Sohini Guha

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Plant Science Department
College of Agricultural Sciences
Pennsylvania State University

Education

- Post-doctoral Researcher. Department of Plant Science, Penn State University, USA **2022-ongoing**
- Post-doctoral Researcher. Department of Microbiology, University of Calcutta, India **2018-2022**
- Ph.D. Department of Biochemistry, The University of Calcutta, India **2010-2017**
- Master of Science (Microbiology) (M.S.), University of Calcutta **2006-2008**
- Bachelor of Science (Microbiology), University of Calcutta. **2003-2006**

Awards

- Best short talk -17th Postdoctoral Research Symposium (2024), Penn State
- National Eligibility Test (All India Rank-309) for doctoral fellowship (2011-2016)
- Graduate Aptitude Test Examination (All India Rank 115) in Life Sciences (2008)

Travel Grants

- Plant Biology 2025, Milwaukee, American Society of Plant Biology (July 2025) $1150
- Shimamoto Travel grant to attend 2023 IS-MPMI, Providence, Rhode Island (June 2023) $1500
- Travel grant to visit James Hutton Institute, Dundee, Scotland (July 2019) $1393
- Travel grant to visit Department of Plant Sciences, University of Oxford. (April-July,2017) $6967
- Travel grant to attend 5th Congress of European Microbiologists, Leipzig (June 2013) $2105

Publications

Published

1. **Sohini Guha**, Regina B Bledsoe, Jeremy Sutherland, Brendan Epstein, Gwendolyn M Fry, Vikram Venugopal, Siva Sankari, Alejandra Gil Polo, Garrett Levin, Barney Geddes, Nevin D. Young, Peter Tiffin and Liana T. Burghardt, (2025) Mutations in legume symbiosis genes that influence symbiosis create a complex selective landscape for rhizobial symbionts. *The ISME Journal* (accepted,2026)

2. Jennifer E. Harris, Regina B. Bledsoe, **Sohini Guha**, Haneen Omari, Sharifa G. Crandall, Liana T. Burghardt, Estelle M. Couradeau (2025). *The activity of soil microbial taxa in the rhizosphere predicts the success of root colonization*. msystems., https://doi.org/10.1101/2024.12.07.627353
3. **Sohini Guha *,** Molla Firoz, Sarkar Monolina, Ibá n ẽ z Fernando, Fabra Adriana, DasGupta Maitrayee* (2022) Nod Factor- independent 'crack-entry' symbiosis in *Arachis hypogaea. Environmental Microbiology* https://doi.org/*10.1111/1462-2920.15888* **corresponding author*
4. **Sohini Guha**, Sarkar Monolina, Ganguly Pritha, Uddin R, Mandal S, DasGupta Maitrayee (2016) Segregation of *nod*-containing and *nod*-deficient Bradyrhizobia as endosymbionts of *Arachis hypogaea* and as endophytes of *Oryza sativa* in intercropped fields of Bengal Basin, India. *Environmental Microbiology* https://doi.org/*10.1111/1462-2920.13348*

Preprints in review

5. Elizabeth L. Paillan., Alejandra Gil Polo, Sohini Guha, Andy Swartley and Liana T. Burghardt (2025) Nodule branching, size, and symbiosis outcomes shaped by natural genetic variation in rhizobia and alfalfa. *bioRxiv.* https://doi.org/10.1101/2025.10.27.684485

Teaching and Mentoring

Teaching

Cumulative teaching experience = 1284 hrs

- **Guest lecturer and Expert Panelist**, PLANT 461: Root Symbiosis, Penn State University (Fall 2025)

  Topic: Global Challenges to Sustainable Agriculture; 12 undergraduates

- **Guest Lecturer**, AGRO 410: Root Symbiosis, Penn State University (Fall 2023)
  Seminar: Root Nodule Symbiosis; 20 upper-level undergraduates
- **Lecturer**, Undergraduate Microbiology Program, Jogamaya Devi College, Kolkata, India (Fall 2016– Fall 2021)
  - Instructor of record for three undergraduate courses:

    1) Microbial Genetics- 3 offerings, 12 weeks @ 3 contact hours/week (Spring 2016)

    2) Cell Biology -(4 offerings, 12 weeks @ 3 contact hours/week)

    3) Microbial Physiology - (2 offerings, 14 weeks @ 3 contact hours/week)
  - Laboratory Instruction and Experiments: Designed and led hands-on laboratory modules, including isolation of root nodule bacteria from various legumes, genomic DNA extraction, gel electrophoresis, and sterile microbiological techniques. *Learning objectives:* By the end of the module, students could competently perform microbiological techniques, extract and analyse DNA, and interpret experimental results.

- Supervised individual student projects requiring training in experimental design, execution, data collection, and statistical analysis. *Learning objectives:* By the end of the project, students were able to design experiments, execute protocols independently, analyse data quantitatively, and communicate results effectively in written and oral formats.

Mentoring

- India (2010–2020): Mentored 10 undergraduate students
  - Tilak Nayak, Scientific Assistant, Indian Statistical Institute
  - Mayur Ingle, Assistant Professor, Microbiology, Janki Devi Memorial College, New Delhi
  - Nitin Gurav, Sales executive, Merck Pharmaceuticals
  - Pankaj Pandey, PhD, Department of Biotechnology, Sikkim University
  - Sreya Das- PhD, Indian Institute of Science, Education and Research(IISER)
  - Somraj Ganguly- Scientist, CuraTeQ Biologics
  - Firoz Molla- Post-doc, Sainsbury Laboratory)
  - Pritha Ganguly- Post-doc, St. Jude's Children Hospital, Memphis.
  - Aritra Biswas-PhD, Benaras Hindu University
  - Subhashini Govindraj- Staff, State Bank of India
- United States (2022–present)
  - Elizabeth Paillan- PhD, NC. Chapel (2023-2024)
  - Amanda Jason, Master's student, Penn State (2024-ongoing)
  - Andy Swartley, Master's student, Penn State (2024-ongoing)
  - Maria Alejandra Gil Polo-Graduate student, Burghardt Lab, Penn State (2023-ongoing)
  - Lily Foley- Graduate student, Medina Lab, Penn State (2024-ongoing)

Teaching Workshops and Professional Development

- "Writing your DEI Statement", Schreyer Institute for Teaching Excellence Workshop: Participated in a professional development session focused on writing effective Diversity, Equity, and Inclusion statements - (**January 2025)**
- **"**How to Plan a Class Session**"**, Schreyer Institute for Teaching Excellence Workshop: Participated in a professional development session focused on designing effective and engaging class sessions (**January 2025)**

Oral Presentations

Talks and Seminars

'Laying the groundwork to breed for mutualisms: Can alfalfa increase populations of rhizobia that provide them more nitrogen?' **Guha, S.**, Alejandra Gil-Polo, Elizabeth Paillan, Kayla M. Clouse and Liana T. Burghardt**, American Society of Plant Biology, Milwaukee, July 2025**

'Laying the groundwork to breed for mutualisms: Can alfalfa increase populations of rhizobia that provide them more nitrogen?' **Guha, S.**, Alejandra Gil-Polo, Elizabeth Paillan, Kayla M. Clouse and Liana T. Burghardt**, Center for Root and Rhizosphere Biology, Penn**

State University, May 2025

'Disruption of Medicago symbiosis genes create a complex selective landscape for naturally occurring genetic variation in rhizobia', **Guha, S.**, Regina B. Bledsoe, Jeremy Sutherland, Brendan Epstein, Gwendolyn M. Fry, Vikram Venugopal, Siva Sankari, Alejandra Gil Polo, Garrett Levin, Barney Geddes, Nevin D. Young, Peter Tiffin, and Liana T. Burghardt, **Early Career Showcase, IS-MPMI, February 2025,**

'Validating candidate genes for competitive colonization of legume roots by nitrogen-fixing bacteria**', Guha,S**., Ping Wang, Brendan Epstein, Elizabeth Pailan, Amanda Jason, **17th Annual Postdoctoral Research Symposium, Penn State University** (Won *Best short talk award*)**, December 2024**

'Disruption of *Medicago* symbiosis genes create a complex selective landscape for naturally occurring genetic variation in rhizobia', **Guha, S.**, Regina B. Bledsoe, Jeremy Sutherland, Brendan Epstein, Gwendolyn M. Fry, Vikram Venugopal, Siva Sankari, Alejandra Gil Polo, Garrett Levin, Barney Geddes, Nevin D. Young, Peter Tiffin, and Liana T. Burghardt, **26th North American Symbiotic Nitrogen Fixation Conference, University of Vermont**, Burlington, **June 2024**

'Validating candidate genes for competitive colonization of legume roots by nitrogen-fixing bacteria', **Guha,S**., Ping Wang, Brendan Epstein, Elizabeth Pailan, Amanda Jason, **Center for Root and Rhizosphere Biology, Penn State University, February 2024**

'Perturbation of known *Medicago* symbiosis genes has variable effects on host and rhizobia fitness in multi-strain inoculations', **Guha, S.**, Regina B. Bledsoe, Jeremy Sutherland, Brendan Epstein, Gwendolyn M. Fry, Vikram Venugopal, Siva Sankari, Alejandra Gil Polo, Garrett Levin, Barney Geddes, Nevin D. Young, Peter Tiffin, and Liana T. Burghardt, **Plant Science Seminar, Penn State University, October 2023**

'Investigating the Alternate Symbiotic Pathways in Peanut', **South Dakota State University** *(virtual)*, **Guha, S.,** Molla Firoz, Sarkar Monolina, Ibań ẽ z Fernando, Fabra Adriana, DasGupta Maitrayee **March 2021**.

'Investigating Nod-independent root nodule symbiosis in *Arachis hypogaea*', **National University of Singapore, Singapore** *(virtual),* **Guha, S.,** Molla Firoz, Sarkar Monolina, Ibań ẽ z Fernando, Fabra Adriana, DasGupta Maitrayee, **April 2021**

'Segregation of *nod*-containing and *nod*-deficient bradyrhizobia as endosymbionts of *Arachis hypogaea* and as endophytes of *Oryza sativa* in intercropped fields of Bengal Basin, India', **Guha, S.**, Sarkar Monolina, Ganguly Pritha, Uddin R, Mandal S, DasGupta Maitrayee **University of Oxford, UK, April 2017**

Poster Presentations

Guha, S., R.B. Bledsoe, J. Sutherland, B. Epstein, G.M. Fry, N.D. Young, and L.T. Burghardt. 2024. *Perturbation of known Medicago symbiosis genes has variable effects on host and rhizobial fitness in multi-strain inoculations.* **Molecular Plant–Microbe Interactions**, 37(5):58. International Congress on Molecular Plant–Microbe Interactions.

Guha, S., P. Wang, B. Epstein, E. Pailan, A. Jason, and L.T. Burghardt. 2024. *Validating candidate genes for competitive colonization of legume roots by nitrogen-fixing bacteria.* One Health–Microbiome Symposium, Penn State University.

Guha, S., R.B. Bledsoe, B. Epstein, P. Tiffin, N.D. Young, and L.T. Burghardt. (2024). *From*

genes to genera: Assessing genetic determinants of rhizobia fitness in legume nodules across scales.
Poster presented at the International Congress on Molecular Plant–Microbe Interactions, page 20–21.

A. Gil-Polo, E.L. Paillan, **Guha, S.**, R.T. Bledsoe, and L.T. Burghardt. (2024). *Do rhizobia with divergent morphologies co-isolated from Pennsylvania alfalfa fields alter host growth and strain competition?*
Poster presented at the International Congress on Molecular Plant–Microbe Interactions, page 6.

Paillan, E.L., M.A. Gil-Polo, **Guha. S**, E.M.C. Harris, and L.T. Burghardt. (2024). *Is the proportion of branched nodules a rhizobia strain forms associated with increased benefits to alfalfa hosts or rhizobial symbionts?*
Poster presented at the 26th North American Symbiotic Nitrogen Fixation Conference, page 87.

Gil-Polo, M.A., E.L. Paillan, **Guha. S**, E.M.C. Harris, and L.T. Burghardt. (2024). *Do Rhizobia Isolated from Different Alfalfa Varieties in Agricultural Ecosystems Exhibit Enhanced Mutualism with Their Host Plants? Poster presented at the 26th North American Symbiotic Nitrogen Fixation Conference, page 53.*

Harris, J.E., R.B. Bledsoe, **Guha. S**, H. Omari, S.G. Crandall, and L.T. Burghardt. (2024). *Active microbes in the rhizosphere are most likely to successfully colonize plant belowground structures when probed with BONCAT.*
Poster presented at The One Health–Microbiome Symposium, page 35.

, **Guha, S.**, Sarkar Monolina, Ganguly Pritha, Uddin R, Mandal S, DasGupta Maitrayee. 2013. *Distinct Bradyrhizobial populations from Oryza sativa and Arachis hypogaea collected from an intercropped field.* 5th Congress of European Microbiologists, Leipzig, Germany.

Research & Experimentation Expertise

Technical Skills & Expertise

- **Plant-Microbe Interactions:** Designed randomized field trials; managed microbial collections from legumes and non-legumes.
- **Molecular & Microbial Techniques:** PCR, DNA/RNA isolation, qRT-PCR, Southern hybridization, mutagenesis, bacterial conjugation, and transgenic plant generation via Agrobacterium rhizogenes.
- **Microscopy & Imaging:** Fluorescence and confocal microscopy, cryosectioning.
- **Protein & Biochemistry:** SDS-PAGE, Western blotting, kinase assays, co-immunoprecipitation.
- **Bioinformatics & Data Analysis:** Comparative genomics, microbial Genome Wide Association (GWAS).
- **Other Skills:** Critical thinking, Analytical ability, Attention to detail, and Strong communication skills.

Additional Research Experience

- Visiting scientist (July 2019), James Hutton Institute, Dundee, Scotland
- Visiting scientist (April - August 2017), Department of Plant Sciences, University of Oxford, UK
- Predoc trainee (April 2009-January 2010), Department of Biochemistry, Bose Institute, India
- Predoc trainee (July 2008 – January 2009), Department of Microbiology, West Bengal

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University of Technology, India

Service

Peer Review

- Invited reviewer for *mSystems, Applied and Environmental Microbiology, Frontiers in Plant Science, ISME Communications, Nature Communications,* and *Microbiome*.

Grant Review

- Reviewer for the Penn State Graduate Student Competitive Grant (2023–present).

Committee & Leadership Roles

- Scientific Programming Chair, 18th Penn State Postdoctoral Symposium (Fall 2025)
- Organizing Committee Member, 2nd Annual Center for Root & Rhizosphere Biology Symposium, Penn State (Fall 2024)
- Steering Committee Member, Center for Root and Rhizosphere Biology, Penn State (Fall 2024)
- Organizing Committee Member, 2nd Annual Center for Root & Rhizosphere Biology Symposium, Penn State (Fall 2023)

Outreach

- Co-designed and facilitated “Know Your Legumes,” an outreach event at the Penn State Student Farm introducing participants to plant–microbe mutualism. Visitors matched common foods (lentils, peanuts, soybeans) to their plants and examined legume roots to discover nitrogen-fixing nodules. (Fall 2024)

References

- Dr. Liana Burghardt (Current Employer), Assistant Professor, Department of Plant Sciences, The Pennsylvania State University. ltb5167@psu.edu
- Dr. Barney Geddes (Collaborator), Assistant Professor, Microbiological Sciences, North Dakota State University. barney.geddes@ndsu.edu
- Prof. Maitrayee DasGupta (Ph.D. Supervisor), Professor, Department of Biochemistry, Calcutta University. maitrayee_d@hotmail.com