David Rower

ASPIRING CONDENSED MATTER PHYSICIST

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Education

Department of Physics, Massachusetts Institute of Technology　　　　　*Cambridge, MA*

PhD (IN PROGRESS)　　　　　*Sep. 2019 - Current*

- Advisors: Riccardo Comin, William Oliver
- Interests: Coherent Diffractive Imaging, Ptychography, Nanoelectronics, Superconducting Qubits.
- Fellowships: MIT Dean of Science Fellowship, NSF Graduate Research Fellowship Program

College of Creative Studies, University of California, Santa Barbara　　　　　*Santa Barbara, CA*

PHYSICS B.S., MATHEMATICS MINOR　　　　　*Sep. 2015 - June 2019*

- GPA: 4.0/4.0
- Coursework: Condensed Matter Physics, Analog Electronics, Quantum Mechanics, Statistical Mechanics, General Relativity, Numerical Analysis, Tensor Analysis, Electromagnetism, Network Theory, Nonlinear Dynamics, Classical Mechanics, Intro to Real Analysis, Group Theory, Waves and Kinetic Theory, Linear Algebra, Differential Equations.

Academic Research

Comin Photon Scattering Lab　　　　　*Cambridge, MA*

MATERIALS RESEARCH LABORATORY, MIT　　　　　*Sep. 2019 - Current*

- Exploring broad questions in nanoscale materials with diffractive imaging techniques.
- In collaboration with the Engineering Quantum Systems Group.

Atzberger Research Group　　　　　*Santa Barbara, CA*

DEPARTMENT OF MATHEMATICS/DEPARTMENT OF MECHANICAL ENGINEERING, UCSB　　　　　*Jan. 2016 - June 2019*

- Implemented single-bead fluid membrane model in C++ for LAMMPS molecular dynamics engine.
- Studied phase-separation of heterogeneous vesicles with species of different preferred curvatures.
- Created numerical bending rigidity estimator for arbitrary star-shaped vesicles utilizing equilibrium fluctuation spectra.
- Conducted numerical experiments to probe vesicle responses to compression and passage through narrow channels.
- Explored effects of surface fluctuating hydrodynamics on the dynamics of Golestanian swimmers on a sphere.
- Work presented in several conferences via posters and talks.

Pedarsani Research Group　　　　　*Santa Barbara, CA*

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, UCSB　　　　　*Sep. 2017 - Feb. 2018*

- Spearheaded utilization of microscopic traffic simulators for testing and validation of autonomous vehicle traffic models.
- Developed numerical validations of models using the SUMO framework.
- Delivered technical write-up to group for future reference.

Industry Work/Research

Toyon Research Corporation　　　　　*Santa Barbara, CA*

AUTONOMOUS SYSTEMS INTERN　　　　　*Jan. 2018 - June 2019*

- Developed end-to-end simulation and tracking framework to prototype bearings-only tracking algorithms in Matlab.
- Developed and debugged various components of C++ multi-target tracking framework.
- Developed and implemented advanced dynamics models for use in the tracking of maneuvering targets.
- Developed and implemented continuous integration scripts for automated generation of PDF documentation from markdown repositories.

OpenEye Scientific Software　　　　　*Santa Fe, NM*

OPTIMIZATION INTERN　　　　　*June 2017 - Sep. 2017*

- Developed and tested Hessian-based filters for shape comparison of small molecules.
- Developed and tested convergence criteria for Newton-like optimization algorithms on volume overlap objective functions.
- Tested and debugged proper rigid transformation representations.

UCSB Enterprise Technology Services *Santa Barbara, CA*
STUDENT DEVELOPER *Feb. 2017 - Sep. 2017*
- Implemented Remotely Triggered Black Hole (RTBH) system via ExaBGP and the Flask framework to replace legacy system.
- Designed RESTful API to communicate with the RTBH server.
- Developed real-time database logging system on Raspberry Pi to replace legacy system.

Presentations

HETEROGENEOUS VESICLES WITH PHASES HAVING DIFFERENT PREFERRED CURVATURES: SHAPE FLUCTUATIONS AND MECHANICS OF ACTIVE DEFORMATIONS

Apr. 2019	**Poster Presenter**, Southern California Applied Mathematics Symposium (SOCAMS 2019)	*Pasadena, CA*
Mar. 2019	**Speaker**, American Physical Society March Meeting (APS March) 2019	*Boston, MA*

PASSIVE AND ACTIVE EXPLORATIONS OF SHAPE-DRIVEN MECHANICS IN MIXED SPECIES LIPID VESICLES

Dec. 2018	**Speaker**, UCSB Research Internships in Science and Engineering (RISE) NSF REU Research Symposium	*Santa Barbara, CA*

BEARINGS-ONLY TRACKING: SINGLE VS. MULTIPLE GAUSSIAN METHODS

Oct. 2018	**Speaker**, Autonomous Systems Team Meeting, Toyon Research Corporation	*Santa Barbara, CA*

EQUILIBRIUM SHAPE FLUCTUATIONS OF HETEROGENEOUS BIOLOGICAL MEMBRANES

Aug. 2018	**Minisymposium Speaker**, SIAM Conference on the Life Sciences (SIAM LS 18)	*Minneapolis, MN*
June 2018	**Speaker**, UCSB RISE NSF REU Research Symposium	*Santa Barbara, CA*

CURVATURE-DRIVEN PHASE-SEPARATION ON SPHERICAL VESICLES: INSIGHTS FROM A SINGLE-BEAD MODEL

Apr. 2018	**Poster Presenter**, Southern California Applied Mathematics Symposium (SOCAMS 2018)	*Santa Barbara, CA*
Mar. 2018	**Poster Presenter**, American Physical Society March Meeting (APS March 2018)	*Los Angeles, CA*

CAN HESSIANS IMPROVE ROCS?

Sep. 2017	**Speaker**, OpenEye Scientific Software Internship Symposium	*Santa Fe, NM*

SELF-ASSEMBLED LIPID BILAYER MEMBRANES: EXPLORING A SINGLE-BEAD MODEL

May 2017	**Poster Presenter**, UCSB Undergraduate Research Colloquium	*Santa Barbara, CA*

Publications

1. *Surface Fluctuating Hydrodynamics Methods for the Drift-Diffusion Dynamics of Particles and Microstructures within Curved Fluid Interfaces*. **D. A. Rower**, M. Padidar, and P. J. Atzberger. *arXiv* (2019). [arXiv]
2. *Heterogeneous Vesicles with Phases having Different Preferred Curvatures: Shape Fluctuations and Mechanics of Active Deformations*. **D. A. Rower**, P. J. Atzberger. *Submitted* (2019). [arXiv]

Skills

Programming	Python, C++, Matlab, Bash, Mathematica, LaTeX, HTML/CSS/JavaScript
Software/OS	Ubuntu, Git, Apache Subversion, ParaView, LAMMPS
Interfaces	Google APIs, Arduino
Credentials	TS, Motorcycle License, Amateur Radio License (KI6PMP)
Languages	English

Fellowships

2019	**MIT**, Dean of Science Fellowship	
2019	**NSF**, Graduate Research Fellowship Program (GRFP)	
Winter 2019	**UCSB**, CCS Travel Undergraduate Research Fellowship (TURF)	
Fall 2018	**UCSB**, Research Internships in Science and Engineering (RISE) NSF REU, Atzberger Group	
Spring 2018	**UCSB**, RISE NSF REU, Atzberger Group	
Winter 2018	**UCSB**, RISE NSF REU, Atzberger Group	

Honors & Awards

Spring 2019 **UCSB Physics,** Research Excellence Award
Spring 2019 **UCSB Physics,** Highest Academic Honors
Spring 2019 **UCSB Physics,** Distinction in the Major
Spring 2019 **UCSB Physics,** Physics Circus Award
Spring 2018 **APS,** Future of Physics Days (FPD) Travel Grant
Spring 2018 **UCSB Physics,** Physics Circus Award
2015-2018 **Andy Goldfarb,** Andy Goldfarb Scholarship Award

Outreach & Societies

Member American Physical Society (APS)
Member Society for Industrial and Applied Mathematics (SIAM)
Member Summer Science Program (SSP) Alumni
Member UCSB Pops Orchestra (cellist)
Volunteer UCSB Physics Circus: an elementary school science outreach program, providing demos and one-on-one interaction
Volunteer UCSB SBCC Physics Partnership: a mentorship program to help transfer students succeed in the physics major
Officer UCSB Music Connection: a club bringing music to community venues (behavioral health centers, retirement homes, etc.)