

Benjamin Safvati

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EDUCATION

2019- PRESENT	Stanford University PhD Candidate in Physics ◊ Advisor: Hari Manoharan, Associate Professor of Physics
2015-2019	University of California, Berkeley B.A. Physics with minor in Mathematics (GPA: 3.82) ◊ Senior Honors Thesis: <i>Topological Phases and the Negative Sign Problem in Neural-Network Quantum State Simulation</i> ◊ Advisor: Joel Moore, Professor of Physics
2011-2015	Palisades Charter High School High School Diploma

WORK EXPERIENCE

SEP 2019- PRESENT	Graduate Research Assistant - Manoharan Lab ◊ Developing and executing experimental techniques with scanning tunneling microscopy (STM) to probe the nanoscale electronic properties of quantum materials. ◊ Assembling atomic nanostructures with STM to simulate electronic lattice models or measure nanoscale features of 2D surfaces. ◊ Writing software for processing and analysis of STM data, as well as implementing various simulations of electronic many-body systems to compare with experiment. ◊ Maintaining a helium purification and liquefaction facility for the recovery of helium that boils off during experiments. ◊ Handling and preparation of various thin-film and monolayer materials for ultra-high vacuum experiments.
JAN 2017- JUN 2019	Undergraduate Research Assistant - Pines Lab ◊ Part of a team that researched new methods for ^{13}C hyperpolarization in NMR experiments using nitrogen-vacancy (NV) centers in diamond and a custom-built NMR experiment integrated with optical and RF sample excitation. ◊ Developed experimental techniques for dynamic nuclear polarization to nuclear spins in nanodiamond powders, attempting to create excess polarization in liquids at room temperature through spin diffusion. ◊ Constructed portable room temperature hyperpolarizing devices for enhanced signal sensitivity in NMR detection, and field tested the device on various NMR systems. ◊ Developed control software for the production and synchronization of a field cycling shuttler apparatus within an NMR magnet to access both low field and high field spin coupling regimes with sub-second travel times. ◊ Created methods to efficiently estimate ^{13}C spin-lattice relaxation (T_1) times over wide field ranges for various diamond samples in the presence of paramagnetic defects.

MAY 2016- **Programming Assistant - Magnetic Sensor Systems**

- DEC 2016
- ◇ Configured the firmware for various microchips to control the dynamics of 3-dimensional motion actuator technology, including implementation of PID control for smoother motion profiles.
 - ◇ Precision measurement of electromechanical components used in electromagnets, solenoids, etc. before production, identifying measurement standards to assure finished products are functional to specifications.

PUBLICATIONS

1. C. Z. Zerger, L. K. Rodenbach, Y. Chen, **B. Safvati**, M. Z. Brubaker, S. Tran, T. Chen, M. Li, L. Li, D. Goldhaber-Gordon, and H. C. Manoharan. "Nanoscale Electronic Transparency of Wafer-Scale Hexagonal Boron Nitride." *Nano Lett.* **2022**, *22*, *11*, 46084615. [[arXiv:2109.01522](#)]
2. A. Ajoy, **B. Safvati**, R. Nazaryan, J. T. Oon, B. Han, P. Raghavan, R. Nirodi, A. Aguilar, K. Liu, X. Cai, X. Lv, E. Druga, C. Ramanathan, J. A. Reimer, C. A. Meriles, D. Suter, and A. Pines. Hyperpolarized Relaxometry Based Nuclear T1 Noise Spectroscopy in Diamond. *Nature Communications*, vol. *10*, no. *1*, 2019. [[arXiv:1902.06204](#)]
3. A. Ajoy, K. Liu, R. Nazaryan, X. Lv, **B. Safvati**, G. Wang, D. Arnold, G. Li, A. Lin, P. Raghavan, E. Druga, D. Pagliero, J. Reimer, D. Suter, C. Meriles and A. Pines, Orientation Independent Room-temperature Optical ^{13}C Hyperpolarization in Powdered Diamond, *Science Advances*, *4*, eaar5492, 2018. [[arXiv:1806.09812](#)]
4. A. Ajoy, R. Nazaryan, K. Liu, X. Lv, **B. Safvati**, G. Wang, E. Druga, J. A. Reimer, D. Suter, C. Ramanathan, C. A. Meriles and A. Pines, Enhanced Dynamic Nuclear Polarization via Swept Microwave Frequency Combs, *Proceedings of the National Academy of Sciences*, 1807125115 (2018). [[arXiv:1807.07664](#)]
5. A. Ajoy, X. Lv, E. Druga, K. Liu, **B. Safvati**, A. Morabe, M. Fenton, R. Nazaryan, S. Patel, T. Sjolander, J. Reimer, D. Sakellariou, C. Meriles and A. Pines, Wide dynamic range magnetic field cyclers: Harnessing quantum control at low and high fields, *Review of Scientific Instruments* *90*, 013112 (2019). [[arXiv:1808.10579](#)]
6. A. Ajoy, R. Nazaryan, E. Druga, K. Liu, A. Aguilar, B. Han, M. Gierth, J. T. Oon, **B. Safvati**, R. Tsang, J. H. Walton, D. Suter, C.A. Meriles, J. A. Reimer, and A. Pines, "Room temperature Optical Nanodiamond Hyperpolarizer: physics, design and operation," *Review of Scientific Instruments* *91*, 023106 (2020); [[arXiv:1811.10218](#)]

TECHNICAL SKILLS

Experimental Methods

- Laboratory electronics, including lock-in amplifiers, feedback controllers, oscilloscopes, waveform generators, and microwave circuits.
- Cryogenics.
- Ultra-high vacuum equipment.
- Optical table design.
- Laser alignment.
- Soldering.

Programming and Operating Systems

- Python (numpy, scipy, matplotlib, pandas, pytorch).
- Matlab.
- Labview.
- Linux (Fortran, C compilers. MPI compatible).
- Git.

Visual Design

- Adobe Illustrator.
- AutoCAD.
- HTML.
- Latex.
- Houdini.

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