

David Rower

QUANTUM INFORMATION PHYSICIST

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Education

Massachusetts Institute of Technology

Cambridge, MA

PHD (PHYSICS, IN PROGRESS), PIS: WILLIAM OLIVER, RICCARDO COMIN

2019 - Expected Aug. 2024

- Interests: quantum hardware, high-fidelity control / noise characterization with superconducting qubits
- Fellowships: MIT Dean of Science Fellowship, NSF GRFP, Quantum Info. Science and Eng. Network (QISE-NET)
- Teaching: 6.S987/8.582, Physics and Engineering of Superconducting Qubits (TA, Spring 2023)

University of California, Santa Barbara

Santa Barbara, CA

PHYSICS B.S., MATHEMATICS MINOR

Sep. 2015 - June 2019

- GPA: 4.0/4.0, degree from College of Creative Studies
- Thesis: Heterogeneous Vesicles with Phases having Different Pref. Curvatures: Shape Fluctuations and Mechanics of Active Deformations

Research Experience

Engineering Quantum Systems Group

Cambridge, MA

PI: WILLIAM OLIVER, DEPARTMENT OF PHYSICS/RESEARCH LABORATORY OF ELECTRONICS, MIT

Sep. 2019 - Current

- Developed, benchmarked state-of-the-art high-fidelity single-qubit gates ($F \gtrsim 0.99997$), characterized pulse distortions and leakage.
- Implemented arbitrary-polarization microwave drives with Fluxonium qubits to avoid counter-rotating effects for fast gates.
- Investigated the microscopic origin of $1/f$ magnetic flux noise through qubit dephasing with applied magnetic fields.
- Developed hardware and software infrastructure for qubit experiments (using direct-synthesis and mixer-based RF control) with automated calibration and data analysis.

Atzberger Research Group

Santa Barbara, CA

DEPARTMENT OF MATHEMATICS/DEPARTMENT OF MECHANICAL ENGINEERING, UCSB

Jan. 2016 - June 2019

- Implemented a custom orientation-dependent particle interaction to investigate phase separation in biomembranes (C++).
- Created a numerical bending rigidity estimator for arbitrary star-shaped vesicles utilizing fluctuation spectra (Python).
- Explored effects of surface fluctuating hydrodynamics on the dynamics of Golestanian swimmers on a sphere.

Toyon Research Corporation

Santa Barbara, CA

AUTONOMOUS SYSTEMS INTERN

Jan. 2018 - June 2019

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

OpenEye Scientific Software

Santa Fe, NM

OPTIMIZATION INTERN

June 2017 - Sep. 2017

- Developed Hessian-based filters for shape comparison of small molecules (Python, C++).
- Developed convergence criteria for Newton-like optimization algorithms on novel objective functions.

Pedarsani Research Group

Santa Barbara, CA

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, UCSB

Sep. 2017 - Feb. 2018

- Developed infrastructure for validation of autonomous vehicle traffic models with microscopic traffic simulators.

UCSB Enterprise Technology Services

Santa Barbara, CA

STUDENT DEVELOPER

Feb. 2017 - Sep. 2017

- Implemented Remotely Triggered Black Hole (RTBH) system via ExaBGP and Flask 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.

Publications

- **D. A. R.***, L. Ding*, et al. Circularly Polarized Driving and Commensurate Pulses for Fast High-Fidelity Gates with Fluxonium Qubits. *In Preparation* (2024).
- L. Ateshian, **D. A. R.**, et al. Fluxonium Qubit Coherence: Characterization of Temperature and Magnetic Field Dependence. *In Preparation* (2024).
- **D. A. R.**, et al. Evolution of $1/f$ Flux Noise in Superconducting Qubits with Weak Magnetic Fields. *Physical Review Letters* (2023). [\[link\]](#)
- B. Kannan, A. Almanakly, Y. Sung, A. Di Paolo, **D. A. R.**, et al. On-demand directional microwave photon emission using waveguide quantum electrodynamics. *Nature Physics* (2023). [\[link\]](#)
- **D. A. R.**, P. J. Atzberger. Coarse-grained methods for heterogeneous vesicles with phase-separated domains: Elastic mechanics of shape fluctuations, plate compression, and channel insertion. *Mathematics and Computers in Simulation* (2023). [\[link\]](#)
- **D. A. R.**, M. Padidar, and P. J. Atzberger. Surface Fluctuating Hydrodynamics Methods for the Drift-Diffusion Dynamics of Particles and Microstructures within Curved Fluid Interfaces. *Journal of Computational Physics* (2022). [\[link\]](#)

Fellowships & Awards

- 2024 **MIT**, QSEC Annual Research Conference Best Poster Award
- 2019- **MIT**, Dean of Science Fellowship
- 2019- **NSF**, Graduate Research Fellowship Program (GRFP)
- 2020-2022 **NSF**, Quantum Information Science and Engineering Network (QISE-NET) Fellowship
- 2021 **iQuHack**, Winner, gate-model quantum computing division
- 2019 **UCSB Physics**, Research Excellence Award, Highest Academic Honors, Distinction in the Major
- 2019 **UCSB**, CCS Travel Undergraduate Research Fellowship (TURF)
- 2018, 2019 **UCSB**, Research Internships in Science and Engineering (RISE) NSF REU, Atzberger Group
- 2018 **APS**, Future of Physics Days (FPD) Travel Grant
- 2018, 2019 **UCSB Physics**, Physics Circus Award
- 2015-2018 **Andy Goldfarb**, Andy Goldfarb Scholarship Award

Skills

- Programming** Python, C++, Matlab, Bash, Mathematica, LaTeX, HTML/CSS/JavaScript
- Software/OS** Sonnet, HFFS, Maxwell, Ubuntu, Git, Apache Subversion, Labber, ParaView, LAMMPS
- Cryogenics** Dilution refrigeration, superconducting magnets, RF & DC wiring and filtering
- Qubits** Transmons, C-shunt Flux Qubits, Fluxoniums
- Credentials** TS (expired), Motorcycle License, Amateur Radio License (KI6PMP)

Outreach

- 2024 **Mentor**, Twin Cities Regional Science Fair
- 2020, 21-24 **Juror/Head Juror**, US Invitational Young Physicists Tournament
- 2021, 2023 **Volunteer**, Skype a Scientist
- 2023 **Guest Speaker**, Nueva HS Quantum Club
- 2020, 2022 **Guest Speaker**, Qubit by Qubit
- 2019-2022 **Mentor**, Summer Science Program (SSP)
- 2019 **Volunteer**, UCSB SBCC Physics Partnership
- 2017-2019 **Volunteer**, UCSB Physics Circus
- 2016-2018 **Volunteer/Treasurer**, UCSB Music Connection