Peyton D. Murray

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Education

University of California, Davis (2012 - 2018)
- Ph. D. Physics (Dec 2018)
- M. S. Physics (Dec 2013)

St Mary's College of California (2007 - 2011)
- B. S. Physics, Minor: Mathematics

Computing

Python, C/C++, Go, Javascript, Rust. Python scientific/data vis stack (contributor to `scipy`, `numpy`, `jupyter`, `conda`, ...). Dashboarding with `panel`, `bokeh`, `plotly`. Web development with FastAPI, Django/Sqlalchemy ORMs, frontend experience with JS/TS, React. Testing with `pytest`, `hypothesis`. Git for version control.

Skills

Agile Development, Automated Testing, Simulations, Continuous Integration, Data Analysis, Statistics, Visualization, Linux, Python Data & Visualization Ecosystem (`numpy`, `scipy`, `pandas`, `jupyterlab`, `matplotlib`, ...) including coding at C/Python and Rust/Python interfaces; Bayesian parameter estimation, HPC (`slurm`), Distributed Computing, VTK.

Experience

Quansight · Arcata, CA *Senior Software Engineer* May 2021 - Present

- As part of Quansight's consulting branch, delivered custom-built solutions to meet a wide range of customer needs. Much of this work consisted of open source bug fixes, feature development, and maintenance for critical packages in the Python scientific ecosystem, including `jupyter`, `scipy`, `numpy`, `conda`, the `tensorflow` ecosystem, and many smaller projects; see my GitHub profile for examples of my work. As technical lead I designed archictecture, led development, and delivered solutions on time and within budget. I also acted as a personnel manager for a team of developers from around the globe.

Voltaiq · Berkeley, CA *Software Engineer* Oct 2019 - May 2021

- Developed and deployed bespoke 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.

Tampere University · Finland *Postdoctoral Scholar* Jan 2019 - Aug 2019

- Simulated nanoscale magnetic materials on the CSC's Taito-GPU supercluster 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 [Skaugen 2019].

UC Davis Department of Physics · Davis, CA *Graduate Student Researcher* Aug 2012 - Dec 2018

- Developed PyFORC, a Python-based suite of open source tools for analyzing and visualizing magnetic measurements using the First-Order Reversal-Curves (FORC) technique.
- 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 evaluate convergence during 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.

Lawrence Berkeley National Laboratory · Berkeley, CA *Junior Specialist* May 2011 - May 2012

- Created control software (C++, with a Qt-based GUI) for automated circuit testing. Hardware tested with this system was deployed as part of the Insertable B-Layer system at the Large Hadron Collider in 2014, enabling continued studies of the Higgs boson.

St. Mary's College of California · Moraga, CA *Research Assistant* Sep 2010 - May 2011

- Classified astronomical data from the Arecibo Observatory as part of the ALFALFA Collaboration.

Teaching

Teaching Assistant, **Physics Department, University of California, Davis** 2012 - 2016

Student Tutor and Live-In Mentor, **Dept. of Physics, 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 electrical techniques including Hall effect and van der Pauw resistivity methods.

Publications

1. Murray, P. D. et al. Electrically Enhanced Exchange Bias via Solid-State Magneto-ionics. ACS Applied Materials & Interfaces 13 (32), 38916-38922 (2021).
2. Burks, E. C. et al. 3D Nanomagnetism in Low Density Interconnected Nanowire Networks. Nano Letters 21, 716–722. issn: 1530-6984 (2021).
3. Gilbert, D. A. et al. Reconstructing phase-resolved hysteresis loops from first-order reversal curves. Scientific Reports 11, 4018. issn: 2045-2322 (2021).
4. Murray, P. D. et al. Interfacial-Redox-Induced Tuning of Superconductivity in YBa2 Cu3 O7–δ . ACS Applied Materials & Interfaces, 9b18820. issn: 1944-8244 (2020).
5. Karayev, S. et al. Interlayer exchange coupling in Pt/Co/Ru and Pt/Co/Ir superlattices. Physical Review Materials 3, 041401 (2019).
6. Rippy, G. et al. X-ray nanodiffraction studies of ionically controlled nanoscale phase separation in cobaltites. Physical Review Materials 3, 082001. issn: 2475-9953 (2019).
7. Skaugen, A. et al. Analytical computation of the demagnetizing energy of thin film domain walls. Phys. Rev. B 100, 094440 (2019).
8. Gilbert, D. A. et al. Ionic tuning of cobaltites at the nanoscale. Physical Review Materials 2, 104402 (2018).
9. Quintana, A. et al. Voltage-Controlled ON–OFF Ferromagnetism at Room Temperature in a Single Metal Oxide Film. ACS Nano 12, 10291–10300 (2018).
10. De Toro, J. A. et al. Remanence plots as a probe of spin disorder in magnetic nanoparticles. Chemistry of Materials 29, 8258–8268 (2017).
11. Sun, L. et al. Magnetization reversal in kagome artificial spin ice studied by first-order reversal curves. Physical Review B 96, 144409 (2017).
12. Zhang, Q. et al. Magnetic fingerprint of interfacial coupling between CoFe and nanoscale ferroelectric domain walls. Applied Physics Letters 109, 082906 (2016).
13. The ATLAS IBL Collaboration. Prototype ATLAS IBL modules using the FE-I4A front-end readout chip. Journal of Instrumentation 7, P11010–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 YBa2 Cu3 O7–δ . 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)CoO3 Films via Redox Design of Oxygen

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