PAIGE MARUSCHAK

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PHYSICS | FINANCE | EMERGING TECHNOLOGY

PROFILE

Student researcher and independent investor working across physics, computational materials, finance, and emerging technology. Experience includes single-crystal growth, low-temperature transport measurements, molecular-dynamics simulations, Python and Linux, investment research, technical presentations, and website development. Interested in understanding how advanced technologies work and evaluating how they can become viable businesses.

EDUCATION

2027 Graduate | Rolla High School

- Graduating one year early with a 3.91 GPA.

Dual-Enrolled Student | Missouri University of Science and Technology | **2025–Present**

- Completed Calculus I, II, with a 3.5 university GPA; currently taking Calculus III; Differential Equations and Linear Algebra planned for Spring 2027.

Other Classes

- Completed "How Things Work: an Introduction to Physics" at age 13 through Coursera and received a certificate for it.
- Audited "Astrophysics: The Violent Universe" at age 13 through EdX
- Completed "Programming for Everybody (Getting Started with Python)" and "Python Data Structures" at age 14 through EdX and received certificates for both.
- Currently auditing "Introduction to Parallel Programming" senior level class at MS&T.

RESEARCH EXPERIENCE

Undergraduate Researcher | Missouri University of Science and Technology | **October 2025–Present**

NPT Barostat limitations in Molecular-Dynamics Simulations

- Tested the limits of the NPT barostat to get familiar with LAMMPS and the Mill, MS&T's local high performance computer.
- Used Linux, and C++
- Built LAMMPS simulations of face-centered cubic argon to study atomic motion during heating and cooling, including models with 2,048 atoms.
- Analyzed mean-squared displacement, pressure, and simulation cell dimensions to identify when diffusion slowed during cooling and distinguish solid-like behavior from changes in box shape.
- Developed Slurm batch scripts and Gnuplot workflows to compare thermostat settings and integration timesteps across runs, track temperature fluctuations, and export atomic trajectories for visualization in OVITO.

Undergraduate Researcher | Missouri University of Science and Technology | **Summer 2025**

Single-Crystal Growth and Physical Properties of Tb6Cr4Al43 | Presented July 27, 2025

- Completed approximately 250 hours of experimental research and produced a usable Tb6Cr4Al43 single crystal for structural and magnetic characterization.
- Investigated how the compound's atomic arrangement and rare-earth/transition-metal interactions influence magnetic ordering, anisotropy, and transport behavior.
- Used X-ray diffraction to study the unit cell and compare it with the Ho6Mo4Al43 structure.
- Prepared resistivity samples and studied transport properties in a superconducting magnet system.
- Temperature- and field-dependent resistivity measurements were interpreted as showing ferromagnetic behavior.
- Observed a residual resistivity ratio near 1, indicating little change in resistivity between room and low temperature.
- Measured increasing resistivity with magnetic field, consistent with normal-metal behavior; Hall-resistivity measurements were inconclusive because strong magnetic attraction interfered with the measurement.
- Delivered a 30-minute technical presentation describing the project, methods, and findings to graduate students.

Computational Materials Research | Li3PS4 Vacancy Configurations | **In Progress** | *Results presentation planned for May 2027 at Undergraduate research conference*

- Predicting the locations of the Lithium ions vacancies by creating a small neural network based on the configuration of PS4
- Optimizing the PS4 to make the Li ions transfer easier. This will help to make charging batteries quicker, and their lifetime will last longer.
- Developed Python models of β-Li_3PS_4 to investigate lithium-site occupancy and vacancy arrangements for solid-state battery electrolytes.
- Reconstructed neutron-diffraction crystal structures and built interactive 3D visualizations using ASE and PyXtal.
- Implemented Monte Carlo simulations with a MACE interatomic potential to study temperature-dependent lithium occupancies and relative free energies.
- Built simulation validation, convergence diagnostics, uncertainty estimation, and checkpointing workflows.

FINANCE AND INVESTMENT

Independent Investor and Market Researcher | Self-Funded Fidelity Account

- Opened a brokerage account at age 15 using money earned by selling personal belongings; selected VTI as the first investment to prioritize diversification while developing investment knowledge.
- Manage a personal portfolio using company and sector research, market conditions, valuation, catalysts, and downside-risk analysis.
- Used the BUR investment and market response to the YPF litigation to study event risk, concentration, and the difference between apparent undervaluation and adequately priced uncertainty.

Financial Research Mentorship | Raymond James | **Monthly**

- Meet monthly with Ms. Sheila King, a lead portfolio analyst, to discuss emerging markets and technologies, potential investments, company health, private markets, corporate finance, private debt, inflation, labor markets, and macroeconomics.

Quantitative Finance Class| Stevens Institute of Technology | **July 2026**

- Took a quantitative finance class through Stevens Institute of Technology and received Bloomberg Market Concepts certification and a Capital IQ certification.

OpenAI and Public Markets Study

- Investigated how OpenAI-related announcements and commercial relationships corresponded with public-company returns, abnormal trading volume, and market-index contribution.

Conclusion was inconclusive to slightly positive.

- Examined event timing and company relationships while recognizing that limited contract disclosures constrained causal conclusions.

Constellation Energy Investment Pitch | Perplexity Stock Pitch Competition

- Created a website, with the help of Perplexity Computer, to pitch why someone should invest in CEG.
- Connected nuclear-generation assets, AI-driven electricity demand, valuation, catalysts, market expectations, and risks in a technical-commercial investment thesis.

ChatGPT Portfolio | **March 16, 2026 -Present**

- Had ChatGPT create its own portfolio for long term gains, with a few restrictions: Only $350 max per new trading day, no forced trades, focus on high-conviction step ups.
- Currently has a 5.51% gain with SPY, NVDA, BRK-B, GOOG, MRK, and XLE

TECHNOLOGY AND DESIGN PROJECTS

FrontierTech Atlas | Next.js Website

- Designed and built a field guide to emerging energy systems, quantum-computing platforms, fuels, and materials, with detailed explanations of how each technology works and why it matters.
- Tracks important technical and commercial developments and offers multiple visual experiences, including Galactic, Art Deco, and Frontier views.
  - **Website:** alt-energy-database.vercel.app

Personal Résumé Website | https://paigemaruschak.vercel.app/

- Built an interactive portfolio that follows a particles-to-markets story, from particle physics and fusion energy to quantum computing and technology commercialization.
- Will allow visitors to view the résumé through Physics, Finance, and combined Physics × Finance perspectives.

Science Olympiad Note Generator | retired

- Built a Science Olympiad Note Generator, to gather the data quickly and efficiently.

Binary Clock | Engineering Project | In Development

- Designing a 5-by-15 binary clock with hour, minute, and second displays to build experience with electronics, digital logic, and physical computing.

EMPLOYMENT

Sandwich Artist | Jersey Mike's | **June 2026–Present**

- Work full time during summer and part time during the school year; serve customers, coordinate with coworkers, fill orders accurately and efficiently, creates cold and hot subs.

LEADERSHIP AND ACTIVITIES

Science Olympiad | Rolla High School | **4 Years**

- Earned second place in astronomy and third place in meteorology; also competed in wind power and got first place, experimental design in fourth place, and bridge design. Competed at reginal and state levels, won at regionals.

Speech and Debate | Rolla High School | **1 Year**

- International Extemporaneous Speaking: researched under time pressure and presented potential solutions.
- Informative Speaking: presentation about the W boson and the Standard Model using LEGO pieces.

Spanish Club | Rolla High School | **1 Year**

- Participated in club activities, celebrations, and cultural-learning events.

Society of Physics Students | Missouri S&T | **3 Years**

- Participate in physics discussions with guest lecturers and department professors and support activities including bake sales and fun Fermi questions.

Biomedical Engineering Prosthetics Design Team | Missouri S&T

- Serve as lead programmer and support CAD development for a myoelectric prosthetic arm intended to reduce weight, increase functionality, and improve affordability.

Immerse Education Essay Competition | International Competition | **2 Years**

- Participated in Immerse Education essay competition.
- First prompt was about "How Physics Helps Create Sustainable Energy Solutions"; first exposure to alternative energies
- Looked at artificial photosynthesis, quantum dot solar cells, and nuclear fusion
- Second prompt was "What is the Significance of the search for the Theory of Everything?"
- Looked at global collaboration and prosperity, new technologies to improve our lives, and answers to deep philosophical questions

COMMUNITY SERVICE

Childcare Volunteer | Weekly | **6 Years**

- Work with children with special needs and teach lessons to students from kindergarten through fifth grade.

Rolla Celebration of Nations Volunteer | 1 Year

- Represented England at a multicultural festival hosted by Missouri S&T and the City of Rolla, sharing cultural information with attendees and helping with event passports.

CURRENT INTERESTS

Emerging technologies, AI and AI infrastructure, fusion, quantum computing, economics & finance.