

SUMMARY

- Physics PhD from UC Santa Cruz; worked from Berkeley Lab in the Advanced Light Source and Materials Sciences Division for dissertation research
- Four years of experience in x-ray characterization of materials and development of Python algorithms to make novel claims
- Proven ability to communicate scientifically rigorous details effectively and collaborate with scientists with diverse scientific expertise

EDUCATION

University of California, Santa Cruz

Ph.D. Physics

August 2025

M.Sc. Physics

August 2021

Santa Cruz, CA

Ohio University

B.S. Engineering Physics (Honors Tutorial College), GPA 3.93/4.0

May 2019

Athens, OH

RESEARCH AND WORK EXPERIENCE

Lawrence Berkeley National Laboratory

September 2021 – August 2025

Graduate Student Researcher, Sujoy Roy Group

Berkeley, CA

- Characterized structural, orbital, and magnetic features of thin films and crystals with x-ray scattering at synchrotron facilities
- Developed time-resolved coherent soft x-ray scattering algorithms and experimental techniques to characterize and discover phases in materials
- Wrote highly technical scientific articles (see [Tumbleson *et al.*, Sci. Adv. **11**, eadt5680 \(2025\)](#))
- Conducted research in small groups and both led experiments and collaborated as a team member
- Commissioned equipment for both personal experiments and user research
- Wrote GPU-accelerated micromagnetic simulations to understand experimental observations
- Wrote Python data analysis pipelines that were scalable up to PBs
- Presented research results to funding agencies and conferences
- Determined data visualization to effectively communicate results succinctly
- Characterized samples with a wide range of techniques including resonant x-ray scattering, x-ray diffraction (XRD), x-ray photon correlation spectroscopy (XPCS), atomic force microscopy (AFM), magnetic force microscopy (MFM), and Laue diffractometry
- Determined strength and validity of scientific arguments and what experiments would provide more thorough results

UC Santa Cruz

September 2019 – August 2021

Graduate Student Researcher, Jairo Valasco Lab

Santa Cruz, CA

- Fabricated graphene devices in a clean room environment
- Imaged nanoscale structures with scanning tunneling microscopy (STM) and atomic force microscopy (AFM)

UC Santa Cruz

September 2019 – August 2021

Teaching Assistant

Santa Cruz, CA

- Facilitated laboratory component for undergraduate physics course on electricity and magnetism

- Graded weekly lab reports and final exams

Argonne National Laboratory

June–August 2016, 2017, 2018, 2019

Summer Intern, Center for Nanoscale Materials, Saw-Wai Hla Group

Lemont, IL

- Imaged molecular machines with scanning tunneling microscope (STM)
- Collaborated on user experiments and publications
- Performed commissioning tasks
- Competed internationally in world's first nanocar race (see highlight from [C&En](#))
- Aided in commissioning tasks and beamline experiments for synchrotron x-ray scanning tunneling microscope

Ohio University

August 2016 – May 2018

Teaching Assistant

Athens, OH

- Facilitated laboratory components for introduction to computer engineering (logic devices), electricity and magnetism, and Newtonian mechanics
- Graded weekly lab reports

PUBLICATIONS

- **Tumbleson, Z.**, S. A. Morley, E. Hollingworth, A. Singh, T. Bayaraa, N. G. Burdet, A. U. Saleheen, M. R. McCarter, D. Raftrey, R. J. Pandolfi, V. Esposito, G. L. Dakovski, F.-J. Decker, A. H. Reid, T. A. Assefa, P. Fischer, S. M. Griffin, S. D. Kevan, F. Hellman, J. J. Turner, and S. Roy (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**, M.-Y. Im, S. A. Montoya, E. E. Fullerton, P. Fischer, S. D. Kevan, S. Roy, S. A. Morley (2025). “Multimodal correlative study of Hall transport and magnetic phases in Fe/Gd multilayer systems”. In: Applied Physics Letters; 126 (14): 142401. <https://doi.org/10.1063/5.0239472>
- McCarter, M. R., A. I. U. Saleheen, A. Singh, **Z. Tumbleson**, J. S. Woods, A. S. Tremsin, A. Scholl, L. E. De Long, J. T. Hastings, S. A. Morley, and S. Roy (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.
- Singh, A., E. Hollingworth, X. M. Chen, **Z. Tumbleson**, P. Fischer, F. Hellman, S. Roy, S. A. Morley, A. U. Saleheen, M. R. McCarter, and S. D. Kevan (2023). “Characterizing Temporal Heterogeneity by Quantifying Nanoscale Fluctuations in Amorphous Fe-Ge Magnetic Films”. In: Advanced Functional Materials 33.29, p. 2300224. issn: 1616-3028. doi: 10.1002/ADFM.202300224.
- Zhang, Z., Y. Li, B. Song, Y. Zhang, X. Jiang, M. Wang, **Z. Tumbleson**, C. Liu, P. Wang, X. Q. Hao, T. Rojas, A. T. Ngo, J. L. Sessler, G. R. Newkome, S. W. Hla, and X. Li (2020). “Intra- and intermolecular self-assembly of a 20-nm-wide supramolecular hexagonal grid”. In: Nature Chemistry 12.5, pp. 468–474. issn: 17554349. doi: 10.1038/s41557-020-0454-z.
- Zhang, Y., J. P. Calupitan, T. Rojas, **Z. Tumbleson**, G. Erbland, C. Kammerer, T. M. Ajayi, S. Wang, L. A. Curtiss, A. T. Ngo, S. E. Ulloa, G. Rapenne, and S. W. Hla (2019). “A chiral molecular propeller designed for unidirectional rotations on a surface”. In: Nature Communications 10.1, pp. 1–9. issn: 20411723. doi: 10.1038/s41467-019-11737-1

SKILLS

Materials science and characterization: Soft X-ray Synchrotron Coherence Techniques, Resonant X-ray Scattering (RSoXS), X-ray photon correlation spectroscopy (XPCS), X-ray Free electron Lasers (XFEL), X-ray Absorption Spectroscopy (XAS), X-ray Diffraction (XRD), Scanning Tunneling Microscopy (STM), Magnetic Force Microscopy (MFM), Atomic Force Microscopy (AFM), Laue X-ray Diffraction, X-ray magnetic Circular Dichroism (XMCD), Mass Spectrometry

Data analysis and software: Python, MATLAB, C++, GoLang, SLURM high performance computing (HPC), Numpy, Scipy, Numba, Matplotlib, Dask, Pytorch, xarray, Bokeh, SQL, Multiprocessing, Microsoft Office, Google Suite, Mumax3, Monte-Carlo, pymc, diffusion

Soft skills: Scientific writing, Public speaking, Communication, Teamwork, Leadership, Teaching, Mentorship