

NOVA

NEWSLETTER OF THE VANCOUVER CENTRE RASC
VOLUME 2023 ISSUE 6 NOVEMBER DECEMBER 2023



Black Holes, Dark Matter and Vacuum Energy

Dr. Robin Catchpole

November 9 @ 7:30pm, room AQ3159, SFU Burnaby Campus

Robin Michael Catchpole works as an astronomer at the Institute of Astronomy, Cambridge, having retired as Senior Astronomer at the Royal Observatory Greenwich in July, 2004.

He joined the Royal Greenwich Observatory (RGO) from Bryanston School in 1962. After obtaining a BSc at University College London, he was posted to the Royal Observatory at the Cape of Good Hope, S. Africa (now known as the South African Astronomical Observatory) and spent the next 24 years working first at the Radcliffe Observatory in Pretoria and then at the SAAO in Cape Town.

He obtained his doctorate at the University of Cape Town on *The Properties of the SC Stars and the Chemical Composition of UY Cen*, under the supervision of Prof. Brian Warner. In 1991, he returned to the RGO in Cambridge until it

closed in 1998, when he moved to Greenwich as Senior Astronomer.

He has authored and co-authored over 120 research papers and articles



and used a number of telescopes around the world, including the Hubble Space Telescope. Research interests include the composition of

stars, exploding stars, the structure of our galaxy and galaxies with black holes at their centres. His current research interest is in the structure of the bulge of our Milky Way Galaxy, as shown by Mira variables.

In 1981, Robin married the late sculptor Gill Wiles (1940 - 2014). He currently lives just outside Cambridge, UK.

Abstract: Gravity is the weakest force and yet it can concentrate matter into a small enough volume from which even light cannot escape, creating a black-hole. On the scale of our solar system, everything is dominated by normal (baryonic) matter, but on the largest scale our universe is dominated by dark matter and vacuum energy, about which we know almost nothing, except their effect through gravity. How does this all work together? How can these apparent opposites co-exist? ★

NOVEMBER 9

SFU

Dr. Robin Catchpole of the Institute of Astronomy in Cambridge: Black Holes, Dark Matter, and Vacuum Energy. Room AQ 3159 and Zoom.

SFU

DECEMBER 14

SFU

Our AGM, followed by a speaker at 8:15pm (speaker TBA). Watch Meetup for details.

SFU

JANUARY 11

SFU

Speaker TBA. Watch Meetup for updates.

SFU

Pitt Meadows Observing and Imaging

by Kai Hui

One of the most enjoyable aspects of astronomy, whether it's visual or imaging, is when you are able to do that with other like-minded enthusiasts. Suzanna, our RASC Secretary, put out an open invitation on our RASC Discord server to join her at an observing site in Pitt Meadows. I was intrigued as I am always looking for sites that are not too far of a drive and would provide a darker sky than my backyard, and also to chat about

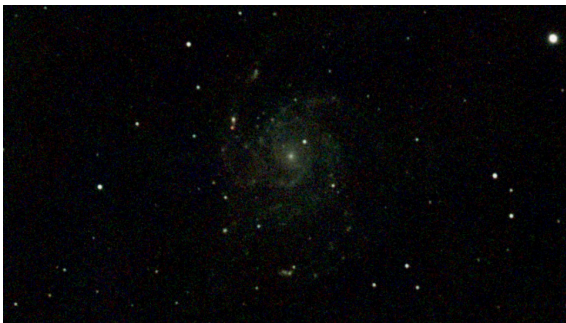
astronomy.

I joined her and two others for the session in October. I was not disappointed! The site, located on the south-side dyke of the Alouette River at Harris Road, provided 360° views of the sky with a good view of the horizon. There was ample parking along with washrooms!

It was an opportunity to try out my new ZWO SeeStar computerized scope. The little scope comes with a

50mm objective and a 250mm focal length. In the 3 hours that I was there, I was able to shoot 3 targets: M16 Eagle Nebula, M101 Pinwheel Galaxy (you can still see the supernova!), and NGC6992 Eastern Veil Nebula. Each exposure was approximately 30 mins with slight tweaks on my iPhone for the final result. For such short exposures, I was impressed with the results.

I will definitely be back to the site! Come join us next time! ✨



Clockwise from upper-left: M16 (Eagle Nebula), NGC6992 (Eastern Veil Nebula), and M101 (Pinwheel Galaxy)

President's Message: Thank-you and an Invitation by Alan Jones

It's been a privilege to be your club president for the last twenty-two months. President is a two-year, non-sequential term and it is time to welcome our next president. I would like to thank everyone that has supported our club during my term as president. We have returned to meeting in person with a hybrid, on-line option

for our regular meetings. We have ventured further into the social media world with Discord. Our relationship with SFU continues to strengthen and rewards our membership, the public and the university. We have an operational club observatory with space for members to observe under a Bortle 4 sky. Council meetings are friendly,

brief and businesslike, respecting our dedicated volunteers that give their time to run our club. Our Vancouver Centre celebrates 90 years of success this month. We have much to be thankful for and celebrate.

Our club runs smoothly as the result of dedicated volunteers with

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About RASC

The RASC Vancouver Centre meets at 7:30 PM on the second Thursday of every month at SFU's Burnaby campus (see map on page 4). Guests are always welcome. In addition, the Centre has an observing site where star parties are regularly scheduled.

Membership is currently \$104.00 per year (\$61.10 for persons under 21 years of age; family memberships also available) and can be obtained online, at a meeting, or by writing

to the Treasurer at the address below. Annual membership includes the invaluable Observer's Handbook, six issues of the RASC Journal, and, of course, access to all of the club events and projects.

For more information regarding the Centre and its activities, please contact our P.R. Director.

NOVA, the newsletter of the Vancouver Centre, RASC, is published on odd-numbered months. Opinions expressed herein are not nec-

essarily those of the Vancouver Centre.

Material on any aspect of astronomy should be e-mailed to the editor or mailed to the address below.

Remember, you are always welcome to attend meetings of Council, held on the first Thursday of every month at 7:30pm in the Trotter Studio in the Chemistry wing of the Shrum Science Centre at SFU. Please contact a council member for directions.

2023 Vancouver Centre Officers

President	Alan Jones president@rasc-vancouver.com
Vice-President	Robert Conrad vp@rasc-vancouver.com
Secretary	Suzanna Nagy secretary@rasc-vancouver.com
Treasurer	Phil Lobo treasurer@rasc-vancouver.com
National Rep.	Nolan Smith national@rasc-vancouver.com
Librarian	William Fearon library@rasc-vancouver.com
Public Relations	Andrew Ferreira publicrelations@rasc-vancouver.com

LPA	Leigh Cummings lpa@rasc-vancouver.com
Dir. of Telescopes	Rick Schneider telescopes@rasc-vancouver.com
Observing	Robert Conrad observing@rasc-vancouver.com
Membership	Marla Daskis membership@rasc-vancouver.com
Events Coordinator	Vacant events@rasc-vancouver.com
Education	Robert Conrad, Andrew Krysa education@rasc-vancouver.com
VRO	Carl Bandura observatory@rasc-vancouver.com

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Imaging	Rob Lyons imaging@rasc-vancouver.com
At Large	Shay Pomeroy, Michael Levy, Milan B
Honourary President	J. Karl Miller

Library

The centre has a large library of books, magazines and old NOVAs for your enjoyment. Please take advantage of this club service and visit often to check out the new purchases. Suggestions for future library acquisitions are appreciated.

On the Internet

rasc-vancouver.com
astronomy.meetup.com/131/
www.facebook.com/RASC.Van
www.instagram.com/rascvancouver/

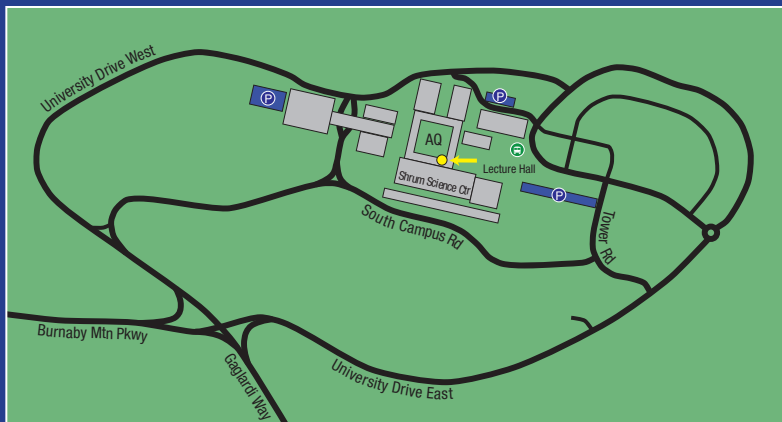


@RASCVancouver

Mailing Address

RASC Vancouver Centre
PO Box 89608
9000 University High Street
Burnaby, B.C.
V5A 4Y0

Map to Meeting Site



Our December meeting is in room AQ 3159 of the Academic Quadrangle, in the south concourse near the southeast corner, as indicated by the arrow on the map.

Pay parking is available at several locations located around campus (indicated as "P" on the map).

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enthusiasm, camaraderie, and support for each other as we explore and are rewarded by the joys of discovery and learning. We all have many interests and other responsibilities. We live in challenging times with disease, climate change and world unrest. Astronomy and discovery about our "neighbourhood" in space through science is advancing at an exciting pace. Access to knowledge has never been better.

The improvements in equipment currently available to the amateur astronomer compared to only a few years ago are stunning. Thanks to current and past members, we have access to amazing telescopes and astrophotography equipment like never before. Over the past two years, we have gained among our core membership and leadership people that are keen in both learning and sharing their knowledge and discovery. I encourage interested members to become active in the imaging group, our observa-

tory group, or our volunteer group. There are always positions on council for members in good standing. Inquire with any council member. The public interested in astrophotography or observing in a darker and reasonably-accessible safe observing site should strongly consider becoming a member. In the last two decades, I am not aware of a better time for people that enjoy learning to be members of our club. There are opportunities for members to learn how to use telescopes visually and for learning about astrophotography that I haven't seen in our club in a long time.

We continue to host a broad range of guest speakers at our monthly member meetings. Our monthly meetings are also open to the public. I invite and encourage our membership to participate in the operation of our club. More involved people make things better. Help us make astronomy more interesting by participating in your club and suggesting great presenters that you would like us

to have at our monthly meetings. This month, we have Dr. Robin Catchpole speaking from the UK because one of you knows him and suggested that we ask him to talk to our group! This is the synergistic connection benefits of involvement in a group of interesting people motivated to learn. Thank-you, and please suggest other speakers and topics of interest for our meetings.

I realize not all membership enjoys astrophotography or even using telescopes. We admire those that push the limits of exploration and we gain immense pleasure when they share their experience with us. We can't all be astronauts or physicists, or astrophotographers. We can all recognize the thrill of discovery and that motivation to seek the next answer. It takes dedication, positive thinking, puzzle-solving aptitude and energy to be successful at anything challenging. A good presenter shares that joy of discovery. We all

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Girl Guides

Staying true to our mission in being shepherds of the stars to young minds, Leigh and I opened the eyes of many Girl Guides on October 20th. Unfortunately, the sky did not cooperate with our session, but we were able to show them the wonders of spectroscopy. After our presentation, the guides were given spectroscopic glasses, which have a filter with a diffraction grating, to look at a lamp with helium gas in it. The gasps and cheers were a sign that they were experiencing something that they have never seen before. In addition to navigating the stars, we brought up the subject of light pollution. We showed them examples of a pristine night sky and the light polluted sky

that they experience from here in the Lower Mainland. We also showed them some of the ways that the problem can be mitigated in the future to leave them with both hope and a goal to work towards by taking responsibility to limit our use of bright lights.

We also spent time explaining the vast lifespan of stars, and we showed them that, with the right tools, invisible forces can be studied. Of course, their passion and excitement could be felt through the questions they asked: What will happen when our star dies? Why do nebulae have colours? What is in a black hole? Young ones continue to astound me with the questions they ask, and it gives me hope that they will be leading the

by Kyle Dally & Leigh Cummings

charge in answering their ponderings. Who knows, maybe we have some future groundbreaking scientists who sat before us on a cold, concrete floor to view the stars with us.

They also astounded us with the knowledge they already possess. When we were comparing our Sun with the size of much larger nearby stars, one young lady spoke out to tell us that our Sun is a "Yellow Dwarf." There were several other examples of when a question directed to us was answered correctly by one of their peers. It was quite impressive, and it highlights one of the goals of science: to elevate, expand, and improve the collective knowledge of our civilization. ★

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recognize and support intellectual explorers.

Thank-you all for your support of our club with your membership. I invite members to become more

involved in your club. I encourage the public to consider membership and members to participate and enjoy your club more through volunteering to help shape your club. Thank you to all our member and

council volunteers for continuing to support a great centre. It's unlikely most of us will be here in 90 years from now but our efforts may mean the club is still successful in another 90 years' time. ★

Membership has its Privileges!

Are you tired of looking at the same objects again and again (planets, moon, etc.)? Is your telescope collecting dust because it's hard to locate deep sky objects? Would you like to bring your observing to a stellar level? Robert Conrad, our observing director, leads the Vancouver RASC observing group and invites you to join by sending him an email at observing@rasc-vancouver.com. Some of the benefits of belonging to this group include:

- Hands on training on how to operate the SFU Trottier observatory
- Weekly observing sessions at the observatory or at dark sky locations
- One-one-one coaching on how to locate thousands of objects in the night sky
- Attend small interactive seminars delivered by Robert on a range of topics including failsafe star-hopping, charting challenging objects and understanding the motions of the cosmos
- Learn to make your telescope dance by locating objects such as asteroids, nova, and supernovae
- Spectroscopy and imaging training from Howard Trottier and an opportunity to collaborate on observatory research projects
- Updates on observable sky events happening during the week like asteroid/comet/deep sky conjunctions
- Access to observing guides and lists that Robert created that took hundreds of hours to create and will help with planning observing sessions
- Knowledge and expertise from other observing group members
- Learn how to quickly and efficiently find and star-hop to deep sky objects using a range of binoculars and telescopes

Upcoming Events

December

14 – AGM

Go to Venus

The climate change which has been predicted for decades has become part of our new reality. Moreover, the effects and resulting damages and difficulties engendered by that change are also evident. Being interested in astronomy, and living in British Columbia, some of the environmental changes caused by the climate change are at least annoying, if not definitely unhealthy. Some much more serious aspects of climate change are hundreds of forest fires in our province alone (other areas have the same problems). People are forced to leave their houses, find them burned down, thereby incurring immense losses. More serious, some people, while fighting the fires, are injured and, sadly, some have died.

Climate changes have occurred a number of times in the past, but, it appears, not at the current rate. Humans, at whatever evolutionary stage,

seem to have developed methods—physiological, biological, and thinking up solutions—which allowed adaptations to changes of climate. Many humans may have lost their lives in these processes.

Evolution, in my thinking, is a ran-

netic internal makeup which will allow their adaption and increase their biological dominance under the new climatic conditions.

As humans, we also have developed a very complex system of dealing with climate change: it is called space travel. Humans have walked on the Moon and have returned to Earth. Current efforts aim at permanent settlement on the Moon, and even Mars. That means getting away from current dangers on Earth and facing new, more likely much more powerful dangers in space.

Humanity is very adaptive. These current efforts will likely result in success sometime in the future. We'll pos-

sibly spread to wider space presence within suitable environments created by us. There is going to be no “hell.” So, if someone annoys you in that future, recommend that person go to Venus. ★



Image: NASA/JPL

dom process. Most genetic and DNA alterations are unsuccessful. The successful versions continue and become more numerous and dominant. I therefore believe that some of our current human individuals have a ge-

Zodiacal Light

Zodiacal light is the glow of sunlight that is scattered by interplanetary dust. In temperate latitudes, zodiacal light is best viewed at the end of the evening astronomical twilight in the weeks before and after the spring equinox, and then at the beginning of the morning astronomical twilight in the weeks before and after the autumnal equinox. This photo was taken from the southeastern end of Denman Island, 75° azimuth, 15 September 2023, 4:36am, Nikon Z6, Nikkor 20 mm lens, 25 s exposure, f/2.8, ISO 6400, and post-processing in the Adobe ecosystem. The red of the morning astronomical twilight has appeared, and the yellow glow of Vancouver is present as well. The cone of zodiacal light, though faint, is clearly present, rising from the red of the astronomical twilight towards the upper right of the photo. Venus has risen and her morning ablutions are underway. The head of the asterism of the Constellation Hydra is visible to the right of Venus and many of those stars are also casting reflections in Lambert Channel. The Beehive Cluster (M44, NGC 2632) is above Venus and smack dab in the middle of the zodiacal light. Pollux and Castor are just above the zodiacal light, directly above Venus, and Procyon is to the far right of M44, near the right edge of the photo. Cautionary

by Peter McNamee

tales abound, and quite properly so, about the challenges, costs, and steep learning curve that astrophotography imposes on neophytes. But, starting slowly, with the equipment at hand, with good planning,

much patience and humility, and some luck along the way, the rewards will flow. You will gasp at the beauty that you have captured and you will once again marvel in wonder at the skies under which we live. ✨



IC 55, IC 63 and Gamma Cassiopeiae

by Phil Lobo

(Image details: 200mm f3.9 Newtonian, 330 minutes Ha, and short RGB exposures for stars.)

closer or further from us than the star. The illumination of the nebulae by the star also means that the nebulae are

seen with smaller instruments, but in any case it requires very dark skies. The photo shows the red hydrogen alpha emis-



Hidden just to the north and west of the bright middle star in the 'W' of Cassiopeia lie two faint nebulae, IC 59 and IC 63. The nebulae and the star Gamma Cassiopeiae are located about 600 light years away. From our line of sight, the nebula appears to be around 3 to 4 light years from Gamma Cassiopeiae, although parts of the nebulae might be

being slowly dispersed by the massive star's stellar winds.

In the *RASC Observer's Handbook*, under 'Deep Sky Challenge Objects,' Alan Dyer and Alister Ling describe IC 59 as a "faint emission/reflection nebula paired with IC 63 very close to γ Cas.; requires clean optics; rated as 'pF'", and as requiring minimum aperture of 200-250mm. It has been

sion light from the nebulae, while visual observations would instead detect the blue reflection light (not evident in the photo).

The star Gamma Cassiopeiae is interesting in its own right. While most bright stars have traditional Latin or Arabic names, Gamma Cassiopeiae did not have a name carried over into Western star atlases,

and its common name, 'Navi', has a more recent origin. The star was used a navigational reference point during NASA space missions while calibrating gyroscopes. The astronaut Gus Ivan Grissom named it Navi, which is 'Ivan' spelt backwards. Grissom was a pilot for the second Mercury flight in 1961, which was sub-orbital and lasted about 15 minutes.

Gamma Cassiopeiae also produces its own small 'nebula' very close to the star. It has the distinction of being the first star whose spectra was discovered, by Angelo Secchi in 1866, to have an emission line (i.e. a bright line in the spectrum), and is classified as a type 'Be' star. The 'B' refers to its spectral class, which is related mainly to its temperature. The 'e' indicates that its spectrum has an emission line. The emission line originates from a disc of hydrogen gas thrown off from the star around its equator, as shown in the adjacent conceptual image. The large amounts of ultraviolet light from the hot star cause the gas in the disk

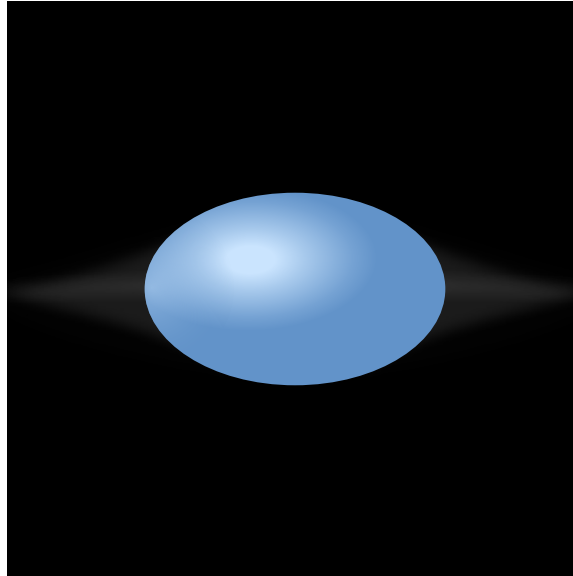
to glow, creating an emission line in the red part of its spectrum. It has been possible to see some of these discs directly using modern interferometers.

The hydrogen alpha emission line can be seen below in the spectrum of Gamma Cas-

type B star. The emission lines can later re-appear, or vary in brightness. Type Be stars are often also variable stars. Gamma Cassiopeiae varies in magnitude between +1.6 down to +3.0. The variability might be related to the gas discs forming and then dispersing.

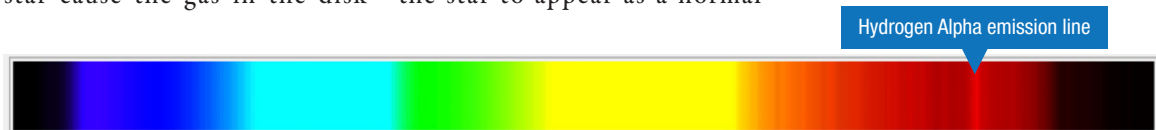
The flattened shape of the star in the conceptual image is based on its rapid rotation rate. Gamma Cassiopeiae has a rotational velocity of 432 km per second, compared to the Sun's rotational velocity at the equator of 2 km per second. Its diameter is around 9 times that of the Sun and its total luminosity is about 40,000 times that of the Sun. In spite of its large size, Gamma

Cassiopeiae will remain as main sequence star for only 8 million years, compared to the Sun which has about a 10 billion year main sequence period. With its high ultraviolet light brightness, large mass ejections and short life-span, Gamma Cassiopeiae would seem an unlikely place for life to evolve. *



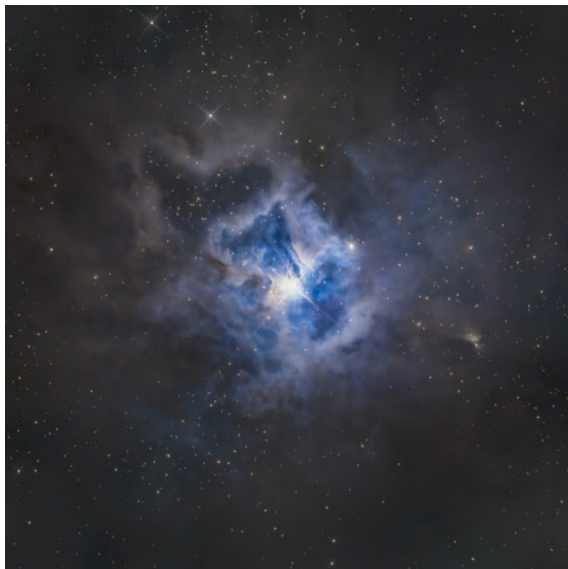
Conceptual image of a type Be star (Wikimedia Commons)

siopaeiae produced using *RSpec* software with data from a *Star Analyzer 100* diffraction grating, taken with a DSLR camera. The emission line can be seen as a bright line in the red end of the spectrum. About 20 percent of type B stars have been identified as type Be. The emission lines of type Be stars sometimes disappear, causing the star to appear as a normal



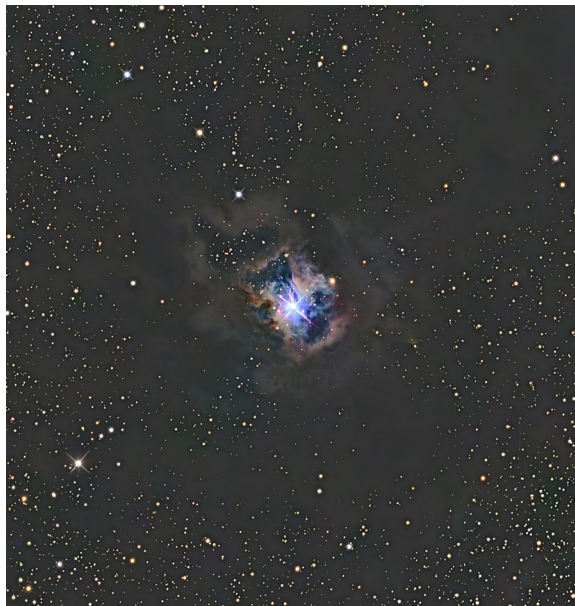
Gamma Cassiopeiae Spectrum using Star Analyzer 100

VRO Gallery



Variations on the Iris Nebula (NGC 7023)

On Sept. 20, 2023, Rick Schneider and Carl Bandura used our VRO observatory to image the Iris Nebula, taking a series of LRGB images over the course of the evening. That raw data was then processed by Rob Lyons (above), Carl (upper right) and Rick (lower right) into three unique images which demonstrate how different the results can be when different people start with the same data.



Fireworks Galaxy (NGC 6946)

by Rick Schneider

Another image from the VRO telescope from an observing session just last week. According to Rick, "the image was difficult to process because of the really poor flats and the full moon shining brightly through the dome shutter, but is okay for just over 2 hours of data."

Members' Gallery



Annular Eclipse by Andrew Krysa

I got some photos with my Lumix G8 DSLR camera of the annular eclipse down in Oregon, east of Eugene. We were madly trying to drive to clear skies but I'm kind of glad we were forced to stop where we did. The sky around the eclipse had just cleared enough to be able to see the eclipsed sun but was just murky enough that it made looking at the eclipse possible with the naked eye (well we're not blind yet anyway, lol).





The Elephant Trunk Nebula by Rob Lyons

The Elephant Trunk Nebula, a mesmerizing spectacle nestled within the vastness of our galaxy, is an astronomical wonder that captivates stargazers and scientists alike. This striking region, located in the constellation of Cepheus, derives its name from the intricate, elongated pillars of gas and dust that resemble the graceful curves of an elephant's trunk. Enveloped in the stellar nursery, where new stars are born, this celestial marvel spans light-years across, showcasing a tapestry of colours and cosmic dust clouds. The nebula's sheer beauty and complexity make it a fascinating subject for astronomers, who study its formation and the processes involved in star birth. This is 27.7 hours of exposure over the nights of September 1, 7, 8, 14, 15, 2023. I captured this from my rooftop in Vancouver, Canada, using my SkyWatcher Quattro 150P (518mm F/3.45) telescope, ASI183MM Pro camera (20mp), and Anilia 3mm narrowband filters, riding on the ZWO AM5 mount.