



President's Message

Fall Paper Session

We are now just a month from our *49th Annual Fall Scientific Paper Session*. It will be hosted at Thomas Gosnell Hall, Rochester Institute of Technology on Saturday, November 4th, 2023, 8 AM to 3 PM.

This is by far my favorite RAS event each year. I believe that if you came and saw the research being done locally in your own field(s) of interest, it would quickly become a favorite for you as well! It is exciting to see the research underway across so many disciplines at our local colleges and universities.

Featured presenters will be area scientists, students, and RAS members, who will share their investigations and interests about scientific topics.

RAS Scientific Paper Session Schedule. Save The Date!
Saturday, November 4
Rochester Institute of Technology
Thomas Gosnell Hall

More info: www.rasny.org/paper-session

Parking: Free, on site.

8-10AM All attendees sign in. Beverages & pastries for all.

8-11AM Poster Session A setup

9-11AM Oral Presentations (5 rooms, 6 sessions each)

11AM-12PM. Poster Session A

12-1PM Lunch – on-campus food stands or bring your own.

12-1PM Poster Session B setup

1-2PM Welcome & Larry King Memorial Lecture. Gosnell 1250.

2-3PM Poster Session B

RIT is at 1 Lomb Memorial Drive, Rochester, NY 14623

Present Your Own Work

RAS members may present a poster or talk, or new this year you may reserve a 6' display table. Although the standard abstract fee for each entry is \$10, any presentation with at least one RAS member on the author list gets a \$5 rebate. If you are not presenting, admission to the event is FREE and the Academy provides morning beverages and snacks. Please register at our website to present or just to attend at <https://rasny.org/paper-session>.

Have Lunch & Hear the Annual Larry King Memorial Lecture

Within a 3- to 4-minute walk from Thomas Gosnell Hall are six food stands, coffee shops, and snack bars. The Larry King Memorial Lecture is featured after lunch.



Dr. Roger Easton, Jr.



Dr. Jeyhan Kartaltepe

The 2023 Larry King Memorial Lecture keynote speakers this year will be Dr. Roger Easton, Jr. of RIT's Carlson Center for Imaging Science partnered with Dr. Jeyhan Kartaltepe of RIT's School of Physics and Astronomy to present on "*Astronomical Images – the Oldest and the Newest.*" They will show exciting images from the James Webb Space Telescope together with recently discovered long lost ancient and medieval star charts using advanced imaging technologies on ancient manuscripts. Dr. Easton will

be on Zoom from Verona, Italy with Dr. Kartaltepe live with us, and with Dr. Easton's students providing a live demonstration of the imaging equipment.

The lecture is free to the public. I hope you will come!

Background: In 1974, two local biology professors, Larry King (SUNY College at Geneseo) and Melvin Wentland (St. John Fisher College) initiated the tradition of the RAS Fall Scientific Paper Session. The event's purpose was to provide a forum for local scientists and students to share the results of their research, most of which occurs during the summer months. Larry and Mel understood that part of the scientific process is to share information. They saw to it that the Rochester Academy of Science became the organizing agency and catalyst for this annual event.

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Michael Grenier, RAS President

VOLUNTEERS NEEDED

We cannot put on our Paper Session without your help.

Contact Michael Grenier at mgrenier@frontiernet.net if you can volunteer for any of these roles.

Friday, November 3

Set up poster session area.

Saturday, November 4

Help greeting and registration, Monitor morning refreshments, Guide attendees to session locations, Moderate Oral Presentation sessions, Photograph presenters, Take down signs & poster frames at end of day, restore area neatness.

Events for October 2023

Oct. 1 Sun: Astronomy Members Open House

12:00 p.m. – 3:00 p.m. Farash Center, Ionia. Come help out and learn how to operate the telescopes. Contact: Anthony Golumbeck at semp@use.startmail.com.

Oct. 3 Tues: Fossil Meeting

7:00 p.m. (Note earlier time). Meeting will be held in the community meeting room at the NEQALS building, 1030 Jackson Rd., Webster 14580. It will also be broadcast on Zoom and is open to all RAS members and guests. Our guest speaker is Dr. Thomas Hegna, Associate Professor, Department of Geology and Environmental Sciences at SUNY Fredonia on *What Trilobites teach us that is meaningful and relevant today*. Trilobites are one of the most charismatic representatives of the Paleozoic. They lived for over 250 million years all over the globe. Learn what trilobites have taught us about diversity, growth, fossilization, and yes, even technology. For details, see the RAS October *FossilLetter* or contact Michael Grenier at paleo@frontier.com.

Oct. 4 Wed: Astronomy Board Meeting

7:00 p.m. Farash Center in Ionia. ASRAS members are welcome. Contact: Anthony Golumbeck at semp@use.startmail.com.

Oct. 6 Fri: Astronomy Members Meeting

7:30 p.m. – 9:30 p.m. Dr. Tony Whitman of L3Harris will speak about

testing the mirror on the JWST. Will meet at the Farash Center, weather permitting. Contact: Anthony Golumbeck at semp@use.startmail.com.

Oct. 13 Fri: Public Observing at Farash Center

7:30 p.m. - 11:00 p.m. Public is welcome. Members come and help visitors observe through our telescopes. Contact: Anthony Golumbeck at semp@use.startmail.com.

Oct. 14 Sat: Herbarium Workshop

10:00 a.m. – 2:00 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). You may bring a lunch or buy lunch at the Cafe. If you plan to attend, please send an RSVP to Elizabeth Pixley. At RMSC meet other participants in the lobby. For more information, contact Elizabeth Pixley, herbarium curator (334-0977 or evpixley@gmail.com).

Oct. 14 Sat: Partial Eclipse Viewing

11:00 a.m. – 3:30 p.m. Farash Center. All RAS members welcome. Contact: Anthony Golumbeck at semp@use.startmail.com.

Oct. 15 Sun: Life Sciences – Nature Walk – Durand Eastman Park

2:00 - 4:00 p.m. The Life Sciences section will hold a Nature Walk at the Durand Eastman Park Arboretum, expecting to catch the fall foliage at its peak. This will be a guided tour by a Monroe County Cornell Cooperative

Extension master gardener who will discuss unique plants and trees. This is a public event and you must register at https://pub.cce.cornell.edu/event_registration/main/events_action.cfm. Also, call or write Larry Hirsch (trip leader) at (585) 512-5672 or lph710@yahoo.com to let him know you are coming. Meet at the kiosk on Zoo Rd. (off Lakeshore) next to the park maintenance center.

Oct. 24 Tues: Mineral Section Meeting

7:00 p.m.- Meet at NEQALS building, 1030 Jackson Road, Webster. Join us for a social gathering and a program to be determined. Contact: Jutta Dudley, juttasd@aol.com.

Oct. 25 Wed: RAS Board Meeting

7:00 p.m. – 9:00 p.m. at Landmark Society Warner Castle. Zoom option available. For details, contact Michael Grenier at mgrenier@frontiernet.net.

ONGOING EVENTS EVERY MONTH:

STRASENBURGH OBSERVATORY

ASRAS will operate the telescope at Strassenburgh Planetarium on mostly clear Saturday nights. Contact: Jim Seidewand (585) 703-9876.



Cocoon Nebula, 2023. Photo: Mark Hehir



American Toad, Farash Center. Photo: Doug Kostyk

2024 Eclipse Watch

By Michael Grenier

Don't Forget! There will be a Partial Eclipse of the Sun here on Saturday, October 14, 2023.

You'll be able to find viewing events all over the region that day. Our own ASRAS Marian and Max Farash Center for Observational Astronomy in Ionia will be a great FREE spot for you to view this event with experts on hand. You might also consider the Rochester Museum & Science Center (RMSC) which will have planetarium shows and other activities. Remember, you will be looking at the sun and you **MUST wear eclipse glasses in order to look at the eclipse that day.**

In the Rochester area, the partial eclipse begins at noon sharp. Maximum partial eclipse coverage of the sun is reached at 1:13 PM. This Partial eclipse of the sun ends at 2:27 PM. Only about 25% of the Sun will be covered.

The last partial eclipse here was June 10, 2021 at dawn. The last U.S.-visible total solar eclipse of August 21, 2017 appeared here only as a partial eclipse with about 70% of the Sun covered. You might have seen that. Most folks in the U.S. outside the path of totality next year will still be able to see a partial solar eclipse.

In the photo by Michael Zelier, below, the third eclipse image from the right on the bottom shows about what you'll see at peak for this partial eclipse. If you want to see the maximum available coverage, you need to go to San Antonio, Texas which is about the closest place to Upstate NY on the path with an airport. Even there you will see only an annular eclipse in which the edge of the sun remains visible as a bright "ring of fire" in the sky (Latin, *annulus*) around the moon because the moon is too far from the earth to

cover the sun. (See *RAS Bulletin* for January 2023 for more.)

RMSC programs on 10/14 include the "Eclipse 2024!" Planetarium show at 9:45am, 10:30am, and 11:15am; and National Livestreams of the eclipse.

What will you see during the 2024 Total Eclipse?

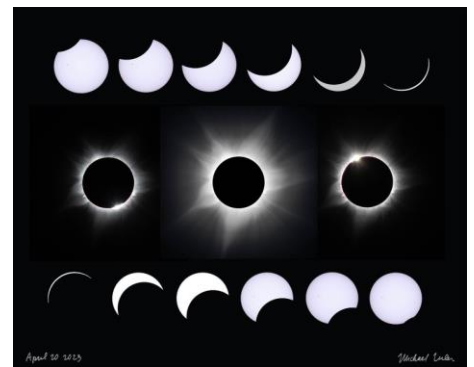
On September 30th, 2023, it will be just **191** days until the total solar eclipse that should be visible from Rochester on Monday, April 8, 2024. I'll be set up before noon. Mary will bring a picnic and I'll be surrounded by friends and family that are coming in from all over for the show, and by crowds of locals. Be early at your desired location to beat the crowd, find parking, and secure your spot. There will be plenty to do with talking to other folks about the eclipse, especially if you have read all about it and are the most knowledgeable person in your vicinity.

This will be my second total eclipse, as Mary and I saw the August 21, 2017 total eclipse at Cape Girardeau, Missouri. Much of what follows is based on my personal experience. *This total solar eclipse may be a life-changing experience for you.*

Make sure you have enough special-purpose "eclipse glasses" for your entire party. (See the July *RAS Bulletin*.) These will be available from the RAS (details forthcoming) or from the RMSC store. *Remember, the ONLY safe way to look directly at a solar eclipse is through such special-purpose solar filters.* Bring extra viewing glasses to pass around to locals in your vicinity, making people share, so you don't feel bad about not sharing your own with those who didn't know enough to get their own. Because of the Sun's brightness you are unlikely to see the moon in the same part of the sky, but it is there. The moon will be lower and to the

right of the sun. By 1PM the sun will be at about its highest, as it is really noon, except we are on daylight savings time. As the sun seems to move to the west (remember that it is the earth spinning and not the sun moving), the moon is moving east and will close the distance with the sun.

At about 2:06PM, the eclipse begins as the leading edge of the moon aligns with the edge of the sun. The Moon has likely been invisible in the daytime sky, but now you can start to see it as a black disk blocking the Sun. It will still be broad daylight, but it will begin dimming, like a sunset that takes over an hour. This will be a partial eclipse until 3:20PM when it becomes total.



Eclipse phases. Credit: Michael Zelier. Photo source: GreatAmericanEclipse.com

The photo above of the total solar eclipse of April 20, 2023 was taken by Michael Zelier at Exmouth Bay, Australia. The moon entered from the upper left (it's a southern hemisphere thing), but read it from lower right to the left to be more like what you'll see here. (My source is Exploratorium.edu which reports that the Moon will be "approaching it [the Sun] from the right as seen from the Northern Hemisphere.") The angle of motion will be somewhat different for next year's eclipse. The bottom row shows the partial phases before totality. These partial phases will last about 1¼ hours. The middle row shows the 3 minutes 40 seconds of

totality you'll see from the first diamond ring to the second. (The 2023 eclipse only lasted a minute at Exmouth Bay.) The top row shows the partial phases after totality, which again will last about 1¼ hours. As more of the Sun is eclipsed and daylight starts to fade, watch for strange lighting effects. Not only will you see shadows, but they will be much sharper than usual as the light source narrows. As it reaches near totality, look for shadow bands—undulating shadows on plain surfaces.

The band of totality as shown on eclipse maps is the Moon's shadow. This moves at about 1875 mph (the Moon's speed adjusted by the Earth's rotation speed adjusted by latitude). If you have a clear view of the ground to the southwest, you may see the moon's shadow speeding toward you. As twilight comes on, stars and planets will appear. The stars are the winter sky you normally see in February. You'll have a few minutes before totality so you can look for the easy-to-find Orion constellation and look for bright Venus to the Sun's bottom-right and Jupiter to the upper-left. Make it quick and don't miss the main show. You might also see an orange sunset-like glow at the horizon all around.

As we lose the Sun's rays, you'll sense the drop in temperature of up to 10 degrees Fahrenheit. Now listen closely. This is eerie. The insects and animals don't know it's an eclipse and they think it is sunset, so you will hear all the nocturnal bird and insect noises coming on very oddly for the middle of the day and the ceasing of normal daytime noise. (The people around you may start behaving oddly as well.)

The Moon is not perfectly round. It has a raggedy edge due to craters,

mountains, and valleys. Sunlight will shine through low points.



Baily's Beads. Credit: Robert B. Slobins, <https://eclipse.aas.org>

Moments before totality (and again after), you will see what looks like a string of beads around the Moon. These are called "Baily's beads" after Francis Baily described the phenomenon to the Royal Astronomical Society in December 1836. They should be "Halley's Beads" because Sir Edmond Halley made the first observations to be published after the 3 May 1715 solar eclipse. (*Philosophical Transactions*, Vol. 29 (1714 - 1716), pp. 245-262).



"Diamond ring." Credit: Rick Fienberg / TravelQuest International / Wilderness Travel, <https://eclipse.aas.org>

As the Moon fully covers the Sun, the beads will disappear until only one remains, looking like a diamond ring as the Sun shines through a deep lunar valley. Momentarily, you may see the Sun's middle atmosphere—the chromosphere—as a red arc along the Moon's edge, and maybe red plasma prominences above the surface.



Chromosphere and prominences. Credit: Robert B. Slobins, <https://eclipse.aas.org>

Take off your eclipse glasses if you like. It is now safe to view the Sun with your unaided eye. This is totality. The corona emerges. This is the Sun's outer atmosphere. The only time you can ever see the corona with the unaided eye is during a total solar eclipse. The corona is much hotter than the Sun's surface. Enjoy the view and everything going on around it.

The show is half over.

All of the preceding events will occur again in reverse order, beginning with the chromosphere and prominences reappearance, followed by the diamond ring and Baily's beads.

Quick! If you took off your eclipse glasses, put them back on. Enjoy the rest of the show.

It doesn't end until 4:33PM.

For more, see planetary.org/articles/eclipse-2024-checklist and <https://www.exploratorium.edu/eclipse/what-to-see-during-eclipse>.

2022-2023 Undergraduate Student Research Grant Award Winner

Editor's Note: The Hubbard Brook Experimental Forest has been used as an outdoor lab for ecological studies since 1955. It consists of 3,160 hectares of unbroken northern hardwood forest situated in the White Mountain National Forest in central New Hampshire. Learn more at birds.cornell.edu/hubbardbrook/.

Oxidative costs and constraints of territory quality on reproductive effort in male black-throated blue warblers,

By Braeden Thomson, Cornell University. Advisor: Dr. Sara Kaiser, Research Ecologist and Director of Hubbard Brook Field Ornithology Program.

[Winner - \$700 2023 Undergraduate Student Research Grant Award from RAS. This research will continue through the 2023-2024 school year.]



Braeden Thomson processing a male warbler after it is captured in a mist net. Photo: Zach Kahn

Background and Rationale for Hypotheses

Life-history evolution is constrained by reproductive costs, as indicated by trade-offs between investing in current reproduction and future reproduction and survival.

Reproduction is one of the most energetically demanding and costly

periods in an animal's life. For migratory songbirds, time and resources for competing reproductive demands are especially limited during their short breeding season. When individuals increase their allocation of resources to raising current broods, this inevitably comes at a cost to raising future broods and survival. This cost of reproduction is an important constraint that shapes life history trade-offs. However, the physiological mechanisms that underlie life-history trade-offs remain poorly understood but are key to understanding the evolution of life histories.

Oxidative stress is a strong candidate mechanism for mediating the costs of reproduction. Yet, few studies have focused on links between oxidative stress and reproductive effort. A paradox of aerobic life, oxidative stress is elevated during periods of increased metabolism, such as reproduction. Increased metabolic demands during reproduction cause the production of reactive oxygen species that can damage lipids, proteins, and DNA.

[Editor's note: These are peroxides and free radicals. These reactive oxygen species can be beneficial, though, as they are used by the immune system as a way to attack and kill pathogens. Animals normally have the ability to detoxify such reactive intermediates or to repair the resulting cellular damage. Under stress, this ability is lessened. In humans, oxidative stress is likely involved in the development of Parkinson's disease, cancer, heart failure, Alzheimer's, and other diseases.]

Birds can prepare for the threat of oxidative damage (e.g., during migratory stopover or in preparation for breeding), by upregulating endogenous antioxidants (e.g., enzymes) or by consuming more antioxidants in their diet (e.g., vitamins and carotenoids). Oxidative stress is measured as the ratio of harmful

reactive byproducts of metabolism to the neutralizing antioxidants.

Oxidative stress is hypothesized to function as a cost or constraint on reproductive effort. The oxidative-cost hypothesis proposes that reproductive effort generates oxidative stress, whereas the oxidative-constraint hypothesis suggests that oxidative stress restricts reproductive effort to mitigate the costs of reproduction. Each hypothesis has received some support (e.g., costs by Guindre-Parker et al. 2013; constraints by Constantini et al. 2016 and by Montoya et al. 2016).



Black-throated Blue Warbler at Hubbard Brook Experimental Forest. Photo by Tom Johnson, courtesy of The Cornell Lab, birds.cornell.edu.

I am examining the oxidative costs and constraints of territory quality on male reproductive effort (mating and parental effort) in the migratory Black-throated Blue Warbler (hereafter, BTBW) (*Setophaga caerulescens*).

Objectives and Suitability of Study System

My research is part of a long-term demographic study of this population wherein all individuals are marked, and their nests are found and monitored within a 330-hectare study area spanning a 400-meter elevation gradient in habitat quality at the Hubbard Brook Experimental Forest, NH (HBEF). The study area is a northern hardwood forest with a shrub layer dominated by hobblebush (*Viburnum lantanoides*), the preferred nest substrate for the warblers, along with saplings of the

major canopy species. BTBW's forage by gleaning prey (mostly Lepidoptera larvae) from foliage in the shrub and lower forest canopy.

Through the following approach, I will examine links between oxidative costs and constraints, territory quality, and reproductive effort to better understand the physiological mechanisms that mediate the cost of reproduction.

One behavior important to survival and reproduction that might be associated with oxidative stress is territorial defense. Most male songbirds establish territories during the breeding season for mating, nesting, and foraging. Males compete for and defend territories because they contain resources that are limited, but it costs energy to defend them. Territorial disputes occur frequently, with prolonged chases and conflict bouts, lasting hours or sometimes days. When neighbors are contesting territorial boundaries, aggressive behaviors can increase the risk of injury and expose the competitors to detection by predators. The benefits of securing a high-quality territory are improved foraging success, mate guarding, attraction of extra-pair mates, and offspring provisioning and survival, leading to higher reproductive success. However, few studies have examined whether variation in territory quality might be associated with oxidative costs or function as a constraint on reproductive effort. My research will examine links between oxidative costs and constraints, territory quality, and reproductive effort to understand the physiological mechanisms that mediate the cost of reproduction.

The breeding ecology of the BTBW has been studied extensively at the HBEF. Males arrive in early May, a week before females, compete with other males to establish territories (1–

4-hectare), pair, and initiate breeding in mid- to late-May. Territory sizes vary based on shrub layer density. Shrub density and breeding density increase from low to high elevations, with fewer and larger territories at low elevations where food availability is more limited. Females build open cup nests in the shrub layer, lay one egg per day (mean clutch size = 3.6), and incubate clutches for 12 days. Both females and males feed nestlings for 9 days until fledging and continue to feed fledglings for 3 weeks until independence. 30% of pairs attempt second broods depending on territory quality. Pairs are socially monogamous, but extra-pair paternity rates are relatively high (56%) and decrease with food availability as males defending food-abundant territories invest more effort into mate guarding to maintain within-pair paternity over pursuing extra-pair mates. Territory quality therefore leads to variance in male reproductive success. Variation in territory quality across the 400-meter elevation gradient at the HBEF and established relationships between territory quality and measures of male reproductive effort in BTBW's provides an excellent system for examining oxidative mechanisms hypothesized to mediate the costs of reproduction.

Research Procedure: Hypotheses, Predictions, and Tests

I conducted my research from May-Aug 2022-2023. As part of the long-term study: 1) males on the 330-hectare study plot were captured with a mist net and song playback, color-banded, and a small blood sample collected early and late in the breeding season; 2) territories were mapped; 3) nest attempts were found and monitored; 4) nests were video recorded during the nestling stage; 5) within-pair and extra-pair young were identified using molecular parentage

analysis of blood samples collected from nestlings and candidate males.



A clutch-complete black-throated blue warbler nest constructed in hobblebush.
Photo: Braeden Thomson

Hypothesis 1: Oxidative stress is a cost of territory size, territory quality, and breeding density. P1a: Territory size will be positively associated with pro-oxidant generation. Test 1a: I used the minimum convex polygon and kernel density estimations to calculate territory size from GPS coordinates of male locations. I measured changes in plasma pro-oxidant levels using d-ROMs test between early and late season samples. [Editor's note: *The d-ROM Lab test used in this study is a photometric test that measures the concentration of hydroperoxides in a biological sample. Hydroperoxides, also called Reactive Oxygen Metabolites (ROMs), are generated in the cells by the oxidative attack on various organic substrates (e.g. carbohydrates, lipids, amino acids, proteins, nucleotides, etc.).*]

P1b: Territory quality will be negatively associated with oxidative stress. Test 1b: Territory quality will be measured as an index of food availability following Kaiser et al. (2015). I measured oxidative stress as the ratio of pro-oxidant and antioxidant species using dROMs and OXY-adsorbent tests. P1c: Breeding density will be positively associated with oxidative stress. Test 1c: I estimated breeding density as the number of neighboring territories.

Changes in oxidative stress (as above).

Hypothesis 2: Oxidative stress constrains parental effort. P2a/b: Male provisioning rates and prey loads will be positively associated with oxidative stress. Test 2a/b: Provisioning rates (number of nest visits/nestling/hour) and prey loads (biomass/nestling/hour) were measured from nestling age = 7 days nest videos. I collected blood from males when nestling age = 6 days.

Hypothesis 3: Oxidative stress is a cost of mating effort. P3a: The number of extra-pair young sired will be positively associated with oxidative stress. Test 3a: I assisted in performing molecular parentage analysis of blood samples to determine the number of extra-pair young sired by each male. Changes in oxidative stress (as above).



A blood sample from a male black-throated blue warbler is collected from the brachial vein. Photo: Amaya Bechler

Timetable and Expected Outcomes

In Fall 2022, I was trained in how to calculate territory sizes, conducted oxidative stress assays, and extracted DNA for parentage analyses. Spring 2023, I calculated territory sizes and territory quality, conducted oxidative stress assays, and completed training in ddRAD sequencing and parentage analyses.

This summer I conducted field research at HEBF for my Undergraduate Honors Thesis at Cornell University. Despite abnormal weather conditions and below-average bird abundance at HEBF, data collection during the 2023 field season was successful.

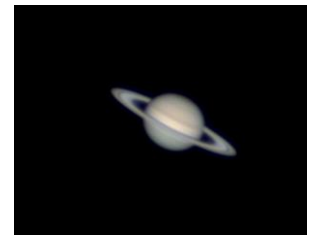
One hundred and fifty nesting attempts were found and monitored across three elevational zones. A sufficient sample size of males was banded, bled, mapped, and monitored from early May to late August. Four lepidoptera count transects were conducted at each elevational zone every two weeks to determine the quality of breeding territories.

This semester I will continue data collection by measuring oxidative status from blood samples collected during the 2023 field season. I will also extract and sequence DNA from adult and nestling blood samples to determine within-pair and extra-pair

paternity rates. I will code an R-script to determine territory size for each male warbler and use Arc-GIS to extract quality measurements for each territory. Finally, I will analyze this data and begin drafting my Honors Thesis manuscript. I will submit my final report in April 2024. I am extremely grateful to the Rochester Academy of Science for providing funds that purchased crucial oxidative stress assay kits. Without these materials, I would not be able to test my hypotheses about the oxidative costs and constraints of reproduction in male black-throated blue warblers. Thank you!

(Formal version with references available upon request.)

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Saturn, Sept, 2023. Photo: Kevin Lyons



M 17, Sept. 2023, Celestron 8" SCT. Photo: Burney Baron



Staghorn Coral and Blue Chromis fish, Great Barrier Reef, 2022. Photo: Bob Crumrine

Rochester Research in Review.

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

[Longevity gene from naked mole rats extends lifespan of mice. August 23, 2023. University of Rochester.](#)

[After treatment with semaglutide, newly diagnosed Type 1 diabetes patients needed little or no insulin. September 6, 2023. SUNY Buffalo](#)

[Ag tech can cut billions of tons of greenhouse gas emissions. September 6, 2023. Cornell University](#)

[New research sheds light on origins of social behaviors. September 5, 2023. Cornell University](#)

[Wildfire, soil emissions increasing air pollution in remote forests. August 29, 2023. Cornell University.](#)

[New modeling method helps to explain extreme heat waves. August 23, 2023. Cornell University.](#)

[Carbon dioxide -- not water -- triggers explosive basaltic volcanoes. August 7, 2023. Cornell University.](#)

[Brilliant galaxies of early universe. September 15, 2023. Rochester Institute of Technology.](#)

[Online AI-based test for Parkinson's disease severity shows promising results. September 7, 2023. University of Rochester.](#)

Many thanks to **Ted Lechman** for continuing to manage the distribution of the RAS Bulletin!

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
Michael Grenier	President 671-8738
Jeff Gutterman	Vice President 392-8299//748-2272
Helen D. Haller	Secretary 387-9570
Tim Tatakis	Treasurer 497-7038//292-2332
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Elizabeth Pixley	Herbarium 334-0974//281-5833
Dan Krisher	Fossil 698-3147
Stephen Busschaert	Mineral 351-7633
Robert Crumrine	Bulletin Editor //813-4157