

RAJIB SAHA

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EDUCATION

The Pennsylvania State University August 2014
PhD, Chemical Engineering
Dept. of Chemical Engineering
Advisor: Dr. Costas D. Maranas
Thesis: Reconstruction and analysis of genome-scale metabolic models of photosynthetic organisms

The Pennsylvania State University May 2011
Master of Science, Chemical Engineering
Dept. of Chemical Engineering
Advisor: Dr. Costas D. Maranas
Thesis: Reconstruction of a genome-scale metabolic model of maize metabolism

Bangladesh University of Engineering and Technology June 2005
Bachelor of Science (Chemical Engineering)
Dept. of Chemical Engineering

PROFESSIONAL AND RESEARCH EXPERIENCE

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

2014 - 2016 Postdoctoral Research Fellow
Department of Biology, Washington University in St. Louis
Advisor: Dr. Himadri B. Pakrasi

2009-2014 Graduate Research Assistant
Department of Chemical Engineering, The Pennsylvania State University

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

RESEARCH INTERESTS

1. Reconstruction and analysis of genome-scale and community models
2. Systems-level analysis of 'omics' data
3. Development of genetic toolkit and engineering metabolic pathways
4. Redesign photosynthetic apparatus and carbon fixing mechanism

SUMMARY OF RECORDS

Journal articles: **11** published (6 first- and 5 co-authored)

Conference papers: **2**

Conference presentations: **10**

Collaboration: Led collaboration across Chemical Engineering, Biology, and Plant Biology in three different (two from the USA and one from France) institutions

Proposal writing: 8+ years of experience in proposal writing with PhD and Postdoctoral advisors

PEER REVIEWED PUBLICATIONS (Citations: **358**; h-index: **8**; i-10 index: **8**, as in August 2016)

(* indicates authors with equal contribution.)

1. **Saha, R.***, Liu, D.*, O'Connor, A.G., Liberton, M., Yu, J., Bhattacharyya, M., Balassy, A., Zhang, F., Moon, T.S., Maranas, C.D. and Pakrasi, H.B. (2016), "Diurnal Regulation of Cellular Processes in the Cyanobacterium *Synechocystis* sp. PCC 6803: Insights from Transcriptomic, Fluxomic and Physiological Analyses", *mBio*, **7(3)**, e00464-16.
2. Liberton, M.*, **Saha, R.***, Jacobs, J. M.*, Nguyen, A.Y., Chrisler, W.B., Gritsenko, M.A., Smith, R.D., Koppenaal, D.W. and Pakrasi, H.B. (2016), "Proteomics analysis of isolated plasma membrane and thylakoid membrane from *Synechocystis* sp. PCC 6803", *Molecular and Cellular Proteomics*, **15(6)**, 2021-2032.
3. Berla, B.M., **Saha, R.**, Maranas, C.D. and Pakrasi, H.B. (2015), "Cyanobacterial Alkanes Modulate Photosynthetic Cyclic Electron Flow to Assist Growth under Cold Stress", *Nature Scientific Reports*, **5**, doi: 10.1038/srep14894.
4. Simons, M.*, **Saha, R.***, Amiour, N., Kumar, A., Guillard, L., Clément, G., Miquel, M., Zheni, L., Mouille, G., Hirel, B. and Costas D. Maranas (2014), "Assessing the Metabolic Impact of Nitrogen Availability using a Compartmentalized Maize Leaf Genome-Scale Model", *Plant Physiology*, **166**: 1659-1674.
5. Simons, M, **Saha, R.**, Guillard, L., Clement, G., Armengaud, P., Canas, R, Maranas, C.D., Lea, P.J. and B. Hirel (2014), "Nitrogen-use efficiency in maize (*Zea mays* L.): from 'omics' studies to metabolic modelling", *Journal of Experimental Botany*, doi: 10.1093/jxb/eru227.
6. **Saha, R.***, Chowdhury, A.* and C.D. Maranas (2014), "Recent advances in the reconstruction of metabolic models and integration of omics data", *Current Opinion in Biotechnology*, **29**, 39-45.
7. Berla, B.M., **Saha, R.**, Immethun, C.D., Maranas, C.D., Moon, T.S. and Pakrasi, H.B. (2013), "Synthetic biology of cyanobacteria: unique challenges and opportunities", *Frontiers in Microbiology*, **4**.
8. **Saha, R.**, A.T. Verseput, B.M. Berla, T.J. Mueller, H.B. Pakrasi and C.D. Maranas (2012), "Reconstruction and comparison of the metabolic potential of cyanobacteria *Cyanothece* sp. ATCC 51142 and *Synechocystis* sp. PCC 6803," *PLoS ONE*, **7(10)**: e48285.
9. **Saha, R.**, P.F. Suthers and C.D. Maranas (2011), "Zea mays iRS1563: A Comprehensive Genome-Scale Metabolic Reconstruction of Maize Metabolism.," *PLoS ONE*, **6(7)**: e21784.
10. Lee, D.Y., **Saha, R.**, Khan, Y.F.N., Park, W. and Karimi, I.A. (2009), "Web-based applications for building, managing and analyzing kinetic models of biological systems", *Briefings in Bioinformatics*, **10(1)**: 65-74.
11. Ahn, J., Lee, H., **Saha, R.**, Park, M., Jung, J-K and Lee, D.Y. (2008), "Exploring the effects of carbon sources on the metabolic capacity for shikimic acid production in

Escherichia coli using in silico metabolic predictions”, *Journal of microbiology and biotechnology*, **18**(11): 1773-1784.

PEER REVIEWED CONFERENCE PROCEEDINGS

1. **Saha, R.**, Suresh, S., Park, W., Lee, D.Y. and Karimi, I.A., “Microbial fuel cell in perspective of strain improvement and mediator selection”, Joint third AOHUPO and fourth structural biology and functional genomics conference, 2006, pp 290.
2. **Saha, R.**, Park, W, Lee., D.Y. and Karimi, I.A., “Comparison on web-based simulation tools of biochemical and cellular model in systems biology”, International conference on modeling in chemical and biological engineering sciences, 2006, pp. 10.

SELECTED ORAL PRESENTATIONS

1. **Saha, R.**, Liu, D., Hoynes-O’Connor, A.G., Liberton, M., Yu, J., Bhattacharyya, M., Balassy, A., Moon, T.S., Maranas, C.D., Pakrasi, H.B., “*Synechocystis* Sp. PCC 6803: Light Plus Endogenous Regulation Governing Gene Expression Patterns in the Diurnal Cycle”, AIChE annual meeting, Salt Lake City, UT, Nov 8-13, 2015.
2. **Saha, R.**, Berla, B.M., Pakrasi, H.B. and Maranas, C.D., “Computations-driven optimization of alkane production in *Synechocystis* sp. PCC 6803”, AIChE annual meeting, Atlanta, GA, Nov 16-21, 2014.
3. **Saha, R.**, Simons, M., Kumar, A., Guillard, L., Hirel, B and Maranas, C.D., “Towards multi-tissue type metabolic modeling of maize”, AIChE annual meeting, San Francisco, CA, Nov 3-8, 2013.
4. **Saha, R.**, Berla, B.M., Mueller, T.J., Welkie, D.J., Sherman, L., Pakrasi, H.B. and Maranas, C.D., “Comparative genome-scale modeling of the metabolic potential of cyanobacteria *Cyanothece* sp. ATCC 51142 and *Synechocystis* sp. PCC6803”, 11th workshop on cyanobacteria, St. Louis, MO, Aug 7-11, 2013.
5. **Saha, R.**, Verseput, A.T., Mueller, T.J. and Maranas, C.D., “Contrasting the metabolic capabilities of cyanobacterial strains for assessing bio-production platform selection”, AIChE annual meeting, Pittsburgh, PA, Oct 28-Nov 2, 2012.
6. **Saha, R.**, Berla, B.M., Mueller, T.J., Elvitigala, T., Page, L.E., Pakrasi, H.B. and Maranas, C.D., “Contrasting the metabolic capabilities of cyanobacterial species for assessing bio-production platform selection”, ACS annual meeting, San Diego, CA, Mar 25-29, 2012.
7. **Saha, R.**, Berla, B.M., Elvitigala, T., Page, L.E., Pakrasi, H.B. and Maranas, C.D., “Contrasting the Metabolic Capabilities of Multiple Cyanobacterial Species”, AIChE annual meeting, Minneapolis, MN, Oct 16-21, 2011.
8. **Saha, R.**, Suthers, P.F. and Maranas, C.D., “Towards Genome-Scale Metabolic Reconstruction of Plant Metabolism”, AIChE annual meeting, Salt Lake City, UT, Nov 7-14, 2010.
9. **Saha, R.**, Park, W, Lee, D.Y. and Karimi, D.Y., “Comparison on web-based simulation tools of biochemical and cellular model in systems biology”, International conference on modeling in chemical and biological engineering sciences, Bangkok, Oct 25-27, 2006.

SELECTED POSTER PRESENTATIONS

1. Yu, J., **Saha, R.**, Berla, B.M., Mueller, T.J., Kumar, A., Simons, M., Khodayari, A., Whitney Hollinshead, W., Abernathy, M., He, L., Tang, Y.J., Maranas, C.D., Pakrasi, H.B., “Systems Level Study of a Novel Fast-Growing Cyanobacterial Strain for Next-Generation Biofuel Production”, DOE genomic sciences meeting, Tysons, VA, Feb 22-25, 2015.
2. **Saha, R.**, Simons, M., Kumar, A., Guillard, L., Hirel, B and Maranas, C.D., “Assessing the Metabolic Impact of Nitrogen Availability using a Compartmentalized Maize Leaf Genome-Scale Model”, 3rd COBRA meeting, Winter Green, VA, May 20-23, 2014.

3. **Saha, R.**, Simons, M., Islam, M.M., Zomorodi, A.R., Hirel, B and Maranas, C.D., “Metabolic modeling of multi tissue and multi organism systems”, DOE genomic sciences meeting, Crystal City, VA, Feb 10-12, 2014.
4. **Saha, R.**, Mueller, T.J., Berla, B.M., Pakrasi, B.M. and Marans, C.D., “Construction of metabolic models for a family of cyanobacteria”, DOE genomic sciences meeting, Bethesda, MD, Feb 24-27, 2013.
5. **Saha, R.**, Berla, B.M., Mueller, T.J., Elvitigala, T., Page, L.E., Pakrasi, H.B. and Maranas, C.D., “Contrasting the metabolic capabilities of *Cyanothece* sp. ATCC 51142 and *Synechocystis* sp. PCC6803”, DOE genomic sciences meeting, Bethesda, MD, Feb 26-29, 2012.
6. **Saha, R.**, Suthers, P.F. and Maranas, C.D., "Zea mays *i*RS1563: A Comprehensive Genome-Scale Metabolic Reconstruction of Maize Metabolism”, DOE genomic sciences meeting, Crystal City, VA, Apr 10-13, 2011.
7. **Saha, R.**, Suresh, S., Park, W., Lee, D.Y. and Karimi, I.A., “Microbial fuel cell in perspective of strain improvement and mediator selection”, Joint third AOHUPO and fourth structural biology and functional genomics conference, Singapore, Dec 4-7, 2006.
8. **Saha, R.**, Park, W, Lee., D.Y. and Karimi, D.Y., “Comparison on web-based simulation tools of biochemical and cellular model in systems biology”, Annual graduate students’ symposium, NUS, Singapore, Sep 24, 2006.

JOURNAL REVIEWING EXPERIENCE

Metabolic Engineering, BMC Genomics, Biotechnology for Biofuels, Computational and Structural Biotechnology Journal, and PLoS Computational Biology

GRANT WRITING EXPERIENCE

1. “A Systems-Level Integrated Study on the Factors Affecting Fast Growth in Cyanobacteria” funded by the **ISPIRE** program of **NSF**, PI: **Himadri Pakrasi**, 2015.
2. “Designing Nitrogen Fixing Ability in Oxygenic Photosynthetic Cells” funded by **NSF**, PI: **Himadri Pakrasi**, 2013.
3. “Development of a Knowledgebase (MetRxn) of Metabolites, Reactions and Atom Mappings to Accelerate Discovery and Redesign” funded by the **Genomic Sciences** program of **DOE**, PI: **Costas D. Maranas**, 2012.
4. “Use of Systems Biology Approaches to Develop Advanced Biofuel-Synthesizing Cyanobacterial Strains” funded by the **Genomic Sciences** program of **DOE**, PI: **Himadri Pakrasi**, 2011.
5. “Microbial Fuel for Clean Energy” funded by **NRF** (National Research Foundation, Singapore), PI: **I. A. Karimi**, 2007.

TEACHING EXPERIENCE

1. Mathematical modeling of Chemical Engineering (ChE 360)
The Pennsylvania State University, Spring 2012
2. Optimization of Chemical Processes (CN 5111)
National University of Singapore, Fall 2008
3. Chemical Engineering Design 1 (CN 4119)
National University of Singapore, Fall 2007
4. Process control lab for the junior undergraduate students
National University of Singapore, Fall 2006

STUDENT MENTORING EXPERIENCE (UNDERGRADUATE AND GRADUATE ROTATION)

1. Fall 2015
Michael Wilkinson (Graduate Rotation Student), Genetics, Washington University in St. Louis, MO
Project: Explore Different Phage Promoter-Polymerase Combinations for Tighter Gene Expression Control
2. Summer 2014
Brandon T Nicklas (Junior), Chemical Engineering, Penn State, PA
Project: Computational Analysis on the Minimal Nitrogen Fixing Cluster in Diazotrophic Cyanobacteria
3. Summer 2011- Fall 2012
Thomas J Mueller (Senior), Chemical Engineering, Penn State, PA
Project: Developing a Computational Pipeline to Reconstruct Genome-Scale Models of Closely Related Cyanobacterial Strains
4. Spring 2007-Fall 2008
Linda Ng (Junior), Chemical and Biomolecular Engineering, NUS, Singapore
Project: Metabolite Essentiality Analysis to Design Efficient Microbes
5. Spring 2006-Fall 2007
Huang Shuo (Junior), Chemical and Biomolecular Engineering, NUS, Singapore
Project: *In silico* Analysis of Various Carbon Sources and their Energy Demands in *E. coli*

AWARDS AND HONORS

2014 NSF N₂ Kick-off Meeting Student Travel Grant

2012 Genomic Sciences Meeting Student Travel Grant by Department of Energy

Prime Minister's Gold Medal, '*Dr. Ali Karim Gold Medal*', and '*Engineers' 6064 Gold Medal*' for topping the graduating class in the faculty of engineering, Bangladesh University of Engineering and Technology

Dean's Scholarship (2001-2005) of Bangladesh University of Engineering and Technology

PROFESSIONAL AFFILIATION

American Institute of Chemical Engineers (AIChE), Society of Biological Engineering (SBE), International Metabolic Engineering Society (MES), American Chemical Society (ACS), and American Society of Plant Biologists (ASPB).

OTHER ORGANIZATIONAL ACTIVITIES

1. Served as the founding President of Bangladesh Student Association, The Pennsylvania State University (2012-2013)
2. Served as the President of Chemical and Biomolecular Engineering Graduate Student Association, National University of Singapore (2007-2008)
3. Served as the head of the organizing committee of ChemBio Engineering Graduate Student Symposium, National University of Singapore (2008)

COURSE WORK AND TECHNICAL SKILLS

1. Graduate coursework includes:

Optimization in Chemical Engineering, Optimization Modeling and Methods, Bioinformatics, Computational Systems Biology, Applied Statistics, Regression Analysis, Advanced Reaction Engineering, Mathematical Methods in Chemical

Engineering, Advanced Process Control, Computer Aided Chemical Engineering, Advanced Thermodynamics.

2. Undergraduate coursework includes:

Engineering Economics and Management, Corrosion Engineering, Process Design, Refinery Technology, Biochemical Engineering, Mass Transfer, Particle Technology, Process Control, Unit operations, Mathematical Methods, Heat Transfer, Fluid Mechanics, Solid Mechanics, Vector Mechanics, Electronics and Machines, Circuit Analysis, Economics, English, Accounting, Physical Chemistry, Inorganic Chemistry, Organic Chemistry, Material Balance, Transport Phenomena, Thermodynamics

3. Extensive familiarity with Python, GAMS, and Matlab.
4. Statistical (i.e., R and Minitab) and plasmid design (i.e., Snapgene and Geneious) packages.
5. Molecular Biology/Synthetic Biology techniques.