Saturn's atmosphere. The instruments were also able to detect the rate of mass loss due to this phenomenon called "Ring Rain". The rate was between 432 and 2870 Kg/sec.

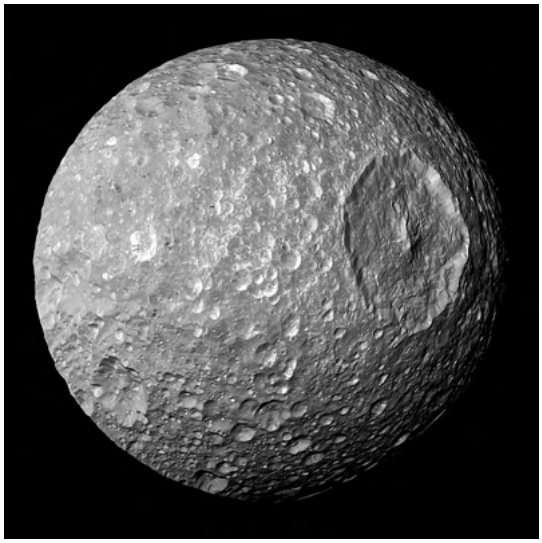
Based on these rates, Saturn's rings might well disappear completely in 100-300 million years. A blink of an eye on the cosmological scale.

Saturn's rings may be young

Cassini's discovery had larger implications beyond the fleeting nature of Saturn's rings. The data Cassini provided, combined with older data obtained from the Voyager missions, suggests that the rings may be between 100 to 400 million years old, far younger than their parent planet (~4.5 billion years).

For a long time, the dominant theory on the formation of Saturn's rings was that they are primordial, formed with the planet 4.5 billion years ago. However, Cassini's data challenged this theory with several facts:

1. The total mass of the rings: Cassini's data showed that the rings' mass is too low to have survived for billions of years. The total mass of the rings is about 40% or the mass of Mimas (the inner Moon popularly known as the Death Star Moon, because of the gigantic Herschel crater that gives the moon a resemblance to the Death Star).
   Mimas, Image from NASA / JPL-Caltech / Space Science Institute - This image or video was catalogued by Jet Propulsion Laboratory of the United States National Aeronautics and Space Administration (NASA) under Photo ID: PIA12570., Public Domain.



2. The relative brightness of the rings: The density of micrometeoroids in the rings would have caused the rings to darken significantly over the course of billions of years.

3. Ring Rain: The loss of mass is significant even at a scale of 10 or 100 million years.

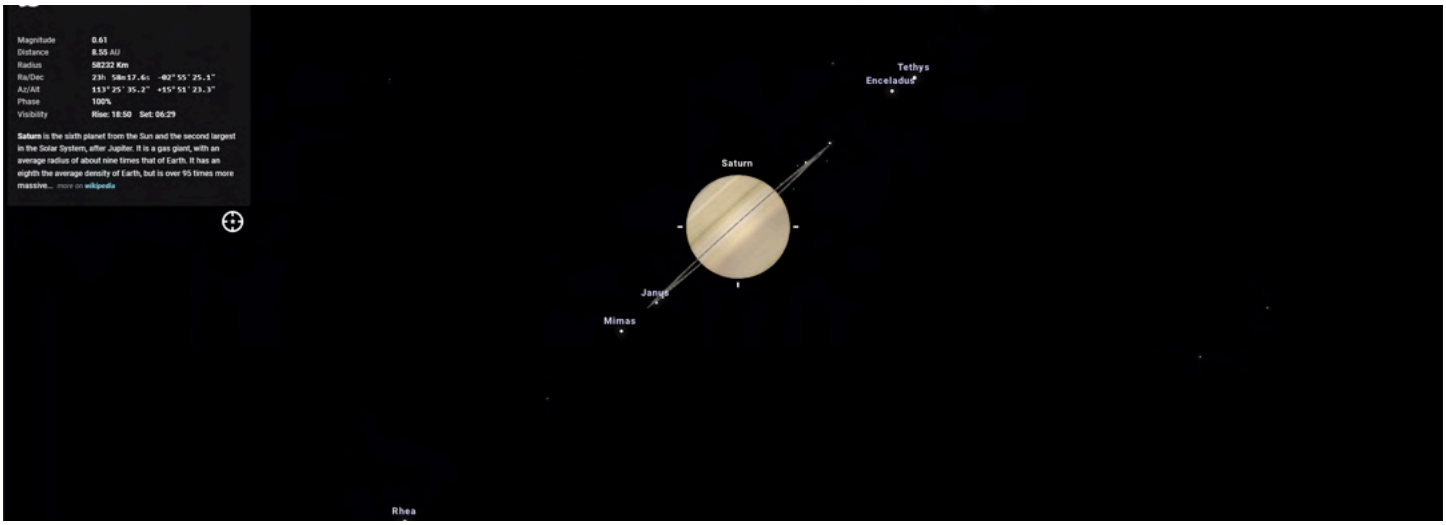
Now a new theory is gaining traction in the Planetary Science circles. The Catastrophic Disruption Hypothesis. The theory essentially suggests that the rings were formed more recently due to a tidal disruption of a large icy body such as a primordial moon or a large Kuiper belt comet.

The same data from Cassini supports this hypothesis. The low mass of the ring, the purity of the water ice, rate of micrometeoroids and the Ring Rain, all suggest that the rings must have formed more recently.

Are we lucky or ***are we lucky***?

I think we are lucky! For our species to exist in such a time when the young, fleeting, majestic, rings of Saturn are bright and shining for us to see, study, visit and admire, knowing that they exist but for a moment in the seemingly eternal cosmos, is nothing less than a miraculous coincidence…

This year, 2025, on Sunday September 21, Saturn will be in opposition and appear its brightest. And it will be a Moonless night. However, its rings will be tilted at 2 degrees, making them barely visible. Nevertheless, put this date in your calendar and go out after sunset, point you telescope up and revel in the beauty of the ringed sentinel!



Screenshot from Stellarium [(Stellarium Web Online Star Map)https://stellarium-web.org/](https://stellarium-web.org/)

Here's the thing about Saturn's rings—they *feel* eternal. Like they've always been there and always will be. But now we know that's not true. They showed up late. They're fading fast. And someday, way down the line, they'll be gone.

It's a reminder that space isn't static. The universe isn't some frozen backdrop — it's alive, changing, and sometimes — unpredictable. Even something as jaw-droppingly beautiful as Saturn's rings has an expiration date.

That's why it matters to keep looking up. Whether you're a professional with a mountain-top observatory or just someone with a telescope in the backyard, we're all witnesses to stuff that won't be here forever. It's kind of amazing — and a little humbling.

montreal centre
Royal Astronomical Society of Canada

Secrets in the Crab Nebula

The Crab Nebula region, Messier 1 (NGC 1952) reveals some of its secrets

G. St-Onge, (RASC/ CDADFS / SAM), Denis Bergeron, Denis St-Gelais, Jean Guy Moreau et Réal Gauvin

ABSTRACT

This report presents some aspects of interest that may be detectable on amateur astronomer images using CCD or CMOS cameras. So if you have made images of the Crab Nebula (Messier 1), you just need to use images from a few decades ago of Messier 1, available on DSS for example, to perhaps be able to detect and even follow up some of the aspects presented here.

Introduction and History:

Historically, the Crab Nebula, Messier 1, (NGC 1952), is the resultant nebula of a supernova star that was observed in 1054 by Chinese astronomers. This star (SN) would have been observed for some time, even in broad daylight. The sufficiently precise surveys of the astronomers of the time allowed modern-day astronomers to trace the position of this star and thus discover the nebula that corresponds to the supernova remnant (SNR), namely the Crab Nebula, or Messier 1. It is observed at the following coordinates, (J2000) $05^h\ 34^m\ 31.8^s$ +22° 01′ 03″. Our observations presented in this document are targeted only at the visible and near IR domain, which is accessible to most amateur astronomers.

1- The star near Messier 1 that has a fast PM (proper motion)

Star G100-20 close to Messier 1 has a fast PM.
Basic data: from Simbad website
Star G100-20, (J2000), $05^h\ 34^m\ 14.8^s$ +22° 05′ 25.3″ (Optical)
Spectral type: K3 D

Figure 1

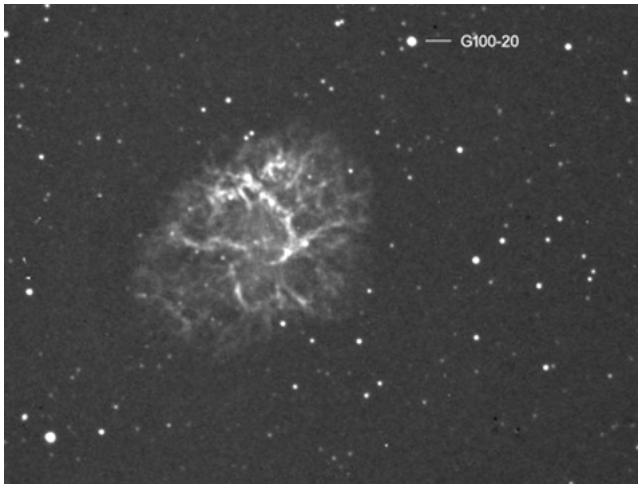


Figure 2

In figures 1 and 2 we can see the star, named G100-20, close and slightly above (at NW) Messier 1, has a tangential motion on the sky, It descends on the images, toward the south, detectable over more than 10 years of interval between the images. Here, on the left, an image from 2009 and, on the right, one from 2023 allow to see a slight movement of this star in the sky.

2 - Changes are detected due to the fast expanding motion of the Messier 1 nebula

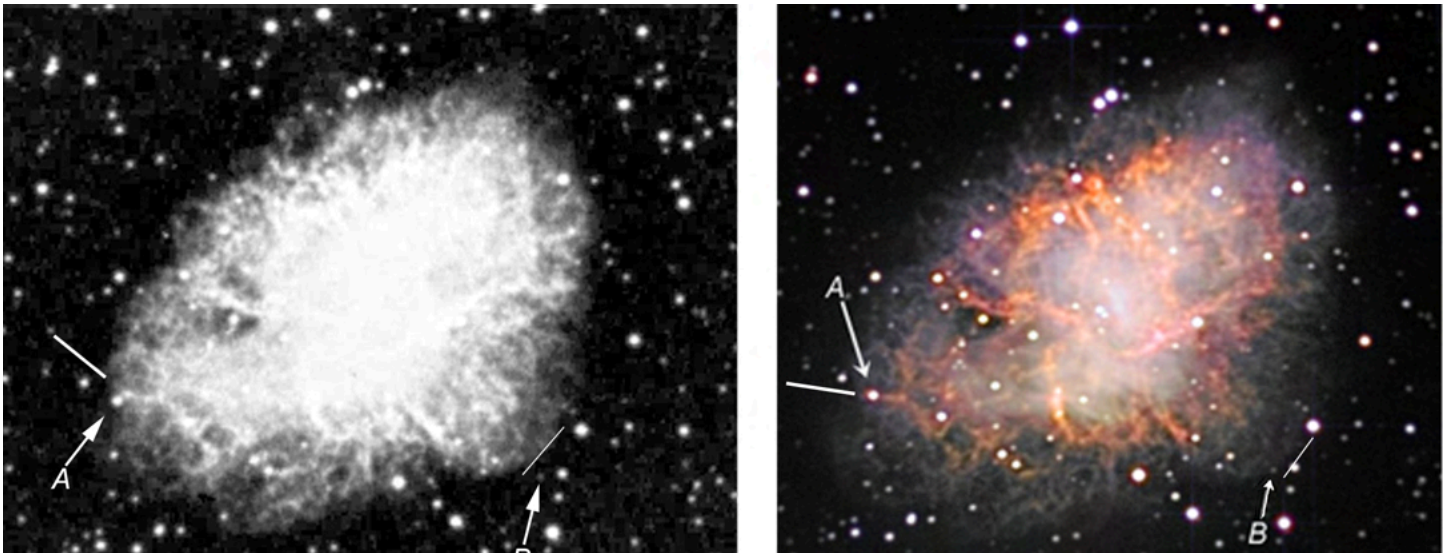


Figure 3. *Left image - Messier 1 (NGC 1592) from DSS1, 1945-1958. Right image - by Denis Bergeron in 2009 using a Meade RCX 12 inch in LRGB.*

Summary of Figure 3

The image on the right by Denis Bergeron is from 2009. It shows several changes in the positions of structures and the size of the nebula when compared with an image from DSS1 (Digitized Sky Survey 1), 1945-1958 (left). As examples, indicated by two arrows marked "A and B", are two regions of interest. Around "A", we notice that the thin line of luminous gas covers the star of the field on the image by Denis (right) while, in the DSS1 image (left), this filiform structure is above the star and it is more curved to the north than on the image by D. Bergeron. Around "B", the cutoff of the southwest edge of the nebula covers the small star marked "B" on the image by D. Bergeron, while in the DSS1 image, it is still far away to the NE of this star.

Messier 1 is at a distance of ~6500 light-years (~2000 pc) from us. Its gases have a velocity of ~1500 km/s. They are moving away from the star that was the supernova of 1054. The nebula already occupies a space with a diameter of ~11.8 light-year on its major axis, (St-Onge et al (2022)).

3 – The jet of the Crab Nebula, Messier 1

Based on paper produced by St-Onge G. et al / JRASC October (2022)

Introduction and History

Canadian astronomer Sidney Van Den Berth, who in 1970 used the 48-inch Schmidt camera from Mt. Palomar, made pictures of Messier 1 which revealed this jet-like structure escaping to the northwest of the nebula. More recent observations have highlighted the morphology of this jet structure. This one is composed of filaments of the same type as the rest of the main nebula Messier 1. This jet moves away from the main nebula with a great velocity similar to that of the filaments found in the main nebula.

Some particularities of this jet structure

Its large propagation axis does not seem to be aligned with the expansion centre of the main nebula filaments, nor even with the position of the pulsar in the nebula. In addition, there seems to be no detectable counterpart (bipolar counter jet) on the other side of the nebula.

High-resolution emission images in Oxygen [OIII] have allowed to estimate the tangential velocity of several nodes of this jet structure. These measurements indicate the first ejection moments (top of jet) around the year 1055 ±24 (G. C. Rudie et al. 2008), which corresponds quite well with the supernova observed in 1054.

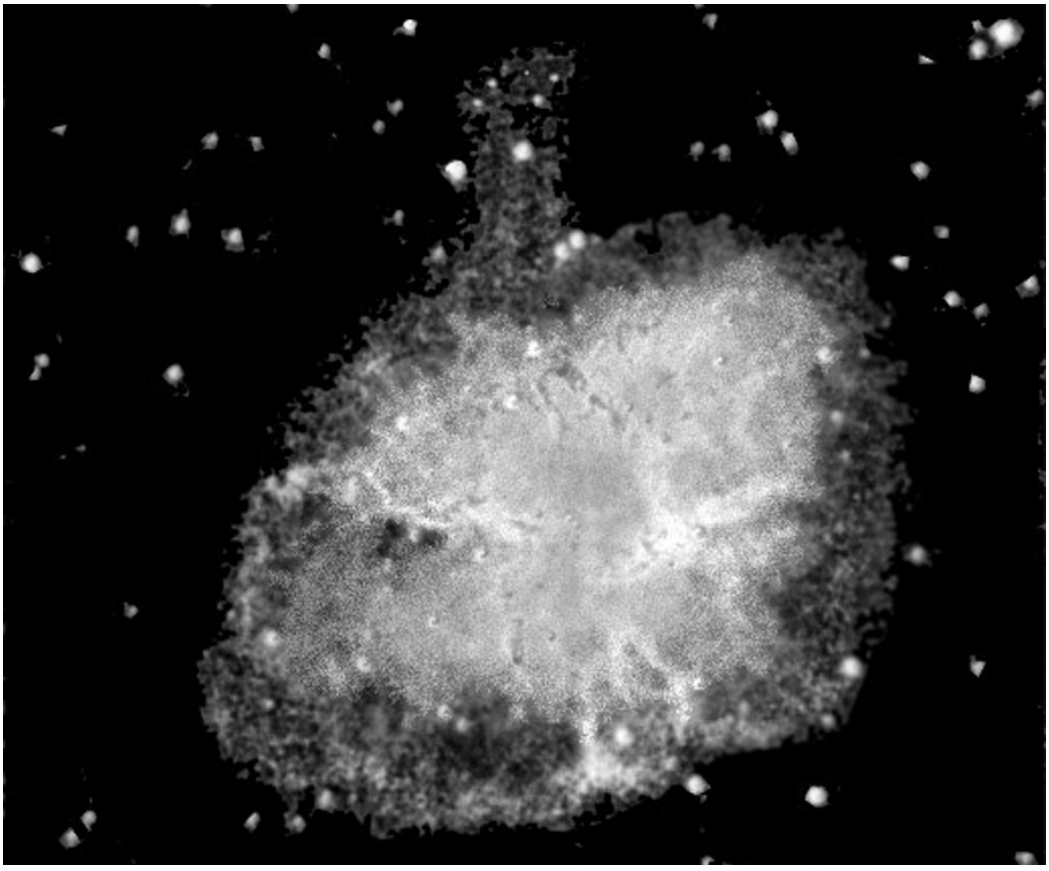


Figure 4

This is the best result we could get using images with wide band filters such as RGB + Ha

You can see the jet on the sky and the whole surface in the nebula. A mask was applied to remove most of the residual noise signal from the reduction on the sky.

In Figure 4 the jet structure extends very far away on the sky.

A complete paper was produced by our team.

St-Onge et al, Une structure peu connue des amateurs dans la partie nord de la nébuleuse du Crabe, Messier 1, JRASC of October 2022, Research Articles, Volume 116 / Number 5 [816] page 168.

***Our observations of this jet structure in Messier 1**

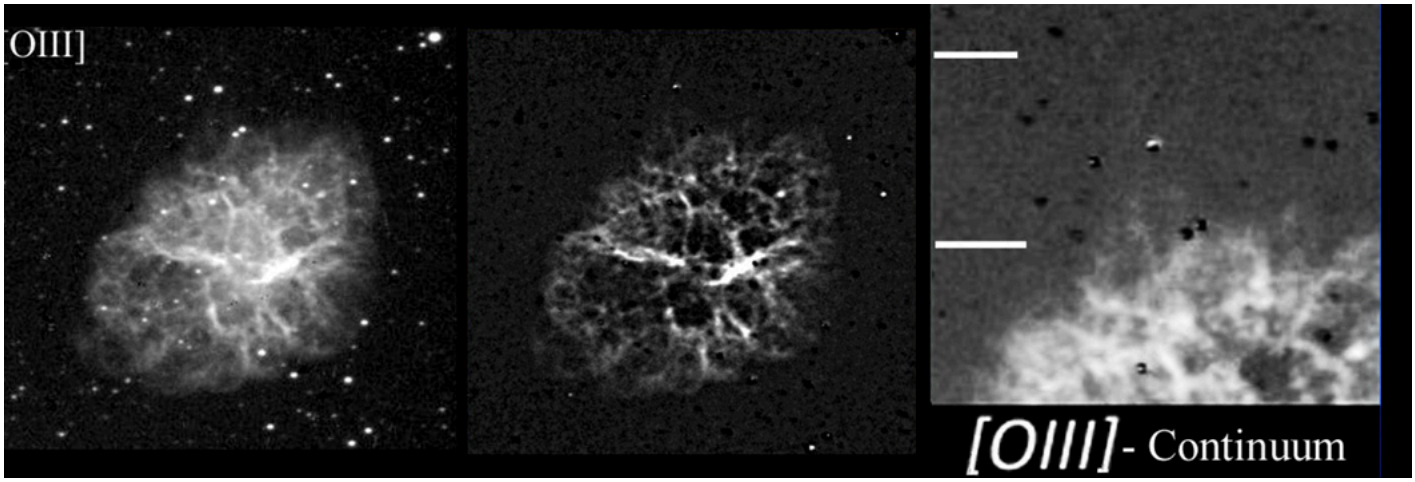


Figure 5

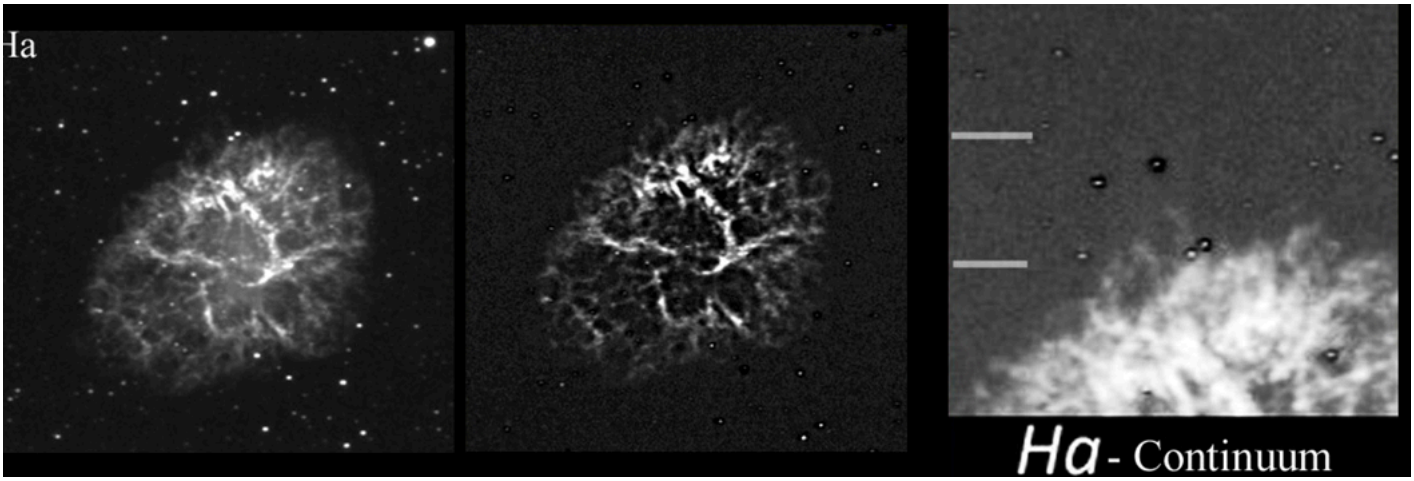


Figure 6

4 - M1, OIII, Hα

Figures 5-6

Some of our images of the jet structure north of Messier 1 show that this structure is more intense in [OIII] than in Hα. In the right hand images in figures 5 and 6, the horizontal lines on the left side indicate the relative size of the jet and its intensity with each of these filters. This jet is very weak, almost to the limit detectable with our instruments. On the other hand, in these images, we can see some of the large structures in filaments coming out of the great nebula at the base of the jet, and the extension of the jet on the sky north of it.

Our estimates of the size of this jet structure

Messier 1 is at a distance of ~6,500 light-years (or ~2,000 pc). Denis Bergeron's camera is an STL-11000M, which has a 9 micron pixel array. The array's sampling allows for images at 0.725” per pixel (binned 1x1).

From his initial G+R+Hα images, we can estimate the size of the jet structure (total length and width at half maximum).

Messier 1 Jet size	Dimension		Conversions	
	arc sec	AU	ly	pc
Major axis	78.3	≈156 000	≈2.4732	≈0.7595
Width at mid height	38.9	≈77 800	≈1.2302	≈0.3773

Table 1

For more information, we suggest you consult the following paper; "A little-known structure in the northern part of the Crab Nebula, Messier 1", in JRASC, October/ 2022, St-Onge et al. https://www.rasc.ca/sites/default/files/publications/jrasc2022-oct-lr.pdf .

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  https://www.esa.int/Space_in_Member_States/France/La_Nebuleuse_du_Crabe
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  2008 The Authors. Journal compilation © 2008 RAS
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- Virtual Telescope / Twitter Web app / 2021
  https://twitter.com/virtualtelescop/status/1362316105390374912

Morgan Arboretum

Welcome to the Morgan Arboretum!

Live, breathe, and enjoy 245 hectares of Saint-Anne-De-Bellevue forest, meadow, and wetland trails inviting you to connect with nature. Our nearly 25 kilometres of all-season paths offer you the chance to explore one of Montreal's most precious nature reserves. Come for a picnic with family or friends in summer, watch in awe at the leaves in fall, ski our groomed trails in winter, and rejoice in the new warmth of spring. Open all seasons, with activities for all ages.

The Morgan Arboretum specialises in 4 main areas; conservation, research, education and leisure. Numerous recreational programs are available for all ages, such as Shinrin Yoku (guided forest bathing), summer camp programs, ecological workshops, scavenger hunts, and holiday events! As protecting and conserving our land is at the forefront of our mission, a combination of youth educational programming and a land maintenance team ensures that our community is well taken care of. The forest also provides fantastic research space for student projects, as it provides a consistent, untouched environment for scientific study.

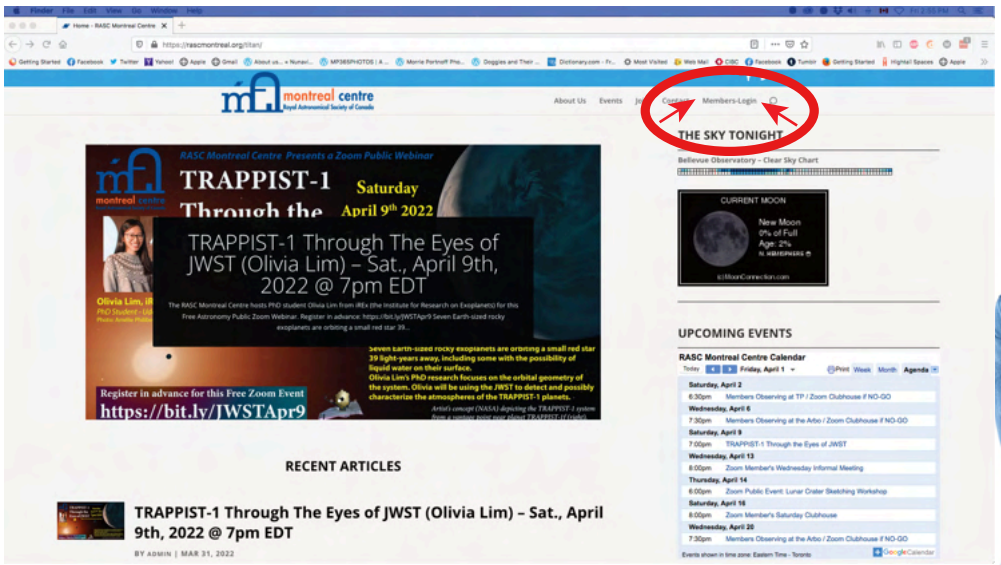
Did you know that the Arboretum is home to over 500 species of plants, animals, insects, and fungi? It is home to many unique species, such as monarch butterflies, jack-in-the-pulpit flowering plants, Cooper's hawks, and giant puffball mushrooms.

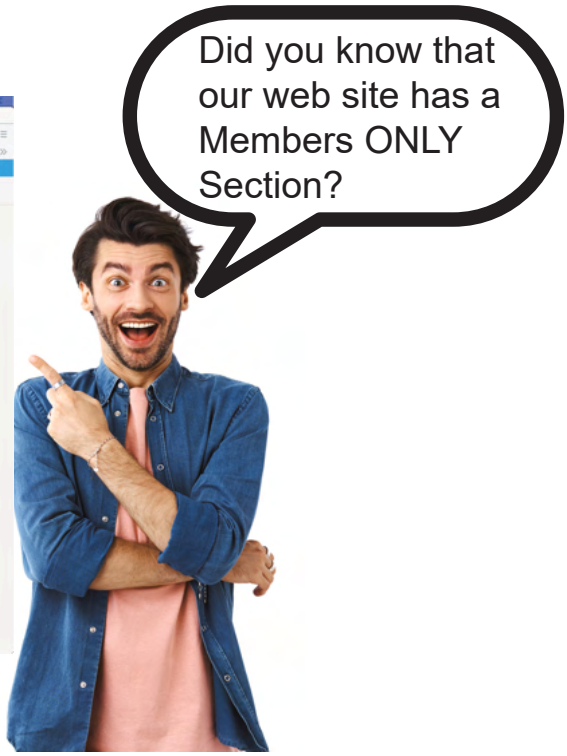
The Morgan Arboretum is open to the public and members every day of the week from 9:00 AM to 4:00 PM. Our membership program offers daily access based on a yearly fee, and is available for purchase now! To purchase a membership, please refer to our website's "membership" section below.

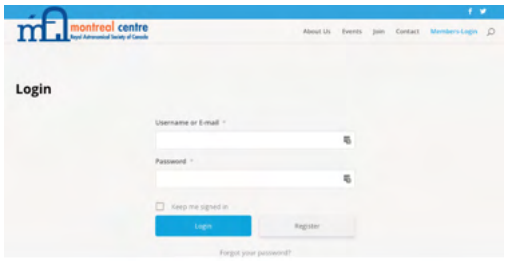
For more information, call 514-398-7811, email gatekeeper.morganarboretum@mcgill.ca, or visit our webpage at www.mcgill.ca/morganarboretum

Being a RASC Montreal Centre Member has its

ADVANTAGES







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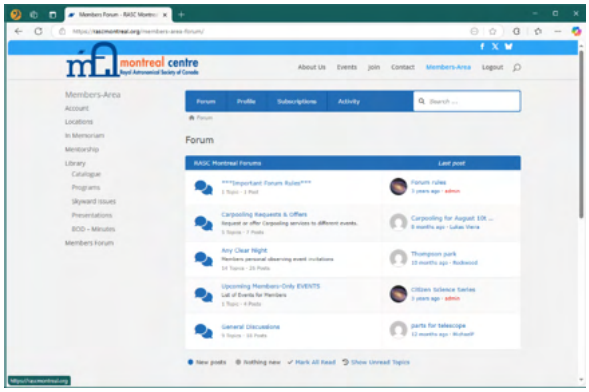

To get notifications or to notify others, you MUST subscribe!

For Sale

Sky-Watcher EvoGuide 50DX Price: $280 firm.

This one hurts a bit, but I'm putting my Sky-Watcher EvoGuide 50DX up for sale. It was my main imaging scope for a couple of years, and I managed to make some good images with it. The scope is in very good shape. There are a few signs of use on the paint.

It's a high-quality ED doublet, with what's almost certainly an FPL-53 element. The colour correction is superb. I'm selling the EvoGuide because I just don't use it much anymore, now that I have a Takahashi FS-60. The Tak has more resolution and is sharper, but I think the EvoGuide has noticeably better colour correction.

You can use this as a straight-through finder, or as a guide scope (it takes 1.25" eyepieces, but is **not** compatible with any star diagonal).

Add your own field flattener (not included), and it becomes a capable astrograph for APS-C and smaller sensors. I've included a 3D-printed clamshell from Starizona (a $39.95 USD value!) for more sturdy mounting.

Notes:

- Sky-Watcher sells a matched field-flattener[1] for this scope, but it only works with dedicated astrocams, and, having only 17.5mm of backfocus, you can't really add any filters. I recommend using the Starizona EvoFF[2] field flattener, which gives you the more standard 55mm backfocus. I like my EvoFF so much I'm keeping it to use with other scopes.
- The optics are superb, but the helical focuser is very, very quirky. It's got a lot of backlash, and is prone to tilt if you're not careful. I always got around these problems by overshooting my focus **inwards**, tightening the focus lock (don't go overboard), and then finishing the focusing stroke **outwards** so the backlash is taken up, and the tilt is countered by gravity and the focuser lock tension.
- The promotional materials state that the focal length is 242mm. Plate-solving with the EvoFF field flattener, I always got 262mm.
- The EvoGuide hardware uses metric hex bolts, but the Starizona clamshell uses 1/4-20 thread.

Contact: Khoa Tran <khoa.sus2@gmail.com>

[1] https://www.skywatcherusa.com/products/field-flattener-for-evoguide-50
[2] https://telescopescanada.ca/products/evoff-v2-field-flattener-for-skywatcher-evoguide-50ed-evoff-v2

Skywatcher Star Adventurer 2i Pro Pack Tracker

Hello, up for sale is my Skywatcher Star Adventurer 2i Pro Pack tracker. It has been my main astrophotography setup for the past 3 years. I have recently upgraded to the GTI with full equatorial capability, so all to say, my tracker isn't being used.

The SW Star Adventurer 2i is very user friendly, its lightweight and just a great grab-and-go multi-function tracker for general astronomy, astrophotography and time-lapse photography.

Specifications:

- Star Adventurer 2i multi-function equatorial tracking mount with built-in Wi-Fi control
- 11-pound payload capacity
- Ball head adapter, Dec bracket, latitude (EQ) base, and counterweight kit included
- Built-in polar scope with illuminator with LED lit polar alignment sight
- Free Star Adventurer Console control app (for iOS and Android) for imaging the night sky, landscape, and deep sky
- 3.63-pound mount head weight (with dec bracket)
- All-metal gearing
- 24 hours of continuous use with two AA batteries or limitless power via 5V mini-USB
- Built-in SNAP port for camera control
- Dual 3/8-inch thread panoramic plate with included ¼-20-inch adapter

Asking price for the tracker is 450$. This includes the Apache waterproof hard case

Tripod not included.

(Unfortunately, shipping would not be an option due to the high cost)

Thanks for your interest.

For more information, please contact me:

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