Peyton D. Murray

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Education

University of California, Davis 2012 – 2018
Ph. D. Physics: Dec 2018
M. S. Physics: Dec 2013

Saint Mary's College of California, Moraga 2007 – 2011
B. S. Physics, Minor: Mathematics, *summa cum laude* (GPA: 3.873)

Computing

Python (proficient), C++ (intermediate), Go (intermediate), Javascript (intermediate), CUDA (intermediate)

Technologies

Git, Python scientific/data vis stack (scipy [contributor], numpy, matplotlib, cython, ...), pytest. Web development with Django (and Django REST), React+Redux, Jest, AngularJS. Jenkins and CircleCI for testing and deployment, codecov for test coverage.

Skills

Agile Development, Automated Testing, Simulations, Data Analysis, Statistics, Visualization, Linux, Python Data & Visualization Ecosystem (numpy, scipy, pandas, dask, matplotlib, ...), Regression, Bayesian parameter estimation, HPC, Distributed Computing, VTK, Jekyll.

Research & Experience

Voltaiq, Berkeley, CA Oct 2019 – Present
Software Engineer

- Developed and deployed bespoke, modern, and production-quality data analysis and visualization tools to provide quantitative insight into battery performance for some of the world's largest battery manufacturers using Django (with Django REST Framework), Plotly.js, and React.
- Followed an agile development cycle, allowing for rapid iteration and delivery of custom software solutions.

Computational Physics Laboratory, Tampere University, Finland Jan 2019 – Aug 2019
Postdoctoral Researcher
Advisor: Lasse Laurson

- Simulated nanoscale magnetic materials using a combination of open source software and in-house code (Go, CUDA, and Python). Numerical calculations of domain wall motion were compared to an analytic model [6].
- Leveraged GPUs deployed as part of the CSC's Taito-GPU supercluster to enable massively parallelized simulations.

Department of Physics, University of California, Davis 2012 – 2018
Graduate Student Researcher
Advisor: Kai Liu

- Developed PyFORC, a suite of open source tools for analyzing and visualizing magnetic measurements using the First-Order Reversal-Curves (FORC) technique (Python).
- Streamlined the Liu group's material analysis pipeline by developing tarmac, a Python library for quickly visualizing Markov-chain monte carlo (MCMC) samples. This library makes it simple to identify correlations between parameters in a statistical model, and to evaluate convergence during curve fitting.
- Fabricated and characterized a wide range of nanoscale magnetic materials, including nanoparticles, thin films, single crystals, and patterned nanostructures using a variety of cutting-edge techniques. Programmed data acquisition and instrument control software for crucial laboratory equipment.

Physics Division, Lawrence Berkeley National Laboratory, Berkeley, CA 2011 – 2012
Junior Specialist, ATLAS Experiment
Principal Investigator: Maurice Garcia-Sciveres

- Tested prototype next-generation hardware developed for tracking the trajectories of charged particles at the Large Hadron Collider (LHC), the largest particle physics experiment in the world.
- Developed system control GUI and backend for an integrated circuit tester (C++ and Qt; version control with SVN). These tools allowed for automated testing of hundreds of chips (entire wafers) at a time, greatly increasing throughput. Chips which passed tests were installed as part of the Insertable B-Layer system at the LHC in 2014, enabling continued studies of the Higgs boson [12].

Physics Department, Saint Mary's College of California, Moraga 2010 – 2011
Research Assistant, ALFALFA Collaboration
Advisor: Ron Olowin

- Classified galactic and extragalactic astronomical observations as part of the Arecibo Legacy Fast-ALFA (ALFALFA) project, an international collaboration of astronomers based at the Arecibo Radio Observatory in Puerto Rico.

Teaching

Teaching Assistant, **Dept. of Physics, University of California, Davis** 2012 – 2016
Student Tutor and Live-In Mentor, **Physics Dept., St. Mary's College of California** 2010 – 2011

Laboratory Skills

Fabrication

Sputtering, e-beam evaporation, and e-beam-/photo-lithography and lift-off.

Magnetic Characterization

Vibrating sample magnetometry (VSM), magneto-optic Kerr effect (MOKE), SQUID magnetometry, and magnetoresistance.

Other Techniques

X-ray diffraction (XRD), reciprocal space mapping (RSM), scanning electron microscopy (SEM), polarized neutron reflectometry (PNR), x-ray absorption spectroscopy (XAS) and magnetic circular dichroism (XMCD), and Hall effect and van der Pauw resistivity methods.

Publications

1. Burks, E. C. *et al.* **3D Nanomagnetism in Low Density Interconnected Nanowire Networks**. *Nano Letters* **21,** 716–722. ISSN: 1530-6984. doi:10.1021/acs.nanolett.0c04366 (Jan. 2021).
2. Gilbert, D. A. *et al.* **Reconstructing phase-resolved hysteresis loops from first-order reversal curves**. *Scientific Reports* **11,** 4018. ISSN: 2045-2322. doi:10.1038/s41598-021-83349-z (Dec. 2021).
3. Murray, P. D. *et al.* **Interfacial-Redox-Induced Tuning of Superconductivity in $YBa_2Cu_3O_{7-\delta}$**. *ACS Applied Materials & Interfaces,* 9b18820. ISSN: 1944-8244. doi:10.1021/acsami.9b18820 (2020).
4. Karayev, S. *et al.* **Interlayer exchange coupling in Pt/Co/Ru and Pt/Co/Ir superlattices**. *Physical Review Materials* **3,** 041401. doi:10.1103/PhysRevMaterials.3.041401 (2019).
5. Rippy, G. *et al.* **X-ray nanodiffraction studies of ionically controlled nanoscale phase separation in cobaltites**. *Physical Review Materials* **3,** 082001. ISSN: 2475-9953. doi:10.1103/PhysRevMaterials.3.082001 (2019).
6. Skaugen, A., Murray, P. D. & Laurson, L. **Analytical computation of the demagnetizing energy of thin film domain walls**. **2,** 1–11. arXiv: 1906.07475 (2019).
7. Gilbert, D. A. *et al.* **Ionic tuning of cobaltites at the nanoscale**. *Physical Review Materials* **2,** 104402. doi:10.1103/PhysRevMaterials.2.104402 (2018).
8. Quintana, A. *et al.* **Voltage-Controlled ON–OFF Ferromagnetism at Room Temperature in a Single Metal Oxide Film**. *ACS Nano* **12,** 10291–10300. doi:10.1021/acsnano.8b05407 (2018).
9. De Toro, J. A. *et al.* **Remanence plots as a probe of spin disorder in magnetic nanoparticles**. *Chemistry of Materials* **29,** 8258–8268. doi:10.1021/acs.chemmater.7b02522 (2017).
10. Sun, L. *et al.* **Magnetization reversal in kagome artificial spin ice studied by first-order reversal curves**. *Physical Review B* **96,** 144409. doi:10.1103/PhysRevB.96.144409 (2017).
11. Zhang, Q. *et al.* **Magnetic fingerprint of interfacial coupling between CoFe and nanoscale ferroelectric domain walls**. *Applied Physics Letters* **109,** 082906. doi:10.1063/1.4961545 (2016).
12. The ATLAS IBL Collaboration. **Prototype ATLAS IBL modules using the FE-I4A front-end readout chip**. *Journal of Instrumentation* **7,** P11010–P11010. doi:10.1088/1748-0221/7/11/P11010 (2012).

Selected Conferences

P. D. Murray. **Invited colloquium:** *Tuning Ionic Distributions for Multifunctional Materials.* Tampere University, Tampere, Finland (2019).

P. D. Murray, D. A. Gilbert, A. J. Grutter, B. J. Kirby, D. Hernandez-Maldonado, M. Varela, Z. E. Brubaker, R. V. Chopdekar, V. Taufour, R. Zieve, J. R. Jeffries, E. Arenholz, Y. Takamura, J. Borchers, and K. Liu. **Poster:** *Interfacial-Redox-Induced Tuning of Superconductivity in $YBa_2Cu_3O_{7-\delta}$.* International Conference on Magnetism and Magnetic Materials, San Francisco, CA (2018).

P. D. Murray, Z. Chen, D. A. Gilbert, J. Zang, T. Stückler, K. Lenz, B. B. Maranville J. Fassbender, H. Yu, J. Borchers, and K. Liu. **Poster:** *Topological Hall Effect in Planar Artificial Skyrmion Lattices.* Conference on Magnetism and Magnetic Materials, Pittsburgh, PA (2017).

P. D. Murray, D. A. Gilbert, A. J. Grutter, A. L. Ionin, R. V. Chopdekar, A. T. N'Diaye, B. J. Kirby, B. B. Maranville, Y. Takamura, E. Arenholz, K. Liu, and J. Borchers. **Talk:** *Complete Suppression of Magnetism in Gd/(La,Sr)CoO_3 Films via Redox Design of Oxygen Distributions.* Conference on Magnetism and Magnetic Materials, New Orleans, LA (2016).

Awards

3rd Place Winner, 2020 John D. Hunter Excellence in Plotting Contest. Entry (video), Source repository