Ryan Patrick Bradley, Ph.D.

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EDUCATION

UNIVERSITY OF PENNSYLVANIA

2009 – 2016 | Ph.D. in Chemical and Biomolecular Engineering

PENNSYLVANIA STATE UNIVERSITY

2006 – 2009 | B.S. in Chemical Engineering
2006 – 2009 | B.S. in Mathematics with Honors

EMPLOYMENT

2018 – 2019 | Senior Research Associate
2016 – 2018 | Post-Doctoral Researcher, advised by Profs. Paul A. Janmey and Ravi Radhakrishnan
University of Pennsylvania, Department of Chemical and Biomolecular Engineering

Multiscale and molecular modeling of protein, bilayer, and polysaccharide systems in order to understand the role of membranes in cell morphological changes, cell signaling processes, and drug delivery applications. Development of software tools for high-throughput simulations.

2018 – Present | Software Engineer
Johns Hopkins University, Maryland Advanced Research Computing Center (**MARCC**)

Maintained the software stack on the Blue Crab supercomputer.
Facilitated user support via code review, debugging, and consultation.
Co-authored a tool called "**Community Collections**" which seamlessly serves containers to researchers on HPC systems and facilitates sharing between institutions.
Provided development assistance for "**Crædl**", a research-oriented data management tool.
Performed a diverse set of systems administration, benchmarking, troubleshooting, and research facilitation tasks necessary to ensure the efficient operation of a large, multi-tenant high-performance computing (HPC) facility.

RESEARCH

2009 – 2016 | Ph.D. Candidate, advised by Prof. Ravi Radhakrishnan
University of Pennsylvania, Department of Chemical and Biomolecular Engineering

Developed multi-scale models of the molecular biophysics of membrane-interacting proteins in order to understand the physical and chemical effectors of membrane shape change.
Received the National Science Foundation Graduate Research Fellowship (GRFP) in 2010.
Ph.D. Dissertation titled: "Molecular simulation of protein-induced membrane remodeling."

2008 – 2009 | Undergraduate research advised by Prof. Timothy Reluga
Pennsylvania State University, Department of Mathematics.

Used kinetic Monte Carlo models to model population dynamics according to mouse experiments which described the viral load of drug-resistant malaria.
Schreyer Honors College thesis title: "A population model of Malaria transmission according to within-host parasite dynamics."

2008 – 2009 | Undergraduate research advised by Prof. Janna Maranas
Pennsylvania State University, Department of Chemical Engineering

Used molecular simulations to study the motion of intrinsically disordered proteins in order to predict misfolding events which lead to pathological aggregates that lead to neurodegenerative disease.

TEACHING

Fall 2019 | **MARCC HPC Practicum**, Johns Hopkins University
Authored and taught a weekly semester-long practical academic-oriented high-performance computing (HPC) workshop for students and faculty at Johns Hopkins University to further the mission of the Maryland Advanced Research Computing Center (MARCC), namely to improve the application of computing towards research and training in multiple domains, from novice to advanced skill levels. This course titrated computer science theory with a set of practical exercises designed to ensure that researchers appreciate both the potential and pitfalls of computation-assisted research. Course content available online:
`https://marcc-hpc.github.io/esc/`

Spring 2018, Spring 2017 | Assisted instruction for **UPenn BE 559: "Multiscale Modeling of Chemical Systems"**
Provided practical exercises in molecular dynamics simulation and analysis for this multiscale modeling course which allowed students to characterize protein motion. These exercises were deployed for the students using container systems on lab servers using reproducible methods available in the BioPhysCode suite (see below, Software Development). Provided additional instruction for students who wished to expand these tools to novel systems (e.g. RNA) for their subsequent research. Workshop materials are available online:
`https://biophyscode.github.io/molecular_dynamics_lab/`

Fall 2014, Fall 2015 | Guest lecture covering molecular modeling methods for students of **UPenn BE 306: "Molecular Physiology and Cellular Engineering from Atoms to Disease"**, a required course in bioengineering which emphasizes the utility of quantitative models in solving physiology problems.

Spring 2012 | Teaching assistant for a bioengineering course titled **UPenn BE 540 "Biomolecular and Cellular Engineering"** for master's students and senior undergraduates.

Fall 2011 | Teaching assistant for **UPenn CBE 240 "Material and Energy Balances of Chemical Processes"**, a sophomore-level chemical and biomolecular engineering core course. Taught a recitation section designed for students who transferred into the major without taking the introductory course.

PUBLICATIONS

Publications are also summarized at ORCiD (`https://orcid.org/0000-0001-9190-8409`) and at Google scholar.

2019 | Farokhirad, S., Bradley, R.P., Radhakrishnan, R., Janmey, P.A., Thermodynamic analysis of multivalent binding of functionalized nanoparticles to membrane surface reveals the importance of membrane entropy and nanoparticle entropy in adhesion of flexible nanoparticles, **Soft Matter**, Accepted.

2019 | Bradley, R.P.*, Slocher, D.R.*, Janmey, P.A., Molecular modeling predicts divalent cations bind to phosphoinositides to induce ion-specific and isomer-specific patterns and propensities for nano-cluster formation in physiologically composed bilayer membranes, **Under Review**. ($\star$ these authors contributed equally)

2019 | Bucki, R., Wang, Y., Yang, C., Kandy S.K., Fatunmbi, O., Bradley, R., Pogoda, K., Svitkina, T., Radhakrishnan, R., Janmey, P.A., Lateral distribution of phosphatidylinositol 4, 5-bisphosphate in membranes regulates formin-and ARP2/3-mediated actin nucleation, **Journal of Biological Chemistry**, Vol. 294 (12), pp. 4704–4722.

2019 Manalo, K., Baber, L., Bradley, R., You, Z.-Q., Zhang, N., Community Collections: A Framework for Openly Sharing Software Stacks Across Research Computing Centers Using Singularity and Lmod, *Proceedings of the Practice and Experience in Advanced Research Computing on Rise of the Machines (Learning)*, **Association for Computing Machinery**, 2019, 6:1-6:6.

2018 Ramakrishnan, N, Bradley, R.P., Tourdot, R.W., Radhakrishnan, R., Biophysics of membrane curvature remodeling at molecular and mesoscopic lengthscales, **Journal of Physics: Condensed Matter**, 2018, Vol. 30 (27), pp. 273001.

2017 Farokhirad, S., Bradley, R.P., Sarkar, A., Shi, A., Telesco, S., Liu, Y., Venkatramani, R., Eckmann, D.M., Ayyaswamy, P.S., Radhakrishnan, R., Computational Methods Related to Molecular Structure and Reaction Chemistry of Biomaterials, **Comprehensive Biomaterials II**, 2017, Editors: P. Ducheyne, K.E. Healy, D.W. Hutmacher, D.W. Grainger, C.J. Kirkpatrick, Ed. 2, Vol. 3, Chapter 13, pp. 245–267. Oxford: Elsevier.

2016 Bradley, R. and Radhakrishnan, R., Curvature-undulation coupling as a basis for curvature sensing and generation in bilayer membranes, **Proceedings of the National Academy of Sciences**, Vol. 113(35), pp. E5117-E5124.

2014 Tourdot, R.W.*, Bradley, R.P.*, Ramakrishnan, N., Radhakrishnan, R., Multiscale computational models in physical systems biology of trafficking, **IET Systems Biology**, Vol. 8, pp. 198-213. ($\star$ these authors contributed equally)

2013 Bradley, R., Radhakrishnan, R., Coarse-Grained Models for Protein-Cell Membrane Interactions, **Polymers**, Vol. 5(3), pp. 890-936.

2013 Zhao, Y., Liu, J., Yang, C., Capraro, B.R., Baumgart, T., Bradley, R.P., Ramakrishnan, N., Xu, X., Radhakrishnan, R., Svitkina, T., Guo, W., Exo70 Generates Membrane Curvature for Morphogenesis and Cell Migration, **Developmental Cell**, Vol. 26(3), pp. 266-278.

2011 Liu, J., Bradley, R., Eckmann, D.M., Ayyaswamy, P.S., Radhakrishnan, R., Multiscale modeling of functionalized nanocarriers in targeted drug delivery, **Current Nanoscience**, Vol. 7(5), pp. 727.

N.b. I have served as an *ad-hoc* reviewer for journals published by the Institution of Engineering and Technology (IET) and *Soft Matter* (a journal of the Royal Society of Chemistry), and by request from colleagues.

PRESENTATIONS

2019 Molecular and Continuum Modeling Methods for Understanding the Role of Polyphosphoinositides in Inducing Cellular Morphology Changes, Ryan Bradley, David Slochower, Ololade Fatunmbi, Sreeja K. Kandy, Robert Bucki, Paul A. Janmey, *Biophysical Society Annual Meeting*, Baltimore, MD.

2017 Curvature-undulation coupling as a basis for curvature sensing and generation in bilayer Membranes, Ryan Bradley, Ravi Radhakrishnan, *Biophysical Society Annual Meeting*, New Orleans, LA.

2016 Curvature-undulation coupling as a basis for curvature sensing and generation in bilayer membranes at molecular and colloidal scales, Ryan Bradley, Ramakrishnan Natesan, Ravi Radhakrishnan, *American Chemical Society Annual Meeting*, Philadelphia, PA.

2014 Modeling membrane sculpting from single proteins to mesoscale morphology changes, Ryan Bradley, Natesan Ramakrishnan, Richard Tourdot, Ravi Radhakrishnan. *American Conference on Theoretical Chemistry*, June 2014, Telluride, CO.

2014 Modeling protein-induced membrane remodeling from the near-atomic to the mesoscale. Ryan Bradley, Ramakrishnan Natesan, Richard Tourdot, Ravi Radhakrishnan, *American Chemical Society, Colloid and Surface Science Symposium*, Philadelphia, PA.

2013 Multiscale modeling of membrane sculpting by the protein exo70, Ryan Bradley, Ramakrishnan Natesan, Yuting Zhao, Wei Guo, Ravi Radhakrishnan, *American Institute of Chemical Engineers (AIChE) Annual Meeting*, San Francisco, CA.

2013 Membrane remodeling by curvature-inducing proteins, Ryan Bradley, Natesan Ramakrishnan, Yuting Zhao, Wei Guo, Ravi Radhakrishnan, *Biophysical Society Annual Meeting*, Philadelphia, PA.

2012 Multiscale modeling of membrane curvature induction by epsin, Ryan Bradley, David Slochower, Peter J. Huwe, Ravi Radhakrishnan. *American Chemical Society Annual Meeting*, Philadelphia, PA.

2012 Multiscale modeling of membrane remodeling by the protein epsin, Ryan Bradley, Ravi Radhakrishnan, *American Institute of Chemical Engineers (AIChE) Annual Meeting*, Pittsburgh, PA.

2012 Molecular modeling of membrane curvature driven by epsin, R.P. Bradley & R. Radhakrishnan, *38th Annual Northeast Bioengineering Conference (NEBEC)*, Philadelphia, PA.

2011	Multiscale modeling of nanocarrier binding to endothelium, Jin Liu, Ryan Bradley (presenting author), Portonovo S. Ayyaswamy, David M. Eckmann, Ravi Radhakrishnan, *American Institute of Chemical Engineers (AIChE) Annual Meeting*, Minneapolis, MN.
2009	Dynamic similarities in pathological forms of α-Synuclein, Ryan Bradley, Janna Maranas, *American Physical Society March Meeting*, Portland, OR.

MENTORSHIP

2016 – 2018	Trained two post-doctoral researchers (members of the Radhakrishnan group) in molecular simulation methods in order to develop (1) novel protein-bilayer simulations and (2) multiscale polysaccharide simulations for their respective research projects.
2016 – 2017	Trained and mentored a master's student in chemical and biomolecular engineering (this student later enrolled in a Ph.D. program at the University of Delaware).
2012 – 2017	Trained five 1st-year Ph.D. (rotation) students from the Perelman School of Medicine in various methods including: modeling protein structure and function, simulations of membrane-protein systems, and software development.
Summer 2014	Trained a research experience for undergraduates (REU) student in molecular simulation methods (this student later enrolled in a Ph.D. program at the University at Albany).
2012-2015	Mentored three high school students who expressed an interest in STEM careers. Students received basic training and introductions to molecular simulation methods in addition to an overview of the use of computer simulations in basic science and personalized medicine.
Summers 2011-2013	Mentored high school students participating in the Summer Academy in Applied Science and Technology (SAAST) at the University of Pennsylvania School of Engineering and Applied Sciences.

AWARDS AND FELLOWSHIPS

2013	XSEDE Startup Allocation
2012	NIH T32 Structural Biology Training Grant
2010	National Science Foundation, Graduate Research Fellowship Program (included funding in 2010-2011 and 2013)
2009	Ashton Fellowship (included funding in 2009 and 2015-2016)

SOFTWARE DEVELOPMENT

2015 – Present

BioPhysCode
`http://biophyscode.github.io`
Designed and developed "BioPhysCode", a suite of open-source software tools designed to standardize and reproduce molecular dynamics simulations at atomistic and coarse-grained length scales along with their corresponding analyses and hypothesis tests in order to make biophysics research methods more extensible, accessible, and correct. This project is a collaboration with a Earl J. Jordan, Ph.D., a contemporary alum of the Radhakrishnan group, designed to ensure that our simulation and analysis methods are easy to share with other research groups.

2018 – 2019

Community Collections
`https://community-collections.github.io/`
Co-authored "Community Collections" presented at the Practice and Experience in Advanced Research Computing Conference (PEARC 19). This program seamlessly integrates Singularity containers with the `Lmod` environment module system so that academic HPC users have direct access to containerized software inside of a standard stack, while administrators can easily share their configurations between institutions.

INDUSTRY EXPERIENCE

Summer 2008
Intern, Merck, Vaccine Operations, West Point, PA
Redesigned master batch records for adjuvant solutions for usability and compliance.

Summer 2007
Intern, Merck, Technical Operations, Danville, PA
Coordinated post-construction cleaning and catalogued automation alarm changes for a new process.

2003 – 2005
Cadet, U.S. Military Academy, West Point, NY
Attended the academy for two academic years and three summers. Rose to the rank of Cadet First Sargeant (1SG) and supervised cadre during cadet basic training (CBT) in the summer of 2005. Resigned to pursue a civilian career.