



# Roanoke Valley Astronomical Society

Amateur Astronomy News and Views  
In Southwestern Virginia



Volume 41—Number 4

April 2024

## *RVAS March Meeting Notes*

# The Hunt for Dark Matter Axions

By Erin Elliott, Secretary

At 7:30, the Celestial Café closed and **RVAS President Mike Hutkin**, along with our Membership Coordinator, **Frank Baratta**, welcomed members and guests to the March meeting. To begin, Mike presented the evening's agenda.

**Attendance:** There were 41 members and 5 guests in attendance at this month's meeting. 14 were in person and 32 attended virtually.

**New Members:** A big welcome to our newest member, **Gerald Smith**. He marks our 100<sup>th</sup> member of the current RVAS roster. Having 100 members rostered in the club has not happened in RVAS history before now. It is exciting to see our membership growing so much!

**Astrophotography:** We thank **Tom Cerul, Ed Dixon, Michael Good, Harry Kessler, Vince St. Angelo and Dave Thomas** for providing their work this month. We had a variety of images focusing on near and deep sky objects.



*John Goss TriStar Summary – Mike Hutkin photo*

To provide each image with the focus it deserves, we are sharing the submissions in a separate article in this newsletter. Do not miss checking out the rest of these images.



*M42 – Michael Good photo*

**Member Observation Reports:** TriStar 2024 took place on March 2 at Guilford Technical College in Greensboro. **John Goss** attended. A highlighted speaker from the event was **Mike St. Claire**, also known as the “Meteorite Man.” He was surprisingly good and enthusiastic in what he shared. Mike talked a lot on the theories of extinction of the dinosaurs and other meteorites. In case people are interested in attending in 2025, TriStar is a free conference that happens the first Saturday in March every year.

**Slate of Officers:** The following list is the slate of officers for the upcoming election in June. This list also appeared in the March Newsletter and members had until March 22 to submit self-nominations. The slate of officers is as follows:

- President: Michael Good
- Vice President: Bill Krause
- Secretary: Erin Elliott
- Treasurer: Frank Baratta
- Officer at Large #1: Nancy Vogelaar
- Officer at Large #2: Caleb White

#### **Member Outreach Committee:**

**Caleb White** has been leading Astronomy outreach at Salem Montessori School. They have an upcoming event where students will build devices to view the April 8 Solar Eclipse. They are especially seeking volunteers for a star gazing opportunity. If you are interested in helping, please reach out to him.

On March 6, **Mike Hutkin** headed over to Ferrum Elementary School to do a presentation on the RVAS April 2024

Planets of Our Solar System. It was a big turn out with all the K-5<sup>th</sup> students, teachers, and administrators.

There are more upcoming outreach events on the horizon, which include the following:

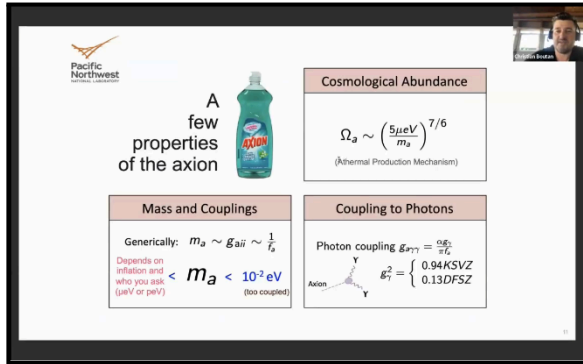
- April 3, 2024: **Ed Dixon** Library in Lexington
- April 8, 2024: **Frank Baratta** and **Ed Dixon** are coordinating a Solar Eclipse event with Roanoke Parks and Recreation at the Mill Mountain Discovery Center.
- June 6, 2024 @ 10am: Astronomy 101 presentation for Senior Citizens through Franklin County Parks and Recreation
- Claytor Nature Center/Belk Observatory is looking for partnership opportunities with RVAS. They have public programs for the community once a month and they would like us to visit or lead a program. An idea is to help with a Perseid Watch Party August 11-12.

**Star Parties in 2024:** We’re trying to get the weather to cooperate with us! The next potential for the Star Party will be May 3 (rain date May 4) at the Cahas Overlook. These are opportunities for members to come together and share the sky with each other. The following parties are projected to be August 16, and November 15. Please reach out to **Mike Hutkin** at [president@rvasclub.org](mailto:president@rvasclub.org) to join RVAS’ Google Group to stay up to date in communication on these events.

**What’s Up?:** Before turning to our program for the evening, Mike asked **Frank Baratta** for his “What’s Up?” program on what the skies of April have in store for us. Frank’s “What’s Up? Highlights” in this issue provide a summary of program. His PowerPoint can be viewed by [clicking here](#). The recording of the program is available by [clicking here](#).

**Featured Program The Hunt for Dark Matter Axions:** **Dr. Christian Boutan** is currently a staff

scientist at Pacific Northwest National Library (PNNL). He is a hands-on experimental physicist with experience in axion dark matter physics, quantum sensing, low-temperature instrumentation, radio-frequency engineering, and digital/analog circuits. Boutan has been a key member of the Axion Dark Matter eXperiment (ADMX) collaboration since 2011. If you would like to view the whole program by video, you may do so by [clicking this link](#).



*A few properties of the axion – Zoom screenshot*

## Mystery #1 - What is Dark Matter?

- Early Evidence for Dark Matter (1930s)
  - Zwicky and Smith
  - Oort
- Rotation Curves (1970s)
  - Rubin
- Dark Matter would explain a lot of things
  - Rotation Curves
  - Gravitational Lensing
  - Bullet Cluster
  - Nucleosynthesis
  - BAO + CMB
  - Simulations
- Abundance of Dark Matter
  - Cosmology: ~70% Dark Energy, ~25% Dark Matter and 5% is everything we understand
- Dark Matter we look for:
  - Very stable
  - Non-interacting
  - Non-baryonic
  - Mostly cold
- Dark Matter Candidates

- Top two contenders are: WIMP and Axion

## Mystery #2 - Why no nEDM?

- Strong CP Problem
- The Peccei/Quinn Solution
- Weinberg/Wilzcek Realization
- A few properties of the axion
  - Cosmological Abundance
  - Mass and Couplings
  - Coupling to Photons



*Installing the eXperiment – Zoom screenshot*

## Axion Haloscope

- Turn axions to photons
- Signal to Noise Equation
- The ADMX Detector
  - ADMX Insert
  - ADMX Receiver
- ADMX Detector Components
  - Microwave Cavity
  - Quantum Noise Limited Electronics
  - The Receiver
- Installing the eXperiment
- Data-taking and analysis (on one slide)
- Axion-Photon Limit Plot
- We want to go to higher frequencies
- Piezoelectric Tuning/Coupling
- Sidecar Cavity + Motors
- Sidecar Receiver
- Piezo Motion control and cavity measurements
- Challenges at Higher Frequencies
- PNNL is responsible for:
  - Cavity frequency locking system
  - RF global design
- ADMX Extended Frequency Range
- The Future of ADMX

- 2 sources of quantum noise
- Realistic axions look a lot like the vacuum state
- Challenges at Higher Frequencies
- The hunt for the axion: current status
- My concerns
  - We need to combine multiple SNR boosting “tricks” for a discovery
  - Every new solution/design leads to more complexity
- ECRP proposal addresses the above concerns
- Developing at PNNL
- Reducing Noise with Photon Counting
- Develop AI/ML tools for characterization and controls
- He got his funding
- Axion is exciting and we should look for it
- ADMX-G2 is taking data at DFSZ sensitivity and is funded to scan up to 4 GHz
- We need to push technology and leverage quantum sensing if we want to get there (and beyond)
- Early Career Award! We will develop new tools and detection strategies
- A discovery would be a big deal!

**Next month:** On April 15, 2024, we will have Roanoke College StarShade project students and professors share about their NASA challenge project. They earned second place in a nationwide NASA challenge. A StarShade is a machine being created to help telescope systems record data about faraway exoplanets that orbit large stars.

Concluding Thoughts

The meeting was adjourned at 9:03 pm.

The Roanoke Valley Astronomical Society is a membership organization of amateur astronomers dedicated to the pursuit of observational and photographic astronomical activities. **Meetings are held at 7:30 p.m. on the third Monday of each month. See calendar on last page of newsletter for location. Meetings are open to the public.** Observing sessions are held one or two weekends a month at a dark-sky site. For information regarding joining RVAS, including annual dues, [click here](#). Articles, quotes, etc. published in the newsletter do not necessarily reflect the views of the RVAS or its editor.

**Officers/Executive Committee/Editor/Webmaster**

**Mike Hutkin, President ([president@rvasclub.org](mailto:president@rvasclub.org))**

**John Wenskovitch, Vice President ([vicepresident@rvasclub.org](mailto:vicepresident@rvasclub.org))**

**Erin Elliott, Secretary ([secretary@rvasclub.org](mailto:secretary@rvasclub.org))**

**Frank Baratta, Treasurer ([treasurer@rvasclub.org](mailto:treasurer@rvasclub.org))**

**Nancy Vogelaar, Member at Large ([memberatlarge@rvasclub.org](mailto:memberatlarge@rvasclub.org))**

**John Goss, Immediate Past President ([immediatepastpresident@rvasclub.org](mailto:immediatepastpresident@rvasclub.org))**

**Michael Martin, Past President ([pastpresident@rvasclub.org](mailto:pastpresident@rvasclub.org))**

**Ed Dixon, RVAS Newsletter Editor ([editor@rvasclub.org](mailto:editor@rvasclub.org))**

**Erin Elliott, Webmaster ([webmaster@rvasclub.org](mailto:webmaster@rvasclub.org))**

# RVAS Member Anniversaries

Congratulations to the following members who reach the indicated number of consecutive years with the RVAS since joining or rejoining during the month of April:

Kevin and Emily Hamilton (1991) – 33 years

Clem and Uche Elechi (2008) – 16 years

Tom Cerul (2020) – 4 years

Jenna Bramlett (2022) – 2 years

Erin Elliott (2022) – 2 years

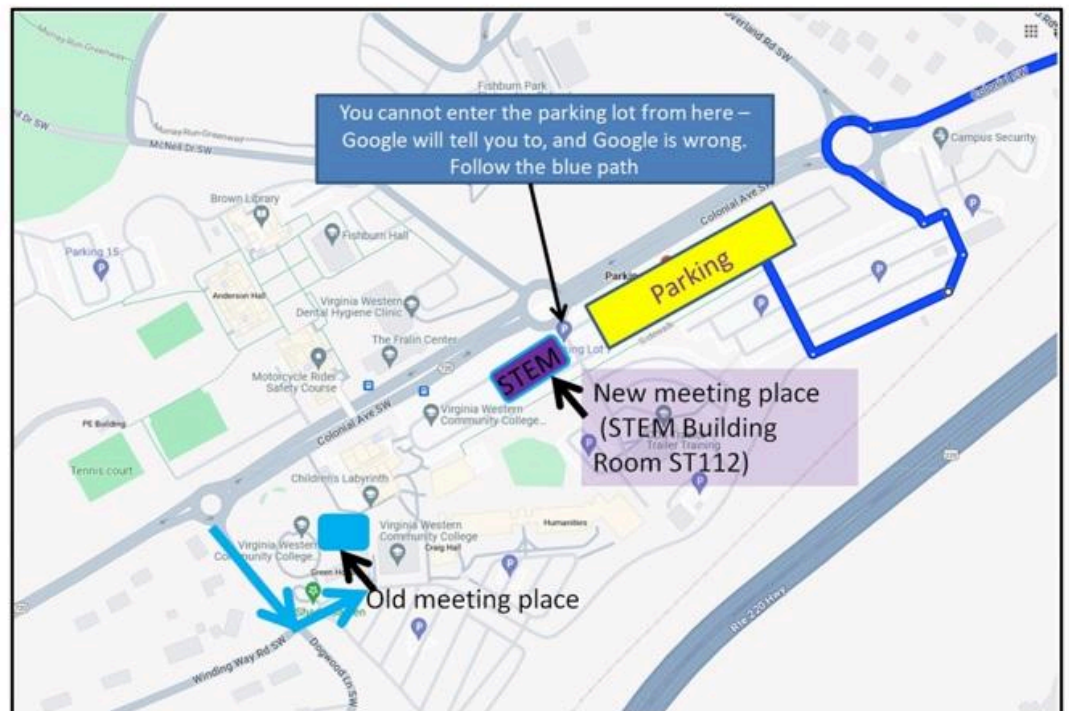
Alijah Adkins (2023) – 1 year

**Thanks to all of you for being RVAS members!**

## Directions to RVAS Meeting Location

Virginia Western Community College STEM Building, Room ST112  
3094 Colonial Ave SW, Roanoke, VA 24015

VWCC is located in the southwestern area of the City of Roanoke. The STEM Building is accessed via the roundabout at Overland Drive and Colonial Avenue, near Campus Security at the top right of the map. The STEM Building is at the opposite end of the Colonial Avenue parking lot from Campus Security. Follow the darker blue path from the roundabout and park anywhere in the lot. **Note:** Google provides incorrect guidance to access the parking lot from the roundabout at McNeill Drive. That roundabout **does not** provide an entrance to the parking lot.





## **Astronomers Without Borders**

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### **We all live on the same planet**

We all live on a very small world floating in a vast, largely unknown cosmos. Sometimes we think that with humanity's many differences, peoples in different lands have little in common with one another.

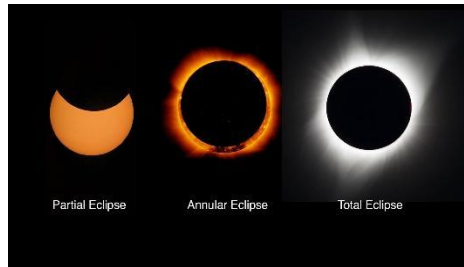
One commonality, though, is that we all see much of the same sky. People in the USA, in Canada, in Australia, in Brazil, in China, and in Russia – and in Ukraine; people in every country of Europe, Africa, Asia, South America and Central America; people in the developed and in the undeveloped world; people living in large, modern cities, in rural farmlands, and on isolated oceanic islands; in other words, everyone everywhere all see the same moon, the same planets, many of the same stars – and we all live under the same sun.

Stand under the starry dome and gaze skyward. Join the rest of humanity and experience the wonder, beauty, and mystery of this incredible universe.

### **Global Astronomy Month begins April 1.**

**<https://my.astronomerswithoutborders.org/programs/global-astronomy-month/gam2024-main>**

# A GUIDE TO THE SOLAR ECLIPSE OF 2024



Astronomical League Solar Eclipse Observer Guide and Checklist

[Solar Eclipse Checklist](#)

2024 Eclipse in Roanoke (1:56 pm start; 4:31 pm finish)

[Where to Observe in Roanoke](#)

[Roanoke Eclipse information](#)

American Astronomical Society

[Solar Eclipse Across America](#)

Observing a Partial or Total Solar Eclipse with Students

[Guide](#)

[Safety](#)

Observing Glasses

[Glasses](#)

Photograph the solar eclipse

[Photograph](#)

**NEVER LOOK DIRECTLY AT THE SUN**

# What's Up? Highlights

April 1 to 30, 2024

(See *RVAS March Meeting Notes* in this issue for links to the PowerPoint and program video.)

## This Month:

Well, one thing's for certain this month: one celestial event unquestionably has everyone's attention. Eclipsing – pun intended! – all other celestial events is the second Great American Eclipse in less than a decade. The first took place August 21, 2017. On April 8, 2024, as in 2017, Roanoke is off the path of totality, resulting in a partial eclipse. Also as in 2017, the new moon will cover about 90% of the sun, so we here in Roanoke won't experience the darkening of daylight. **Most importantly, looking at the sun at any time during the event without proper eye protection risks immediate and permanent eye damage.** The eclipse begins at 1:58 p.m., reaches maximum coverage at 3:15 p.m. and ends at 4:29 p.m., all local Eastern Daylight Time. In 2017 the path of totality was Coast to Coast, from Oregon to South Carolina. This time, the path extends from Texas to Maine. Again, the entirety of the contiguous 48 states will see some level of coverage. Don't miss it!

## Celestial Events:

- Mon., 8<sup>th</sup> – Solar Eclipse. U.S. path of totality spans Texas to Maine. Local view is a partial eclipse, with 88% the maximum covered for Roanoke.
- Mon., 8<sup>th</sup> – Comet 12/P Pons-Brooks, about 25° from the Sun during the eclipse, has a chance – if an outburst occurs – of being visible during totality of the eclipse.
- Wed., 10<sup>th</sup> – Early risers with a clear ESE horizon may catch Mars and Saturn, less than ½° apart, rising an hour before sunrise.
- Fri., 14<sup>th</sup>, 11:00 PM – The Equation of Time is 0. One of the 4 instants during the year when solar (sundials) and civil (clocks) time agree on the time.
- Thu., 18<sup>th</sup> – Astronomically, the Sun enters Aries. But in non-sidereal forms of astrology, it will enter Taurus in less than 24 hours.
- Sun./Mon., 21<sup>st</sup>/22<sup>nd</sup> – Annual Lyrid Meteor Shower. Typically, about 18 meteors per hour. Unfortunately, the Moon is nearly full.

## Sunset and Twilight:

Sunset Range: 7:42 p.m. (Apr. 1<sup>st</sup>) to 20:08 p.m. (Apr. 30<sup>th</sup>)

Twilight Ends: 9:11 p.m. (Apr. 1<sup>st</sup>) to 9:46 p.m. (Apr. 30<sup>th</sup>)

## Weekend Observing Opportunities:

(Dark of the Moon Weekends)

Apr. 5<sup>th</sup>/6<sup>th</sup>

Apr. 12<sup>th</sup>/13<sup>th</sup>

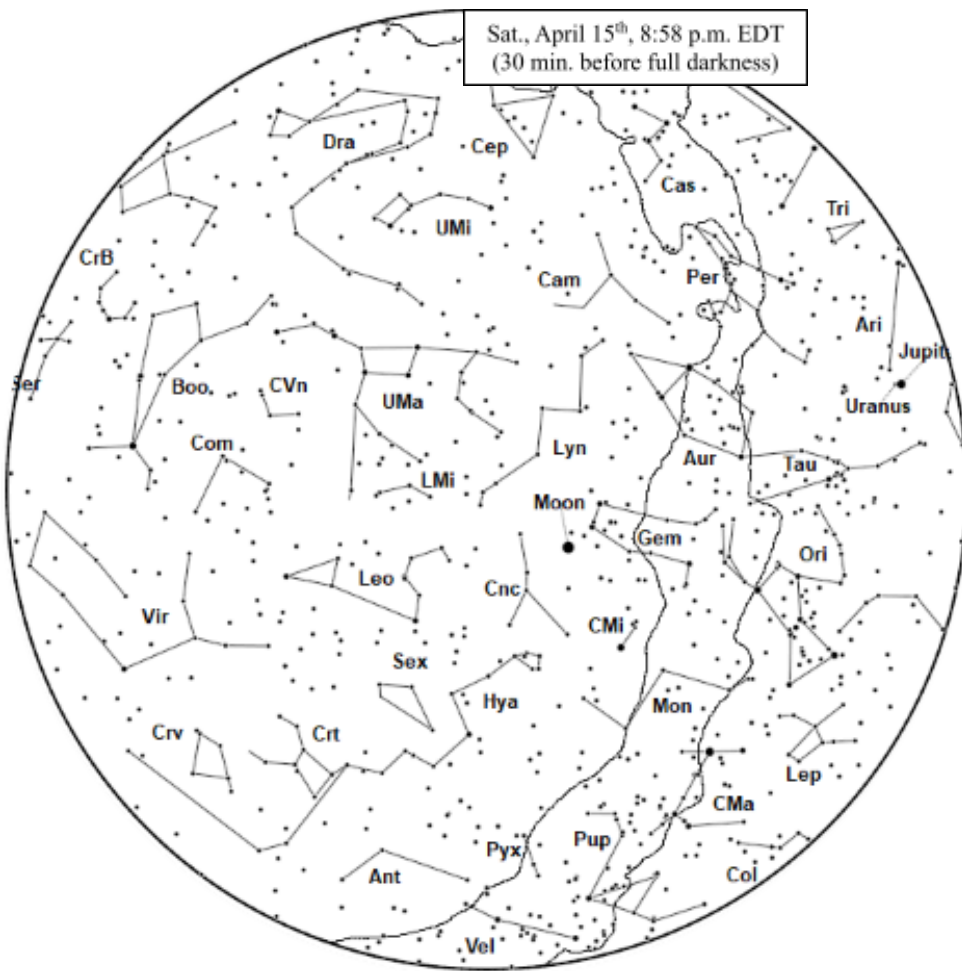
## Moon Phases:

Mon., 1<sup>st</sup> – Last Quarter

Mon., 8<sup>th</sup> – New Moon

Mon., 15<sup>th</sup> – First Quarter

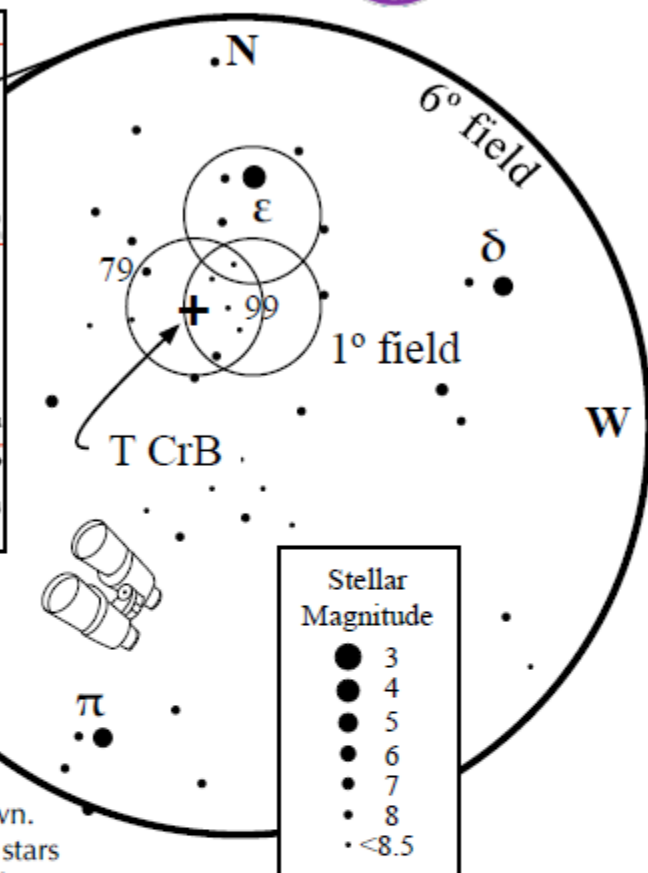
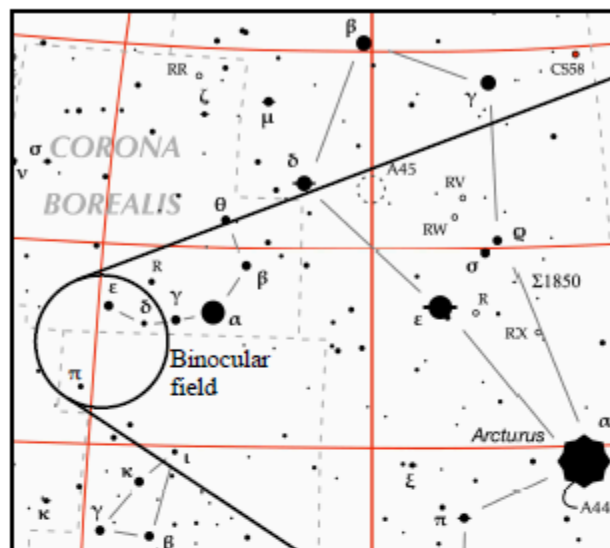
Tue., 23<sup>rd</sup> – Full Moon



# T Coronae Borealis

*A nova waiting to happen – soon!*

also known as HIP 78322 and the "Blaze Star"



## How to find T Coronae Borealis

- Locate bright Arcturus and the kite shaped constellation Boötes.
- Corona Borealis lies directly east of Boötes.
- Trace the semi-circle of the stars of the crown.
- Epsilon and Delta are fourth magnitude stars shining east of Alpha (Gemma), the brightest member of the crown.
- Place Epsilon in the northern half of the binocular (or finder) field. Fifth magnitude Pi Serpentis lies near the bottom of the field.
- T Coronae Borealis is about 1/4 the distance between Epsilon and Pi.
- Move two low power eyepiece fields south of Epsilon.
- Then move 1/2 low power eyepiece field east.
- This is the vicinity of 10th magnitude T CrB.

- The star normally is magnitude 10.3.
- Ten years before its outburst, it rises to magnitude 9.8. It did this 10 years ago.
- It then dims to about magnitude 12 one year before outburst. It did this in April 2023.

Between now and September, T CrB is predicted to nova, quickly reaching 2nd magnitude and rivaling the brightness of Alpha CrB (Gemma).

- Its brightness rise will take 1 day or less.
- It will likely remain near maximum brightness (2nd mag.) for less than 10 days.



## ***FOR YOUR INFORMATION***

**APRIL 2024**

***DUE TO MEETING TIME CONSTRAINTS, HERE ARE A FEW ITEMS THAT I DID NOT GET TO PRESENT.***

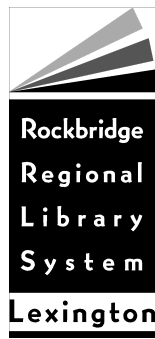
**CONGRATULATIONS** to Michael Martin. He is listed in the current issue of the Reflector – page 27 for completing the Sunspotter Observing program

**THE EYE PLANETARIUM** – I visited the planetarium on March 8. There was an 18 minute show titled “Passport to the Universe” and a 20 minute show titled “Our sun”. Tickets were \$7.50 +2.25 service fee. Please go and let us know what you think. We would like to have a joint event with the planetarium in the future.

**EARTH DAY** – we have decided not to participate this year. The event is being combined with the Blue Ridge Marathon and there will be significant restrictions on set up, parking, and coordination that would impact our ability to participate.

**BLUE RIDGE KITE FESTIVAL** - In lieu of participating in the Earth Day event on April 20, 2024, **Nancy Vogelaar** is coordinating the RVAS booth at the Blue Ridge Kite Festival at Green Hill Park in Salem, 10AM -3PM. It is a fun, family-friendly event with many attendees!

Mike Hutkin, President



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Lexington, VA 24450  
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## PRESS RELEASE

MARCH 22  
LEXINGTON  
ROCKBRIDGE REGIONAL LIBRARY GETTING READY FOR APRIL SOLAR ECLIPSE

### FOR IMMEDIATE RELEASE

Rockbridge Regional Library in Lexington will host Ed Dixon from Roanoke Valley Astronomical Society (RVAS) for an informational overview on Wednesday, April 3, at 1:00 p.m. for the upcoming solar eclipse.

Ed, RVAS member and astrophotographer, will give a basic overview of eclipse phenomena and talk about what to expect. He'll answer questions and demonstrate a robotic telescope that will provide live eclipse data during the big event. The Roanoke Valley Astronomical Society seeks to advance the understanding and appreciation of astronomy and related sciences among the Society members and the public. Rockbridge Regional Library will also host viewing events for everyone from 2-4:30 p.m. on Monday, April 8, with activities and viewing glasses.

The Lexington Branch of Rockbridge Regional Library System is open Monday - Thursday 10 AM - 7 PM, and Friday 10 AM - 5 PM and Saturday 10 AM - 2 PM. Visit us online at [www.rrlib.net](http://www.rrlib.net).

Rockbridge Regional Library System (RRLS) serves the counties of Rockbridge and Bath and the cities of Lexington and Buena Vista. RRLS has branches in Buena Vista, Glasgow, Goshen, Warm Springs and Lexington. Outreach and bookmobile services are provided across the region. It is an Equal Opportunity Employer and a United Way agency.

**March 2023**

*Ctrl- Click on the picture see the source file and additional information*

**TOM CERUL**



**IC 434 Horsehead and Flame Nebula**

**TOM CERUL**



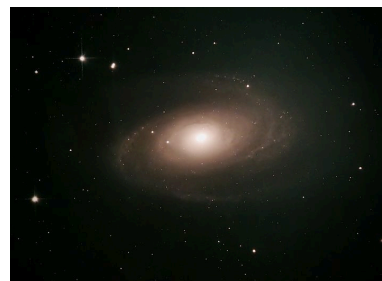
**NGC 2174 and NGC 2175**

**ED DIXON**



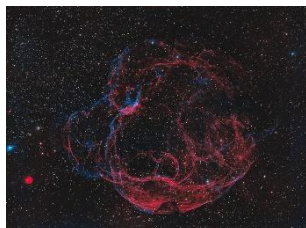
**Orion Nebula (M42)**

**ED DIXON**



**Messier 81**

**CLEM ELECHI**



**Sh2 240, a supernova remnant in Taurus**

**MICHAEL GOOD**



**Pleiades M45**

**MICHAEL GOOD**



**Double cluster C14**

**MICHAEL GOOD**



**Rosette Nebula / NGC2244**

**MICHAEL GOOD**



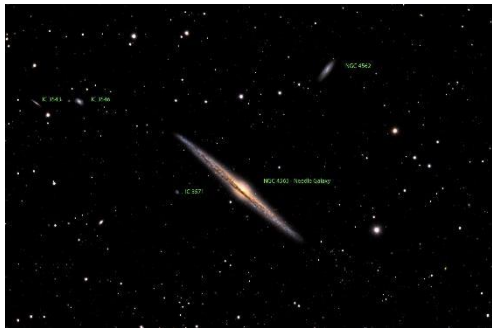
**Orion Nebula M42 / NGC1977 Running Man**

**HARRY KESSLER**



**NGC 1973 Running Man Reflection Nebula**

**HARRY KESSLER**



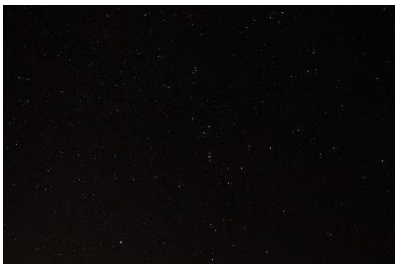
**Needle Galaxy**

**VINCE ST. ANGELO**



**Canis Major**

**VINCE ST. ANGELO**



**Orion**

**DAVE THOMAS**



**Moon and Venus**

# Monthly Calendar

**RVAS Monthly Meeting: Monday, April 15<sup>th</sup>, 7:30 p.m. (Informal “Celestial Café” chat session begins at 7:00 p.m.) STEM Building, Room ST112, Virginia Western Community College, Colonial Avenue, Roanoke, VA.** In late January this year Roanoke College received some exciting news. A team of its students had placed second in a NASA Starshade Undergraduate Challenge, a national competition that put them to work on a real problem that leading scientists are pursuing. An outgrowth of NASA’s Hybrid Observatory for Earth-like Exoplanets (HOEE), ten students across multiple disciplines formed the team led by Bobby Hoyer ’24 and faculty advisor Troung Le, Visiting Assistant Professor of Physics and Astronomy. This evening, for our featured program the RVAS will welcome members of the Roanoke College team to share with us their experiences in the competition: the hybrid observatory concept; designing a starshade; obstacles encountered and overcome; and NASA’s invitation to continue pursuing the project and building a relationship with its scientists. Along with our featured program we’ll have our announcements, outreach updates, astrophotography, observing reports and What’s Up for May. Make plans to attend, in person or virtually, and watch for the Zoom invitation in the days prior to the meeting. [See elsewhere in this issue for directions to the meeting place.](#)

**Weekend Observing Opportunities:** The following information on Fridays and Saturdays that may be suitable for observing is provided as a courtesy to RVAS members and other readers. The RVAS assumes no responsibility for the health or safety of anyone venturing out to stargaze, and cautions all who may do so to observe appropriate health and safety precautions.

- **Friday and Saturday, April 5<sup>th</sup> and 6<sup>th</sup>.** Sunset is at 7:47p.m. Astronomical twilight ends at 9:18p.m. The Moon sets at 4:16 and 5:31 p.m., respectively.
- **Friday and Saturday, April 26<sup>th</sup> and 27<sup>th</sup>.** Sunset is at 8:05 p.m. Astronomical twilight ends at 9:43 p.m. The Moon rises at 11:15 p.m. and 12:18 a.m., respectively.
- **Future Weekend Observing Opportunities: May 3<sup>rd</sup> & 4<sup>th</sup>; May 31<sup>st</sup> & June 1<sup>st</sup>.** (Note: May 3<sup>rd</sup> and 4<sup>th</sup> are the quarterly RVAS star party and rain date.)

## Astro-Quiz

Ranked among the world’s top ten annual amateur astronomy conventions, the Winter Star Party is held on Scout Key, in the Florida Keys, at latitude 24°39’N. Compared to Roanoke at latitude 37°16’N, how many of the first magnitude stars (i.e., those not exceeding magnitude 1.50) can be seen from Scout Key? (Click [here](#) for an article containing a table of the 100 brightest stars.)

**Answer to Last Month’s Quiz:** Last month we asked for the Messier catalog number of the globular star cluster closest to Earth and the object’s distinctive feature, seen when viewed at moderate magnification. The globular cluster is M4, about 5,500 light years from Earth in the constellation Scorpius, the scorpion. Between and slightly below the stars Antares (alpha [ $\alpha$ ] Scorpii) and Alniyat (sigma [ $\sigma$ ] Scorpii), it forms the apex of a thin triangle. Well-known to observers, its distinctive feature is a bar-like line up of stars, seen in the accompanying graphic. Interestingly, this feature is less visible at low or high magnifications. Observing M4 provides a good opportunity to use “averted vision,” the technique of directing one’s central vision slightly off to the side of what is being observed, which aims the eye’s peripheral rod cells (more sensitive in low light) at the object. Have an answer to this month’s quiz (or a future quiz question and answer to suggest)? E-mail it to [treasurer@rvasclub.org](mailto:treasurer@rvasclub.org)!

