# 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), Bash (intermediate), CUDA (intermediate), Git (proficient)

**Skills**

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**

**Computational Physics Laboratory, Tampere University**, Finland Jan 2019 – Present
*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 [4].
- 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 [11].

**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. Gilbert, D. A. *et al.* **Building Bridges from FORC to Phase-Resolved Major Loops**. *In preparation.*
2. 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).
3. 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).
4. 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).
5. 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).
6. 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).
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. 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).
9. 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).
10. 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).
11. 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).