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Education

Postdoctoral Fellowship, UC Berkeley and Lawrence Berkeley National Lab, 2016 – 2018.

Ph.D. Physics, Columbia University in the City of New York, 2016.

M.Phil. Physics, Columbia University in the City of New York, 2014.

M.A. Physics, Columbia University in the City of New York, 2013.

B.S. Physics, Brigham Young University, 2011. Summa cum laude with University Honors.

Academic Employment

Assistant Professor, Brigham Young University Department of Physics and Astronomy, 2018 – 2024.

Associate Professor, Brigham Young University Department of Physics and Astronomy, 2024 – present.

Peer-Reviewed Articles

Primary or Enabling Author

1. Blake Hawkins, Edison P. Carlisle, Raju Baral, Jacquelyn Clark, Matthew Scherer, Rajendra Gautam, Alexis Gibson, Brian F. Woodfield, Karine Chesnel, AM Milinda Abeykoon, Joya A. Cooley, Branton J. Campbell, and **Benjamin A. Frandsen**. Large magnetovolume effect in multifunctional ferromagnet MnSb driven by unconventional magnetostructural coupling. *Acta Materialia* **319**, 122645 (2026). https://doi.org/10.1016/j.actamat.2026.122645.
2. Sabrina R. Hatt, Camille Shaw, Emma Zappala, Raju Baral, Stuart Calder, Gerald D. Morris, Brenden R. Ortiz, Karine Chesnel, and **Benjamin A. Frandsen**. Cluster spin glass correlations and dynamics in $Zn_{0.5}Mn_{0.5}Te$. *Phys. Rev. B* **112**, 144440 (2025). https://doi.org/10.1103/qv69-dv54.
3. Edison P. Carlisle, George Yumnam, Stuart Calder, Bianca Haberl, Jia-Xin Xiong, Michael A. McGuire, Alex Zunger, Raphaël P. Hermann, and **Benjamin A. Frandsen**. Tuning the magnetic properties of the spin-split antiferromagnet MnTe through pressure. *Phys. Rev. B* **112**, 014450 (2025). Designated as an Editors' Suggestion. https://doi.org/10.1103/dzk6-f68q.
4. Emma Zappala, Timothy A. Elmslie, Gerald D. Morris, Mark W. Meisel, Rémi Dingreville, James J. Hamlin, and **Benjamin A. Frandsen**. Tuning the spin dynamics and magnetic phase transitions of the Cantor alloy via composition and sample processing protocols: A muon spin relaxation study. *Phys. Rev. Materials* **8**, 104408 (2024). https://doi.org/10.1103/PhysRevMaterials.8.104408.
5. **Benjamin A. Frandsen** and Henry E. Fischer. A New Spin on Material Properties: Local Magnetic Structure in Functional and Quantum Materials. *Chem. Mater.* **36**, 9089–9106 (2024). https://doi.org/10.1021/acs.chemmater.4c01535.
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7. Kristina Michelle Nuttall, Christiana Z. Suggs, Henry E. Fischer, Mitchell M. Bordelon, Stephen D. Wilson, and **Benjamin A. Frandsen.** Quantitative investigation of the short-range magnetic correlations in candidate quantum spin liquid $NaYbO_2$. *Phys. Rev. B* **108**, L140411 (2023). https://doi.org/10.1103/PhysRevB.108.L140411.

8. Raju Baral, Milinda Abeykoon, Branton J. Campbell, and **Benjamin A. Frandsen**. Giant spontaneous magnetostriction in MnTe driven by a novel magnetostructural coupling mechanism. *Advanced Functional Materials* **33**, 2305247 (2023). https://doi.org/10.1002/adfm.202305247.

9. Parker K. Hamilton, Jaime M. Moya, Alannah M. Hallas, E. Morosan, Raju Baral, and **Benjamin A. Frandsen**. Symmetry-mode analysis for local structure investigations using pair distribution function data. *J. Appl. Cryst.* **56**, 1192 – 1199 (2023). https://doi.org/10.1107/S1600576723005794.

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Major Contribution

1. Mayia A. Vranas, Alejandro Ruiz, Vikram Nagarajan, Erik S. Lamb, Gerald D. Morris, Zahir Islam, Christie Nelson, Nobumichi Tamura, **Benjamin A. Frandsen**, James G. Analytis, and Alex Frano. Anisotropic Kitaev spin glass in $Li_2Ru_xIr_{1-x}O_3$. *npj Quantum Materials* (2026). https://doi.org/10.1038/s41535-026-00935-y.
2. Adam A. Aczel, Brenden R. Ortiz, Yi Luo, Ganesh Pokharel, Paul M. Sarte, Clarina dela Cruz, Jue Liu, Gabriele Sala, Stephen D. Wilson, **Benjamin A. Frandsen**, and Joseph A. M. Paddison. Influence of controlled disorder on the dipolar spin-ice state of Ho-based pyrochlores. *Phys. Rev. B* **113**, 214415 (2026). Selected as an Editors' Suggestion. https://doi.org/10.1103/pvl4-vxzx.
3. Yu Tao, Pahuni Jain, Yi Zhang, Fred Tutt, D. Phelan, Christian Balz, Sabrina Hatt, Jörg C. Neuefeind, Stephan Rosenkranz, **Benjamin A. Frandsen**, and Chris Leighton. High-temperature anomalous Hall effect driven by frustrated spin fluctuations in the antiferromagnetic delafossite metal $PdCrO_2$. *Proceedings of the National Academy of Sciences* **122**, e2524774122 (2025). https://doi.org/10.1073/pnas.2524774122.

4. Chubin Huang, Abhishek Rakshit, Gianluca Janka, Zaher Salman, Andreas Suter, Thomas Prokscha, **Benjamin A. Frandsen**, and Yoav Kalcheim. Magnetic precursor to the metal-insulator transition in V_2O_3. *Adv. Electron. Mater.* 2500028 (2025). https://doi.org/10.1002/aelm.202500028.

5. Chao-Chun Wei, Xiaoyin Li, Sabrina Hatt, Xudong Huai, Jue Liu, Birender Singh, Kyung-Mo Kim, Rafael M. Fernandes, Paul Cardon, Liuyan Zhao, Thao T. Tran, **Benjamin A. Frandsen**, Kenneth S. Burch, Feng Liu, and Huiwen Ji. $La_2O_3Mn_2Se_2$: a correlated insulating layered d-wave altermagnet. *Phys. Rev. Materials* **9**, 024402 (2025). https://doi.org/10.1103/PhysRevMaterials.9.024402.

6. Olivia Aalling-Frederiksen, Rebecca K. Pittkowski, Andy S. Anker, Jonathan Quinson, Lars Klemeyer, **Benjamin A. Frandsen**, Dorota Koziej, and Kirsten M. Ø. Jensen. Crystallite size effects on the atomic structure of cobalt iron oxide nanoparticles. *Nanoscale Advances* **6**, 5949 (2024). https://doi.org/10.1039/d4na00590b.

7. George Yumnam, Duncan H. Moseley, Joseph A. M. Paddison, Christiana Z. Suggs, Emma Zappala, David S. Parker, Garrett E. Granroth, Gerald D. Morris, Md Mobarak Hossain Polash, Daryoosh Vashaee, Michael A. McGuire, Huaizhou Zhao, Michael E. Manley, **Benjamin A. Frandsen**, and Raphaël P. Hermann. Magnon gap tuning in lithium-doped MnTe. *Phys. Rev. B* **109**, 214434 (2024). https://doi.org/10.1103/PhysRevB.109.214434.

8. Timothy A. Elmslie, Jacob Startt, Yang Yang, Sujeily Soto-Medina, Emma Zappala, Mark W. Meisel, Michele V. Manuel, **Benjamin A. Frandsen**, Rémi Dingreville, and James J. Hamlin. Tuning the Magnetic Properties of the CrMnFeCoNi Cantor Alloy. *Phys. Rev. B* **108**, 094437 (2023). https://doi.org/10.1103/PhysRevB.108.094437.

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10. V. Ovidiu Garlea, Stuart Calder, Thomas Huegle, Jiao Y. Y. Lin, Fahima Islam, Alexandru Stoica, Van B. Graves, **Benjamin A. Frandsen**, and Stephen D. Wilson. VERDI: VERsatile DIffractometer with wide-angle polarization analysis for magnetic structure studies in powders and single crystals. *Rev. Sci. Instrum.* **93**, 065103 (2022). https://doi.org/10.1063/5.0090919.

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14. Hualei Sun, Xiaodong Li, Yazhou Zhou, Jia Yu, **Benjamin A. Frandsen**, Shan Wu, Zhijun Xu, Sheng Jiang, Qingzhen Huang, Edith Bourret-Courchesne, Liling Sun, Jeffrey W. Lynn, Robert J. Birgeneau, and Meng Wang. Nonsuperconducting electronic ground state in pressurized $BaFe_2S_3$ and $BaFe_2S_{2.5}Se_{0.5}$. *Phys. Rev. B* **101** 205129 (2020). https://doi.org/10.1103/PhysRevB.101.205129.

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Significant Contribution

1. Yi Luo, Brenden R. Ortiz, Miles J. Knudtson, Stephen D. Wilson, Jue Liu, **Benjamin A. Frandsen**, Si Athena Chen, Matthias D. Frontzek, Andrey A. Podlesnyak, Joseph A. M. Paddison, and Adam A. Aczel. Disorder-induced proximate quantum spin ice phase in $Pr_2Sn_2O_7$. *Materials Today Physics* **67**, 102169 (2026). https://doi.org/10.1016/j.mtphys.2026.102169.

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7. A. Frano, M. Bluschke, Z. Xu, **B. Frandsen**, Y. Lu, M. Yi, R. Marks, A. Mehta, V. Borzenets, D. Meyers, M.P.M. Dean, F. Baiutti, J. Maier, G. Kim, G. Christiani, G. Logvenov, E. Benckiser, B. Keimer, and R. J. Birgeneau. Control of dopant crystallinity in electrochemically treated cuprate thin films. *Phys. Rev. Materials* **3** 063803 (2019). https://doi.org/10.1103/PhysRevMaterials.3.063803.

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Minor Contribution

1. A. Brassington, Q. Ma, G. Duan, S. Calder, A. I. Kolesnikov, K. M. Taddei, G. Sala, E. S. Choi, H. Wang, W. Xie, **B. A. Frandsen**, N. Li, X. F. Sun, C. Liu, R. Yu, H. D. Zhou, and A. A. Aczel. Unconventional bipartite entanglement in the quantum dimer magnet $Yb_2Be_2SiO_7$. *Nature Communications* **17**, 2751 (2026). https://doi.org/10.1038/s41467-026-69258-7.

2. George Yumnam, Parul R. Raghuvanshi, John D. Budai, Dipanshu Bansal, Lars Bocklage, Douglas Abernathy, Yongqiang Cheng, Ayman Said, Igor I. Mazin, Haidong Zhou, **Benjamin A. Frandsen**, David S. Parker, Lucas R. Lindsay, Valentino R. Cooper, Michael E. Manley, and Raphaël P. Hermann. Constraints on magnetism and correlations in RuO_2 from lattice dynamics and Mössbauer spectroscopy. *Cell Rep. Phys. Sci.* **6**, 102852 (2025). https://doi.org/10.1016/j.xcrp.2025.102852.

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4. Junjie Yin, Changwei Wu, Lisi Li, Jia Yu, Hualei Sun, Bing Shen, **Benjamin A. Frandsen**, Dao-Xin Yao, and Meng Wang. Large negative magnetoresistance in the antiferromagnetic rare-earth dichalcogenide $EuTe_2$. *Phys. Rev. Materials* **4** 013405 (2020). https://doi.org/10.1103/PhysRevMaterials.4.013405.

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19. C. Ding, H. Man, C. Qin, J. Lu, Y. Sun, Q. Wang, B. Yu, C. Feng, T. Goko, C.J. Arguello, L. Liu, **B.A. Frandsen**, Y.J. Uemura, H. Wang, H. Luetkens, E. Morenzoni, W. Han, C.Q. Jin, T. Munsie, T.J. Williams, R.M. D'Ortenzio, T. Medina, G.M. Luke, T. Imai, and F.L. Ning. $(La_{1-x}Ba_x)(Zn_{1-x}Mn_x)AsO$: A two-dimensional 1111-type diluted magnetic semiconductor in bulk form. *Phys. Rev. B* **88** 041102(R) (2013). https://doi.org/10.1103/PhysRevB.88.041102.

20. Z. Deng, K. Zhao, B. Gu, W. Han, J.L. Zhu, X.C. Wang, X. Li, Q.Q. Liu, R.C. Yu, T. Goko, **B. Frandsen**, L. Liu, J. Zhang, Y. Wang, F.L. Ning, S. Maekawa, Y.J. Uemura, and C.Q. Jin. Diluted ferromagnetic semiconductor Li(Zn,Mn)P with decoupled charge and spin doping. *Phys. Rev. B* **88** 081203(R) (2013). https://doi.org/10.1103/PhysRevB.88.081203.

Articles Under Review

1. Shaofei Wang, Edison P. Carlisle, Yuguang Pu, Junjie Zhang, S. Cosette Putnam, Jiaqiang Yan, Qiang Zhang, Stuart Calder, Barry L. Winn, Garrett E. Granroth, David Dahlbom, Pyeongjae Park, Kipton Barros, Ilya Sergeev, Tom Berlijn, Gerald D. Morris, Lucas Lindsay, Michael E. Manley, **Benjamin A. Frandsen**, Peng Cao, and Raphaël P. Hermann. Collective Spin and Lattice Excitations in Rock-salt High-Entropy Oxides. Under review at *Communications Materials*.

2. Raju Baral, Haidong Zhou, **Benjamin A. Frandsen**, Joseph A. M. Paddison, and Stuart Calder. Local magnetic order in vacancy-disrupted spin ice Ho_2TiO_5. Under review at *Phys. Rev. B*.

3. Hao-Yuan Tang, Ke-Liang Chen, Sheng-Li Guo, Zhi-Cheng Xu, Yi-Jian Hu, J. K. Bao, Z. T. Tang, Ling-Feng Xie, Xun Pan, **B. A. Frandsen**, L. Liu, S. C. Cheung, T. J. Munsie, M. N. Wilson, Y. P. Cai, G. M. Luke, Y. J. Uemura, Guang-Han Cao, Wen Huang, and Fan-Long Ning. Nodeless spin-triplet pairing in $K_2Cr_3As_3$ evidenced by μSR. Under review at *Physical Review Letters*.

4. Birender Singh, Xian Xu, Sabrina R. Hatt, Suvodeep Paul, Yu-Mi Wu, Chao-Chun Wei, Violet Williams, Kyung-Mo Kim, Yihao Zhang, Mohamed Shehabeldin, Michael Geiwitz, Xiaoyin Li, Garrett E. Granroth, Feng Liu, Quiong Ma, Benedetta Flebus, Judy J. Cha, Vinod M. Menon, **Benjamin A. Frandsen**, Diana Y. Qiu, Huiwen Ji, and Kenneth Burch. Altermagnetism Produces Dark Excitons and Photoluminescence in the Lieb Lattice $La_2O_3Mn_2Se_2$. Under review at *Nature Materials*.

Book Chapters

1. **Benjamin A. Frandsen**. "Magnetic PDF", in *PDF to the people: an atomic pair distribution function analysis primer*, Oxford University Press (2023).
2. **Benjamin A. Frandsen**. "Investigating the tetragonal-to-orthorhombic phase transition in $SrFe_2As_2$", in *PDF to the people: an atomic pair distribution function analysis primer*, Oxford University Press (2023).
3. **Benjamin A. Frandsen**. "More advanced crystal structure modeling: the room-temperature structure of crystalline $Ba_{0.7}K_{0.3}(Zn_{0.85}Mn_{0.15})_2As_2$", in *PDF to the people: an atomic pair distribution function analysis primer*, Oxford University Press (2023).
4. Simon J.L. Billinge, Sandra H. Skjaervoe, Maxwell W. Terban, Songsheng Tao, Long Yang, Yevgeny Rakita, and **Benjamin A. Frandsen**. "Local structure determination using total scattering data", in *Reference Module in Chemistry, Molecular Sciences and Chemical Engineering*, Elsevier (2021). `https://doi.org/10.1016/B978-0-12-823144-9.00040-6`.

Presentations

Invited

1. *Exploring the Influence of Short-Range Magnetic Order on Technologically Relevant Properties of Multifunctional Magnets.* 27th Congress of the International Union of Crystallography, Calgary, August 2026.
2. *Two is Greater Than One (and Other Obvious Facts): Learning More about Quantum Materials by Combining Muon Spin Spectroscopy and Neutron Scattering.* Second Target Station New Science and Applications Workshop, Oak Ridge National Laboratory, June 2026.
3. *Exploring the Influence of Short-Range Magnetic Order on Technologically Relevant Properties of Multifunctional Magnets.* University of Tennessee Materials Science and Engineering Spring Seminar Series, Knoxville, April 2026.
4. *Zooming in on local magnetic correlations and dynamics in altermagnetic $La_2O_3Mn_2Se_2$: Insights gained from neutrons and muons.* American Physical Society Global Summit, Denver, March 2026.
5. *An introduction to magnetic PDF.* ADD2026: Analysis of Diffraction Data in Real Space, Institut Laue Langevin, Grenoble, France, January 2026.
6. *When the Tail Wags the Dog, aka Short-range Correlations with Long-range Implications.* Chemical Engineering Department Seminar, Brigham Young University, October 2025.
7. *Short-Range Correlations With Long-Range Implications: The Influence of Local Magnetic Structure in Quantum Materials.* International Conference on Quantum Materials and Technologies, Fethiye, Türkiye, April 2025.
8. *Beyond the ground state of MnTe: Short-range magnetism at high temperature and magnetic evolution under pressure.* Roadmap for Altermagnetism Brainstorming Workshop, Newark, New Jersey, January 2025.
9. *When the Tail Wags the Dog, aka Short-range Correlations with Long-range Implications: A Magnetic PDF Story.* University of Minnesota Condensed Matter Seminar, Minneapolis, October 2024.
10. *When the Tail Wags the Dog, aka Short-range Correlations with Long-range Implications: A Magnetic PDF Story.* American Crystallographic Association Research Conference, Denver, July 2024. Margaret Etter Early Career Award lecture.
11. *Probing short-range magnetism in candidate quantum spin liquids and related materials with a "both-and" approach to diffuse neutron scattering data.* March Meeting of the American Physical Society, Minneapolis, March 2024.

12. *Microscopic insight into the large and unconventional magnetostructural coupling in antiferromagnetic MnTe.* 26th Congress of the International Union of Crystallography, Melbourne, Australia, August 2023.
13. *Maximizing the Potential of Powder Total Scattering.* 26th Congress of the International Union of Crystallography Satellite Workshop: Next-generation atomistic-level structural modeling using combined powder and single-crystal scattering data, Melbourne, Australia, August 2023.
14. *Magnetic Total Scattering and PDF Analysis: Introduction, Opportunities, and Challenges.* 26th Congress of the International Union of Crystallography Satellite Workshop: Next-generation atomistic-level structural modeling using combined powder and single-crystal scattering data, Melbourne, Australia, August 2023.
15. *Magnetic PDF: Introduction and Application to Manganese Telluride.* 5th U.S. School on Total Scattering Analysis, Oak Ridge National Laboratory, May 2023.
16. *Rich surprises in a "simple" material: A pair distribution function story.* NSLS-II Users' Meeting, Brookhaven National Laboratory, April 2023.
17. *An introduction to magnetic PDF.* ADD2022: Analysis of Diffraction Data in Real Space, Institut Laue Langevin, Grenoble, France, October 2022.
18. *Magnetic PDF: A new tool for the magnetic scattering workbench.* Polarized Neutron Diffraction and Spectroscopy: Applications to Quantum Materials, Oak Ridge National Laboratory, September 2022.
19. *Magnetic PDF: A Magnetic Addition to the Total Scattering Toolbox.* Neutrons and Complementary Techniques for Quantum Materials, Oak Ridge National Laboratory, September 2022.
20. *Probing the local structure and magnetism in quantum matter with neutrons, photons, and muons.* Quantum Materials Young Investigators Workshop, Oak Ridge, TN, August 2022.
21. *Recent Advances in Magnetic PDF Analysis: A Case Study with MnTe.* American Crystallographic Association Meeting, Portland, Oregon, August 2022.
22. *Magnetic PDF: A Magnetic Addition to the Total Scattering Toolbox.* European Powder Diffraction Conference (EPDiC17), Sibenik, Croatia, May 2022.
23. *Understanding technologically relevant materials from a local structure perspective using pair distribution function techniques.* Alabama Collaborative for Materials Exploration Seminar Series, February 2022.
24. *Of Spins and Pseudospins: Magnetic PDF as a powerful probe of short-range magnetic correlations.* 4th U.S. School on Total Scattering Analysis, November 2021.
25. *From Quantum Magnets to Magnetic Thermoelectrics: Short-Range Spin Correlations and the Secrets They Tell.* Brown University Condensed Matter Physics Seminar, October 2021.
26. *From Quantum Magnets to Magnetic Thermoelectrics: Short-Range Spin Correlations and the Secrets They Tell.* University of British Columbia Quantum Materials Institute Seminar, October 2021.
27. *New Possibilities for Magnetic Pair Distribution Function Analysis with Polarized Neutrons.* SNS/HFIR User Group Conference and Workshop, August 2021.
28. *A New Spin on Thermoelectrics: Investigating Short-Range Magnetic Correlations in MnTe with Magnetic Pair Distribution Function Analysis.* SNS/HFIR User Group Conference and Workshop, August 2021.
29. *From superconductors to super insulators: What pair distribution function analysis can tell us about exotic electronic states in quantum materials.* National Synchrotron Light Source II Users' Meeting, May 2021.
30. *A local structure perspective on iron pnictides and chalcogenides: Insights gained from pair distribution function analysis.* American Physical Society March Meeting, March 2021.
31. *Exploring the Rich Physics of Triangular Lattice Antiferromagnets with Neutron Scattering.* American Physical Society Four Corners Meeting (virtual), October 2020.
32. *Magnetic Pair Distribution Function Analysis: A New Addition to the Magnetic Toolbox.* Oak Ridge National Laboratory Seminar Series, Oak Ridge, TN, November 2019.
33. *Understanding Geometrically Frustrated Magnets Without Getting Frustrated.* American Physical Society Four Corners Meeting, Prescott, AZ, October 2019.
34. *Magnetic PDF analysis: A tool for making geometrically frustrated magnets less frustrating.* American Crystallographic Association Meeting, Covington, KY, July 2019.
35. *Local structure and magnetism in quantum matter studied with neutrons, muons, and photons.* Quantum Materials Young Investigators Workshop, Oak Ridge, TN, June 2019.

36. *Geometrically Frustrated Magnetism: Not So Frustrating, After All.* Idaho State University Department of Physics Colloquium, April 2019.
37. *Fluctuations and Frustration: Two Short Stories of Local Structure and Magnetism in Quantum Materials.* Argonne National Laboratory Materials Science Division, April 2019.
38. *The Magnetic Pair Distribution Function Grows Up: Recent Developments in mPDF Analysis.* Institute Laue Langevin Seminar, Grenoble, France, March 2019.
39. *Zooming in on Nematic Fluctuations in Iron-based Superconductors.* Utah State University Department of Physics Colloquium, February 2019.
40. *Zooming in on Nematic Fluctuations in Iron-based Superconductors.* University of Louisville Department of Physics Colloquium, February 2019.
41. *New Insights into the Mott Quantum Phase Transition Gained from μSR.* International Peer Review of TRIUMF (Canada's premier particle accelerator facility), Vancouver, Canada, November 2018.
42. *Ask the Locals: Investigations of Local Atomic and Magnetic Structure in Complex Materials.* Utah Valley University Department of Physics Colloquium, November 2018.
43. *Ask the Locals: Investigations of Local Atomic and Magnetic Structure in Complex Materials.* University of Utah Department of Materials Science and Engineering Colloquium, November 2018.
44. *Taking a Spin with the Magnetic Pair Distribution Function.* The NSLS-II Pair Distribution Function School, Brookhaven National Laboratory, September 2018.
45. *In-depth studies of nematic fluctuations in iron-based superconductors enabled by pair distribution function analysis.* The NSLS-II Triennial Review, Brookhaven National Laboratory, September 2018.
46. *Ask the Locals: Insights Gained from Pair Distribution Function Studies of Iron-Based Superconductors and Geometrically Frustrated Magnets.* American Conference on Neutron Scattering, College Park, MD, June 2018.
47. *Recent advances in the magnetic pair distribution function technique for determining local magnetic structure.* 24th Congress of the International Union of Crystallography, Hyderabad, India, August 2017.
48. *Revealing the local atomic and magnetic structure of a new dilute ferromagnetic semiconductor by pair distribution function analysis.* NSLS-II Friday Seminar Series, Brookhaven National Laboratory, March 2017.
49. *Investigating the metal-insulator quantum phase transition in archetypal Mott insulators.* 5th Frontiers of Condensed Matter Physics / REIMEI Workshop, Tokai, Japan, January 2017.
50. *A new spin on pair distribution function analysis: Introducing magnetic PDF.* Institute Laue Langevin Seminar, Grenoble, France, March 2016.
51. *From Mott insulators to Weyl fermions: Using muons, neutrons, and photons to probe unconventional states of matter.* Condensed Matter Seminar, Princeton University, December 2015.
52. *Combined μSR and PDF studies of $(Ba,K)(Zn,Mn)_2As_2$ and $Cu(Ir,Cr)_2S_4$.* 11th International Workshop on Nanomagnetism and Superconductivity at the Nanoscale, Coma Ruga, Spain, July 2015.
53. *Exploring the quantum phase transition in the rare-earth nickelates.* 4th Super-PIRE REIMEI Workshop on Frontiers of Condensed Matter Physics, Vancouver, Canada, May 2015.
54. *Magnetic structure determination from the magnetic pair distribution function.* Oak Ridge National Laboratory Neutron Scattering Seminar Series, Oak Ridge, TN, October 2014.
55. *A new spin on pair distribution function analysis: Magnetic PDF and its potential applications.* 10th International Workshop on Nanomagnetism and Superconductivity at the Nanoscale, Coma Ruga, Spain, July 2014.
56. *Magnetic pair distribution function: Introduction and applications.* American Conference on Neutron Scattering 2014, Knoxville, TN, June 2014.
57. *Charge order and superconductivity in the titanium-oxypnictide family of superconductors.* 3rd Super-PIRE REIMEI Workshop on Frontiers of Condensed Matter Physics, Beijing, China, March 2014.
58. *Local structure models of diffuse scattering in relaxor ferroelectrics.* (Given on behalf of Branton Campbell, Brigham Young University). TMS 2012 (The Minerals, Metals and Materials Society), Orlando, FL, March 2012.

Contributed

1. *Anomalous Muon Dynamics In Multifunctional Antiferromagnet MnTe.* 16th International Conference on Muon Spin Rotation, Relaxation, and Resonance. St. John's, Canada, July 2025.

2. *The structure of topologically insulating amorphous Bi_2Se_3.* Global Physics Summit. Anaheim, CA, March 2025.
3. *When the Tail Wags the Dog: Short-range Correlations with Long-range Implications.* American Conference on Neutron Scattering, Knoxville, TN, June 2024.
4. *Polarised neutrons for magnetic pair distribution function analysis: methods and applications.* 26th Congress of the International Union of Crystallography, Melbourne, Australia, August 2023.
5. *Exceptionally large magnetovolume effect in MnTe driven by a novel magnetostructural coupling mechanism.* American Crystallographic Association Research Conference, Baltimore, Maryland, July 2023.
6. *Local structure of giant magnetocaloric system $(Mn,Fe)_2P_{0.5}Si_{0.5}$.* American Physical Society March Meeting, Chicago, March 2022.
7. *Investigating Kosterlitz-Thouless physics in the triangular lattice antiferromagnet $TmMgGaO_4$.* 25th Congress of the International Union of Crystallography, August 2021.
8. *Probing Superparamagnetism in Fe_3O_4 Nanoparticles with Muon Spin Relaxation.* MMM 2019: Magnetism and Magnetic Materials, Las Vegas, NV, November 2019. Presented by Dr. Karine Chesnel (BYU) on my behalf.
9. *Nanoscale degeneracy lifting in triangular antiferromagnets studied by combined PDF + mPDF.* ADD2019: Analysis of Diffraction Data in Real Space, Grenoble, France, March 2019.
10. *Probing nematic fluctuations in iron-based superconductors with pair distribution function analysis.* American Physical Society March Meeting, Boston, March 2019.
11. *Short-Range Nematic Correlations in Iron-Based Superconductors Probed by Pair Distribution Function Analysis.* American Physical Society March Meeting, Los Angeles, March 2018.
12. *Revealing the local atomic and magnetic structure of a new dilute ferromagnetic semiconductor by pair distribution function analysis.* American Crystallographic Association Meeting, New Orleans, May 2017.
13. *Local magnetic correlations in MnO investigated with magnetic pair distribution function analysis and ab initio theory.* American Conference on Neutron Scattering, Long Beach, California, July 2016.
14. *Magnetic pair distribution function (mPDF) analysis of short-range magnetism in strongly correlated materials.* ADD2016: Analysis of Diffraction Data in Real Space, Grenoble, France, March 2016.
15. *Magnetic pair distribution function analysis (mPDF): A case study with MnO.* International Conference on Magnetism, Barcelona, Spain, July 2015.
16. *Muon spin relaxation studies of Mott transition systems: $RENiO_3$, V_2O_3, $(Ca,Sr)_2RuO_4$, and $(Sr,La)_2IrO_4$.* International Conference on Magnetism, Barcelona, Spain, July 2015.
17. *Evolution of antiferromagnetic order in rare-earth nickelates probed by muon spin relaxation.* American Physical Society March Meeting 2015, San Antonio, TX, March 2015.
18. *Magnetic pair distribution function analysis.* 23rd Congress of the International Union of Crystallography, Montreal, Canada, July 2014.
19. *Superconductivity and charge-density wave formation in layered oxypnictide $BaTi_2(As,Sb)_2O$.* American Physical Society March Meeting 2014, Denver, CO, March 2014.
20. *Quantitative Modeling of Diffuse Scattering from a Relaxor Ferroelectric.* Poster. 22nd Congress of the International Union of Crystallography, Madrid, Spain, August 2011.

Externally Funded Awards & Grants

Western Alliance to Expand Student Opportunities (WAESO) Undergraduate Research Grant, *Stabilizing Many-Body Entangled States in Quantum Magnets with Controllable Disorder*, Winter 2025, $1,000. Principal investigator.

National Science Foundation LEAPS-MPS Award, *LEAPS-MPS: Controllable Disorder as a Path to Many-Body Entanglement in Quantum Magnets*, 2024 - 2026, $250,000. Principal investigator.

Department of Energy Early Career Award, *Probing Short-Range Structure and Magnetism in Next-Generation Energy Conversion Materials*, 2020 - 2025, $750,000. Principal investigator.

Western Alliance to Expand Student Opportunities (WAESO) Undergraduate Research Grant, *Reimagining Nuclear Energy: Toward a Quantitative Understanding of the Structure of Molten Salts for Application to Alternative Nuclear Reactor Designs*, Fall 2020, $3,000. Principal investigator.

National Science Foundation Graduate Research Fellowship, 2011 - 2016, $98,000. Principal investigator.

Other Awards and Honors

Edward and Betty Seppi Endowed Chair, College of Computational, Mathematical, and Physical Sciences, Brigham Young University, 2025-2028.

American Crystallographic Association Margaret C. Etter Early Career Award, 2024.

Brigham Young University College of Physical and Mathematical Sciences Early Career Scholarship Award finalist, 2023.

Berkeley Postdoc Association Professional Development Award, 2017, competitive travel grant awarded to postdocs to support conference attendance.

***Crystals* Journal Travel Fellowship**, 2017, awarded to two young scientists to support travel expenses to crystallography-related research conferences.

Frances and Charles Townes Fellowship, 2016, Columbia Physics Departmental award for graduate students in condensed matter.

Allen Sachs Teaching Award, Columbia University, 2015, awarded to two Columbia Physics graduate students annually for outstanding teaching at the undergraduate level.

Travel Fellowship Award, U.S. National Committee for the International Union of Crystallography, 2014.

International Union of Crystallography "Young Observer" IUCr Congress travel grant, 2014 and 2011.

Phi Kappa Phi Honor Society Marcus L. Urann Fellowship, 2011, $10,000.

Rhodes Scholarship Finalist, 2010.

Hinckley Presidential Scholar, 2005-2011, most prestigious scholarship at Brigham Young University.

Professional Service

Member, Program Committee for the International Conference on the Hyperfine Interactions and Their Applications, September 2026 — present.

Member, International Advisory Council for the 17th International Conference on Muon Spin Rotation, Relaxation, and Resonance, August 2026 — present.

Member, Board of Directors, American Union of Crystallography, December 2025 — present.

Editorial Board Member, *Communications Materials* (Nature Portfolio journal), December 2025 — present.

Grant Proposal Reviewer, Gordon and Betty Moore Foundation, March 2025 — present.

Member, Award Selection Committee for the American Crystallographic Association, October 2024 — present.

Member, Communications Committee for IUCr2026, the Twenty-Seventh Congress of the International Union of Crystallography, September 2024 — August 2026.

Member, International Advisory Council for the 16th International Conference on Muon Spin Rotation, Relaxation, and Resonance, June 2024 — August 2025.

Member, SNS/HFIR User Group Executive Committee, January 2024 — December 2025.

Secretary, SNS/HFIR User Group Executive Committee, December 2022 — January 2024.

Executive Committee Member, American Association for the Advancement of Powder Diffraction, September 2020 — present.

Advisory Team Member, VERDI instrument proposed for the Second Target Station at the Spallation Neutron Source, September 2020 — present.

Session Chair, Conference of the American Crystallographic Association, Denver, July 2024.

Session Chair, Congress of the International Union of Crystallography, Melbourne, Australia, August 2023.

Session Chair, Conference of the American Crystallographic Association, Baltimore, July 2023.

Session Chair, Conference of the American Crystallographic Association, August 2021 (virtual).

Chair, Neutron Scientific Interest Group of the American Crystallographic Association, November 2019 — November 2022.

Session Chair, American Physical Society March Meeting, Denver, March 2020 (cancelled due to COVID-19).

Program Assistant, BYU-GAL ("Girls And Light") science education summer program, July 2019.

Referee, *Physical Review Letters, Physical Review B, Physical Review Materials, Physical Review Applied, Nature Communications, IUCrJ, Acta Crystallographica Section A, Journal of Superconductivity and Novel Magnetism, Physical Chemistry Chemical Physics, Inorganic Chemistry, Journal of Physics: Condensed Matter, Journal of Nuclear Materials, Advanced Materials, Advanced Functional Materials, Chemistry of Materials, Angewandte Chemie, Science Advances.*

Grant Proposal Reviewer, US Department of Energy Office of Science, October 2020 — present.

Beamtime Proposal Reviewer, Oak Ridge National Laboratory, October 2018 — present.

Social Media Specialist, Young Scientist Interest Group of the American Crystallographic Association, May 2017 — July 2018.

Session Chair, Conference of the American Crystallographic Association, New Orleans, May 2017.

Secretary, Berkeley Postdoctoral Association Board, June 2016 — June 2018.

Department Representative, Columbia University Graduate Student Advisory Council, Fall 2015 — Spring 2016.

Conference Assistant, Super-PIRE REIMEI Workshop on Frontiers of Condensed Matter Physics, Vancouver Canada, May 2015.

Conference Assistant, Super-PIRE REIMEI Workshop on Frontiers of Condensed Matter Physics, Beijing, China, March 2014.

Student Organizer, Joint U.S.-Africa Materials Institute Symposium at Africa-MRS, Addis Ababa, December 2013.

Student Organizer, Joint U.S.-Africa Materials Institute School for Energy Materials, Addis Ababa, December 2012.

University Service

Member, Student Employee of the Year Selection Committee, 2026.

Chair, Internships and Career Placement Committee, August 2023 — present.

Faculty Supervisor, BYU chapter of the Society of Physics Students, August 2020 — August 2023. Recipient of Distinguished Chapter Award, 2022.

Member, Teaching Improvement Committee, Department of Physics and Astronomy, August 2019 — August 2020.

Member, Faculty Evaluation Committee, Department of Physics and Astronomy, January 2019 — April 2020.

Member, Graduate Committee, Department of Physics and Astronomy August 2018 — present.

Teaching Experience

Professor, "PHSCS 222: Modern Physics" Introductory Physics Laboratory, BYU, Spring 2024 — Spring 2026.

Professor, "PHSCS 107: General Physics Lab 1" Introductory Physics Laboratory, BYU, Spring 2024 — Spring 2026.

Professor, "PHSCS 581: Introduction to Solid State Physics" Graduate-Level Physics Course, BYU, Fall 2022 — Winter 2025.

Professor, "PHSCS 321: Advanced Mechanics" Upper Level Physics Course, BYU, Spring 2020 — present.

Professor, "PHSCS 106: General Physics II" Introductory Physics Course, BYU, Fall 2018 — Fall 2021.

Instructor, "Physics Laboratory I" Introductory Physics Lab, UC Berkeley Extension, Spring 2018.

Lecturer, "Physics for Scientists and Engineers" advanced undergraduate physics course, UC Berkeley, Summer 2017.

Teaching Assistant, "Physics for Poets" Introductory Physics Course, Columbia University, Spring 2015 — Spring 2016.

Teaching Assistant, Ernest Kempton Adams Advanced Undergraduate Physics Laboratory, Columbia University, Fall 2012 — Spring 2016. I taught the relevant physics concepts to the students and assisted them with the use of the experimental equipment.

Teaching Assistant, Frontiers of Condensed Matter Physics, Columbia University (graduate level), Fall 2012 — Fall 2015.

Instructor, Experiments in Modern Physics, Columbia Science Honors Program (high-school level), Spring 2014.

Instructor, German 101, Brigham Young University, Spring 2010.

Supervised Students

BYU Graduate Students

Boldface indicates that I am/was the primary supervisor.

1. **Edison Carlisle** (Doctoral), *Novel investigations of magnetic quantum materials using neutron scattering and other advanced techniques*, 2023 – present.
2. **Emma Zappala** (Masters), *Extracting Magnetic Exchange Interactions from Magnetic Pair Distribution Function Data via Monte Carlo Simulations*, 2023 – 2025.
3. **Sabrina Hatt** (Doctoral), *Pushing the Boundaries of Magnetic Pair Distribution Function Analysis: Technique Development and Applications to Novel Systems*, 2022 – present.
4. **Braedon Jones** (Masters), *Local atomic and magnetic structure of multiferroic (Sr,Ba)(Mn,Ti)O_3*, 2021 – 2023.
5. **Parker Hamilton** (Masters), *Enhanced Capabilities for Investigating Local Structure and Magnetism: Three Dimensional Magnetic Pair Distribution Function and Symmetry Mode Analysis*, 2020 – 2023.
6. **Raju Baral** (Doctoral), *Short-Range Magnetic Correlations, Spontaneous Magnetovolume Effect, and Local Distortion in Magnetic Semiconductor MnTe*, 2019 – 2022.
7. Rajendra Prasad Gautam (Doctoral), *Structural and Magnetic Characterization of Magnetite (Fe_3O_4) Nanoparticle Beads for Medical Applications*, 2023 – present.
8. Johnathon Rackham (Doctoral), *Dynamics of Magnetic Ordering in Assemblies of Magnetite Nanoparticles Throughout the Superparamagnetic Transition*, 2023 – present.
9. Joshua Forsyth (Doctoral), *Characterizing Quirky Signals*, 2023 – present.
10. Carter Shirley (Doctoral), Modeling Key Characteristics of Metal Halide Perovskites, 2022 – present.
11. Daniel Hodge (Doctoral), *Single-shot, ultrafast, multi-frame x-ray imaging of defect-bearing ablator materials in extreme conditions*, 2022 – present (transitioned from MS program).
12. Andrew Carroll (Doctoral), *Solutions to Binary Systems of Black Holes of Intermediate Mass Ratios and Alternative Theories of Gravity in Numerical Relativity*, 2021 – present.
13. Aiden Harbick (Doctoral), *Computational Study of Magnetic Field Interaction with Superconductors Under Extreme Conditions*, 2021 – present.
14. Daniel Hodge (Masters), *Single-shot, ultrafast, multi-frame x-ray imaging of defect-bearing ablator materials in extreme conditions*, 2020 – 2022.
15. Scott Olsen (Doctoral), *Extreme Ultraviolet Application Of Carbon Nanotube Collimator*, 2020 – present.
16. Kolten Barfuss (Masters), *Constructing Suprema in a Nested Hierarchy of Cluster Expansion Models*, 2018 – present.

External Graduate Students

1. Neno Fuller (Masters; University of Kansas), *Engineering The Nanoscale: Exotic Emergent Excitonic Properties & Their Technological Utilization*, 2023 – 2026.
2. Steven Vallone (Doctoral; City University of New York), *Diffraction Based Studies of Magneto- and Baro- Caloric Materials*, 2019 – 2021.

Undergraduate Students

1. Blake Hawkins (Thesis), *Magnetostructural Coupling in Magnetocaloric MnSb via X-ray and Neutron Scattering*, 2023–2025.
2. Camille Shaw (Thesis), *Magnetic Behavior of Li-Doped and Pure MnTe: A Muon Spin Relaxation Analysis*, 2023–2025.
3. Mitchell Hilbig (Thesis), *Uncovering the Local Structure of Amorphous Topological Insulator Bi_2Se_3 with X-ray Scattering*, 2023–2024.
4. Ethan Robinson (Thesis), *Investigating the Internal Magnetic Field of $CoTa_2O_6$ Using Muon Spin Relaxation*, 2023–2024.
5. Emma Zappala (Thesis), *Exploring the Magnetic Dynamics of CrMnFeCoNi*, 2021–2023.
6. Kristina Brown Nuttall (Thesis), *Magnetic Spin Correlations in $NaYbO_2$ at Near-zero Temperatures*, 2022–2023.
7. Karolyn Mocellin (Capstone), *Local ionic structure of molten salts for nuclear applications*, 2020–2023.
8. Elliot Tidd (Thesis), *Magnetic Pair Distribution Function Software Development and Application to Manganese Telluride*, 2022–2023.
9. Russel Anderson (Capstone), *Source-Gap Analysis: A New Method for Analyzing Environmental Problems*, 2021–2023.
10. Jacob Christensen (Thesis), *Pair Distribution Function Analysis of the Short-Range Magnetic and Atomic Correlations in Manganese Telluride*, 2020–2022.
11. Kane Fanning (Thesis), *Deconvolution and the Magnetic Pair Distribution Function*, 2021–2022.
12. Ethan Fletcher (Thesis), *Clarifying the role of the lattice degree of freedom in the canonical metal to insulator transition in V_2O_3*, 2018–2021.
13. Charlotte Read (Thesis), *Fe_3O_4 nanoparticles investigated by vibrating sample magnetometry and muon spin relaxation*, 2018–2021. Co-advised with Prof. Karine Chesnel.
14. Jade Stevens (Capstone), *Analysis of μSR Data From 5 nm and 20 nm Magnetite Nanoparticles*, 2018–2021.
15. Ethan Gibson (Thesis), *Numerical Renormalization of Divergences in QED*, 2019–2021.
16. Nicolas Ducharme (Thesis), *Connections between magnetic correlations and local crystalline structure in two dilute magnetic semiconductors: Li(Zn,Mn)As and (Ba,K)$(Zn,Mn)_2As_2$*, 2019–2020.
17. Jake Hughes (Capstone), *A New Approach to PDF Symmetry Mode Calculations*, 2019–2020.