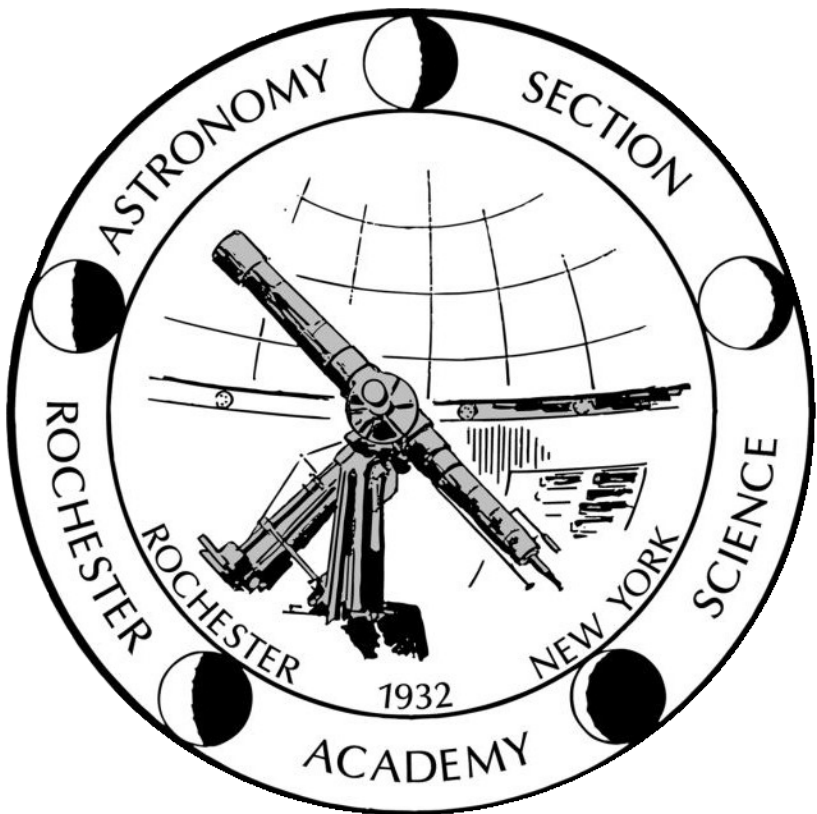


Annual Report 2020

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, 11 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 232 memberships represent about 330 individuals who span all ages and a wide array of interests and abilities.

Farash Center Investments

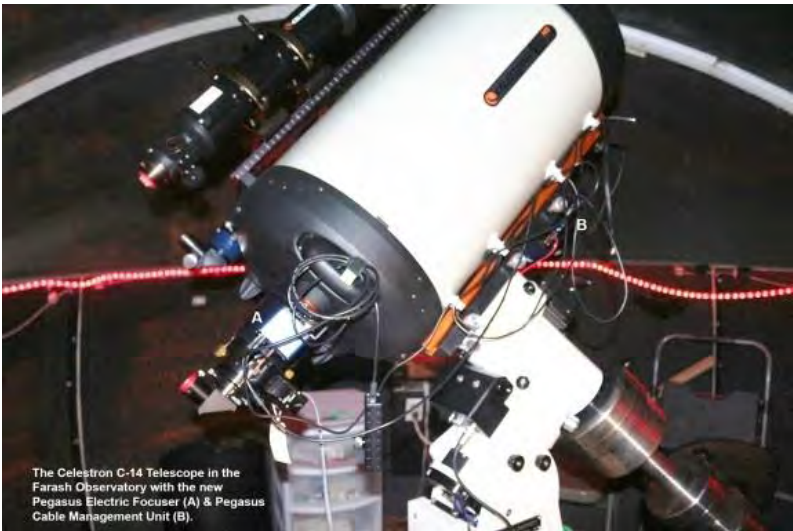
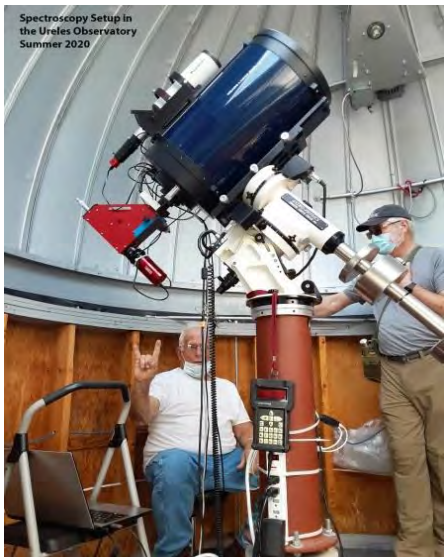
A full length asphalt walkway was added to cover the old one of crushed stone. This makes walking from the parking area to the upper buildings much easier.

The Astronomy Section also had about a dozen trees removed that presented possible hazards to existing buildings or interfered with viewing opportunities.



The Mineral Section of the Academy purchased a pre-fab building and had it put on the eastern edge of the lawn area of the observatory to house their extensive mineral collection.

The below image shows a spectroscope attached to the telescope in the Ureles Observatory. This will allow the Astronomy members and outreach students to explore this area of science.

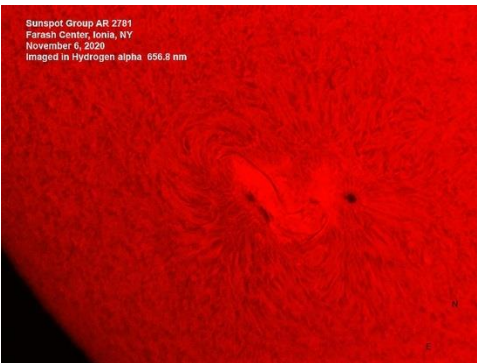
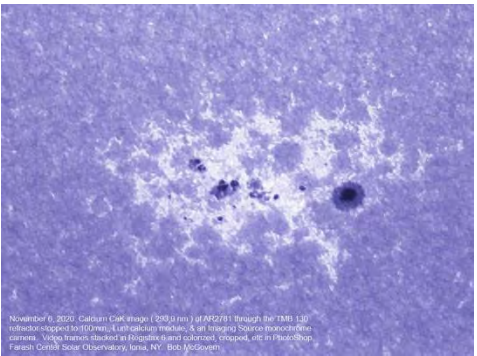
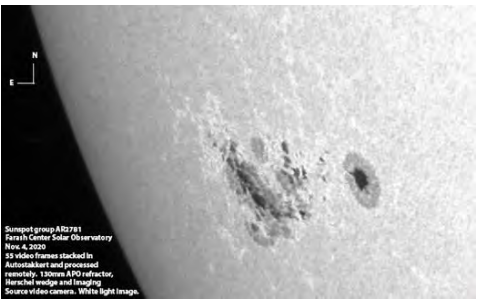


The above image shows our primary imaging telescope in the Farash Observatory fitted with its new Pegasus focusing motor and cable management system.



DayStar Solar Observatory – a compliment to our existing solar observatory, this observatory will allow hydrogen-alpha observations at a bandpass of 0.3 angstroms.

The three images to the right were taken at the prime solar observatory in November 2020 at different times, of the same active area of the Sun in white light (top), the light of singly ionized calcium (center), and in the light of hydrogen alpha (bottom). The Sun has just started to enter an active period.



Outreach and Education

Virtual Star Parties

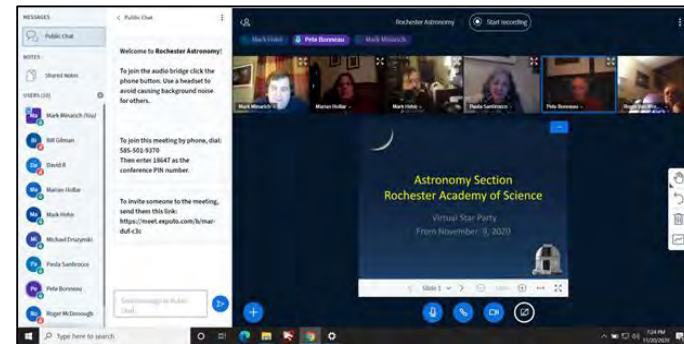
As COVID 19 precluded the Astronomy Section from conducting the close contact of in-person Star Parties in 2020, we found a way to do a Virtual version. Using the Celestron C14 in the Big Dome at the Marian & Max Farash Center for Observational Astronomy, ASRAS held five virtual star parties over the summer and into the fall.

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.

We were able to observe the Great Comet of 2020: NEOWISE. We saw the close approach of Mars and were able to image with some nice detail. The planets queued up nicely for us over the summer and fall evenings so we had two planet themed observing sessions. The visual planets lined up from West to East: Jupiter, Saturn, and Mars. We also viewed the two ice giants on either side of Mars: Uranus and Neptune. We were surprisingly able to actually view some of the moons of Neptune. The Neptunian moons of Triton, Nereid, and Proteus were captured with our ASI294 CMOS OSC camera surrounding the blue ice giant of Neptune at over 2.5 billion miles away.

We held two deep sky themed observing sessions as well. In one session we observed Galaxy groups of two or more in one session. In another star party we searched for Deep Sky Objects in two of the heroes in the summer sky: Hercules and Ophiuchus.

We drew over 70 people for the live events and over 120 views of the recorded sessions on our YouTube channel. We are working on improving internet capabilities at the Farash Center so that we can stream more of these events live.



Virtual Star Party of November 2020



Scouts

We only had a narrow window when we could have scouts at the site. This year that window was only one month long! However kids do not wait, they keep on growing no matter what is happening.

Here are images of one event which happened on October 3rd 2020. This is a girl scout troop from Fairport NY. The hills at the site appear to be perfect for rolling down the hill:



Even though it was a cloudy day we could still give the girls a tour of the observatories, and of course a presentation on space. The trick was getting them to social distance!

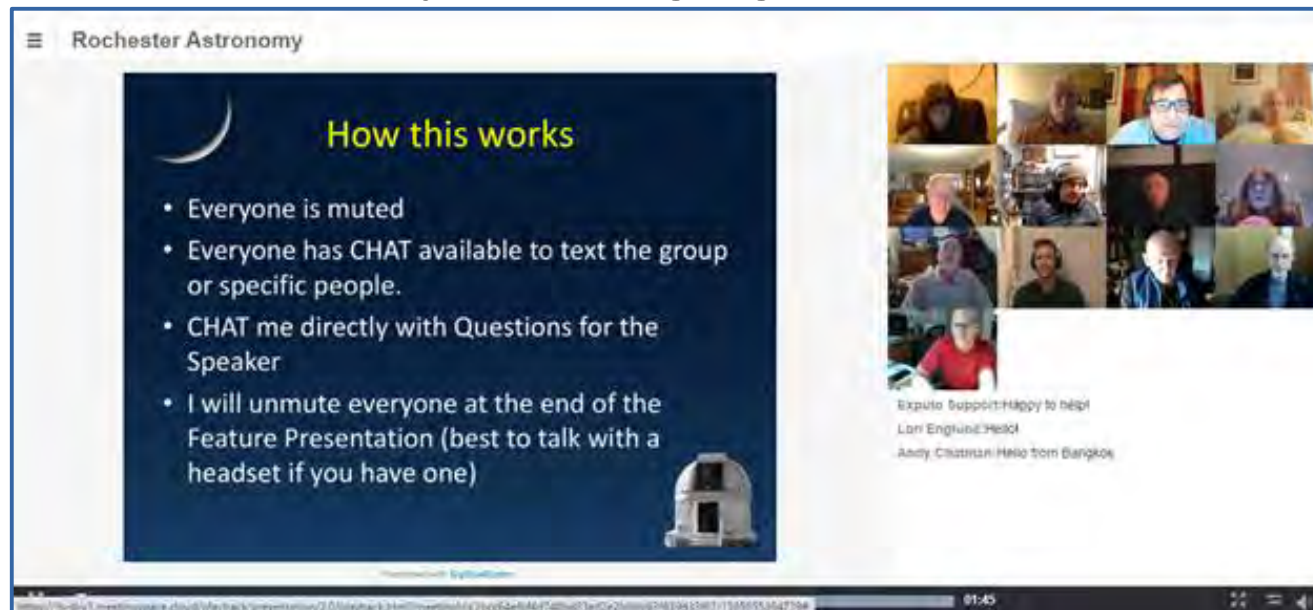
Mendon Ponds Park WinterFest

ASRAS, once again, utilized this event to provide scientific information and membership opportunities to the public. This event is always fun as we connect with a large group of outdoor enthusiasts from all different backgrounds and members of other volunteer organizations. This was our last outreach event before Covid-19 restrictions were put into place in New York State.



Member Activities

ASRAS Monthly Meetings go to Virtual Format

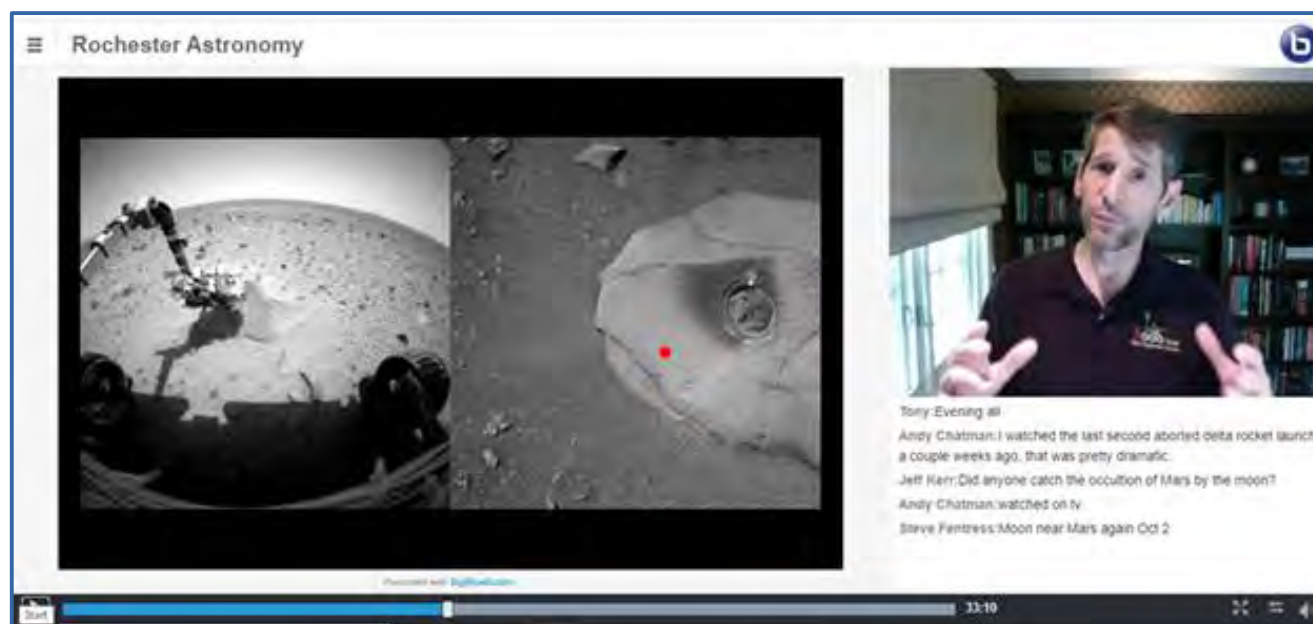


When COVID-19 hit, we lost our ability to meet in person and our access to meeting spaces. ASRAS recovered quickly and found an Astronomy Section member whose company, Exputo.com, was eager to donate unlimited meeting services for our monthly meetings. We've met uninterrupted picking up virtually in April 2020 where we left off in person in March.

Meeting virtually opened up the possibility of hosting more remote speakers and as such we've been able to get speakers from all over the country. This year we've had speakers from The Jet Propulsion Laboratory, The Smithsonian Astrophysical Observatory, and a popular club speaker from the Oil Region Astronomical Society in Southwestern Pennsylvania.

ASRAS was also able to host members from as far away as Georgia and Thailand due to the virtual nature of our new "normal" in 2020.

We held nine virtual monthly meetings in 2020 attended by over 470 people.



Open Houses



Due to Covid, only eight of our regular monthly open houses were held hosting a total of about 125 people. Open houses are typically held on Sundays from noon until 4 p.m. or later if the skies are clear. This year we recognized the "passing of the trowel" from our 15 year Site Manager Bob McGovern to Roger McDonough. Also, taking advantage of an unusually warm November, we surprised our President, Mark Minarich, recognizing him as our Outstanding Astronomer of the Year for 2020 on a warm, sunny early November Saturday.

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.

Special events in 2020 included our first Covid observing during what would have been RocheStar Fest, the Perseid Meteor shower in August, and the Geminid Meteor Shower in December.

Science and Astrophotography

Project ART: Autonomous Radio Telescope

The Farash Foundation, through its generous educational outreach funding through ASRAS, has enabled 40 students of RIT to research, design and build a Solar Radio Telescope that will autonomously operate and relay coronal mass ejection warning data from the Farash Center site in Ionia to the solar scientists of the e-Callisto Project in Zurich, Switzerland. This will also enhance our understanding of Solar Physics. Progressive Farash support has put the ASRAS organization on the Global astronomy stage.

The first few years were spent in developing 'proof of concept' ideas for basic functions. We partitioned the overall system design into basic functional subsystems to be implemented by separate groups as yearly Senior Projects at the Rochester Institute of Technology (RIT). Our priority was the design of the mission-critical solar autonomous tracking feature first. This system automatically acquires and continuously tracks the position of the Sun. Additionally, we decided to develop a modified feed 7' (2M) dish for its superior front to back ratio rather than a standard Log Periodic 'Yagi' like design. Purpose was to ignore strong local TV stations to our back (North).

A Right Ascension/Declination mount was designed, built and then installed at the Farash Center for Observational Astronomy in Ionia (ref- photo, *lower left*) to enable basic manual operation, and the taking of local data during the summer to both further our understanding of local ambient noise, as well as take basic Solar data.



The e-Callisto station **USA-KROC** located at the Farash Center for Observational Astronomy, summer 2019. We hope to be on-line to Zurich with actual Solar data by May 2021.

We also added an uninterruptable power supply (UPS) to minimize system crashes and data corruption, improved software operability, and let us have an orderly shutdown whenever AC power was interrupted.

The following year's design team concentrated on designing a graphical user interface to look like a piece of test equipment for student operators' input and controls. The team incorporated a planetarium program, '**Radio Eyes**' that is a view of the night sky, BUT in the RF radio spectrum.

By adding switchable low noise amplifiers (LNAs), the system can be expanded to look at the strongest **RF** objects in the **night** sky as well. The LNAs are meant to try to acquire the top 40 brightest objects in the northern night sky, limited by the meager dish size of only 2 meters. This is our lowest priority task.

A concept was devised for self-calibration, consisting of a 'zero' signal (75Ω load) and a 100% (RF noise source) implemented with RF switches under processor control. This enables occasional self-checks and calibration, or whenever data quality/integrity is questioned. Present thoughts are to perform this task twice a day (AM, just before Sunrise and PM, just after Sunset).

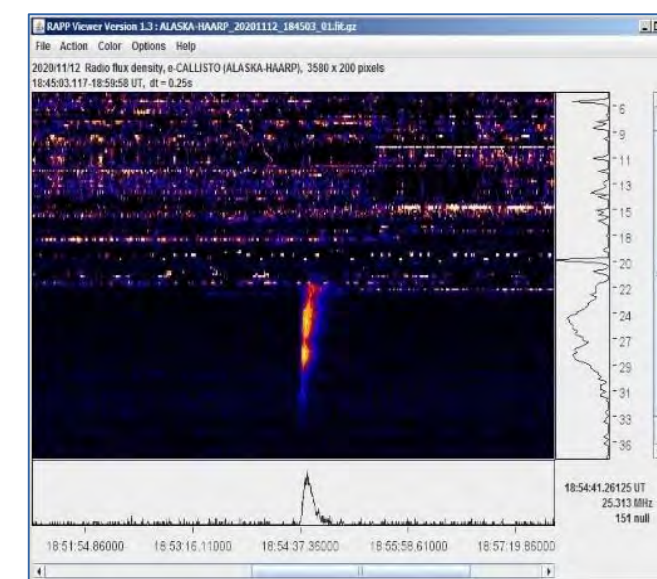
At this point, the system was operational enough to make preliminary data runs and to try sending preliminary data to Zurich, basic file transfer demonstrated.

The present team is concentrating on systems level integration, software development, and adding functionality, including a web-based interface 'portal' for remote operations as well as LED system status and operability indicators.

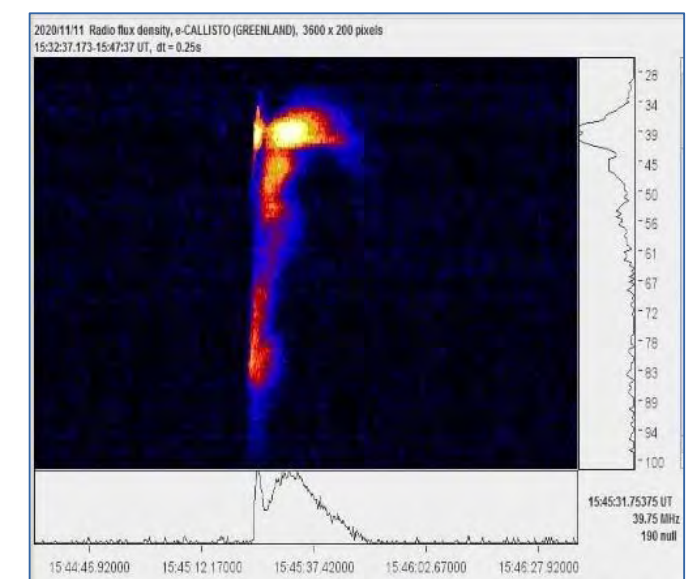
The hardware is also being expanded to include dual (stereo) receivers, one on the main solar dish antenna, and the second, a dipole antenna, to collect local radio interferers. The second interference dipole is attached directly onto the solar dish antenna mount, so it tracks with the dish. Imagine making the photo (lower left) look like the photo (lower right). This has the potential to improve ALL Callisto stations, especially with the expansion of 4G & 5G cell phones into the DTV bands (more interfering sources).

While this year's Covid restrictions have severely slowed our progress, it has NOT dampened the team's enthusiasm.

Many thanks to the Farash Foundation for funding provided under this educational outreach grant through ASRAS. This funding allowed 40 students across seven teams to learn not only about Radio Astronomy but also engage in a hands-on team approach to real-world project development.



Example of a noisy image due to local Radio & TV.
The horizontal lines show the interference.



Example of a good Solar RT fits image,
without interference.

Science and Astrophotography

Member Astrophotography

ASRAS members continue to refine and improve their astrophotography skills using 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.



Moon, Kevin Lyons, Feb. 2020



M31, Bill Hugh,
December 2020



Veil Nebula (Western section), James Canning, July 2020

Science and Astrophotography

Member Astrophotography - continued



M106, Patrick Cosgrove, June 2020

The Rosette Nebula, Dan Kuchta, April 2020



Supernova Webpage

2020 – A good year for supernova observers – *By David Bishop 2020/11/22*

For most things, 2020 has not been a good year. However, the universe keeps on going regardless of what is happening down here. Last year, a record number of discoveries (15,914) were made, but it was quantity, not quality that made 2019 a good year. Two objects got bright enough to see with amateur telescopes ($> 13^{\text{th}}$ magnitude). So far this year, eleven such bright objects were discovered, including some nice bright Mag 11 objects! This year brought another record number of discoveries (16,711 as of mid-November).

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.

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.

Our brightest object of the year was actually discovered early on in the year. SN2020ue is in a galaxy named NGC 4636 (a galaxy in the constellation Virgo). Fifteen days after discovery it got up to magnitude 11.8, and dimmed down to 18^{th} magnitude by June.



Figure 1 - Supernova 2020ue - Robert Ligustri image

Happening at the same time and very close to the core of the galaxy was supernova 2020oi in M100 (a galaxy in Ursa Major). It only got to 12^{th} magnitude, but a supernova in a Messier galaxy is a rare thing.

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

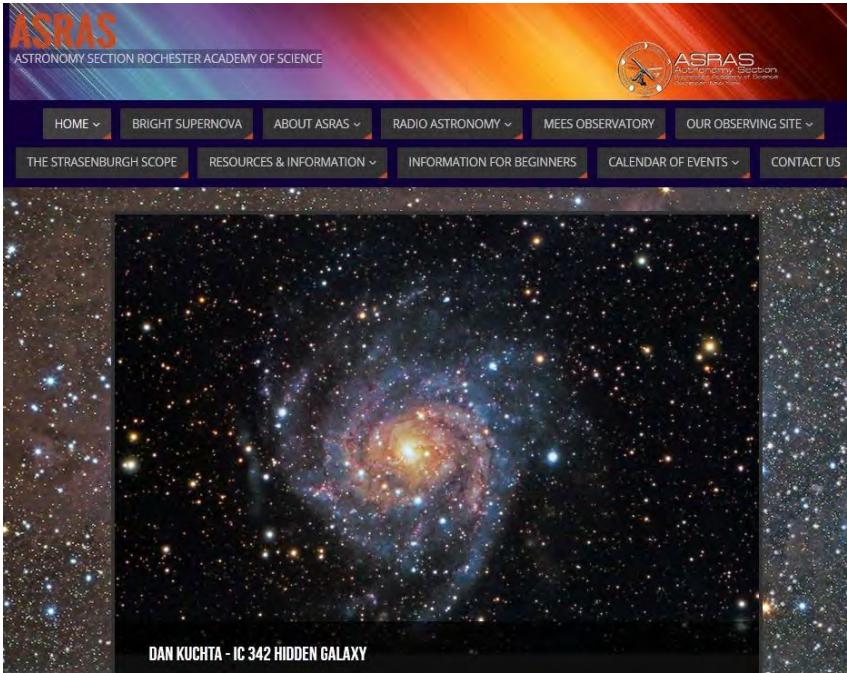
Communications

ASRAS Website

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:

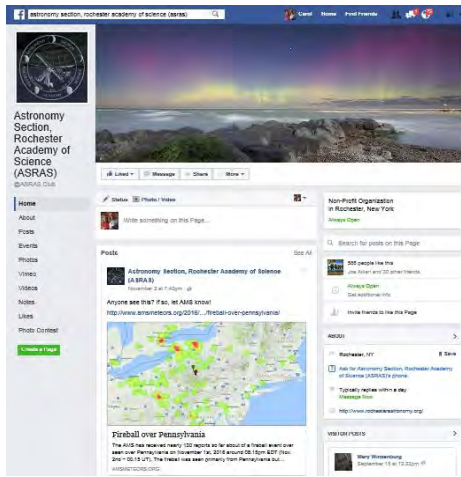


Monthly Newsletter

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)

The last 30 to 40 years have seen remarkable changes in the Astronomy Section. The Marian and Max Farash Center for Observational Astronomy was born and has grown to become a state-of-the-art facility with an education center, as well as multiple observatories and a wide variety of observing and imaging equipment. As enabled by that incredible resource, the member and outreach programs have grown exponentially, as has the membership.

AHIP's mission is to capture the story of that growth while the supporting memories and documents still exist. Thus, it seeks to collect, organize and store all pertinent official documents (minutes, newsletters, building permits, etc.) as well as images and personal recollections of the journey. Many will be stored in both original and digital formats.



The project kicked off in early 2020 and, although slowed somewhat by the pandemic, continues the process of collection and storage. The hope is to celebrate the 30th anniversary of Farash Center in summer of 2021 (delayed a year during social distancing) featuring a presentation recapping the journey so far.

Plans and Achievements

2020 Achievements

Member Events

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

Outreach Events

- 5 Virtual star parties
- 4 Scouting events
- 1 School and community event
- 1 Community festival

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

Scientific Achievement Areas

- Radio astronomy
- Supernova website

Farash Center Improvements

- An asphalt walkway was added facilitating travel up to the buildings from the parking area.
- Removed over a dozen trees presenting a hazard to buildings on site and to improve sky viewing.
- A spectroscope was attached to the telescope in the Ureles Observatory allowing the Astronomy Section members and outreach students to explore this area of science.
- Our primary imaging telescope in the Farash Observatory was fitted with its new Pegasus focusing motor and cable management system.

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. At year end, the value of our total funds is \$88,000. 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.

2021 Plans

- Expand our partnership with RCSD to provide classroom and hands-on experiences for students
- Form a member staffed Telescope Inquiry Group to address member & public telescope inquiries
- Add crushed stone to the Farash Center entry roadway
- 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
- Remove stumps from tree trimming done in Fall
- 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