

LOGAN BISHOP-VAN HORN

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EDUCATION

Stanford University

M.S. Physics (Jan. 2019), PhD Physics (in progress)

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)

Advisor: Prof. Charles C. Agosta

Honors Thesis: *Investigating the FFLO state in the organic superconductor λ -(BETS) $_2$ GaCl $_4$*

RESEARCH EXPERIENCE

Graduate Research Assistant

Sept. 2017 – Jan. 2019, Jan. 2021 – present

Stanford University Department of Physics, Advisor: Kathryn A. Moler

Stanford, CA

- \diamond Developed software for simulating the magnetic response of 2D superconducting devices with arbitrary geometry using both London-Maxwell and time-dependent Ginzburg-Landau (TDGL) techniques.
- \diamond Performed large-scale nonlinear programming (NLP) to model the local magnetic response of disordered Josephson junction arrays.
- \diamond Deployed the above software applications on Stanford's Sherlock HPC cluster.
- \diamond Constructed two new cryogen-free scanning Superconducting QUantum Interference Device (SQUID) microscope systems: one capable of measuring samples at temperatures from 3 K to over 100 K, the other capable of measuring samples below 100 mK.

Research Associate

Jan. 2019 – Jan. 2021

Quantum Circuits, Inc., Supervisors: Rob Schoelkopf & Harvey Moseley

New Haven, CT

- \diamond Characterized, modeled, and optimized superconducting devices for quantum information processing using qubits encoded in microwave bosonic modes.
- \diamond 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

- \diamond 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

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

TECHNICAL SKILLS

Scientific Computing

Python, Git/GitHub, QuTiP, MATLAB, L^AT_EX, Bash, Slurm, MPI, JAX, 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

6. **Logan Bishop-Van Horn**, *pyTDGL: Time-dependent Ginzburg-Landau in Python*. arXiv:2302.03812 (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 **Volume 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*. Energy Frontier Research Center 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*. Energy Frontier Research Center 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)₂GaCl₄: 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 magnetic response of 2D superconducting devices
scanning-squid	Instrument control and data acquisition for scanning SQUID microscopy
SeQuencing	A framework for simulating and benchmarking realistic quantum control sequences using QuTiP, the quantum toolbox in Python

TEACHING & MENTORSHIP

Teaching Assistant, Physics 21/22, Mechanics, Fluids, and Heat <i>Stanford University Department of Physics</i>	Sept. 2022 – Dec. 2022 <i>Stanford, CA</i>
Teaching Assistant, Physics 67, Introduction to Laboratory Physics <i>Stanford University Department of Physics</i>	April 2022 – June 2022 <i>Stanford, CA</i>
CAMPARE Graduate Student Mentor <i>Stanford University Department of Physics</i>	June 2018 – August 2018 <i>Stanford, CA</i>
Teaching Assistant, Physics 43, Electricity and Magnetism <i>Stanford University Department of Physics</i>	April 2018 – June 2018 <i>Stanford, CA</i>

Updated: March 13, 2023