

## Research Interests

My research focuses on the **science of AI** and **AI for science**. I apply techniques and ideas from physics to artificial neural networks to understand how they learn, and I develop methods for AI to learn to conduct science effectively. My current research in machine learning and AI includes projects in **interpretability**, **AI for scientific discovery**, **in-context learning**, **LLM multi-agent interactions**, and **AI safety**.

## Education

**M.A., Ph.D. — Princeton University — Physics** 2022 - 2027  
NSF GRFP  
**Advisors:** William Bialek and David Schwab.  
**B.A. — University of Pennsylvania — Physics (Honors)** 2018 - 2022  
**Advisor:** Dani Bassett.  
Cum Laude; Minors in Mathematics and French & Francophone Studies.

## Experience

**Junior Research Scientist — Polymathic AI** Mar 2026 - Aug 2026  
Internship Project: AI for Scientific Discovery (paper under review at NeurIPS 2026).  
**Mentee — MARS (Mentorship for Alignment Research Students)** Jul 2025 - Feb 2026  
MARS 3.0 participant at the Cambridge AI Safety Hub. Co-first author on project investigating AI control and steering via Chain-of-Thought (CoT) injections (paper at workshop at ICLR 2026).  
**Graduate Researcher — Princeton University** Aug 2022 - Present

## Awards & Honors

**Citadel GQS Physics PhD Fellowship Finalist** 2026  
3 finalists in USA  
**National Science Foundation (NSF) ACCESS Computing Award** 2025  
(200,000 credits, ~ \$5,000)  
Applied for and am Principal Investigator for this award.  
**NSF AI Institutes Virtual Organization (AIVO) Travel Grant (\$2,000)** 2025  
**American Physical Society (APS) GSNP Student Speaker Award Finalist (\$500)** 2025  
**NSF Graduate Research Fellowship Program (GRFP) (\$159,000 + \$12,000 bonus from Princeton)** 2022 - 2027  
**Charlotte and Morris Tanenbaum \*52 Graduate Fellowship in Physical or Life Sciences (\$40,000)** 2022 - 2023  
**Joseph Henry Merit Award (\$5,000)** 2022  
**University Scholars Program (\$7,000)** 2020 - 2022  
Applied for and awarded summer research funding in 2020 and 2021.  
**National French Honor Society – Pi Delta Phi** 2020 - Present  
**Sister Loretta Thome Scholarship (\$10,000)** 2018 - 2023

## Publications [Google Scholar] \* indicates equal contribution.

8. Matt L. Wiemann\*, **Lindsay M. Smith\***, Peter Melchior, Siddharth Mishra-Sharma, Andrew Gordon Wilson, Pavel Izmailov, Carolina Cuesta-Lázaro (2026). DISCOVERPHYSICS: Benchmarking LLMs for Out-of-the-Box Scientific Thinking. *Under review*, <https://arxiv.org/abs/2605.26087>.

7. **Lindsay M. Smith\***, Ananya Malik\*, Edward James Young, Puria Radmard, Cameron Tice, and Hannes Whittingham (2026). Chain-of-Thought Injection as an Inference-Time Safety Intervention. *ICLR 2026 Workshop on Logical Reasoning of LLMs*, <https://openreview.net/forum?id=v0XkgeD6U>.
6. Colin Scheibner\*, **Lindsay M. Smith\***, and William Bialek (2025). Large language models and the entropy of English. *Under review*, <https://arxiv.org/abs/2512.24969>.
5. Jeff Shen\* & **Lindsay M. Smith\*** (2025). ALICE: An Interpretable Neural Architecture for Generalization in Substitution Ciphers. *Under review*, <https://arxiv.org/abs/2509.07282>.
4. Chase Goddard, **Lindsay M. Smith**, Vudtiwat Ngampruetikorn\*, David J. Schwab\* (2025). When can in-context learning generalize out of task distribution? *ICML 2025*, <https://arxiv.org/abs/2506.05574>.
3. **Lindsay M. Smith**, Chase Goddard, Vudtiwat Ngampruetikorn\*, David J. Schwab\* (2024). Model Recycling: Model component reuse to promote in-context learning. *NeurIPS 2024 Workshop on Scientific Methods for Understanding Deep Learning*, <https://openreview.net/forum?id=vWSu8nEURM>.
2. Chase Goddard, **Lindsay M. Smith**, Vudtiwat Ngampruetikorn\*, David J. Schwab\* (2024). Specialization-generalization transition in exemplar-based in-context learning. *NeurIPS 2024 Workshop on Scientific Methods for Understanding Deep Learning*, <https://openreview.net/forum?id=D1ui5QwHqF>.
1. **Lindsay M. Smith**, Jason Z. Kim, Zhixin Lu, and Dani S. Bassett (2022). Learning continuous chaotic attractors with a reservoir computer, *Chaos* 32, 011101, <https://doi.org/10.1063/5.0075572>. *Selected as an Editor’s Pick and publicized with a Scilight summary: <https://doi.org/10.1063/10.0009079>.*

## Talks

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| <b>Kempner Institute Workshop: Learning Dynamics in Natural &amp; Artificial Intelligence</b> ,<br>Cambridge, MA | Sep 2026 |
| Talk: “Learning long-ranged structure in English: Code length and entropy dynamics during LLM training.”         |          |
| <b>APS Global Summit</b> , Denver, CO                                                                            | Mar 2026 |
| Talk: “Universality of LLM mechanisms across scale and diversity.”                                               |          |
| <b>Princeton University Machine Learning Journal Club</b> , Princeton, NJ                                        | Sep 2025 |
| Invited talk: “ALICE: An Interpretable Neural Architecture for Generalization in Substitution Ciphers.”          |          |
| <b>APS Global Summit</b> , Anaheim, CA                                                                           | Mar 2025 |
| <i>(GSNP Student Speaker Award Finalist)</i>                                                                     |          |
| Talk: “Multi-Agent Debate: Analyzing Consensus in Networks of LLM Agents.”                                       |          |
| <b>APS March Meeting</b> , Chicago, IL                                                                           | Mar 2022 |
| Talk: “Learning Continuous Chaotic Attractors with a Reservoir Computer.”                                        |          |

## Posters

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| <b>Princeton Center for Theoretical Science Workshop: The Physics of John Hopfield</b> , Princeton, NJ | Sep 2025 |
| “ALICE: An Interpretable Neural Architecture for Generalization in Substitution Ciphers.”              |          |
| <b>Meta 2025 PhD Forum</b> , Menlo Park, CA                                                            | Oct 2025 |
| “ALICE: An Interpretable Neural Architecture for Generalization in Substitution Ciphers.”              |          |
| <b>NeurIPS 2024 Workshop on Scientific Methods for Understanding Deep Learning</b> , Vancouver, Canada | Dec 2024 |
| “Model Recycling: Model component reuse to promote in-context learning.”                               |          |
| <b>Conference for Undergraduate Women in Physics (CUWiP)</b> , Virtual                                 | 2022     |
| “Learning Continuous Chaotic Attractors with a Reservoir Computer.”                                    |          |

**Penn Research Expo**, Philadelphia, PA

2020, 2021, 2022

“Development of control in brain networks over temporal and spatial scales using graph models.”

“Learning Continuous Chaotic Attractors with a Reservoir Computer.”

## Teaching and Mentoring

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**Teaching Assistant**, Princeton University

Fall 2025

PHY 103: General Physics I

**Mentor**, Princeton Towards an Inclusive Physics cOmmunity in graduaTe Students (TIPOTS) 2024 - Present

Mentored younger physics graduate students each semester.

**Mentor**, Princeton Physics Mentorship

2022 - 2024

Mentored one to two undergraduate physics students each semester. Met at least once a semester to give career and academic advice.

**Tutor**, CIS 110: Introduction to Computer Programming

2021 - 2022

Tutored two to three students weekly.

**Mentor**, Side By Side Agency

2021

Advised a student on an independent astrophysics research project and poster.

## Professional Service and Outreach

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**Reviewer**: Workshop on Scientific Methods for Understanding Deep Learning (Sci4DL) at NeurIPS 2024 and ICLR 2026.

Princeton Women in Physics, **Executive Board** (2023 - Present)

Princeton Physics EDI, **Events Committee** (2022 - 2024)

## Technical Skills

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Python, PyTorch, JAX, L<sup>A</sup>T<sub>E</sub>X, bash, Git, Jupyter, MATLAB, Java, C++, ROOT, Mathematica, Linux