Mira Littmann

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Education

University of Chicago, *Physics* *B.S. Expected 2026*

GPA: 3.79 / 4.00
Relevant coursework: quantum field theory (graduate courses), particle physics (graduate course), mathematical methods in physics (graduate courses), quantum mechanics, statistical mechanics, electricity & magnetism
Bachelor's thesis: Benchmarking Detection of Long-lived Particles at a Future 10 TeV Muon Collider, under supervision of Prof. Karri DiPetrillo.

Awards and Honors

- **Student Marshal, University of Chicago**
  One of the highest honors awarded to undergraduates, given to less than 2% of graduating seniors. For students who demonstrate academic excellence, evidence of leadership commitment to public service, and ambassadorial potential.
- **Nathan Sugarman Award for Excellence in Undergraduate Research** *(May 2025)*
  Awarded to 1-2 students per year by the Enrico Fermi Institute. Nominated by Karri DiPetrillo and David Miller for "contributions to the development of intelligent pixel detectors for future high energy physics experiments" and "outstanding contributions to the GigaBREAD experiment".
- Wentzel Prize Selection Committee Member *(2025)*
- Straetz International Undergraduate Research Scholar *(Summer 2025)*
- Quad Summer Undergraduate Research Scholar *(Summer 2024)*
- Quad Undergraduate Research Scholar *(Academic Year 2023-24)*

Research Experience

Karri DiPetrillo Lab at University of Chicago *Aug 2024 - Present*

Muon Collider Simulation Studies: Studying efficiency of long-lived particles at a 10 TeV muon collider using simulation and reconstruction software. Determining the effects of tracker timing windows on reducing background and optimizing signal.

Development of on-chip machine learning for colliders: Developing and testing of on-chip neural networks for pixel detectors, for application in future particle colliders in order to increase detection ability and reduce data volume. Responsible for test-stand creation and operation.

ATLAS Experiment: At CERN, shifted on Inner Detector control room desk. Learned from summer student lectures and software tutorials, ATLAS Week collaboration meeting, and theory group colloquia while working on muon collider simulation studies.

Theoretical particle and quantum physics research *Mar 2024 - June 2025*

Studied the intersection of particle physics and quantum information with Profs. Carlos Wagner, Marcela Carena, Ian Low, and their graduate students. Examined symmetries and maximal entanglement conditions in scatterings of the Two Higgs Doublet Model.

The Miller Lab at University of Chicago, BREAD Collaboration *Apr 2023 - Aug 2024*

Worked on the Broadband Reflector Experiment for Axion Detection (BREAD) in collaboration with Prof. David Miller and Fermilab.

- Supported all aspects of BREAD's data-taking and operations, including running noise-temperature and reflectivity measurements, troubleshooting the full experimental chain, and organizing the analysis pipeline from spectral averaging to final statistical limits.
- Designed and built mechanical and electronic subsystems for the experiment (reflector supports, motor mounts, PCB and amplifier chain configuration), and independently explored future detector concepts

through RF simulations and readout-technology studies.

Publications and Presentations

Enabling Searches for Heavy Meta-Stable Charged Particles at a Future 10 TeV Muon Collider *Dec 2025*

Mira Littmann, Mark Larson, Benjamin Rosser, Tate Flicker, Kane Huang, Leo Rozanov, Karri Folan Di Petrillo

arXiv Preprint

In-pixel integration of signal processing and AI/ML based data filtering for particle tracking detectors Oct 2025

Benjamin Parpillon, Anthony Badea, *et al.*, including **Mira Littmann**

arXiv Preprint

Poster Presentation at United States Muon Collider Collaboration Meeting: Benchmarking Direct Detection of Long-lived Particles at a Future Muon Collider Aug 2025

Poster

Entanglement Maximization and Mirror Symmetry in Two-Higgs-Doublet Models May 2025

Marcela Carena, Guglielmo Coloretti, Wanqiang Liu, **Mira Littmann**, Ian Low, Carlos E.M. Wagner

J. High Energ. Phys. 2025, 16 (2025)

United States Muon Collider Community White Paper for the European Strategy for Particle Physics Update May 2025

United States Muon Collider Collaboration, including **Mira Littmann**

arXiv Preprint

First Axion-Like Particle Results from a Broadband Search for Wave-Like Dark Matter in the 44 to 52 μeV Range with a Coaxial Dish Antenna Jan 2025

Gabe Hoshino, Stefan Knirck, Mohamed H. Awida, Gustavo I. Cancelo, Simon Corrodi, Martin Di Federico, Benjamin Knepper, Alex Lapuente, **Mira Littmann**, David W. Miller, et al.

Phys. Rev. Lett. 134.171002

First Results from a Broadband Search for Dark Photon Dark Matter in the 44 to 52 μeV Range with a Coaxial Dish Antenna Mar 2024

Stefan Knirck, Gabe Hoshino, Mohamed H. Awida, Gustavo I. Cancelo, Martin Di Federico, Benjamin Knepper, Alex Lapuente, **Mira Littmann**, David W. Miller, et al.

Phys. Rev. Lett. 132.131004

Poster Presentation at Quad Undergraduate Research Symposium: Searching for Dark Matter with BREAD Apr 2024

Poster

Poster Presentation at Conference for Undergraduate Women in Physics: BREAD Ongoing Results and Progress Jan 2024

Poster

Slides Presentation at BREAD Collaboration Meeting: Dish Antenna Details: Focal Point, Resonances, and Noise Temperature Oct 2024

Slides

Teaching, Leadership, Outreach, and Mentoring Experience

President of Society of Women in Physics *President since 2024*

Served on board since 2022, became President in 2024. Create, plan, and organize speaker events, workshops, journal clubs, mentorship programs, socials and study breaks, and panels with helpful advice. Average attendance at events of ∼30 students, feature ∼10 speakers per year from both within and outside the university, manage a board of 10 people, and oversee a budget of $3000.

Muon Collider Social Media Strategist and Creator *Aug 2025 – present*

Developed strategic plan for muon collider social media presence and carry out communication and outreach through the platforms of Instgram and TikTok (@muoncollider.us). Design content with the intention of making particle physics accessible and exciting to the general public.

Learning Assistant for Phys 131-132-133 *Sept 2023 - Sept 2024*

Provided support for students in the introductory physics sequence laboratory sections. Worked with a graduate student teaching assistant to provide support such as answering questions about theory underlying the week's experiment, lab equipment operation, data analysis, and lab report writing.

Mentor for Girls Invent: Building Young Girls' Identities in STEM *Sept 2023 - Jan 2024*

Assisted UChicago Ph.D. Candidate Juliet Crowell in her program to support female middle school students in the Southern Chicago area to feel comfortable and excited about science. Guided the girls through weekly invention projects, taught them about modern physics research (including my own) at an appropriate level, and helped to foster a welcoming learning environment.

Skills

- **Programming, software development, and data analysis**: Python, C++, Linux, statistical methods, PyLCIO analysis, bash scripting, GitHub, HTCondor and OSG submission, ATLAS DAQ and alarm screen monitoring, track reconstruction software development (ACTS, Marlin, Gaudi), Mathematica
- **Hardware and Electronics**: FPGA programming, ASIC testing, embedded systems, RF simulation, Spacely, Vivado, Peary
- **Engineering and Design**: Computer-aided Design (AutoCAD, KiCad, FreeCAD, Fusion360), machine shop operation