

Troy Anthony Brier

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Education

Ph.D. Chemistry, August 2017 - present

Advisor: Professor Zaida Luthey-Schulten

University of Illinois at Urbana-Champaign (UIUC), Champaign, IL

Bachelor of Science: Chemistry ACS certified with research, August 2013 - May 2017

Advisor: Professor Joseph L. Baker

The College of New Jersey (TCNJ), Ewing, NJ

Honors and Awards

Young Scholars Outstanding Mentor Awardee, UIUC	Summer 2018
Alfred P. Sloan Fellow, UIUC	Fall 2017
Rodger Adams Fellow, UIUC	Fall 2017
Hannum Fellow, UIUC	Fall 2017
Goodkin Physical Chemistry Awardee, TCNJ	Spring 2017
Research Experience for Undergraduate (REU), Colorado State University	Summer 2016
Mentored Undergraduate Summer Experience (MUSE), TCNJ	Summer 2015
TCNJ Chairman of the Board Scholar, TCNJ	All Semesters

Publications

Zane R. Thornburg, David Bianchi, Troy A. Brier, Benjamin R. Gilbert, Tyler M. Earnest, Marcelo CR Melo, Nataliya Safronova, James P. Sáenz, Andras T. Cook, Kim S. Wise, Clyde A. Hutchison III, Hamilton O. Smith, John I. Glass, Zaida Luthey-Schulten. Fundamental behaviors emerge from simulations of a living minimal cell. *Cell*. 2022.

Zane R. Thornburg, Marcelo C.R. Melo, David Bianchi, Troy A. Brier, Cole Crotty, Marian Breuer, Hamilton O. Smith, Clyde A. Hutchison III, John I. Glass, Zaida Luthey-Schulten. Kinetic Modelling of the Genetic Information Processes in a Minimal Cell. *Front Mol Biosci*. 2019.

David M. Bianchi*, Troy A. Brier*, Anustup Poddar, Muhammad S. Azam, Carin K. Vanderpool, Taekjip Ha, Zaida Luthey-Schulten. Stochastic analysis demonstrates the dual role of Hfq in chaperoning *E. coli* sugar shock. *Front Mol Biosci*. 2020.

Presentations

Troy A Brier, Pratap Venepally, John I. Glass, Zaida Luthey-Schulten. Towards deciphering the influence of genome architecture in a minimized bacterial genome. Seminar presented at the annual International Physics of Living Systems Meeting in Montpellier, France, June 2022.

Troy A Brier, Pratap Venepally, John I. Glass, Zaida Luthey-Schulten. Deciphering the influence of genome architecture in a minimized bacterial genome. Seminar presented at the annual American Physical Society Meeting in Chicago, IL, March 2022.

Troy A. Brier, Pratap Venepally, John I. Glass, Zaida Luthey-Schulten. Genome architecture in Syn1.0 and the minimal cell, Syn3A. Seminar presented virtually for the JCVI Minimal Cell Workshop 2021, Virtual 2021.

Troy A Brier, David M. Bianchi, Zane R. Thornburg, Marcelo Melo, Marian Breuer, Hamilton O. Smith, Clyde A. Hutchison III, Kim S. Wise, John I. Glass, Zaida Luthey-Schulten. Modelling the Nucleotide Metabolic Network of a Genetically Minimal Cell. Poster presented at the annual Biophysical Society Meeting in San Deigo, CA, February 2020.

Troy A. Brier, David M. Bianchi, Anustup Poddar, Muhammad S. Azam, Carin K. Vanderpool, Taekjip Ha, Zaida Luthey-Schulten. Modeling the impact of point mutations on the regulatory potency of the small RNA SgrS. Poster presented at the annual Biophysical Society Meeting in Baltimore, MD, March, 2019.

Troy A. Brier, Peter T. Lake, and Martin McCullagh. Developing a method to identify ligand binding sites in proteins using molecular dynamics. Poster presented at Colorado State University Research for Undergraduates Experience poster session in Fort Collins, CO, August 2016.

Troy A. Brier and Joseph L. Baker. Molecular simulations of type IV pilin subunits from three organisms in a lipid. Poster presentation delivered at the American Chemical Society meeting in San Diego, CA, March, 2016.

Troy A. Brier and Joseph L. Baker. Stabilizing effect of a bacterial lipid membrane on type IV pilin subunits. Poster presentation delivered at the Mentored Undergraduate Summer Experience poster session hosted at TCNJ in Ewing, NJ, September, 2015.

Research Experience

Graduate Research Assistant, UIUC

Spring 2018 - present

Work in the Luthey-Schulten Group constructing a doctoral thesis related to whole-cell modelling. Developing a kinetic model for the regulation of *pstG* mRNA via SgrS in *Escherichia coli* using stochastic whole-cell simulations. Involved in additional work constructing a metabolic network for the nucleotide metabolism of a minimal cell genome. This work is a part of a larger project to develop a whole-cell model of the

all cellular processes in the minimized genome bacterium. Hosted numerous meetings with collaborators at JCVI, JHU, and UIUC presenting results and proposing new experiments.

Undergraduate Researcher, TCNJ

Fall 2015 – Spring 2017

Worked in the Baker Biomolecular and Baker Biomolecular Modeling and Simulation Group as a part of BS chemistry degree. Investigated individual and multi type IV pilin subunit dynamics and aggregation in a membrane environment using atomistic and MARTINI coarse grained molecular dynamics simulations.

REU Researcher, Colorado State University

Summer 2016

Worked in the McCullagh Group for a ten week program consistent of a two week computational chemistry course and a eight week research period. Developed a method using molecular dynamics to identify binding pockets in a given protein based on a specified ligand.

MUSE Researcher, TCNJ

Summer 2015

Worked in the Baker Biomolecular Modeling and Simulation Group for an eight week program. Investigated the effect membrane environments have on type IV pilin subunits from *Neisseria gonorrhoeae* and *Pseudomonas aeruginosa* using atomistic molecular dynamics simulations.

Teaching Experience

Graduate Teaching Assistant (TA), UIUC

Fall 2017 – Fall 2019

Instrumental Analysis Laboratory (Undergraduate level)
Statistical Thermodynamics (Graduate level)

Center for the Physics of Living Cells (CPLC) Summer School TA

Summer 2019

Served as a teaching assistant for summer school hosted by the CPLC. Graduate students and post-doctoral associates from different schools visit the UIUC to learn new techniques. With fellow collaborators, instructed the students on how to perform super resolution imaging experiments and combine the data with computational techniques.

Math and Science Tutor, TCNJ

Fall 2014 – Spring 2017

Tutored fellow students in Calculus I, General Chemistry I, General Chemistry II, Physics 201, Computer Programming I (Java) through the tutoring center. My objective was to provide students with the tools necessary to succeed in their respective courses.

Additional Experience

Sloan Mini-Conference

Winter 2018 - present

Attended a professional development, networking, and research poster session event for the Sloan fellows through the University Center of Exemplary Mentoring. Learned about

graduate studies planning along with incorporating diversity at the graduate level. Hosted at the UIUC. Attended January, 2018, 2019, and 2020.

Google Chicago PhD Summit Participant

Fall 2019

Accepted and attended an event highlighting opportunities at Google for PhD recipients in computer science related fields.

Poster Judge for ACS Undergrad Conference

Fall 2019

Served as a graduate student judge for the ACS Undergraduate conference held at the University of Illinois at Urbana-Champaign

Young Scholars Summer Research Program Mentor Facilitator

Summer 2019

Served in more senior role in the Young Scholars Summer Research program this time working with other mentors and their students to provide support throughout the program. Advised two sets of mentor-mentee pairs throughout the program.

Physical Chemistry Student Seminar Selection Committee Member

Fall 2018 – Fall 2019

Served on panel of students responsible for choosing and hosting guest speakers. Presented brief research presentations to visiting faculty during lunch with fellow committee members.

Institute on Teaching and Mentoring Conference

Fall 2018

Attended a multi-day event focused on spreading research, networking, and mentoring/teaching targeted towards under-represented graduate students. Learned strategies for success at the graduate student level but also in roles as faculty members. Hosted by Alfred P. Sloan Foundation. Attended October 2018.

Young Scholars Summer Research Program Mentor

Summer 2018

Mentored a student from a local area high school student through an eight week research program tailored to teach roughly 30 students about research and the skills necessary to be a productive scientist. Advised the student on a project, which culminated in a poster presentation at the end of the program. Recognized for as an “outstanding mentor” by the program. Hosted at UIUC.

Encouraging Tomorrows Chemist (ETC) Member

Spring 2018

Performed demos for local middle school students with other graduate student in ETC at UIUC. Focused on promoting science to youth and teaching them about basic concepts such as luminescence. Hosted at UIUC.