

Rajib Saha

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SUMMARY

My research group known as Systems and Synthetic Biology (SSBio) Laboratory (<https://engineering.unl.edu/ssbio/>) focuses on *the role of modeling/theoretical approaches to design experiments and investigate biotechnological and biomedical issues*. Its major goal is to apply modeling and experimental concepts from Systems and Synthetic Biology to build tools for non-model microbes, microbial communities, and plants for biotechnological and biomedical applications. Topics of interest include:

- (i) Non-model Microbes for Bioproduct Applications
- (ii) Microbial Community and Antibiotic Resistance
- (iii) Systems Biomedicine Applications
- (iv) Integrated Study of Plants for Improved Traits
- (v) Environmental and global health implications of electronic waste and plastic wastes

My research is **extramurally supported by total ~\$4 M grants** from the National Institute of Health (NIH) Outstanding Early Career Investigator (MIRA) R35, National Science Foundation (NSF) CAREER, NSF Molecular and Cellular Biology Grant, NSF EPSCoR Track 1 Grant, Nebraska Soybean Board Grant, Nebraska Ethanol Board Grant, and Nebraska Collaboration Initiative Grants. My research also resulted in **44 publications (41 peer-reviewed journal articles, 1 book chapter, and 2 conference proceedings)** among which 30 journal articles and 1 book chapter were produced after joining UNL.

EDUCATION

PhD, 2014, Chemical Engineering, The Pennsylvania State University, University Park, PA
Dissertation: "Reconstruction and analysis of genome-scale metabolic models of photosynthetic organisms"

M.S., 2011, Chemical Engineering, The Pennsylvania State University, University Park, PA
Thesis: "Reconstruction of a genome-scale metabolic model of maize metabolism"

B.Sc., 2005, Chemical Engineering, Bangladesh University of Engineering & Technology, Bangladesh

PROFESSIONAL APPOINTMENTS

2016 - Assistant Professor, Chemical & Biomolecular Engineering, University of Nebraska Lincoln

2014 - 2016 Postdoctoral Research Fellow, Biology, Washington University in St. Louis

2005-2009 Research Scholar, Chemical and Biomolecular Engineering, National University of Singapore

AWARDS AND HONORS

1. 2021 Society of Industrial Microbiology and Biotechnology (SIMB) Annual Meeting Invited Speaker Travel Grant
2. 2020 Penn State Chemical Engineering Early Career Alumni Award
3. 2020 Distinguished Alumni Lecturer, Department of Chemical Engineering, Bangladesh University of Engineering and Technology, 2020
4. 2018 Society of Industrial Microbiology and Biotechnology (SIMB) Annual Meeting Invited Speaker Travel Grant
5. 2017 American Indian Society of Engineering and Science (AISES) National Meeting travel grant for early career faculty member
6. 2014 NSF N2 Kick-off Meeting Student Travel Grant
7. 2012 Genomic Sciences Meeting Student Travel Grant by Department of Energy (DOE)
8. 2005 Bangladesh Prime Minister's Gold Medal, 'Dr. Ali Karim Gold Medal', and 'Engineers' 6064 Gold Medal'

Research Funding

Summary of Research Funding:

Funding Category	Total	Saha's Share
External sources	\$4,010,049	\$3,328,855
Internal sources	\$1,105,000	\$535,000
Total Funded Research	\$5,115,049	\$3,863,855

PUBLICATIONS

Publication Types and Numbers: Total **published/in-review works** including **41 peer-reviewed journal articles**, 1 book chapter, and 2 peer-reviewed conference papers.

Peer-Reviewed Journal Articles:

41 Published/In-Review (**30 after joining UNL in 2016**).

[Google Scholar Link](#), Total Citations: 1212, h-index: 14, i10-index: 15.

Select Journal Articles

1. Alqarzaee, A.A., Chaudhari, S.S., Islam, M.M., Kumar, V., Zimmerman, M.C., Saha, R., Bayles, K.W., Frees, D, and Thomas, V.C., Staphylococcal ClpXP protease targets the cellular antioxidant system to eliminate fitness-compromised cells in stationary phase, *PNAS*, 118 (47) e2109671118, doi: <https://doi.org/10.1073/pnas.2109671111>.
2. Chowdhury, N.B., Schroeder, W.L., Sarkar, Debolina, Amiour, N., Quiller, I., Hirel, Bertrand, Maranas, C.D., and Saha, R. (2021), Dissecting the Metabolic Reprogramming of Maize Root under Nitrogen Limiting Stress Condition, *J Exp Bot*, erab435, doi: <https://doi.org/10.1093/jxb/erab435>.
3. Alsiyabi, A., Brown, B., Immethun, C., Wilkins, M., and Saha, R. (2021), Synergistic Experimental and Computational Approach Identifies Novel Strategies for Polyhydroxybutyrate Overproduction, *Met Eng*, doi: <https://doi.org/10.1016/j.ymben.2021.08.008>.
4. Schroeder, W., Baber, A., and Saha, R. (2021), Optimization-based Eukaryotic Genetic Circuit Design (EuGeneCiD) and modeling (EuGeneCiM) tools: Computational approach to synthetic biology, *iScience*, 24(9), doi: <https://doi.org/10.1016/j.isci.2021.103000>.

5. Schroeder., W., Baber, A., and **Saha, R.** (2021), Using EuGeneCiD and EuGeneCiM Computational Tools for Synthetic Biology, *STAR Prot*, 2(4), doi: <https://doi.org/10.1016/j.xpro.2021.100820>.
6. Alsiyabi, A, Stroh, S., and **Saha, R.** (2021), Investigating the Effect of E30 Fuel on Long Term Vehicle Performance, Adaptability and Economic Feasibility, *Fuel*, 306, 121629, doi: <https://doi.org/10.1016/j.fuel.2021.121629>.
7. Alsiyabi, A, Chowdhury, N.B., Long, D., and **Saha, R.** (2021), Enhancing in silico Strain Design Predictions Through Next Generation Metabolic Modeling Approaches, *Biotech Adv*, 107806, doi: <https://doi.org/10.1016/j.biotechadv.2021.107806>.
8. Islam, M. M., Schroeder, L. W., and **Saha, R.** (2021), Kinetic Modeling of Metabolism: Present and Future, *Curr Op Sys Biol*, 26, 72-78, doi: <https://doi.org/10.1016/j.coisb.2021.04.003>.
9. Long, D., Immethun, C., Vallecilla-Yepe, L., Wilkins, M., and **Saha, R.** (2021), One Step Forward, Two Steps Back: Transcriptional Advancements and Fermentation Phenomena in *Actinobacillus succinogenes* 130Z, *PLOS One*, 16(5): e0245407, doi: <https://doi.org/10.1371/journal.pone.0245407>.
10. Alsiyabi, A, Solis, A.G., Cahoon, E., and **Saha, R.** (2021), Dissecting the Regulatory Roles of ORM Proteins in the Sphingolipid Pathway of Plants, *PLOS Comp Biol*, 17 (1), e1008284, doi: <https://doi.org/10.1371/journal.pcbi.1008284>.
11. Zamani, E., Johnson, T. J., Chatterjee, S., Immethun, C., Sarella, A., **Saha, R.**, and Dishari, S. K. (2020), Cationic π -Conjugated Polyelectrolyte Shows Antimicrobial Activity by Causing Lipid Loss and Lowering Elastic Modulus of Bacteria, *ACS App Mat Int*, 12, 44, 49346-49361, doi: <https://doi.org/10.1021/acsami.0c12038>.
12. Schroeder., W., and **Saha, R.** (2020), Introducing an Optimization- and explicit Runge-Kutta- based Approach to Perform Dynamic Flux Balance Analysis, *Sci Rep*, 10: 9241, doi: <https://doi.org/10.1038/s41598-020-65457-4>.
13. Islam, M. M., Sandhu, J., Walia, H., and **Saha, R.** (2020), Transcriptomic Data-Driven Discovery of Global Regulatory Features of Rice Seeds Developing under Heat Stress, *Comp Struct Biotech J*, 18:2556-2567, doi: <https://doi.org/10.1016/j.csbj.2020.09.022>.
14. Islam, M. M., Le, T., Daggumati, S. R., and **Saha, R.** (2020), Investigation of microbial community interactions between lake Washington methanotrophs using genome-scale metabolic modeling, *PeerJ*, 8:e9464, doi: <https://doi.org/10.7717/peerj.9464>.
15. Schroeder., W., and **Saha, R.** (2020), Computation-Driven Analysis of Model Polyextremotolerant Fungus *Exophiala dermatitidis*: Defensive Pigment Metabolic Costs and Human Applications, *iScience*, 23:100980, doi: <https://doi.org/10.1016/j.isci.2020.100980>.
16. Brown, B., Immethun, C., Wilkins, M., and **Saha, R.** (2020), *Rhodospseudomonas palustris* CGA009 polyhydroxybutyrate production from a lignin aromatic and quantification via flow cytometry, *Bio Tech Rep*, 11:1000474, doi: <https://doi.org/10.1016/j.biteb.2020.100474>.
17. Schroeder., W., and **Saha, R.** (2020), Protocol for Genome-scale Reconstruction and Melanogenesis Analysis of *Exophiala dermatitidis*, *STAR Prot*, doi: [10.1016/j.xpro.2020.100105](https://doi.org/10.1016/j.xpro.2020.100105).
18. Schoreder, W., **Saha, R.** (2020), OptFill: A Tool for Infeasible Cycle-Free Gapfilling of Stoichiometric Metabolic Models, *iScience*, doi: <https://doi.org/10.1016/j.isci.2019.100783>.
19. Islam, M. M., Thomas, V. C., Beek, M. V., Ahn, J. S., Alqarzaee, A. A., Zhou, C., Fey, P. D., Bayles, K. W., **Saha, R.** (2020), An integrated computational and experimental study to elucidate *Staphylococcus aureus* metabolism, *npj Systems Biology and Applications*, 6, 3, doi: <https://doi.org/10.1038/s41540-019-0122-3>.

20. Islam, M. M., Fernando, S., **Saha, R.** (2019), Metabolic Modeling Elucidates the Transactions in the Rumen Microbiome and the Shifts upon Virome Interactions, *Frontiers in Microbiology*, 10, 2412, doi: <https://doi.org/10.3389/fmicb.2019.02412>.
21. Alsiyabi, A., Immethun, C., **Saha, R.** (2019), Modeling the Interplay between Photosynthesis, CO₂ Fixation, and the Quinone Pool in a Purple Non-Sulfur Bacterium, *Scientific Reports*, 9, 12638, doi: <https://doi.org/10.1038/s41598-019-49079-z>.
22. Zamani, E., Chatterjee, S., Changa, T., Immethun, C., Sarella, A., **Saha, R.**, Dishari, S.K. (2019), Mechanistic Understanding of Interactions of Cationic Conjugated Oligo- and Polyelectrolytes with Wild-type and Ampicillin-resistant *Escherichia coli*, *Scientific Reports*, 9, 20411, doi: <https://doi.org/10.1038/s41598-019-56946-2>.
23. CM Immethun, T Daher, and **R Saha** (2019), Applying Blended Learning Techniques: Perspectives from Chemical Engineering Computation, *Chemical Engineering Education* (invited paper).
24. MM Islam, AA Siyabi, **R Saha**, and Toshihiro Obata, Dissecting Metabolic Flux in C₄ plants - Experimental and Theoretical Approaches (2018), *Phytochemistry Reviews* (invited paper), doi: <https://doi.org/10.1007/s11101-018-9579-8>.

INVITED TALKS AND CONFERENCE PRESENTATIONS

Select Invited Talks

1. **Rajib Saha**, "Modeling and Omics-Data Integration in Context of Biological Systems", **AICHE 2021 Fall Meeting**, Boston, MA, NOV 07-11, 2021.
2. **Rajib Saha**, "Model-guided Analysis of Biological Systems", **LSU**, Oct 29, 2021.
3. **Rajib Saha**, "Systems Biomedicine and its Applications", **UNMC**, Oct 22, 2021.
4. **Rajib Saha**, "Model-guided Analysis of Biological Systems", **Washington University in St. Louis**, Sep 17, 2021.
5. **Rajib Saha**, "Model-guided Design Strategies for Bioplastic Overproduction in *Rhodospseudomonas palustris*", **SIMB 2021**, Austin, TX, Aug 08-11, 2021.
6. **Rajib Saha**, "Metabolic Modeling and 'Omics' Data Exploration to Tackle Real World Problem", Department of Biological Sciences, **Rensselaer Polytechnic Institute**, Mar 01, 2021.
7. **Rajib Saha**, "Metabolic Modeling and 'Omics' Data Exploration in the Context of Systems Biology", Department of Chemical Engineering, **Colorado State University**, Feb 25, 2021.
8. **Rajib Saha**, "Fundamentals of Systems and Synthetic Biology", Distinguished Alumni Speaker Series, Department of Chemical Engineering, **Bangladesh University of Engineering & Technology**, Oct 3, 2020.
9. **Rajib Saha**, "Metabolic Modeling and 'Omics' Data Exploration in the Context of Systems Biology", Keynote Speech at The Graduate Student Symposium, Department of Chemical Engineering, **Penn State University**, Sep 18, 2020.
10. **Rajib Saha**, "Metabolic Modeling and 'Omics' Data Exploration in the Context of Systems Biology", Tim Taylor Department of Chemical Engineering, **Kansas State University**, Sep 9, 2020.
11. **Rajib Saha**, "Metabolic Modeling and 'Omics' Data Integration in the Context of Plant Systems Biology", **Agronomy & Horticulture Seminar**, **University of Nebraska-Lincoln**, November 22, 2019.

12. Cheryl Immethun, Adil Alsiabi, and **Rajib Saha**, *Rhodopseudomonas palustris*: Toward building a bioproduction platform, **SIMB Annual Meeting**, Chicago, IL (Jul 21-24, 2018)
13. **Rajib Saha**, Maize metabolic models: from model building to ‘omics’ data integration and answering important biological questions, **ISU Research Symposium: Future Directions in Maize Kernel Biology**, Ames, IA (June 5-6, 2017)

RESEARCH STUDENT ADVISEMENT

- Graduated 3 PhD and 1 MS students
- Currently supervising 5 PhD students
- Supervised 18 undergraduate students in addition to 11 NSF REU and high school students thus far.

TEACHING

Students achieved **two national** fellowships and **sixteen university** fellowships/recognition, and a postdoctoral fellow was awarded **USDA NIFA Postdoctoral Fellowship**.