



## President’s Message

### Another Exciting Year in Store for RAS Members

Among my many resolutions for the New Year is taking more advantage of the many interesting events that our various sections offer month after month. I usually keep my resolutions because I pick easy ones for self-improvement or more delight in life. You should note, among all the others, the annual Mendon Ponds Park Winterfest Celebration ([www2.monroecounty.gov/parks-winterfest](http://www2.monroecounty.gov/parks-winterfest)) on Sunday, January 12. Even if you cannot help with our Astronomy, Mineral, or Fossil section exhibits, you will enjoy the many family activities. Stop in and see what our sections do for educational outreach in the community.

\* \* \*

### North American Bird Populations Down by 3 Billion Since 1970!

Did you see this headline in papers, magazines, and web sites across the country after the publication of a years-long study by a team of scientists led by the staff at the Cornell Lab of Ornithology?

The paper, released on September 19th, reported the cumulative loss of nearly three billion birds since 1970 across most North American biomes. This 29% loss of population signals a pervasive and ongoing avifaunal crisis. **Come to the Annual Meeting for more details!** Our Annual Meeting is scheduled for April 2, 2020 and will feature as our keynote speaker one of the co-authors of this paper. We will be joined by Dr. Laura Helft, Ph.D., the managing science editor of the Cornell Lab of Ornithology, who will discuss the findings and how they accomplished this important study.

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### Nominations for RAS Board of Directors Being Finalized

The Nominations Committee (Tim Tatakis, Tony Golumbeck, and Dan Krisher) will present a slate of candidates for office at the January 15, 2020 Directors meeting. If you are interested in running for a position and not already on the slate endorsed by the committee, the bylaws allow you to be

placed on the ballot by submitting a petition signed by ten endorsing members, and sending the petition to Secretary Helen Haller by February 1. 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, when ballots will be tabulated, and the results announced.

Michael Grenier, RAS President

Figure 1: Male Eastern Bluebird



Photo Credit Lee R. DeHaan, Source: Wiki

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## Biofilms

Bacterial biofilms are generally defined as structured cluster-communities of bacterial cells enclosed in a 3-D slimy extracellular polymeric matrix, attached to wet surfaces. Biofilms protect member prokaryotic cells through homeostasis, and facilitating complex interactions between the biofilm bacterial cells through the mechanism called *quorum sensing*, discussed below, and researched in the RIT Poster on page 2. Figure 2 at right shows the life cycle of a biofilm, mediated by quorum sensing. Examples of ubiquitous biofilms include dental plaque, pond scum, and biofilms that grow on cardiac pacemakers and other medical implants, as well as inside municipal water system pipe surfaces.

Civil engineers consider water pipe biofilms to be a major nuisance as they reduce flow, are a reservoir for pathogens, corrode pipes, and impact the smell, color, and taste of water. Consequently, biofilm

abatement is a major effort for municipal waterworks. But in Flint, Michigan, because of a diminishing tax base, the waterworks depended on thick biofilm deposits in their lead pipes to prevent lead leaching into the water supply. But in April 2014, when switching water sources, the biofilms in the pipes were disrupted causing increases in lead levels. Flint is presently reducing lead levels by encouraging biofilm growth using phosphates.

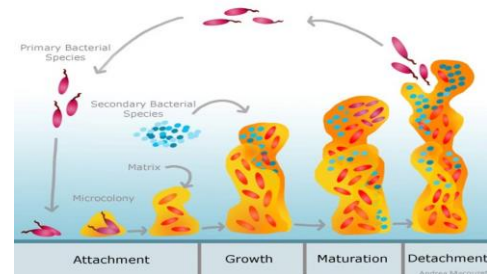


Figure 2: Biofilm Lifecycle

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## The Social Life of Bacteria: Quorum Sensing

Bacteria have intriguing and diverse social lives. A unique phenomenon where microbes communicate and synchronize their behavior by the secretion of a hormone-like substance called an autoinducer is called Quorum Sensing (QS). QS functions both within and between different species. When a bacterium senses that the external concentration of autoinducer exceeds a minimum threshold, this corresponds to the local population density having gotten large enough to achieve a “quorum”. When a quorum is sensed, this triggers changes in rRNA gene expression within the bacteria. QS is thus a phenomenon that allows bacteria to sense one another and to regulate a wide variety of physiological functions including symbiosis, motility, antibiotic production, biofilm formation (see left), and the expression of virulence in pathogens. QS also alters gene expression that allows bacteria to mount coordinated responses to their environ-

ments, comparable to behavior and signaling in higher organisms. Not surprisingly, it has been suggested that quorum sensing may have been an important evolutionary milestone that ultimately gave rise to multicellular life forms.

The first quorum-sensing system, discovered in 1970, is that of the bioluminescent marine bacterium *Vibrio fischeri*, considered the paradigm for quorum sensing in bacteria (such as *E. coli* and called *Gram negative*) that have a characteristic cell envelope. *V. fischeri* colonizes the light organ of the Hawaiian squid *Euprymna scolopes*. In this organ, the bacteria grow to high cell density and induce the expression of genes required for bioluminescence. The squid uses the light provided by the bacteria for counter-illumination to mask its shadow and avoid predation. See Figure 3 below.



Figure 3: Hawaiian Squid *Euprymna scolopes*

Two proteins, LuxI and LuxR, control expression of the light-emitting protein (*luxICDABE*) required for light production (Figure 3.). LuxI generates the autoinducer acyl-homoserine lactone (AHL), and LuxR is the cytoplasmic-autoinducer-receptor-DNA-binding transcriptional activator. Figure 5 show the autoinducer molecule AHL, represented by the red triangles in Figure 4. This creates a positive feedback loop that causes the entire population to switch into “quorum-sensing mode” and produce light.

Figure 4: Quorum sensing mechanism

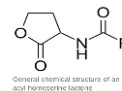
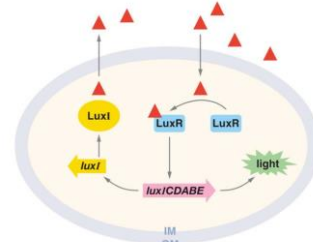
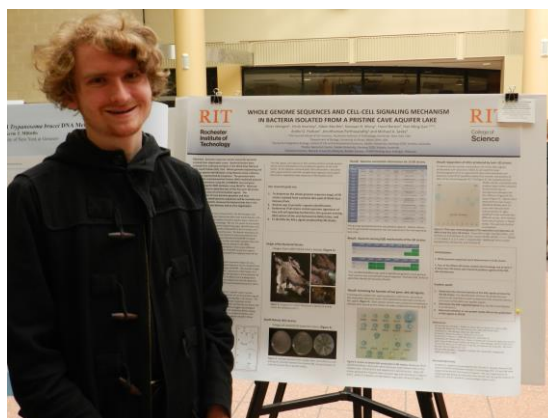


Figure 5: AHL

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RIT Student Peter Wengert with poster.

RAS Fall Paper Session Poster: **Whole Genome Sequences and Cell-Cell Signaling Mechanism in Bacteria Isolated from a Pristine Cave Aquifer Lake.** Peter Wengert, Michael A. Savka, Ph.D., the Gosnell School of Life Sciences, RIT, et al.

RIT is at the forefront of this scientifically exciting and medically critical field of molecular biology – Quorum Sensing!

# 2020 Rochester Academy of Science, Inc.

## Membership Form

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 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
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<b>Gift (Thank you!)</b> Fill in amount ⇨							
Check box(es) if you are interested in volunteering ⇨ ⇨ ⇨ ⇨ ⇨							

Please write the months you are away here: \_\_\_\_\_

# Events for January 2020

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

## NOT MEETING IN JANUARY:

Fossil Section  
Astronomy Star Parties  
Life Sciences Field Trip

## 3 Fri: ASTRONOMY SECTION MEETING

7:30 p.m.–10:00 p.m. RIT Carlson Center for Imaging Science, CAR-1125. Lot F. First speaker: Stephen Fentress of the RMSC will speak on how to use your Observer's Handbook. Main speaker: Keith Havey of L3Harris speaking on their current and future space projects. Snacks available at 7:00 p.m. prior to meeting. Contact: Mark Minarich: (585) 257-6042.

## 8 Wed: ASTRONOMY BOARD MEETING

7:00 p.m. University of Rochester, Bausch & Lomb Hall, 4th floor Chart Room. All ASRAS members are welcome. Contact Mark Minarich: (585) 257-6042.

## 10 Fri: ASTRONOMY OYER'S HOME INVASION

6:30 p.m. 56 Creekwood Drive, Greece, NY. First half: slides of aurora and geology in Iceland, and the European Southern Observatory Supernova Planetarium in Garching, Germany. Final half: the film "Hidden Figures." RSVP Brian Oyer at [rrr@rochester.rr.com](mailto:rrr@rochester.rr.com) or 225-4001

## 15 Wed: RAS BOD MEETING

7:00 p.m. Brighton Town Hall, Stage Conference Room

## 15 Wed: LIFE SCIENCE HERBARIUM WORKSHOP

1-4 pm. Basement Rochester Museum and Science Center (RMSC). No experience needed! If you plan to attend, please send an RSVP to Elizabeth Pixley. Contact: Elizabeth Pixley, herbarium curator: 334-0977 or [eypixley@gmail.com](mailto:eypixley@gmail.com).

## 19 Sun: ASTRONOMY PUBLIC OPEN HOUSE

12:00 p.m. - 4:00 p.m. (or later, if skies are clear). Marian and Max Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. Sledding, weather permitting. For weather related cancellations or changes contact Mark Minarich: (585) 257-6042 or see [www.rochesterastronomy.org/calendar-of-events](http://www.rochesterastronomy.org/calendar-of-events).

## 21 Tues: MINERAL SECTION MEETING

7:00 p.m. Brighton Town Hall, downstairs meeting room. Join us for a fascinating look at salt mining in western NYS with presentations by Bill Glynn and Joe Bucci. Door prize and refreshments. Contact: Stephen Busschaert, (585) 351-7633.

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## ONGOING EVENTS

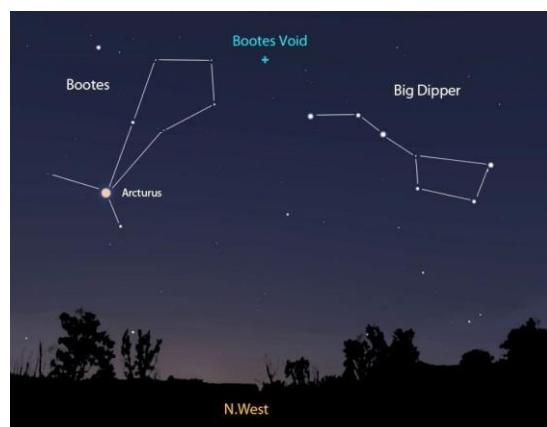
### STRASENBURGH OBSERVATORY

Operations of the Strasenburgh rooftop observatory will resume in April, but there may be last minute exceptions on warm, clear Saturday nights. Contact: Jim Seidewand (585) 703-9876.

## OTHER EVENTS

### 3 Fri- 4 Sat: QUADRANTID METEOR SHOWER

First meteor shower of 2020. Best viewing after midnight Friday and Saturday evening. Meteors will radiate from the constellation Bootes but can appear anywhere in the sky.



### 12 Sun: WINTERFEST

11:00a.m. to 4:00 p.m. Mendon Ponds Park. Join the community at the County's Annual Winterfest at Mendon Ponds Park. Enjoy hiking, racing, geocaching, ride a wagon, watch sled dogs run, meet wild critters, a patrol dog and horse, plus much more! See: <https://www2.monroecounty.gov/parks-winterfest>. Don't forget, we'd like your help at the Astronomy, Fossil, and Mineral booths. We'll be in the Cobblestone House.

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Don't forget to  
**Renew your RAS  
Membership  
for 2020!**  
Form on Page 2.

**Rochester Academy of Science**  
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**January 2020 - Vol. 74, #1, Page 4**

**CHANGING ADDRESS?**

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For information, contact President Michael Grenier at (585) 671-8738 or by e-mail [pres@rasny.org](mailto:pres@rasny.org).

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

This "BULLETIN" is produced monthly, except July and September, by the Astronomy Section, Rochester Academy of Science. Submissions are due by the 10<sup>th</sup> of the month and may be emailed to:  
[editor@rasny.org](mailto:editor@rasny.org).

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