

# Gavin Hester, Ph.D.

Assistant Professor, Department of Physics, Brock University

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## Research Interests

Quantum materials, quantum phase transitions, spin liquids, magnetic materials, amorphous solids, neutron scattering, crystal growth, magnetometry, heat capacity

## Current Position

**Assistant Professor**, Department of Physics, Brock University

2023–Present

## Education

**Colorado State University**, Fort Collins, CO

*Ph.D. Physics, 2021*

Dissertation: *Quantum Magnetism in the Rare-Earth Pyrosilicates*

Advisor: Prof. Kate Ross

**Missouri State University**, Springfield, MO

*B.Sc. Physics, 2016*

Capstone: *Neutron Scattering Studies of Lithium-Ion Diffusion in Ternary Phosphate Glasses*

Advisor: Prof. Saibal Mitra

## Professional Appointments

**Postdoctoral Research Associate**, Purdue University

2021–2022

*Banerjee and Chen Laboratories*

- Developed a departmental crystal growth lab and synthesized quantum materials
- Advanced spin-current neutron scattering techniques

**Graduate Research Assistant**, Colorado State University

2016–2021

*Ross Laboratory*

- Single crystal growth and bulk property characterization
- Conducted neutron scattering experiments
- Supervised undergraduate research

**Undergraduate Research Assistant**, Missouri State University

2014–2016

- Synthesized solid electrolytes and performed molecular dynamics simulations
- Analyzed lithium diffusion using quasielastic neutron scattering

**Science Undergraduate Laboratory Intern**, Ames National Laboratory

Summer 2015

- Improved Nd-Fe-B magnets by diffusing Dy into grain boundaries
- Sealed and annealed samples; analyzed magnetic hysteresis curves

**Research Assistant**, University of Missouri Research Reactor

Summer 2014

- Elastic measurements of amorphous electrolytes with a triple-axis spectrometer
- Developed research outreach website

**Grants**

- Global Impact Postdoctoral Scholars Award, Brock University (\$45,000/year, 2024–2026)
  - Joint with Prof. Jianbo Gao
- Match of Minds Award, Brock University (\$5,000, 2024)
  - Student: Sebastien Duguay
- Match of Minds Award, Brock University (\$5,000, 2023)
  - Student: Sam Studdy

**Awards and Fellowships**

- Faculty of Mathematics and Science Teaching Award (2025)
- ACNS Outstanding Student Poster Prize, American Conference on Neutron Scattering (2020)
- Harry Lustig Award Finalist, American Physical Society - Four Corners Section Meeting (2019)
- Best Poster Prize, Front Range Advanced Magnetism Symposium (2018, 2019)
- Graduate Student Council Travel Award, Colorado State University (2018)
- Best Student Poster Finalist, SHUG-CNMS Joint User Meeting (2016)
- Research and Scholarly Excellence Fellowship, Colorado State University (2016)

**Publications**

8. N. M. Eassa, J. Gibbs, Z. Holmes, A. Sornborger, L. Cincio, **G. Hester**, P. Kairys, M. Motta, J. Cohn, and A. Banerjee, *High-fidelity dimer excitations using quantum hardware*, Phys. Rev. B **110**, 184414 (2024) [Editor's Suggestion]
7. **G. Hester**, T. N. DeLazzer, S. S. Lim, C. M. Brown, and K. A. Ross, *Néel ordering in the distorted honeycomb pyrosilicate:  $C\text{-Er}_2\text{Si}_2\text{O}_7$* , J. Phys: Condens. Matter **33**, 12 (2021)
6. **G. Hester**, T. N. DeLazzer, D. R. Yahne, C. L. Sarkis, H. D. Zhao, J. A. Rodriguez-Rivera, S. Calder, and K. A. Ross, *Evidence for a field-induced quantum phase transition in Ising-like  $D\text{-Er}_2\text{Si}_2\text{O}_7$* , J. Phys: Condens. Matter **33**, 40 (2021)
5. **G. Hester**, H. S. Nair, T. Reeder, D. R. Yahne, T. N. DeLazzer, L. Berges, D. Ziat, J. R. Neilson, A. A. Aczel, G. Sala, J. A. Quilliam, and K. A. Ross, *Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet:  $\text{Yb}_2\text{Si}_2\text{O}_7$* , Phys. Rev. Lett. **123**, 027201 (2019). [Chosen by Oak Ridge National Laboratory as a Top 10 Neutron Scattering Achievement of 2019]

4. H. S. Nair, T. N. DeLazzer, T. Reeder, A. Sikorski, **G. Hester**, and K. A. Ross, *Crystal Growth of Quantum Magnets in the Rare-Earth Pyrosilicate Family  $R_2Si_2O_7$  ( $R = Yb, Er$ ) Using the Optical Floating Zone Method*, Crystals **9**, 10 (2019)
3. H. S. Nair, J. M. Brown, E. Coldren, **G. Hester**, M. P. Gelfand, A. Podlesnyak, Q. Huang, and K.A. Ross. *Short-range order in the quantum XXZ honeycomb lattice material  $BaCo_2(PO_4)_2$* , Phys. Rev. B **97**, 134409 (2018)
2. T. Heitmann, **G. Hester**, S. Mitra. *Evolution of Boson Peak with Li-Salt Concentration in Superionic  $xLi_2SO_4-(1-x)LiPO_3$  glasses*, Physica B: Condensed Matter, **551**, 315-319 (2018)
1. **G. Hester**, T. Heitmann, M. Tyagi, M. Rathore, A. Dalvi, and S. Mitra. *Neutron Scattering Studies of Lithium-Ion Diffusion in Ternary Phosphate Glasses*, MRS Advances, **1**, 45 (2016)

## Invited Talks

- *Two-Dimensional Triplon Excitations in the Quantum Dimer Magnet  $Yb_2Si_2O_7$* , Brockhouse Institute for Materials Research, Hamilton, ON (February 2025)
- *Unraveling the Ground State and Field-Induced Properties of the Quantum Dimer Magnet  $Yb_2Si_2O_7$*  - Canadian Association of Physics Congress (May 2024).
- *Quantum Magnetism in  $Yb_2Si_2O_7$  as a Platform for Novel Quantum Phases* - Oak Ridge National Laboratory Quantum Materials Young Investigators Workshop, Oak Ridge, TN (June 2023)
- *Laue X-Ray Diffraction for Crystal Growth and Neutron Scattering* - Crystal Orientation Using the Laue Method Webinar, Organized by Precision X-Ray Inc. (April 2023)
- *Quantum Magnetism in  $Yb_2Si_2O_7$  as a Platform for Novel Quantum Phases* - Canadian Institute for Neutron Scattering (CINS) Science Meeting, Hamilton, ON (March 2023)
- Harry Lustig Award Talk: *Discovery of Bose-Einstein Condensation in a Strongly Spin-Orbit Coupled Quantum Magnet*, American Physical Society - Four Corners Section, Prescott, AZ (October 2019)

## Contributed Presentations (Selected)

- *Exchange Symmetry and Single-Ion Anisotropy in the Quantum Dimer Magnet  $Yb_2Si_2O_7$* , American Conference on Neutron Scattering, Oral Presentation (2024).
- *"A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet:  $Yb_2Si_2O_7$ "*, Polarized Neutron Diffraction and Spectroscopy Workshop, Poster (September 2019)
- *"A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet:  $Yb_2Si_2O_7$ "*, Spring Materials Research Society Meeting, Oral Presentation (April 2019)
- *"A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet:  $Yb_2Si_2O_7$ "*, Highly Frustrated Magnetism Conference, Poster (July 2018)
- *"A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet:  $Yb_2Si_2O_7$ "*, Canadian Institute for Advanced Research Quantum Magnetism Summer Meeting, Poster (May 2018)
- *"Discovery of a New Quantum Dimer Magnet in a Strongly Spin-Orbit Coupled Material"*, American Physical Society March Meeting, Oral Presentation (March 2018)

## Highly Qualified Personnel (HQP) Training

- **Tuhin Ghosh** — Postdoctoral Researcher (co-supervised with Prof. Jianbo Gao), *In Progress*
- **Rachit Kapoor** — M.Sc. Student, *In Progress*
- **Ross Booker** — Undergraduate Capstone Project (PHYS 4F90), *In Progress*
- **Josefina Ramirez Diaz** — Undergraduate Research Volunteer, *In Progress*
- **Hitenkumar Patel** — Undergraduate Capstone Project (PHYS 4F90), *Now at Sun Life Financial*
- **Sam Studdy** — Undergraduate Research Assistant (2023–2024), *Now with Prof. R. Ganesh's Group*
- **Sebastien Duguay** — Undergraduate Research Assistant (2023–2024), *Now at Niagara College – EMT Program*
- **Josin James** — MSMP Summer Student (2023), *Now Instructor at Newton's Grove School*

## Teaching Experience (2023–Present)

- Foundational Physics I - PHYS 1P21/1P91 (2 semesters)
- Foundational Physics III - PHYS 1P94 (2 semesters)
- Classical Mechanics - PHYS 3P90 (1 semester)
- Essential Skills for the Modern Scientist - PHYS 1P97 (1 semester)

## Professional and Service Activities

### Graduate Committee Service

- Member, M.Sc. Supervisory Committee for Jordan Fazio (2025–Present)
- Member, M.Sc. Supervisory Committee for Gurmeet Singh (2025–Present)
- Member, M.Sc. Supervisory Committee for Pritish Behura (2024–Present)
- Member, M.Sc. Supervisory Committee for Hansima Keppetiya (2023–Present)
- Internal External Examiner, Ph.D. Examination Committee for Anne Worrel, Department of Chemistry (2025)
- Examiner, Ph.D. Comprehensive Exam for Collin Tower, Department of Physics (2025)

### Academic and Community Outreach

- Project Presenter, *Scientifically Yours* Outreach Program (2025)
- Adjudicator, NSERC USRA Awards, Brock University (2025)

### Departmental and Institutional Roles

- External Member, Brockhouse Institute for Materials Research, McMaster University (2024–Present)
- Organizer, Annual FMS Undergraduate Research Symposium (2023 - Present)
- Member, Provost's Open Education Working Group (2023–Present)

**Editorial and Peer Review**

- Referee: *Physical Review Letters, Journal of Physics: Condensed Matter* [**IOP Trusted Reviewer**]