

BULLETIN

"An organization of people interested in the Natural Sciences"



February 2024; Vol. 78, #1

President's Message

Best Wishes for the New Year!

You have my best wishes for what should prove to be an exciting year. The eclipse on April 8 is only one of the special events this year. Do get out with your like-minded RAS friends and enjoy the wealth of the natural world. My New Year's resolution—*do two RAS activities that I have not done before*. I am looking forward to another busy and interesting year with all my friends in the Academy.

Nominations for RAS Board of Directors Now Open

The Nominations Committee (Tim Tatakis, Tony Golumbeck, and Dan Krisher) will present a slate of candidates for office at the February 21, 2024 Directors meeting. If you are interested in running for a position and not already on the slate endorsed by the committee, we encourage you to submit a petition signed by ten endorsing members to Helen Haller (Secretary) by February 1, per the Bylaws. Please include a brief sketch of your qualifications and desire to serve.

All officer positions (1-year term) and two directorships (3-year terms) are up for election each year. A ballot will be provided in the March RAS Bulletin, a month prior to the Annual Meeting in April, when ballots will be counted, and the results announced.

2024 Eclipse Watch I

Rochester was named best place to view the eclipse at a museum by National Geographic. Eclipse glasses may be in short supply, so get yours early. The RMSC has ordered 500,000 eclipse glasses. 15,000 come to RAS. Get yours soon.

The Rochester NY metro area has over a million people, we are expecting 350,000 visitors, and people in surrounding counties will be drawing on those also.

Of course you can get eclipse beer for your eclipse party!



This collection is a collaboration of three local breweries. Strangebird Brewery will produce a barrel-lagered Helles called THE LIGHTER SIDE, Rohrbach Brewing Company will produce TOTALITY, a black lager; Three Heads Brewing will produce THE DARKER SIDE, a Steam style lager. Production dates not yet announced.

Undergrad Student Grant Program Results Announced

Our Undergraduate Student Research Grant Review Committee recently selected nine students to receive research grants from the Rochester Academy of Science based on the quality of research and presentation. This important program encourages the scientists of the future currently pursuing undergraduate degrees. Committee members reviewed and graded these, consulted with each other, and presented a consensus on the awards. Thank you to members Tim Tatakis, Karen Wolf, Michael

Richmond, Zachary Murphy, Geoff Lippa, and Jonathan Millen for their diligence in completing this.

Each September, we send our Request for Proposals to the sciences faculty at the colleges and universities throughout Upstate NY. The money awarded principally comes from three endowments: the Katherine H. Jensen Memorial Research Grant Fund, the Thomas F. & Annie A. and Grace Murray Memorial Research Grant Funds, and the Student Grants Endowment Fund. I am thrilled to report that thanks to the generosity of the Life Sciences Section and a few other members, we were able to make an additional award to one student and were also able to increase the size of the awards. The most highly rated proposal was given the newly created *Dr. William L. Hallahan Award for Excellence in Grant Proposal Writing*. This award is named in honor of our long serving but now retired Corporate Treasurer and chairman of the Student Grants Committee. In addition to a fully funded grant of up to \$750, the student also gets an unrestricted stipend of \$50 to be used as seen fit. Congratulations to our first-ever recipient, April Soule of the Thomas H. Gosnell School of Life Sciences at Rochester Institute of Technology. The full list of winners and their projects follows inside.



Michael Grenier, President RAS

Announcement of the 2023-2024 Undergraduate Student Research Grant Awards:

Our mission was to review all submitted applications, grade them on the quality of the request writing, and to award significant grants rather than small, partial awards. The maximum amount of any grant is \$750. The RAS Grants Committee awarded a total of \$4762 for nine research projects. Proposals for which we provided the entire amount requested are considered fully funded.

First place: **April Soule, Rochester Institute of Technology**. *Investigating Migration Timing Patterns of Thrushes Using Molecular Sexing*. Award: \$715 full funding plus \$50 unrestricted to the student. Sponsor: Susan Smith Pagano, Ph.D.

Andrew Seyler, Rochester Institute of Technology. *Cloning of the Nudix Diadenosine Polyphosphatases from M. tuberculosis and M. leprae to Increase Protein Solubility*. Award: \$650. Sponsor: Suzanne O'Handley, Ph.D.

Bethany Mangioni, Niagara University. *Iron-nitrogen cycling through a seasonal cycle within Devil's Bathtub, a ferruginous meromictic lake*. Award: \$650 (full funding). Sponsors: Dr. Cassandra Marnocha and Dr. William Edwards.

Samantha Wrobel, Niagara University. *Characterization of the lower Niagara River copepod diet and phytoplankton community composition using 16S rRNA and 18S rRNA gene sequencing*. Award: \$633 (full funding). Sponsors: Prof. Coleen Edwards, Dr. William Edwards, Dr. Cassandra Marnocha.

Bailey Hamm, Wells College. *Identifying Differences Between Mycological Colonies Under Treated and Affected Hemlock Trees Afflicted by the Woolly Adelgid*. Award: \$394.00 (full funding). Sponsor: Prof. Jaclyn Schnurr.

Mya Soto, Rochester Institute of Technology. *A HAD Superfamily Phosphoglycolate Phosphatase in Staphylococcus aureus as a Potential Virulence Factor*. Award: \$450. Sponsor: Dr. Suzanne O'Handley, Ph.D.

Brian Hofstetter, Cornell University Lab of Ornithology. *Paternity as a driver of post-fledging brood division and male parental behavior in the socially monogamous black-throated blue warbler*. Award: \$450. Sponsor: Sara Kaiser, Ph.D.

Peggy Chen, Rochester Institute of Technology. *A CTPase Nudix Hydrolase from Mycobacterium tuberculosis as a Potential Novel Antibiotic Target*. Award: \$400. Sponsor: Suzanne O'Handley, Ph.D.

Jebadiah Braunscheidel, Canisius University. *Organic Synthesis of Rhytismatone Natural Products*. Award: \$400. Sponsor: Timothy Gregg, Ph.D.

The money for the grants this year was from the Undergraduate Student Research Grants Fund, with the addition of \$300 from Life Sciences Section, and \$140 in member donations.

2024 Eclipse Watch II

On January 31st, 2024, it will be just **67** days until the total solar eclipse passes through Rochester on Monday, April 8, 2024.

Many members will be at our own ASRAS Marian and Max Farash Center for Observational Astronomy in Ionia to view this event. Reservations are required. One advantage is that there'll be many friends and experts on hand. However, parking space is limited. The Rochester Museum & Science Center (RMSC) expects to be crowded during the eclipse. They will have a full slate of activities all day long as well as on Saturday and Sunday, including planetarium shows, solar telescope viewing, live stage entertainment. At the RMSC, the Eclipse begins at 2:07pm, totality is from 3:20 to 3:23 (lasting 3 minutes

and 38 seconds), and it ends at 4:33pm. My plan is to take my guests to RMSC over the weekend and then to Farash Observatory or Braddocks Bay area for Eclipse Day, depending on forecast.

The RMSC is not at the center line of totality. If you are on the center line, you get five more seconds of totality. For this, you want places like Hilton, Clarkson, and Clarendon. If you are at the Farash Center, you get 24 seconds less totality than at RMSC. A few seconds won't matter much, though, and is worth it to be with friends and experts.

How does this work? On the Earth's surface, the moon's umbral shadow is a circle of darkness roughly **269 km (167 mi)** in diameter. If you are on the center line, the full diameter of

the shadow passes over you. If you are near the edge, the time is shorter.



Above, the red circle is the area of the moon's shadow and total eclipse at 3:22PM (two minutes and halfway into the totality of eclipse phase). The upper orange line is the center path, the middle is at Ionia, and the bottom is for Syracuse which gets only 38% of the time you'll get at Ionia. The shadow moves at the same speed everywhere, so the distance proportions are the same as time.

Events for February 2024

FEBRUARY, 2024 EVENTS

Feb. 2 Fri: Astronomy Members Meeting

7:30 p.m. – 9:30 p.m. RIT, Carlson Building, room 1125. Larry McHenry will speak about Edwin Hubble: Surveryer of the Univerise. Eclipse glasses will be available. Contact: Anthony Golumbeck at semp@use.startmail.com.

Feb. 6 Tues: Fossil Members Meeting

7:00 p.m. The meeting will be held in the community meeting room at the NEQALS building, 1030 Jackson Road, Webster 14580. Our guest speaker is Dr. Kristina Curry Rogers, professor and vertebrate paleontologist at Macalester College in Saint Paul, Minnesota. She specializes in the long-necked dinosaurs called sauropods and has traveled around the globe researching them and collecting their remains. She'll be speaking on "The Unlikely (but Very Lucky!) Triumph of Dinosaurs". These magnificent characters ruled Earth's terrestrial ecosystems for 150 million years. But how did they get that way? In this talk

Kristi will explore the humble origins of the Dinosauria. She is the author of more than 50 scholarly articles, has published two articles in Scientific American, and is editor (with Jeffrey Wilson) of the book *The Sauropods: Paleobiology and Evolution*. For details, see the RAS February *FossilLetter* or contact Michael Grenier at paleo@frontier.com.

Feb. 7 Wed: Astronomy Board Meeting

7:00 p.m. – 9:00 p.m. ASRAS Members are welcome to attend. Contact: Anthony Golumbeck at semp@use.startmail.com.

Feb. 14 Wed: Herbarium

1:00 p.m.-4:00 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). We will be continuing to organize plant specimens in preparation for digitizing the collection. If you plan to attend, please send an RSVP to rasherbarium@gmail.com. At RMSC, go to the front desk to meet other participants. For more information, contact herbarium curators, Tim Tatakis

and Steven Daniel, by emailing rasherbarium@gmail.com.

Feb. 21 Wed: RAS Board Meeting

7:00 p.m. – 9:00 p.m. Zoom only. For details, contact: Michael Grenier, mgrenier@frontiernet.net

Feb. 25 Sun: Astronomy Open House.

12:00 p.m. - 3:00 p.m. Farash Center. Contact: Anthony Golumbeck at semp@use.startmail.com.

Feb. 27 Tues: Mineral Section Virtual Meeting

7:00 p.m. Zoom only. Professor Christian Schrader of SUNY Potsdam will speak on a geological topic. Members will receive more information in mid-February. Contact: Jutta Dudley, juttasd@aol.com.

Feb. 28 Wed: Astronomy Members Forum

7:30 p.m. Farash Center and Zoom. "Making Your Own Solar Telescope / Binoculars Filter and Solar Viewer" by Nick Lamendola. Contact: Anthony Golumbeck at semp@use.startmail.com.

RAS Herbarium - Digitization is Happening!

by Elizabeth Pixley, Timothy Tatakis and Steven Daniel

For many years, Rochester Academy of Science (RAS) Herbarium volunteers have discussed and explored potential strategies and funding opportunities to image and digitize the large collection of mainly New York State plants in the RAS Herbarium. We estimate that the RAS herbarium currently contains 20,000-30,000 plant specimens; the great majority were collected from 1860's through the

1950's. After the imaging and digitizing our collection is done, any researcher, educator, or student anywhere in the world can see a high-resolution image of a plant that may have been collected by a Rochester botanist in the 19th century! Many other herbaria are pursuing a similar goal.

To explore one such opportunity, in March 2023, RAS Herbarium volunteers participated in a webinar series presented by the Mid-Atlantic Herbarium Consortium (MAHC). MAHC is a network of over 20 herbaria in the Mid-Atlantic region (including New York) and includes herbaria ranging from very small to very large

in size (number of specimens). MAHC is part of a larger project referred to as iDigBio (Integrated Digital Biocollections), the National Resource for Advancing Digitization of Biodiversity Collections funded by the National Science Foundation (NSF).

The four RAS Herbarium volunteers who participated in the webinar series with MAHC were Elizabeth Pixley, Curator and long-time volunteer; Steven Daniel and Tim Tatakis, long-time volunteers; and Tony Monahon, who completed a graduate school internship with the RAS Herbarium in 2023. As the webinar series progressed, it was clear that MAHC had resources that would support a

RAS Herbarium digitization project - they would supply expertise and train our volunteers, and potentially loan us the equipment to do the work.

Following the completion of the webinar series, the RAS Herbarium was invited to join MAHC and the RAS Herbarium agreed to do so.

Since joining MAHC in 2023, the RAS Herbarium has already benefited in several ways. Taxonomic and collection information (no images) of nearly 4500 of our specimens had been entered into a database by Steven Daniel and Kyle Webster over the past 13 years. That data has now been uploaded to the MAHC website. On December 19-20, 2023, Dr. Cynthia (Cindy) Skema (Botanical Scientist with the Morris Arboretum of the University of Pennsylvania), our contact at MAHC, came to Rochester and worked with volunteers in the RAS Herbarium. Cindy brought an imaging rig that is on loan to the RAS Herbarium for several months.

Figures 1 and 2 show the imaging equipment. For 2 days, Cindy trained RAS Herbarium volunteers on using the imaging equipment and other herbarium procedures related to the digitization project. The guidance and instruction received from Cindy was outstanding; further encouraging RAS

volunteers as they proceed with the project.

Preparation of specimens for digitization and imaging is time consuming. Many of the specimens in the herbarium are over 100 years old and information on the specimen labels is incomplete and/or contains taxonomic nomenclature no longer in use. In addition, not all specimens are properly sorted into individual species folders at this time. Therefore, properly sorting and organizing specimens into species folders, carefully barcoding each specimen, and imaging each specimen requires significant time and effort by volunteers. The overall project is expected to last for several years, given the time required for specimen preparation and that the imaging equipment will need to be returned periodically to MAHC because other herbaria will likely borrow it as well. While the project completion date may be years away, RAS Herbarium volunteers are extremely excited that the long-awaited imaging and digitization process is now happening and we are very encouraged by the progress that has already been made. As of the third week in January 2024, we estimate we already have imaged about 10% of our collection - over

2400 specimens. For example, [here](#) is a sedge, *Carex pseudocyperus*, collected by George Fish along the west bank of Irondequoit Bay, a few months after the end of the Civil War, on July 14, 1865. You can click on the “large image” and zoom in to see the high quality and resolution of these images.

If you are interested in seeing information about RAS herbarium specimens that is already available online as a result of this project, visit the MAHC website portal (<https://midatlanticherbaria.org/portal/collections/misc/collprofiles.php?colld=553>) and search the Rochester Academy of Science Herbarium collection (ROCH). It is exciting that the RAS Herbarium is now part of MAHC and, by extension, the national iDigBio project!

If you are an RAS member interested in learning about volunteer opportunities in the RAS Herbarium, contact the curators at rasherbarium@gmail.com . There are many different tasks associated with the digitization process and herbarium specimen maintenance, some require knowledge/experience of plant biology and taxonomy, others do not. All levels of volunteer inquiry are welcome.

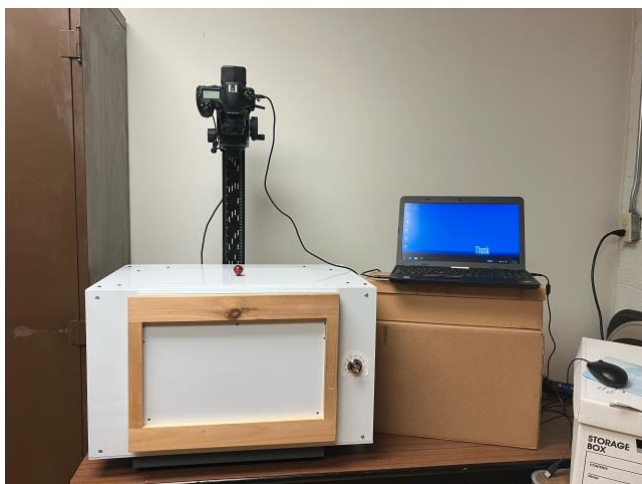


Image rig on loan from MAHC.



Herbarium specimen sheet in “Lightbox” of imaging rig.

RAS Herbarium - Curator Elizabeth Pixley Retiring

Elizabeth Pixley is retiring as Curator of the RAS Herbarium in January, 2024. While she is retiring as Curator, Liz is planning to still remain actively engaged with herbarium volunteers and the digitization project. Liz has volunteered regularly in the RAS herbarium since the 1970's, and has served as Curator since 2007. Liz deserves much credit for protecting, organizing, resolving problems and developing new initiatives in the RAS Herbarium over the years. We should all join in congratulating Liz on her retirement as Curator, thank her for serving in that role, and be thrilled that she is planning to stay engaged and working with

herbarium volunteers as the digitization project continues. Tim Tatakis and Steven Daniel will now serve as the Curators for the RAS Herbarium (new contact email address for curators is rasherbarium@gmail.com)

Rochester Research in Review.

(These are Hot Links which when clicked lead to the press release on the Science Daily website.)

[Researchers identify path to prevent cognitive decline after radiation. University of Rochester](#)

[Is oxygen the cosmic key to alien technology? University of Rochester](#)

[Scientists uncover link between the ocean's weather and global climate. University of Rochester](#)

[Researchers find neurons work as a team to process social interactions. University of Rochester.](#)

[Pancreatic cancer discovery opens the door for new clinical trial. University of Rochester.](#)

[Fast-charging lithium battery seeks to eliminate 'range anxiety'. Cornell University.](#)

[Online versus reality: Social media influences perceptions. Cornell University.](#)

[Little bacterium may make big impact on rare-earth processing. Cornell University.](#)

2024 Rochester Academy of Science, Inc.

Membership Form Mail to: R.A.S. Att'n: Treasurer P O Box 92642 Rochester, NY 14692-0642 <input type="checkbox"/> New <input type="checkbox"/> Renewal		Name _____ E-mail _____ Street _____ Phone _____ City _____ State _____ ZIP _____ - _____ For your convenience, please pay your dues to the R.A.S. and its sections with a single check. Make check payable to: Rochester Academy of Science or pay at https://rasny.org/how-to-join (bottom of page) with PayPal, Credit or Debit Card. CIRCLE the amount you are paying for an Academy category (shaded column) and for the Section(s) in which you wish membership.						
Membership Categories <i>R.A.S. dues are a prerequisite for section membership</i>		Rochester Academy of Science	Anthropology Section	Astronomy Section	Life Sciences Section	Fossil Section	Mineral Section	Total
Member (Individual over age 18)	\$10.00	\$2.00	\$25.00	\$2.00	\$10.00	\$5.00		
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Student (Through full-time undergrad.)	\$5.00	\$1.00	\$5.00	\$1.00	\$5.00	\$2.00		
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Gift (Thank you!) Fill in amount ⇄								
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Fall Paper Session Poster Presentations

The following are a few posters from the November, 2023 Fall Paper Session held at RIT.



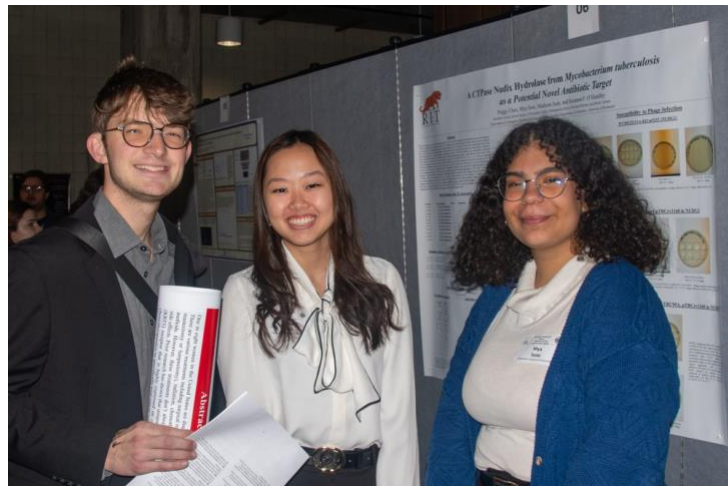
Patterns in the Physiological Condition of Migrating Thrushes,

by Jessenia Salto, April Soule, Gabriella Orfanides, and Susan Smith Pagano. Rochester Institute of Technology.

April Soule was awarded an RAS grant for this project, this year's first place winner.

Abstract:

Migration is a demanding time for birds, and intermittent pauses at stopover sites allow birds to rest and refuel on their migratory journeys. Stopover habitat along the south shore of Lake Ontario may be especially important for songbirds; thus, understanding physiological patterns of birds at lakeshore sites could prove essential from a conservation perspective. In this study, we sampled Swainson's Thrushes (*Catharus ustulatus*), Gray-Cheeked Thrushes (*Catharus minimus*) and Hermit Thrushes (*Catharus guttatus*) at Braddock Bay Bird Observatory (Hilton, NY) during spring and fall migration and measured robust physiological metrics in the birds. We used plasma metabolite profiling to assess refueling tendencies in the birds, and leukocyte counts were derived as a measure of immunological condition. We analyzed these metrics with respect to migration season, molecular sex, and a scaled mass index to assess seasonal/sex-related patterns and the dependence of physiological variables on body condition. Results provide insight into the physiological condition of songbirds on the south shore of Lake Ontario and biological factors that may drive variation in stopover physiology.



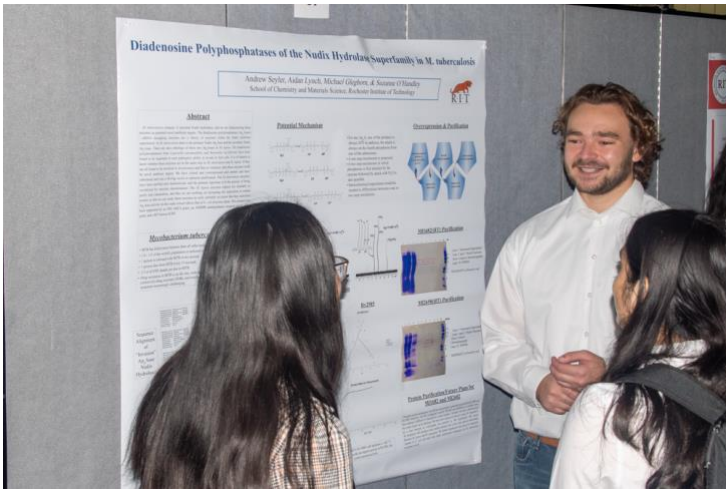
A CTPase Nudix Hydrolase from *Mycobacterium tuberculosis* as a Potential Novel Antibiotic Target,

by Peggy Chen, Mya Soto, Kenneth Gerian, Sarah Denial, Christopher Daley, Emmanuella Delva, Elizabeth Richter, Brent Cotman, and Suzanne F. O'Handley. Rochester Institute of Technology.

Peggy Chen was awarded an RAS grant for this project.

Abstract:

Mycobacterium tuberculosis (Mtb) currently infects ~1/4 of the world's population, kills ~1.5 million people annually, and there are many strains that are multidrug resistant. Thus, investigating potential novel antibiotic targets for Mtb is essential. We have been systematically discovering the activity for and characterizing the Nudix hydrolases from Mtb as potential drug targets due to their ability to hydrolyze substrates involved in important metabolic and pathogenic processes. One Nudix hydrolase from Mtb that we have been studying is a (d)CTPase, which has an ortholog in *E. coli*. One substrate for this enzyme is CTP, which is the feedback inhibitor of pyrimidine biosynthesis, and a precursor to lipid biosynthesis including cell membrane formation; the CTPase may help regulate these pathways through degradation of CTP. The *E. coli* knockout mutant is less susceptible to streptomycin and thus indicates a phenotype consistent with a change in the cell membrane; the CTPase from Mtb complements this *E. coli* homolog. Another substrate for this enzyme is 5 Methyl dCTP. There are some bacteriophage that can synthesize 5-Methyl dCTP, which could then be incorporated into bacterial DNA in place of dCTP. Thus, this bacterial (d)CTPase could be a defense mechanism against phage infection, which we are in the process of testing by comparing phage infection of the wildtype *E. coli*, knockout *E. coli*, and the knockout complemented with the Mtb enzyme. If our (d)CTPase is part of a defense mechanism against phage, targeting this enzyme and infecting with phage could be a treatment against Mtb.



Diadenosine Polyphosphatases of the Nudix Hydrolase Superfamily in *M. tuberculosis* and *M. leprae*,
by Andrew Seyler and Suzanne F. O'Handley, Rochester Institute of Technology.

Andrew Seyler was awarded an RAS grant for this project.

Abstract:

M. tuberculosis contains 11 potential Nudixhydrolases, and we are characterizing these enzymes as potential novel antibiotic targets. The diadenosine polyphosphatases (ApnAases) / mRNA decapping enzymes are a family of enzymes within the Nudix

hydrolase superfamily. In *M. tuberculosis* there is the primary Nudix ApnAase and the secondary Nudix ApnAase. There are also orthologs of these two ApnAases in *M. leprae*. The diadenosine polyphosphatases from *Legionella pneumophila* and *Bartonella bacilliformis* have been found to be important in each pathogen's ability to invade its host cells. It is of interest to know whether these enzymes act in the same way in *M. tuberculosis* and *M. leprae*. If they are all found to be involved in invasiveness and thus in virulence, then these enzymes could be novel antibiotic targets. We have cloned and overexpressed each protein and have subcloned each into a HisTag vector to optimize purification. The *M. leprae* enzymes express too insolubly to purify and characterize, and thus we are working on increasing the expression of soluble protein so that we can study these enzymes as well; currently we know that they each have ApnAase activity. This research has been supported by an NIH AREA grant, a CUR-Goldwater Scholars Faculty Mentor Award, an ASBMB undergraduate research award, and a RIT honors SURF.

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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The Academy postal address is P.O. Box 92642, Rochester NY 14692-0642.

ROCHESTER ACADEMY OF SCIENCE CONTACTS

		(585) home//cell
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