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

2023 – Present | Director of Research Computing, **Lehigh University**
Library & Technology Services (**LTS**)

- Guided the strategy for research computing support to enhance researcher-facing resources, services, policy, and processes in order to support the "strengthened research environment" component of the University's 2023 strategic plan.
- Convened a cross-functional team called the Research and Scholarship Support Team (RSST) to assess unmet researcher needs, marshal the relevant staff and technology, iteratively standardize LTS support for novel projects, and communicate these projects to stakeholders.
- Expanded research computing support beyond high-performance computing (HPC) to include both on-premises environments and the Lehigh Secure Research Cloud (SRC), which is compliant to host sensitive data under NIST SP 800-171 using Amazon Web Services (AWS).
- Led the high-performance computing steering committee (HPCSC) to develop a more sustainable funding model, set access and resource sharing policies, and identify science drivers to seek both federal and internal funding for new collective resources.
- Supervised the HPC Architect responsible for managing the Lehigh HPC cluster and storage systems, and coordinated with data center support staff to expand these systems.
- Performed researcher-facing facilitation, training, software support, proposal assistance, and consultation services.

2020 – 2023 | Associate Research Engineer, **Johns Hopkins University**
Alliance for Cardiovascular Diagnostic and Treatment Innovation (**ADVANCE**)

- Developed and scaled numerical algorithms for use in an FDA-approved, randomized and controlled clinical trial (**OPTIMA**, Optimal Target Identification via Modeling of Arrhythmogenesis) which uses patient-specific cardiac imaging and simulation to inform catheter ablation treatments for persistent atrial fibrillation in patients at Johns Hopkins Hospital.
- Managed a five-member engineering team, including research scientists, post-doctoral researchers, and Ph.D. candidates, to operate and test the clinical pipeline.
- Deployed customized data management tools to safeguard, catalog, and mine a large active data set ($>$ 500TB) in order to improve clinical workflows and perform retrospective studies.
- Facilitated scale-up, validation, and data management solutions for researchers.
- Technologies: Python, Spack, Tensorflow, Docker, Apache, Flask, SQL, Bootstrap, ZFS, Ansible.

2018 – 2023 | Software Engineer, **Johns Hopkins University**
Advanced Research Computing at Hopkins (**ARCH**)
Maryland Advanced Research Computing Center (**MARCC**)

Facilitate computational scale-up on high-performance computing (HPC) resources by training and consulting with users who require parallelism, graphics processing units, container systems (Singularity, Docker), optimized libraries, and efficient use of the scheduler to perform highly parallel and I/O-intensive computations.
Interface with both systems engineers and faculty to ensure that the combination of policy and computing resources can meet the needs of a diverse group of basic science and engineering researchers, including responsibility for configuring the scheduler (SLURM).
Deployed and extended the Spack package manager to provide a comprehensive user-facing HPC software library for a $\sim$2 petaflop HPC cluster (Rockfish) which serves as level-2 XSEDE (now ACCESS) service provider.
Deployed and adapted the ColdFront resource allocation portal (built with Django) to authenticate, register, and provide allocations to Rockfish users.
Updated the user management system for a petaflop cluster (Blue Crab) following OS upgrades in 2018. This cluster would remain in service through 2022, with over 3,000 users serving 350 research groups across multiple universities.
Co-authored a tool called "Community Collections" which seamlessly serves containers to researchers on HPC systems and facilitates sharing between institutions.
Technologies: SLURM, Spack, Singularity, Docker, Lmod, LDAP, GPFS, ZFS, Django, CUDA, MPI.

2018 – 2019 | Senior Research Associate, **University of Pennsylvania**
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.

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.

MENTORSHIP AND TRAINING

2020 – 2023	Responsible for training all members of the Alliance for Cardiovascular Diagnostic and Treatment Innovation (**ADVANCE**) at the undergraduate through post-doctoral levels in high-performance computing, software engineering, and data science methods and best practices to facilitate their respective biomedical engineering projects.
2019 – 2020	Trained two new members of the Advanced Research Computing at Hopkins (**ARCH**) group to configure and maintain the scheduler and user management system on the Rockfish cluster at Johns Hopkins University.
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 and is now tenure-track faculty).
2012 – 2017	Trained five 1st-year Ph.D. (rotational) students from the Perelman School of Medicine in various methods including: modeling protein structure and function, simulations of membrane-protein systems, and software development.
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.

TEACHING

2023 – Present	**LTS Seminar Series**, Lehigh University Contributed a high-performance computing seminar series with 4-6 sessions offered each spring, summer, and fall session. These classes were designed to on-board users of all skill levels; to establish a basis for longer-term collaborations and engagements including consultations and code review; and to ensure that Lehigh researchers are poised to take advantage of the services offered across LTS and the Research Computing group. `https://lts.lehigh.edu/lts-seminars`
Spring 2025	Guest lecture providing an overview of academic high-performance computing for **Lehigh BIOS 279: "Experimental Molecular Neuroscience Laboratory,"** including support for a lab exercise that utilized shared storage, Open OnDemand, and Jupyter Notebooks on our HPC cluster.
Fall 2019	**MARCC HPC Practicum**, Johns Hopkins University Authored and taught a weekly semester-long practical academic-oriented high-performance computing workshop for students and faculty to further the mission of the Maryland Advanced Research Computing Center (MARCC), namely to improve the application of computing tools towards research and training in multiple domains, from novice to advanced skill levels. This workshop 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 is partially available online: `https://marcc-hpc.github.io/esc/`
Spring 2018,	Assisted instruction for **UPenn BE 559: "Multiscale Modeling of Chemical Systems"**

Spring 2017	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 software. 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 on ORCID (`https://orcid.org/0000-0001-9190-8409`) and on Google scholar (user `hT9vGZUAAAAJ`). This list includes well-cited conference papers but excludes other presentations. ***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.

2025	Piersanti R, Bradley R, Ali SY, Quarteroni A, Dedè L, Trayanova NA, Defining myocardial fiber bundle architecture in atrial digital twins, **Computers in Biology and Medicine**, Vol. 188. pp. 109774.
2024	Sakata K, Bradley RP, Prakosa A, Yamamoto CAP, Ali SY, Loeffler S, Tice BM, Boyle PM, Kholmovski EG, Yadav R, Sinha SK, Marine JE, Calkins H, Spragg DD, Trayanova NA, Assessing the arrhythmogenic propensity of fibrotic substrate using digital twins to inform a mechanisms-based atrial fibrillation ablation strategy. **Nature Cardiovascular Research**, Vol. 3, pp. 857–868.
2024	Parihar K, Ko SH, Bradley R, Taylor P, Ramakrishnan N, Baumgart T, Guo W, Weaver VM, Janmey PA, Radhakrishnan R, Free energy calculations for membrane morphological transformations and insights to physical biology and oncology. **Methods in Enzymology** Vol. 701, pp. 359–386.
2024	Parihar K, Ko SH, Bradley R, Taylor P, Ramakrishnan N, Baumgart T, Guo W, Weaver VM, Janmey PA, Radhakrishnan R, Asymmetric crowders and membrane morphology at the nexus of intracellular trafficking and oncology. **Mechanobiology in Medicine** Vol. 2, pp. 100071.
2020	Fatunmbi O*, Bradley RP*, Kandy SK, Bucki R, Janmey PA, Radhakrishnan R, A multiscale biophysical model for the recruitment of actin nucleating proteins at the membrane interface, **Soft Matter**, Vol. 7 (5), pp. 192208. ($\star$ these authors contributed equally)
2020	Eckmann DM, Bradley RP, Kandy SK, Patil K, Janmey PA, Radhakrishnan R, Multiscale modeling of protein membrane interactions for nanoparticle targeting in drug delivery, **Current Opinion in Structural Biology**, Vol. 64, pp. 104–110.
2020	Bradley RP*, Slochower DR*, Janmey PA, and Radhakrishnan R, Divalent cations bind to phosphoinositides to induce ion and isomer specific propensities for nano-cluster initiation in bilayer membranes, **Royal Society Open Science**, Vol. 7 (5), pp. 192208. ($\star$ these authors contributed equally)
2019	Farokhirad S, Bradley RP, Radhakrishnan R, Janmey PA, 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**, Vol. 15, (45), pp. 9271–9286.

2019 Bucki R, Wang Y, Yang C, Kandy SK, Fatunmbi O, Bradley R, Pogoda K, Svitkina T, Radhakrishnan R, Janmey PA, 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 RP, Tourdot RW, 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 RP, Sarkar A, Shi A, Telesco S, Liu Y, Venkatramani R, Eckmann DM, Ayyaswamy PS, Radhakrishnan R, Computational Methods Related to Molecular Structure and Reaction Chemistry of Biomaterials, **Comprehensive Biomaterials II**, 2017, Editors: P Ducheyne, KE Healy, DW Hutmacher, DW Grainger, CJ Kirkpatrick, Ed. 2, Vol. 3, Chapter 13, pp. 245–267. Oxford: Elsevier.

2016 Bradley R, 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 RW*, Bradley RP*, 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 BR, Baumgart T, Bradley RP, 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 DM, Ayyaswamy PS, Radhakrishnan R, Multiscale modeling of functionalized nanocarriers in targeted drug delivery, **Current Nanoscience**, Vol. 7(5), pp. 727.