

Gavin Hester, Ph.D.

Condensed Matter Physicist and Neutron Scatterer
Department of Physics
Brock University

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Research Interests

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

Current Position

Assistant Professor
Department of Physics

Brock University
2023 - Present

Previous Positions

Postdoctoral Research Associate
Banerjee and Chen Laboratory

Purdue University
2021 - 2022

- Setup and development of a departmental crystal growth laboratory
- Synthesis and measurement of novel quantum materials
- Development of a technique to probe spin currents with neutron scattering

Graduate Research Assistant
Ross Laboratory

Colorado State University
2016 - 2021

- Single crystal growth and characterization
- Bulk property measurements using a Quantum Design PPMS with a dilution insert and a Quantum Design MPMS XL with a iQuantum He3 insert
- Neutron scattering with an emphasis in high-resolution inelastic scattering and magnetic neutron diffraction
- Advising undergraduate students in research projects

Undergraduate Research Assistant
Mitra and Sakidja Laboratories

Missouri State University
2014 - 2016

- Synthesis of amorphous solid electrolytes
- Neutron scattering with a focus on quasielastic neutron scattering to measure the diffusion of Li⁺ ions in a solid electrolyte
- Predicting conduction properties using molecular dynamics simulations

Science Undergraduate Laboratory Internship (SULI)
Critical Materials Institute

Ames National Laboratory
May 2015 - July 2015

- Exploratory research to improve Nd-Fe-B magnets by diffusing Dy into grain boundaries
- Sealing and annealing samples in quartz tubes
- Performing and analyzing hysteresis curves from over 100 samples

Research Assistant
Neutron Scattering Group

University of Missouri Research Reactor
May 2014 - July 2014

- Performing elastic measurements on amorphous electrolytes with a triple-axis spectrometer
- Development of a research outreach website

Education

- **Colorado State University** Fort Collins, CO
Doctorate of Philosophy in Physics 2016 - 2021
 - Dissertation: *Quantum Magnetism in the Rare-Earth Pyrosilicates*
 - Advisor: Prof. Kate Ross
- **Missouri State University** Springfield, MO
Bachelor of Science in Physics 2012 - 2016
 - Capstone Title: *Neutron Scattering Studies of Lithium-Ion Diffusion in Ternary Phosphate Glasses*
 - Advisor: Prof. Saibal Mitra

Grants, Awards, and Fellowships

- ACNS Outstanding Student Poster Presentation Prize, 2020 American Conference on Neutron Scattering (December 2020).
- Harry Lustig Award Finalist, American Physical Society - Four Corners Section Meeting (October 2019).
- Best Poster Prize, Front Range Advanced Magnetism Symposium (August 2019)
- Graduate Student Council Travel Award, Colorado State University (October 2018)
- Best Poster Prize, Front Range Advanced Magnetism Symposium (August 2018).
- Best Student Poster Finalist, SHUG-CNMS Joint User Meeting (August 2016)
- University Programs for Research and Scholarly Excellence Fellowship, Colorado State University (Fall 2016)
- First Place Physics Poster Presentation, Missouri State University Undergraduate Research Day (April 2016)
- Second Place Physics Oral Presentation, University of Arkansas INBRE Conference (November 2014).
- NASA Space Grant Consortium Student, Missouri State University (2014-2015)

Publications

- 7) **G. Hester**, T. N. DeLazzer, S. S. Lim, C. M. Brown, and K. A. Ross, *Néel ordering in the distorted honeycomb pyrosilicate: C-Er₂Si₂O₇*, 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-Er₂Si₂O₇*, 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: Yb₂Si₂O₇*, 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 R₂Si₂O₇ (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 BaCo₂(PO₄)₂*, Phys. Rev. B 97, 134409 (2018).
- 2) T. Heitmann, **G. Hester**, S. Mitra. *Evolution of Boson Peak with Li-Salt Concentration in Superionic xLi₂SO₄-(1-x)LiPO₃ glasses*, Physica B: Condensed Matter, (2017).
- 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), 3057-3062 (2016).

Teaching Experience

Winter 2023

Lecturer, Foundational Physics III

Winter 2022

Guest Lecturer (two *self-written* 75 minute lectures), Quantum Mechanics II (Honors)

Fall 2019

Guest Lecturer, Graduate Mathematical Methods for Physicists

Winter 2018

Teaching Assistant, Conceptual Physics Lab (Four Sections)

Fall 2017

Teaching Assistant, Physics for Scientists and Engineers II (Two Labs, Two Recitations)

Winter 2017

Teaching Assistant, Modern Physics Laboratory (Two Sections)

Fall 2016

Teaching Assistant, General Physics I (Two Labs, Two Recitations)

Professional and Service Activities

- Referee for Physical Review Letters (March 2022 - Present)
- Referee for the Journal of Physics - Condensed Matter (February 2022 - Present) [IOP Trusted Reviewer]
- Adopt-a-Physicist Participant with High School Class (Fall 2021)
- Referee for The Journal of Undergraduate Research (June 2019 - April 2021)
- Poster Judge at Colorado State University Undergraduate Research and Creativity Poster Session (April 2020)
- Interview for Oak Ridge National Laboratory Neutron Sciences Highlight on $\text{Yb}_2\text{Si}_2\text{O}_7$ Phys. Rev. Lett. (December 2019)
- Interview for Physics Buzz Article on $\text{Yb}_2\text{Si}_2\text{O}_7$ Phys. Rev. Lett. (November 2019)
- Poster Judge at Colorado State University Undergraduate Research and Creativity Poster Session (April 2019)
- Interview on "STEM Spots" for KSMU Radio (November 2018)
- Poster Judge at Colorado State University Undergraduate Research and Creativity Poster Session (April 2018)

Invited Talks

- 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)
- "*A Simple Case of Quantum Magnetism: Evidence of Bose-Einstein Condensation in Unexpected Places*", Missouri State University Physics Department Colloquium, Springfield, MO (November 2018)
- "*Breaking Into Research: A Single Case Study of a Graduate Researcher*", Missouri Valley College Colloquium Speaker, Marshall, MO (October 2018)

Select Contributed Presentations (2018 - present)

- "*A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet: $\text{Yb}_2\text{Si}_2\text{O}_7$* ", Polarized Neutron Diffraction and Spectroscopy Workshop, Poster (September 2019)
- "*A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet: $\text{Yb}_2\text{Si}_2\text{O}_7$* ", Front Range Advanced Magnetism Symposium, Poster (August 2019)
- "*A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet: $\text{Yb}_2\text{Si}_2\text{O}_7$* ", 6th PRSE Center for Advanced Magnetism Workshop, Oral Presentation (June 2019)
- "*A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet: $\text{Yb}_2\text{Si}_2\text{O}_7$* ", Spring Materials Research Society Meeting, Oral Presentation (April 2019)

- “*A Novel Strongly Spin-Orbit Coupled Quantum Dimer Magnet: $Yb_2Si_2O_7$* ”, Front Range Advanced Magnetism Symposium, Poster (August 2018)
- “*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)