



# David Rower

ASPIRING CONDENSED MATTER PHYSICIST

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## Education

### Massachusetts Institute of Technology

PHD, CONDENSED MATTER PHYSICS (IN PROGRESS)

Cambridge, MA

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

### University of California, Santa Barbara

PHYSICS B.S., MATHEMATICS MINOR

Santa Barbara, CA

Sep. 2015 - June 2019

- GPA: 4.0/4.0, Degree from College of Creative Studies
- 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

MATERIALS RESEARCH LABORATORY, MIT

Cambridge, MA

Sep. 2019 - Current

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

### Atzberger Research Group

DEPARTMENT OF MATHEMATICS/DEPARTMENT OF MECHANICAL ENGINEERING, UCSB

Santa Barbara, CA

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

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, UCSB

Santa Barbara, CA

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

AUTONOMOUS SYSTEMS INTERN

Santa Barbara, CA

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

OPTIMIZATION INTERN

Santa Fe, NM

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.

- 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

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### 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

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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

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

## Fellowships

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

## Honors & Awards

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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

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**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.)