

A close-up photograph of a person's hand holding a single green leaf. The hand is positioned palm-up, with the leaf resting on the palm. A large, semi-transparent teal graphic is overlaid on the image. This graphic features a large, bold white '2025' at the top, followed by the words 'ANNUAL REPORT' in a slightly smaller white font. The graphic also includes a large teal circle at the top and teal bars on the left side.

2025  
ANNUAL REPORT

By PRI Communications Manager Morgan Koetje Magilligan



The Plant Resilience Institute, or PRI, at Michigan State University is a globally renowned research center for plant resilience. Established in 2016 as part of MSU's Global Impact Initiative, PRI comprises 13 labs and brings together over 120 plant scientists from multiple departments and colleges across the university to address the global challenges of improving plant resilience and stabilizing crop production.

## VISION

To be a leader in innovative plant resilience research, fostering a collaborative environment that attracts diverse talent and drives impactful discovery at MSU and across the globe.

## MISSION

To strengthen our position as an internationally recognized "Center of Excellence" for groundbreaking laboratory and field research on plant resilience where adaptable future leaders of plant research are trained and the advancement of plant resiliency in our society and environment are advocated for and prioritized.

## VALUES

PRI values professionalism, collegiality, and respect in a collaborative environment to facilitate resilience-related research with rigorous and high ethical standards.



# DIRECTOR'S MESSAGE



As we move deeper into an era defined by rapid climate change, global food insecurity, and unprecedented ecological pressures, the work of the Plant Resilience Institute has never been more essential. By working together to address these grand challenges, our institute experienced another year of extraordinary growth and scientific achievement.

PRI has excelled in several synergistic areas of plant resilience research this past fiscal year. The NSF Global Center C-SPIRIT began work in January, a major international initiative to discover molecules from plants and microbes that will accelerate plant resilience in the field. As part of our strategic planning process, PRI faculty identified three flagship areas of research meant to synergize the collective knowledge, interest, and expertise of PRI's laboratories and build organically from their ongoing areas of excellence in research.

Our community engagement also continues to flourish. From spearheading the World of Plants experience at the Michigan State University Science Festival, to organizing the

MSU Plant Science Excellence training group, to developing new K-12 plant science curriculum, PRI scientists reached thousands of students, families, and lifelong learners.

We also led the organization of the inaugural Great Lakes Plant Science Conference, convening scientists from diverse institutions, disciplines, and career stages from the Great Lakes region and beyond. This effort reinforces PRI's strategic vision to be at the forefront of advancing plant research and scientific community-building not only at MSU, but across the globe.

I feel a huge sense of gratitude, privilege, and pride to lead and support our outstanding faculty, trainees, and staff. Together, our progress demonstrates the profound affect that collaborative, impact-driven science can have on global challenges.

**Seung Yon "Sue" Rhee, PhD**  
Director, Plant Resilience Institute  
Michigan State University

# THE PRI COMMUNITY



PRI continues to grow as a dynamic, collaborative research environment. Now home to 13 laboratories, PRI is a thriving community of over 120 members encompassing faculty, staff, students, and postdoctoral scholars with a wide array of experiences and expertise.

By drawing on the unique perspectives and talents within the PRI team, we can push the boundaries of knowledge and drive meaningful impact. Together, we will pursue innovative research that transcends traditional disciplinary limitations. Together, we will address complex challenges and create solutions that benefit society as a whole. Together, we are PRI.



**13 LABS  
126 MEMBERS  
1 PRI**



This year, Assistant Professor **Andrea Glassmire** joined PRI and launched the Glassmire lab, expanding PRI's expertise in plant-insect interactions and chemical ecology.

**Chris Topp** was also hired as a new PRI faculty member and will officially begin his appointment in January 2026, bringing internationally recognized leadership in root biology and plant phenotyping.



PRI also celebrated the extraordinary career of **Thomas D. Sharkey**, who retired after 51 years of groundbreaking research, transformative teaching, and service to the global plant science community. He now holds the title of Emeritus University Distinguished Professor.

# AWARDS & HONORS

## FACULTY MEMBERS

- **Andrea Glassmire** – Douglas & Maria Bayer New Initiatives Fund for Sustainable Agriculture Award
- **Christine Sprunger** – Ecological Society of America Early Career Fellow, W.K. Kellogg Biological Station LTAR Researcher of the Year, and World Food Prize Foundation Top Agri-food Pioneer
- **Hatem Rouached** – College of Agriculture and Natural Resources Established (Mid-Career) Researcher Award
- Additionally, **Emily Josephs**, **Christine Sprunger**, and **Hatem Rouached** were all promoted to associate professors with tenure, and **David Lowry** was promoted to full professor.

## POSTDOCTORAL SCHOLARS

- **Danielle Hoffmann** – Hans Kende Memorial Award in Plant Sciences
- **April Kaneshiro** – Bayer Crop Sciences University Mentoring Program
- **Lauren Stanley** – Danny Schnell Outstanding Postdoctoral Award

## GRADUATE STUDENTS

- **Elliot Braun** – National Corn Growers Association Research Ambassador and Plant Biotechnology for Health and Sustainability Fellowship
- **Sophie Buysse** – Don Hall Fellowship in Ecology, Evolution, and Behavior
- **Tommy Conway** – Molecular Plant Sciences Fellowship
- **Mashal Copperman** – Great Lakes Plant Science Conference Poster Award
- **Maddy Creach** – Paul Taylor Travel Award
- **Erin Cushing** – PRI-Molecular Plant Sciences Fellowship, Plant Biotechnology for Health and Sustainability Fellowship, and Great Lakes Plant Science Conference Poster Award
- **Shannon Donnelly** – Bayer Crop Sciences University Mentoring Program
- **Briana Hashim** – Black Faculty, Staff, and Administrators Association Emerging Leaders Award, University Distinguished Fellowship, Plant Biotechnology for Health and Sustainability Fellowship, and Great Lakes Plant Science Conference Poster Award
- **Asia Hightower** – Bessey Award for Outstanding Graduate Research
- **Bailey Kleven** – Keegstra-Thomashow Travel Fellowship
- **Mohit Mahey** – American Society of Plant Biologists Travel Award
- **Daniel Mok** – Paul Taylor Travel Award
- **Miles Roberts** – NSF Postdoctoral Research Fellowship in Biology and Genetics and Genomes Sciences Outstanding Student Award
- **Jenny Schuster** – Molecular Plant Sciences Leadership in Community Building and Outreach Award
- **Febri Susanto** – Biochemistry and Molecular Biology Outstanding Graduate Student Research Award, Bayer Crop Sciences University Mentoring Program, and Molecular Plant Sciences Outstanding Paper Award

## UNDERGRADUATE STUDENTS

- **Claudia Colligan** – University Undergraduate Research and Arts Forum Poster Award
- **Natali Gonzalez** – College of Agriculture and Natural Resources Outstanding Student Leadership Award

# 2025 RESEARCH EXCELLENCE



TEAM SCIENCE AT  
A GLOBAL SCALE



FIELD TO LAB TO  
FIELD PARADIGM



FUNDAMENTAL-  
TRANSLATIONAL  
-APPLIED CYCLE

51

PEER-  
REVIEWED  
PAPERS

31

BIORXIV  
PREPRINTS

3

PATENTS

\$ 9

MILLION IN  
NEW GRANTS

# HIGH-IMPACT PUBLICATIONS

PRI scientists advanced the global understanding of plant resilience over the past fiscal year by publishing 51 peer-reviewed papers in top journals including *Nature Plants*, *Nature Communications*, *Science Advances*, and *New Phytologist*. The following publications highlight the breadth and depth of PRI's excellence in research. Please see the appendices for the full list of PRI publications.

## **“Anthocyanin impacts multiple plant-insect interactions in a carnivorous plant”**

**Martin-Eberhardt, Weber, and Gilbert, *The American Naturalist* (2025)**

This study demonstrates that anthocyanins shape both herbivory and prey capture, revealing a multifunctional resilience trait affecting diverse trophic interactions.

## **“Comparison of resurrection grasses reveals convergent evolution of desiccation tolerance”**

**Marks and VanBuren, *Nature Plants* (2024)**

This paper shows that independent lineages of resurrection plants evolved shared genomic strategies for extreme drought survival, offering a blueprint for engineering similar resilience in crops.

## **“A high-throughput behavioral screening platform for measuring chemotaxis by *C. elegans*”**

**Fryer et al., *PLOS Biology* (2024)**

This collaborative publication introduces DIY laboratory tools to greatly speed up a crucial method in which nematodes help evaluate plant-derived molecules.

## **“Isoprene deters insect herbivory by priming plant hormone responses”**

**Sahu, Mostofa, Xu, Serda, and Sharkey, *Science Advances* (2025)**

The authors uncover a new ecological role for isoprene, demonstrating that it primes defensive hormone pathways and reduces insect herbivore damage.

## **“Life on the dry side: a roadmap to understanding desiccation tolerance and accelerating translational applications”**

**Marks et al., *Nature Communications* (2025)**

This global synthesis outlines the key mechanisms, research gaps, and translational pathways needed to advance desiccation tolerance research toward agricultural applications.

# NEW FLAGSHIP PROJECTS

PRI faculty identified three flagship areas of research as part of a bold, multi-phase vision covering the next decade to address major agricultural challenges posed by climate change. Each unique initiative synergizes the collective knowledge, interest, and expertise of PRI labs and builds organically from their ongoing areas of excellence in research. Together, the flagship projects aim to make PRI a global hub for climate-resilient agriculture and systems-level plant science.

## GREAT LAKES ADVANCED CLIMATE IMPACT & EXPERIMENTAL RESEARCH CENTER (GLACIER)

GLACIER will be an advanced research facility designed to investigate how crops and ecosystems in the upper Great Lakes region will respond to the environmental conditions projected for 2050-2100.

This initiative will replicate future extreme climatic scenarios in the midwest by constructing infrastructure like rainout shelters, heating arrays, and flooding platforms for controlled stress experiments with the goal of identifying resilience traits across diverse food crops.

## ENVIRONMENTAL WIDE ASSOCIATION STUDY FOR PLANT RESILIENCE (EWAS-PR)

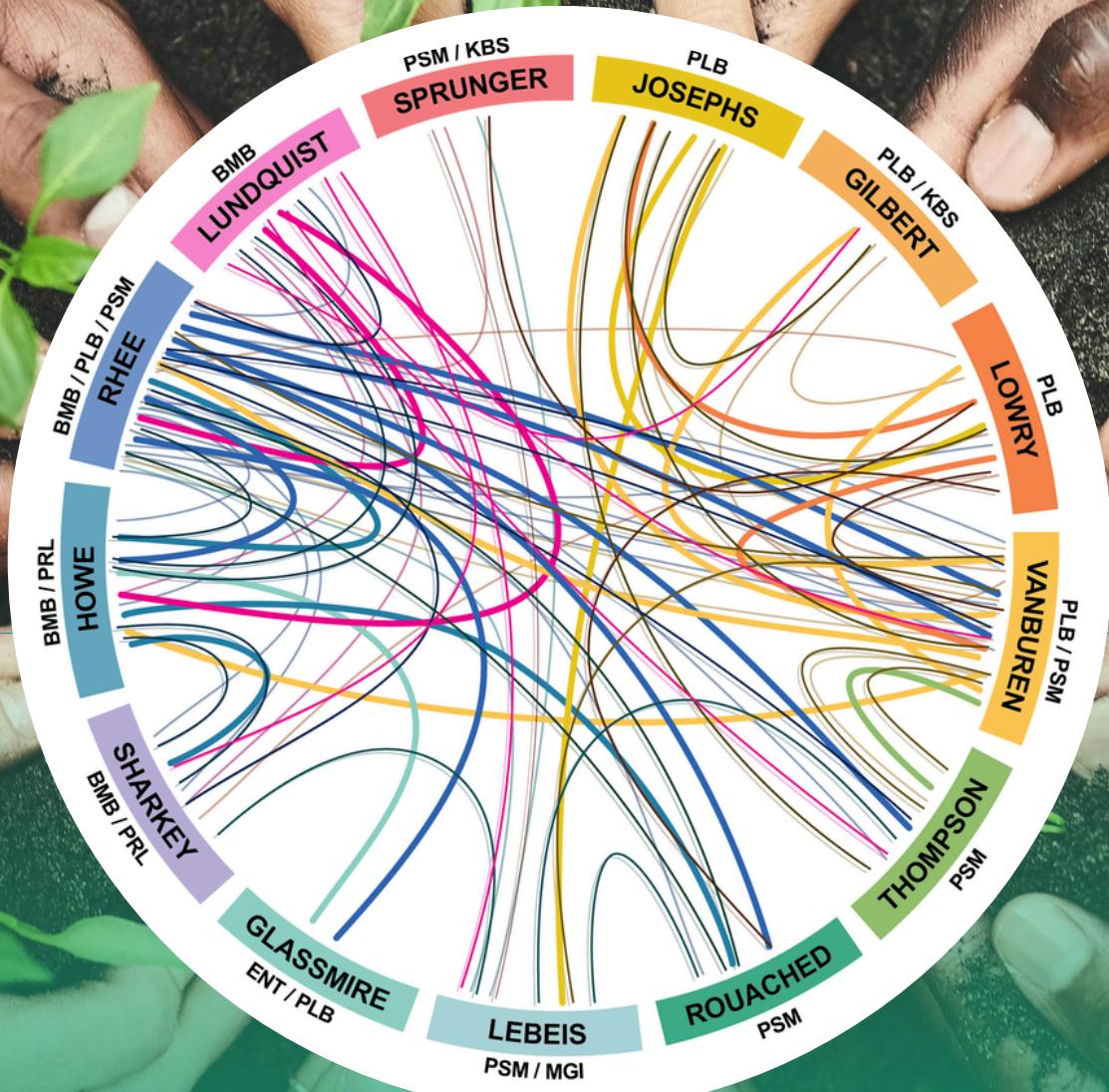
The EWAS-PR flagship project aims to identify environmental variables that causally shape plant resilience in the field through an Environment-Wide Association Study (EWAS).

By integrating dense environmental sensing, multi-site field trials, phenotyping, and genomics, the project will align breeding and management with environmental drivers to transform agriculture in a changing environment.

## PLANT RESILIENCE-INDUCING METABOLITE EFFECTORS (PRIME)

The PRIME initiative seeks to identify a new class of regulatory metabolites and their nuclear signaling mechanisms that govern plant resilience.

The project integrates bioinformatics, molecular genetics, protein structural prediction, and experimental validation to investigate the metabolites' roles in gene regulation and stress response, positioning PRI as a global leader in this previously unexplored field.



## 123 TOTAL COLLABORATIONS ACROSS PRI LABS

— 2023 — 2024 — 2025

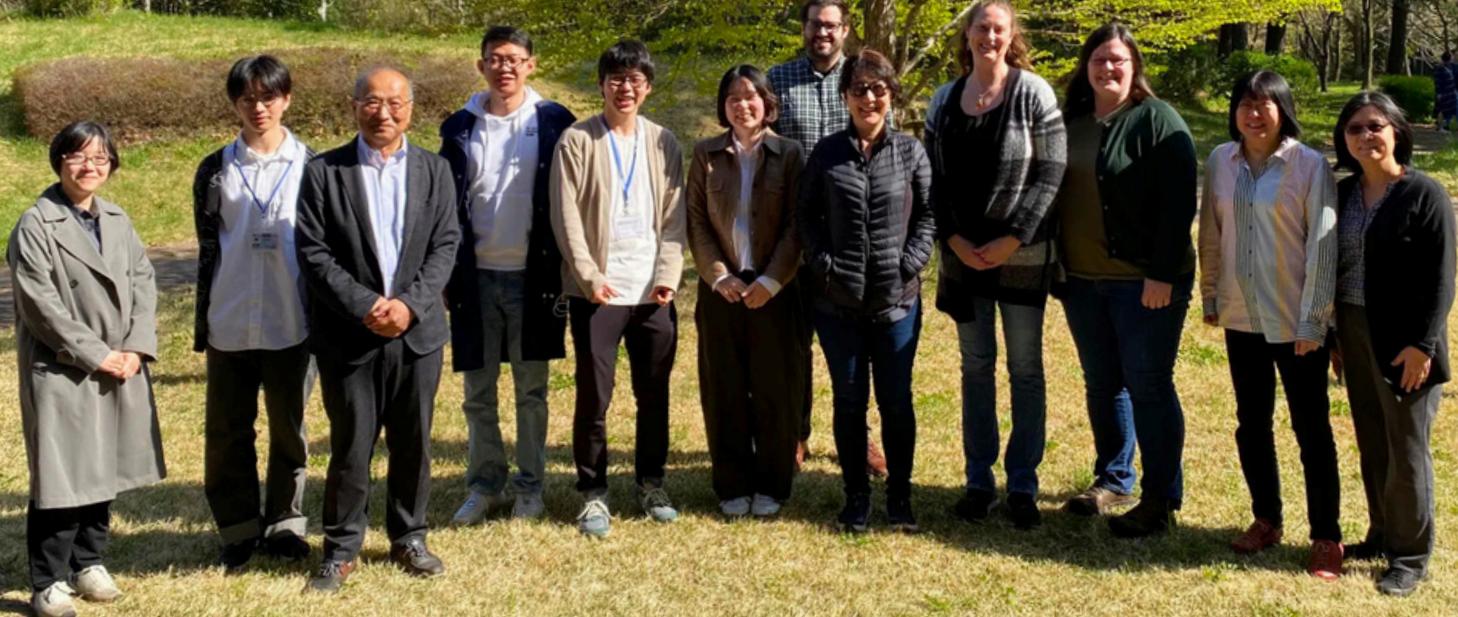
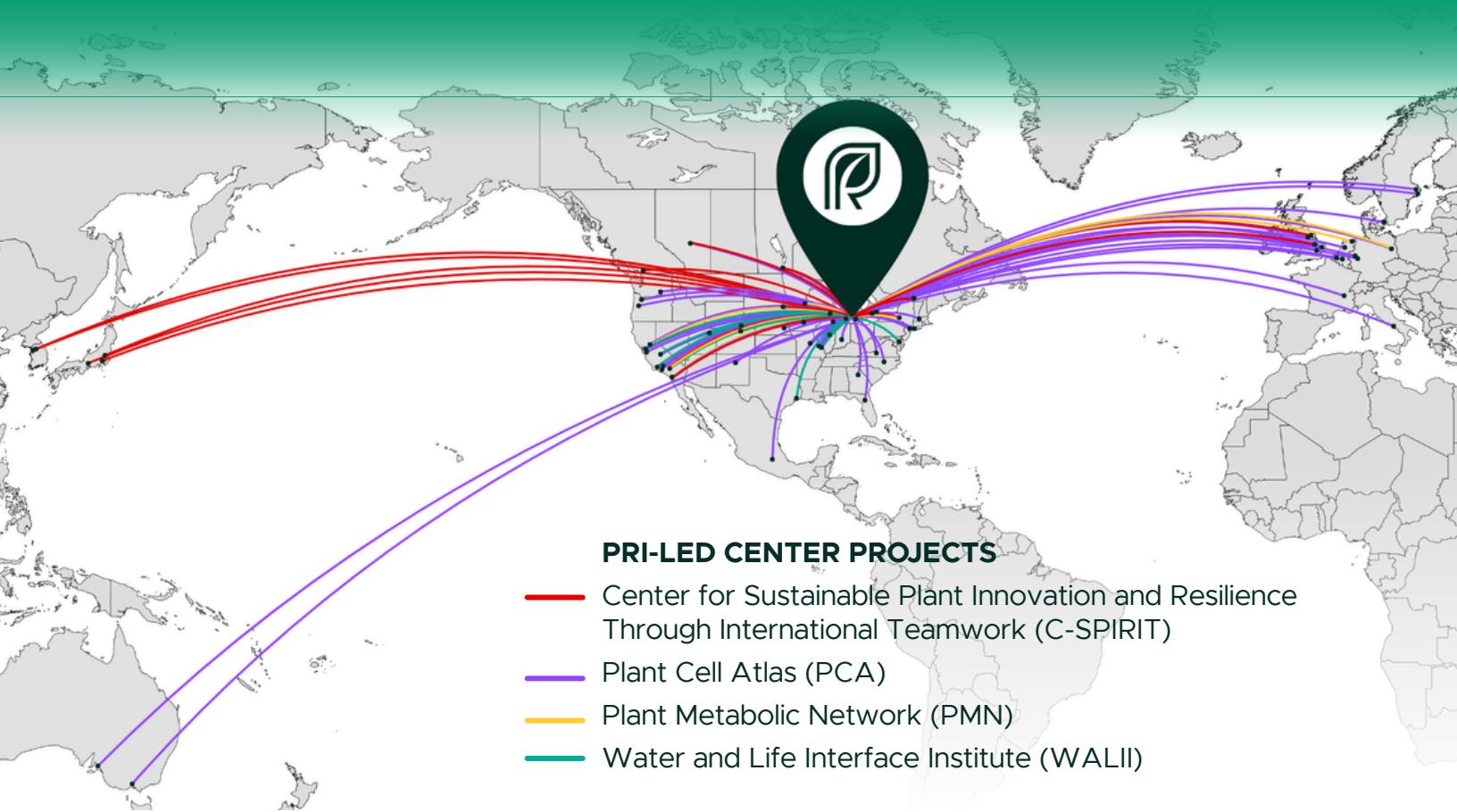
Each line on the plot indicates a collaboration between PRI labs, including developing grants, working together on research, and co-authoring papers.

Figure updated July 2025.  
Credit: Tanya Bakja

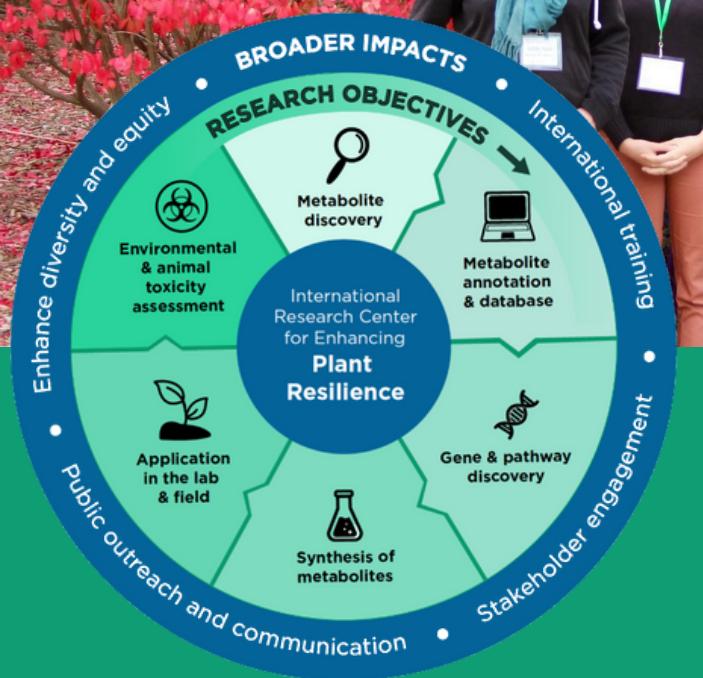
### DEPARTMENTS

BMB: Biochemistry and Molecular Biology  
 ENT: Entomology  
 KBS: W.K. Kellogg Biological Station  
 MGI: Microbiology, Genetics, & Immunology  
 PLB: Plant Biology  
 PRL: MSU-DOE Plant Research Laboratory  
 PSM: Plant, Soil and Microbial Sciences

# OVER 600 CENTER-LEVEL COLLABORATORS ACROSS THE GLOBE



# LAUNCH OF C-SPIRIT



In January 2025, PRI launched the NSF Global Center for Sustainable Plant Innovation and Resilience Through International Teamwork, or C-SPIRIT, a multi-institutional collaboration designed to transform agricultural resilience on a global scale. C-SPIRIT aims to contribute to a stable food supply, environmental health, and societal well-being by:

- Discovering bioactive compounds that improve plant and soil health.
- Partnering with industry and stakeholders to co-develop sustainable technologies and build public trust.
- Training future leaders in the bioeconomy and green agriculture to create resilient food systems.



**5 COUNTRIES  
OVER 20  
INSTITUTIONS  
MORE THAN 100  
MEMBERS**

**6 AIMS**

**LEARN MORE:  
C-SPIRIT.ORG**

# TRAINING NEXT-GEN SCIENTISTS

PRI is deeply committed to cultivating the next generation of plant scientists by expanding recruitment pathways, enhancing research experiences, and strengthening professional development opportunities across the institute and beyond. By coordinating multi-unit training efforts, empowering trainee-led programming, and investing in personal and professional well-being, PRI continues to shape a community where emerging plant science leaders can thrive.

## MSU PLANT SCIENCE EXCELLENCE TRAINING GROUP

PRI advanced its vision for cross-campus training excellence by initiating and leading the MSU Plant Science Excellence training group, a collaborative network of 16 academic departments, research institutes, and training programs. This coalition is dedicated to unifying plant science training and outreach efforts across MSU, reducing barriers for prospective students, and elevating the visibility of MSU's plant science ecosystem.

In partnership with this group, PRI spearheaded the development of a new prospective-student guidance pamphlet and website, designed to demystify the application process and highlight training opportunities across the university. Thanks to support from the MSU Graduate School, these materials were disseminated at national conferences including ABRCMS and NDiSTEM.

## PRI NETWORKING HOUR

The PRI Networking Hour seminars continued to grow as a central pillar of trainee professional development. Now open to plant science trainees across MSU, these biweekly, hybrid events attract 30-40 attendees each.

Topics covered this past year, primarily suggested by the trainees, included mental wellness, science communication, alternative career paths, and Responsible Conduct of Research – all areas identified as key to holistic career preparation.

## PRI TRAINEE COMMUNITY

PRI established a new postdoctoral networking and community-building fund, made possible through a generous donation from a member of the Scientific Advisory Board. This resource supports informal and structured gatherings that encourage collaboration, shared mentorship, and peer support among PRI trainees.

Beginning in FY2025, PRI postdocs organized three trainee events, with plans to expand programming in the coming year to strengthen cross-lab connections and community cohesion.

# RESOURCES ENABLING TRAINEE INNOVATION & DEVELOPMENT



## TRAVEL GRANTS

To help trainees share their work with the larger scientific community, PRI offers travel grants of up to \$500 for those presenting at conferences worldwide. Eligible applicants must be active members of PRI labs and first authors of the poster or presentation they plan to deliver.

In fiscal year 2025, PRI awarded 14 travel grants, supporting:

- 5 postdoctoral researchers
- 8 graduate students
- 1 post-baccalaureate

These awards enable PRI trainees to gain professional exposure, receive valuable feedback, and build collaborative networks that shape their future careers.

## SEED GRANTS

The PRI Seed Grant Program provides a dedicated funding stream for trainees' innovative, collaborative research projects that advance plant resilience science.

In 2025, PRI expanded the program's reach by opening the spring 2025 (Cohort 3) competition to the broader MSU plant science community, welcoming proposals from across campus. Cohort 3 projects launched in April 2025, and Cohort 4 followed in October 2025, marking continued growth in trainee-led innovation.

To date, the program has funded 19 proposals that strengthen interdisciplinary ties, empower trainees to lead independent research directions, and fuel the exploratory work that often becomes the foundation for future external funding.



# SCIENTIFIC OUTREACH & PUBLIC ENGAGEMENT



## THE WORLD OF PLANTS AT THE MSU SCIENCE FESTIVAL

PRI spearheaded the World of Plants room at the 2025 MSU SciFest STEAM Expo Days, an opportunity to explore the fascinating world of plants through hands-on activities, experiments, and educational displays.

Bringing together 17 plant-related booths from across academic departments and research institutes, this event connected approximately 450 families with PRI scientists, igniting curiosity about how plants sustain life.

## HIGH SCHOOL SUMMER RESEARCH PROGRAMS

PRI faculty members also participated in several MSU summer research programs designed to give high school and pre-college students an opportunity to explore education and career opportunities in plant and agricultural science.

Initiatives include the High School Honors Science, Math and Engineering Program, Multicultural Apprenticeship Program, and 4-H Exploration Days.

## MYSTERY OF THE MONKEY FLOWER

The Lowry lab, in collaboration with MSU's CREATE for STEM Institute, developed an education module for middle and high school students based on their research about the evolution of monkeyflower plants. The curriculum includes an accompanying graphic novel, *Mystery of the Monkeyflower*, to guide students through the lessons. This module has been implemented in middle and high school classes in Detroit, Flint, Troy, and Richland.

## GLENCAIRN ELEMENTARY SCHOOL SCIENCE NIGHT

PRI labs visited Glencairn Elementary School in East Lansing for their 2025 Science Night, showcasing to young students how science plays an integral role in our everyday lives.



# INAUGURAL GREAT LAKES PLANT SCIENCE CONFERENCE



PRI lead the organization for the inaugural Great Lakes Plant Science Conference (GLPSC 2025) in Lansing, Michigan. A joint endeavor with nine other leading universities in the states and provinces around the Great Lakes, GLPSC 2025 helped foster a vibrant, collaborative plant research community across the Great Lakes region.

By convening scientists from diverse institutions, disciplines, and career stages, the conference served as a catalyst for building long-term research networks and accelerating global innovations in plant science. This effort reinforces PRI's strategic vision to be at the forefront of advancing plant research and scientific community-building not only at MSU, but across the globe.



**416  
REGISTRANTS**  
**55 INSTITUTIONS**  
**28 TALKS**  
**212 POSTERS**  
**6 INDUSTRY  
PANELISTS**  
**10 EXHIBITORS**

# LOOKING AHEAD



PRI strives to become the world's leading institute for understanding the multifaceted mechanisms of plant resilience, translating that knowledge to the bioeconomy, and advancing conservation and sustainability efforts. Achieving this goal will require us to further build upon our existing research efforts, collaborations, and programs to develop meaningful solutions to the grand challenges of the 21<sup>st</sup> century.

## 2026 PLANS

- Expanding PRI labs through our ongoing faculty search
- Cultivating the three new PRI flagship projects
- Continuing to foster our center-level grant efforts and collaborations
- Growing PRI's resources and programs including the PRI Seed Grant Program and professional development opportunities
- Further advancing our engagement efforts through participation in various conferences, science outreach, and recruiting events
- Beginning the move into the new, state-of-the-art MSU Plant and Environmental Sciences Building
- Celebrating the 10<sup>th</sup> anniversary of PRI





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# FISCAL YEAR 2025 ALUMNI

## FORMER POSTDOCTORAL SCHOLARS

- **Daniel Anstett** – Assistant Professor at Cornell University
- **Nathan Catlin** – Staff Scientist in the Grotewald Lab at MSU
- **Sterling Field** – Aspiring Leaders Program Fellow at BASF
- **Leslie Kollar** – Research Development Officer at the University of Michigan
- **Rose Marks** – Assistant Professor at University of Illinois
- **Mohammad Mostofa** – Assistant Professor at the State University of New York
- **Abira Sahu** – Research Specialist at the University of Alabama
- **Stephanie Schmiege** – Assistant Professor at Union College
- **Lauren Stanley** – Assistant Professor at Central Michigan University

## FORMER GRADUATE STUDENTS

- **McKena Lipham Wilson** – CRCIL Postdoctoral Fellow at Clemson University
- **Serena Lotreck** – Postdoctoral Researcher in the Farre and Walker Labs at MSU
- **Tvisha Martin** – NSF Postdoctoral Fellow at the University of New Hampshire
- **Anna Pardo** – Postdoctoral Researcher at the University of Connecticut
- **Miles Roberts** – NSF Postdoctoral Fellow at University of California, Berkeley
- **Robert Shrote** – Breeding Systems Optimization Scientist at Corteva
- **Qianjie Wang** – Senior Scientist at Astra-Zeneca

## FORMER POST-BACCALAUREATE AND UNDERGRADUATE STUDENTS

- **Cam Durant** – PhD Student at the University of Michigan
- **Claire Hanley** – PhD Student at Oklahoma State University
- **Otto Kailing** – PhD Student at Pennsylvania State University
- **Aidan Kile** – Environmental Engineering Intern at the City of Grand Rapids
- **Liam Markell** – Quality Control Analyst at Forge Biologics
- **Ritta Mouayed** – Masters Student at Case Western University
- **Andrew Scheil** – Histology Technician at the MSU College of Veterinary Medicine
- **Lane Vitek** – PhD Student at the University of Michigan
- **Jeffrey Yang** – Masters Student at Carnegie Mellon University
- **Andrew Yonker** – Production Agronomist at Corteva

# END OF 2025 DIRECTORY

## FACULTY MEMBERS

- **Kadeem Gilbert** – Assistant Professor of Plant Biology
- **Andrea Glassmire** – Assistant Professor of Entomology and Plant Biology
- **Gregg Howe** – University Distinguished Professor and MSU Research Foundation Professor of Biochemistry and Molecular Biology
- **Emily Josephs** – Associate Professor of Plant Biology
- **Sarah Lebeis** – Associate Professor of Plant, Soil and Microbial Sciences and Microbiology, Genetics, & Immunology
- **David Lowry** – Professor of Plant Biology
- **Peter Lundquist** – Associate Professor of Biochemistry and Molecular Biology
- **Sue Rhee** – MSU Research Foundation Professor of Biochemistry and Molecular Biology, Plant Biology, and Plant, Soil and Microbial Sciences
- **Hatem Rouached** – Associate Professor of Plant, Soil and Microbial Sciences
- **Thomas Sharkey** – Emeritus University Distinguished Professor of Biochemistry and Molecular Biology
- **Christine Sprunger** – Associate Professor of Plant, Soil and Microbial Sciences
- **Addie Thompson** – Associate Professor of Plant, Soil and Microbial Sciences
- **Robert VanBuren** – Associate Professor of Plant Biology and Plant, Soil and Microbial Sciences

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- **Mary Lou Guerinot** – Professor at Dartmouth College and Member of the U.S. National Academy of Sciences
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- **Corné Pieterse** – Professor at Utrecht University
- **Anne W. Sylvester** – Director of Research at the Marine Biological Laboratory

## ADMINISTRATION

- **Gaëlle Cassin-Ross** – Training & Outreach Coordinator
- **Brandi Howell** – Business Manager
- **Morgan Koetje Magilligan** – Communications Manager
- **Elena Lazarus** – WALII Scientific Coordinator
- **Maricar Macalincag** – C-SPIRIT Project Manager
- **Rita Martin** – Post-Award Manager
- **Johanna Murray** – PCA, PMN, & WALII Communications Coordinator
- **Joe Saenz** – Office Coordinator
- **Paige Smith** – Germplasm Curator
- **Ashley Stender** – C-SPIRIT Promotion & Outreach Coordinator

## SPECIALISTS

- **Flavia Bossi** – Research Specialist
- **Charles Hawkins** – Research Specialist
- **Adrian Platts** – Information Technologist

- **Karine Prado** – Research Specialist
- **Yuan Xu** – Research Specialist
- **Bo Xue** – Data Resource Analyst

## POSTDOCTORAL SCHOLARS

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- Nadia Bouain
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- Abby Sulesky-Grieb
- Febri Susanto
- Tri Tran
- Tyler Wintermute
- Jinny Yang
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## GRADUATE STUDENTS

- Lydia Bergerson
- Andrew Bleich
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- Donielle Brottlund
- Sophia Buysse
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- Shannon Donnelly
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- Asia Hightower
- Monica Jean
- Abigail Jensen
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- Leah Knoor
- Kristin Leutgeb
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- Keara Grady
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- Saniya Henderson
- Hailey Hilscher
- Britta Hamberger
- Meredith Mann
- Katie Phillips
- Linsey Newton
- Sidney Richardson
- Arlo Robles

## UNDERGRADUATE STUDENTS

- Abby Holland
- Natalia Kozierski
- Arjun Kuruppu Goonetilleke
- Jacob Lanning
- Basia Love
- Sam Manson
- Bethany Nolta
- Amro Turkistani
- Sarah Weber
- Carolina Wheeler
- Esther Woolcock