Alec Glisman — Curriculum Vitae

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Summary

I am a Ph.D. candidate at Caltech researching the fundamental physics underlying aqueous polyelectrolyte and ion complexation. By utilizing a combination of multiscale simulations, machine learning techniques, and theoretical approaches, I explore the intricate macroscopic structure and relaxation phenomena within these systems. I possess a diverse skill set that includes expertise in transport phenomena, statistical mechanics, and polymer physics. I have developed a strong ability to break down complex problems into their core components and drive independent progress. My passion lies in physics-based modelling and I thrive in fast-paced environments, quickly grasping new concepts and applying them effectively to solve challenges.

Education

California Institute of Technology **Pasadena, CA**
Ph.D. in Chemical Engineering, GPA: 4.0 *2019 – 2024 (expected)*
Honorable Mention: National Science Foundation Graduate Research Fellowship Program

University of California, Berkeley **Berkeley, CA**
B.S. in Chemical Engineering, GPA: 3.91 *2015 – 2019*
Graduated with Highest Honors
Tau Beta Pi Honor Society
Phi Kappa Beta Honor Society
Regents' and Chancellor's Scholarship
Chemical Engineering Departmental Honors
Dean's List

Skills

Languages: Python, Bash, C/C++, CUDA, CMake, FORTRAN, MATLAB, Mathematica, SQL, LaTeX
Molecular Simulation: GROMACS, PLUMED, ORCA, AutoDock Vina
Data Analysis: NumPy, SciPy, Pandas, Scikit-Learn, Matplotlib, PyTorch, RDKit
Linux Tools: Git, SSH, Slurm, Docker, Ansible

Experience

Academic Research

California Institute of Technology **Pasadena, CA**
Graduate Researcher, Advisor: Prof. Zhen-Gang Wang *2022 – Present*
Employed large-scale enhanced sampling and non-equilibrium molecular dynamics simulations to study the aqueous chelation mechanism of multivalent ions onto polyelectrolytes. Generated phase diagrams of polyelectrolyte and ion complexes using statistical mechanics and machine learning techniques in an aqueous bulk and at crystalline interfaces to prevent calcium scale formation. Negotiated with funding agency to purchase and build a $120,000 high-performance computational cluster consisting for both my research project and the Wang group as a whole. Maintained and administered the Wang group's computational clusters consisting of 40 GPUs, 600 CPU threads, and 1,100 GB of RAM using Ansible and Slurm.

California Institute of Technology **Pasadena, CA**

Graduate Researcher, Advisor: Prof. John F. Brady *2019 – 2021*

Theoretically modelled hydrodynamic interactions between self-propelling bodies in low and high Reynolds number flow using a multi-polar expansion of the Stokes and Euler equations of motion, respectively. Programmed a highly parallelized C++ code using the Eigen and OpenMP libraries to simulate the dynamics of many self-propelling bodies in a potential flow.

University of California, Berkeley **Berkeley, CA**

Research Assistant, Advisor: Prof. Kranthi K. Mandadapu *2017 – 2019*

Investigated the dynamics of phospholipid bilayer membranes using differential geometry and a balance law formulation to understand how surface geometry and in-plane flow are coupled. Defined a new dimensionless number comparing out-of-plane bending forces and in-plane viscous forces to characterize the dynamics and stability of different lipid membrane geometries.

Lawrence Berkeley National Lab **Berkeley, CA**

Research Assistant, Advisor: Prof. Nitash P. Balsara *2016 – 2017*

Fabricated solid-state polymer pouch cells to investigate ionic transport and conductivity properties. Tested cells via electrochemical impedance spectroscopy, and analyzed large data sets with MATLAB using numerical differentiation to find relationship between electrolyte concentration and cell performance.

Teaching

California Institute of Technology Chemical Engineering Department **Pasadena, CA**

Teaching Assistant: Graduate Transport (Fluids, Heat, & Mass), ChE 151 a/b *Jan. 2021 – Jun. 2021*

The foundations of heat, mass, and momentum transfer for single and multiphase fluids will be developed. Governing differential equations; laminar flow of incompressible fluids at low and high Reynolds numbers; forced and free convective heat and mass transfer, diffusion, and dispersion. Emphasis will be placed on physical understanding, scaling, and formulation and solution of boundary-value problems. Applied mathematical techniques will be developed and used throughout the course.

Industry

Nissan: Automotive Energy Supply Corporation **Smyrna, TN**

Battery Cell Intern *May 2018 – Aug. 2018*

Developed automated system for evaluation of 25,000 battery cells per day based on voltage stability using Microsoft VBA, and trained colleagues on how to operate the new system for an annual savings of $50,000 in labor-hours. Found relationship between misalignment of the first layer cathode and anode in cell stack and eventual cell failure in later process. Proposed decreasing tolerance limits for first layer electrodes which reduced material scrap costs by $55,000 annually.

Bosch Research & Technology Center **Palo Alto, CA**

Battery Research Intern *May 2017 – Aug. 2017*

Evaluated how electrode additive materials stabilize electric vehicle (EV) batteries by measuring their dissolution during expected EV conditions. Used inductively coupled plasma optical emission spectrometry (ICP-OES) to quantify lithium in various lithium-ion cell components to support development of advanced battery management system.

Publications

Alec Glisman, Sriteja Mantha, Zhen-Gang Wang, and Decai Yu "Divalent cation mediated polyelectrolyte association", *Manuscript in preparation* (2023)

Sriteja Mantha, **Alec Glisman**, Zhen-Gang Wang, and Decai Yu "Adsorption isotherm and mechanism of Ca^{2+} binding to polyelectrolyte", *Manuscript in preparation* (2023)

Alec Glisman and John F. Brady, "Swimming in potential flow", *JFM Rapids* **952** (2022) R5

Amaresh Sahu, **Alec Glisman**, Joël Tchoufag and Kranthi K. Mandadapu, "Geometry and dynamics of lipid membranes: The Scriven-Love number", *Phys. Rev. E* **101.5** (2020) 05240

Conference Presentations

Alec Glisman, Sriteja Mantha, Zhen-Gang Wang, Decai Yu, Thomas Kalantar, Christopher Tucker, Eric Wasserman, Scott Backer, Larisa Reyes, and Dipti Singh "Divalent cation-mediated polyanion attraction in an aqueous solution", American Physical Society March Meeting (2023)

Sriteja Mantha, **Alec Glisman**, Zhen-Gang Wang, Decai Yu, Thomas Kalantar, Christopher Tucker, Eric Wasserman, Scott Backer, Larisa Reyes, and Dipti Singh "Structure of polyelectrolyte and multi-valent ion complexes", American Physical Society March Meeting (2023)

Awards

2019: **NSF GRFP Honorable Mention**
The NSF accords Honorable Mention to meritorious applicants who do not receive Fellowship awards. This is considered a significant national academic achievement and provides access to resources through the XSEDE.

2015 – 2019: **Regents' and Chancellor's Scholarship**
The most prestigious scholarship offered by U.C. Berkeley, awarded to the top 2% of entering undergraduates.