

# David Gallacher

PhD Candidate, Brunner Neutrino Lab  
McGill University

davidgallacherphysics.com   
david.gallacher@mail.mcgill.ca 

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## Education

### Doctor of Philosophy

Experimental Nuclear Physics  
McGill University  
2021 — Present  
Supervisor - Thomas Brunner

### Master of Science

Astroparticle Physics  
Carleton University  
2019 — 2021  
Supervisor - Mark Boulay

### Bachelor of Science

Experimental Physics, Honors  
Carleton University  
2012-2019  
Supervisor - Mark Boulay

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## Awards and Scholarships

2024 Alexander McFee Fellowship  
(\$10,000)

2024 McGill Department of Physics  
Travel Award  
(\$750)

2022 McGill Department of Physics  
Travel Award  
(\$1000)

2019-2021 Carleton Faculty of  
Science Master's Scholarship  
(\$7000 x year)

2019 Carleton University Deans'  
Honors List

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## Profile

Experimental physicist with advanced detector and computation skills, passionate about teaching and building community in physics.

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## Research Skills

### Science Communication

- Lead workshops training new graduate students in science communication skills.
- Lead organizer for physics software hackathon outreach event for physics students.

### Physics Computation

- 6 years' experience in ROOT, C++, and python analysis, including HPC techniques.
- Lead developer for fast multi-threaded SiPM waveform analysis framework, MERCI.

### Cryogenics for Liquid Noble Gas Detectors

- Commissioned small scale liquid argon and liquid xenon cryostats, designed cooling system upgrade for LoLX experiment.
- Created automated slow control systems in MIDAS and LabVIEW using PID for cryogenic systems.

### Data Acquisition

- Created DAQs for multiple SiPM and PMT based experimental setups (w/ 100+ channel readout)
- 6 years' experience in MIDAS DAQ systems development.

### Monte Carlo Simulations

- Experienced GEANT4 developer, including custom physics extensions.
- 6 years' experience in optical transport simulations development, including GPU accelerated transport using Chroma.

### Light Detection

- Developed systems for single photon counting applications, with SiPMs and PMTs.
- Performed detailed optical characterization measurements for detector materials.

## Highlighted Publications

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- **D. Gallacher et al**, Measurement of SiPM external cross-talk in the Light Only Liquid Xenon detector, *Under review*
- **nEXO Collaboration** (2022) Performance of novel VUV-sensitive Silicon Photo-Multipliers for nEXO, December 2022, *EPJC 82, 1125*, [DOI](#)
- **DEAP Collaboration** (2024) Relative Measurement and Extrapolation of the Scintillation Quenching Factor of  $\alpha$ -Particles in Liquid Argon using DEAP-3600 Data, 2024, *Submitted to EPJC*, [arXiv](#)
- **D. Gallacher et. al** (2022). Development and characterization of a slow wavelength shifting coating for background rejection in liquid argon detectors, July 2022, *NIMA 1034,16683*, [DOI](#)
- **D. Gallacher and M. Boulay** (2020) Surface background rejection technique for liquid argon dark matter detectors using a thin scintillating layer. Proceedings for LIDINE 2019, *JINST Vol 15* (2020)
- **DEAP Collaboration** (2019) Search for dark matter with a 231-day exposure of liquid argon using DEAP-3600 at SNOLAB. *Physical Review D* 100, 022004

## Highlighted Presentations

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- **CAP Congress 2024 [Talk]**
  - Measurement of SiPM External Crosstalk in a Liquid Xenon Detector, *London, ON, Canada, May 2024*
- **Vienna Workshop on Simulations (VIEWS) 2024 [Invited Talk on behalf of nEXO]**
  - The search for neutrinoless double-beta decay using the nEXO experiment: Simulation needs and challenges, *Vienna, Austria, April 2024*
- **WNPPC 2024 [Talk]**
  - Advancements in SiPM Characterization and Optical Simulations for Noble-Liquid Detectors in Nuclear Physics, *Bromont, QC, Canada, February 2024*
- **LIDINE 2022 [Talk]**
  - Measurement of SiPM external cross-talk in a liquid xenon detector, *AstroCENT Warsaw, Poland, September 2023*
- **NEUTRINO 2022 [Poster]**
  - LoLX: Light-only Liquid Xenon experiment for R&D studies towards next-generation neutrino-less double beta decay experiments, *Virtual, May 2022*
- **LIDINE 2021 [Talk]**
  - Development and characterization of a slow wavelength shifting coating for background rejection in liquid argon detectors, *Virtual, September 2021*

## Volunteer and Outreach Experience

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- President of McGill Graduate Association of Physics Students (MGAPS) (2023-2024)
- Co-Chair of nEXO DEI Committee (January 2023 – Present)
- McGill Science Outreach Coordinator for Physics (2022-2024)
  - Lead organizer of [McGill Physics Hackathon](#)
- Gave 2 public lectures on dark matter detection.

## Teaching Experience

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- Co-supervised 10+ undergraduate thesis and student intern projects; including software, analysis, and hardware projects.
- Teaching assistant for undergraduate labs at Carleton University, assisted running observatory for astronomy, and created assignment sets for classical optics course.