AstroNotes
Newsletter of the Ottawa Centre, RASC
Volume 62 – No.01 – January 2023

Send submissions to: astronotes@ottawa.rasc.ca .

Editor's Message

Happy New Year Ottawa Centre members. We hope 2023 finds you all healthy and happy. We aren't off to a great start on clear skies, but it is January.

This year we also have a new President, Dave Chisholm, a new Vice-President, Oscar Echererri, a new Councillor, Katie Francis and a new Public Outreach Coordinator, Asser ElGindy. Thank you all for stepping forward.

We have another big issue for you this month. My amazing Assistant Editor, Doug Fleming has once again produced an index to previous year's AstroNotes. Andrea Girones has an article on clouds on Mars and as promised last month, we have Bob Olson's fabulous article on his technique of processing Astro-images by removing the stars. And of course, we have all our regular features.

If you have any thoughts, ideas, special tips, or techniques you would like to share with your fellow Centre members, please consider putting together an article for AstroNotes. If you have sketches (we need more sketches) or photos we would love to see them. Don't be shy.

As always, stay safe and spend more time with your telescope: it gets lonely in the cold and the dark and misses you.

Clear skies and stay safe,

Gordon

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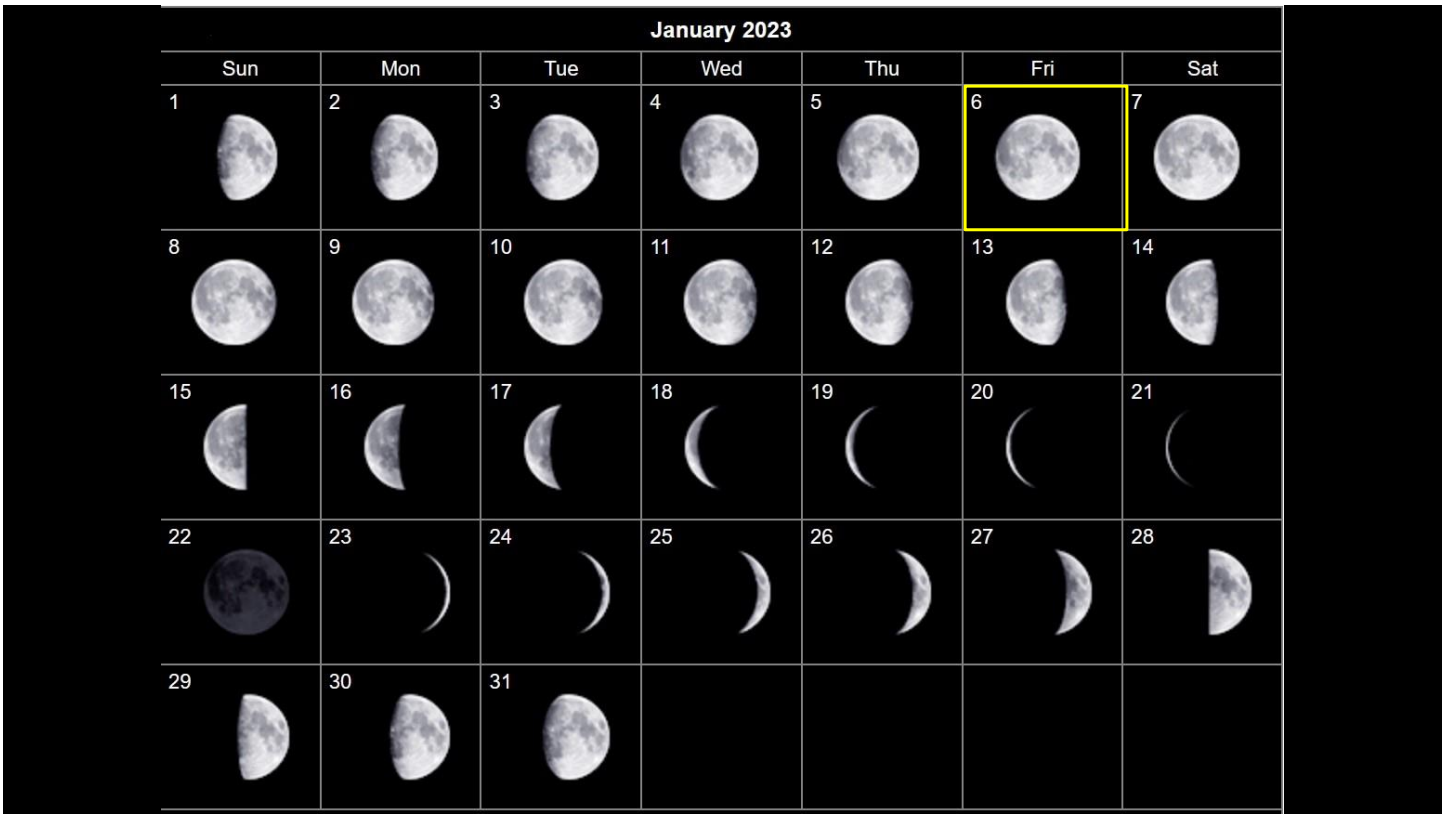
Ottawa Skies

By David Chisholm

Planet Visibility 2023

	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
January	AM (30th)	PM	PM	PM	PM	PM	PM
February	X	PM	PM	PM	PM (1-15)	PM	PM (1-15)
March	X	PM	PM	PM	X	PM	X
April	PM (11th)	PM	PM	PM (1-15)	X	PM	AM (15-30)
May	AM (29th)	PM	PM	X	AM	X	AM
June	X	PM	PM	AM	AM	AM	AM
July	X	PM	PM	AM	AM	AM	AM
August	PM (9th)	PM	PM	AM	PM	AM	PM
September	AM (2nd)	AM (15-30)	X	PM	PM	PM	AM
October	X	AM	X	PM	PM	PM	PM
November	X	AM	X	PM	PM	PM	PM
December	PM (4th)	AM	X	PM	PM	PM	PM



January 6 - Full Moon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 23:09 UTC. This full moon was known by early Native American tribes as the Wolf Moon because this was the time of year when hungry wolf packs howled outside their camps. This moon has also been known as the Old Moon and the Moon After Yule.

Quandrantids Meteor Shower – January 3/4

The Quadrantids is an above average shower, with up to 40 meteors per hour at its peak. It is thought to be produced by dust grains left behind by an extinct comet known as 2003 EH1, which was discovered in 2003. The shower runs annually from January 1-5. It peaks this year on the night of the 3rd and morning of the 4th. The thin, crescent moon will set early in the evening leaving dark skies for what should be an excellent show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Bootes but can appear anywhere in the sky.

Mercury

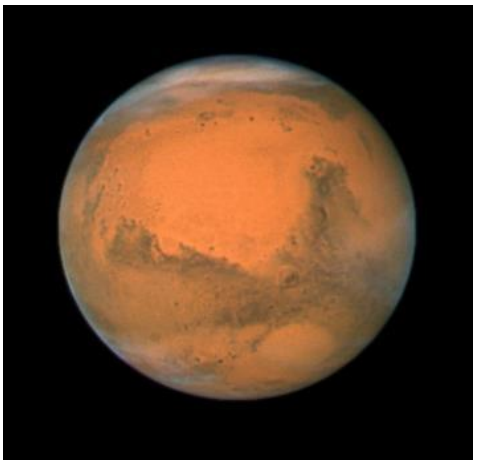
Rise/Set 08:27/17:27 -> 06:06/14:55

January 30th - Greatest Western Elongation. The planet Mercury reaches greatest western elongation of 25 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the morning sky. Look for the planet low in the eastern sky just before sunrise.

Venus

Visible in the evening.

Rise/Set 08:56/17:44 -> 16:22/15:46



Mars

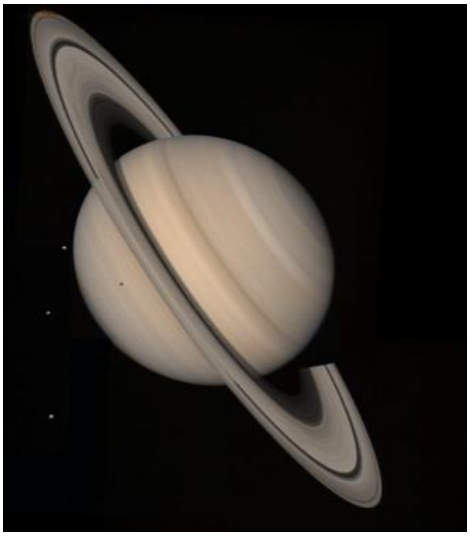
Visible in the evening.

Rise/Set 03:54/05:36 -> 12:01/03:43

Jupiter

Visible in the evening.

Rise/Set 11:27/23:19 -> 09:38/21:46

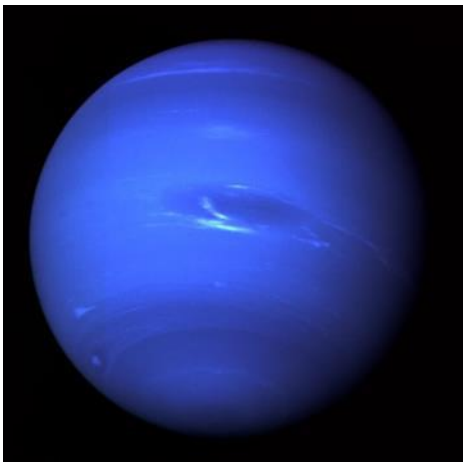


Saturn

Visible in the early evening.
Rise/Set 10:03/19:53 -> 08:13/18:13

Uranus

Visible in the evening.
Rise/Set 13:01/03:17 -> 11:02/01:18



Neptune

Visible in the evening.
Rise/Set 11:10/22:35 -> 09:13/20:41

ASTRONOTES INDEX: 2022 **(Vol.61)**

Compiled by Douglas Fleming

(01) January; (02) February; (03) March; (04) April; (05) May; (06) June; (07) July; (08) September; (09) October; (10) November; (11) December Note: No August edition

Reports and Notices

(01)
- Index for Astronotes 2021
- Mick Wilson new meeting chair; thanks to Dave Chapman

(03)
- Message from the European Astronomical Society about the scientific community in Ukraine
- Andrea Girones: Tentative dates for Public Star Parties

(07)
- Andrea Girones: Public Star Parties Back!

(09)
- The passing of Frank Bayerl

(10)
- Notice of Annual General Meeting and Elections

Announcements

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- RASC Montreal Centre Partner Outreach
  - RASC Montreal Centre Zoom Webinar with Erin Gibbons
  - The Denver Astronomical Society Youth Workshop on Alien Drawing with Taara Jaffer
  - Guelph Physics Star Gazing Guides
  - iREx (Institute for Research on Exoplanets) French ExoBites series
  - The Rio Tinto Alcan Planetarium reopens
- RASC Central
  - Celebrating Black History Month
  - Robotic Telescope Update
  - Insiders Guide to the Universe
  - SkyNews article on Exoplanet XO-3b

(03)
- Taras Rabarskyi request for binoculars and/or spotting scopes for Ukraine

(04)
- International Astronomy Day: Call for volunteers

(08)
- Rick Scholes and Paul Klauninger's update on the FLO (featuring the opening of the Rolf Meier Memorial Telescope) is on YouTube.
- Tristan Young, formerly of Focus Scientific available for tech work and repairs

(09)

- Tristan Young, formerly of Focus Scientific available for tech work and repairs

(10)

- Tristan Young, formerly of Focus Scientific available for tech work and repairs

Members in the News

(01)

- SkyNews articles
  a. Letter from Joe Holmes complementing Randy Atwood's article on Apollo 15
  b. Award to James Thompson: Follow up Lunar image
  c. Award to Andrea Girones: Best Astro image editing
- Congratulations to Curtis Breslin: RASC Explore the Universe Certificate
- Gary Boyle's appearance on Global TV Calgary about the JWST
- Excerpt from Dickenson and Dyer's *The Backyard Astronomers Guide* quoting Astronotes

(02)

- Rob Dick recognised in RASC Bulletin for his work on light pollution abatement

(03)

- Andrea Girones: Landscape (lunar eclipse and Milky Way) images published in Readers' Digest
- Andrea Girones: Composite Image of lunar eclipse published in the RASC Journal

(06)

- Chuck O'Dale published an article on meteor craters in SkyNews
- Andrea Girones and Pierre Martin both have images in the running for Picture of the Year in SkyNews

(08)

- Milky Way Image by Richard Taylor featured on the RASC Central website

(11)

- Congratulations to Dave Anderson: Messier Certificate
- Congratulations to Andrea Girones: Solar Observing Certificate
- Oscar Echeverri received an honorable mention in SkyNews for his image of the Shark Nebula

Features

(02)

- Ottawa Centre Anthem: Newtonian Rhapsody by Mick Wilson
- Auctioning off a friendship: Saying Goodbye to Focus Scientific by Paul Sadler

(03)

- Member Profile: Richard Taylor
- The El Reloj de Sol de Santo Domingo by Douglas Fleming

(04)

- Member Profile: Chris Teron

(05)

- FLO Update by Rick Scholes
- Mosquito repellent system for FLO
- Member Profile: Hugo Lama

(06)

- Member Profile: Jim Sofia

- Cassini Biography by Bob Olson

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- Member Profile: Tim Cole

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- The Bortle Scale by Paul Sadler
- A Great Night Under the Stars: Public Star Parties Back! By Andrea Girones:

(09)
- Final Carp Star Party of the Year and National Truth and Reconciliation Day by Andrea Girones:
- Volunteering at the Ottawa Centre by Gordon Webster and Mike Moghadam
- October Techie Tip: Photographing the November 8th, 2022, Lunar Eclipse by Andrea Girones
- The Very Future of Canadian Astronomy by Mick Wilson

(10)
- Historic Ottawa Centre Observatory DVD Videos by Frank Roy
- The Montjuïc Castle and then Length of the Meter by Douglas Fleming
- Member Profile: Andrea Girones

(11)
- A Review of RASC's "Observer's Handbook, 2023" by Paul Sadler

Submitted Images

(01)
- Richard Taylor: Mare Imbrium
- Richard Taylor: Lunar South Pole
- Richard Taylor: Tycho Crater
- Richard Taylor: Lacus Timoris
- Bob Olson: NGC 2403
- Bob Olson: NGC 1499
- Bob Olson/Pat Greenways: Moon & Venus
- Paul Klauninger: Comet Leonard
- Paul Klauninger: Comet Leonard Closeup
- Paul Klauninger: Orion Region
- Andrea Girones: The Cocoon Nebula in Cygnus
- Andrea Girones: The Veil Nebula
- Andrea Girones: IC342
- Andrea Girones: M33
- Andrea Girones: M78 and Barnards loop
- Tom Taylor: JWST (2)

(02)
- Jim Sofia: NGC2244 Rosette
- Jim Sofia: NGC2174 Monkey Head
- Jim Sofia: IC405 Flaming Star
- Jim Thompson: Montes Riphaeus

- Jim Thompson: IC1795 the Fish Head Nebula
- Jim Thompson: IC1805 the Heart Nebula Detail
- Jim Thompson: Barnard 33 the Horsehead Nebula
- Jim Thompson: Orion Nebula, M42 Detail
- Taras Rabarskyi: Eastern Veil/Bat Nebula
- Taras Rabarskyi: Jupiter
- Bob Olson: Orion Nebula and the Sky Glow Noise over Orlando
- Bob Olson: Camera and alligator (2)
- Paul Klauninger: Orion region in broadband colour
- Paul Klauninger: Orion region in H-alpha narrowband
- Paul Klauninger: Horsehead Nebula
- Paul Klauninger: Crab Nebula M1

(03)

- Richard Taylor: The Running Man Nebula
- Richard Taylor: Trapezium in M42
- Jim Sofia: M82
- Jim Sofia: NGC7380
- Bob Olson: Orion star trails from Orlando (3)
- Oscar Echeverri: M82
- Paul Klauninger: Cone Nebula & Christmas Tree Cluster
- Paul Klauninger: Flame & Horsehead Nebula
- Paul Klauninger: M42 & Horsehead Nebula
- Paul Klauninger: M42 & Running Man Nebula
- Paul Klauninger: M45 The Pleiades
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- Paul Klauninger: Sirius
- Paul Klauninger: The Witch Head Nebula

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- Bob Olson: Moon Laying Down, Orlando
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- Richard Taylor: Whale Galaxy and Hockey Stick Galaxy
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- Paul Klauninger: M96
- Paul Klauninger: M105, NGC3384 and NGC3389

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- Oscar Echeverri: M101

- Oscar Echeverri: M100
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- Oscar Echeverri: M96
- Howard Simkover: "Parade of Planets" from Sandy Hill
- Howard Simkover: Mercury and the Pleiades
- Richard Taylor: Sinus Iridum
- Richard Taylor: M98
- Richard Taylor: NGC4312 and M100 (2)
- Richard Taylor IC3355 and M86 (2)
- Andrea Girones: Orion's belt
- Andrea Girones: Zodiacal light
- Andrea Girones: NGC5033
- Bob Olson: M98
- Bob Olson: NGC4312 (2)
- Bob Olson: M100
- Bob Olson: M57
- Pierre Martin: 200 Geminid meteors
- Pierre Martin: 98 Geminid meteors
- Paul Klauninger: Markarian's Chain
- Paul Klauninger: Sinus Iridum (2)
- Paul Klauninger: Venus-Jupiter conjunction
- Paul Comision: M98 by submitted by Paul Klauninger
- Mick Wilson: Star Link Rising

(06)

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- Oscar Echeverri: Total Lunar Eclipse
- Oscar Echeverri: Total Lunar Eclipse Occultation
- Oscar Echeverri: Markarian's Chain
- Oscar Echeverri: Eyes Galaxies
- Oscar Echeverri: M51
- Oscar Echeverri: Leo Quartet
- Howard Simkover: Jupiter and Mars (3)
- Richard Taylor: Crater Maginus (2)
- Richard Taylor: Lunar Eclipse single
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- Richard Taylor: NGC4651
- Richard Taylor: NGC4565
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- Paul Klauninger: Total lunar eclipse with drone trail
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- Paul Klauninger: The Eyes NGC 4435 & 4438

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- Oscar Echeverri: The Lost Galaxy of Copeland
- Oscar Echeverri: Lunar Eclipse – Drone

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- Richard Taylor: Hercules Star Cluster
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- Richard Taylor: M106
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- Andrea Girones: Orion's Belt
- Andrea Girones: Zodiacal Light
- Andrea Girones: NGC5033
- Andrea Girones: 290 combo solar
- Andrea Girones: Sunspot 3046
- Andrea Girones: Milky Way with Lunar eclipse
- Andrea Girones: The Milky Way

(08)

- Oscar Echeverri: NGC6946
- Richard Taylor: North American and Pelican (2)
- Richard Taylor: Trifid
- Richard Taylor: Lagoon
- Richard Taylor: Pluto
- Richard Taylor: Bullialdus
- Richard Taylor: Jupiter
- Richard Taylor: Saturn
- Bob Olson: Abell 2199 (2)
- Bob Olson: IC4954 (3)
- Bob Olson: Cave Nebula
- Bob Olson: M31
- Bob Olson: Wizard Nebula
- Andrea Girones: Starfest
- Andrea Girones: Saturn
- Andrea Girones: Jupiter

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- Richard Taylor: M16
- Richard Taylor: M8
- Richard Taylor: M33
- Richard Taylor: Barnard's E
- Richard Taylor: Jupiter and Io
- Richard Taylor: Baader Solar Filter
- Richard Taylor: Sunspots (2)
- Oscar Echeverri: The Cocoon Nebula
  Oscar Echeverri: NGC660
- Oscar Echeverri: The Wizard Nebula
- Oscar Echeverri: Stephan's Quintet, NGC7331, & The Deer Lick Group (3)
- Andrea Girones: The Sun in H Alpha

- Andrea Girones: Elephant Trunk Nebula
- Paul Klauninger: Aurora-1 2022-10-02 (3)
- Paul Klauninger: Jupiter (2)

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- Richard Taylor: The Pac Man Nebula
- Richard Taylor: IC59 & IC63
- Richard Taylor: NGC 404
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- Richard Taylor: Mare Anguis
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- Oscar Echeverri: Mirach's Ghost
- Oscar Echeverri: The Pac Man Nebula
- Oscar Echeverri: The Ghost of Cassiopeia
- Oscar Echeverri: The Dark Shark Nebula
- Andrea Girones: The Sun in H alpha with the LUNT 40mm scope
- Andrea Girones: The heart and Soul nebulae in Perseus
- Andrea Girones: The M class flare of September 30th
- Paul Klauninger: M31
- Paul Klauninger: Triangulum Galaxy
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- Paul Klauninger: Running Man Nebula
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- Jim Sofia: Mars
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- Bob Olson: B175
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- Bob Olson: NGC281
- Bob Olson: NGC404 (2)
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- Richard Taylor: NGC7814
- Richard Taylor: NGC520
- Richard Taylor: M33 (2)
- Richard Taylor: Mars
- Oscar Echeverri: NGC7635
- Oscar Echeverri: M2
- Oscar Echeverri: M15
- Oscar Echeverri: NGC7814

- Andrea Girones: Mars
- Andrea Girones: The Heart and Soul nebula
- Andrea Girones: M45
- Brian McCullough: Mars
- Brian McCullough: Mars through Trees
- Brian McCullough: Sunlight phenomena (4)
- Paul Klauninger: Lunar Eclipse (3)
- Paul Klauninger: Moon with iridescent cloud halo
- Paul Klauninger: Cryovolcanic eruption on Comet 29P Schwassmann-Wachmann
- Bob Olson: Comparing images of Crab Nebula with Tony Peterson (8)
- Bob Olson: Converting pixel speeds
- Bob Olson: Pulsar

Regular Departments

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• Ottawa Skies: Dave Chisholm
• Monthly Challenge Objects: Oscar Echeverri
• Estelle's Pick of the Month from the Stan Mott Library (closed due to COVID)
• FLO Star Party Dates: Gordon Webster
• Carp Star Parties
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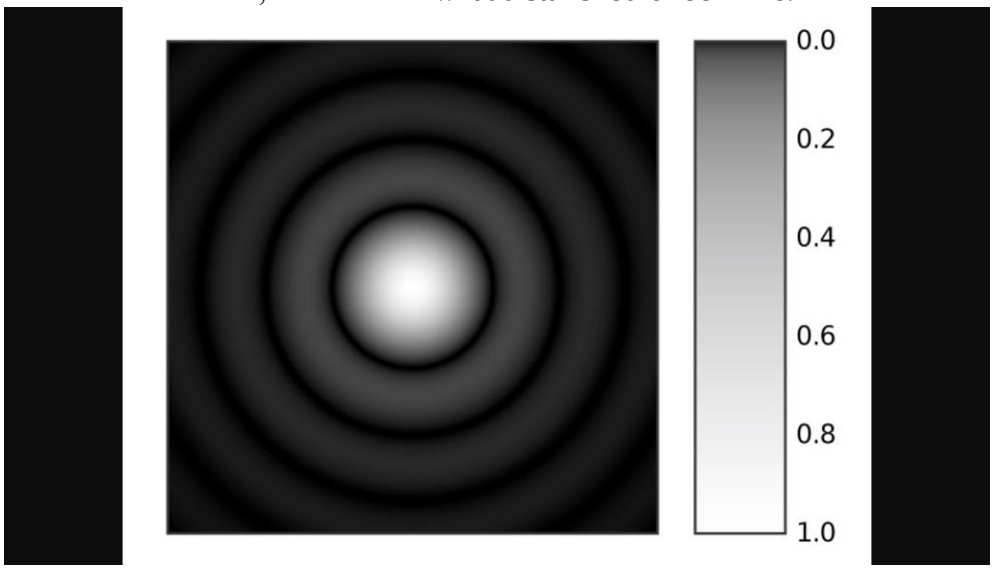
Processing Images Without Stars

by Bob Olson

When I first started to image, I made a philosophical decision to do the same thing to every part of my image. This was a desire to keep the image as true to the original object as possible. This was probably a subconscious decision based on my scientific background. Thus, I had an aversion to things like masks and weird colour adjustments. But this is in fact nonsense as all my images fall into the category of pretty pictures rather than scientific research. So recently I have started playing a little loose with my imaging philosophy.

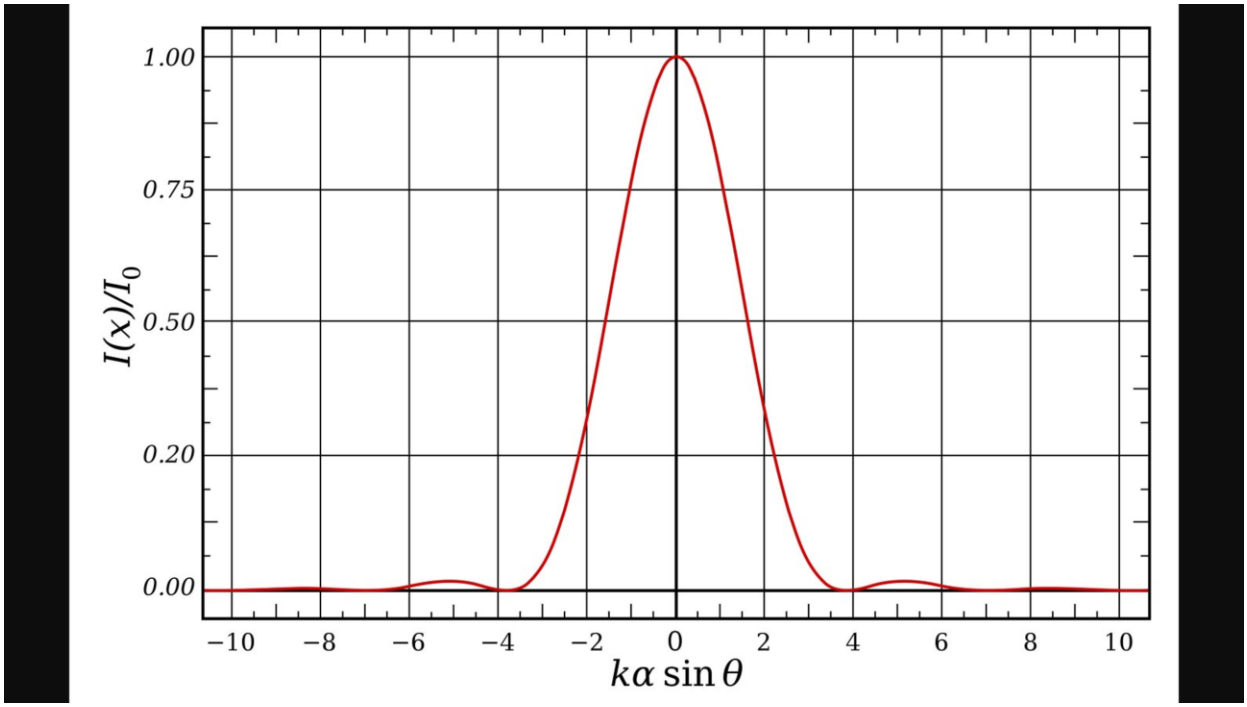
All of us want tight small stars. This is a sign that you are in control of your equipment and processing. Sometimes knowing the cause of a problem can suggest a solution. So, let's look at some causes of large stars in your image

First, let's look at what a star should look like.



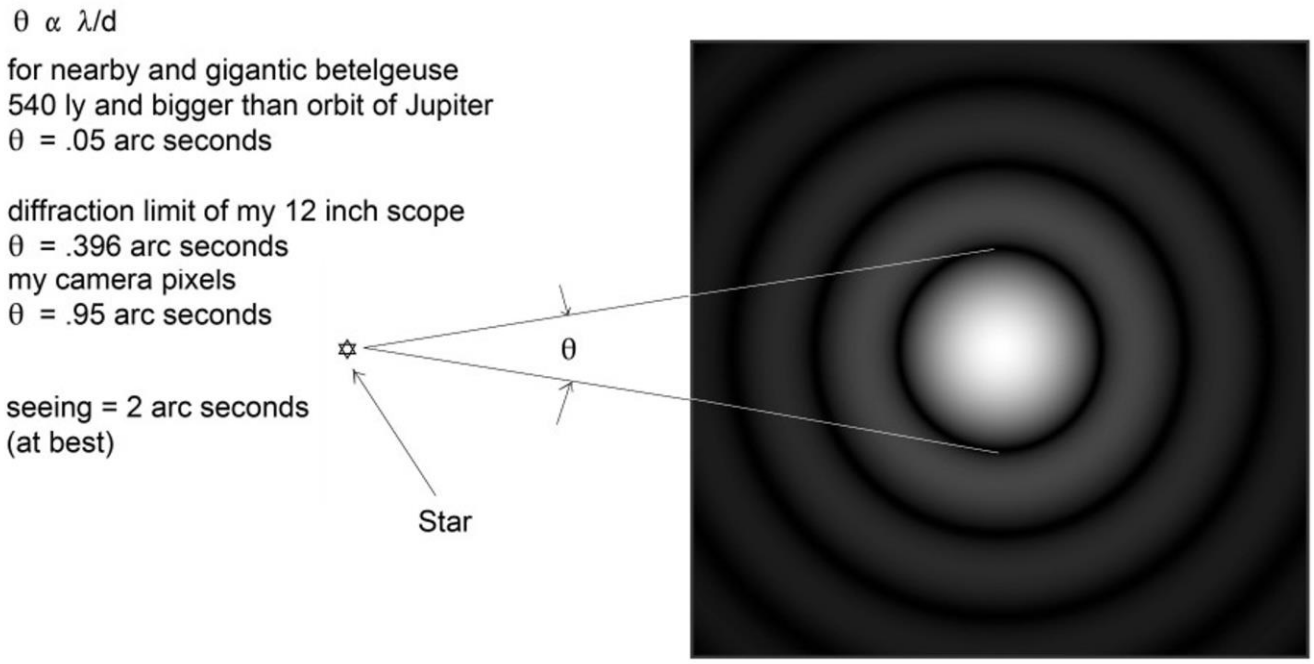
This image is a theoretical, computer-generated image of a star. You can see the central maximum spot surrounded by fainter diffraction rings. If your optics were perfect, and you were imaging in outer space with no air this is what your star images would look like.

A graph of this image would look like this. If you look carefully at the first diffraction ring you can see that it might be brighter than what you are trying to image.



How would this image be affected by our imaging equipment. Let's use my 12-inch Newtonian reflector as an example.

Theta is the angle from the edges of the central spot to the star that you are imaging. Choosing a gigantic and nearby star, Betelgeuse, we find that angle to be 1/20 of an arc second.

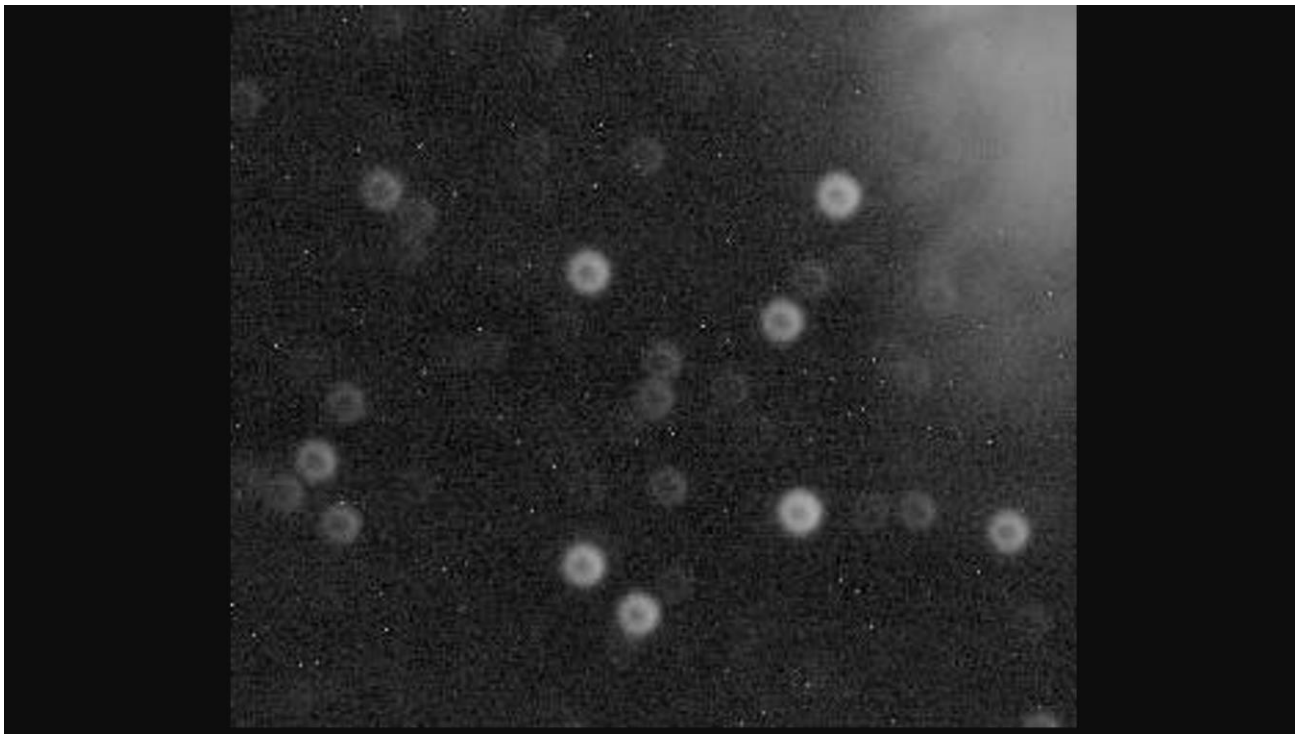


Theta is proportional to the frequency of the light and inversely proportional to the diameter of the mirror. On my scope that makes it 0.396 arc seconds. This is eight times larger than the diffraction spot of Betelgeuse. It becomes worse when you realize that the pixels of my camera are .95 arc seconds which is 20 times larger than Betelgeuse.
But we are not done yet! In my area the seeing is 2 arc seconds at best and usually closer to three arc seconds which is 40 times bigger than the diffraction spot of Betelgeuse. So, a star which should easily fit in one pixel will cover at least 4, and probably 9 pixels, if everything else is perfect.

What can we learn from this? First, get a bigger telescope. Say, 10 m across. Second, get out of the air. Maybe go to the top of the mountain. It seems that the professional astronomers are aware of this formula.

Before you start working at getting smaller stars using image processing make sure that your stars aren't big because your scope is not focused properly.

This was a photo of the crab nebula taken in OIII light. I forgot that I had a filter in the optical path, so my image is wildly out of focus.

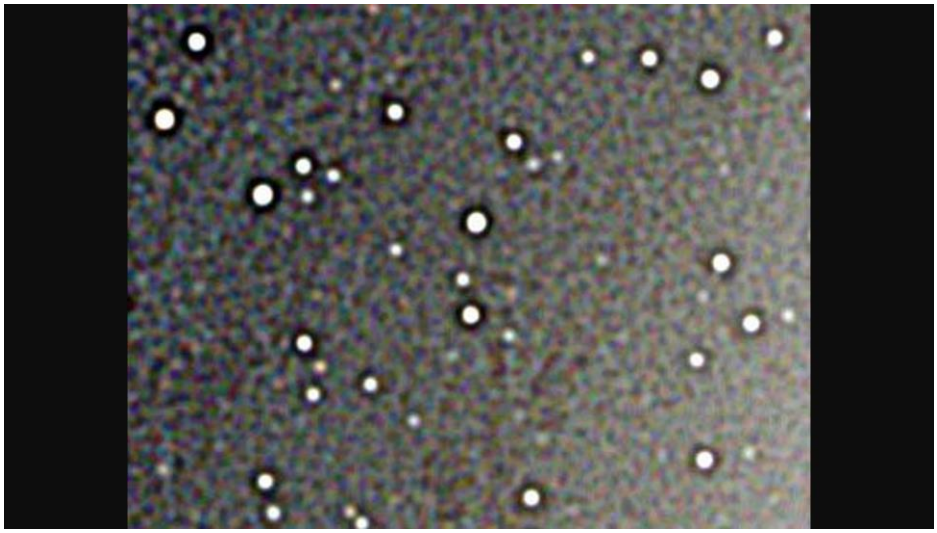


This is a magnified view of some of those stars. I use a reflecting telescope, so it has a secondary. The shadow of this secondary shows up if the scope is badly out of focus.

This is a crop of one of my Andromeda Galaxy images. It is some what soft. The focus might not be quite right or possibly the seeing was bad.

It is very tempting to head to the sharpening button to reduce star sizes. Most of these, like unsharp masking, enhance the edges. When an edge looks fuzzy to the program, it steals some of the grey, and puts it in the bright or dark, which ever makes the edge look more distinct.

This is what the picture would look like if you used an insane amount of unsharp mask. You can see that not only has it sharpened stars, but it has also sharpened the noise and the picture looks terrible.



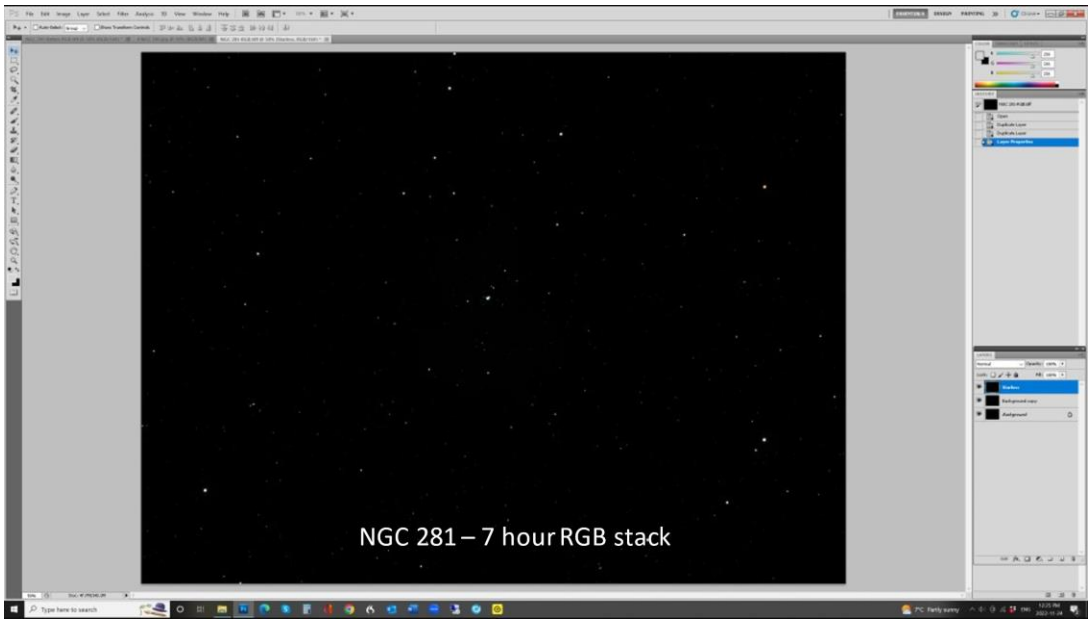
Here is a close-up of that sharpened image. This can produce a sharp-edged star which does not look real. This can also produce rings around the stars. So instead of a large star you have an unattractive star. I don't find this a big improvement.

If you Google "reducing star sizes in images" you will find all kinds of instructions for the various image processing programs. I use Photoshop and do have a set of instructions for Photoshop. The steps are onerous at best, and the results are mediocre.

There are also add-on programs for almost all astronomical processing programs. Many of these work very well.

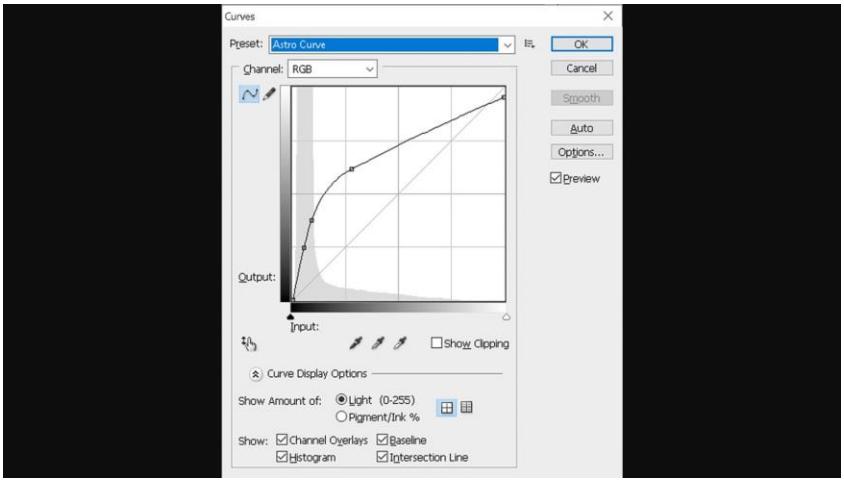
But today I'm going to talk about an entirely different way of approaching star reduction and that is processing the background and the stars separately.

This idea has been around a long time, but it is only recently that the computing power and programming knowledge has been aimed at this problem. The first time I became aware of this technique was in the processing of comet pictures where the comet moves relative to the background stars. You could get a much more pleasing picture if you processed the stars from only one image and combined it with the stack of just comet pictures. In the beginning this was done manually which was painstakingly slow. Eventually, some programs were developed that could do it automatically although not well. With the advent of artificial intelligence there are now several programs that do this and do it very well.



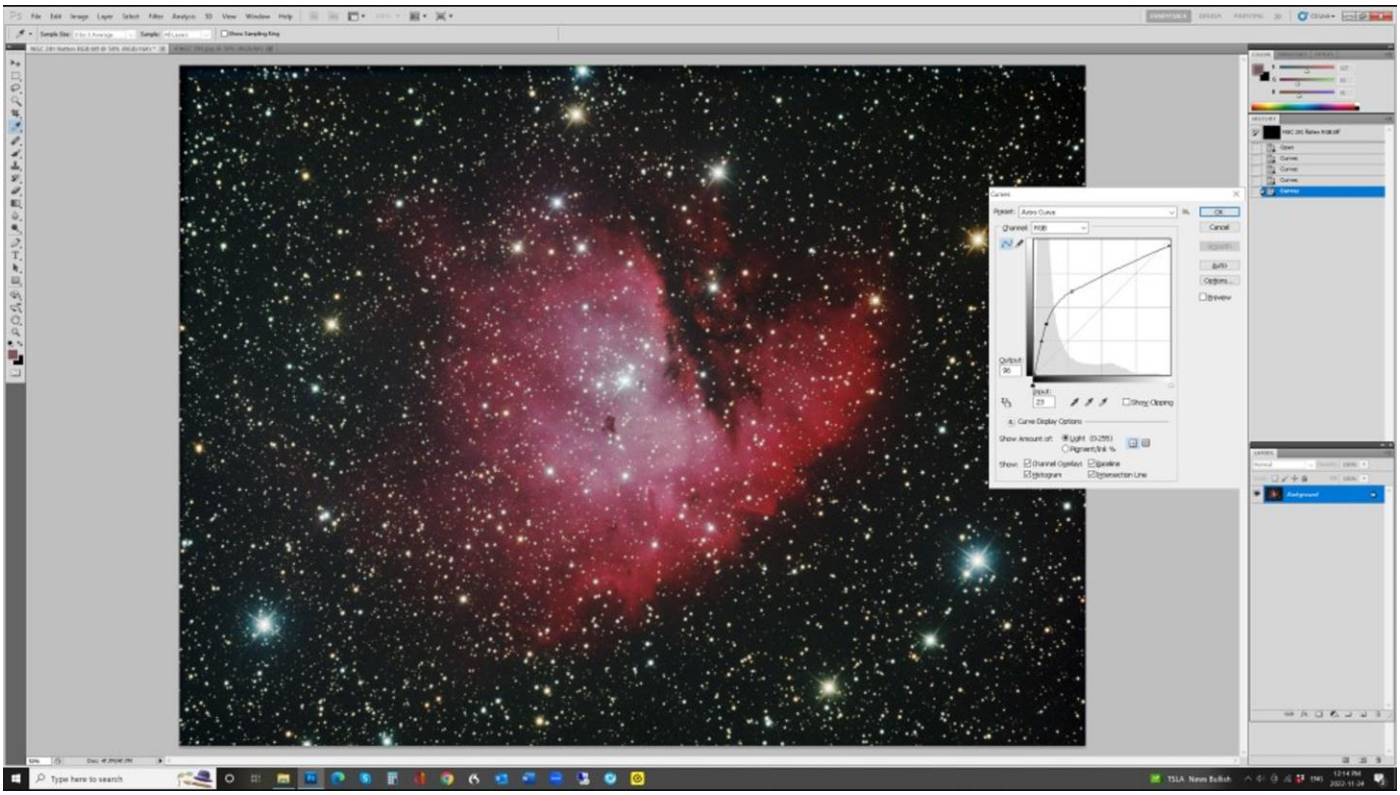
Here is the unprocessed stack of images that produced the image in the last slide.

When an image comes out of the camera and you look at it without stretching it, all that you will see are a few of the brighter stars. Even if you stack tons of individual images, all you will see are the stars. To see the fainter stuff the image must be stretched.



Every astronomical imaging program has some method of stretching an image so that the dim parts look brighter. Curves is the process used by Photoshop which is the program I use.

The bottom axis in this graph is the brightness of the pixels from dark on the left to white on the right. The left vertical axis is the brightness of the pixels after the curve is applied. If you leave the curve as the faint diagonal line from corner to corner, no change in the image occurs. If you pull the line up, the image gets brighter. If you pull the line down the image gets darker. You can selectively increase the brightness of just the dim parts or just the bright parts or all of the image depending on the shape of the curve. The example shown here selectively brightens the dim parts more than the bright parts. I have saved this curve under the name "Astro curve".

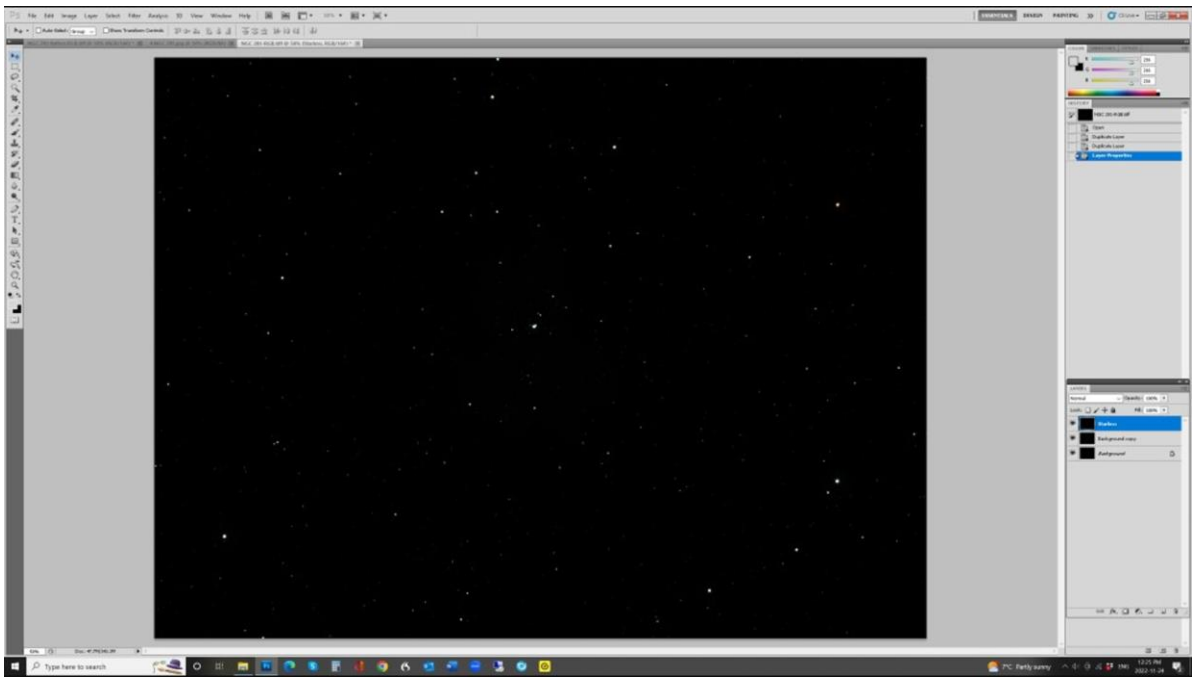


Here is the image after I have applied this curve. I achieve more control by applying a less severe curve several times until I reach the brightness that I wish. In this case the curve was applied three times.

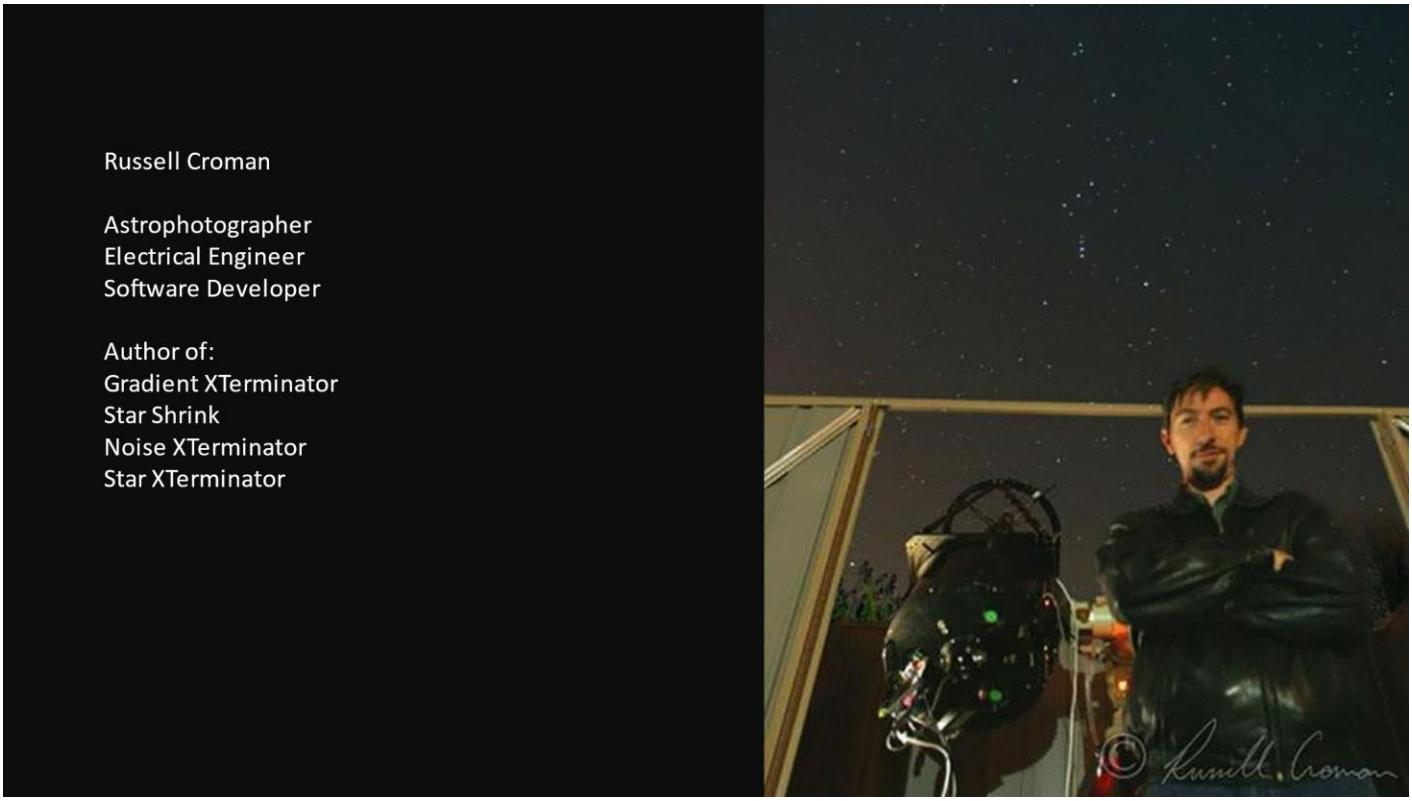
Unfortunately, when you stretch the faint stuff, the stars are also stretched. Some of those faint diffraction rings that we talked about earlier start to show up in the image. They might even be brighter than the object you are trying to image. The trick is how to stretch the faint stuff without making the stars brighter.

Notice that the grey histogram part of the graph is moving to the right as we stretch the image. This is exactly what we want. We want stuff that we are interested in to be in the mid-range of brightness.

But as we do this the stars are also getting brighter and bigger. This is clearly shown when we compare the correctly processed image on the left with the stretched only image on the right.

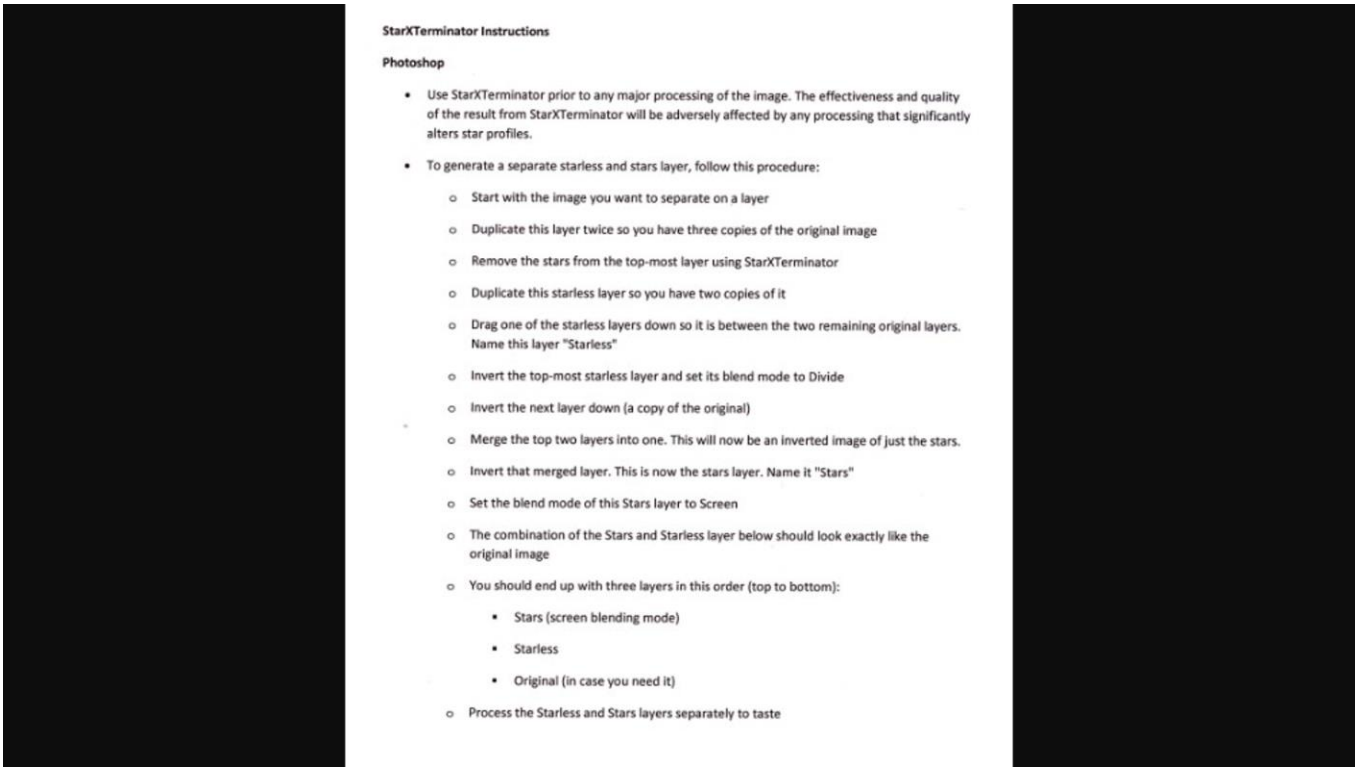


Here is the original image again. Let's try and keep the stars this size if we can.
The obvious solution to this is to remove the stars from the image before we stretch it.



For many years now I have used GradientXTerminator written by Russell Croman. He recently developed a program that he calls StarXterminator. This program will eliminate the stars in almost any image. It uses artificial intelligence and now is in version 2. It is available as a Photoshop plug-in and as an add-on to PixInsight. Since I use Photoshop in my image processing, I bought that version. It is about $80 Canadian for either version. I must give a recommendation here for PixInsight. Most imagers have switched from Photoshop to PixInsight as it is better suited to astronomical images than Photoshop and probably more powerful. I have stuck with Photoshop because I am too lazy to learn a new program. PixInsight is available for about $320. You can no longer buy Photoshop but must rent it for about $25 a month. I am the owner of an old version.

I must be clear that there are many image processing programs besides Photoshop and PixInsight. Many are cheaper and even free so if you are just starting off look around. There are also other programs besides StarXterminator that may also be cheaper and may be even better. I am only describing the programs with which I am familiar.



StarXTerminator Instructions

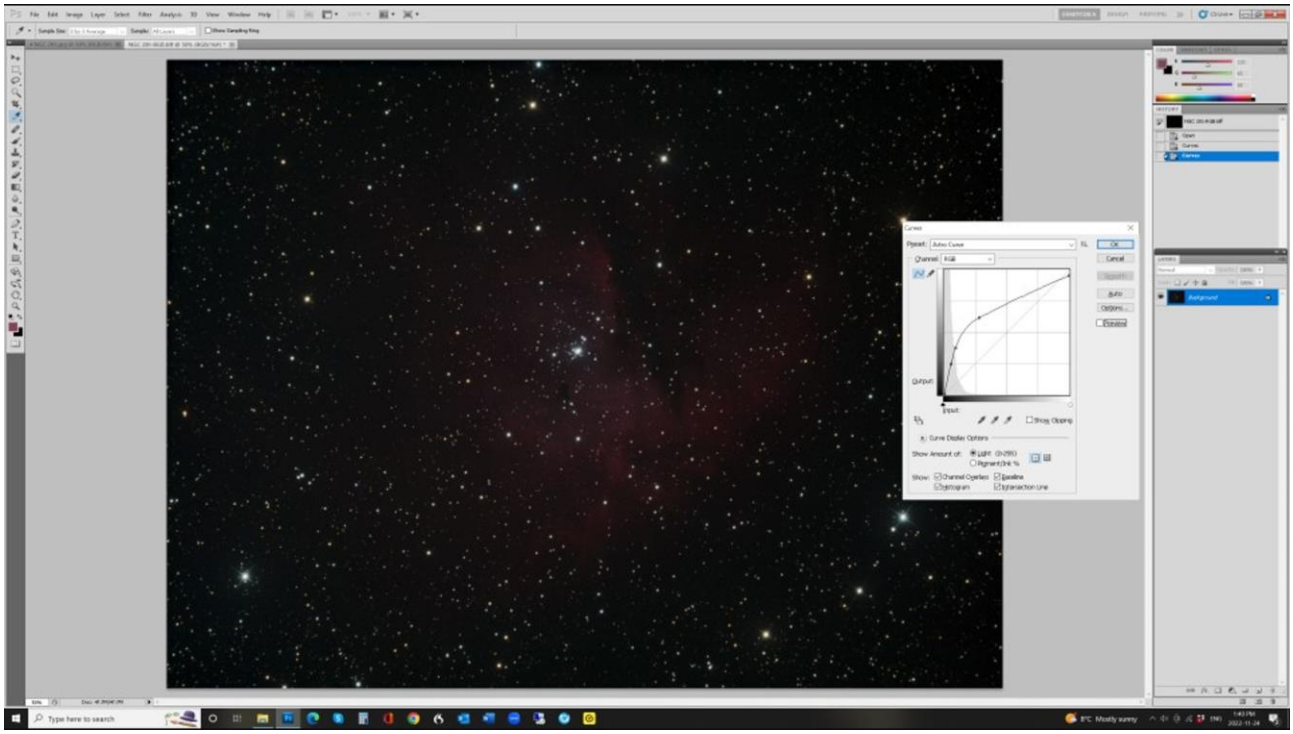
Photoshop

- Use StarXTerminator prior to any major processing of the image. The effectiveness and quality of the result from StarXTerminator will be adversely affected by any processing that significantly alters star profiles.
- To generate a separate starless and stars layer, follow this procedure:
  - Start with the image you want to separate on a layer
  - Duplicate this layer twice so you have three copies of the original image
  - Remove the stars from the top-most layer using StarXTerminator
  - Duplicate this starless layer so you have two copies of it
  - Drag one of the starless layers down so it is between the two remaining original layers. Name this layer "Starless"
  - Invert the top-most starless layer and set its blend mode to Divide
  - Invert the next layer down (a copy of the original)
  - Merge the top two layers into one. This will now be an inverted image of just the stars.
  - Invert that merged layer. This is now the stars layer. Name it "Stars"
  - Set the blend mode of this Stars layer to Screen
  - The combination of the Stars and Starless layer below should look exactly like the original image
  - You should end up with three layers in this order (top to bottom):
    - Stars (screen blending mode)
    - Starless
    - Original (in case you need it)
  - Process the Starless and Stars layers separately to taste

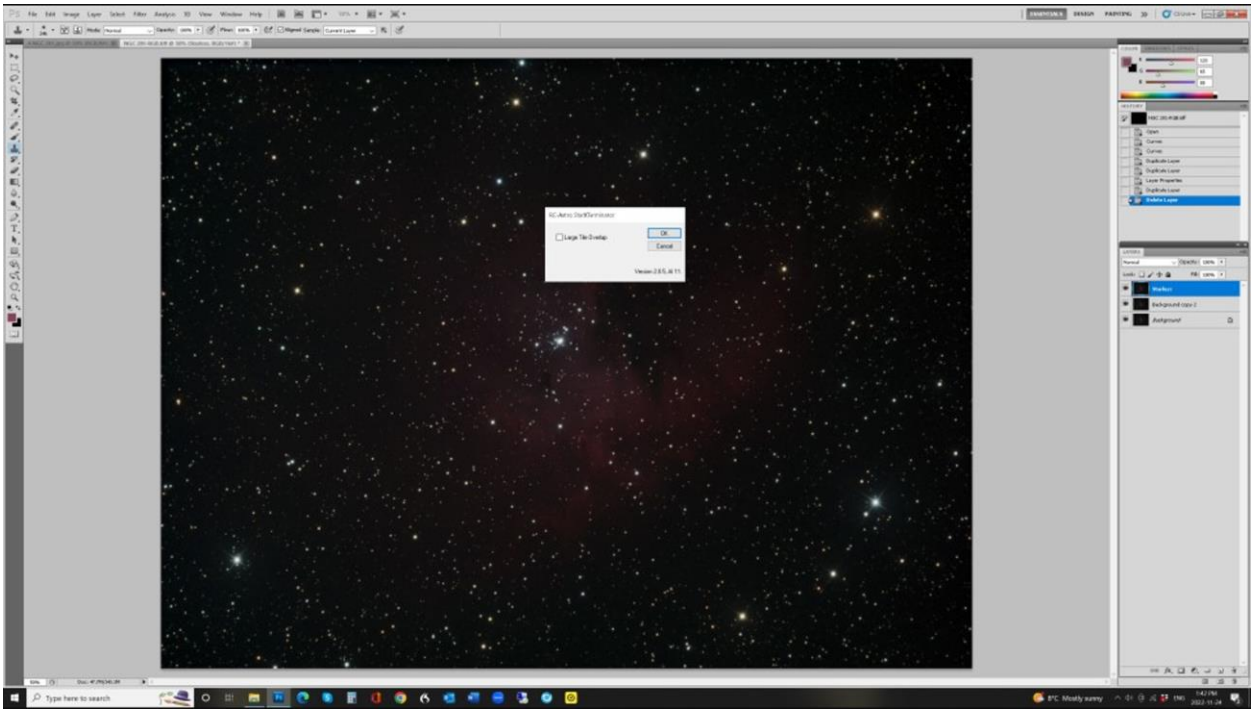
When you read the instructions from Russell Croman, he suggests removing the stars before you do any image processing. That is processing after calibration.

If you look at the second last instruction you will see that you will end up with three layers in Photoshop. The stars, a starless layer, and the original image in case you screw up.

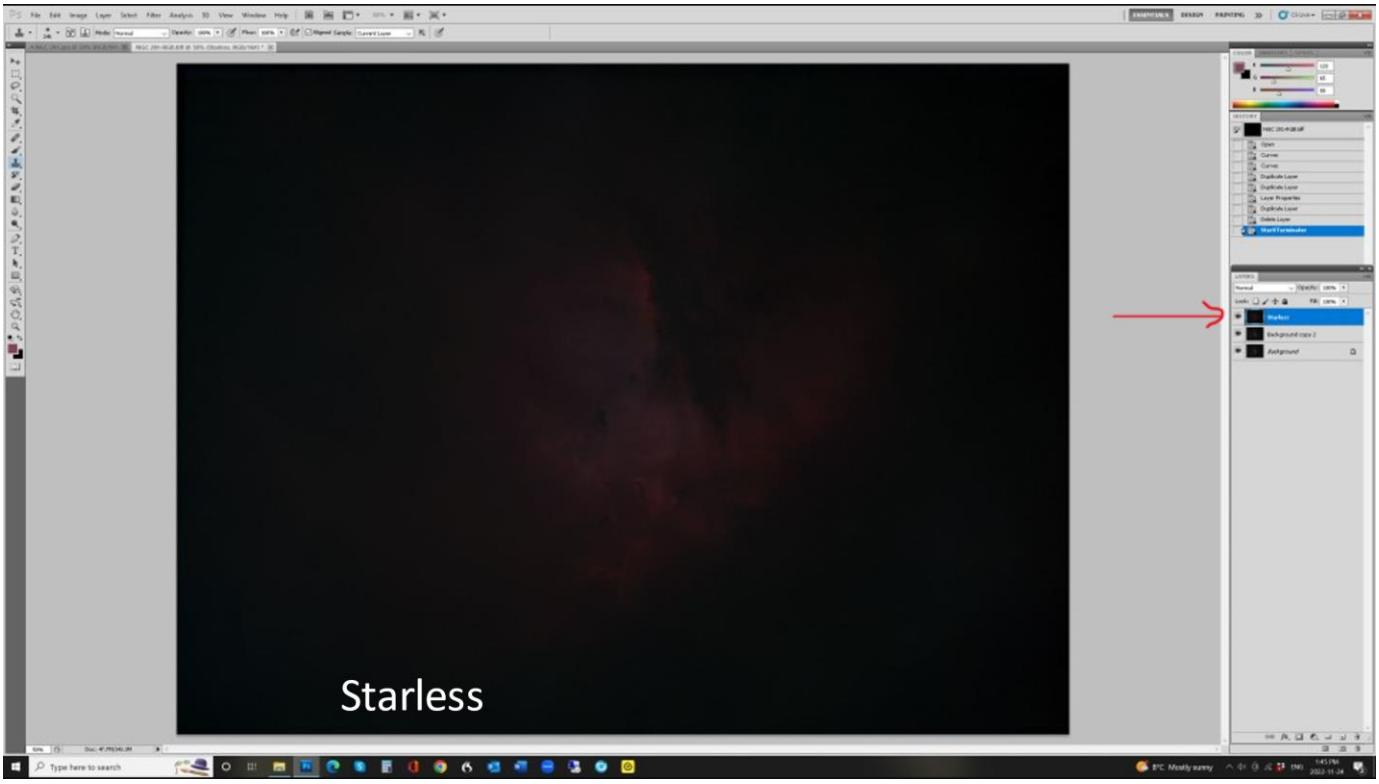
He then suggests that you process the starless and stars layer separately to taste. I think the operative phrase here is “to taste”.



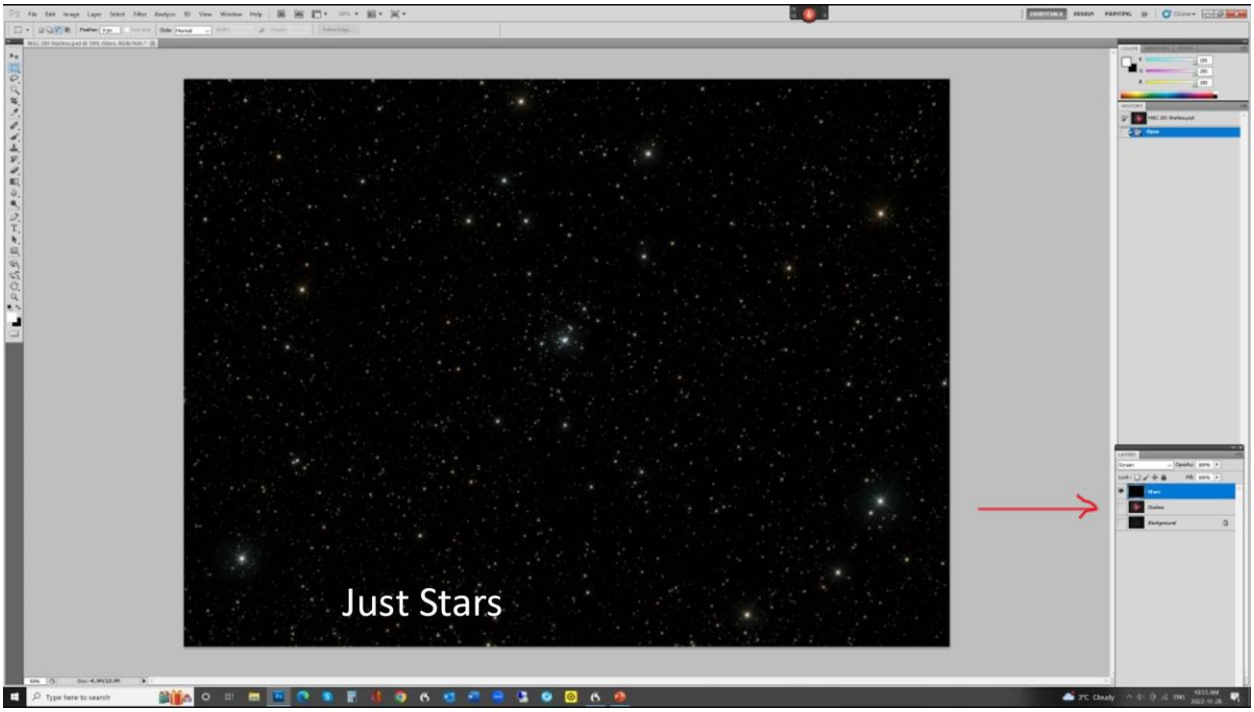
Against Russell's suggestion I do a preliminary stretch on an image and quit when the stars are about as bright as I want them. I must admit that I have not experimented with doing it his way. It is always risky doing something contrary to what the author of the program suggests, so be advised, read the instructions, and proceed accordingly.
The faint background is still too faint.



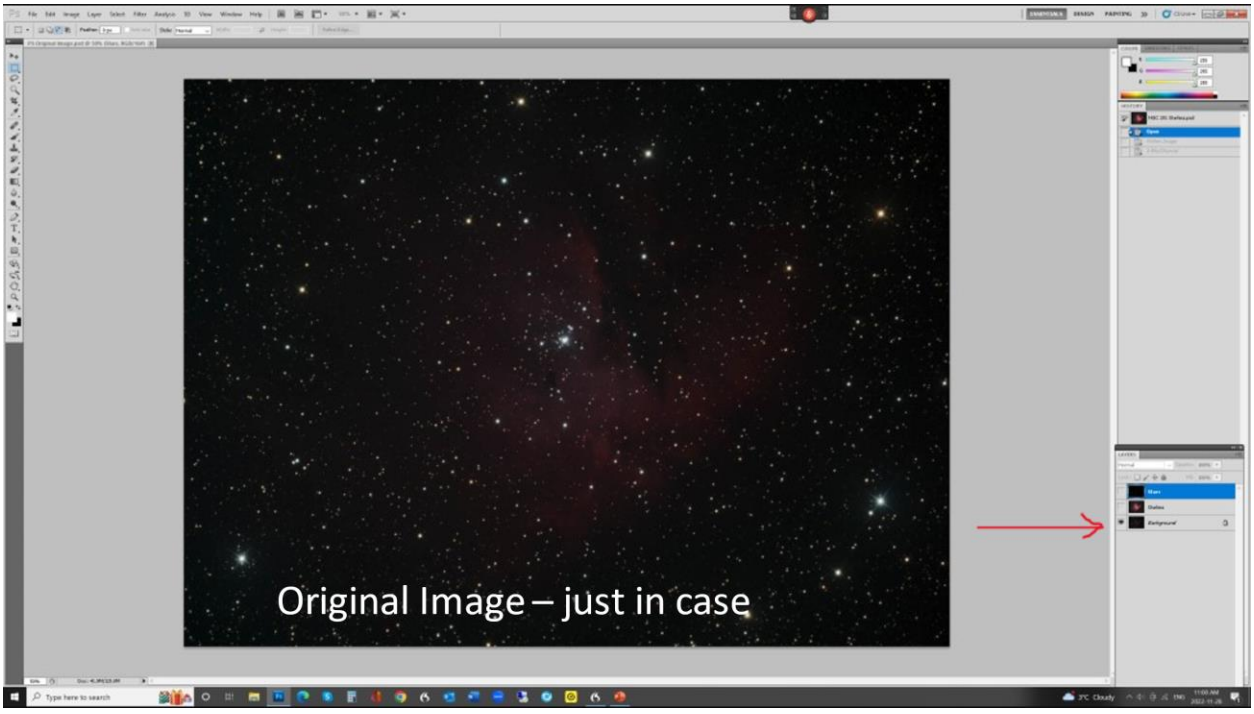
Here is the opening dialogue box for StarXTerminator. As you can see, you don't get a lot of options. I have never checked the "Large Tile Overlap" box but have read that it slows the processing down. When you click the OK button, the program takes over and removes the stars. Depending on your image size and complexity, and the power of your computer, this can take a bit of time. Several minutes of processing is apparently not uncommon. But compared to the hours it takes to manually remove stars it is a monstrous improvement.



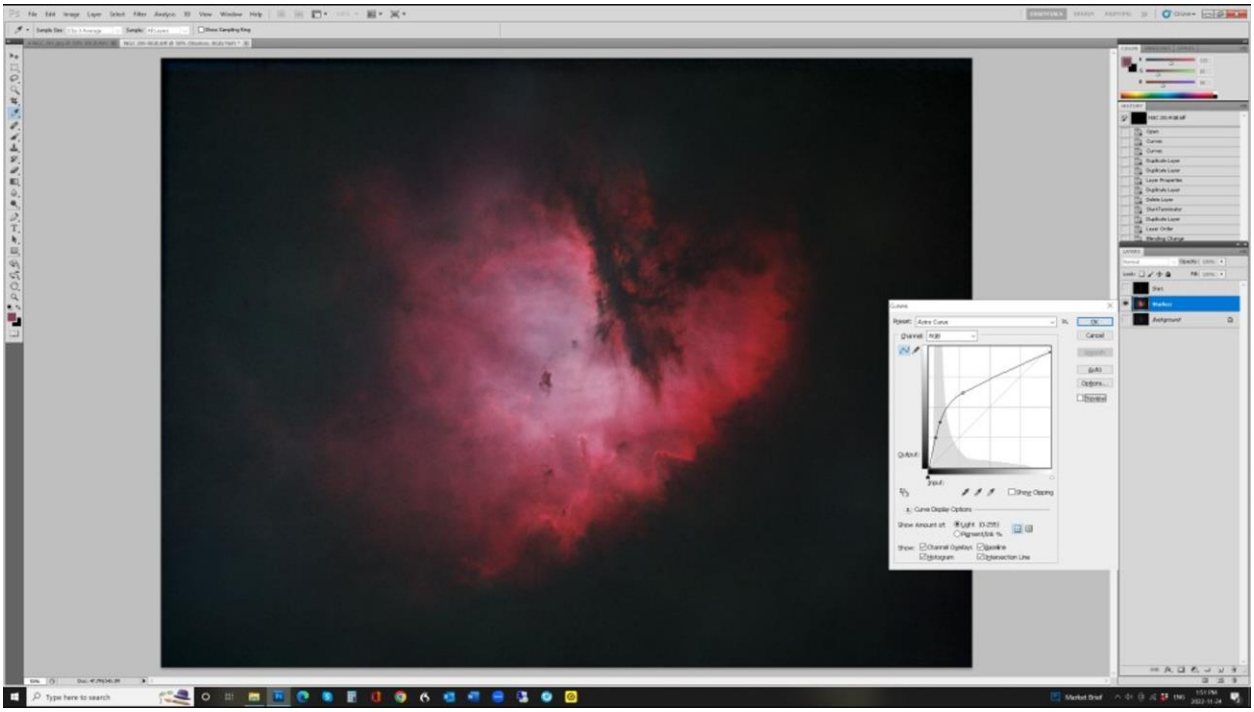
You are left with this layer completely void of stars. The red arrow is showing the Photoshop layer.



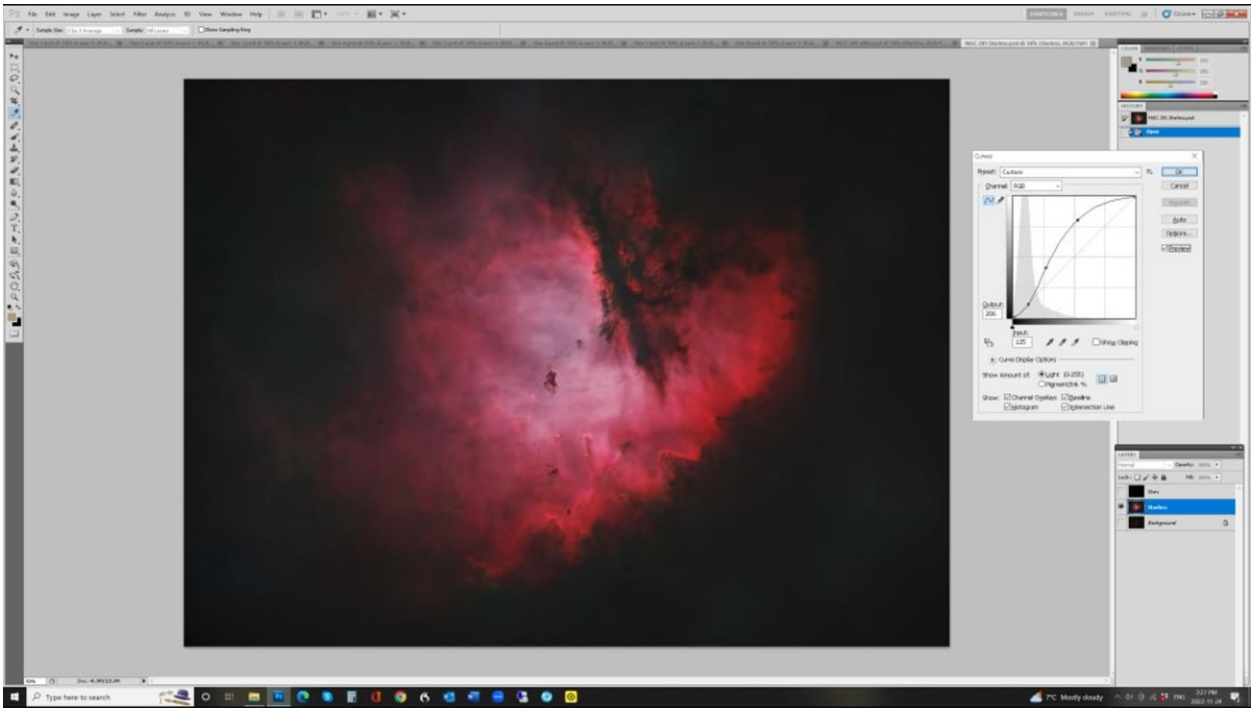
This is the layer of just the stars. You get it by following the instructions. The basic idea is to subtract the starless image from the original leaving just the stars.



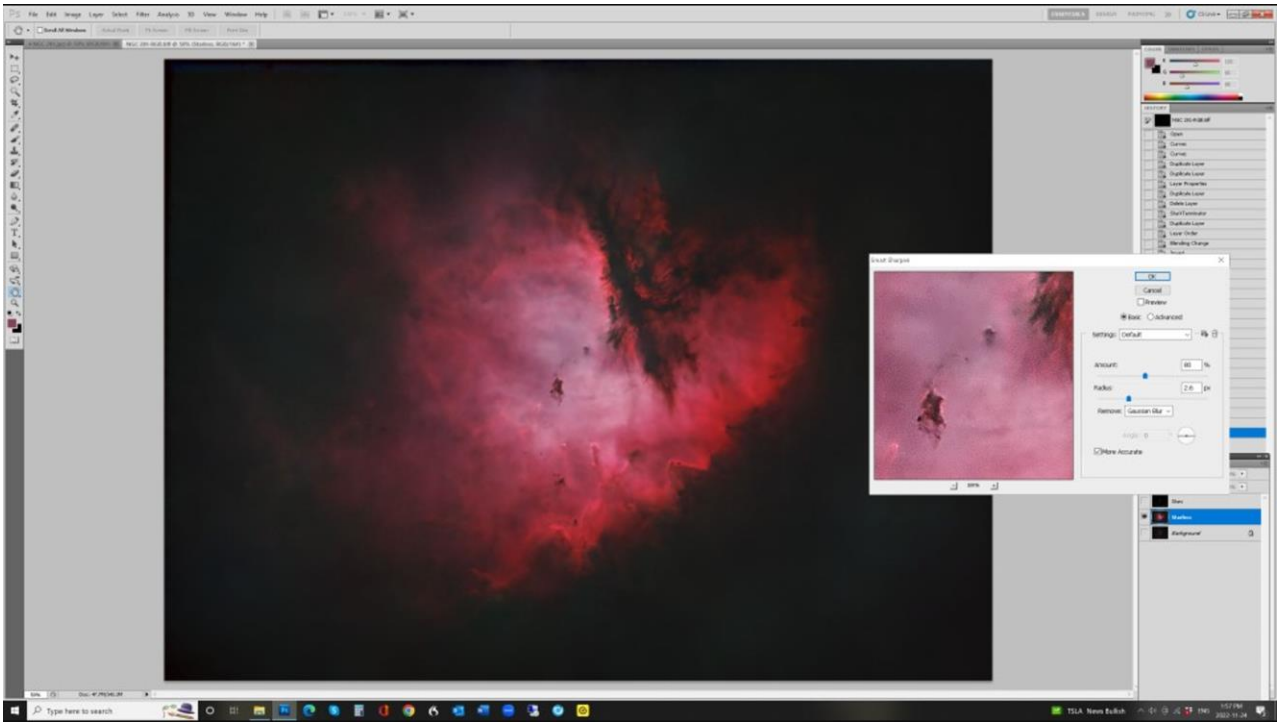
The bottom layer is the original image which hopefully you will not need.



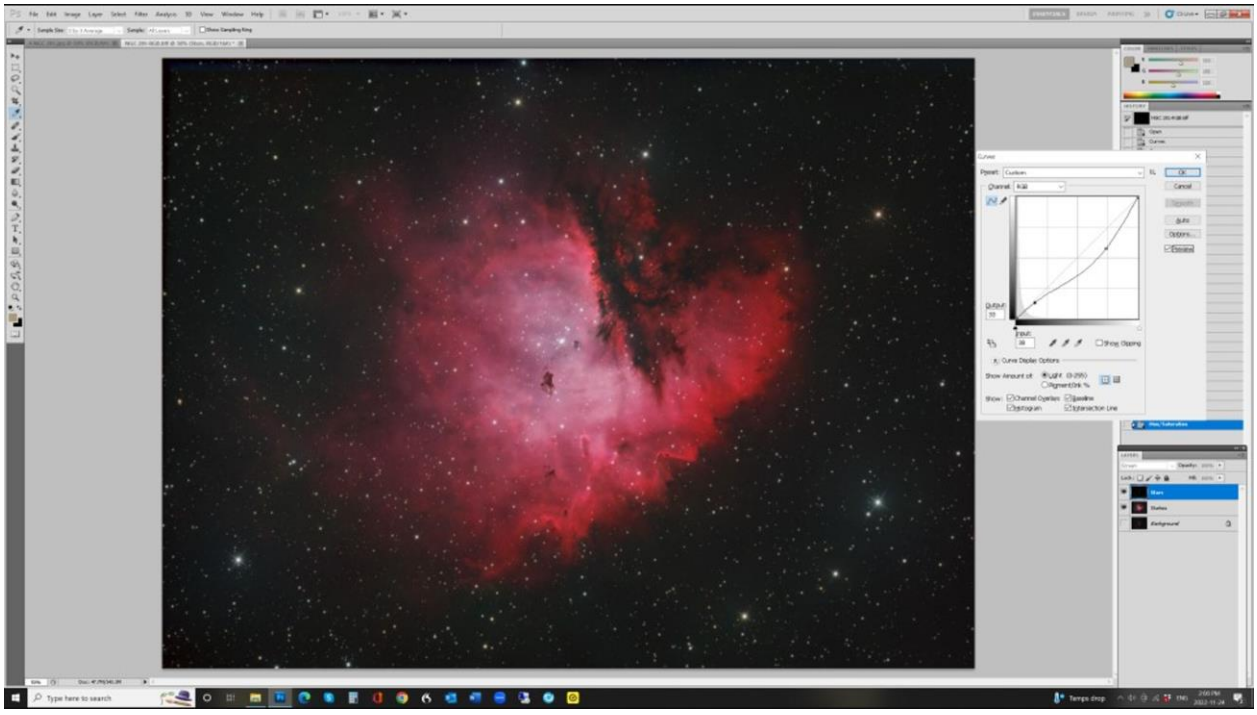
I am back on the starless layer. I can now stretch it to suit my taste without any fear of also stretching the stars, as they are gone.



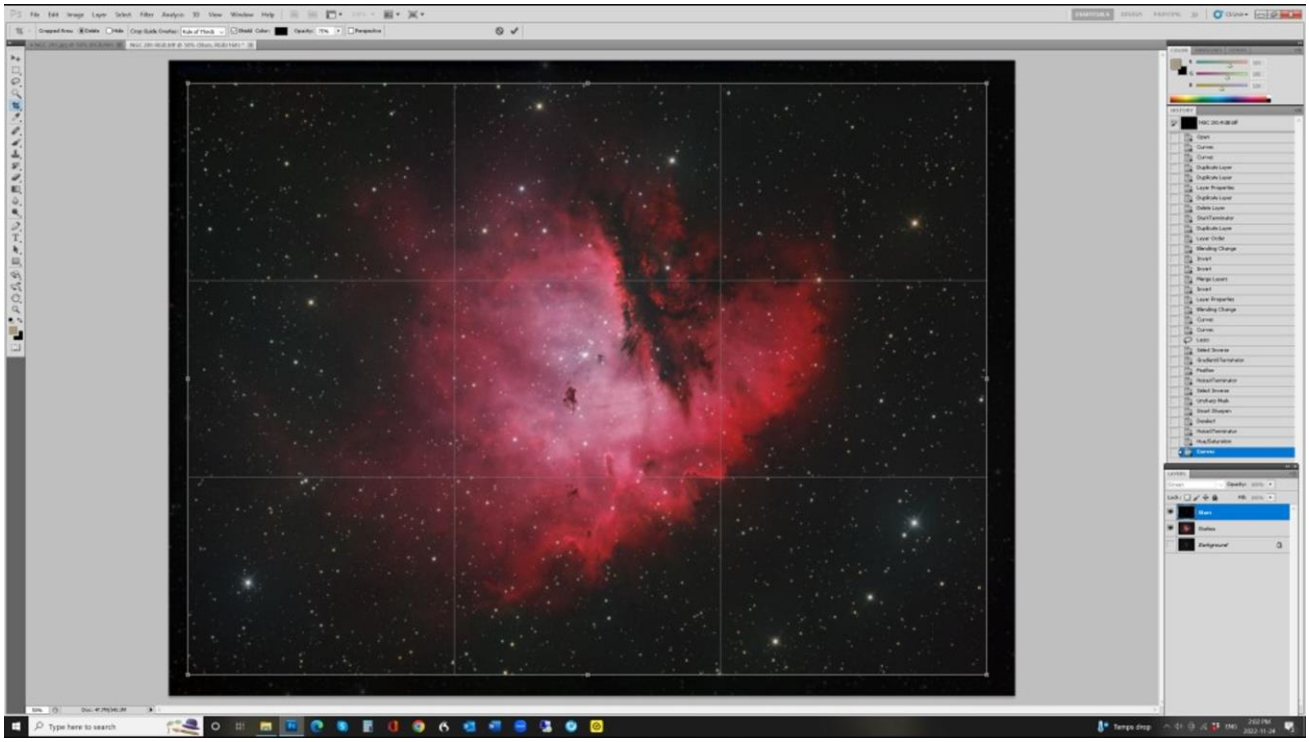
I mentioned earlier that I tend to stretch several times rather than one big stretch. That allows me to fine tune the brightness of my image. In this case I decided to stretch some of the brighter parts of the nebula and to increase the contrast of some of the mid-tones. Contrast is increased when the stretch line gets steeper.



On this image I used a small amount of unsharp mask to sharpen some of the fine detail. As you can see in the blow-up area the sharpening also increased the noise.



I now turn on the stars, so they appear in the image. From the curves graph you can see that I reduced their brightness a small amount. Again, to suit my taste.



When you stack many images, they are rarely all identical. This makes the edges a bit ragged as the different images overlap differently. So usually, I crop the edges of my image.

This is the final image. That is until I discover some new processing trick and try it again.

Clouds on Mars: Are they Real or Artifacts?

by Andrea Girones

Like many others I spent early December chasing a pretty picture of Mars, using my monochrome planetary camera, the ASI290MM and RGB filters. When putting my images together for Dec. 9th, 2022, I noticed some unusual features showing up in my Mars images, particularly in the blue channel.

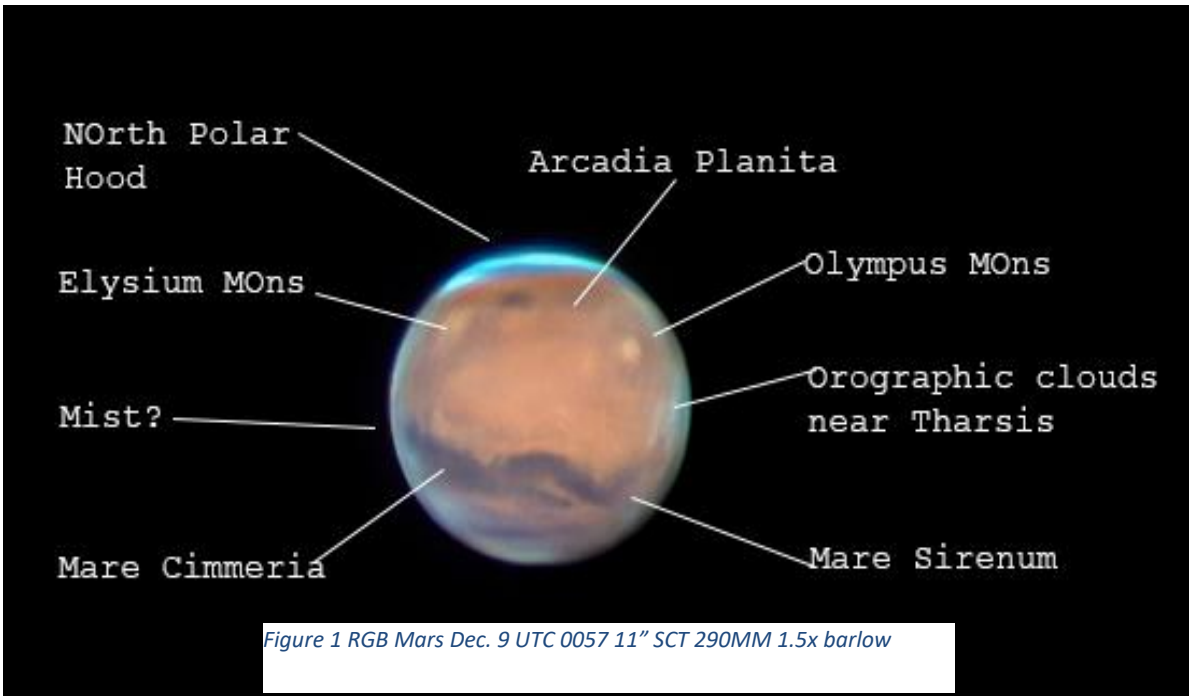


Figure 1 RGB Mars Dec. 9 UTC 0057 11" SCT 290MM 1.5x barlow

Was I seeing clouds on Mars? Or were these strange white patches just an artifact of poor seeing, focus and processing? As many of you know Mars appears very different through red, green and blue filters. In particular, the blue filter is where you primarily observe white patches, haze mist, ice and clouds. (Beish 2021)

After investigating the science behind Martian clouds, I concluded that I imaged 3 different kinds of clouds on Mars: the north polar hood, morning mist in the south, and orographic clouds over the volcanoes of Tharsis. The scientific causes of these clouds are described below.

For clarity this article will refer to the "seasons" of the Martian northern hemisphere and will reference the solar longitude or LS of Mars (location in solar orbit) as set out in figure 5. All images were shot from the Ottawa backyard in December 2022 with a Celestron Edge HD 11" SCT, and are oriented so that north is up, the left edge is the morning limb (following) and the right edge is the evening limb.

Types of Clouds on Mars

a) **Polar hood**

The most obvious white feature in 2022 was an expansive north polar hood (NPH) which was thick, bright, and especially visible in the green and blue channels. This is not the north polar ice cap but a veil of clouds that formed over the polar ice cap during the Martian northern autumn (LS180) (Pellier 2020).

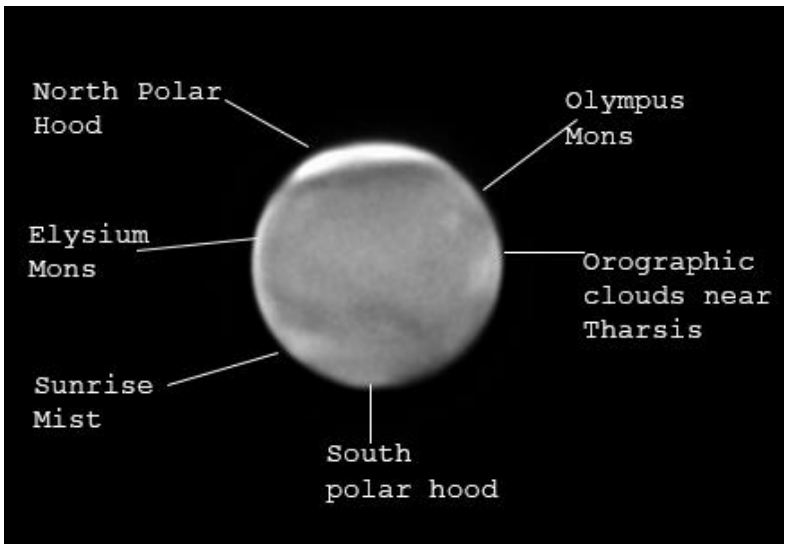


Figure 2 Mars Dec. 9th 2022 UTC 0057 Blue filter 11" SCT 290MM

Dec. 9, 2022, when my images were taken, marked the end of the Martian northern winter (LS 351) when the polar hood cloud cover was at its maximum for the year. As the spring equinox approaches and warms the northern hemisphere, (LS 0 will occur on December 27th, 2022) the north polar hood will begin to dissipate. The disappearance of the NPH will expose the north polar cap underneath, which in turn will then melt and shrink over the long Martian summer. The opposite will occur in the southern hemisphere and the south polar hood will start to form.

Figures 1 and 2 both illustrate the characteristically bright northern hood clouds as well as the thinner and duller developing southern hood. (Pellier 2020) By the end of December 2022 (early autumn in the southern hemisphere) the development of the south polar hood and the shrinking of the north polar hood should be very apparent.

b) **Topographic and orographic clouds**

Figure 3 is a NASA topographical map of Tharsis, a mountainous region of Mars known to have orographic clouds formed by moist air encountering high mountains. (Beish 2021) This region includes Olympus Mons, the tallest mountain in the solar system, and three tall volcanos, Ascraeus Mons, Pavonis Mons, and Arsia Mons.

Orographic clouds are associated with the rapid spring thawing of the northern polar hood, which increases the humidity of the Martian atmosphere. (Chilton 1976, Pellier 2020) As the warm and humid spring air on Mars rises up the slopes of the volcanoes, the air cools and clouds develop. (Beish 2021) The clouds are rarely visible until the Martian afternoon because they must wait until the Sun has warmed the surrounding air sufficiently. (Pellier 2020)

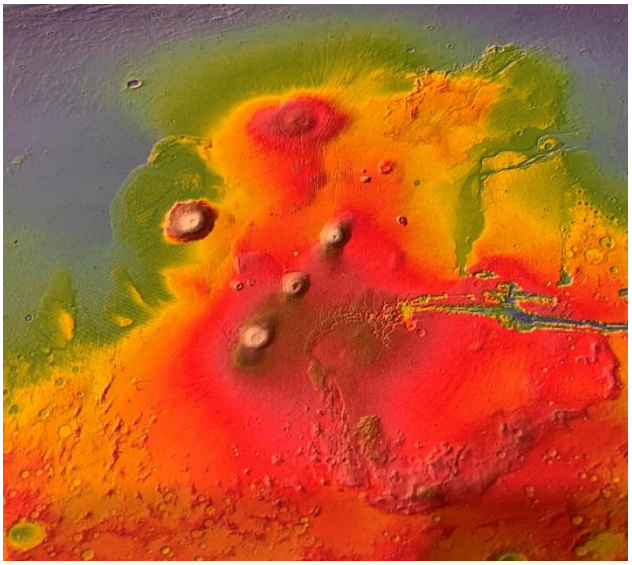


Figure 3 Topographical Map of Mars Volcanos NASA

The December 9th image (figures 1 and 2) shows orographic clouds (white patch) below Olympus Mons and in late evening on Mars. (close to the preceding limb) As the Martian spring continues we should see even more of these clouds in the Tharsis region just below Olympus Mons. In 2018 there was a famous long orographic cloud band floating off Arsia Mons which was visible for months. (link)

c) **Morning Cloud /Sunrise Mist**

Morning clouds or mists are bright, isolated patches of surface fog or frost near the morning limb. (Beish 2021) During the night, the Martian sky is clear and the heat from the ground escapes to space and the ground air becomes dense. This air pours into low lying areas such as canyons and valleys, cools and becomes mist or fog. The fogs usually dissipate by mid-morning. (Pellier 2020)

These bright features are best seen through blue or violet filters. Sunrise mists are usually seen along the morning terminator and extend 20-30 degrees from the limb (Beish 2021)

In many of my images and those of other RASC Ottawa observers around the same time, the morning mist is clearly visible in the southern hemisphere along the morning terminator.

d) **Equatorial Cloud Bands**

The Equatorial Clouds Band clouds (ECBs) appear as a broad diffuse hazy band along the Martian equatorial zone. They are difficult to see from Earth and are best seen in the blue/violet light. (Beish 2021) Equatorial cloud bands are probably composed of thin water i.e. crystals carried aloft by high winds and generally form around LS 70 (aphelion) and dissipate by LS 180 (Beish 2021), although CO2 Clouds have been detected at high latitudes. (Aoki 2018)

I was not able to observe any equatorial cloud bands in December 2022 which is to be expected since these clouds tend to develop later in the Martian spring.

Analysis

The images taken on Dec. 9th UTC 0057 clearly show at least 3 different cloud features in the blue channel. The location of the white patch south of Olympus Mons is the expected location for orographic clouds, and the white patch in the south along the following limb, matches the expected location of morning mist. Additionally, my observations of the cloud formations visible in the blue channel images were confirmed by experienced Mars scientists, Christophe Pellier and Roger Venable in the online Mars Forums.

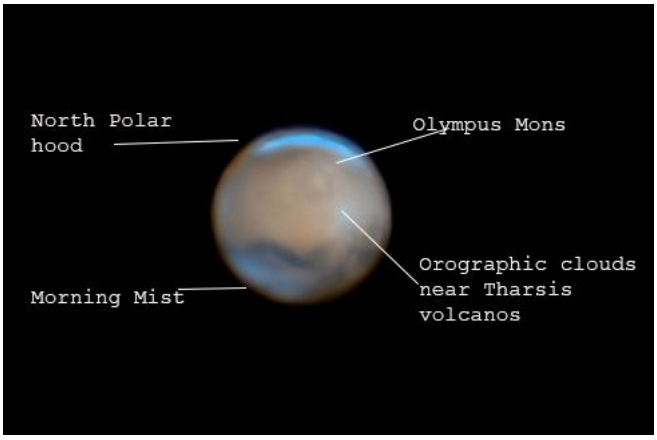


Figure 4 RsGB Mars Dec. 13 UTC 0126 11" SCT 290MM

I double checked my observations with a return to Mars on December 13th where again the NPH, orographic clouds and morning mists were visible. The Dec. 13 imaging session had an over exposed green channel, so I used a synthetic green layer instead, which served to further emphasize the clouds (figure 4).

Finally, the season of Mars, namely the end of northern winter, corresponds with the warming of the northern hemisphere and the dissipation of the northern hood. As illustrated in Figure 5 the Martian spring and summer in the northern hemisphere is long, cool and far from the sun. This is the period of time when Mars should exhibit more cloudy features. (Venable 2018, Pellier 2020) The appearance and frequency of the clouds follow the regression of the northern polar cap and increase during the Martian northern spring and summer. (Beish, 2021,1986, 1987). The Martian clouds are made up of both water and carbon dioxide and are especially bright in the blue light. (Beish 2021)

In conclusion, various cloud formations on Mars can be observed from earth with a consumer grade backyard telescope. While Mars will be getting smaller in 2023, it remains high in the sky and is still a great target for the intrepid planetary photographer. In particular watch for orographic clouds south of Olympus Mons which will continue to develop over the remainder of this apparition. Let's hope the clouds stay on Mars!

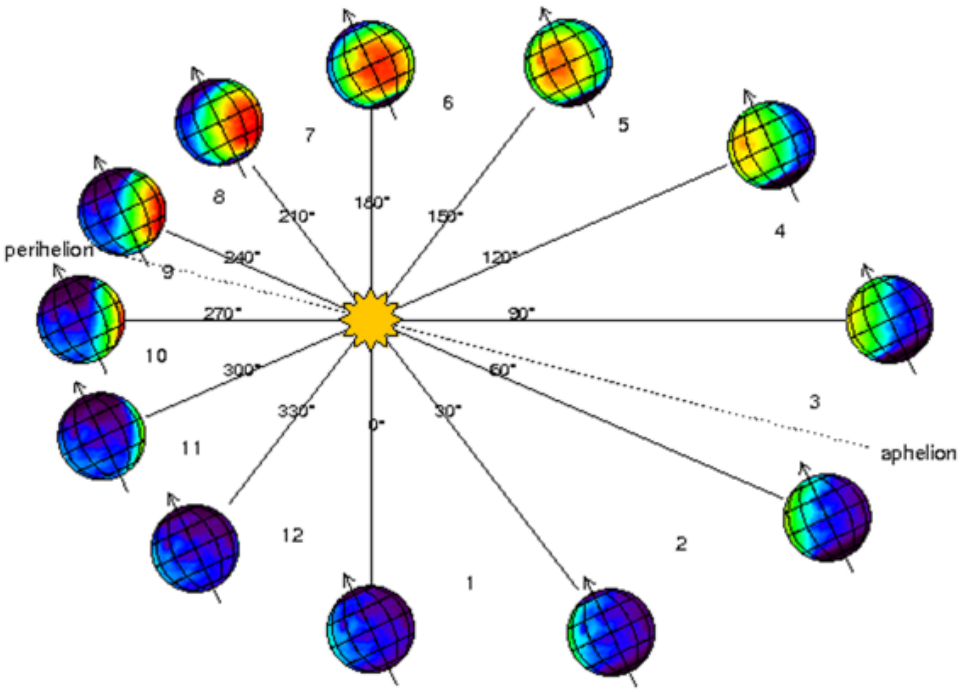


Figure 5 Solar Longitude http://www-mars.lmd.jussieu.fr/mars/time/solar_longitude.html

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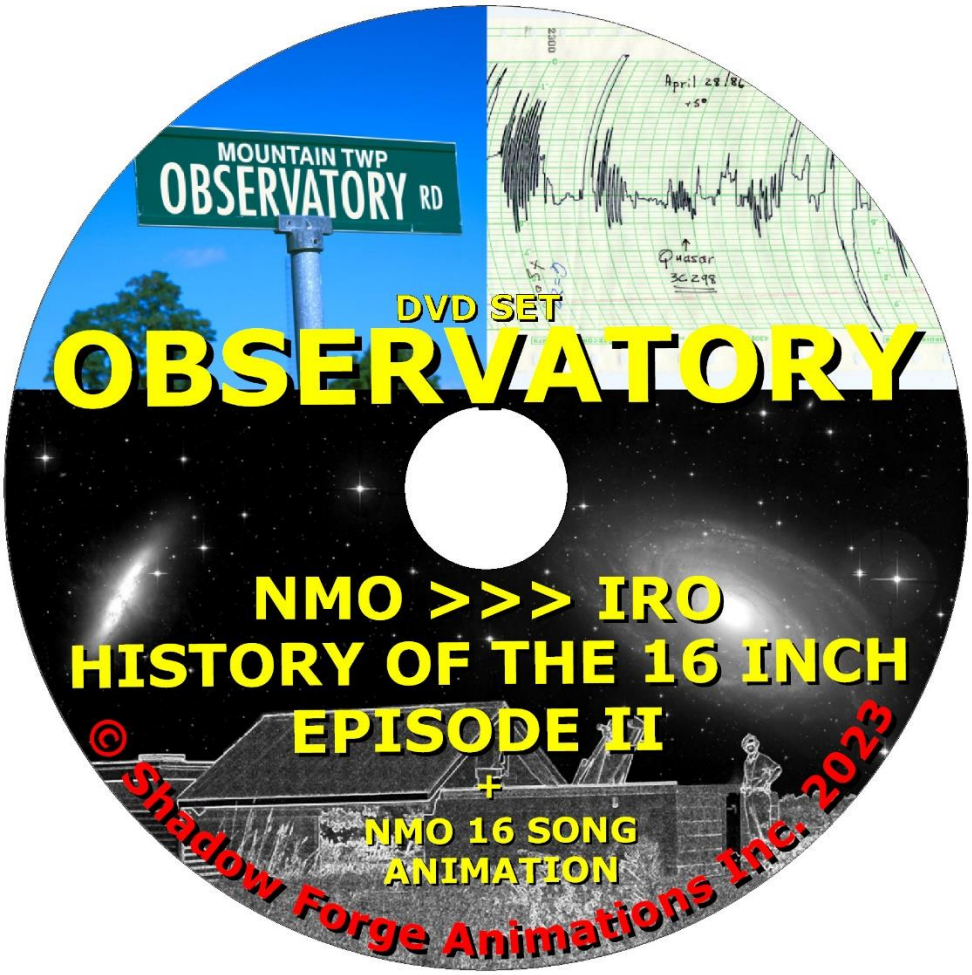
Ottawa Centre Observatory DVD Set

This DVD set has its roots in 1977 with the production by Jon Buchanan and Doug Welch of the Great Move from North Mountain Observatory to Indian River Observatory: **NMO >>> IRO**. Filmed in Super 8, it was converted to digital in 2003, a soundtrack added, and released in that same year. In 2006, for the 100th anniversary of the Ottawa Centre, **HISTORY OF THE 16 INCH** was produced. In 2007, a follow-up video to promote the **HISTORY** was released,
entitled: **EPISODE II**.

The three DVD set chronicles the foundation of the **Observatory** and its successes, highlighting key events and those involved. A history that every member should be very proud of. A deep part of the Ottawa Centre's identity was forged at the Observatory.

The 50th anniversary of the Observatory in October 2021, prompted me to re-release all three DVD's together as a set on separate discs in late August of 2022. To facilitate the general availability, the three DVD's are now combined onto a single disc for 2023, with a selection menu. This allows the addition of two more videos, the **NM0 16 SONG** and an **ANIMATION** depicting the moving of North Mountain Observatory.



NMO>>>IRO

1977. 20 minutes.
Jon Buchanan and Doug Welch.
Recounting the story of the Great Move from North Mountain Observatory to Indian River Observatory.

HISTORY OF THE 16 INCH

2006. 20 minutes.
Jon Buchanan, Frank Roy and Peter MacKinnon.
A narration of how the Observatory came to be, and its phenomenal successes.

EPISODE II

2007. 5 minutes.
Jon Buchanan and Frank Roy.
A very nice montage of the key figures and events from the period 1954 to 1998. With a powerful soundtrack.

NMO 16 SONG

2006. 2 minutes 30 seconds.
Jon Buchanan.
A song written by Doug Welch and Doug Somers during the NMO days, to celebrate the 16 INCH and it's great observing team. Played and sung by Doug and Mike Somers.

MOVING NMO - Animation

2006. 19 seconds.
Jon Buchanan.
A very funny animation depicting the moving of North Mountain Observatory.

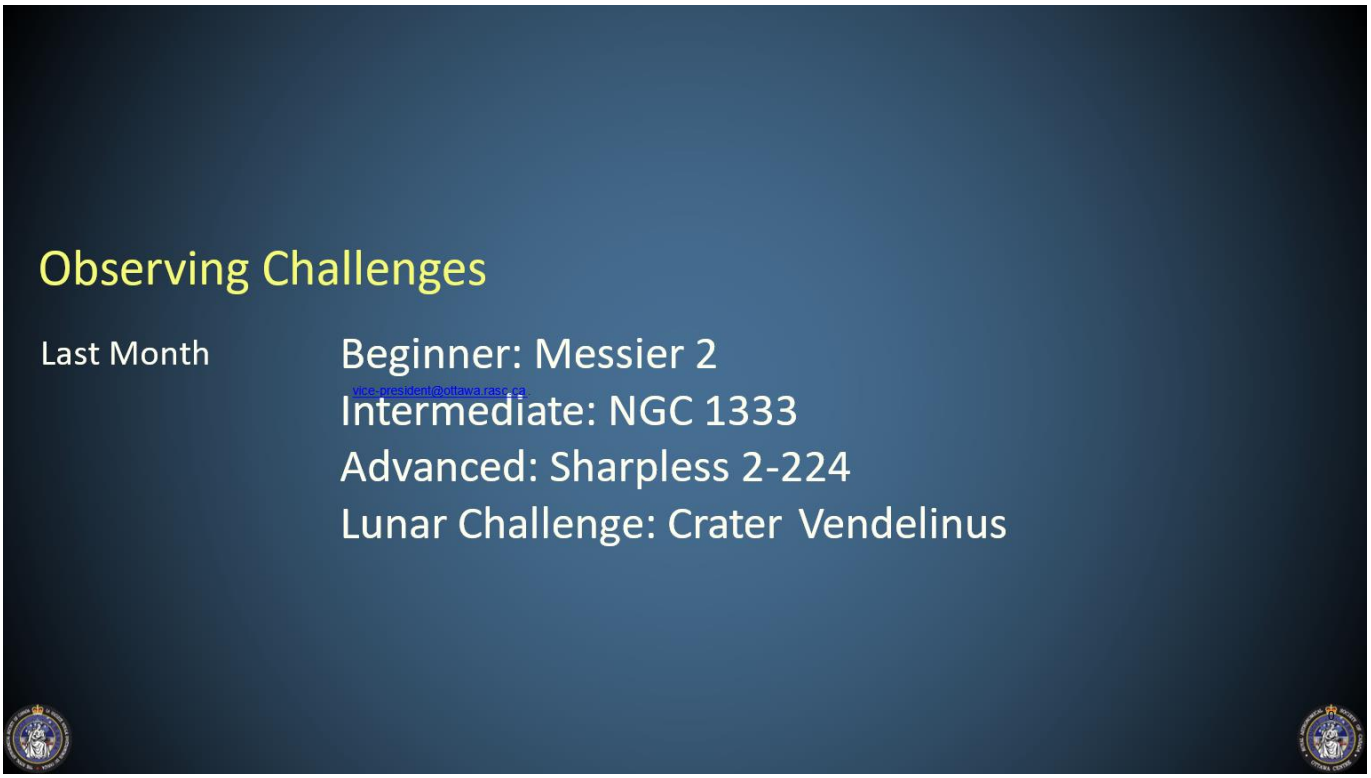
EXTRAS

Included on the DVD is a poster (2007) showing key events, which you can see at the Clubhouse and a photo by Art Fraser of the 16 INCH on opening day in October of 1971, a professional recording (2016) of the NMO Song by Jef Leeson, Pat Walsh and Doug Somers. And this document.

Frank Roy
January 1st, 2023

Monthly Challenge Objects

By Oscar Echeverri

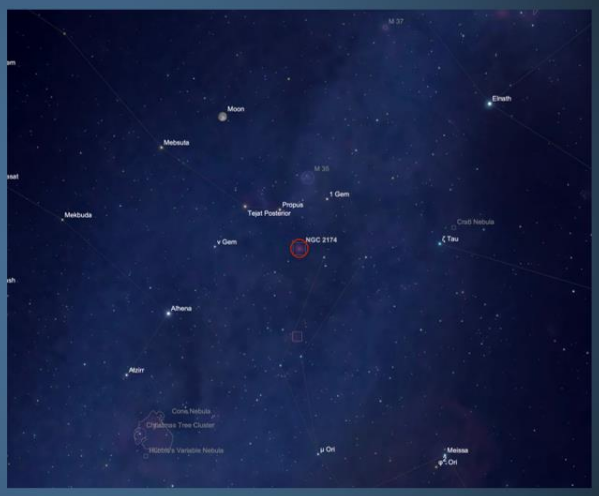


Deep Sky Challenge

Intermediate

NGC 2174

- Also known as the Monkey Head Nebula
- Emission Nebula in Orion
- 6.8 magnitude in brightness
- 40'x40' apparent size

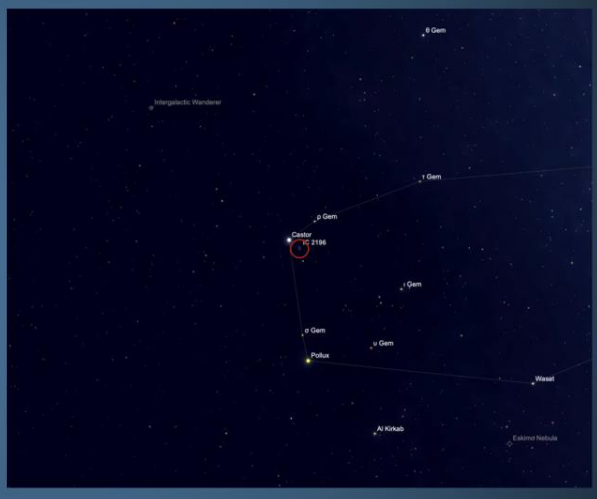


Deep Sky Challenge

Advanced

IC 2196

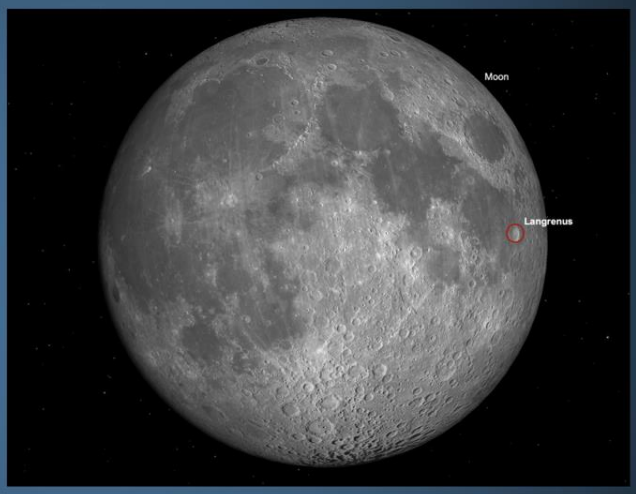
- Elliptical Galaxy in Gemini
- 13.91 magnitude in brightness
- 1.7' x 0.9' in size
- 230 Mly away



Lunar Challenge

Crater Langrenus

- Lunar impact crater near the eastern lunar limb
- 132 km in diameter
- 2.7 km deep



Observing Challenges

Beginner: Messier 35
Intermediate: NGC 2174
Advanced: IC 2196
Lunar Challenge: Crater Langrenus

Submitted Images

Jim Sofia

Mars series with labels

Mars SCT8 2xbarlow DS10c-TEC best 30% of 2800 frames AstroSurface TS2 UVIR cut filter Ottawa Dec 8, 2022-studio

Sun disc composite image SCT8 1.5barlow DS10c-TEC inPixio Photo Studio TS2 Ottawa Nov 2 2022

Sun composite image SCT8 1.5barlow DS10c-TEC inPixio Photo Studio TS2 Ottawa Nov 2, 2022

Richard Taylor

M2

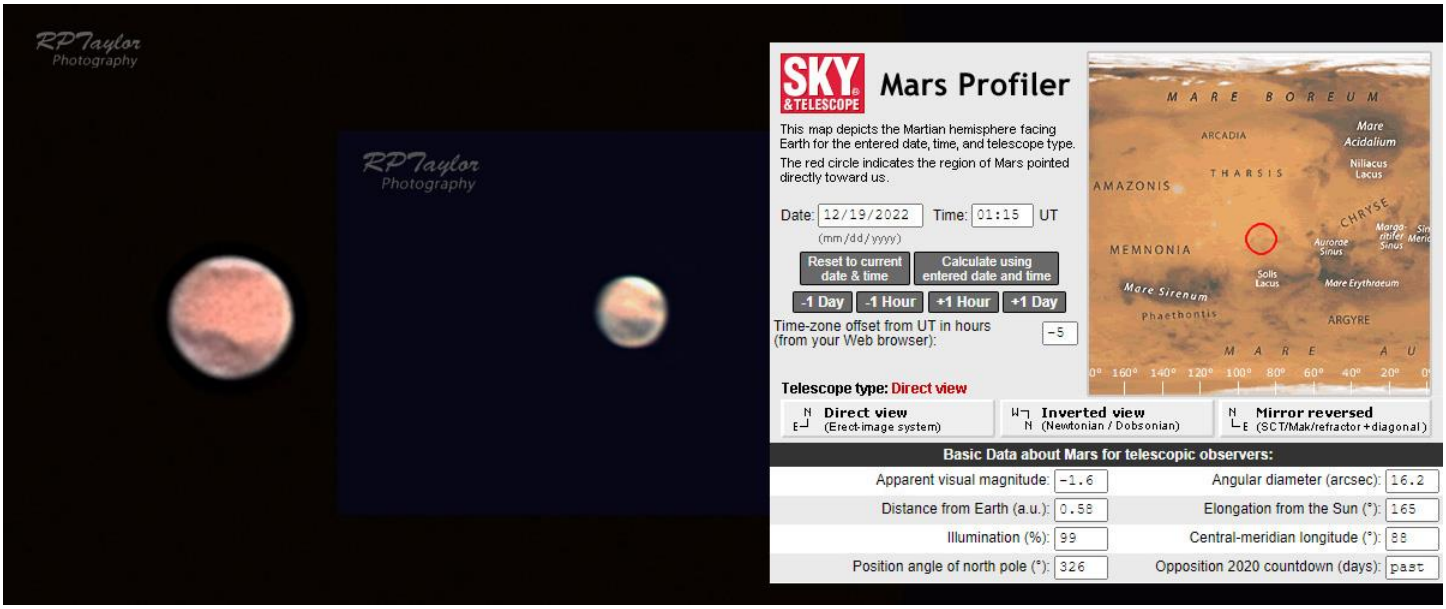
M2 was the beginner challenge object for the month. But from my back yard, it was already hiding in the trees in the early evening. Using my new HEM27 goto mount I was able to find it, but I only managed to capture 7 frames between the branches of the trees. Still, it's a nice bright globular cluster and it was an easy capture.

NGC 1333 Ottawa

The intermediate challenge object was NGC 1333, also known as the Embryo Nebula. This is a new one for me and it turns out to be a lovely, multicoloured nebula, nicely placed high in the sky at this time of year, near Mars and the Pleiades. However, Ottawa light pollution spoils the view of faint nebulae. This is a stack of 122 30s light frames from my Ottawa back yard, and I had difficulty separating the nebula from the background. Compare with the next picture...

NGC 1333 FLO

Here is the same nebula, rotated and cropped to match the previous image and taken with the same equipment. However, this is a stack of only 69 30s light frames taken at FLO four nights later. You can see that the background is darker, the nebula stands out better, and the dark dust lanes are MUCH more visible. So for anyone trying to take nebula pictures, I encourage you to take advantage of the RASC membership benefit that is our Fred Lossing Observatory site.



Mars

Then the clouds came in and stayed. So no further challenge objects for me. However, I have been taking some pictures of Mars, so here is another comparison of FLO and home-based photography. At FLO on December 12, I was fortunate to be able to use the 14" Meade SCT with a focal length of about 3500mm. This results in the bigger image of Mars on the left and has the potential to show more detail. The middle picture was taken on December 18 from my Ottawa back yard using my 8" SCT with a focal length of 2000mm. The image is significantly smaller. However, the amount of detail that I can actually capture depends on many other factors: seeing (atmospheric turbulence) is the biggest factor, but at FLO I was also hampered by the dome over the telescope which gets in the way when Mars is so high; another factor shown here is the amount of detail available to be seen. Some views of Mars (like on the 12th) just don't have much detail - Amazonis and Tharsis are pretty bland. On the 18th, there were more features to see including the gap between Mare Sirenum and Solis Lacus in the south and Mare Acidalium coming into view in the north. By the way, if you haven't already done so, you should try Sky and Telescope magazine's on-line tools for showing what's visible on and around each planet at any time.

Oscar Echeverri

Messier 27 - The Dumbbell Nebula

This image is of Messier 27, or the Dumbbell Nebula. It is a planetary nebula in the constellation Vulpecula, at a distance of approximately 1360 lighyears from earth. It has a brightness of visual magnitude 7.5 and is about 8 arcminutes in diameter.

I found this image in my backlog of images to process from 4 years ago, taken the night of July 19th, 2018. This image was taken through a 11" Celestron EdgeHD at F10 using a Canon 60Da DSLR. It is comprised of 43 300s exposures, for a total of 3h35m of integration.

NGC 1333 - The Embryo Nebula

NGC 1333, The Embryo Nebula is a reflection nebula located in the constellation Pegasus. It is between 960 and 1140 ly away from earth, being part of the Perseus molecular cloud, and is a young region of very active star formation. It contains several star clusters that are still embeded in the molecular cloud in which they formed. The region is has a mass of approximately 450 million solar masses.

This image was taken the nights of November 27th and December 13th of this year. I shot this through the 8" Celestron EdgeHD using a ZWO ASI2600MM Pro through an LRGB filter set. Each color received 2h of exposure, and the luminance channel was exposed for 7h36m for a total integration of 13h36'.

Paul Klauninger

M77 Galaxy in Cetus_Paul Klauninger

Moon and Mars close encounter on 2022-12-08_Paul Klauninger

Moon-Eastern limb_Paul Klauninger

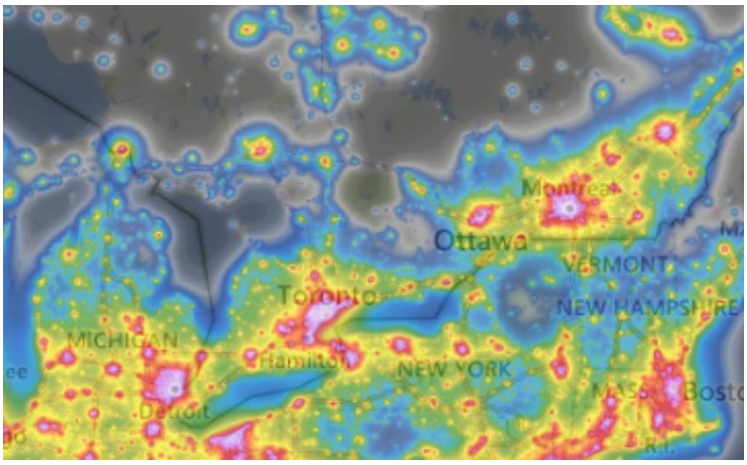
Announcements

New Member Guide

Are you a new member looking to get more out of your RASC membership? Do you need more information on how to get started in Astronomy? We are pleased to announce the release of our New Member Guide to help new members learn more about astronomy and our local Ottawa group. Feel free to reach out to any of our Council members for more ideas and information. The Guide can be found here.

https://ottawa.rasc.ca/centre/guide-new-members

Light Pollution Abatement -Call for volunteers



Are you a dedicated astronomer concerned about light pollution in your neighborhood? Are you interested in learning more about preserving the night sky for future generations? Are you worried that artificial satellites will ruin the night sky for years to come? Then joining the Light Pollution Abatement Committee is for you.

Please send an email to the RASC Ottawa light pollution abatement coordinator Andrea Girones at lpa@ottawa.rasc.ca expressing your interest. We are looking to have some initial meetings in the New Year to establish some realistic goals and projects. The time commitment is what you want it to be for you. If you love astronomy then hopefully you are motivated to help with this important work.

Tristan Young, who worked at Focus Scientific serving the astronomical community here in Ottawa for many years, is currently doing an apprenticeship as an electrician.

He will now be supplementing his income by providing the local community with technical work and repairs pertaining to astronomical equipment such as telescope collimation, gear adjustments, bearing service, soldering of replacement power jacks, taking apart and cleaning the optics, etc.

This service will be on a trial basis to insure compatibility with his current schedule.

If interested, contact Tristan at: tryoung@exeverse.com

Public Star Parties

Returning to a parking lot near here April 29th next year.

FLO Star Party Dates for 2022

- Our Ottawa Centre's Members' Star Parties at the FLO will continue this winter. If you haven't attended before, be sure to mark at least one of these dates on your calendar. You are welcome to bring family members or a guest. The GO/NO GO call will be made on the Centre mailing list, about noon the day of the star party.

DATES for the rest of this year and all of next year

- ~~September 24 - Waning Crescent~~ **GO**
- ~~October 22 - Waning Crescent~~ GO
- ~~November 26 - Waxing Crescent 13.7%~~ GO
- ~~December 17 - Waning Crescent 33%~~ NO GO
- January 21 – New Moon .3%
- February 18 – Waning Crescent 2.4%
- March 18 – Waning Crescent 10.1%
- April 22 – Waxing Crescent 9.4%
- May 20 – Waxing Crescent2.2%
- June 17 – Waning Crescent .1%
- July 15 – Waning Crescent 2.9%
- August 19 – Waxing Crescent 11.7%
- September 16 – Waxing Crescent 3.7%
- October 14 – New Moon .1% (Annular Solar Eclipse, Max 2:01PM)
- November 11 – Waxing Crescent 1.8%
- December 9 – Waning Crescent 9.5%

Next Meeting

7:30 PM **Friday, January 6**, **2023.** This will be ***A VIRTUAL MEETING ON ZOOM***. ***Watch for email updates***. Note there will be no $4.00 parking fee. The meeting runs until 9:30 pm

PLUS: all our regular meeting features: Ottawa Skies, Observation Reports and, sadly, no Door Prizes!

All RASC monthly meetings are **free** and open to members and non-members alike. A reminder that refreshments will be available in *your fridge* for all virtual meetings or at Mick's place where there is, I hear, FREE BEER. When we return to in person meetings at the Aviation and Space Museum this will be a wonderful opportunity to meet new friends (and catch up with those old friends you haven't seen in a couple of years) who share a common interest and chat in a relaxed, stimulating, and fun environment. Please join us!

Centre Information

To subscribe (or unsubscribe) to our members-only discussion list (rascottawa@googlegroups.com) please contact secretary@ottawa.rasc.ca .

The Ottawa Centre 2023 Council

President: Dave Chisholm (president@ottawa.rasc.ca)
Vice President: Oscar Echeverri (vice-president@ottawa.rasc.ca)
Secretary: Chris Teron (secretary@ottawa.rasc.ca)
Treasurer: Richard Taylor (treasurer@ottawa.rasc.ca)
Centre Meeting Chair: Mick Wilson (meetingchair@ottawa.rasc.ca)
Councillors: Gerry Shewan, Jim Sofia, Katie Francis
National Council Representatives: Mick Wilson, Johnathan Falbo, OPEN
Past President: Stephen Nourse

2023 Appointed Positions (Pending Council's Approval)

Membership: Art Fraser(membership@ottawa.rasc.ca)
Star Parties: Katie Francis (starparties@ottawa.rasc.ca)
Fred Lossing Observatory: Rick Scholes (flo@ottawa.rasc.ca)
Light Pollution Abatement: Andrea Girones (lpa@ottawa.rasc.ca)
Public Outreach Coordinator: Asser ElGindy (outreach@ottawa.rasc.ca)
Hospitality: **OPEN**
Stan Mott Astronomy Library: Estelle Rother (librarian@ottawa.rasc.ca)
Ted Bean Telescope Library: **OPEN** (telescopelibrary@ottawa.rasc.ca)
Webmaster: Mick Wilson (webmaster@ottawa.rasc.ca)
AstroNotes Editors: Gordon Webster & Douglas Fleming (astronotes@ottawa.rasc.ca)