ZOEY TUMBLESON

Experimental Physicist & Data Scientist

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EXPERIENCE & PROJECTS

Discovery of Nematic Phases in *a*-FeGe

Berkeley Lab | Advanced Light Source | SLAC| Molecular Foundry

- Acquired and analyzed spatio-temporal x-ray scattering data to find previously unknown magnetic phases in the magnetic spin textures
- Performed micromagnetic simulations to understand how the spin textures evolve due to temperature excursions
- Wrote and implemented photon statistics correlation code in Python to find sub-nanosecond dynamics
- Used high performance computing cluster to generate hundreds of micromagnetic simulations simultaneously to understand the energetic terms responsible for the ground state magnetic structures

Sampling Microsecond Dynamics in FeGd at EuXFEL

EuXFEL | SLAC | Berkeley Lab

- Generated $\sim$ 3 PB of data during a week long experiment
- Wrote a data reduction and analysis pipeline from scratch in Python
- Implemented micromagnetic simulations seeded from experimental microscopy data to compare to dynamics extracted from photon correlations

SELECTED PUBLICATIONS

Tumbleson, Z., S. A. Morley, E. Hollingworth, A. Singh, T. Bayaraa, N. G. Burdet, et al. (2025). "Thermodynamic phase transitions of nematic order in magnetic helices". In: *Science Advances* 11.25, eadt5680. DOI: 10.1126/sciadv.adt5680.

Saleheen, A. U., A. Singh, D. Raftrey, M. A. Brozius, M. R. McCarter, **Z. Tumbleson**, et al. (2025). "Multimodal correlative study of Hall transport and magnetic phases in Fe/Gd multilayer systems". In: *Applied Physics Letters* 126 (14). DOI: 10.1063/5.0239472.

Singh, A., E. Hollingworth, S. A. Morley, A. U. Saleheen, **R. Tumbleson**, D. Raftrey, et al. (2024). "Ergodicity transitions in spin spiral domains in amorphous FeGe thin films". In: *Physical Review B* 110 (22), p. L220406. DOI: 10.1103/PhysRevB.110.L220406.

McCarter, M. R., A. I. U. Saleheen, A. Singh, **Z. Tumbleson**, J. S. Woods, A. S. Tremsin, et al. (2023). "Antiferromagnetic real-space configuration probed by dichroism in scattered x-ray beams with orbital angular momentum". In: *Physical Review B* 107. DOI: 10.1103/PhysRevB.107.L060407.

Zhang, Y., J. P. Calupitan, T. Rojas, **R. Tumbleson**, G. Erbland, C. Kammerer, et al. (2019). "A chiral molecular propeller designed for unidirectional rotations on a surface". In: *Nature Communications* 10.1, pp. 1–9. DOI: 10.1038/s41467-019-11737-1.

EDUCATION

Ph.D. in Physics

University of California, Santa Cruz

Sept 2019 – Present, Anticipated Aug 2025

Thesis Title: Uncovering Hidden Phases In Magnetic Spin Textures Using Time-Resolved Coherent X-ray Scattering

M.Sc. in Physics

June 2021

B.Sc. in Engineering Physics

Ohio University

Aug 2015 – May 2019

Honors Tutorial College | GPA: 3.93
Advisor: Saw-Wai Hla

EXPERTISE

Coding

Python | Dask | Matplotlib | numpy | SLURM HPC | Multiprocessing | Numba | Scipy | pytorch | Mumax^3 | Bokeh

Equipment & Techniques

Synchrotron Resonant Soft X-ray Scattering | X-ray Photon Correlation Spectroscopy | X-ray Free Electron Lasers | Scanning Tunneling Microscopy | Magnetic Force Microscopy | Atomic Force Microscopy

Key Skills

Communication | High Dimensional Data Analysis | Data Visualization | Statistical Analysis