

Soumyadev Sarkar, Ph.D.
Arizona State University
Center for Fundamental and Applied Microbiomics
Mobile: +1 (716) 235-7461
E-mail: ssarka54@asu.edu

EDUCATION

2012 – 2019: Ph.D. Science, Jadavpur University, India

PI: Prof. Ratan Gachhui, Department of Life Science & Biotechnology, Jadavpur University, India

Thesis:

Novel insights into the nitrogen stress response of *Papiliotrema laurentii* strain RY1

2010 – 2012: Master of Science in Biotechnology, Jadavpur University, India

Thesis:

Gene expression analysis of mutant p53 transcriptional targets conferring increased chemoresistance to human tumors

2007 – 2010: Bachelor of Science in Microbiology, University of Calcutta, India

RESEARCH

2022 – Present: Postdoctoral Research Scholar, Arizona State University

PI: Prof. Ferran Garcia-Pichel, Regents' Professor and Center Director, Center for Fundamental and Applied Microbiomics, Arizona State University

I am implementing the techniques of microbiology and bioinformatics to elucidate the symbiotic relationship between the cyanobacteria and the heterotrophs residing in the cyanosphere.

2019 – 2022: Postdoctoral Scientist, Kansas State University

PI: Dr. Sonny T.M. Lee, Assistant Professor, Division of Biology, Kansas State University

I have been primarily using metagenomics to dissect the complex microbe-microbe and host-microbe interactions in plant-microbe systems. I was in charge to set up the laboratory. Right from planning to the purchase of the equipment and to set it up – I oversaw everything. I did set up and standardized a wide range of high-end instruments and experiments such as Nanopore technology, Biolog technology, Chemostat, Bead-beaters, among others.

I spearheaded the lab's functioning and was responsible for the standardization of microbiological culturing techniques, molecular biology techniques such as DNA and RNA extraction from a wide range of samples like leaves, roots, soil, and fecal samples. In these three years, I was not only responsible for standardizations and set-ups but also led several projects. I oversee the following projects: (1) Drought soil microbial function (2) Simple State Community (3) *Andropogon* adaptation – Colby 16S, ITS (4) *Andropogon* adaptation – Colby culturomics (5) Soil stratification

– gene-centric (6) Soil stratification – genome-centric (7) YR343 (8) *Andropogon* fungi microbiome.

2011: Project Assistant, Indian Institute of Chemical Biology, India

Analyzed the gene expression of mutant p53 transcriptional targets that had the potential to confer increased resistance to human tumors.

TEACHING

2012 – 2018: Tutor and laboratory instructor, Jadavpur University, India

Provided teaching support for post-graduate students of Biotechnology at the Department of Life Science & Biotechnology. Designed and taught the students how to conduct the experiments in Microbiology and Biochemistry (MSBT 1/7). Supervised the practical examination annually.

MENTORING

Name	Department	Project type and details	Dates	Fellowship received	Current position
Kaitlyn Ward	Biology / Kansas State University	Microbiology, molecular biology, computational	2019 - 2021	Undergraduate Research Award, College of Arts and Sciences, Kansas State University	Laboratory technician, Quest Diagnostics
Abigail Kamke	Biology / Kansas State University	Microbiology	2019 - 2021	Undergraduate Research Award, College of Arts and Sciences, Kansas State University	Medical Laboratory Science Student, Saint Luke's Hospital of KC
Brendan Newcomer	Biology / Kansas State University	Microbiology, molecular biology	2020 - 2022	Undergraduate Research Award, College of Arts and Sciences, Kansas State University	Undergraduate student in Kansas State University
Nicholas Reese	Biology / Kansas State University	Microbiology, molecular biology, computational	2021 - 2022	-	Undergraduate student in Kansas State University
Christopher Hargreaves	Biology / Kansas State University	Computational	2021 - 2022	-	Undergraduate student in Kansas State University
Leslie Raudela	Biology / Kansas State University	Microbiology	2021	-	Undergraduate student in Kansas State University

SCHOLARSHIP

1. Recipient of the Senior Research Fellowship under State Government Fellowship Scheme, 2016 – 2019, India
2. Recipient of the Junior Research Fellowship under State Government Fellowship Scheme, 2014 – 2016, India
3. Recipient of the UGC Fellowship for Doctoral Studies, 2013 – 2014, India

PUBLICATION

1. Kazarina, Anna, **Soumyadev Sarkar**, Shiva Thapa, Leah Heeren, Abigail Kamke, Kaitlyn Ward, Eli Hartung, et al. 2023. “Home-Field Advantage Affects the Local Adaptive Interaction between *Andropogon Gerardii* Ecotypes and Root-Associated Bacterial Communities.” *Microbiology Spectrum*, August, e0020823.
2. **Sarkar, Soumyadev**, Tanner Richie, and Sonny Lee. 2023a. “Metagenomic Protocol (from Quality Control to Mapping) for Metagenome-Assembled Genomes Using Anvi'o.” *Bio-Protocol* 13 (9). <https://doi.org/10.21769/bioprotoc.4683>. (Invited)
3. **Sarkar, Soumyadev**, Tanner Richie, and Sonny Lee. 2023. “Visualizing, Binning, and Refining of Metagenome-Assembled Genomes (MAGs) with Anvi'o.” *Bio-Protocol* 13 (9). <https://doi.org/10.21769/bioprotoc.4684>. (Invited)
4. Morrison, Austin Gregory, **Soumyadev Sarkar**, Shahid Umar, Sonny T. M. Lee, and Sufi Mary Thomas. 2023. “The Contribution of the Human Oral Microbiome to Oral Disease: A Review.” *Microorganisms* 11 (2): 318. <https://doi.org/10.3390/microorganisms11020318>
5. **Sarkar, Soumyadev**. 2023. "Proteogenomic Approaches to Understand Gene Mutations and Protein Structural Alterations in Colon Cancer" *Physiologia* 3, no. 1: 11-29. <https://doi.org/10.3390/physiologia3010002> (Feature Paper, Invited)
6. **Sarkar, Soumyadev**, Abigail Kamke, Kaitlyn Ward, Eli Hartung, Qinghong Ran, Brandi Feehan, Matthew Gallart, Ari Jumpponen, Loretta Johnson, and Sonny T. M. Lee. 2022. “*Pseudomonas* Cultivated from *Andropogon Gerardii* Rhizosphere Show Functional Potential for Promoting Plant Host Growth and Drought Resilience.” *BMC Genomics* 23 (1): 784. <https://doi.org/10.1186/s12864-022-09019-0>
7. **Sarkar, Soumyadev**, Abigail Kamke, Kaitlyn Ward, Aoesta K. Rudick, Sara G. Baer, Qinghong Ran, Brandi Feehan, et al. 2022. “Bacterial but Not Fungal Rhizosphere Community Composition Differ among Perennial Grass Ecotypes under Abiotic Environmental Stress.” *Microbiology Spectrum*, April, e0239121. <https://journals.asm.org/doi/full/10.1128/spectrum.02391-21>

8. **Sarkar, Soumyadev**, Kaitlyn Ward, Abigail Kamke, Qinghong Ran, Brandi Feehan, Tanner Richie, Nicholas Reese, and Sonny T. M. Lee. 2022. "Perspective: Simple State Communities to Study Microbial Interactions: Examples and Future Directions." *Frontiers in Microbiology* 13 (January): 801864. <https://doi.org/10.3389/fmicb.2022.801864>

9. Gupta, Suchetana, Ditipriya Mallick, Kumarjeet Banerjee, Shrimon Mukherjee, **Soumyadev Sarkar**, Sonny Tm Lee, Partha Basuchowdhuri, and Siddhartha S. Jana. 2022. "D155Y Substitution of SARS-CoV-2 ORF3a Weakens Binding with Caveolin-1." *Computational and Structural Biotechnology Journal* 20 (January): 766–78. <https://doi.org/10.1016/j.csbj.2022.01.017>

10. Ghosh, Bidisha, **Soumyadev Sarkar**, Nayim Sepay, Kaustuv Das, Sukhen Das, and Sujata Ghosh Dastidar. 2021. "Factors for COVID-19 Infection That Govern the Severity of Illness." *SciMedicine Journal* 3 (2): 177–97. <https://doi.org/10.28991/SciMedJ-2021-0302-9>

11. Mukherjee, Avishek, **Soumyadev Sarkar**, Rubia Parvin, Debbethi Bera, Uttariya Roy, and Ratan Gachhui. 2020. "Remarkably High Pb²⁺ Binding Capacity of a Novel, Regenerable Bioremediator *Papiliotrema Laurentii* RY1: Functional in Both Alkaline and Neutral Environments." *Ecotoxicology and Environmental Safety* 195 (June): 110439. DOI: <https://doi.org/10.1016/j.ecoenv.2020.110439>

12. Bhattacharya, Debanjana, Ritam Sinha, Priyadarshini Mukherjee, Debaki Ranjan Howlader, Dhrubajyoti Nag, **Soumyadev Sarkar**, Hemanta Koley, Jeffrey H. Withey, and Ratan Gachhui. 2020. "Anti-Virulence Activity of Polyphenolic Fraction Isolated from Kombucha against *Vibrio Cholerae*." *Microbial Pathogenesis* 140 (March): 103927. DOI: <https://doi.org/10.1016/j.micpath.2019.103927>

13. Mukherjee, Avishek, **Soumyadev Sarkar**, Suchetana Gupta, Sayanika Banerjee, Sanjib Senapati, Riya Chakrabarty, and Ratan Gachhui. 2019. "DMSO Strengthens Chitin Deacetylase-Chitin Interaction: Physicochemical, Kinetic, Structural and Catalytic Insights." *Carbohydrate Polymers* 223 (November): 115032. DOI: <https://doi.org/10.1016/j.carbpol.2019.115032>

14. **Sarkar, Soumyadev**, Avishek Mukherjee, Subhadeep Das, Bidisha Ghosh, Shouvik Chaudhuri, Debanjana Bhattacharya, Arpita Sarbajna, and Ratan Gachhui. 2019. "Nitrogen Deprivation Elicits Dimorphism, Capsule Biosynthesis and Autophagy in *Papiliotrema Laurentii* Strain RY1." *Micron* 124 (September): 102708. DOI: <https://doi.org/10.1016/j.micron.2019.102708>

15. **Sarkar, Soumyadev**, Avishek Mukherjee, Rubia Parvin, Subhadeep Das, Uttariya Roy, Somdeep Ghosh, Punarbasu Chaudhuri, et al. 2019. "Removal of Pb (II), As (III), and Cr (VI) by Nitrogen-Starved *Papiliotrema Laurentii* Strain RY1." *Journal of Basic Microbiology* 59 (10): 1016–30. DOI: <https://doi.org/10.1002/jobm.201900222>

16. **Sarkar, Soumyadev**, Somnath Chakravorty, Avishek Mukherjee, Debanjana Bhattacharya, Semantee Bhattacharya, and Ratan Gachhui. 2018. "De Novo RNA-Seq Based Transcriptome

Analysis of *Papiliotrema Laurentii* Strain RY1 under Nitrogen Starvation.” *Gene* 645 (March): 146–56. DOI: <https://doi.org/10.1016/j.gene.2017.12.014>

17. **Sarkar, Soumyadev**, Suchetana Gupta, Writachit Chakraborty, Sanjib Senapati, and Ratan Gachhui. 2017. “Homology Modeling, Molecular Docking and Molecular Dynamics Studies of the Catalytic Domain of Chitin Deacetylase from *Cryptococcus Laurentii* Strain RY1.” *International Journal of Biological Macromolecules* 104 (Pt B): 1682–91. DOI: <https://doi.org/10.1016/j.ijbiomac.2017.03.057>

18. Bhattacharya, Debanjana, Deblina Ghosh, Semantee Bhattacharya, **Soumyadev Sarkar**, Parimal Karmakar, Hemanta Koley, and Ratan Gachhui. 2018. “Antibacterial Activity of Polyphenolic Fraction of Kombucha against *Vibrio Cholerae*: Targeting Cell Membrane.” *Letters in Applied Microbiology* 66 (2): 145–52. DOI: <https://doi.org/10.1111/lam.12829>

19. Chakraborty, Writachit, **Soumyadev Sarkar**, Somnath Chakravorty, Semantee Bhattacharya, Debanjana Bhattacharya, and Ratan Gachhui. 2016. “Expression of a Chitin Deacetylase Gene, up-Regulated in *Cryptococcus Laurentii* Strain RY1, under Nitrogen Limitation.” *Journal of Basic Microbiology* 56 (5): 576–79. DOI: <https://doi.org/10.1002/jobm.201500596>

20. Bhattacharya, Debanjana, Semantee Bhattacharya, Madhu Manti Patra, Somnath Chakravorty, **Soumyadev Sarkar**, Writachit Chakraborty, Hemanta Koley, and Ratan Gachhui. 2016. “Antibacterial Activity of Polyphenolic Fraction of Kombucha Against Enteric Bacterial Pathogens.” *Current Microbiology* 73 (6): 885–96. DOI: <https://doi.org/10.1007/s00284-016-1136-3>

21. Chakravorty, Somnath, **Soumyadev Sarkar**, and Ratan Gachhui. 2015. “Identification of New Conserved and Variable Regions in the 16S rRNA Gene of Acetic Acid Bacteria and Acetobacteraceae Family.” *Molecular Biology*. DOI: <https://link.springer.com/article/10.1134/S0026893315050052>

22. Chakravorty, Somnath, Semantee Bhattacharya, Debanjana Bhattacharya, **Soumyadev Sarkar**, and Ratan Gachhui. 2019. “10 - Kombucha: A Promising Functional Beverage Prepared From Tea.” In *Non-Alcoholic Beverages*, edited by Alexandru Mihai Grumezescu and Alina Maria Holban, 285–327. Woodhead Publishing. DOI: <https://doi.org/10.1016/B978-0-12-815270-6.00010-4>

Preprints

23. Richie, Tanner G., Leah Heeren, Abigail Kamke, Sophia Pogranichniy, Kourtney Rumbach, Trey Summers, Hallie Wiechman, Qinghong Ran, **Soumyadev Sarkar**, Brandon Plattner, Sonny TM Lee. 2022. “Limitation of Sulfur-Containing Amino Acid Availability by Specific Bacterial Populations during Enhanced Colitis in IBD Mouse Model.” *BioRxiv*. <https://doi.org/10.1101/2022.10.03.510649>.

24. **Sarkar, Soumyadev**, Kaitlyn Ward, Janet K. Jansson, and Sonny T. M. Lee. 2020. “Detection of Stress Functional Responses in Bacterial Populations under Dry Soil Conditions Show Potential

TALKS AND POSTER PRESENTATION

1. Presented a poster entitled “Insights Into Perennial Grass Ecotype Host-rhizobiome Interaction Under Abiotic Environmental Stress Through Marker Genes And Culturomics” at the ASM Microbe 2022 organized by American Society for Microbiology, held at Washington D.C., USA, 2022
2. Contributed an oral presentation entitled “Interactive effect of depth profile, land history, and precipitation gradients across Kansas determines microbial community and function” at the ESA Annual Meeting, USA, 2021 (virtual conference)
3. Contributed an oral presentation entitled “Effects of moisture perturbations on the potential nitrogen cycle contributors in native prairie soil” at the MAPS Symposium organized by Kansas NSF EPSCoR held at The University of Kansas, USA, 2020
4. Presented a poster entitled “Interactive Effects of Precipitation and Land-use On Microbial Functional Potential Over Different Soil Depth Profiles” at the ASM Microbe 2020 organized by American Society for Microbiology, held at Chicago, USA, 2020 (virtual conference)
5. Contributed an abstract entitled “Detection of stress functional responses in bacterial populations under dry soil conditions show potential microbial mechanisms to resist drought conditions” at the 2020 Annual Meeting organized by The Ecological Society of America, USA, 2020 (virtual conference)
6. Presented a poster entitled “De novo RNA-Seq based transcriptome analysis of *Cryptococcus laurentii* strain RY1 under nitrogen starvation” at the Microbiology in the new Millennium: from Molecules to Communities organized by Bose Institute held at Kolkata, India, 2017
7. Presented a poster entitled “Structural insights into a chitin deacetylase, over-expressing under nitrogen limitation in *Cryptococcus laurentii* strain RY1” at the 11th Asia Pacific Chitin and Chitosan Symposium and 5th Indian Chitin and Chitosan Society Symposium held at Kochi, Kerala, India, 2016
8. Presented a poster entitled “Identification and in silico characterization of a chitin deacetylase gene over-expressing in *Cryptococcus laurentii* strain RY1 in nitrogen limiting condition” at the

9th International Conference on Yeast Biology organized by IISER Kolkata, Jadavpur University, IACS, University of Calcutta and CSIR IICB, India, 2015

9. Contributed an oral presentation and a poster entitled “Insights from Modeling the 3D structure of γ Glutamyl transferase from *Cryptococcus laurentii* strain RY1” at the International Conference on Molecular Biology and its Applications organized by The Department of Life Science & Biotechnology, Jadavpur University, India, 2014

10. Presented a poster entitled “Biochemical and molecular characterization of chitin deacetylase isolated from *Cryptococcus laurentii* strain RY1” at the 27th International Carbohydrate Symposium organized by The International Carbohydrate Organisation, held at Indian Institute of Science, Bangalore, India, 2014

GRANTS AND AWARDS

1. Department of Biotechnology, West Bengal – Grant: Identification of genes involved in the growth of *Cryptococcus laurentii* strain RY1 in nitrogen limiting condition, INR 2,00,000. 2013-2015

2. Winner of The Best Presenter Award for Best Poster at the International Conference on Molecular Biology and its Applications organized by The Department of Life Science & Biotechnology, Jadavpur University, India, 2014

ACADEMIC SERVICE

Reviewed for Journal: RSC Advances; Cell Stress and Chaperons; Journal of Biomolecular Structure & Dynamics; Food Research International; Encyclopedia; Genes; Journal of Scientific Research and Reports; Water; Biomolecules; Asian Journal of Agricultural and Horticultural Research; International Journal of Molecular Sciences; Sustainability; Journal of Pharmaceutical Research International; Archives of Current Research International, Life; Applied Food Research; Agronomy, Biomed.

Research Topic Coordinator: Symbiotic and pathogenic relationships at the fungi-plant interface under environmental constraints, Frontiers in Fungal Biology.

Guest Editor: Special Issue: Vaccines in the 21st Century, Vaccines.

Guest Editor: Special Issue: The Uptake and Transport of Nutrients in Plants, Agronomy.

TECHNICAL SKILLS

Cellular Biology:

- Cell culture: Culturing and maintenance of primary cells, Chromatin Immunoprecipitation Assay.
- Microbiology: Aerobic and anaerobic culturing. Liquid and solid culture of bacteria and yeast, Isolation and identification of important groups of bacteria, yeasts, molds and actinomycetes, screening for amylase and protease producing organisms. Bacteriological analysis of water. Microbiological assay of antibiotics. Biolog Technology. Chemostat.

Biochemistry:

- Western Blot, Northern Blotting, Southern Blotting, (co-) immunoprecipitation, ELISA, Enzymatic Assays, Analysis of proteins by Polyacrylamide Gel Electrophoresis (Native/SDS PAGE).

Whole Genome Sequencing and Transcriptome Sequencing:

- Sequencing and analysis by Nanopore Technology
- Sequence and analysis of Illumina generated raw reads of whole genome and transcriptome from *Papiliotrema laurentii* strain RY1.

Molecular Biology:

- Vectors design: primers design, digestions, ligations.
- Cloning: Transformation, Electroporation. RNA Extraction, Reverse Transcription, PCR, Colony PCR, Real Time PCR, DNA Extraction, DNA Purification, DNA and RNA gel analysis, DNA and RNA quantification, Sanger Sequencing.

Immunology:

- MTT Assay, Trypan Blue Assay, Chromosomal Banding, Immunoelectrophoresis, Immunodiffusion.

Biophysics:

- X-ray Diffraction Powder Diffraction (XRD), Zeta Potential measurements.
- Proteins, DNA, ligand and nucleic acid binding study by spectrophotometer and spectrofluorometer, study of apoptosis and necrosis by fluorescence microscopy.

Spectroscopy:

- Induced Coupled Plasma Optical Emission Spectrometry (ICP-OES), Atomic Absorption Spectroscopy (AAS), Energy-dispersive X-ray Spectroscopy (EDX), Fourier-transform infrared Spectroscopy (FTIR).

Microscopy:

- Transmission Electron Microscopy, Scanning Electron Microscopy, Differential Interference Contrast Microscopy, Fluorescence microscopy.

Bioinformatics:

- Homology modeling, sequence and structural analysis of proteins, phylogenetic analysis, molecular dynamics simulation, *in silico* mutagenesis, molecular docking. Knowledge of bioinformatics analysis skills like Modeller, Chimera, Cytoscape, Amber12, MATLAB, Trinity 2, KEGG Automatic Annotation Server (KAAS), DAVID Functional Annotation Bioinformatics Microarray Analysis, MicroSatellite Identification (MISA) tool, JAVA, C, Python, R.
- 16S and ITS analyses. Metagenomics and analyses of microbiome.

Biological systems working expertise:

- Bacteria, yeast, plant, mouse.

Experience in greenhouse and field:

- Maintained and carried out experiments on *Andropogon gerardii* in both greenhouse and field.