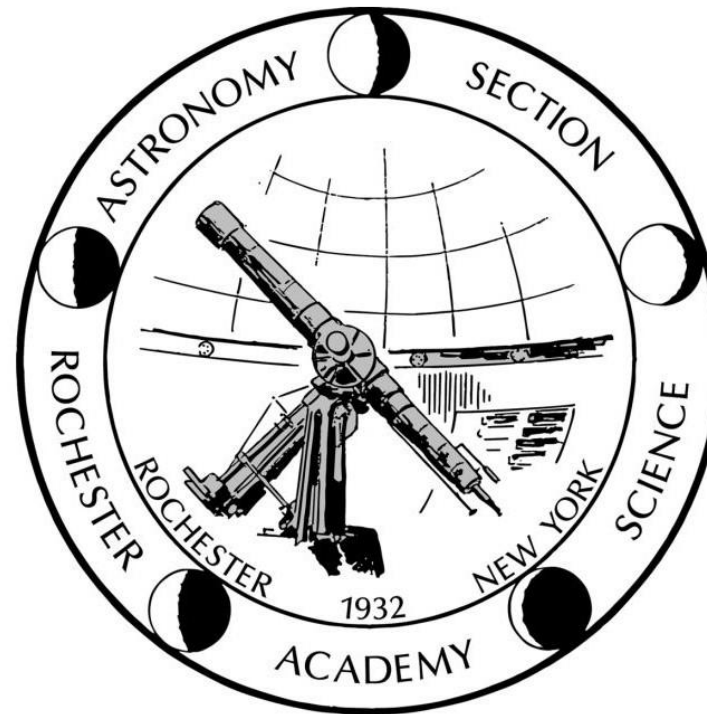


Astronomy Section of the Rochester Academy of Science

ASRAS



Annual Report 2018

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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 star-gazers, our 229 memberships represent about 350 individuals who span all ages and a wide array of interests and abilities.

Farash Center Investments

In September, a second round of tree cutting and brush cutting was undertaken to better open the viewing horizons and to prevent possible damage to the buildings from falling trees or tree limbs.

Tree growth control and road maintenance will be ongoing operations at the site.

We plan on grinding the tree stumps around the site and on the ridge behind the large observatories. This will allow a local scout group to ready the area for placing reclining benches on the ridge, creating an excellent spot for relaxing and viewing the grounds or night sky.

A number of evergreen trees were planted in the parking lot area to help complete a light barrier shielding the observing areas from automobile headlights.

New trail markings were put in place by one of our visiting scout groups to help hikers follow the number of trails totaling nearly two miles in the wooded areas to the west and south of the Farash Center.



The hydrogen alpha telescope in the solar building was upgraded with a second etalon to increase the resolution to 0.5 angstroms. The telescopes in this building can be controlled from the adjacent Farash Observatory's warm room during the winter months or over the internet by interested students.

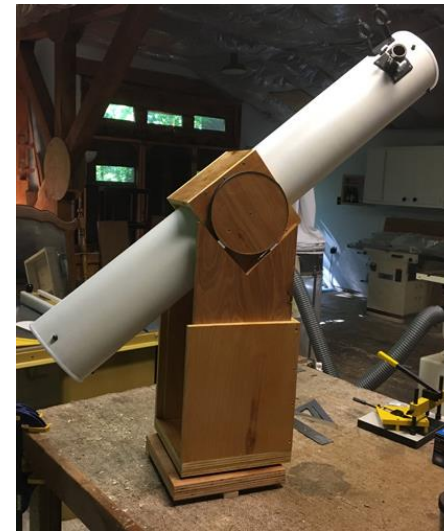
The window in the library was removed and the area covered allowing for the installation of additional shelves. The extra shelf space will also house equipment for the Radio Jove project.



Farash Center Investments

Telescope Loaner Program

In October, ASRAS announced a new and improved Telescope Loaner program, making the resources of ASRAS more available to our members. All of this equipment is housed in a newly organized space in the Farash Center basement so it can easily be tracked. Nine telescopes of various designs and sizes can be signed out by members for up to eight weeks at a time. This will allow members to try out different kinds of scopes before they buy their own. In addition, having equipment out in the community, instead of just at our site, can expand neighborhood opportunities for astronomical observing.



Included in this program is a pair of 11x80 binoculars with a parallelogram mount. Also, newly available for astrophotography is an iOptron Sky Guider camera mount and tripod for one week loan. Borrowers will sign an agreement making them financially responsible for adequately protecting the equipment from theft or damage.



California Nebula by Nick Lamondela using iOptron Sky Guider

Outreach to Rochester City School District

To expand our outreach to some that truly NEED the interaction, ASRAS sought out contacts within the Rochester City School District (RCSD) this year to cooperatively bring Astronomy to urban school kids that are underserved in Science, Technology, Engineering, and Mathematics (STEM) outreach. This year we found four separate areas where we could help to strengthen science education with these children.

First, working with a STEM coach who tutors two RCSD high school and middle school STEM teams, ASRAS coordinated a field trip to visit the Farash Center for a live presentation of basic astronomy and a tour of our facilities and telescopes in October. The talk and tour were well received, and we have commitments for new members to ASRAS as well as an annual ongoing visit from this coach and his teams.

Second, working with Dr. Mittal, an Astrophysics professor from RIT and the RIT K-12 Outreach Director, ASRAS is working with the Children's School of Rochester to generate scientific interest among the primary school students. By using their weekly Teaching & Learning briefing period during school hours, ASRAS members and Dr. Mittal will deliver short talks with hands on demonstrations on Astronomy every other month to 350 diverse and disadvantaged children.

Third, ASRAS is working directly with local Science teachers through the Rochester Area Physics Teachers Out-Reach (RAPTOR) group by hosting the group at the Farash Center to demonstrate the capabilities we have and to offer our site as a resource to their education.

Fourth, ASRAS anchored a Space Exploration Day at the Exploration Elementary Charter School of Rochester. ASRAS members presented demonstrations and interacted with students throughout the day on astronomical subjects: Telescopes and how they work; Our Solar System and where we look for life; and Gravity experiments. Coaching over 200 students at each of the three stations throughout the school gave the kindergarten through second grade students an inspiring hands-on and eyes-on astronomical experience.



Summer Science Camp 7/30-8/3, 2018

This year's 6th Annual ASRAS Science Summer Camp was another in our series of high-powered, science-and-fun-filled weeks at Farash Center and RMSC. Fifteen young people enthusiastically joined us for lessons, experiments, and adventures in physics, optics, chemistry, biology and astronomy. In total, 13 ASRAS members volunteered their knowledge, ideas, imagination, teaching skills and equipment to the success of camp, five of them supporting camp from 9 a.m. to 4 p.m. each day.

A new feature this year was the creation of a science demonstration by each of our three camper teams, who chose topics and produced memorable, multi-media presentations on Transfer of Kinetic Energy, Power of Air Pressure versus Brute Force, and Protecting the Payload.

A few of the conclusions drawn from camp:

- Galileo was right.
- Humans mostly imagine aliens to be humanoid.
- A fold-it-yourself microscope really works.
- Thermal convection between gases of different densities can be made visible.
- Micrometeorites are out there, but not that easy to find.
- Stop-action, infrared and slow-motion observations show us new perspectives.
- Explosions, dry ice + water, flying balsa wood airplanes, and identifying elements by their spectra, and catapulted water balloons are fun!

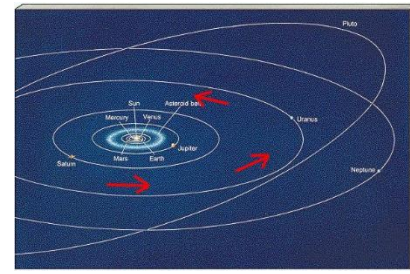
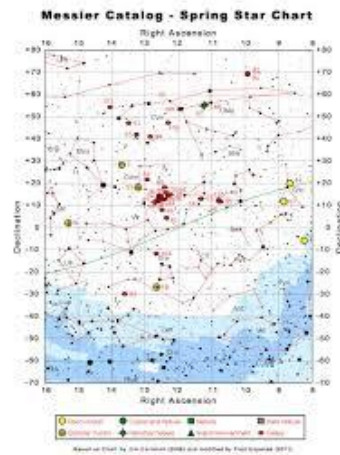


Top row: Assembled Foldscopes and campers on display; ecosystem terrariums; dry ice fascination; middle row: aerodynamics trial; Galileo's experiment; solar experiment; Bottom row: discerning spectra of different elements; Foldscope imaging; playing with Newton



Young Astronomers Program

This year our Young Astronomers program continued with three events during the year. Topics covered included planet orbits, Kepler's harmonics law, and Messier objects. We had lots of fun comparing the circumference and radius of circles and calculating pi for ourselves. We also enjoyed our annual visit to the Rochester Museum & Science Center (RMSC) to experience all its offerings, including *Science on a Sphere*.



Science Exploration Days

Science Exploration Days at St. John Fisher College were held on May 17 for the public and May 18 for high school students. Over 700 students attended the event. Educational handouts from NASA and Astronomy magazine were distributed to attendees.



School and Special Programs

We fulfill special requests for astronomy programs. This year, these included:

- Participation at the local Adirondack Mountain Club (ADK) spring festival
- Presentations at the Greece Library Makers Fair
- Working directly with local Science teachers through the Rochester Area Physics Teachers Out-Reach (RAPTOR)

Star Parties

We successfully held two star parties this year in Mendon Ponds and Northampton Parks – several others were planned, but Mother Nature did not cooperate. At these events, members set up their own telescopes and binoculars, then invite all who come to take a look while we describe what they are seeing. These events are wonderful opportunities to engage individuals who otherwise would not share our privileged view, and to discuss events and news in astronomy. Star parties have also been a great means of attracting new members to ASRAS. Average attendance this year was 25 individuals.



Strasenburgh Planetarium Observing

Our 50+ year commitment to RMSC and the Rochester community continues, as we operate two roof-top telescopes every clear Saturday night. An average night typically brings 50 – 100 guests up the stairs to view the Moon, planets, and the brighter deep sky objects. A vital part of this experience is for our visitors to find a friendly, well-informed amateur astronomer, who loves to talk about the heavens and answer questions, operating the telescope. This year was a particularly cloudy one, limiting the number of successful observing nights. We were able to operate the telescopes on 32 nights, and host approximately 2300 visitors at those events.



Scouts

Our goal for Scout Outreach this year was to increase awareness in STEM related activities. It was a great opportunity to stretch students' understanding and imagination of the world around them by making our observatory an extension of their classroom. We covered a variety of activities that expressed a nice relationship between the STEM components. The Scouts learned how Science, Technology, Engineering, and Math are the foundation for moving us forward in our quest to reach for the stars.

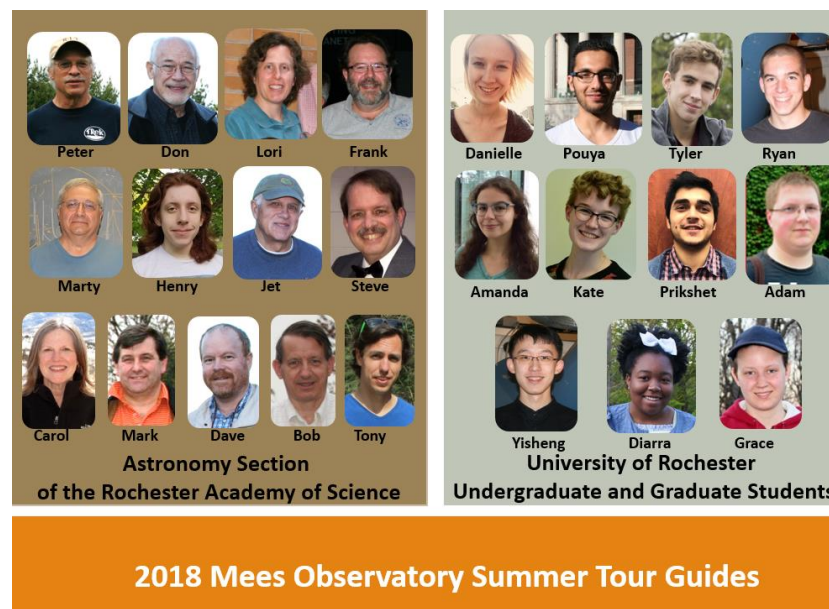
ASRAS also plays a major role in helping our Eagle Scouts and Venture Crew Scouts fulfill community projects. It has been a wonderful outlet for them to plan, design, build, and dedicate their projects to benefit others. This year we had two beautiful reclining benches made for the top of the hill at the observatory and trail posts created to help others find their way through our hiking field.



Mees Observatory Tours

We partner with University of Rochester (UR) students and professors to provide free public summer tours at Mees Observatory, applying our astronomy and telescope operation knowledge to share the heavens with guests. This year, guides provided 22 tours for 445 guests. Thirteen ASRAS members support this effort, with several achieving 16 years tenure as contributors to the Mees Tours program.

UR Department of Physics and Astronomy recognizes ASRAS as a key enabler for what has become a highly-sought experience for members of the Greater Rochester community.



Telescope Tune-up Days

In 2018, we held one telescope tune-up event at the Strasenburgh Planetarium to provide guidance to members of the public needing assistance with setting up and using their telescopes. Over 24 individuals and families were helped with small repairs and advice on how to setup and enjoy their telescopes.



Ionia Fall Festival

In support of the local Ionia community, we welcomed Fall Festival guests up our hill (as we do every year) to check out our observatory. Several of us also greeted visitors from our booth on the fire house grounds, sharing our enthusiasm about astronomy and all ASRAS has to offer. Sharing our resources with the locals serves the dual purposes of outreach and inspiring them to watch over our home.



Mendon Ponds WinterFest

ASRAS, once again, was treated to a table in the Cobblestone House, a lovely old, historic structure in Mendon Ponds Park. We spoke to a crowd of about 50 people, mostly during the afternoon hours as the weather gave us a late start. 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.

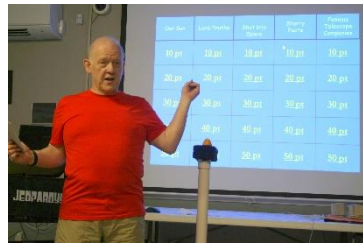
Member Activities

Monthly Meetings

Our monthly member meetings (always open to non-members as guests) are attended by 60 – 80 individuals and include long and short talks on many topics. Attendees also share observing and event reports and enjoy connecting with fellow astronomers. During summer months when meetings are held at the Farash Center, we conclude with nighttime observing. 2018 main talks covered topics ranging from the astronomy year in review to neutrino detectors in Antarctica. At the March meeting, ASRAS had the pleasure of hearing the Director of the Vatican Observatory, Brother Guy Consolmagno present a talk on the history of the Vatican Observatory.

In winter when observing conditions are less favorable, we schedule a series of additional talks and lessons. This year, these talks included astrophotography basics and a night of “My Most Memorable Astronomy Experience” talks by six members who described viewing the 2017 solar eclipse, astronomy camping, and having Maasai warriors as observing companions.

RocheStar Fest – July 13-15, 2018



RocheStar Fest 2018 was, as always, a major event for ASRAS. Friday night featured a riveting round of astro-music trivia, followed by astronomy themed Jeopardy. Saturday was a full day filled with gatherings, lessons, fun and opportunities to share ideas, equipment

and experiences with like-minded amateur astronomers and guests. The day also included door prizes, our usual outstanding and self-catered barbecue dinner, a silent auction, and a fascinating talk by Featured Speaker, Daniel W. E. Green of the International Astronomical Union, Harvard University, Department of Earth and Planetary Science, about the history of Central Bureau for Astronomical Telegrams (CBAT).

Member Activities

Open Houses



Eleven 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.

December Celebration Meeting at Strassenburgh Planetarium

Our annual holiday season celebration event at the Strassenburgh Planetarium is a highlight of our year, and a perfect chance to showcase our organization to friends, family members, and guests. Members bring food to share in the lobby, followed by a demonstration of the new Digistar system’s capabilities. We use this event as the opportunity to recognize members who have made unique and significant contributions, such as the annual Outstanding Astronomer.



Then, all attendees experience a star show, like those presented to the public. The event culminates in our member images show, featuring the remarkable and ever-improving astrophotography skills of our members. Attendance at this event was over 110 in 2018.

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 2018 included the Messier Marathon and Perseid meteor shower.

Radio Astronomy

Amateur Radio Astronomy is still in its infancy. A crossover group of amateur astronomers and ham radio operators are beginning to be the most significant contributors to this emerging field. Why the local interest? Well, the skies of Western New York do not provide the best observing conditions. Rochester and Buffalo are consistently amongst the top ten cloudiest cities nationally. What do you do? Add longer wavelengths to your observing toolset (radio waves pierce the cloud cover).

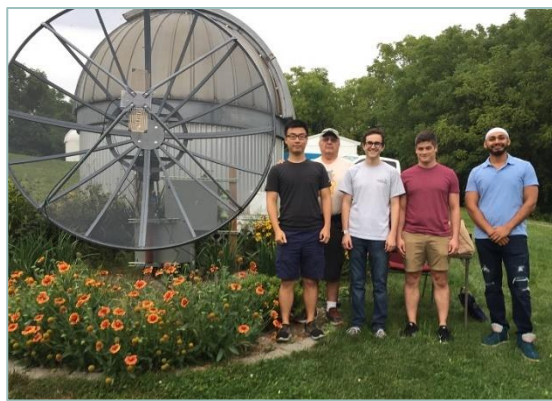
City – Days of Heavy Cloud Cover	
Seattle, Washington	226
Portland, Oregon	222
Buffalo, New York	208
Pittsburgh, Pennsylvania	203
Cleveland, Ohio	202
Rochester, New York	200

In 2018, the ASRAS Radio Astronomy work has centered on the following three projects: a Solar Spectrometer to study the radio frequency (RF) signature of sunspots, a study of the radio emissions from Jupiter, and a small radio telescope to demonstrate radio astronomy/telescope principles in the classroom. ASRAS is also happy to report our continued involvement with Rochester Institute of Technology's (RIT) Multidisciplinary Senior Design (MSD) program, where students develop the projects and deal with the real-world problems associated with a project, thus preparing them for technical careers.

Solar Spectrometer – This autonomous Solar Spectrometer, a multi-year development project, will be used to study the radio frequency signature of sunspots. Each year multi-disciplinary teams of between 4 to 6 students have taken a critical module or operational function of the spectrometer and carried through from concept to build and delivery. The students are responsible for building the hardware, writing the software, and integrating them into a working unit. In doing so, they get a sense for what it takes to go from an idea to a delivered, reliable, working product. Employers have said it's one of the most effective college programs they've experienced; and thus, these graduates are in very high demand.

Accomplishments so far include the following:

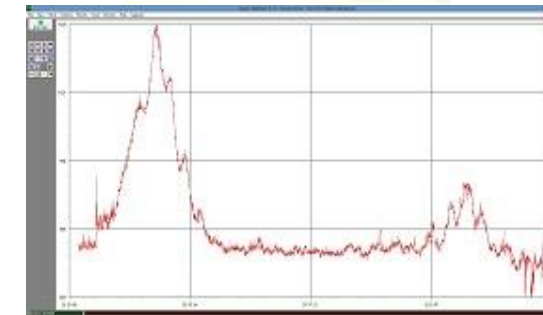
- A computer controlled motorized Right Ascension and Declination mount for pointing the 7-foot radio telescope dish.
- A PC based system that wakes itself up in the morning, tracks the Sun, puts itself to sleep at night, and sends the recorded data to Zurich, Switzerland for use by the global, professional, helio-science community.
- A dual-receiver (stereo) with one channel receiving the Sun's signature and the other measuring the 'local' radio frequency (RF) interference.
- An algorithm designed to subtract the local RF interference from the desired Sun signal – a potential patent worthy invention.



The final item will be the potential global inclusion of noise removal. Even in remote places like Nepal, the local RF noise is so bad that only large solar disturbances can be detected. By removing the local RF noise, the resulting signal represents a major improvement in dynamic range and sensitivity.

Radio Astronomy

Radio Emissions from Jupiter – In 1998, NASA launched a citizen science program called Radio Jove. Its mission is to provide a hands-on inquiry-based educational project that allows students, teachers and the general public to learn about radio astronomy. The scientific goal of the Radio Jove project is to study the RF emissions from the planet Jupiter. The motions of Jupiter's Moons (mostly Io and Europa) with the planet's intense magnetic fields, produce radio emissions in the mid-frequency range of 18 – 32 MHz.



Through the NASA Radio Jove program, ASRAS has acquired two JOVE Receivers, one for development and one installed at the Farash Center in the Education Center classroom (left, data recorded at Farash Center). Classroom lesson plans are available direct from the NASA website. No longer does radio astronomy, math and science have to be limited to only 'book' concepts; now, they can be experienced first-hand by students for a lasting educational experience. In addition, data can be shared and compared amongst classes and schools across the country!

Itty Bitty Telescope (IBT) - For this project, the students have adapted a satellite television dish to become what we affectionately call the Itty Bitty Telescope. The IBT is able to show how everything that is above absolute zero in temperature ($0^{\circ}\text{K} > -273^{\circ}\text{C}$) gives off radio waves, including our own warm bodies. It is a portable, battery operated telescope - perfect for use in middle to high school classrooms to provide hands-on in-class lessons in the physics of radio telescope principles. IBT operation was demonstrated to attendees of the Northeast Astronomy Forum (NEAF) and to several Boy Scout troops at the Farash Center.



2019 Plans

- Solar Spectrometer – implement and integrate the noise subtraction algorithm
- Radio JOVE – obtain and integrate an RF calibrator to enable this system to be available on-line, for Rochester area schools
- IBT – make it available to groups visiting Ionia and building more IBT's to loan out as we do regular optical telescopes
- Video Interferometer – ****New Project**** to generate high resolution 'images' of the Sun's surface

We gratefully acknowledge the support of the Farash Foundation for its foresight and support of these special programs. They have not only benefited ASRAS, but have given students the chance to take concepts from the classroom to building of actual working hardware as part of their engineering education.

Member Astrophotography

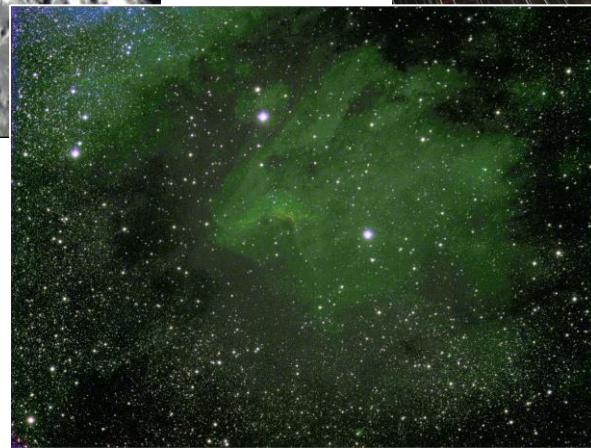
ASRAS members continue to refine and improve their astrophotography skills using equipment available to them at the Farash Center. Techniques learned from experience and fellow members who enthusiastically share their knowledge help create images such as these, which are included on our website and newsletter,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



Lunar Craters
- Kevin Lyons, 3/24/18



Star Trails
- Brian Oyer, 7/10/18



Pelican Nebula - Dave Bradley

Supernova Webpage

This page was recognized by Purdue University this year which provided us with a new mirror (on line copy) of the web page. More than 7000 supernovae were cataloged this year. The odd object was 2018cow, which was a type 1b in the tiny distant galaxy named CGCG 137-068. The remarkable thing about this object was that it was 100 times brighter than a normal supernova.



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

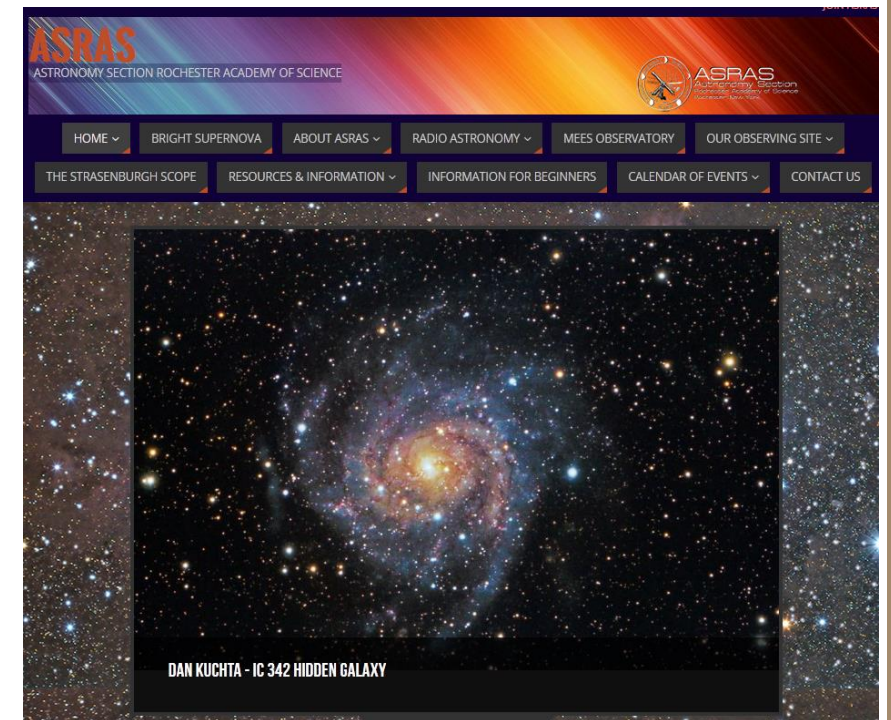
Check it out:
www.rochesterastronomy.org/supernova.html

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:

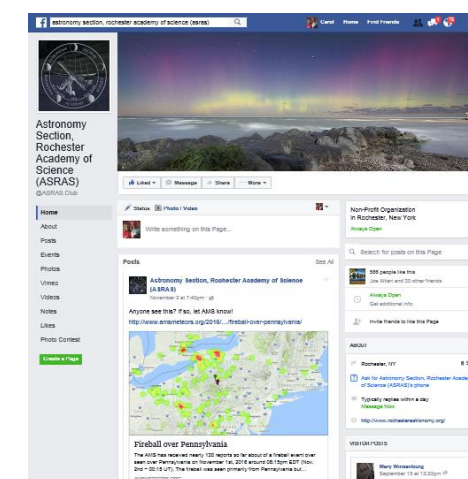


Monthly Newsletter

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 60% open rate of our new format among our 235 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 812 Likes and 815 Followers.

2019 Achievements

Member Events

- 14 member events with talks
- 5 member observing events
- 15 member social events and open houses
- 12 work parties
- 12 board meetings

Outreach Events

- 2 star parties
- 13 scouts and SEDS events
- 32 Planetarium telescope nights
- 22 Mees observing tours
- 4 Summer Science Camp and Young Astronomers events
- 5 school and community events
- 3 community festivals
- 1 daytime Planetarium event

More than four thousand individuals touched by astronomy-related experiences provided by ASRAS

Scientific Achievement Areas

- Radio astronomy
- Supernova website

Farash Center Improvements

- Improved the Solar Observatory Hydrogen Alpha telescope resolution capabilities
- Created area in basement for Loaner Telescopes to be stored
- Library of Education Building cleaned out, removed window, and installed new shelving
- Planted more evergreen trees planted on edge of lower parking area
- Revitalized hiking trail markings courtesy of boy scouts

ASRAS Financial Position

Receiving funds from the Farash Foundation has been fundamental to our growth. Our financial position has been strengthened incrementally by the 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 \$74,000. We critically need the increase in 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.

2019 Plans

- **Augment the 14-inch telescope to allow operation at a very fast focal ratio of f/1.9**
- **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**
- **Paint rest of the Education Building**
- **Install boy scout made benches on the top of the observing hill**
- **Obtain additional chairs for Classroom**
- **Continue implementation of radio telescope projects**
- **Continue to support educational & outreach programs**

Astronomy Section of the Rochester Academy of Science



Scorpius wide field during the Lyrid Meteor shower, 4/22/2018, taken at the Farash Center in Ionia, NY.

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.