David Beckwitt, Ph.D. Candidate

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PhD candidate (Spring 2026) in **Condensed Matter Physics** specializing in data science, **computational modeling** and **X-ray and neutron scattering** with **6 years of experience** in experimental design, structural characterization, and algorithm development.

Education

May 2026 **University of Missouri, Columbia, MO — Ph.D. in Physics**

- Dissertation: *Investigating Disorder in van der Waals Thin Films*
- Advisor: Dr. Paul Miceli

May 2022 **University of Missouri, Columbia, MO — M.S. in Physics**

May 2020 **Missouri State University, Springfield, MO - B.S.in Physics**

Minor: Mathematics, Chemistry

Research Experience

2021–Present **Graduate Research Assistant**, University of Missouri

- Developed **Python**-based GIWAXS forward-modeling framework to extract site occupancies, anisotropic Debye–Waller factors, mosaicity, and geometric parameters (APS Mar 2023).
- Extended GIWAXS to **model diffuse scattering** from stacking faults to **quantify defect densities** (APS Mar 2024).
- Grew phase-controlled PbI_2 films via **Chemical Vapor Deposition**; validated polytype fractions (ACS AMI 2023).
- **Implemented CNNs** on simulated GIWAXS data using **PyTorch** for automated structure analysis.

2019–2020 **Research Intern**, NASA Space Consortium

- **Synthesized graphene films** via PLD/PVD; characterized with **Raman spectroscopy** and **electron microscopy**.

2017–2020 **Research Assistant**, Missouri State University (Advisors: Dr. K. Ghosh, Dr. S. Mitra)

- Designed and **built** a **PLD system**; characterized thin films by XRD, Raman, SEM/EDS, profilometry (MRS Spring 2019).

2019 **R&D Intern**, Dynatek Labs

- **Developed software** for biomedical testing and automated hardware systems.

Research Publications

Journal Articles

- C. J. Arendse, R. Burns, **D. Beckwitt**, *et al.*, "Insights into the Growth Orientation and Phase Stability of Chemical-Vapor-Deposited Two-Dimensional Hybrid Halide Perovskite Films," *ACS Applied Materials & Interfaces*, vol. 15, no. 50, pp. 56 692–56 703, Dec. 2023. DOI: 10.1021/acsami.3c14559.

In Review / In Preparation

- **D. Beckwitt** *et al.*, "Quantitative Simulation of Stacking Faults and Structural Disorder in CVD-Grown PbI_2 Thin Films," In Review—Anticipated Spring, Mar. 2026.
- **D. Beckwitt** *et al.*, "Simulation-Guided Control of Polytypism in CVD-Grown PbI_2," In Preparation—Anticipated Summer, Jun. 2026.
- **D. Beckwitt** *et al.*, "Supervised Convolutional Neural Networks Trained on Simulated GIWAXS Patterns for Structural Analysis of Thin Films," In Preparation—Anticipated Fall, Sep. 2026.
- **D. Beckwitt** *et al.*, "Quantitative Modeling of Grazing-Incidence Wide-Angle X-Ray Scattering Patterns from Van der Waals Thin Films," In Review—Anticipated Fall, Sep. 2025.

Conference Proceedings

- **D. Beckwitt**, "X-Ray Diffraction Investigation of Disorder in Van der Waals Thin Films," in *APS March Meeting, ACNS, and MSU Seminar (3 Talks)*, Presented at APS Prairie Section 2023 and at multiple venues 2024, 2024. URL: http://dx.doi.org/10.13140/RG.2.2.25835.04649.
- **D. Beckwitt**, "Fabrication and Characterization of 2D Heterostructure of Graphene and Transition-Metal Oxides," Missouri State University, 2020.
- **D. Beckwitt**, "Development of a Sol-Gel TiO_2 Buffer Layer for Perovskite Solar Cell Applications," in *Einhellig Interdisciplinary Forum*, Springfield, MO, 2018.
- **D. Beckwitt**, "Investigation of Solid-State LiPON Thin Films Grown by Pulsed Laser Deposition for Application as an Electrolyte," in *Arkansas INBRE Poster Presentation*, University of Arkansas, Oct. 2018. URL: https://bpb-us-e1.wpmucdn.com/wordpressua.uark.edu/dist/9/86/files/2015/08/2018-INBRE-program-A3c-Final-1m51yhx.pdf.
- **D. Beckwitt**, "Synthesis of PbO_2 Thin Films for Perovskite CH_3PbX_3-Based Solar Cell," in *Einhellig Interdisciplinary Forum*, Springfield, MO, 2017. URL: https://science.missouristate.edu/_Files/AbstractsCNAS_UGRD_2019.pdf.

Select Programming Projects

2025–Present **2D_Mosaic_Sim** – X-ray Diffraction Simulator

- Developed interactive **Python** tools to **visualize X-ray diffraction patterns**, emphasizing materials with specific crystal orientations.
- Created visualizations that help analyze and understand diffraction measurements beyond standard software.

2024–Present **ra_sim** – Crystal Analysis Software

- Built specialized software to **simulate** and **analyze X-ray diffraction data** from R-Axis IV++ detectors.
- Integrated an intuitive user interface and optimization methods, tailored specifically for this detector type.

2024 **OSC_Reader** – Detector Data Converter

- Developed a user-friendly tool to **convert proprietary detector files into accessible formats**.
- Included interactive features **allowing detailed examination of diffraction images** without commercial software.

2025 **Ising_Model** – Physics Simulation Tool

- Created an **interactive simulation** demonstrating fundamental physics concepts, with customizable parameters and real-time visualization.

Technical Skills

Programming	**Python** (7 years), Fortran, C++, R, Git, MPI, Bash scripting, LaTeX, SQL, **Excel**, **Visual Basic Advanced**
Data Analysis	Monte Carlo methods, Machine Learning (**PyTorch**, TensorFlow), **NumPy**, pandas, SciPy
Data Visualization	**Matplotlib**, **Plotly**, OriginLab, MATLAB, Jupyter Notebooks, Dash
Instrumentation	**X-ray/neutron scattering**, Chemical Vapor Deposition (CVD), Pulsed Laser Deposition (PLD), Scanning Electron Microscopy (SEM), Raman spectroscopy
Communication	**Technical writing**, Video and Animation creation/editing, Grant proposal development, Peer-review process
AI-augmented workflow	Claude, **GitHub Copilot**, **Perplexity** ,ChatGPT- used for **coding support**, data/EDA scripts, literature synthesis, and report drafting with human-in-the-loop review.

Teaching Experience

2018–2023 **Instructor and Teaching Assistant**, University of Missouri and Missouri State University Student Reviews

- Calculus-based Mechanics, Electricity & Magnetism, and Introductory C++ Programming

2021–Present **Academic Tutor**, Physics Courses, University of Missouri, Columbia, MO

2018–2021 **ACT Prep Tutor**, Club Z!, Springfield, MO

2014–2020 **Martial Arts Coach**, Dunham's Martial Arts, Springfield, MO

Leadership, Service & Outreach

Outreach and Service

2022–2024 **Graduate Student leadership**, University of Missouri: Physics and Astronomy President 2022–2023; Vice President 2023–2024; Director, *PhysAssist* mental health program.

Research outreach, University of Missouri: eclipse events with MU Extension; 4-H; DeafLEAD; Moberly Correctional Center; Columbia Young Scientist Expo; department open house.

2022–2023 **CGW Diversity Officer**, University of Missouri: Coordinating Committee; DEI advocacy for graduate workers.

2022 **Sigma Pi Sigma Physics Congress judge**, Washington, DC: presentation and poster judging.

2018–2019 **CNAS Leadership Board**, Missouri State University: student engagement and outreach.

2017–2020 **SPS high school engagement**, Missouri State University: demonstrations and mentoring.

Awards

2023 **NSSA Outstanding Student Research Prize**: contributions to neutron science; ACNS invited talk.

2022–2023 **University of Missouri teaching and leadership**: Green Chalk Teaching Award (student driven); GPC Excellence in Student Leadership.

2021–2023 **University of Missouri research scholarships**: Fergason Fund; Newell S. Gingrich; O.M. Stewart.

2023 **Travel awards**: Ron Boain & Catherine Rangel-Boain; departmental travel support.

Professional Contacts

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