

Duston Wetzel

Ph.D., Applied Physics
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Summary

Experimental condensed matter physicist specializing in magnetotransport and magneto-optical phenomena in spintronic thin films and heterostructures. Experienced in designing and automating custom experimental systems using LabVIEW (Keithley, KEPCO, DATAQ, Thorlabs). Additionally, conducts interdisciplinary research in architected metamaterials, including the discovery and realization of triply periodic helical weave structures bridging physics and mathematical art.

Research Interests

Spintronic materials and devices; magnetotransport phenomena; magneto-optics; experimental instrumentation and automation; thin-film heterostructures; architected metamaterials; triply periodic helical weaves.

Education

Ph.D., Applied Physics (GPA: 3.8/4.0)
Southern Illinois University

Aug 2024
Carbondale, IL

M.S., Physics (GPA: 3.8/4.0)
Southern Illinois University

May 2021
Carbondale, IL

B.S., Nanoscience: Nanoscale Physics (GPA: 3.6/4.0)
Northwest Missouri State University

Apr 2017
Maryville, MO

Professional Experience

Adjunct Instructor
Southeast Missouri State University

Aug 2025 – Dec 2025
Cape Girardeau, MO (online)

- Taught algebra-based Physics II lecture.

Research Scientist
SIU Quantum Optics / Quantum Materials Laboratory

Sep 2024 – Dec 2024
Carbondale, IL

- Assembled and automated magneto-optics experiments.
- Implemented Faraday-effect measurements.

Research Assistant
SIU Novel Materials and Heterostructures Laboratory

Apr 2021 – Aug 2024
Carbondale, IL

- Designed and constructed in-plane, out-of-plane, and rotational magnetotransport systems
- Analyzed anomalous Hall scaling and temperature-dependent transport in $\text{Mn}_{3-x}\text{Fe}_x\text{Sn}$ thin films.
- Developed LabVIEW VIs for synchronized multi-instrument control and automated data acquisition.
- Designed Hall-bar sputtering masks and built a magnetic annealing system for thin-film processing.
- Performed vacuum system maintenance and diagnostics including pump upgrades, cleaning, and RGA.

Teaching Assistant
SIU Department of Physics and Applied Physics

Jan 2018 – Apr 2021
Carbondale, IL

- Taught introductory physics laboratory courses.
- Graded for lecture courses, tutored at help-desk

Research and Creative Work

Helical Weave Scientist / Designer

Sep 2019 – Present

Independent research and mathematical art practice

- Discovered 27 periodic arrangements of woven helices (5 doubly periodic and 22 triply periodic).
- Constructed 23 physical triply periodic helical weave models (held together by friction).
- Exhibited in Bridges Mathematical Art exhibitions (2023–2025)
<https://gallery.bridgesmathart.org/artists/aSRtNv/duston-wetzel-phd>
- Helical Weave Portfolio: <https://www.instagram.com/wetzelsweaves>
- Wolfram Feature: <https://community.wolfram.com/groups/-/m/t/3126212>

Publications

- *Synthesis and properties of stoichiometric $Mn_{3-x}Fe_xSn$ thin films*. Sapkota, Y. R., Sanchez Llamazares, J. L., Hofer, S., **Wetzel, D.**, et al. *Next Materials* 9 (2025).
<https://www.sciencedirect.com/science/article/pii/S2949822825007294>
- *Magnetotransport Properties of Polycrystalline $Mn_{3-x}Fe_xSn$ Thin Films*. **Wetzel, D.** SIU Dissertation (2024). <https://opensiuc.lib.siu.edu/dissertations/2296/>
- *Triply Periodic Helical Weaves*. **Wetzel, D.**, Gailiunas, P., Gaither-Ganim, M., Holt, W. Proceedings of Bridges 2024, pp. 267–274. <https://archive.bridgesmathart.org/2024/bridges2024-267.pdf>
- *Magnetostatic interaction energy between a point magnet and a ring magnet*. Warnakulasooriya, N., Gallaba, D. H., Marchetta, J. J., **Wetzel, D.**, et al. *Physics Open* 15, 100140 (2023).
<https://www.sciencedirect.com/science/article/pii/S2666032623000054>
- *Room Temperature Magnetoresistance in Large Area Co/Bi_2Se_3 Bilayers*. **Wetzel, D.** SIU Master's Thesis (2021). <https://opensiuc.lib.siu.edu/theses/2841/>

Presentations

- *Triply Periodic Helical Weaves*. NWMSU RAMMINS seminar (Nov 2025)
- *Triply Periodic Helical Weaves*. SEMO Physics Seminar (Oct 2025)
- *Triply Periodic Helical Weaves*. SIU Physics Seminar (Oct 2025)
- *Magnetotransport Properties of Polycrystalline $Mn_{3-x}Fe_xSn$ Thin Films*. 26th International Conference on Electronic Properties of Two-Dimensional Systems / 22nd International Conference on Modulated Semiconductor Structures (Sep 2025)
- *Triply Periodic Helical Weaves*. SIU Alan Schoen Memorial Lecture and Gyroid Symposium (Sep 2024)
Video: <https://echo360.org/public/media/d72e1bd8-cdde-4a16-b344-b0ba4e710404>
- *Triply Periodic Helical Weaves*. Bridges Mathematical Art Conference, Halifax (Aug 2024).
- *Magnetic, Magnetotransport, and Anomalous Hall Effect Behavior in Polycrystalline Hexagonal Mn_2FeSn Thin Films*. APS March Meeting (2024)
- *Effect of Substrate on Polycrystalline Hexagonal Fe_2MnSn Thin Films*. APS March Meeting (2024)
- *Triply Periodic and Polyhedral Helical Weaves*. SIU Mathematics Seminar (Oct 2023)
Video: <https://echo360.org/public/media/b55fed07-add6-4b7d-b1c8-ddf20f52fa97>
- *From Gyroid to the Triply Periodic Helix Linkages*. SIU Mathematics Seminar (Apr 2023)
Video: <https://echo360.org/public/media/2e33ccac-8756-409c-abb5-0c2faa097955>
- *Magnetotransport Properties of Polycrystalline Fe_2MnSn Thin Films*. APS March Meeting (2022)
- *Large Unidirectional Magnetoresistance in Topological Insulator/Ferromagnet Bilayer*. APS March Meeting (2020)

Technical Experience

- **Magnetotransport:** Hall, planar Hall, anomalous Hall, topological Hall, MR, AMR; temperature- and field-dependent measurements; rotational magnetotransport; scaling analysis and resistivity modeling.
- **Magneto-optics:** Faraday effect measurements; Kerr microscopy; optical alignment and signal optimization; automated data acquisition.
- **Instrumentation and automation:** LabVIEW-based system design and automation; integration of Keithley sourcemeters, KEPCO power supplies, DATAQ acquisition systems, and Thorlabs Kinesis motion control; synchronized multi-instrument control; custom measurement routines.
- **Thin films and vacuum systems:** Magnetron sputtering (thin-film deposition); chamber maintenance (pump operation, target changes, cleaning); vacuum diagnostics (RGA); thin-film processing including magnetic annealing; Hall bar mask design (AutoCAD).
- **Experimental design:** Design and construction of in-plane, out-of-plane, and rotational magnetotransport systems; fixture design; sample mounting and measurement geometry optimization.
- **Fabrication and prototyping:** 3D printing and assembly of complex geometries (helical weave structures); mechanical prototyping; tolerance-aware design.

Technical Appendix

- **Programming:** LabVIEW (automation), Python (data analysis), Mathematica (geometric modeling), Fortran (computational physics), Excel (fitting), Origin (figures) .
- **Instrumentation:** Keithley 2182A, 2400, 6221; KEPCO 72-6D, 100-4D; DATAQ 2008, 2108; Stanford Instruments 830; Thorlabs Kinesis linear and rotational stages.
- **Fabrication:** Magnetron sputtering, mask design (AutoCAD), aluminum machining woodworking, weaving, macrame, knot tying

Awards

- SIU Dissertation Research Assistantship Award (2023)
- NWMSU Honors Program Graduate (2017)
- NWMSU Distinguished Scholar Scholarship (2013–2017)
- Missouri Bright Flight Scholarship (2013–2017)
- Camp Geiger Staff Member of the Year (2015)
- Nodaway-Holt High School Valedictorian (2013)
- Eagle Scout (2010)