

Brennon L. Shanks

Curriculum Vitae

Department of Chemical Engineering

University of Utah

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Github LinkedIn



Professional Summary Statement

- Engineering Ph.D candidate with a deep background in statistical mechanics, quantum mechanics, molecular simulations, neutron scattering, and machine learning, leading to publications and international conference presentations on neutron scattering analysis.
- Adaptable and creative researcher with diverse experiences in both academic and industry positions, including fundamental scientific research, process engineering and design, intellectual property strategy, marketing, and manufacturing.
- Thoughtful and driven team member who works to build healthy professional relationships that encourage an interdisciplinary, inclusive, and productive work environment.

Education

- 2019 – **Doctor of Philosophy in Chemical Engineering**, *University of Utah*, Salt Lake City, UT.
Neutron scattering analysis, statistical and quantum statistical mechanics, materials science, molecular simulation, thermodynamics, Bayesian statistics and machine learning
- 2019 – 2021 **Master of Science in Chemical Engineering**, *University of Utah*, Salt Lake City, UT.
- 2015 – 2019 **Bachelor of Engineering in Chemical and Biomolecular Engineering and Mathematics**, *Ohio State University*, Columbus, OH.
Protein complex synthesis and chemical processing, chemical informatics, computational quantum chemistry, electronic transitions in strongly correlated systems

Research Experience

- 2019 – 2024 **Neutron scattering analysis with molecular simulation and machine learning**, *University of Utah*, Salt Lake City, UT, **Dr. Michael Hoepfner**, Associate Professor ([Link](#)).
Application of statistical and quantum statistical mechanics to determine interatomic forces from microstructure of condensed matter.
- 2017 – 2018 **Theoretical quantum chemistry of strongly correlated systems**, *Ohio State University*, Columbus, OH, **Dr. Alexander Sokolov**, Assistant Professor ([Link](#)).
Quantum mechanical properties of charged excited states in strongly correlated electronic systems.
- 2015 – 2017 **Apo-hemoglobin processing and reconstitution for novel cancer therapies**, *Ohio State University*, Columbus, OH, **Dr. Andre Palmer**, Professor ([Link](#)).
Developed an improved method to separate heme from hemoglobin and initiated project aimed to determine the most likely drug candidates for apo-hemoglobin cancer therapeutic reconstitution as a treatment for leukemia.

Industry Experience

Internships

- 2017 **Process Engineer**, *The Procter & Gamble Company*.
Development of dye mixing model that recovers an estimated net loss of $\sim \$ 1.3$ million/year.

2016 **Strategic Innovation and Technology Engineer**, *The Procter & Gamble Company*.
Molecule development and intellectual property filing strategy in China and Brazil.

Project Collaborations

2019 **Process Engineer**, *Honda Motor Company, Ltd.*
Heat exchanger network design to improve thermal efficiency and recovery for a body paint process.

Publications

Journal Articles

Dec 5, 2022 **B. L. Shanks**, J. J. Potoff, and M. P. Hoepfner, *Transferable Force Fields from Experimental Scattering Data with Machine Learning Assisted Structure Refinement*, *J. Phys. Chem. Lett.*, 13, 49, 11512–11520 ([link](#)).

Conference Presentations

Contributed Talks

Jan, 2022 **Combining Multi-scale Simulation and Scattering for Structural Analysis of Complex Systems**, *Centre Européen de Calcul Atomique et Moléculaire*, Lausanne, CH.
Transferable force fields with structure-optimized potential refinement

Jan, 2021 **Utah Biomedical Engineering Conference**, Salt Lake City, UT.
Characterizing self-assembly in biological liquids with machine learning

Poster Sessions

Mar, 2022 **Recent Advances in Machine Learning Accelerated Molecular Dynamics**, *Centre Européen de Calcul Atomique et Moléculaire*, Trieste, IT.
Bayesian optimized force fields enabled by a radial distribution function surrogate model

Oct, 2021 **US Total Scattering School**, Oak Ridge National Laboratory, TN.
Transferable force fields with structure-optimized potential refinement

Jan, 2021 **Combining Multi-scale Simulation and Scattering for Structural Analysis of Complex Systems**, *Centre Européen de Calcul Atomique et Moléculaire*, Lausanne, CH.
Neutron scattering predicts emergent thermodynamic behavior in noble gas liquids

Fellowships & Awards

Fellowships

Jan, 2023 **University Teaching Assistantship Award** at the University of Utah.

Aug, 2019 **Graduate Research Fellow** at the University of Utah.

Grant Proposals

Sept, 2016 **Undergraduate Research Scholar Grant** at the Ohio State University.

Leadership

Jun, 2023 **Research Leader Award** at the *Energy Frontier Research Center for Multi-scale Fluid-Solid Interactions in Architected and Natural Materials*, University of Utah.

Academic Excellence

Feb, 2021 **1st Place Presentation** at the **Graduate Engineering Symposium**, University of Utah.

Positions of Responsibility

2023 – 2024 **Early Career Network Representative**, *Basic Energy Sciences*, Department of Energy.

2019 – 2023 **Vice President**, *Graduate Student Advisory Committee*, University of Utah.

Teaching Experience

Courses

Fall, 2023 **CHEN 5960** | **Molecular Simulations**, *University of Utah*, ([Link](#)).

Mentorship

2021 – 2023 **CHEN 7973** | **Research Mentor**, *University of Utah*, Harry W. Sullivan.

Teaching Assistantship

Fall, 2022 **CHEN 6853** | **Advanced Thermodynamics**, *University of Utah*, Guest Lecturer.

Fall, 2021 **CHEN 6853** | **Advanced Thermodynamics**, *University of Utah*, Guest Lecturer.

Fall, 2021 **CHEN 7703** | **Uncertainty Quantification and Machine Learning**, *University of Utah*.

Fall, 2020 **CHEN 6853** | **Advanced Thermodynamics**, *University of Utah*.

Spring, 2019 **C&BE 2523** | **Separation Processes**, *Ohio State University*.

Fall, 2018 **C&BE 2420** | **Transport Phenomena I**, *Ohio State University*.