

# LOGAN BISHOP-VAN HORN

lbvh@stanford.edu  $\diamond$  loganbvvh.github.io

## EDUCATION

---

### Stanford University

M.S. Physics (Jan. 2019), PhD Physics (expected 2023)

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  $\lambda$ -(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 instrument 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<sup>A</sup>T<sub>E</sub>X, 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

---

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

---

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.
1. *New details in the superconducting phase diagram of  $\lambda$ -(BETS) $_2$ GaCl $_4$ : further evidence of a FFLO phase*. APS March Meeting 2017, New Orleans.

## 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

---

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