LOGAN BISHOP-VAN HORN

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EDUCATION

Stanford University
M.S. Physics (Jan. 2019), PhD Physics (expected Spring 2024)
Advisor: Prof. Kathryn A. Moler
Research focus: Local magnetic response and vortex dynamics in two-dimensional superconductors.

Clark University
B.A. Physics & Mathematics, *summa cum laude*, highest honors in Physics (Dec. 2016)

RESEARCH EXPERIENCE

Graduate Research Assistant Sept. 2017 – Jan. 2019, Jan. 2021 – present
Stanford University Department of Physics, Advisor: Kathryn A. Moler *Stanford, CA*

- ◇ Developed open-source software for simulating the magnetic response of 2D superconducting devices with arbitrary geometry using both London-Maxwell and time-dependent Ginzburg-Landau (TDGL) techniques.
- ◇ Applied the above numerical tools to interpret measurements of vortex dynamics induced by scanning superconducting quantum interference device (SQUID) susceptometry.
- ◇ Modeled the local magnetic response of disordered Josephson junction arrays using large-scale nonlinear programming (NLP).
- ◇ Constructed two new scanning SQUID microscope systems in cryogen-free fridges, together spanning sample temperatures from < 100 mK to over 100 K.
- ◇ Implemented low-cost, reliable FPGA-based digital flux feedback for readout of scanning SQUID microscopes, replacing legacy analog electronics.

Research Associate Jan. 2019 – Jan. 2021
Quantum Circuits, Inc., Supervisors: Rob Schoelkopf & Harvey Moseley *New Haven, CT*

- ◇ Characterized, modeled, and optimized superconducting devices for quantum information processing using qubits encoded in high-Q microwave cavities.
- ◇ Developed software for quantum control, automated calibration, and quantum device simulation.

Cornell Center for Materials Research REU Summer 2016
Cornell University Department of Physics, Advisor: Dan Ralph *Ithaca, NY*

- ◇ Developed new tools in Python for performing and analyzing GPU-accelerated micromagnetic simulations of spin transfer torque-driven ferromagnetic resonance (ST-FMR) in spintronics devices.

Undergraduate Researcher June 2014 – Dec. 2016
Clark University Department of Physics, Advisor: Charles C. Agosta *Worcester, MA*

- ◇ Performed rf penetration depth measurements of quasi-2D organic superconductors in pulsed and DC magnetic fields using a tunnel diode oscillator (TDO).

TECHNICAL SKILLS

Scientific Computing	Python, Git/GitHub, QuTiP, MATLAB, LaTeX, Bash, Slurm, JAX, CuPy, finite element electromagnetic & micromagnetic modeling, simulating open quantum systems.
Condensed Matter & Quantum Physics	Superconducting circuits (dc to microwave), transmon qubits & high-Q cavities, scanning probe microscopy, two-dimensional materials and devices, instrument control & automation, cryogenics, cryogen-free dilution fridges.

PUBLICATIONS

7. **Logan Bishop-Van Horn**,* Eli Mueller,* and Kathryn A. Moler, *Vortex dynamics induced by scanning SQUID susceptometry.* Physical Review B **107**, 224509 (2023). *Equal contribution

6. **Logan Bishop-Van Horn**, *pyTDGL: Time-dependent Ginzburg-Landau in Python.* Computer Physics Communications **291**, 108799 (2023).

5. **Logan Bishop-Van Horn**,* Irene P. Zhang,* Emily N. Waite, Ian Mondragon-Shem, Scott Jensen, Junseok Oh, Tom Lippman, Malcolm Durkin, Taylor L. Hughes, Nadya Mason, Kathryn A. Moler, and Ilya Sochnikov, *Local imaging of diamagnetism in proximity coupled niobium nano-island arrays on gold thin films.* Physical Review B **106** 054521 (2022) (*Editors' Suggestion*). *Equal contribution

4. **Logan Bishop-Van Horn** and Kathryn A. Moler, *SuperScreen: An open-source package for simulating the magnetic response of two-dimensional superconducting devices.* Computer Physics Communications **280**, 108464 (2022).

3. Irene P. Zhang, Johanna C. Palmstrom, Hilary Noad, **Logan Bishop-Van Horn**, Yusuke Iguchi, Zheng Cui, John R. Kirtley, Ian R. Fisher, and Kathryn A. Moler, *Imaging anisotropic vortex dynamics in FeSe.* Physical Review B **100**, 024514 (2019).

2. **Logan Bishop-Van Horn**, Zheng Cui, John R. Kirtley, and Kathryn A. Moler, *Cryogen-free variable temperature scanning SQUID microscope.* Review of Scientific Instruments **90**, 063705 (2019).

1. Charles C. Agosta, **Logan Bishop-Van Horn**, & Max Newman *The Signature of Inhomogeneous Superconductivity.* Journal of Low Temperature Physics (2016).

PRESENTATIONS

6. *Vortex dynamics induced by scanning SQUID susceptometry.* APS March Meeting 2023, Las Vegas, NV.

5. *Simulating the static magnetic response of thin film superconducting devices.* APS March Meeting 2022 (presented virtually).

4. *Designing, making, imaging and modeling landscapes of superfluid density in two-dimensional superconductors.* DOE Energy Frontier Research Center (EFRC) Quantum Sensing and Quantum Materials (QSQM) Research Symposium, Feb. 15, 2022 (presented jointly with Irene P. Zhang, Emily N. Waite, and Prof. Nadya Mason).

3. *Quantum sensing with superconducting qubits.* DOE Energy Frontier Research Center (EFRC) Quantum Sensing and Quantum Materials (QSQM) Research Symposium, Sept. 10, 2021.

2. *Cryogen-free variable temperature scanning SQUID microscope.* APS March Meeting 2019, Boston, MA.

1. *New details in the superconducting phase diagram of* λ*−*$(BETS)_2GaCl_4$*: further evidence of a FFLO phase.* APS March Meeting 2017, New Orleans, LA.

OPEN SOURCE PROJECTS

`pyTDGL`	2D time-dependent Ginzburg-Landau in Python
`SuperScreen`	A package for modeling the linear magnetic response of 2D superconducting devices
`SeQuencing`	Simulate and benchmark realistic quantum control sequences in `QuTiP`

TEACHING & MENTORSHIP

Teaching Assistant, Physics 21/22, Mechanics, Fluids, and Heat — Sept. 2022 – Dec. 2022
Stanford University Department of Physics — *Stanford, CA*

Teaching Assistant, Physics 67, Introduction to Laboratory Physics — April 2022 – June 2022
Stanford University Department of Physics — *Stanford, CA*

CAMPARE Graduate Student Mentor — June 2018 – August 2018
Stanford University Department of Physics — *Stanford, CA*

Teaching Assistant, Physics 43, Electricity and Magnetism — April 2018 – June 2018
Stanford University Department of Physics — *Stanford, CA*