



President's Message

This fall, on Saturday, October 29th, we will host the **48th Annual RAS Fall Scientific Paper Session**. We now call for RAS Member Abstracts. As an RAS member, you may make an oral presentation, present a poster, or (new this year) you may set up a 6' display table. You may register to present or just to attend at <https://rasny.org/paper-session>.

Registration includes free admission to the museum.

A small survey of members found that bees were a popular topic for our annual Larry King Memorial Lecture at the Paper Session. So, your RAS Board of Directors selected [Dr. Bryan Danforth of Cornell University](#), see figure 1 below, to be our speaker this year. He has recently published a book, [The Solitary Bees: Biology, Evolution, Conservation](#) and will give a talk on this topic.



Figure 1: [Dr. Bryan Danforth of Cornell University](#)

Did you know that there are at least 416 bee species in New York state? Did you know that 81% of these are solitary bees, making nests in the ground or existing in above-ground cavities in trees and plant stems? Did

you know that these are vital pollinators, including for our apple trees? It is not just the European *Apis* domesticated honeybees that pollinate our native and crop plants. Dr. Danforth's lab studies the history of bee/plant co-evolution, historical biogeography of bees, and patterns of bee social evolution. Dr. Danforth is a sought-after speaker.

* * *

2024 Eclipse Watch

On July 31st, 2022, it will be just **617** days until the total solar eclipse that should be visible from Rochester on Monday, April 8, 2024. I am sure you are making viewing plans. The partial eclipse as viewed from Rochester, NY is calculated to begin at 2:06 PM with totality starting at 3:20 PM and lasting 3 minutes and 40 seconds (<https://www.greatamericaneclipse.com>). If you go to all the way to Eagle Pass, TX, you only get an extra 43

Save The Date!
Saturday, October 29, 2022
RAS Scientific Paper Session
Rochester Museum & Science Center

seconds of totality. Will it be worth the trip? You'll have to ask the visitors that make their way there. Cape Girardeau, MO only gets 26 seconds more than Rochester. Keep a close eye on weather forecasts as the date gets closer and pray for clear skies in New York!

* * *

NASA's *Lucy* Spacecraft to Trojans

I watch for science news that will appeal to more than just one section of the RAS. Here's one that connects our Astronomy and Anthropology sections. *Lucy* is a NASA space probe launched from Cape Canaveral October 16, 2021, see figure 2 below. The principal target is Jupiter's Trojan asteroids. While the asteroid belt between Mars and Jupiter is well-known, there are also two groups of asteroids that share Jupiter's orbit. These sit in elongated arcs at two of the five places (Lagrange points) where Jupiter's and the Sun's gravitational forces are balanced.

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Figure 2: Artists rendition of *Lucy* probe at <https://solarsystem.nasa.gov> flying past the Trojan asteroid [617 Patroclus](#) and its binary companion Menoetius.

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These two points are designated L4, 60° ahead of the planet in its orbit, and L5, 60° behind. The asteroid cluster ahead is called “the Greek camp” and that behind (L5) is called “the Trojan camp”. By convention, they are all called “trojans” and each is named after a figure from the Trojan War, generally from the *Iliad*, with asteroid names of Greek figures at L4 and of Trojan figures at L5. The first Jupiter trojan was found in 1906 at L4 by German astronomer Max Wolf and named *588 Achilles*, setting the naming pattern. According to *Wikipedia* more than 9,800 Jupiter trojans had been found as of May 2021 and some researchers believe that there may be as many as 1 million of them larger than 1 km in diameter. The mission will take twelve years. The spacecraft will make loops of the earth in 2022 and 2024 to gain gravitational boosts. It will then fly by

the inner main-belt asteroid 52246 *Donaldjohanson* in 2025. This asteroid is named for the discoverer of the famous Lucy hominin fossil in 1974 at Hadar in Ethiopia. Hence, the name “Lucy” for the mission. (The Trojans are considered “fossils” of planet formation.) The hominin was named after the 1967 Beatles song “Lucy in the Sky with Diamonds” and one of the spacecraft’s instruments includes a disc made of lab-grown diamonds. In 2027, it will arrive at the L4 Trojan cloud (Greek camp) and fly by and study four of these, returning to Earth in 2031 for another gravity assist toward the L5 cloud to visit and study two more asteroids. This ends the planned mission, but additional research may be added on later. You can learn more at lucy.swri.edu/ and at en.wikipedia.org/wiki/Lucy_spacecraft

By the way, I first heard of this mission in David Bishop’s “Astronomy Year in Review” presentation this spring in which he covered the launch.



Michael Grenier, President RAS

Events for August-September 2022

For updates to events, Academy website <http://www.rasny.org> and section websites.

August

Not Meeting in August

Astronomy Members Meeting
Fossil Section Meeting
Herbarium Workshop
Mineral Section

3 Wed: Astronomy Board Meeting

7:00 p.m. Farash Education building at the Farash Center for Observational Astronomy in Ionia, NY. Also Zoom meeting. ASRAS members are welcome. Contact: Mark Minarich at mminaric@rochester.rr.com.

18 Wed: RAS Board Meeting

7:00 p.m. Virtual meeting using Zoom. For details, contact Michael Grenier at mgrenier@frontiernet.net.

20 Sat: Day-Long Fossil Section Collecting Field Trip Devonian Forests

6:00 a.m. Departure from I-490 exit 47 Bushnell Basin commuter parking lot to New York State Museum, Cairo Quarry Devonian Forest site, and Gilboa Museum to explore Devonian Forest sites and specimens. Also collecting at Schoharie, NY Rickard Hill Road exposure of Helderberg Group. RAS members and guests welcome, but group size is limited. For additional information contact Michael Grenier at mgrenier@frontiernet.net.

26 Fri: Astronomy Public Observing

7:30 p.m. – 11:00 p.m. Open to the public. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For weather related cancellations or changes contact Mark Minarich at mminaric@rochester.rr.com.

27 Sat – 28 Sun: Astronomy Member Observing

New moon deep sky member observing, starting at dusk till last person leaves. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For weather related cancellations or changes contact Mark Minarich at mminaric@rochester.rr.com

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Events for August-September 2022 (Continued)

September

Not Meeting in September

Fossil Section

7 Wed: Astronomy Board Meeting

7:00 p.m. Farash Education building at the Farash Center for Observational Astronomy in Ionia, NY. Also Zoom meeting. ASRAS members are welcome. Contact: Mark Minarich at mminaric@rochester.rr.com.

9 Fri: Astronomy Members Meeting

7:30 p.m. – 10:00 p.m. Wolk Education Center at Farash Center for Observational Astronomy, 8355 County Road, Ionia. Meeting will also be held virtually via Zoom. Speaker: Conrad Wells, JWST designer at L3Harris from Houston, TX. Contact: Mark Minarich at <mailto:mminaric@rochester.rr.com>.

17 Sat: Life Sciences - Herbarium Workshop

10:00 a.m. – 2 p.m. The Life Sciences section will hold a workshop at the RAS Herbarium, located in the basement of the Rochester Museum and Science Center (RMSC). At RMSC go to the front desk to meet other participants. We will be working on re-mounting herbarium specimens; no special experience required. You may bring a lunch or buy lunch at the Cafe. We encourage attendees to be fully vaccinated. If you plan to attend, please send RSVP or any inquiries to

Elizabeth Pixley, herbarium curator, at eypixley@gmail.com, or call (585) 334-0977

21 Wed: RAS Board Meeting

7:00 p.m. Location: TBD. Virtual meeting option using [Zoom](#). For details, contact Michael Grenier at mgrenier@frontiernet.net.

23 Fri: Astronomy Public Observing

7:30 p.m. – 11:00 p.m. Open to the public. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For weather related cancellations or changes contact Mark Minarich at mminaric@rochester.rr.com.

24 Sat – 25 Sun: Astronomy Member Observing

New moon deep sky member observing, starting at dusk till last person leaves. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For weather related cancellations or changes contact Mark Minarich at mminaric@rochester.rr.com

24: Sat Fossil Collecting Field Trip Silurian Rochester Shale

Lockport, NY. Collecting in the Silurian Rochester Shale. Information will be sent to section members about two weeks before the scheduled date. Contact Dan Krisher DLKFossil@gmail.com for additional information.

27: Tue Mineral Section

Meeting to be determined. Members will be contacted. For questions, ask Jutta Dudley, juttasd@aol.com.



RocheStar fest 2022 Cake in honor of the JWST Space Telescope. Photo: Peter Blackwood.



RocheStar Fest July 23, 2022, Group photo by Peter Blackwood.

An Inordinate Fondness for Salamanders



Richard T. Stevens, Ph.D.,
Department of Biology, Monroe
Community College

There is just something about salamanders (figure 1). For me, they are the most amazing and beautiful animals. I get a massive dopamine release every time I see one. I think many of us have an animal that does that for us.

As a professor, getting to introduce students to these animals is always deeply satisfying. A few years back I had a golden opportunity to do some salamander research with students. A former student reached out to me and was interested in doing an independent research project. I had just read a paper about how important

cutaneous bacteria are for all vertebrates [1], and how very little was known about these bacteria in amphibians. A brief literature search led me to learn that while there were a few studies of the bacteria living on frogs, much less work had been done with salamanders. I told my former student that maybe we could look at bacteria living on salamanders. She had taken my Vertebrate Zoology course and we had found salamanders in the field during this course. She was down for this. Thusly, a project was begun.

Professor Tim Tatakis also had a student who was interested in doing independent research. So, we enlisted the help of our MCC microbiologist friend, Professor Suzanne Long, and all five of us went to Mendon Ponds together to see what bacteria we could find living on the local salamanders.

We found Spotted Salamanders (*Ambystoma maculatum*) and Blue-spotted salamanders (*Ambystoma laterale*) as they were migrating to their breeding ponds (vernal pools) in early spring. We sampled by swabbing the skin of the salamanders with a sterile cotton swab and then streaked the swab on a petri dish. Then, all we had to do was wait a few days to see

what bacteria grew. And to see if we could identify those bacteria.

We began by using biochemical tests to identify bacteria and during our first year we were able to identify one species, *Pseudomonas aeruginosa*, that grew on many salamanders. This bacterium was well known for its anti-fungal capacity. A closely related species of *Pseudomonas* bacteria, *P. fluorescens*, is used in agriculture as an anti-fungal [2]. This was both interesting and important because amphibians around the world were, and are still, being adversely affected by two species of parasitic chytrid fungi, *Batrachochytrium dendrobatidis* (*Bd*), which primarily affects frogs, and *Batrachochytrium salamandrivorans* (*Bsal*), which primarily affects salamanders. These fungi destroy the skin of amphibians. For amphibians, skin is especially important. Salamanders, and all amphibians, use skin for respiration, osmoregulation, ion regulation (electrolytes, etc.) as well as for defense against pathogens. So, the bacteria that live on a salamander, and the antifungal properties that come with them, could be essential for survival in environments with the parasitic chytrid fungi. I was hooked on this research. And we got our students their first scientific publication! ([3]).

Over the next few years, I kept at it and swabbed as many spotted salamanders as I could. I tried to sample a diversity of age classes to see if there were any differences in cutaneous bacteria species among these groups. (Spoiler alert: there were). I got some funding from the Monroe Community College Foundation to do ribosomal RNA sequencing to more accurately identify bacterial species. I got as many students involved as I could all along the way. Some interesting bacteria were found ([4], [5]), none more so than *Janthinobacterium lividum* (figure 2). The bacteria make a



Figure 1: Spotted salamander, *Ambystoma maculatum*. Illustration by Erin Strobl,
MCC Department of Biology.

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compound called violacein, a bis-indole that is anti-bacterial, anti-viral, and anti-fungal, and even anti-tumor, as well as being responsible for the beautiful purple color of the colonies. *Janthinobacterium* and its violacein are so effective at stopping the chytrid fungus that they have been inoculated onto the skin of boreal toads (*Anaxyrus boreas*) before these endangered toads were reintroduced into habitats where chytrid had



Figure 2: A pure colony of *Janthinobacterium lividum*, illustrating the purple color due to the antifungal compound violacein.

decimated their populations [6]. The toads survived and reproduced, which the researchers attributed to the bacteria.

Because the United States has one of the greatest diversities of salamanders in the world [7] especially the southern Appalachian mountain region, biologists are very concerned about *Bsal*. Currently, *Bsal* has not been found in the Americas. Both species of chytrid fungi appear to be Asian species that originated on the Korean peninsula, and *Bsal* has moved into Europe through the pet trade decimating salamanders, especially newts, along the way. Studies have shown that many North American salamanders and newts are highly

susceptible to the *Bsal* fungus. Thus, the concern.

In 2022, I was able to join a program sponsored by the U.S Geological Survey and the *Bsal* Task Force called SNAPS, or [Student Network for Amphibian Pathogen Surveillance](#). The idea was to get undergraduate students out into the woods and swamps to swab amphibians for the chytrid fungi. Salamander swabbing was a priority because while *Bsal* hasn't been found yet in North America, global trade has the capacity to bring it to us at any time. Early detection will be the key to trying to manage this potential biological disaster. This spring, I took 23 Monroe Community College students to Mendon Ponds Park to swab Spotted Salamanders and Eastern Newts for both species of chytrid fungus. Results came back in late May 2022. No chytrid fungi were found at all. No *Bd*. No *Bsal* — for now. But constant vigilance will be required. I hope to have my students out again in 2023 and beyond. And I hope that there are plenty of salamanders at Mendon Ponds, in North America, and on Earth, forever.

References:

[1] Colston, T.J. and C.R. Jackson. 2016. Microbiome evolution along divergent branches of the vertebrate tree of life: what is known and unknown. *Mol. Ecol.* 25: 3776-3800.



Eastern garter snake. *Thamnophis sirtalis sirtalis*. The snake is consuming a toad. July 2021. Photo: Jutta Dudley.

[2] Vershuere, L., Rombaut, G., Sorgoeloos, P., and W. Verstraete. 2000. Probiotic bacteria as biological control agents in aquaculture. *Microb. Mol. Biol. Rev.* 64: 655-671.

[3] Stevens, A.M., Fellows, K.E., Long, S., Stevens, R.T., and T. Tatakis. 2019. *Ambystoma maculatum* and *Ambystoma jeffersonianum*: Cutaneous bacteria. *Herpetol. Rev.* 50: 543.

[4] Stevens, R.T. 2020. A survey of the cutaneous bacteria of Spotted Salamanders, *Ambystoma maculatum*, in western New York, USA. *Herpetol. Rev.* 51: 253-257.

[5] Stevens, R.T. 2021. Further identification of the cutaneous bacteria of Spotted Salamanders, *Ambystoma maculatum*, in western New York, USA. *Herpetol. Rev.* 52: 307-309.

[6] Kueneman, J.D., Woodhams, D., Harris, R., Archer, H., Knight, R. and V. McKenzie. 2016. Probiotic treatment restores protection against lethal fungal infection lost during amphibian captivity. *Proc. R. Soc. B* 283:20161553.

[7] Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Books, Washington, DC. 592 pp.



Juvenile Cooper's Hawk. *Accipiter cooperii*. July 2022. This bird and its siblings were observed hunting chipmunks and squirrels. Photo: Jutta Dudley.

Spotting New Planets with Small Telescopes



Valerie Rapson, Ph.D., Assistant Professor of Physics and Astronomy, State University of New York at Oneonta.

[Editor's Note: Dr. Rapson is an Astronomer and public outreach enthusiast who enjoys teaching people of all ages about science. A native of Rochester, NY, she earned her Ph.D. in Astrophysical Sciences and Technology at RIT where her research focused on the chemical composition and structure of planet-forming disks around nearby young stars. Her research interests include star and planet formation, exoplanets, and projects that can be done with small telescopes. She also enjoys giving public talks, visiting K-12 schools to teach astronomy, and participates in [WAMC's Vox Pop radio show](#) with Astronomer Bob Berman.]

When you think of astronomical discoveries you probably think of big telescopes high atop mountains taking data, or the beautiful images taken by the James Webb Space telescope. But even small backyard telescopes are capable of taking important data that teaches us more our Universe, including searching for new planets around stars in the night sky. That's exactly what SUNY Oneonta undergraduate students did this summer.

Exoplanets are planets that orbit stars outside of our solar system. Over 5000 planets have been discovered by

ground and space-based telescopes, and there are thousands more candidate exoplanet systems waiting to be confirmed. Astronomers can use many different methods to find or study an exoplanet, but the most common one is the transit method. In this scenario, an exoplanetary system is tipped edge on relative to Earth. From our perspective, the planet appears to cross in front of the star, making the star appear to dim for a short time once per orbit. We don't actually see the planet move in front of the star, but we can detect the periodic dimming of the star and infer that an exoplanet is present.

Students Hadley Chan and Joshua Ippolito, working with Dr. Valerie Rapson, spent the summer observing exoplanet transits with the 14inch telescope at SUNY Oneonta's College Camp Observatory (Figure 1). Their main goal was to test the equipment's capabilities to see if they could detect known exoplanet transits and attempt to observe some exoplanet candidates identified by the Transiting Exoplanet Survey Satellite (TESS). The students successfully observed full or partial transits from three exoplanetary systems: KELT-23 Ab, HAT-P-32b, and

WASP-10b. These three planets are all Jupiter-sized planets that orbit very close to their host star, and only take a few days to make one full revolution around the star.

A light curve of KELT-23 Ab, in figure 2 below, shows the relative brightness of the star KELT-23 A over time. You can see that the star drops about 2% in brightness for a period of roughly 2.5 hours while the planet moves in front of the star. The data was fit with exoplanet light curve modeling code called EXOTIC, which helps to measure the transit depth and central transit time. Overall, we were able to successfully detect and measure the properties of a Jupiter-sized planet orbiting a relatively bright sun-like star!

Along with these three confirmed exoplanets, the students are actively taking and analyzing data for a few TESS exoplanet candidates. These stars are often faint at visible wavelengths and push the limits of our detection capabilities with the 14in telescope. But if we are able to detect

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Figure 1: Dr. Rapson's Students Joshua and Hadley Chan in front of SUNY Oneonta's JMI 40" Alt-Azimuth Folded Newtonian Mounted on a Trailer.

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these exoplanet transits, we can then determine the planet properties and learn more about the formation and evolution of planetary systems.

SUNY Oneonta also has a 1m JMI folded-Newtonian telescope (the largest telescope in NY state!) and we hope to start using that to observe exoplanet transits in the near future. That telescope has much greater light gathering power than the 14in telescope, so we will be able to observe fainter targets with ease.

Small telescope observations of exoplanet transits are incredibly important. They can help confirm candidate planets, detect new, never before seen, exoplanet transits, and monitor known exoplanet systems for any changes. This data is crucial in the era of the James Webb Space Telescope. Small telescope data can help professional astronomers know exactly when and where to look with space telescopes to learn more about an exoplanetary system.

The students will be submitting their data to the AAVSO's exoplanet light curve database and to a project called Exoplanet Watch (<https://exoplanets.nasa.gov/exoplanet-watch/>) which aims to keep close track of exoplanet transit times for use by space telescopes.

In the future, we hope to study more exoplanet candidates and help confirm or deny their existence. If you have a small telescope and CCD camera and are interested in taking your own exoplanet observations, check out the Exoplanet Watch website for more information.

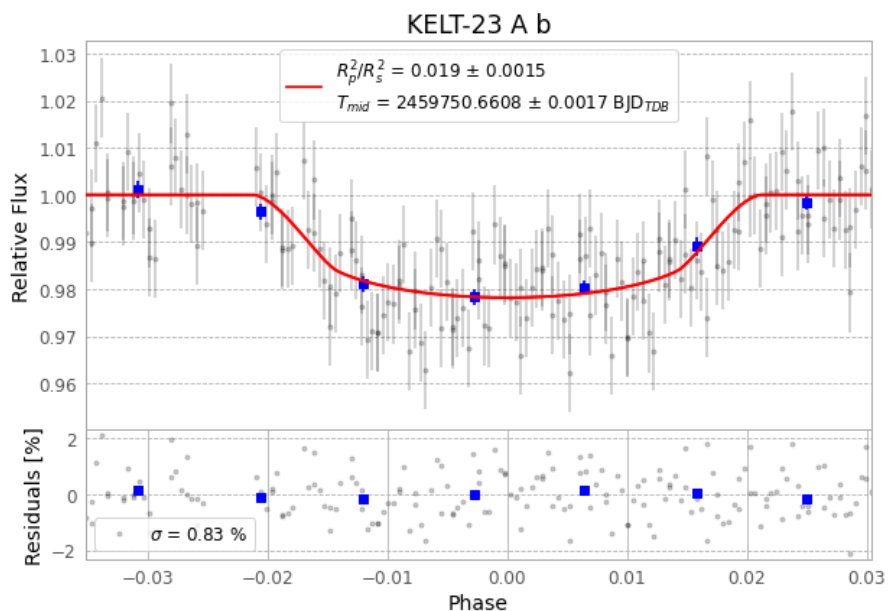
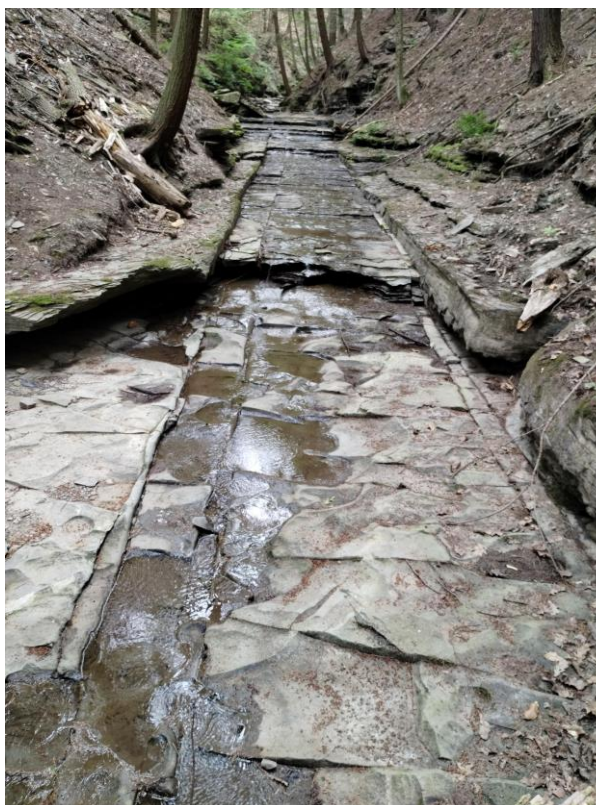


Figure 2: Light curve of KELT-23 Ab shows the relative brightness of the star KELT-23 A over time.



Clark's Gully, upper portion (42°40'8.5"N, -77°20'1.0"W), at the south end of Canandaigua Lake in Naples, NY on 16 July, 2022. Northeast running parallel joints revealed by stream erosion in the Devonian shale. Photo: Douglas Kostyk.

Seneca nation of the Iroquois Federation (Onodowaga) consider that at this area, called Kanandague — which translates to 'the chosen spot', the earth opened on Nundawao (South Hill) and their founders emerged to populate the land. The name "Canandaigua" originates from "Kanandague".

Many visitors come to the Gulley unprepared; without a trail map, without proper climbing shoes, and come in the evening without lights —and so slip and fall, needing to be rescued, as fire rescue volunteers Jessica Reed-Golumbeck, Tony Golumbeck, and Douglas Kostyk (the last two also being RAS directors) can readily testify to.

ROCHESTER AREA RESEARCH IN REVIEW

Member Photos of [Giant Comet K2](#)



K2 at about ½ degree from globular cluster M10. July 14, 2022. Photo: Kevin Lyons.



Giant Comet K2 ½ degree from M10. July 14, 2022. Photo: Tom Powers.

[July 18, 2022, University of Rochester Medical Center, Brains of children with autism may not always 'see' body language, study finds](#)

[July 18, 2022, Cornell University, New links found between dogs' smell and vision](#)

[July 11, 2022, Cornell University, Soft but tough: Biohybrid material performs like cartilage](#)

[July 6, 2022, University of Rochester, Helping teens channel stress, grow in resilience](#)

[July 6, 2022, University of Rochester, 'Supergene' wreaks havoc in a genome](#)

[June 28, 2022, University at Buffalo, Monitoring COVID-19: Could medicine found in wastewater provide an early warning?](#)

[June 28, 2022, Binghamton University, New biobatteries use bacterial interactions to generate power for weeks](#)

[June 21, 2022, University of Rochester Medical Center, Walking gives the brain a 'step-up' in function for some](#)

[June 21, 2022, University of Rochester, How the brain interprets motion while in motion](#)

[June 14, 2022, University at Buffalo, Magnetic material could help monitor battery life](#)

[June 14, 2022, Syracuse University, Hidden in plain sight: Biologists say southern right whale habitat choice is key to keeping young calves safe](#)

[June 13, 2022, University of Buffalo, Biochemists use enzymes to change how brain cells communicate with each other](#)

[June 6, 2022, University at Buffalo, How species form: What the tangled history of polar bear and brown bear relations tells us](#)

[June 1, 2022, University at Buffalo, How placentas evolved in mammals](#)

[May 31, 2022, University of Rochester, The secret to a longer lifespan? Gene regulation holds a clue](#)

[May 31, 2022, University of Rochester, Photonics: Quest for elusive monolayers just got a lot simpler](#)

[May 26, 2022, Cornell University, Autonomous underwater imaging: Faster and more accurate](#)

[May 24, 2022, Cornell University, Artificial cilia could someday power diagnostic devices](#)

ABOUT THE ACADEMY

The Rochester Academy of Science, Inc. is an organization that has been promoting interest in the natural sciences since 1881, with special focus on the western New York state region. Membership is open to anyone with an interest in science. Dues are minimal for the Academy and are listed in the membership application online. Each Section also sets dues to cover Section-related publications and mailings. We are recognized as a 501(c) 3 organization.

For information, contact President Michael Grenier at (585) 671-8738 or by email paleo@frontier.com.

The Academy Internet website is <http://www.rasny.org> or see us on Facebook at <https://www.facebook.com/Rochester-Academy-of-Science-792700687474549>.

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