

# BULLETIN



*“An organization of people in the Natural Sciences”*

May 2021; Vol. 75, #4

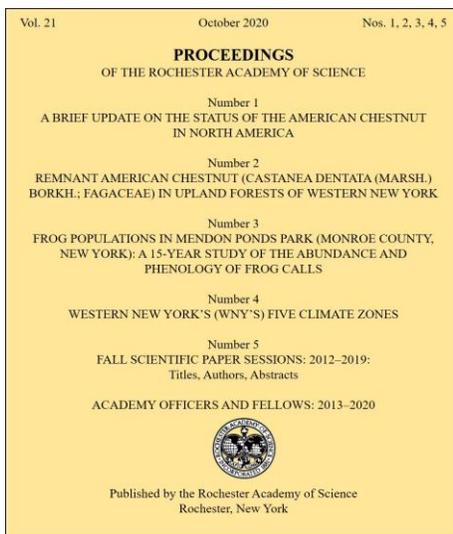
## President’s Message

This past April 13th was the 141st Annual Meeting of the Rochester Academy of Science and forty-nine people attended. Note that the Academy continued to operate throughout the Great Depression and through World War II and has never missed holding its annual meeting. Some might argue that it was our 142nd meeting, but I will start from our 1881 founding, and ignore our predecessor’s meeting (see our history on our website [rasny.org](http://rasny.org)). Most of those attending were there for our speaker, Dr. Sara Lewis—one of the world’s leading authorities on fireflies. Those who didn’t make it missed a real treat, but we will put her recorded lecture up for member viewing.

Our treasurer, Bill Hallahan, reviewed the 2020 annual financial report, which was published in last month’s Bulletin. If anyone has any questions on it, you are invited to write him at [whallah3@naz.edu](mailto:whallah3@naz.edu). We operated at a surplus (largely due to reduced meeting expenses), successfully funded our programs, and increased membership. Tony Golumbeck conducted the election for officers and board members, about which more elsewhere. My remarks summarized Academy successes over the past challenging year. I started that in the April Bulletin and won’t repeat those points here. In addition, the Academy conducted our annual meeting last year, and though we could not hold the annual scientific paper session we did have our Fall lecture that is typically part of that

program. This was a fascinating program of the evolution of dogs by Dr. Abby Grace Drake. Dan Krisher runs our speakers program for the Spring and Fall lectures. Let him know if you have anyone you would like to recommend (or if you want to give a talk).

Our publications committee worked to put out Volume 21 of the Proceedings of the Rochester Academy of Science, our first such publication in several years. With four scientific papers and numerous abstracts from past paper sessions, this came in at 471 pages. It is available on our website. I thank the committee—Jutta Dudley, Bill Hallahan, Helen Haller, and Tim Tatakis very much for this achievement.



Our student grants committee reviewed numerous applications at the end of the year and made six undergraduate research grants for over \$2300. You will continue to see these summarized in the Bulletin. Thank you to Bill

Hallahan, Helen Haller, Tim Tatakis and Michael Richmond for this.

Our monthly Bulletin did not miss an issue, but we had to switch to electronic distribution through email. Our Editor, Ted Lechman, took advantage of the medium to expand from four to eight pages, with more event description and much more original content from Academy authors. Please let us know what you have liked or disliked and we will do more or less of that accordingly. We are unlikely to return to mail delivery, but do mail copies to those who find email difficult. (Contact me if you need to get hard copy.)

We are an affiliate of the American Association for the Advancement of Science (AAAS) and Helen Haller represented us at their annual meeting as she has done for years. Alliances and shared programming have been established with Science societies in other parts of the country, making more lectures available to our members. Our newest facility is a specimen repository shed built at our Ionia site by Mineral Section led by Jutta and Paul Dudley with many volunteers. All-in-all, I look at 2020 as a successful year for the Rochester Academy of Science despite all impediments.

**Michael Grenier, President RAS**

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# Events for May 2021

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

## 4 Tue: Fossil Section Meeting

7:30 p.m. The meeting will feature a presentation by Professor Ben Dattilo of Purdue University on the life position of fossil brachiopods. Determining the original ecology of creatures from their fossil remains is challenging, and Dr. Dattilo (one of our most popular past speakers) offers case studies from a commonly found order of Devonian brachiopods. Meeting will be held remotely via ZOOM and is open to all RAS Members and guests. Contact Michael Grenier at [paleo@frontier.com](mailto:paleo@frontier.com) for meeting details and logon info.

## 7 Fri: Astronomy Section Meeting

7:30 p.m. Meeting to be held remotely via [BigBlueButton](#). Speaker: Don Bridy, Ph.D., Syracuse, NY. Topic: "Practical Wormhole Engineering Considerations, General Relativity, Gravitational Time Dilation (with a nod to its use in GPS)" Meeting details will be shared via email. Contact: Mark Minarich at [mminaric@rochester.rr.com](mailto:mminaric@rochester.rr.com).

## 8 Sat: Fossil Section Field Trip

Collecting field trip to Rickard Hill and other nearby localities. Lower Devonian roadcuts located in Schoharie, New York. For final details, including meet-up times and precautions to be taken, contact Dan Krisher at [DLKFossil@gmail.com](mailto:DLKFossil@gmail.com).

## 8 Sat: Astronomy Section Member Observing

Start from dusk till last person leaves. Observing social distancing and masks as appropriate. Specific rules for bathroom are posted at the facility. Members may bring guests, but all must sign in at [Wolk Building](#) to facilitate contact tracing. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. 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).

## 12 Wed: Astronomy Board Meeting

7:00 p.m. Meeting to be held remotely via [BigBlueButton](#). Meeting details will be shared via email. Contact: Mark Minarich at [mminaric@rochester.rr.com](mailto:mminaric@rochester.rr.com).

## 16 Sun: Astronomy Public Open House

12:00 p.m. - 4:00 p.m. (or later, if skies are clear). Observatory tours and work parties. Outdoors only. Observing social distancing and masks as appropriate. Specific rules for bathroom are posted at the facility. Members may bring guests, but all must sign in at [Wolk Building](#) to facilitate contact tracing. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. 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).

## 18 Tues: Mineral Virtual Meeting

7:00 p.m. Zoom meeting. Archeologist Dr. Douglas Perrelli of the University at Buffalo is an expert on lithic analysis and will discuss stone tools and the rock materials they are made from. Members will receive information via email. Contact: J. Dudley at [juttasd@aol.com](mailto:juttasd@aol.com).



[Rosette Nebula](#) and the open cluster [NGC 2244](#) formed from the matter of the nebula.

(Photo credit: James Canning)

## 19 Wed: RAS Board Meeting

7:00 p.m. Meeting to be held remotely via [ZOOM](#). Meeting details will be shared via email. Contact: Michael Grenier at [mgrenier@frontiernet.net](mailto:mgrenier@frontiernet.net).

## 22 Sat: Life Sciences Field Trip

10 a.m. Tinker Nature Park parking lot, 1525 Calkins Rd., in Henrietta. Trail walk and visit Tinker's Hansen Nature Center. Contact: Larry Hirsch 429-6199 or [lph710@yahoo.com](mailto:lph710@yahoo.com).

## 22 Sat: Fossil Section Field Trip

Collecting field trip to several road cuts near Tioga, PA. Upper Devonian sites located just south of the NY/PA border near the "old" route 15. For final details, including meet-up times and precautions to be taken, contact Dan Krisher at [DLKFossil@gmail.com](mailto:DLKFossil@gmail.com).

## OTHER ACTIVITIES

### 13 Thu: Rochester Birding Association Monthly Virtual Meeting

7:00 p.m. – 9:00 p.m. RAS members invited to attend monthly talk by Nathan Pieplow on "Hearing Evolution". For more information see [rochesterbirding.org/events/category/monthly-speakers](http://rochesterbirding.org/events/category/monthly-speakers). For virtual invite contact President Liz Magnanti at [lizmagnanti@gmail.com](mailto:lizmagnanti@gmail.com).

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April Red Fox (*Vulpes vulpes*) from Naples, NY French Hill.

(Photo: John Larysz)

## Featured Article

### **The History of RAS and AAAS**

By Helen D. Haller, Ph.D.,  
RAS Secretary

The American Association for the Advancement of Science (AAAS) was founded in 1848. It is the world's largest multidisciplinary scientific society and a leading publisher of cutting-edge research through its *Science* family of journals.

The AAAS seeks to “advance science, engineering, and innovation throughout the world for the benefit of all people.” To fulfill this mission, the AAAS Board has set the following broad goals:

- Enhance communication among scientists, engineers, and the public;
- Promote and defend the integrity of science and its applications;
- Strengthen support for the science and technology enterprise;
- Provide a voice for science on societal issues;
- Promote the responsible use of science in public policy;
- Strengthen and diversify the science and technology workforce;
- Foster education in science and technology for everyone;
- Increase public engagement with science and technology; and
- Advance international cooperation in science.

RAS was founded in 1881. The Centennial Issue, Vol. 14, of the *Proceedings* was published in 1981: “History of The Academy the First Hundred Years” by Reginald Hartwell, and it is from that publication that I will draw some of the material that follows. (That issue, as well as all other *Proceedings*, is available on the RAS website. It is chock-full of information, and is a delightful and easy read, in a breezy, chatty style. I commend it to any of you who are interested in the first

hundred years of RAS for its own sake.)

“On March 14, 1881, the Rochester Microscopical Society, meeting in the Rochester Free Academy building on Fitzhugh Street, adopted the report of the committee on constitution and by-laws. ‘By adoption of the committee report the Society will be known henceforth as the Rochester Academy of Science.’ In the spring of 1881, it was a brand new and [yet] an already going concern with an active membership of 110, plus 9 honorary members and a modest cash balance.”

“In 1892, Rochester was host to the 41st Annual Meeting of the American Association for the Advancement of Science (AAAS). Planning for the event, which was in August, began in February when [RAS] President Fairchild appointed a Special Committee on the AAAS Meeting. That committee immediately notified other scientific, educational, and business groups with the result that soon there came into existence a city-wide organization dedicated to planning the event, at which about 1000 visitors were expected, down to the last tiny detail. There were 13 committees consisting of anywhere from 10 to 50 members each. The list read like a roster of Rochester's business, professional, educational, and social leaders. There was a Women's Reception Committee, a Finance Committee and a Committee on Invitations and Receptions. There were committees on Excursions, Transportation, Hotels and Lodgings, Rooms, Mail, Telegraph and Express, Printing, Membership, and Press. The American Microscopical Society and the Botanical Club were not yet sections of the AAAS but held their own separate meetings, and committees were organized to take care of their needs.”

“There were 8 sections of the AAAS: Mathematics; Astronomy; Mechanical Sciences and Engineering; Geology and Geography; Biology; Anthropology; Economic Sciences; and Statistics. They all had to be provided with meeting rooms for their

own separate sessions. Most of the sessions were held in buildings at the University of Rochester. Closing sessions for the full membership were held in the YMCA Music Hall. Every evening a new 25-page schedule of events for the following day was printed for distribution. On Monday evening, August 22, the Rochester Academy of Science held a special ‘Complimentary Meeting’ for their AAAS guests in the Music Hall. Speaker of the evening was Dr. G. Karl Gilbert, Chief Geologist for the U.S. Geological Survey. His subject was ‘Coon Butte and the Theories of Its Origin’ [now known as the Meteor Crater Natural Landmark, in Arizona]. No sessions were held on Saturday or Sunday but on Saturday, guests had a choice of four free excursions (Niagara Falls and Lewiston, or Portage and Mt. Morris, or Stony Brook Glen, or Canandaigua Lake). The outstanding success of this event was due in no small measure to the efforts of Professor Fairchild as Executive Secretary. His incredible energy and ability to organize and get things done were to pervade Academy affairs for the next 50 years.”

“In 1936 Rochester was host for the second time to the American Association for the Advancement of Science when their 98th meeting was held here on June 16–18. [There is no arithmetic error: there were several years, including 1936, in which more than one Annual Meeting was held.] Responsibilities for the local arrangements were assumed largely by members of the University of Rochester faculty, not all of whom were Academy members. There were several subcommittees that arranged for matters such as Program, Publicity, Meeting Rooms and Equipment, Field Trips, and Entertainment. The various sections of the AAAS had increased since 1892 from 8 to 12. Headquarters were at the Seneca Hotel and practically all the sessions were held at the University of Rochester River Campus and at the

School of Medicine and Dentistry. One event at this meeting was a comparatively new AAAS development, an Annual symposium, that year sponsored by the Ecological Society of America. The subject chosen was ‘Scientific Aspects of Flood Control’. We quote from the record of the event published in *Science* for July 31, 1936. ‘A violent storm broke before the hour of the meeting and lasted several hours. It interfered seriously with the assembly of an audience.’ ”

“Field trips were arranged for all the delegates. There were industrial tours and exhibits at Bausch & Lomb, Eastman Kodak, Delco, Gleason Works, Taylor Instrument Company, Ward's Natural Science Establishment, Will Corporation and Stromberg Carlson. Botanists were taken to Bergen Swamp, Mendon Ponds and Highland Park, and the geologists were able to visit the many points of their special interests.”

“All those activities were forerunners to the time in 1958 when science education grants from the AAAS became available to the Academy. January 1958 saw the beginning of the Academy affiliation with the AAAS, which continues today. Accompanying the welcoming letter was the notification that the Academy would be eligible to receive \$50 annually from the AAAS, to be used for local research grants. The grants would be given to students, preferably in high school, chosen by the Academy. No grants were awarded in 1958 so the \$50 carried forward into 1959, when the AAAS raised the annual award to \$100. Finding itself with \$150 to give away, the Academy set about doing it. City high school science teachers were contacted and asked for recommendations. When the returns were tallied, it was decided to award grants to 13 students in Monroe and McQuaid High Schools in amounts ranging from \$5 to \$15. Among them, two telescope builders received \$10 each and two students

building cloud chambers received \$5 each. Of those initial 13 grantees, nine were boys and four were girls.”

“The Academy continued to receive \$100 annually from the AAAS and to give out grants. Toward the end of the 1960s there occurred a decline in the number of high school students applying for AAAS grants. As a result, in 1970 the focus of the grants shifted to college students. The grant program was funded by AAAS through 1978. After that year, an AAAS ruling that grants must go to high school students took effect. The Academy Council discussed changing the program to conform to that ruling and they decided against it.”

From the preceding paragraph I deduce that the RAS became an Affiliate of the AAAS in 1958, and as our author said, it remains one to this day. The AAAS now has about 250 affiliated organizations; about 50 are [state] academies, the rest are professional societies. This is a status not easily attained. It gives us access to programs and services of the AAAS. These include their research on government programs and budgeting for science, their advocacy for the interests of scientists, and their programs such as “Local Science Engagement Network”, “Campaign for Science”, “Center for Scientific Evidence in Public Issues”, and “Societies Consortium on Sexual Harassment in Science, Technology, Engineering, Mathematics, and Medicine”. Being an Affiliate also enables us to join with other Affiliates in speaking out on issues of importance (for example, by being among the signers of letters sent to organizations whose policies we support or oppose). I cannot stress enough how valuable our membership in AAAS as an Affiliate Organization is, and how potentially useful, helpful, inspiring, etc. it can be.

Affiliates also have the opportunity to send a delegate to a Section of the AAAS, in our case, Section Y, “General Interest in Science and Engineering”. Larger affiliates can have representation in several sections,

of which there are now 24, ranging from Agriculture, Anthropology, and Astronomy through Biological Sciences ... Chemistry ... Dentistry ... Geology and Geography ... and Linguistics ... to Neuroscience ... Physics ... and Statistics. It is the Sections that propose, arrange, and conduct the scientific sessions and presentations (lectures, symposia, workshops, etc.) at the Annual Meetings. Sections also bring forward nominees to be AAAS Fellows, a sought-after honor.

Section meetings are free-wheeling and wide-ranging, with members encouraged to speak up on anything that matters to them. Of course, much of what is brought up is suggestions for presentations at the next year's Annual Meeting but matters that are being neglected or not given sufficient consideration are also brought forward. In that regard, I have a little story. At the Annual Meeting in 2019, I was dismayed that the rooms for the lectures and symposia had, on tables at the back, not a big dispenser of cold water and stacks of cups, but ranks and ranks of disposable plastic water bottles. I spoke up about this as being contrary to the AAAS policy of conserving resources. The section leadership listened to me and took the word to the higher-ups in the national organization. At the 2020 Annual Meeting there were water fountains and dispensers, and not a single disposable bottle in sight anywhere. All individual members of AAAS can join up to three Sections. Sections are a great way to network with other members while participating in the AAAS Annual Meeting, and also provide the national leadership with expertise on issues of importance within the scientific community. Other benefits of membership include: *Science* magazine, weekly Policy Alerts with news of national and international policies and events as they relate to science in its broadest applications, “Member Updates” with news of a

(Continued from p.4)

more personal nature, including opportunities for participation, job openings, and so forth.

One thing I call to your special attention is that the AAAS makes awards in a number of areas of significant endeavor (the site that lists them all is

<https://www.aaas.org/aaas-awards>).

The following are given annually:

- Science Diplomacy;
- Scientific Freedom and Responsibility;
- Early Career Award for Public Engagement with Science;
- Kavli Science Journalism Awards;
- Mani L. Bhaumik Award for Public Engagement with Science;
- John P. McGovern Award Lecture in the Behavioral Sciences;
- Mentor Awards (one for early career, one for lifetime mentoring);
- Newcomb Cleveland Prize, awarded annually to the author or authors of an outstanding paper published in the Research Articles or Reports sections of *Science*;
- Philip Hauge Abelson Prize, which recognizes an individual who has made exceptional contributions to the advancement of science as a public servant, or a scientist who has been distinguished for both scientific achievement and other notable services;
- AAAS/Subaru SB&F Prize for Excellence in Science Books, which celebrates outstanding science writing and illustration for children and young adults.

We (RAS or even individual members) can submit nominations for any of these prizes. As a heart-warming update, I report to you that the 2021 winner of the P. H. Abelson Prize was Dr. Anthony Fauci.

AAAS also gives out the Golden Goose Awards (<https://www.goldengooseaward.org/news>). The Golden Goose was established in 2012 as a counterpoint to the late Sen. William Proxmire's (D-Wisconsin) monthly Golden Fleece Award which often ridiculed basic scientific research. The Golden Goose instead honors those whose federally funded research may have been considered odd or obscure when first conducted but has resulted in significant benefits to society. The high stakes for public policy and health led this year's award committee of bipartisan congressional supporters and science and higher education organizations to focus on science addressing the pandemic.

In summary, the RAS is an organization with a long and rich history of achievement, education, and advocacy. The AAAS is older and much larger, but they share visions and goals, and each is made stronger by its connection to the other.

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Cherry Blossoms at Highland Park  
(Credit: Lambertton Conservatory)

## Citizen Science Feature:

### Fossil and Life-Science Field trips are back in business!

Given an early spring, widespread COVID-19 vaccinations, and loosening restrictions, RAS is now offering opportunities for citizen science field work, especially by the Fossil Section, which will be having upper and lower Devonian fossil collecting outings at Rickard Hill and Tioga, PA, and that just in May! See the RAS May Calendar of Events on p.2 of this *Bulletin*. See future *Bulletins* for more field trips later this summer.



Figure 1: John Handley at Fossil Field Trip at Jaycox Run between Geneseo and Avon.



Figure 2: Fossil Field Trip to Buffalo Creek in Erie County.



Figure 3: Fossil Field Trip to Little Beard's Creek outside of Leicester.

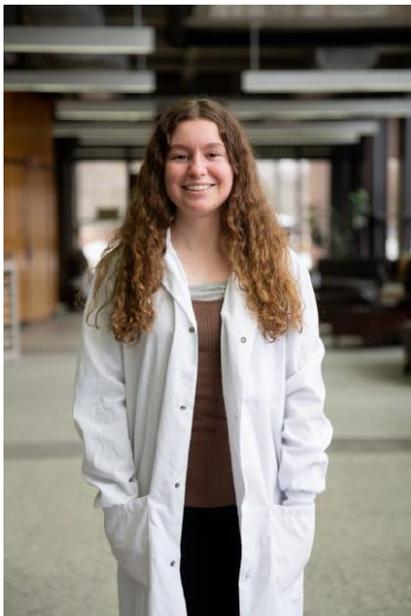
(Photo Credits: Dan Krisher)

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## Featured 2020-2021 Undergraduate Student Research Grant Award Winner

Emalee Wrightstone, Rochester Institute of Technology, *The Role of Green Leaf Volatiles and Ethylene on the Maize Rhizosphere Microbiome*.

Sponsor: Eli Borrego, Ph.D., Thomas H. Gosnell School of Life Sciences, RIT.



(Photo Credit: Emalee Writestone)

### Abstract

The rhizosphere microbiome is the complex community of microorganisms on the surface of plant roots. Communication between the microbiome and the host plant is mediated through chemical signals such as phytohormones and green leaf volatiles. In this study mutant maize plants with ethylene or green leaf volatile-deficiency or overproduction will provide genetic evidence to understand the role those compounds play on the rhizosphere microbiome. To investigate the hypothesis that rhizosphere communities will differ between mutant and wild-type (WT) plants, this study will validate the homozygosity of the maize seed, characterize each rhizosphere microbiome through 16S and ITS

sequencing, and analyze results through operational taxonomic units (OTU) and alpha/beta diversity. The knowledge gained in this study will be informative for improving important agricultural traits such as plant growth conditions, drought tolerance, pathogen defense, and yield.

Despite the explosion of research in the past decade to understand the rhizosphere microbiomes of plants, the vast majority of these studies are limited to descriptive analysis of bacterial communities under chemical treatments or environmental stress. In contrast, this study seeks to provide a mechanistic understanding using genetic evidence of the signaling components that govern the rhizosphere microbiome. In addition to providing much needed genetic evidence for green leaf volatile and ethylene impact on the rhizosphere microbiome, this research will be presented by undergraduate students at regional symposiums.

### Project Narrative

The rhizosphere microbiome is the community of bacteria, fungi, protozoa, and other microorganisms that associate with the root surface of a plant host. This microbiome regulates numerous plant biological processes including root growth and development, drought tolerance, and resistance to insects and pathogens [10]. The rhizosphere-microbiome interaction is established and maintained by a complicated exchange of signals between the plant host and the microbial community. Despite the numerous studies elucidating the importance of phytohormone signaling in these processes, genetic evidence is lacking for the role of hormone biosynthesis in the rhizosphere-microbiome adenosyl chemical exchange [3, 9, 2].

Unlike the majority of phytohormones, ethylene (ET) and green leaf volatiles (GLVs) are airborne signals that can passively diffuse far distances and affect surrounding organismal communities. In maize, ET production begins the production of 1-Aminocyclopropane-1-carboxylic acid

(ACC) from S-adenosyl-L-methionine (SAM) by ACC synthase (ZmACS2/7) followed by the conversion of ACC into ET through ACC oxidase activity [8].

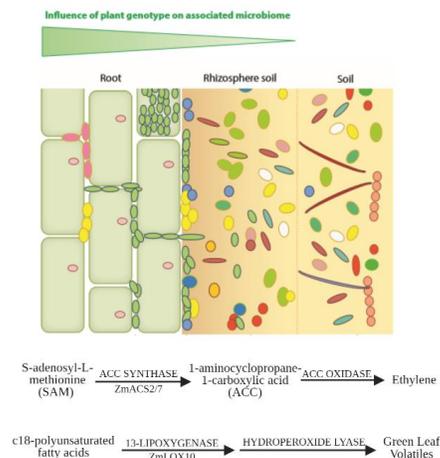


Figure 1: Influence of plant genotype on associated microbiome, see [14, 15]. (Credit:[13])

GLVs are synthesized from c18-polyunsaturated fatty acids by a 13-lipoxygenase (ZmLOX10) activity followed by cleavage by hydroperoxide lyase (HPL) [1]. In this study, the ET-deficient *acs2 acs6* double mutant [11] and the GLV-deficient *lox10* single mutant [4] will be employed in a reverse-genetics approach to provide genetic evidence for the role of volatile hormones biosynthesis in the rhizosphere microbiome. Additionally, the GLV- and ET-overproducing *lox3* mutant will be employed to understand the consequences of overabundance of these molecules in these interactions [7].

The purpose of this proposal is to characterize the role of GLVs and ET in the establishment of the maize rhizosphere microbiome. Despite the explosion of research in the past decade to understand the rhizosphere microbiomes of plants, the vast majority of these studies are limited to descriptive analysis of bacterial communities under chemical treatments or environmental stress. In contrast, this study is significant in that it seeks to provide a

mechanistic understanding of the signaling components that govern the rhizosphere microbiome substantiated with genetic evidence in an agro-economically important staple crop. Additionally, the project develops a volatile-based model system to dissect the role of hormone biosynthesis in these processes. Understanding the signals that regulate the rhizosphere microbiome allows the development of environmentally conscientious strategies to optimize the microbial communities to improve maize growth, pathogen defense, drought tolerance, and yield.

### Goals

The specific aims of this project are to: (1) validate the genetic tools through a PCR-based genotyping approach; (2) profile the rhizosphere microbiome communities of WT, GLV- and ET-deficient plants; and (3) analyze the microbiome communities profiled through a bioinformatic approach.

### Procedure

To validate the integrity of the genetic tools used in this study a PCR-based genotyping strategy will identify the presence of homozygous mutants containing a transposable element in the genes of interest. Seeds will be germinated, and young tissue harvested for DNA extraction and PCR-based genotyping. Several packets of seeds from putative mutant plants will be screened to identify those with the best germination rate and with limited seedborne fungal infections.

Next, to capture the impact of GLV and ET perturbation on the maize rhizosphere microbiome communities, *lox3-4*, *lox10-2*, *lox10-3*, and *acs2 acs6* mutants will be grown and compared to their near-isogenic wild-type (WT), the B73 inbred line. To approximate typical microbial communities from natural conditions for root colonization, homozygous seeds of each genotype will be planted individually in

containers containing a mixture of non-autoclaved potting soil and local farmland soil in a 1:1 ratio.

At the V4 collar stage of development, the bulk soil will be shaken off from the seedling roots and the rhizosphere microbes harvested by vigorous shaking of roots suspended in a buffer with glass beads. A total of four biological replicates will be collected for each genotype and each replicate will consist of three pooled plants to reduce plant-to-plant variation.

DNA will be extracted from the soil microbes using a commercial kit and followed by PCR to amplify the 16S rRNA and ITS regions of the bacterial and fungal components, respectively. DNA sequencing will be performed in-house by Illumina MiSeq analysis. A computational approach will be used to analyze the composition of taxa for each genotype [6]. DNA sequences will be trimmed, and quality-controlled to retain ultra-high quality merged reads for generating operational taxonomic units (OTU).

Taxonomical assessment and alpha- and beta-diversity will be performed with QIIME1 using RDP trained on the Greengene v13.8 database [5] and association networks will be produced using Gephi v0.9.2 [12]. Relative abundance of the bacterial and fungal communities will allow the determination of the core microbiome that is resistant to phytohormone perturbation. A principal component analysis will be used to understand the variability that contributes the most to the separation of the samples.

This project is expected to provide genetic evidence for the role of GLVs and ET in establishing the maize rhizosphere microbiome. In the short-term, this knowledge will be shared by the student researchers at local symposiums such as at the Rochester Academy of Science Symposium. Due to the ongoing COVID-19 pandemic, opportunities to present this work online will also be pursued (e.g., American Phytopathological Society and American Society for Plant Biologists).

Moreover, this work will establish a foundation for exploring the role of understudied hormone and hormone-like signals in governing the specific members of the rhizosphere microbiome communities.

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

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