Duston Wetzel

Ph.D., Applied Physics
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Summary

Experimental physicist and instrumentation specialist with expertise in magnetotransport, magneto-optics, and thin-film systems. Designed and built automated measurements integrating multiple instruments (LabVIEW, Keithley, KEPCO, DATAQ, Thorlabs) for field- and angle-dependent transport studies. Strong background in vacuum systems, thin-film processing, and experimental design. Combines rigorous measurement science with hands-on system construction and automation, with additional work in architected metamaterials including the discovery of 27 periodic helical weave structures.

Selected Achievements

- Presented at APS March Meeting and authored peer-reviewed publications in magnetotransport
- Designed and constructed fully automated magnetotransport systems (in-plane, out-of-plane, rotational)
- Developed synchronized multi-instrument control (LabVIEW; Keithley, KEPCO, DATAQ, Thorlabs)
- Conducted temperature, field-, and angle-dependent transport studies in $Mn_{3-x}Fe_xSn$ thin films
- Discovered 27 periodic helical weave structures and constructed 23 physical TPHW models

Research Interests

Spintronic materials and devices, magnetotransport, magneto-optics, experimental instrumentation and automation, thin-film heterostructures, architected metamaterials, triply periodic helical weaves (TPHW)

Education

Ph.D., Applied Physics (GPA: 3.8/4.0) — Aug 2024
Southern Illinois University — Carbondale, IL

M.S., Physics (GPA: 3.8/4.0) — May 2021
Southern Illinois University — Carbondale, IL

B.S., Nanoscience: Nanoscale Physics (GPA: 3.6/4.0) — Apr 2017
Northwest Missouri State University — Maryville, MO

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/

Professional Experience

Helical Weave Scientist/Designer/Artist 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

Assembly Line Team Member March 2026 - Present
Kawasaki Motors (Advance Services) Maryville, MO

- Short-term role while applying to research and engineering positions

Adjunct Instructor Aug 2025 – Dec 2025
Southeast Missouri State University Cape Girardeau, MO (online)

- Taught algebra-based Physics II lecture.

Research Scientist Sep 2024 – Dec 2024
SIU Quantum Optics / Quantum Materials Laboratory Carbondale, IL

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

Research Assistant Apr 2021 – Aug 2024
SIU Novel Materials and Heterostructures Laboratory Carbondale, IL

- Designed and constructed in-plane, out-of-plane, and rotational magnetotransport systems
- Analyzed anomalous Hall scaling and temperature-dependent transport in $Mn_{3-x}Fe_xSn$ 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 Jan 2018 – Apr 2021
SIU Department of Physics and Applied Physics Carbondale, IL

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

Sales Associate September 2017 - December 2017
Sears Marion, IL

- Sold tools, exercise equipment, and lawn and garden supplies

GIS Digitizer December 2013 - August 2017
Midland GIS Solutions Maryville, MO

- Digitized tax map dimensions and water, forest, and soil-type boundaries

Tutor September 2015 - May 2016
Independent Maryville, MO

- Tutored calculus-based physics I and II for a dual-credit student

Technology Support Assistant August 2013 - December 2015
Northwest Missouri State University Maryville, MO

- Repaired student-issued laptop hardware
- Gave technical assistance in university library

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 magneto-transport systems; fixture design; sample mounting and measurement geometry optimization.
- **Programming:** LabVIEW (automation), Excel (fitting), Origin (figures), Python (data analysis), Mathematica (geometric modeling), Fortran (computational physics)
- **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)