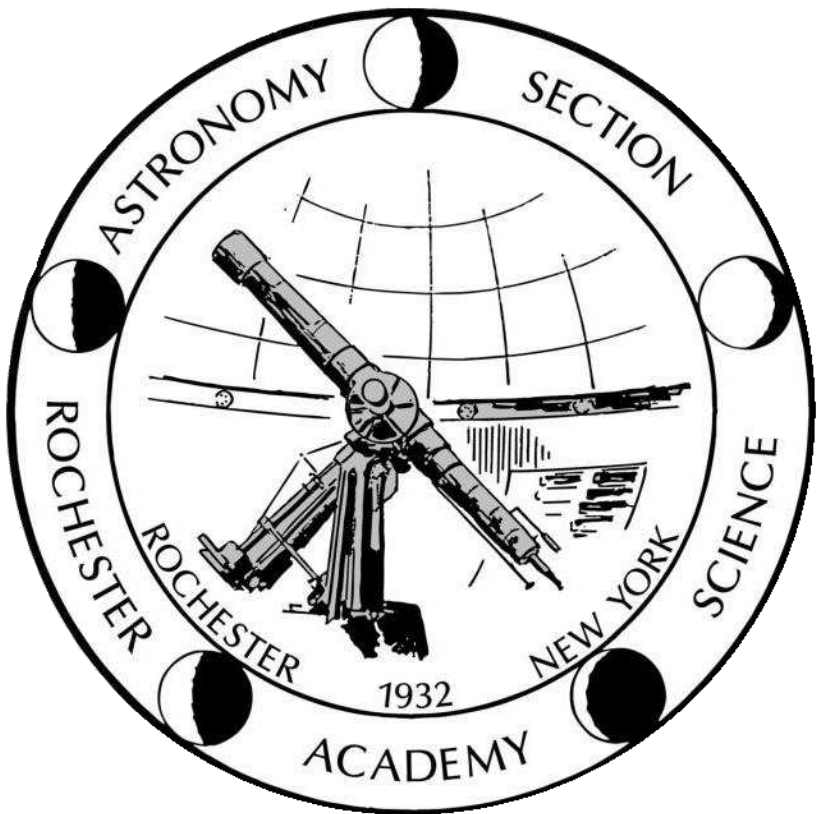


# Astronomy Section of the Rochester Academy of Science

## Annual Report 2021

The Board of Directors and members of the Astronomy Section of the Rochester Academy of Science gratefully acknowledge the continuing support of the Marian and Max Farash Foundation which enables us to achieve our goals, *“the education of members and the general public in the knowledge and enjoyment of the wonders of the universe, and to furthering the understanding of astronomy in the Greater Rochester area”.*



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# Who and what we are

**Our Observatory**  
*The Marian and Max Farash Center  
for Observational Astronomy*  
Ionia, NY

The Farash Center, comprising 17 groomed acres, 12 observatory, meeting and storage buildings, provides the central meeting place for our members and guests.

## **Our Membership**

Ranging from professional astronomers to amateurs to stargazers, our 210 memberships represent about 254 individuals who span all ages and a wide array of interests and abilities.



# Farash Center Investments

# Outreach and Education

The Astronomy Section removed about a dozen tree stumps after last year's tree removal. The stumps had presented hazards to driving around and plowing our site.



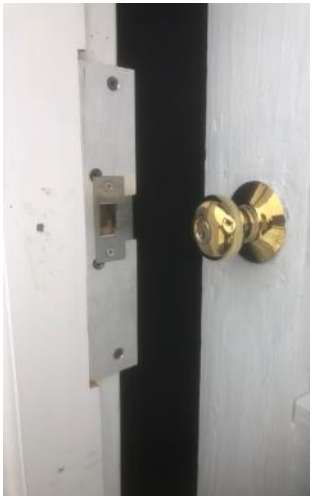
We surveyed the Marian & Max Farash Center for Observational Astronomy for security and decided to upgrade the locksets on all buildings. A plan was developed for secure door locks and an order has been placed for replacement locks, keys, and cores for all Farash Center doors. Lock replacement began in December, 2021 and will be completed in 2022.



First new lockset installed December, 2021

Many buildings had repairs this year:

- Farash Observatory Roll-off door frame was strengthened with new metal plate.
- New support for the Brewhaus roll-off track was installed.
- Big Dome leak at western wall and dome was repaired and sealed. (need to do interior wall repair in 2022)



New "Cave Building" Strike Plate

Brewhaus roll-off support repair



Western Big Dome leak repair

## Scouts

COVID held our numbers down; however, the Farash Center was still a magnet for kids from throughout the area. We hosted two Boy Scout troops, one Girl Scout Troop, one Explorer group, and one inner-city STEM group.



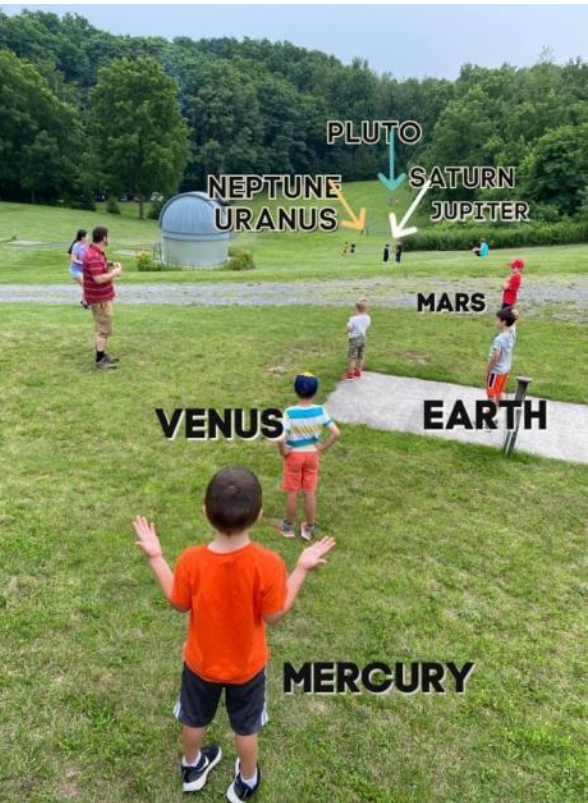
Cub scout troop after rolling off the top of the building on the 17-inch Cave telescope.



Urban-Suburban STEM Team Observing Session

## STANYS

Science Teachers Association of New York State held their annual meeting on November 6, 2021. It was a rare warm clear day at the Rochester Convention Center. ASRAS set up a solar telescope and showed the teachers the sun, which had several sunspots to view. After the viewing session, ASRAS distributed STEM material from NASA. ASRAS has been supporting this event for the past 15 years.



Cub scout troop demonstrating how far away the planets are from each other.





# Outreach and Education

## Virtual Star Parties

As COVID 19 continued to preclude the Astronomy Section from conducting the close contact of in-person Star Parties in 2021, we continued to host our Virtual version of a Star Party. Using the Celestron C14 in the Big Dome at the Marian & Max Farash Center for Observational Astronomy, ASRAS held three virtual star parties in the Spring.

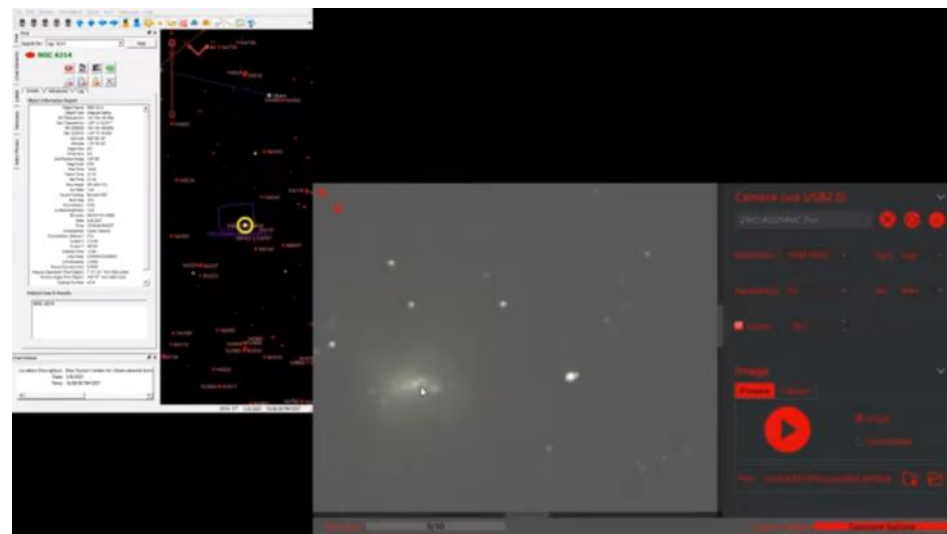
Although our internet streaming capabilities are limited due to low bandwidth, we recorded observing sessions, edited them and held online star parties with the observations.

In the early Spring we held a Virtual Messier Marathon over two consecutive weekend evenings. On the evening of March 13-14, 2021, we observed 68 of the 110 objects. The following weekend, March 22, beginning at 2:00AM, we continued until about 5:30 AM to capture another 38 objects to reach 106 of the 110 total as the morning sky brightened to end our marathon.



Virtual Messier Marathon of March 13, 2021

We held a deep sky themed observing session as well. We followed the *Sky & Telescope* article of May 2021 outlining some star-forming regions in other galaxies in our skies. We imaged eight galactic star-forming regions and added a few others that complemented the S&T article.



v Hubble ST image of NGC4214



< Star-forming region Virtual Star Party Image of NGC4214 from May 8 , 2021

We drew over 50 people for the live events and over 113 views of the recorded sessions on our YouTube channel. We are continuing work on improving internet capabilities at the Farash Center so that we can stream more of these events live soon. View these and all of our Virtual Star Parties on our YouTube Channel:

[https://www.youtube.com/channel/UCNsazs\\_ONVne-hZt7FFePig](https://www.youtube.com/channel/UCNsazs_ONVne-hZt7FFePig)

## Outreach: Mees Observatory Tours

After missing the 2020 tours season at UR's Mees Observatory completely, ASRAS members were again able to provide astronomy learning and observing experiences in 2021. The format was dramatically changed, using Zoom as the meeting place and observing via imaging conducted using remote operation of the Observatory. But with the exception of experiencing the grounds and facilities at Mees Observatory in person, all aspects of traditional tours were replicated. Guests were given opportunities to ask questions and make requests; they were treated to astronomy talks; they were provided with observing experiences even surpassing those of someone looking directly into the eyepiece of the large reflecting telescope.

During summer 2021, 14 tours were conducted for approximately 150 guests. Eight of the tours included live imaging of objects in that evening's sky, while five more provided a similar experience, using images captured on earlier nights. To accomplish this, six ASRAS members became skilled in remote observatory operation and four others joined eight UR students and three UR astronomers in this effort. All aspects of planning, training and conducting tours were conducted remotely as well.

All participants judged the experience and the quality of the tours to be excellent, and worth repeating in future years as needed. We also note that this format provides outstanding ADA compliance.



Virtual Tour Guide Team Meeting



Virtual Tour (Kids' Version)



# Member Activities

## ASRAS Monthly Meetings In-Person & Virtually!



When COVID-19 hit in 2020, we lost our ability to meet in person and our access to meeting spaces. ASRAS recovered quickly and began using online meeting services for our monthly meetings. We've continued to meet virtually until June 2021, when we began meeting in-person AND virtually starting a new hybrid meeting strategy.

In 2021, we again were able to host more remote speakers and as such we've been able to get speakers from all over the country. We were, once again, precluded from hosting our annual RocheStar Fest, but we were able to secure a top-of-the-line Keynote Speaker in Alexei Filippenko of UC Berkeley to talk virtually about dark energy and the now-possibly changing Hubble "Constant"! We held six virtual meetings and six hybrid monthly meetings in 2021 attended by over 700 people.



## Open Houses



Observing a set of site gathering protocols due to Covid, we held 12 regular monthly open houses hosting a total of about 200 people. Open houses are typically held on Sundays from noon until 3-4 p.m. or later if the skies are clear.

## Observing Nights at Farash Center



Picking the optimal Moon phase for deep sky observing and imaging, we schedule a series of observing nights at the Farash Center for members. On these evenings, all of the many observatories are in use, as well as equipment members bring for the evening. Besides these scheduled events, on numerous other occasions, members came to observe under the Farash Center's clear, dark skies.



Lunar Eclipse Images: Douglas Kostyk, November 2021

Special events in 2021 included a Covid protocol observing session during what would have been RocheStar Fest, The Perseid Meteor Shower and the Partial Lunar Eclipse of November 19<sup>th</sup>



# Science: Radio Telescope

## Project ART: Autonomous Radio Telescope

The Farash Foundation’s educational outreach grant has enabled RIT engineering students to research, design and build a Solar Radio Telescope that will study the Radio Frequency signature of solar disturbances (Fig 1).

Sunspots, Prominences and Coronal Mass Ejections (CMEs) present a significant danger to Earth’s increasingly electronic world, especially as they interact with Earth’s magnetic field (Fig 2).

It’s not a matter of **if** we will be impaired by these events, but **when**. It’s no longer a possible inconvenience, but a serious potential commercial and military disaster. Weather, security, communications, banking, and even airline flight operations increasingly use satellites to enable day to day operations. We’ve been lucky that major flares have not directly hit the Earth, but at the best just grazed us. We need a better early warning indicator, as the satellites that study the Sun operate in various optical bands, but none in the RF spectrum.

An **Autonomous Radio Telescope (ART)** has been in development at RIT for the Farash Center site in Ionia, NY. Its mission is to detect and relay coronal mass ejection warning data from the Sun to the solar (helio-) scientists of the e-Callisto Project in Zurich, Switzerland. This will enhance our understanding of Solar Physics dynamics. Additionally, it will put the ASRAS organization on the global astronomy stage. This is a sizable undertaking in the professional world, let alone in the world of college students. This work has been an uphill effort, given the COVID challenges of the last two years. It’s extremely difficult to teach a ‘hands-on’ lab remotely.



Fig 1; Radio Telescope @ Ionia, with flowers

A concept for self-calibration, involving a precision noise source, will allow periodic calibration to be self-contained, without the need for any outside (human / user) intervention. Additionally, we’ve added an Uninterruptible Power Supply (UPS), to ensure no data is lost during temporary power interruptions.

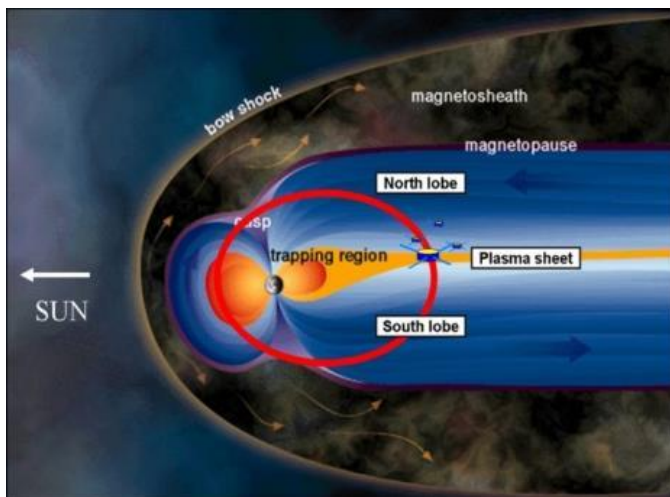


Fig 2: Solar / Earth Magnetic Field

Each year, the new incoming senior team is assigned a critical module to develop, according to a master plan. We’ve been able to develop tracking servos, PC controls, dual receivers, etc. This year we’re working on an ASCOM software interface to the Radio Eyes Planetarium program (Fig 3) for autonomously pointing & tracking the Sun.

A novel / advanced method of noise removal consisting of measuring the Sun’s signal with one receiver, and the local ‘Ambient’ noise on the other receiver (aka; Stereo) is progressing from our ‘proof of concept’ phase to the ‘reduced to practice’ phase. An example of the final result is in (Fig 4) and shows our ability to actively remove the ‘local’ noise. *The Red & Green traces show the Sun signal (with & without an Amplifier (LNA) & the Blue trace is the local noise. Please notice, **NO** noise is present in the Red/Green traces at the FM radio bands (88 - 108 MHz) or at 657 MHz, a local strong frequency for DTV Channel 8.*

A new software version enables very fine ‘slices’ of the data to only 1/16<sup>th</sup> (0.0625) Megahertz increments, this is equivalent to HD video. The upper left of the figure shows a picture of the active sunspots, and the one on the upper right shows the prototype setup.

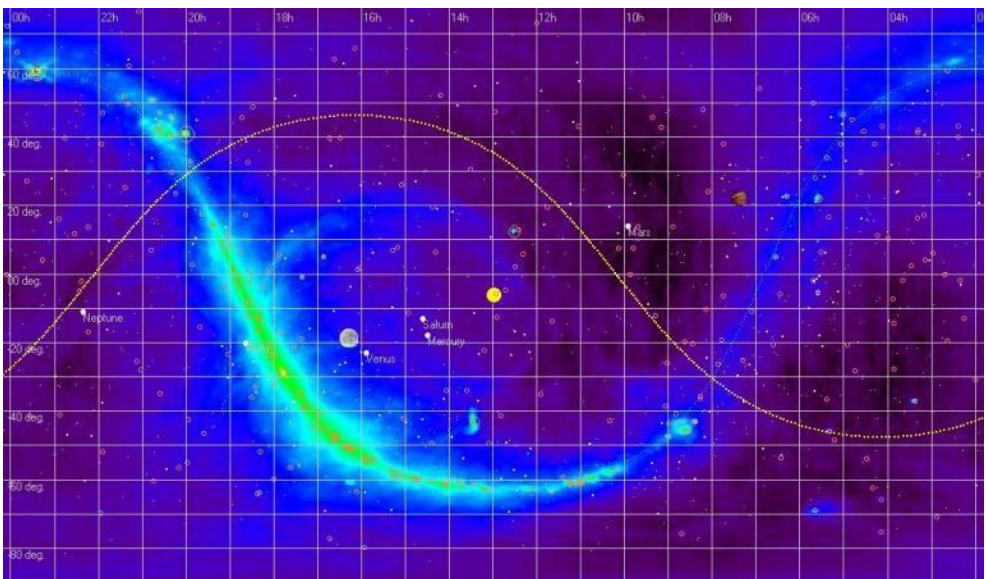


Fig 3; Radio Eyes sample output

For maintenance, a set of critical spares is being kept to insure near continuous operation, including system software backups. A proposal for establishment of an operation and maintenance review board of three members is being developed to manage ongoing operations.

In closing, I’d like to thank the Farash Foundation and ASRAS for their continued support in enabling this Western New York (WNY) benchmark astronomy project. –MJ Pepe

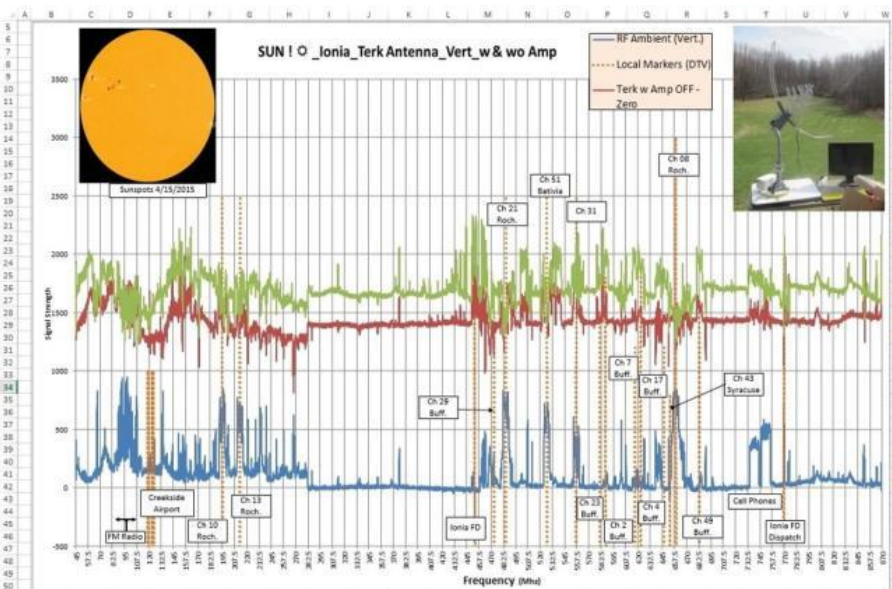


Fig 4; Noise removal sample plot

Finally, software integration, and system debug / hardening will be performed at the RIT John St. observatory to maximize performance and logistics before moving it out to Ionia. Finally, we validated that the Ionia site is a rather ‘radio quiet’ zone, compared to metro locations (i.e.; RIT campus, Metro Rochester, Metro Buffalo, etc.)



# Science and Astrophotography

## Member Astrophotography

ASRAS members continue to refine and improve their astrophotography skills using their own equipment or equipment available to them at the Farash Center. Techniques learned from experience and fellow members who enthusiastically share their knowledge help create images such as these, which are included on our website and newsletter, shared online with members, and routinely posted to online sharing sites.



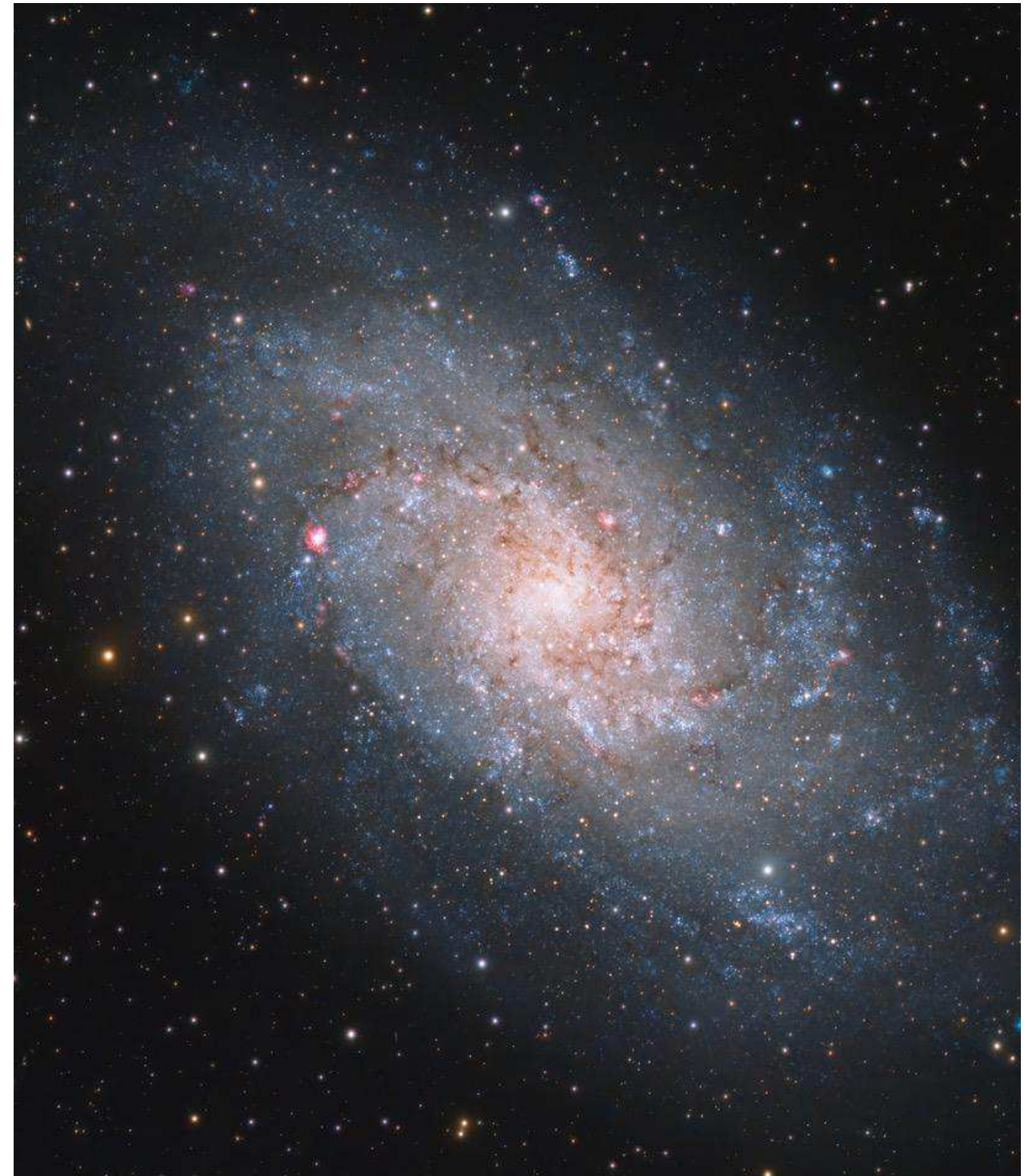
NGC 281 (AKA Pacman Nebula), Eric Day December 2021



Jupiter, Kevin Lyons, October 2021



The Coat hanger Asterism, Bill Schlein, September 2021



Triangulum Galaxy M33, Dan Kuchta, November 2021



# Science and Astrophotography

## June 10, 2021 Partial Solar Eclipse at Dawn

At dawn on June 10 (about 5:32AM) the sun rose while partially eclipsed. The Astronomy Section staffed three sites for public observation of the morning Partial Eclipse. The eclipse lasted until about 7:30 AM when the moon moved past the sun's surface. Over 700 people came out to our observing sites to see the eclipse.

### Hamlin Beach State Park



Bill Schlein, June 2021

Steve Fentress, June 2021

### Ontario Beach Park in Charlotte



Bob Berch, June 2021



Brian Oyer, June 2021

### Martin Road Park in Henrietta



Mark Minarich, June 2021



Joe Altieri, June 2021

## Supernova Webpage

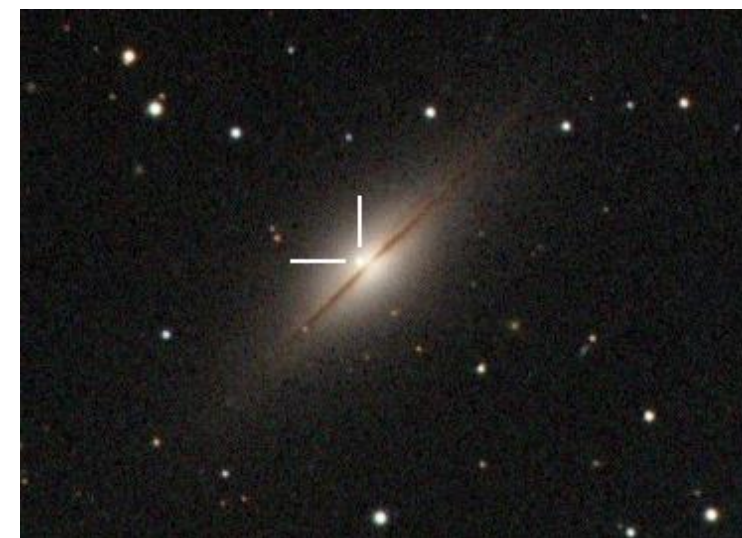
2021 – Finally some bright supernova!

A supernova is an exploding star in another galaxy. These events happened millions of years ago, and we are just now seeing the result. These explosions are some of the most energetic events noticeable by humans. For a matter of weeks a supernova can be as bright as the host galaxy it comes from.

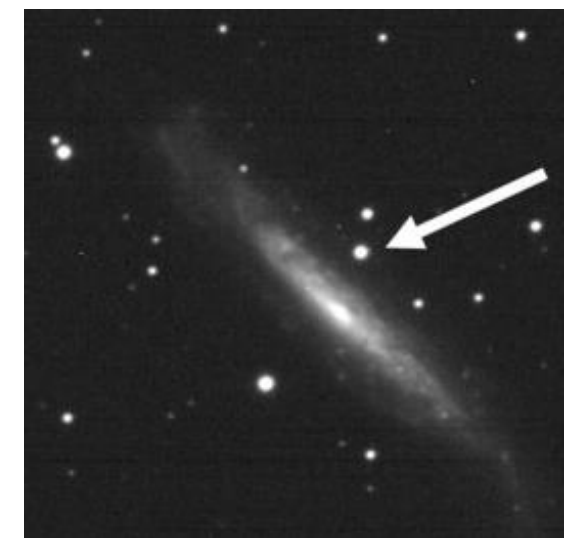
Supernova 2021rhu in NGC 7814 reached magnitude 12.2, which was our brightest of the year. Not as good as last year (2020), but much better than the year before (2019). It was followed closely by 2021pit in NGC 1448 at magnitude 12.3, and then by 2021J in NGC 4414 at magnitude 12.5. Note that you needed at least an 8-inch telescope to see any of these objects. On average, a galaxy the size of the Milky Way (our home galaxy) should have one supernova every 100 years, making a supernova in the Milky Way 300 years overdue!

ASRAS member, Dave Bishop has made the cataloging of supernova a study of his. A quarter of a century ago Dave made a list of the currently observable supernovae (plural of supernova). The list was designed so that people could easily see what objects were visible. His web page is the only source of supernova reference images on the web (<http://www.RochesterAstronomy.org/snimages>). It has been cited in many technical papers.

Fun Supernova Page Fact: One of our many speakers this year was Dr. Alex Filippenko of the University of California at Berkeley. During his talk, Dr. Filippenko mentioned that he uses the ASRAS web page to hunt for targets for the Hubble space telescope.



Supernova 2021rhu in NGC 7814



Supernova 2021pit in NGC 1448

**Ours is the only web page that keeps track of and can keep up with the pace of discovery.**

**Check it out: [www.rochesterastronomy.org/supernova.html](http://www.rochesterastronomy.org/supernova.html)**



# Communications

## ASRAS Website

[www.rochesterastronomy.org](http://www.rochesterastronomy.org)

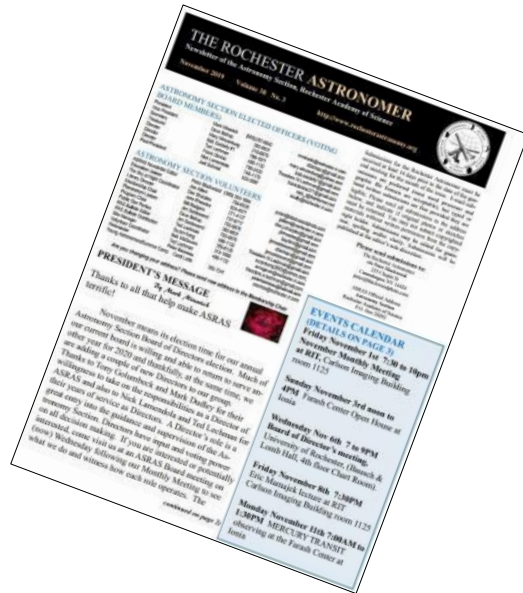
Our website continued to provide information about astronomy-related events and happenings in the Rochester area. This year, it had over 10,000 visitors from the public and ASRAS members.

ASRAS internet provided by:

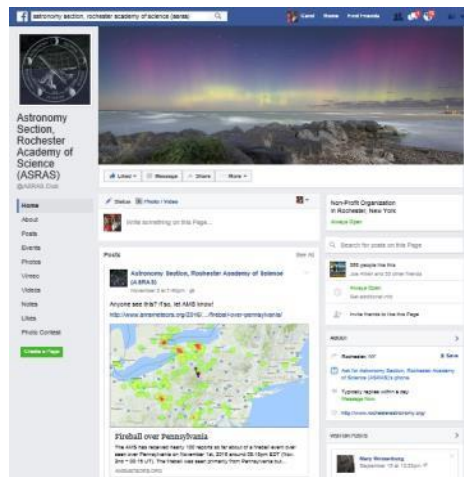


## Monthly Newsletter

The Rochester Astronomer is our monthly newsletter with reminders of ASRAS upcoming events, recaps of activities, interesting Astronomy articles, and critical member information. It's a handy monthly connection to what's happening at ASRAS. The newsletter continues to be distributed in an all-digital format, both to be more “green” and also because members preferred it. We've had a 52% open rate of our new format among our 229 subscribers.



## Facebook



The ASRAS Facebook page continues to function as a public outreach and serves as an avenue to draw local interest to our public star parties, Farash Center open houses, monthly lectures, and more. Many of those who attend our public events become members! Currently, our page has 917 Likes and 945 Followers.

## ASRAS Historical Information Project (AHIP)

In 2020, Farash Center reached the 30<sup>th</sup> anniversary of its establishment. Given the pandemic, we delayed the celebration until 2021. A video was created from the historical images and other records that have been assembled as part of the AHIP effort over the past two years; it was shown to the members at our September meeting. Several of the original members involved in the earliest days of ground-clearing and construction joined us for the event. We were all able to visualize the remarkable growth and development of our beautiful Observatory, step by step, as it evolved. The gathering of ASRAS historical records and the establishment of the ongoing process for maintaining them continues at this time.





# Achievements and Plans

## 2021 Achievements

### Member Events

- 12 member events with talks
- 12 member observing events
- 12 member social events and open houses
- 8 work parties
- 12 board meetings

### Outreach Events

- 3 Virtual star parties
- 4 Scouting events
- 3 School and community events
- 1 Community festival
- Consultation and Image Support for Blackfriars Theater production of “Silent Sky” about Henrietta Swan Leavitt and her discovery of Cepheid Variable stars’ periodicity and distance relationship.

**Thousands of individuals  
were touched by  
astronomy-related experiences  
provided by ASRAS**

### Scientific Achievement Areas

- Radio astronomy
- Supernova website

### Farash Center Improvements

- Installed a Mobile Beacon internet service to improve upload speed for streaming data to the web for Radio Telescope as well as Virtual Observing
- Ground up and buried over a dozen tree stumps from trees removed last fall presenting a hazard to driving and plowing the site
- Farash Center was surveyed for security and a plan was developed for secure door locks on all buildings. New secure Lockset replacement began in December, 2021 and will be completed in 2022

## ASRAS Financial Position

Receiving funds from the Farash Foundation has been fundamental to our growth. Our financial position has been strengthened incrementally by the Farash Legacy Fund, so that ASRAS has been able to pay for needed site repairs/improvements and keep dues at a level that is affordable to the individuals and families in the Rochester community. We critically need that contribution to our accounts to provide an adequate cushion to support the large site expenses, insurance, etc. in case of economic downturn or large unplanned repairs as well as to continue to support our many community programs.

## 2022 Plans

- **Expand our partnership with RCSD to provide classroom and hands-on experiences for students**
- **Telescope Inquiry Group to create web links and white papers to address new member & public telescope inquiries**
- **Add crushed stone to the Farash Center driveway**
- **Add solar powered ventilation fans to select observatories to aid in more rapid equipment cool-down**
- **Upgrade security at the Farash Center through the purchase of a private server to control the site security cameras**
- **Upgrade locks and locksets on all doorways throughout the Farash Center**
- **Increase pathway visibility for observation night traveling**
- **Conduct scientific work through spectroscopy observations and study as well as photometry**
- **Continue implementation of radio telescope projects**
- **Continue to support our full spectrum of educational & outreach programs**