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Experience

Junior Researcher	2011 – 2012	Lawrence Berkeley National Lab
Teaching Assistant	2012 – 2015	U.C. Davis Physics Department
Graduate Student Researcher	2012 – 2018	U.C. Davis Physics Department
Postdoctoral Researcher	2018 – present	Tampere University

Education

Ph. D., Physics	December 2018	University of California, Davis
B. Sc., Physics	May 2011	Saint Mary's College of California, Moraga, <i>summa cum laude</i>

Honors and Awards

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- Summer Graduate Student Researcher Award, U.C. Davis, 2016 – 2017

Research Interests

Current interests include computational methods for investigating the magnetic properties of nanostructures and bulk materials, including micromagnetic simulations as well as atomistic approaches; application of these methods to electrically and chemically driven ion migration, particularly as an approach for modifying magnetic and transport properties to achieve low-dissipation switching. Magnetic vortices and skyrmionic materials, including bulk systems as well as multilayered and nanopatterned geometries. Application and theory of First Order Reversal Curves (FORCs) and the use of FORCs in probing switching behavior and interactions in hysteretic systems. Magnetic reversal in nanostructured films, wires, particles, and other patterned structures. More generally, the development of open-source software for scientific applications and data visualization.

Technical Skills

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- **Programming:** 10 years of Python and 8 years of C++ experience writing data reduction, visualization, analysis, and instrument control software; GUI development with Qt (C++) and PyQt (Python); packaging and release on PyPI; optimization with Numba and Cython. Proficient with Go, CUDA, Mathematica, Matlab, LabView, and LaTeX, as well as revision control (Git and SVN) and continuous integration (Travis CI). Web development experience with Jekyll, HTML, and Markdown.
 - **Characterization:** Vibrating sample magnetometry (VSM), magneto-optic Kerr effect (MOKE) magnetometry, with particular experience in applications of the First Order Reversal Curves (FORC) method in understanding magnetic interactions and hysteretic behavior. Structural characterization including X-ray diffraction (XRD), reflectivity (XRR), and reciprocal space mapping (RSM). Electrical

transport, including Van der Pauw and Hall effect techniques. Imaging using scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS).

- **Fabrication:** DC/RF magnetron sputtering, e-beam evaporation, nanopatterning by photolithography and lift-off.
- **Other:** Familiar with maintenance and repair of VSM, XRD, SEM, MOKE, and high vacuum equipment. Experience with cryogenics, high-temperature furnaces, and standard laboratory chemicals.

Publications

- P. D. Murray, J. Zhang, X. Zhang, and K. Liu, “Electrically Tunable Exchange Bias”, in preparation.
- D. A. Gilbert, P. D. Murray, J. De Rojas, R. K. Dumas, J. E. Davies, and K. Liu. “Building Bridges from FORC to Phase-Resolved Major Loops”, in preparation.
- 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. “Interfacial-Redox-Induced Tuning of Superconductivity in $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ ”, in review.
- S. Karayev, P. D. Murray, D. Khadka, T. R. Thapaliya, K. Liu, and S. X. Huang. “Interlayer exchange coupling in Pt/Co/Ru and Pt/Co/Ir superlattices,” *Physical Review Materials*, in press.
- A. Quintana, E. Menéndez, M. O. Liedke, M. Butterling, A. Wagner, V. Sireus, P. Torruella, S. Estradé, F. Peiró, J. Dendooven, C. Detavernier, P. D. Murray, D. A. Gilbert, K. Liu, E. Pellicer, J. Nogués, and J. Sort. “Voltage-controlled ON-OFF ferromagnetism at room temperature in a single metal oxide film”, *ACS Nano*, in press, [doi:10.1021/acsnano.8b05407](https://doi.org/10.1021/acsnano.8b05407).
- D. A. Gilbert, A. J. Grutter, P. D. Murray, R. V. Chopdekar, A. M. Kane, A. L. Ionin, M. S. Lee, S. R. Spurgeon, B. J. Kirby, B. B. Maranville, A. T. N'Diaye, A. Mehta, E. Arenholz, K. Liu, Y. Takamura, and J. A. Borchers. “Ionic Tuning of Cobaltites at the Nanoscale”, *Physical Review Materials* 2, 104402 (2018).
- L. Sun, C. Zhou, J. H. Liang, T. Xing, N. Lei, P. D. Murray, K. Liu, C. Won, and Y. Z. Wu. “Magnetization reversal in kagome artificial spin ice studied by first-order reversal curves”, *Physical Review B* 96 (14), 144409 (2017).
- J. A. De Toro, M. Vasilakaki, S. S. Lee, M. S. Andersson, P. S. Normile, N. Yaacoub, P. D. Murray, E. H. Sánchez, P. Muniz, D. Peddis, R. Mathieu, K. Liu, J. Geshev, K. N. Trohidou, and J. Nogués. “Remanence plots as a probe of spin disorder in magnetic nanoparticles”, *Chemistry of Materials* 29 (19), 8258-8268 (2017).
- Q. Zhang, P. D. Murray, L. You, C. Wan, X. Zhang, W. Li, U. Khan, J. Wang, K. Liu, and X. Han. “Magnetic fingerprint of interfacial coupling between CoFe and nanoscale ferroelectric domain walls”, *Applied Physics Letters* 109 (8), 082906 (2016).

Presentations

- “Tuning Ionic Distributions for Multifunctional Materials,” P. D. Murray, Tampere University, 20 February 2019.
- “Interfacial-Redox-Induced Tuning of Superconductivity in $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ ”, 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 presentation. International Conference on Magnetism and Magnetic Materials, San Francisco, CA, 20 July 2018.
- “Topological Hall Effect in Planar Artificial Skyrmion Lattices”, P. D. Murray, Z. Chen, D. A. Gilbert, J. Zang, T. Stücker, K. Lenz, B. B. Maranville, J. Fassbender, H. Yu, J. Borchers, and K. Liu, poster presentation. Conference on Magnetism and Magnetic Materials, Pittsburgh, PA, 9 November 2017.

- “Complete Suppression of Magnetism in Gd/(La,Sr)CoO₃ Films via Redox Design of Oxygen Distributions”, 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. Conference on Magnetism and Magnetic Materials, New Orleans, LA, 2 October 2016.
- “Complete Suppression of Magnetism in Gd/(La,Sr)CoO₃ Films via Redox Design of Oxygen Distributions”, 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. APS meeting of the Far West Section, 29 October 2016.
- “Interfacial Coupling of Ferroelectric Domain Walls and CoFe Investigated via First Order Reversal Curves”, Q. Zhang, P. D. Murray, L. You, C. Wan, X. Zhang, W. Li, U. Khan, J. Wang, K. Liu, and X. Han, poster presentation. IEEE Magnetics Summer School, Tohoku University, Sendai, Japan, 11 July 2016.

Additional Information

- Member of the American Physical Society (APS) and Institute of Electrical and Electronics Engineers (IEEE)

References Available Upon Request