FALL/WINTER 2023

AURORA SPOREALIS



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FALL/W	AURORA SPOREALIS
Department Head's Letter	<u>A Journal</u> Vol. I, No. 1. August 1, 1924.
Welcoming new graduate students 2023	Wherein are recorded the recollections, the ruminations,
Lab Update: Olivera Lab	and the respirations of those who have drunk from the foaming fount in the Department of Plant Pathology of the University of Minnesota and who now spout forth in divers ways.
Fungal Symposium	Let the fount foam and never run dry, Let the spout squirt and never lose power.
APS meeting 2023	Published by the Seminar Committee, aided and abetted by many others.
Borlaug Inspire Day	The Committee: Helen Hart H. A. Rodenhiser A. W. Henry (chairman)
Eurofins donation and shared lab	
Staff spotlight on Chana Johnston	•
——— My Plant Path: Ryan Franke	

WHO WE ARE

Since 1907 the Department of Plant Pathology at the University of Minnesota has had a strong impact on plant health, agricultural development, and ecosystem vitality on a local, national, and international scale.

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We are global leaders in plant pathology and continue to adapt our research, teaching, and Extension efforts to respond to contemporary needs and opportunities. While institutional support and research grants from public and private entities are critical, contributions from donors play an increasingly important role in helping the Department remain an agile, adaptable, and highly effective world leader. https://z.umn.edu/PlantPathGiving

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Dear Friends,



Ruth Dill-Macky Professor and Department Head

It has been almost two years since I started as interim department head. The search for a permanent head for Plant Pathology remains on hold, likely till the college's administrative alignment process is completed and the structure of CFANS is defined. Over the past year the faculty, staff, and students of Plant Pathology have provided input through town halls and discussions that will shape the future structure of the college's administration. While the future seems somewhat uncertain, I have every confidence that Plant Pathology will prosper into 2024 and beyond. Our department has a rich history, our research is critical to understanding pathogens, the process of disease and in improving plant health, and our classes and educational programs are shaping the future of plant pathology.

In 2023 the department has had many successes to celebrate. Early in the year Dr. Ashish Ranjan was appointed as an Assistant Professor. Dr. Ranjan, who has served as a Research Assistant Professor since 2020, brings expertise in molecular plant-microbe interactions to his new role as one of our tenure-track faculty. Dr. Robert Alvarez Quinto joined the department at the start of the academic year as an Assistant Professor with expertise in plant virology. Drs. Ashok Chanda and Cory Hirsch were promoted from Assistant Professors to Associate Professors with tenure, and Dr. Pablo Olivera Firpo was promoted from Research Assistant Professor to Research Associate Professor. We welcomed four new graduate students in 2023; Ryan Franke (MS advisor: Robert Blanchette), Kay Lerohl (MS advisor: Ashish Ranjan), Colin Peters (PhD advisor: Robert Blanchette) and Connor Slawin (co-advisors: Mitch Elmore and Brian Steffenson) and celebrate the seven students that graduated from our graduate program in 2023; Isaac Schmitt (MS advisor: Dean Malvick), Rae Page (PhD advisor: Brian Steffenson), Sita Paudel (MS co-advisors: Brett Arenz & Ben Lockhart), Yeidymar Sierra Moya (MS advisor: Deborah Samac), Nick Greatens (PhD advisor: Pablo Olivera), Cristina Toapanta (PhD advisor: Robert Blanchette), and Kristi Ledman (PhD advisor: Ruth Dill-Macky).

In September three of our faculty, Drs. Devanshi Khokhani, Ashish Ranjan and Megan McCaghey, hosted a fungal symposium in collaboration with Dr. Peter Kennedy (Plant & Microbial Biology, CBS), entitled "Fungi: A Global Nexus for Cross-Kingdom Interactions" that brought local and national researchers to campus. In October, students from the Plant Pathology, Applied Plant Science and Natural Resource Sciences graduate programs coordinated the 17th Annual Borlaug Memorial Lecture. The keynote speaker, Dr. Mahalingam Govindaraj, presented an engaging lecture on his work developing biofortified millets. The Borlaug Memorial Lecture is held the same week as the 2023 Norman E. Borlaug International Dialogue hosted by the World Food Prize Foundation in Des Moines Iowa, and graduate students Kay Lerohl, Pranaya Kaki, José Ortiz Solórzano and Connor Slawin traveled with Dr. Brett Arenz to attend the dialogue and engage with scientists working to bolster the resiliency of the global food chain.

There is more about several of these successes in this issue of the Aurora. I hope you enjoy the read.

Best,

Ruth Dill-Macky

Interim Department Head

Rith Dill-Marky

2023 New Grad Students by José Solórzano

Hear from our new students in 2023 about their interests and goals.



Colin Peters

Ryan Franke

MS Student, Blanchette Lab

"I aim to identify a fungal agent of biological control for European and Glossy Buckthorn and develop a protocol for its field application. My long-term goal is to teach my son to appreciate the beauty of life and honor its many forms, including himself. Joining this department has felt like coming home. Having PPSO colleagues with whom I can share my enthusiasm for plant pathology has been intellectually invigorating and passion-inspiring. A fun fact about me is that I began using my parent's basement and backyard as the footprint to build out my mushroom cultivation business. During the spring, summer, and fall of 2020, I ran the Twin Cities firstever mushroom-only communitysupported agriculture with a membership of 50 households."

"I hope to obtain my doctorate through my work on the emerald ash borer. My long-term goal is to steward the land and forests that have shaped me by preserving them for generations using holistic approaches. The department and PPSO have been extremely welcoming. I am constantly inspired by the quality of scientists in this department, many of whom are not just colleagues to me but mentors and friends. My fun fact is that I studied music for a while during my undergrad and am a composer/ songwriter for a local band called Willows."

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PhD Student, Blanchette Lab



Kay Lerohl MS Student, Ranjan Lab

"I would like to connect with potato growers to retrieve samples of Verticillium spp. to understand the variation of the causative pathogens across Minnesota. My long-term objective is to develop and investigate the viability and ecological impact of engineered biopesticides. I have been in the plant pathology department since my undergraduate work-study position. It comprises the most collaborative and caring faculty and staff I've enjoyed working with. Coming from a community college, I was concerned about the upsizing, but the department and PPSO have all the welcoming and cooperative spirit a departmental community can have. A fun fact about me is that environmental justice and sustainability motivate me both in and outside academia. I am currently working on issues in my neighboring neighborhoods, East Phillips and Little Earth, regarding pollution from Smith Foundry."



Christos Robertson PhD Student, Khokhani Lab

"I would like to see if arbuscular mycorrhizal fungi (AMF) transfer nitrogen fixed by free-living bacteria through their hyphae into plant tissue. My long-term objective is to improve and streamline metabolomic inquiries into AMF biology by constructing special apparatuses and careful media design. The department seems focused on utilizing and applying research in the field, and PPSO seems like a group of motivated and caring students. A fun fact about me is that I was a chef for ten years before returning to college."



Connor Slawin MS Student, Steffenson and Elmore Labs

"I hope to contribute to the understanding of Fusarium Head Blight and to develop into a contributing member of the scientific community. My long-term goal is to challenge myself and expand my knowledge of plant pathology through my coursework and research. I am extremely thankful for this graduate opportunity in this department, which has enabled me to accomplish my educational and career goals. Similarly, PPSO fosters long-lasting friendships and collaborations united by our common interest in plant pathogens. My fun fact is that one of my greatest passions is getting outdoors through exercise, camping, recreation, or a combination of all 3!"



Since he was appointed as Research Assistant Professor at the Department of Plant Pathology in 2017. Pablo Olivera based his research activities at the USDA-ARS Cereal Disease Laboratory (CDL) working in close collaboration with Dr. Yue Jin. However, in October 2022, Pablo and his research team moved across the street and opened the doors of their new lab at 108 Christensen (formerly Jim Kurle's lab). Having his own lab allows Pablo to expand his research team and activities while maintaining strong collaboration with CDL scientists. Pablo defines himself as a rust pathologist and his research program is focused on the study of rust diseases of cereal crops. Research

collaborators.

stem rust pathogen

Pablo's lab is part of an international surveillance network focused on monitoring the occurrence, spread, and evolution of new strains of the stem rust pathogen. Stem rust is a re-emerging disease that is posing a significant threat to wheat production in many wheat-growing regions around the globe. Since 2009, in collaboration with CDL partners, Pablo has analyzed over

Research Update: Olivera Lab

by Pablo Olivera Firpo

from his lab has a strong international footprint and has been conducted in collaboration with an extensive network of national and international

Surveillance and monitoring of the

3,000 stem rust samples from 23 countries. His main contribution is the pathotyping of stem rust samples from international collections and the identification and characterization of new virulent races that threaten wheat production. Special emphasis has been put on populations of sexual origin where new and significant virulences have been detected. Molly Veregge, a PhD student who recently joined Pablo's lab, will study a sexual population from Spain aiming to identify avirulence (AVR) genes through association studies.

Enhancement and diversification of genetic resistance to stem rust in durum and bread wheat

Pablo's lab efforts are directed to identify, characterize, and genetically map new stem rust resistance genes effective against Ug99 and other dangerous races in durum wheat and its wild and cultivated relatives. The limited availability of resistance to stem rust in durum wheat coupled with the rapid occurrence and spread of virulent races of the stem rust pathogen requires the identification and deployment of new and diverse resistance genes. Collaborating widely with national and international

scientists, Pablo led to the discoveries and characterization of many new sources of stem rust resistance by conducting extensive evaluations of diverse gene pools. As part of this effort, Nisha Paneru, an MS student at Pablo's lab, is working on elucidating the basis of stem rust resistance and mapping of resistance genes in the durum wheat line 'Rusty.'

Study of invasive barberry and buckthorn species in Minnesota

Although international agriculture has been Pablo's major interest, his lab also has a local research footprint by addressing major problems that affect the state of Minnesota. Funded by the Minnesota Invasive Terrestrial Pathogens and Pests Center (MITPPC), Pablo's team has been studying the role of the alternate hosts in rust epidemiology, characterizing rust pathogens that affect invasive species, and evaluating the effect

of rust infection in suppressing the



growth of buckthorn seedlings. Dr. Nick Greatens, who recently graduated from this lab, conducted a comprehensive characterization of Puccinia coronata var. coronata, a recently introduced crown rust fungus that completes its life cycle in two highly invasive plant species: glossy buckthorn (Frangula alnus) and reed canarygrass (Phalaris arundinacea). Dr. Jyoti Sharma, a postdoctoral researcher, developed a set of molecular markers to identify hybrid barberry (Berberis x otawensis) from their parental species (European and Japanese buckthorn), and now is working on identifying the species in the crown rust complex that infect common buckthorn in Minnesota and their relative prevalence, and assess their effect in suppressing the growth of buckthorn seedlings under

Discovery and utilization of new oat stem rust resistance genes

controlled and field conditions.

Through a cooperation agreement with the USDA. Pablo's lab has started conducting research to enhance resistance to stem rust in

oats. His focus is: 1) to inventory the diversity and level of stem rust resistance (or a lack thereof) in current cultivars and breeding germplasm from regional breeding programs, and 2) to identify new sources of resistance through seedling screening in the greenhouse and effective field screening. In collaboration with Yue Jin at the CDL, Pablo is also developing a stem rust phenotyping platform that includes field nurseries and seedling evaluations to support the oat breeding programs in the region. In 2023, over 1,500 oat genotypes from five breeding programs in the Midwest (Minnesota, Wisconsin, South Dakota, North Dakota, and General Mills) have been phenotyped in seedling evaluations.

Training and capacity building

In addition to his research heavily involved in capacity

responsibilities, Pablo has been building and training in Ethiopia and Kenya. Utilizing the on-ground opportunities and distance learning, he participated in several trainings that enhanced human resource

development and technical capacity in cereal rust pathology for wheat scientists. In 2023, Pablo visited Ethiopia twice to provide direct hands-on training to the Ambo Plant Protection Center staff to develop protocols for race-typing operations that suit local conditions.

Fungal Symposium by Dan Schlatter

This past September members of the UMN Plant Pathology faculty, including Drs. Devanshi Khokhani, Ashish Ranjan, and Megan McCaghey partnered with Dr. Peter Kennedy (Plant and Microbial Biology) to organize a symposium entitled "Fungi: A Global Nexus for Cross-Kingdom Interactions." This event provided an exciting forum to bring together a multidisciplinary group of local and national experts on fungi and their diverse interactions with each other, bacteria, plants, and animals. Lectures by researchers from the University of Minnesota, Cornell University, University of

Massachusetts-Amherst, University of California - Davis, and the USDA-ARS encompassed a wide array of topics: using fungal natural products to combat the devastating whitenose syndrome of bats, the roles of Minnesota wildlife in yeast dispersal, interactions between plant-beneficial mycorrhizae with free-living N-fixing bacteria and the importance of microbial synergies in plant resilience, how Fusarium-bacteria interactions impact the assembly of plant microbiomes, drivers of copy number variation in plant-microbe interactions, and the use of powerful remote sensing technologies and



aerosol transport monitoring for soilborne pathogen surveillance. The range of different research areas presented was particularly appreciated by UMN researchers:

"One thing I really appreciated about the event was the scope of knowledge presented. It was wellrounded, and covered a lot of ground while being continuously relevant" Hunter Kleugel, a said Dill-Macky lab researcher.

"It was very interesting to hear about other research being done on a wide variety of fungi! It always broadens my perspective to hear about how other researchers go about studying fungi. Overall, the fungal symposium helped me to understand where the gaps of knowledge are, and it is very interesting how little we know about some fungal interactions," says Jake Botkin, a PhD student in the Curtin lab.

Other highlights included a keynote talk by Dr. Krishna Subbarao (UC -Davis) on the population genomics of defoliation phenotypes of Verticillium dahliae, a student poster session accompanied with a tasty luncheon, and stimulating discussions



Event photos courtesy of Jeff Thompson, CFANS

that allowed for researchers to interact and collaborate within and across departments and colleges.

Andrew Mann, a PhD student in the Blanchette lab, said that "I appreciated how the organizers attracted so many different types of mycologists and even some people who may not consider themselves to be mycologists. I go to mycology meetings every year, but it's not often that I get to have lunch with or present a poster to medical mycologists, for example."

With over 110 registered attendees, including graduate students, undergraduates, post-docs, faculty, and alumni from around 17 different departments and institutes, the symposium was well attended by scientists from different disciplines

to better manage natural and similar symposiums on themes of



and career stages with shared interests in harnessing knowledge of fungal cross-kingdom interactions agricultural systems. Given the great success of this event, the department looks forward to hosting high interest to the Plant Pathology and broader University of Minnesota community on a biennial basis.



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American Phytopathological Society (APS) Meeting 2023

by the Dept of Plant Pathology

UMN Plant Pathology was well-represented at the 2023 American Phytopathological Society (APS) Annual Meeting in Denver, CO, including attendance, giving presentations, networking, postering, and hosting a social.

Here are some first-person highlights from Gophers at APS:



This was my first experience of an APS meeting but it was a great one. First day was overwhelming as there were lots of people and many events going on but eventually I got the flow. Poster presentation went well. Many people came to see the poster and discussed their work as well. In terms of networking it was awesome, I connected with lots of PhDs and scientists from different universities. Industrial networking experience was great too, some of the industry people gave lots of useful information to build a career in industry. Some interesting talks on various topics which gave an idea that so much work is going on plant pathology. It was also an opportunity to connect with UMN postdocs and grad students, as we get less time to connect personally during work hours. The closing party at Denver was great, everybody danced their hearts out. Denver had pleasant weather and some good food too. Overall a very satisfying experience.

-Kriti Tyagi

My presentation was on one of the chapters of Nick Greatens's PhD thesis-he was the one presenting the abstract and because he graduated and moved to New York, he wasn't able to attend APS. The talk went really well, and was about new crown rust species that are affecting Kentucky bluegrass that was first identified in China but also detected in the United States.

And I have a colleague that was a Fulbright fellow that came to visit my lab in 2018, and we haven't seen each other since then and we are planning to publish together. So we met finally at APS and had a couple hours' discussion about what we need to get done. So it was a good opportunity for networking and seeing people that otherwise you don't get the chance to see at all.

–Pablo Olivera



I really enjoyed my first experience at APS and got some good feedback on my poster and project as well as making a lot of connections. I didn't have a lot of people stop at my poster but those that did were interested in the project and had insightful feedback.

I had a few favorite parts. The diagnostic bowl was fun to participate in and gain experience. There were lots of networking opportunities with industry and academia. My overall favorite part was probably the unique opportunity that our former department head Jim Bradeen offered us students and alumni the opportunity to tour CSU Spur campus. I also enjoyed reconnecting with students that I knew in the past. Someone who was an undergraduate in my plant microbe interactions class in spring 2022 is now a graduate student at CSU Ft. Collins campus in plant pathology so I saw her there.

I made a few connections with graduate students, specifically Kelly Debbink in Damon Smith's lab at UW-Madison where Megan was previously a graduate student. I also met a graduate student at Michigan State working with Jamie Wilbur and Martin Chilvers (previous collaborators of Megan's) working on white mold in potato and dry mold but some in soybean. Finally, I met a grad student Wesley Bills who is in Darren Mueller's lab at Iowa state who has also collaborated with Megan. Wesley is doing drone and 3-D imaging of soybean plants and canopy closure.

I was interested to learn that the Government Office of Science & Technology only recently in 2022 added a statement to include indigenous knowledge into research and policies.

-Alisha Hershman



I love going to Plant Health meetings as a way to learn more about cutting edge research in our field to possibly apply to our lab curriculums. However, my favorite part is being able to reconnect with friends and alumni from our department!

-Becca Hall

Borlaug Inspire Day

by Annie Harvieux

Years before his research at the University of Minnesota launched his career as a key figure in the Green Revolution and eventually led to his Nobel Prize, Norman Borlaug grew up in a farm family and attended a one-room schoolhouse near Cresco, Iowa. Much of the world has changed since Norm's childhood, but the Norman Borlaug Heritage Foundation (NBHF) in Iowa has preserved Borlaug's boyhood farms as well as the schoolhouse he attended.

Among the slate of educational programs and projects hosted by the NBHF is its Borlaug Inspire

Days, during which Iowan 5th graders take a field trip to the sites of Borlaug's childhood and get ample learning experiences in both science and history. In addition to touring the sites of importance, speakers with expertise in topics such as entomology, agronomy, plant pathology, environmental preservation, and global food security issues.

University of Minnesota Plant Pathology department members brought another piece of Borlaug's history to life by attending Inspire Day 2023 and engaging students in an interactive lesson on Borlaug's field of research, rust disease

in cereal grains. Professor Brian Steffenson, Senior Teaching Specialist Becca Hall, PhD student Yoonjung Lee, researcher Oadi Matny, and post-doc Eric Nazareno all made the trek from Saint Paul to the Cresco area, along with the department's Norm statue (buckled up for safety, of course)!

UMN-PLPA presented on wheat plants, cereal rusts, and Norman Borlaug history to the crew of attending students. To add some hands-on fun, all the students were given wheat samples and got to thresh them, competing to see who had the highest yield. Could future CFANS students, or the next great plant health researchers, have been in the crowd of students that day? Only time will tell!









Donation of lab equipment by Eurofins by Pablo Olivera



Equipping a laboratory always requires a significant investment, especially when it comes to expensive equipment that is not always covered by research grants. This is particularly true for early career scientists that are trying to establish a new laboratory with limited funds. In July 2023, during a tour at Eurofins BioDiagnostics Inc. laboratory in River Falls, WI, Dr. Shahryar Kianian, the research leader at the Cereal Disease lab. was informed that the company was donating lab equipment as they were going through restructuring. The donation offer came from its vice president, Dr. Farhad Ghavami, who was a senior research associate at the Department of Plant Pathology, working in Dr. Shahryar Kianian's lab before joining Eurofins BioDiagnostics in 2016.

in equipment for his recently Pathology shared lab. In coordination with Dr. Ghavami and

As Dr. Kianian communicated this donation offer to USDA and University of Minnesota researchers, Pablo Olivera expressed his interest established lab in Christensen Hall and for the Department of Plant

his staff, a significant donation for the Department of Plant Pathology was arranged. The equipment donation included one -80°C freezer, a table-top centrifuge, and two PCR machines for Olivera's lab; two -20°C freezers, one refrigerator, one orbital

shaker, and two PCR machines for the Department of Plant Pathology shared lab in Christensen Hall; and one biosafety hood for the Plant Disease Clinic. The Department of Plant Pathology covered the moving costs. Grace Anderson, the Department Safety Officer, played a critical role in coordinating and facilitating the moving of the equipment.

The Department of Plant Pathology wants to thank Eurofins BioDiagnostics, and in particular Dr. Farhad Ghavami, for this generous donation.

Staff Spotlight: Chana Johnston

compiled by Yanhong Dong and Jennifer Flynn

Tell us about yourself, and how you joined our Department.

l use she/her/hers pronouns. My origins stem from rural Wisconsin. I attended the U of M and after living in a few different big cities, another country and the suburbs, I returned back to the woods of Wisconsin where I live with my husband of 13 years and three children (two 5 year olds and a 4 year old). I started in Plant Pathology in 2015 when I was blindly applying for admin positions at the U. Back then I tried to find any information about the discipline I was interviewing into with no luck. I came right out and told Kristen Opitz and Jim Bradeen that I had no idea what your science was about: of course, Jim graciously gave me a crash course on Plant Pathology, Norman Borlaug and the department's Emmy.

What are your responsibilities in the department? Can you tell us a few details about your favorite part of your job? What is one thing that you wish people knew about your job?

I often describe my role in the department as a firefighter. More seriously, I am an Administrative Coordinator which acts as the department's generalist; I do our course scheduling, assist the Head,

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some HR hiring tasks, event planning, to name a few areas. One of the aspects I like most about my job is "other duties as assigned" which often has led me to redesigning our spaces! I've had an integral part in the renovations of Borlaug Commons, all of our departmental conference rooms, 495 Borlaug - the department main office, the Borlaug patios and 3rd floor corridor, in addition to faculty offices and labs that need assistance in the design process.

How has your role evolved over time since you have been here? What makes you want to stay at the department?

Most recently, my position has taken on some of our hiring tasks. I greatly enjoy our administrative team and the department as a whole.

Can you describe a challenge you have had to overcome in your plant pathology career?

When I first started, the University had recently adopted the Google platform and the department was finally ready to fully plunge into the digital era. It took a few years to adapt the department's processes and procedures to be fully digital and help migrate to the Google Suite, but we got there in the end! The transition and payoff was felt the most when the pandemic first hit and the administrative office was able to pretty seamlessly transition to working fully remote.

What did you study as an undergraduate student? What were some of your favorite classes?

My degree is in Spanish Studies with Global Studies and Family Social Science minors. I really loved any class that challenged my world view and taught me about new cultures, which was a vast majority of all my classes in all three areas I studied. There was also a speaking class I took that was focused around our local theater scene. Being new to the area at the time, it burgeoned a great love for the community theater scene in Minneapolis.

Has anyone been a source of inspiration for you in what you do?

Jim Bradeen and Kristen Opitz have challenged me to find the pieces of my role that I enjoy the most and find ways to build my career around those. They truly are the best bosses. Jim's charisma and joy in communicating his science has kept me curious and sparked an interest in STEM. I never had a teacher who made me curious about any of the sciences, it was always delivered dryly and without emotion until Jim and others in the department! It is an honor to help the department run administratively so our scientists can continue to save the world!

What came together in your life that helped you fit into your current role?

Quite honestly, the pandemic. Being able to work remote most of the time has allowed me to be more available for my children and endless task list on our little homestead.

Are you currently volunteering with any CFANS committees?

I have served on the CFANS Honors and Awards Committee for all of my years in the department. I was the co-chair and chair several years back, even. It is great to see people lifting up others through the award nominations and read about the wonderful things so many in our college are doing.

Though you're not a plant pathologist, you're an avid gardener, we hear!

I completed the instructional portion of the WI Master Gardener course in 2022 (did not take the exam). It was great to learn some of the science behind gardening; it made me feel like a more competent gardener. We have a large garden and with the expertise of my gardening mentor, Grace Anderson, it was our most successful year to date!

My hobbies are quite varied, but all have to do with creating. One of my biggest passions is cooking. Over the last couple of years, I've begun to explore preserving my harvest and cooking with the native plants that are abundant around my house. I enjoy crafting in pretty

work?

What do you enjoy doing outside of

much any form but recently it has revolved around creating toys and stuffies/dolls for my children. Last, but certainly not least, I am an avid reader and library patron; primarily fiction though I love reading through a new cookbook, gardening and canning book, or foraging for native plants reference books.

What is your proudest accomplishment(s) in your work/ life?

I think my proudest accomplishment is an ongoing endeavor: raising kind, curious and accepting children.



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My Plant Path: Ryan Franke

Can you tell us a little bit about yourself?

I grew up in Eagan, MN. My wife and I actually bought our house about half of a mile from my childhood home and where my parents still reside. Since we had a baby last year, it's been great having support from my folks, Grandma M and Grandpa D. These days I spend most of my free time hanging out with my wife and our 15-month old son, Malachi. I also enjoy fixing anything that needs repair around the house, canoe camping, connecting with other dads, and exercise (especially soccer).

How did you get involved with plant pathology as a discipline?

In 2021, I was working as a lab technician for the bioinoculant company TerraMax Inc. when I realized that I wanted to do research. I decided that a good path to doing research was to first gain employment at the UMN. I read through most of the UMN faculty webpages in CFANS and CBS and a few caught my eye. I emailed three faculty and one of them had an open lab technician position for which I

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interviewed and was hired. However, the Seabloom-Borer ecology lab wasn't my first pick. I knew I wanted to work in the Blanchette forest pathology lab, and when I found out there wasn't an open position, I even asked if I could volunteer, but alas there was no opportunity. While working in the Borer-Seabloom lab, I took an undergraduate ecology class at my local community college, Inver Hills Community College. My capstone project for the class was an investigation into what was causing disease in a stand of European Buckthorn in Fort Snelling State Park in hopes of isolating the causal agent and using it as a biocontrol. The following semester, I enrolled in Bob Blanchette's Forest Pathology course, "Diseases of Forest and

Shade Trees." I had no idea that his lab had just begun a project aimed at developing a fungal biocontrol for invasive Buckthorn. I stayed late after the first lab session talking with Bob about our shared research interest, and I was thrilled to hear about the possibility of working on biocontrol of invasive Buckthorn in his lab. A couple months later, I applied to the PLPA graduate studies program as a research assistant in the Blanchette lab and was accepted.

Tell me about a specific moment in your life that made you decide to pursue a career in Plant Pathology?

I was looking over UMN faculty web pages when I stumbled upon the Blanchette lab. I remember scrolling through photos of various tree diseases posted to his class website and thinking, "I don't know why, but my intellectual interest lies here. This is what I want to study."

What has it been the most rewarding moment of your career so far and what lead to that moment?

I presented the sum of my research for the first time this past week. It was a presentation for our grant funders to keep them up-to-date on our progress, and the reception was entirely positive. It was nice to have external validation that I'm off to a great start.

What do you enjoy most about the department of plant pathology?

Joining the Plant Pathology Department has felt like a coming home. Having colleagues with whom I can share my enthusiasm for plant pathology has been intellectually invigorating and passion-inspiring.

Can you describe how being part of this department has helped your mission as a scientist?

Being part of this department has enabled me to continue my research that I began as an undergraduate ecology student at Inver Hills Community College. Before working in the Blanchette lab, I was sterilizing media and isolating fungi in my basement, no kidding. I am very grateful for the resources that the department has provided for my research - mentors, greenhouse space, DNA extraction equipment and supplies, graduate-level courses, and professional colleagues and more!

Can you tell us about your plans for the future?

Long term (personal): Teaching my son to appreciate the beauty of life, and honor its many forms—including himself. Living a playful and loving family life wherein every member feels respected, trusted and free to express themselves.

Long term (career): I'm a life-long

learner and a teacher at heart. This being said, I hope to apply the skills that I acquire as a graduate student to protect and support our midwest forest ecosystems. I also hope to teach the next generation of science learners.



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My Plant Path: Zoe Hansen



Can you tell us a little bit about yourself?

My name is Zoe Hansen and I use she/her pronouns. I am a postdoctoral associate in Dr. Kinkel's Lab in the Department of Plant Pathology. I earned my PhD in Microbiology and Molecular Genetics from Michigan State University in May 2022 and joined the University of Minnesota shortly after. Although I'm technically not a plant pathologist, I am very interested in the microbial ecology of plant-microbe interactions, of which there are many in plant pathology!

How did you get involved with plant

pathology as a discipline?

After graduating from my undergraduate institution, St. Olaf College, I sought out a position in research to gain more experience thinking critically about scientific questions. Dr. Kinkel actually had an opening at the time and hired me as a research technician to contribute to an NSF Macrosystems Biology project exploring how inorganic fertilizer treatments in the soil influence foliar endophytes of Big Bluestem grass. So, I really became acquainted to plant pathology through a microbial ecology lens. I really enjoyed thinking about how microbial interactions (with other microbes, with plants, with pathogens) play such an important role in agricultural and natural systems.

Tell me about a specific moment in your life that made you decide to pursue a career in Plant Pathology?

This is a tough question, because I think it's taken many moments to shape my research and career interests. Working with Dr. Kinkel as a technician really piqued my interest in microbial ecology of agricultural and environmental systems. In applying for graduate school, I

really wanted to continue with a similar line of work. I was incredibly excited about exploring microbes' responses to various climate changerelated disturbances and how these responses could influence plant health. Funnily enough, though, my thesis research actually focused on the human gut microbiome and its response to foodborne illness. I had found a lab group and an advisor that fit really well, and I prioritized these things above a specific research topic. Although I had intended to do my PhD on microbial ecology in an agricultural or environmental space, I really enjoyed doing research on the human gut. My project was also heavily reliant on bioinformatics, and so I learned a whole new set of skills related to computational analysis. As I was nearing the end of my PhD, however, I decided that I wanted to look into post-grad opportunities related to natural or agricultural systems again. Dr. Kinkel serendipitously had a postdoc position opening up, and I was ecstatic to join her lab in this new role.

What has been the most rewarding moment of your career so far and what lead to that moment?

Earning my PhD is something that

I will always regard as a proud and rewarding compilation of moments. I learned a lot about myself during graduate school and I really enjoyed my time at Michigan State. During this time I discovered that I hold a deep respect and passion for teaching. I was able to teach multiple classes as a graduate student and it's helped me form a more concrete picture for my career. Finishing my PhD also helped prove to myself that I was capable of performing rigorous science that could stand up to peer review. It's so easy to doubt yourself and your ability when an experiment or line of code just isn't working out. But to overcome those bouts of imposter syndrome and really push through to the end was an incredibly gratifying feeling.

What do you enjoy most about the department of plant pathology?

Plant Pathology is an incredible department at the University of Minnesota. The openness, approachability, and kindness of this department is palpable. Since returning to UMN as a postdoc, I've felt welcomed by the students, faculty, and staff and it's been a joy to get to know people through weekly seminars and coffee hours. There is definitely something special about how PLPA functions here; it's a very positive environment with a peoplefirst mentality.

Can you describe how being part of this department has helped your mission as a scientist?

As a postdoc, being a part of Plant Pathology has been an enriching experience. Since my background is primarily in basic research related to microbiology and microbial ecology, I have really enjoyed learning about relevant and important applications of these ideas. Through conversations with other members of the department and attending weekly seminars I've learned so much about how to translate and interpret basic research principles into applied, measurable outcomes. And I think that improving my understanding of this link has really strengthened the way I think about scientific questions.

Can you tell us about your plans for the future?

I aspire to stay in academia and pursue a professorship at a primarily undergraduate institution (PUI). I really enjoy teaching and look forward to connecting with students during a very critical and exciting time of their lives. I hope to also lead an undergraduate research program that's focused on microbial ecology and soil health. One of my goals as an academic, instructor, advisor etc. is to give students access to research opportunities in an inclusive, accessible, and equitable way. I'm also looking forward to continuing my advocacy work for women and historically underrepresented identities in STEM.

17th Annual Borlaug Memorial Lecture

by Brian Steffenson



The 17th Annual Borlaug Memorial Lecture was presented by Dr. Mahalingam Govindaraj on October 23, 2023. Dr. Govindaraj is a Senior Scientist for Crop Development with HarvestPlus at the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) based in Telangana, India. His lecture entitled "Biofortified Millets for Food and Nutrition Security in the Dryland Tropics" captured his recent efforts to develop and distribute high-yielding, biofortified crops for India and Africa. Deficiencies of iron and zinc in the diet can have many adverse effects on humans, such as stunted growth, impaired physical and cognitive development, anemia, and increased vulnerability to infections.

Low- and middle-income countries have been particularly affected by deficiencies in these micronutrients. Dr. Govindaraj's research led to the development of several pearl millet

varieties with enhanced levels of iron and zinc. The world's first biofortified pearl millet variety 'Dhanashakti' was developed by Dr. Govindaraj and released to farmers in 2014. Currently, over 120,000 farmers grow 'Dhanashakti' in India. That number is expected to grow to over 9 million farmers in the next few years. 'Dhanashakti' can provide women with more than 80 percent of their daily requirements for iron compared to just 20 percent from standard pearl millet varieties. This variety alone has greatly increased the overall nutrition and health of thousands of communities across the country.

Dr. Govindaraj comes from a farm family. In an interview he said that his grandmother would select and then distribute to neighbors her own selections of pearl millet growing on their land. Today, just like his grandmother, Dr. Govindaraj also develops and distributes superior pearl millet varieties, but with all the advances of modern breeding technology. In breeding pearl millet, Dr. Govindaraj uses hybrid technology and was instrumental in developing a cost-effective, high throughput screening protocol for assaying the level of micronutrients in the grain. For poor communities stricken with continual droughts, pearl millet is an ideal crop because it is climate-resilient and grows well on marginal land. For these reasons, Dr. Govindaraj has expanded and fasttracked the distribution pipeline for improved and biofortified pearl millet varieties to Sub-Saharan Africa.

In addition to leading a pearl millet improvement program, Dr. Govindaraj has also been instrumental in establishing critical collaborations for pearl millet research, development, and use among various research councils, non-governmental organizations, producers, seed companies and food companies. Like Norman Borlaug, Dr. Govindaraj understands how critical it is to have local communities fully embrace new varieties and agricultural practices. He worked tirelessly with these communities to establish on-site trials and conduct taste tests of end-use products to gain their acceptance. The results of his work have been a stunning success, leading to the economic revitalization of thousands of farm communities while at the same time reducing hunger and malnutrition. In 2022, Dr. Govindaraj received the Norman E. Borlaug Award for Field Research and Application for his work on improving new high-yielding, biofortified pearl millet varieties. This prestigious award is given by the World Food Prize to scientists under the 40 years of age who demonstrate "exceptional sciencebased achievements in international agriculture and food production." Dr. Govindaraj received his BS degree from the Agricultural College and Research Institute in Killikulam India. His MS and PhD degrees were awarded in Plant Breeding & Genetics from Tamil Nadu Agricultural University in India.

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