

Contact Information

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Education

Ph. D. 2009 Condensed Matter Physics,

Henry A. Rowland Department of Physics & Astronomy, Johns Hopkins University, Baltimore, MD

M. S. 2002 Condensed Matter Physics, Department of Physics, Nanjing University, Nanjing, China

B. S. 1999 Biophysics (major), Economics (minor), Department of Physics, Nanjing University, Nanjing, China

Professional Experience

2021/04 – now Oak Ridge National Laboratory

STS Diffraction Instrument Development Scientist, Second Target Station Project Office

2015/01 – 2021/03 Oak Ridge National Laboratory

Neutron Scattering Scientist, Neutron Sciences Directorate

2009/06 – 2014/11 Argonne National Laboratory

Postdoctoral Appointee/Assistant Physicist, Materials Science Division

2002/08 – 2009/04 Johns Hopkins University

Graduate Teaching/Research Assistant, Henry A. Rowland Department of Physics & Astronomy

1999/09 – 2002/06 Nanjing University

Graduate Teaching/Research Assistant, Department of Physics

Personal Statement

At the Second Target Station (STS) Project Office at Oak Ridge National Laboratory, I develop next-generation neutron scattering instruments to tackle critical scientific and technological challenges beyond the reach of current characterization tools. My responsibilities include engaging with the user community to understand their evolving needs, collaborating with instrumentation experts, and working closely with engineers on instrument design and development.

Prior to this, I served as a Neutron Scattering Scientist at the Spallation Neutron Source (SNS), contributing to the commissioning and operation of the CORELLI beamline. My background also encompasses over 20 years of extensive research on low-dimensional magnetic materials in bulk and thin-film forms. I have authored approximately 100 peer-reviewed articles, with 10 selected publications from the last 5 years listed below.

1. Yaohua Liu and Peter Torres, “*Incident beam optics optimization for the single crystal neutron diffractometer Pioneer with a polarized beam option*,” Review of Scientific Instruments **96**, 033904 (2025).
2. Yaohua Liu, Peter Torres, Scott Dixon, Cameron Hart, Darian Kent, Anton Khaplanov, Bill McHargue, Kumar Mohindroo, and Rudolf Thermer, “*Optical design for the single crystal neutron diffractometer Pioneer*,” Review of Scientific Instruments **96**, 033903 (2025).
3. Liu, Yaohua. “*General guide concepts for compact, high-brilliance neutron moderators*.” Review of Scientific Instruments **95**, 073902 (2024).

4. Yin, Junqi, ..., Liu, Yaohua. "Integrated edge-to-exascale workflow for real-time steering in neutron scattering experiments." *Structural Dynamics* **11**, 064303 (2024).
5. Song, Q, ..., Liu, Yaohua, ..., Julia Mundy. "Antiferromagnetic metal phase in an electron-doped rare-earth nickelate." *Nat. Phys.* **19**, 522 (2023).
6. S. Hameed, D. Pelc, Z. W. Anderson, A. Klein, R. J. Spieker, L. Yue, B. Das, J. Ramberger, M. Lukas, Y. Liu, et al., "Ferroelectric quantum criticality and enhanced superconductivity in plastically deformed strontium titanate." *Nat. Mater.* **21**, 54 (2022).
7. Gao, Shang, Michael A. McGuire, Yaohua Liu, Douglas L. Abernathy, Clarina dela Cruz, Matthias Frontzek, Matthew B. Stone, and Andrew D. Christianson. "Spiral Spin Liquid on a Honeycomb Lattice." *Phys. Rev. Lett.* **128**, 227201 (2022)
8. Yaohua Liu, Lin-Lin Wang, Qiang Zheng, Zengle Huang, Xiaoping Wang, Miaofang Chi, Yan Wu, Bryan C. Chakoumakos, Michael A. McGuire, Brian C. Sales, et al., "Site Mixing for Engineering Magnetic Topological Insulators", *Phys. Rev. X* **11**, 021033 (2021).
9. Liu, Chao, Yaohua Liu, Bangmin Zhang, Cheng-Jun Sun, Da Lan, Pingfan Chen, Xiaohan Wu et al. "Ferroelectric self-polarization controlled magnetic stratification and magnetic coupling in ultrathin $\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3$ films." *ACS Appl. Mater. Interfaces* **13**, 30137 (2021).
10. Liu, Yaohua, Liurukara D. Sanjeeva, V. Ovidiu Garlea, Tiffany M. Smith Pellizzeri, Joseph W. Kolis, and Athena S. Sefat. "Complex magnetic order in the decorated spin-chain system $\text{Rb}_2\text{Mn}_3(\text{MoO}_4)_3(\text{OH})_2$." *Phys. Rev. B* **101**, 064423 (2020).

Publications (total ~ 100, total citations ~ 5000, H-index = 37, [Google Scholar](#))

Peer-Reviewed Journal Articles:

1. Yaohua Liu and Peter Torres, "Incident beam optics optimization for the single crystal neutron diffractometer Pioneer with a polarized beam option," *Review of Scientific Instruments* **96**, 033904 (2025).
2. Yaohua Liu, Peter Torres, Scott Dixon, Cameron Hart, Darian Kent, Anton Khaplanov, Bill McHargue, Kumar Mohindroo, and Rudolf Thermer, "Optical design for the single crystal neutron diffractometer Pioneer," *Review of Scientific Instruments* **96**, 033903 (2025).
3. Anderson, Zachary W., Marin Spaić, Nikolaos Biniskos, Liam Thompson, Biqiong Yu, Jack Zwettler, Yaohua Liu et al. "Nanoscale structural correlations in a model cuprate superconductor." *Physical Review B* **110**, 214519 (2024).
4. Yin, Junqi, Viktor Reshniak, Siyan Liu, Guannan Zhang, Xiaoping Wang, Zhongcan Xiao, Zachary Morgan et al. "Integrated edge-to-exascale workflow for real-time steering in neutron scattering experiments." *Structural Dynamics* **11**, 064303 (2024).
5. Yang, Detian, Yaohua Liu, and Xiaoshan Xu. "Intrinsic exchange bias from interfacial reconstruction in an epitaxial $\text{Ni}_x\text{Co}_y\text{Fe}_{3-x-y}\text{O}_4$ (111)/ $\alpha\text{-Al}_2\text{O}_3$ (0001) thin film family." *Journal of Physics: Condensed Matter* **36**, 505802 (2024).
6. Khayr, Issam, Sajna Hameed, Jakov Budić, Xing He, Richard Spieker, Ana Najev, Zinan Zhao et al. "Structural properties of plastically deformed SrTiO_3 and KTaO_3 ." *Physical Review Materials* **8**, 124404 (2024).
7. Yang, Detian, Arjun Subedi, Chao Liu, Haile Ambaye, Valeria Lauter, Peter A. Dowben, Yaohua Liu, and Xiaoshan Xu. "Microstructural underpinnings of giant intrinsic exchange bias in epitaxial NiCo_2O_4 thin films." *Advanced Electronic Materials* 2400149 (2024).
8. Liu, Yaohua. "General guide concepts for compact, high-brilliance neutron moderators." *Review of Scientific Instruments* **95**, 073902 (2024).

9. Xing He; Matthew Krogstad; Mayanak K. Gupta; Tyson Lanigan-Atkins; Chengjie Mao; Feng Ye; Yaohua Liu; Tao Hong; Songxue Chi; Haotong Wei, Jinsong Huang, Stephan Rosenkranz, Raymond Osborn, and Olivier Delaire. "Multiple Lattice Instabilities and Complex Ground State in Cs₂AgBiBr₆", PRX Energy **3**, 013014 (2024)
10. Saizheng Cao, Xin Ma, Dongsheng Yuan, Zhen Tao, Xiang Chen, Yu He, Patrick N Valdivia, Shan Wu, Hang Su, Wei Tian, Adam A Aczel, Yaohua Liu, Xiaoping Wang, Zhijun Xu, Huiqiu Yuan, Edith Bourret-Courchesne, Chao Cao, Xingye Lu, Robert Birgeneau, and Yu Song. "Superstructures and magnetic order in heavily Cu-substituted (Fe_{1-x}Cu_x)_{1+y}Te." Phys. Rev. B **109**, 045142 (2024).
11. Song, Q, Spencer Doyle, Grace A Pan, ..., Liu, Yaohua, ..., Luca Moreschini, and Julia Mundy. "Antiferromagnetic metal phase in an electron-doped rare-earth nickelate." Nat. Phys **19**, 522 (2023).
12. Liu, Yaohua, Huibo Cao, Stephan Rosenkranz, Matthew Frost, Thomas Huegle, Jiao YY Lin, Peter Torres, Alexandru Stoica, and Bryan C. Chakoumakos. "PIONEER, a high-resolution single-crystal polarized neutron diffractometer." Review of Scientific Instruments **93**, 073901 (2022).
13. S. Hameed, D. Pelc, Z. W. Anderson, A. Klein, R. J. Spieker, L. Yue, B. Das, J. Ramberger, M. Lukas, Y. Liu, M. J. Krogstad, R. Osborn, Y. Li, C. Leighton, R. M. Fernandes and M. Greven, "Ferroelectric quantum criticality and enhanced superconductivity in plastically deformed strontium titanate", Nat. Mater **21**, 54 (2022).
14. Tao Hong, Tao Ying, Qing Huang, Sachith E. Dissanayake, Yiming Qiu, Mark M. Turnbull, Andrey A. Podlesnyak, Yan Wu, Huibo Cao, Yaohua Liu, Izuru Umehara, Jun Gouchi, Yoshiya Uwatoko, Masaaki Matsuda, David A. Tennant, Gia-Wei Chern, Kai P. Schmidt and Stefan Wessel, "Evidence for pressure induced unconventional quantum criticality in the coupled spin ladder antiferromagnet C₉H₁₈N₂CuBr₄." Nat. Commun **13**, 3703 (2022).
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33. Dun, Zhiling, Marcus Daum, Raju Baral, Henry E. Fischer, Huibo Cao, Yaohua Liu, Matthew B. Stone et al. "Neutron scattering investigation of proposed Kosterlitz-Thouless transitions in the triangular-lattice Ising antiferromagnet TmMgGaO₄." *Phys. Rev. B* **103**, 064424 (2021).
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35. Liurukara D Sanjeeva, Yaohua Liu, Randy S. Fishman, Mudithangani T. K. Kalambage, Jie Xing, Michael McGuire, Colin D. McMillen, Joseph W. Kolis and Athena S. Sefata, "Stacking Faults and Short-Range Magnetic Correlations in Single Crystal Y₅Ru₂O₁₂: A Structure with Ru^{+4.5} One-Dimensional Chains", *Physica Status Solidi B* **258**, 2000197 (2021)

36. Liu, Yaohua, Liurukara D. Sanjeeva, V. Ovidiu Garlea, Tiffany M. Smith Pellizzeri, Joseph W. Kolis, and Athena S. Sefat. "Complex magnetic order in the decorated spin-chain system $\text{Rb}_2\text{Mn}_3(\text{MoO}_4)_3(\text{OH})_2$." *Phys. Rev. B* **101**, 064423 (2020).
37. Zhou, Jing, Xinyu Shu, Yaohua Liu, Xiao Wang, Weinan Lin, Shaohai Chen, Liang Liu et al. "Magnetic asymmetry induced anomalous spin-orbit torque in IrMn." *Phys. Rev. B* **101**, 184403 (2020).
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Book Chapter:

94. Zouhair Sefrioui, Yaohua Liu, Carlos Leon, Suzanne G. E. te Velthuis, Manuel Bibes, Agnes Barthelemy, Jacobo Santamaria, "Novel Functionalities in Oxide Magnetic Tunnel Junctions: Spin Filtering by Interface-Induced Magnetism", Oxide Spintronics, Ch. 7, Jenny Stanford Publishing, New York (2019).

Technical reports:

95. Liu, Yaohua, David A. Cullen, Alexey Serov, Hanyu Wang, John Ankner, Leighton Coates, Mamontov Eugene, and Shuo Qian. Second Target Station Project: STS Cross-Directorate Workshop on Hydrogen Fuel. No. ORNL/TM-2024/3477. Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States), 2024.
96. Liu, Yaohua, Gabriel Veith, Mali Balasubramanian, John Ankner, Leighton Coates, and Shuo Qian. Second Target Station Project: STS/PSD/ESTD Workshop on Batteries and Energy Storage. No. ORNL/TM-2024/5; S04000000-TRT10004. Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States), 2024.
97. Liu, Yaohua, and Peter Torres III. Second Target Station (STS) Project: PIONEER Technical Report. No. ORNL/TM-2024/3290-Rev. 1; S04050100-TRT10000-R01. Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States), 2023.
98. Campbell, Stuart, Mathieu Doucet, Steven Hartman, John Hetrick, Jiao Lin, Yaohua Liu, Thomas Naughton III, Thomas Proffen, Shuo Qian, and Jon Taylor. Second Target Station Computer Science and Math Workshop Report. No. ORNL/TM-2022/2666. Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States), 2022.

Conference Proceedings:

99. Liu, Yaohua, Stuart Calder, Andrew May, and Yawei Hui. "Single crystal neutron diffuse scattering of layered ferromagnet Fe₃-xGeTe₂." Foundations of Crystallography **75** a229 (2019).
100. Hui, Yawei, and Yaohua Liu. "Volumetric data exploration with machine learning-aided visualization in neutron science." Advances in Computer Vision: Proceedings of the 2019 Computer Vision Conference (CVC), 1 1, 257 (2020).
101. Yuelin Li, Donald Walko, Qing'an Li, Yaohua Liu, Stephan Rosenkranz, Hong Zheng, JF Mitchell, Haidan Wen, Eric Dufresne, Bernhard Adams, "Photo-modulated dynamic competition between metallic and insulating phases in a layered manganite". MRS Proceedings, **1636**, mrsf13-1636-u6.09 (2013).
102. Yaohua Liu, Suzanne GE te Velthuis, "Understanding the interface properties of magnetic heterostructures", Acta Crystallographica Section A **67** (a1), C207 (Invited, 2011).

Selected Preprints:

103. Hui, Yawei, and Yaohua Liu. "Computer Vision-aided Atom Tracking in STEM Imaging." arXiv:1809.05076(2018).
104. Liu, Yaohua, M. Iavarone, A. Belkin, G. Karapetrov, V. Novosad, M. Zhernenkov, Q. Wang, M. R. Fitzsimmons, V. Lauter, and S. G. E. te Velthuis. "Neutron reflectometry studies on magnetic stripe domains in permalloy/superconductor bilayers." arXiv:1410.5520 (2014).

Selected Invited Talks at Major Conferences:

1. "Neutron Scattering for Studying Materials Under Extreme Conditions", TMS Fall Meeting 2023 at MS&T, Columbus, OH, October 1, 2023
2. "Neutron Scattering on Magnetic Thin Films: continue pushing the limit", Intermag Conference 2018 Singapore, April 23-27, 2018
3. "Emergent Magnetic Phenomena at Oxide Interfaces", APS March Meeting 2017. New Orleans, LA, March 17th, 2017

4. “Insights into Spintronics from Neutrons and X-rays”, 14th International Conference on Surface X-ray and Neutron Scattering, Stony Brook, NY, July 11st, 2016
5. “Implications of Interfacial Magnetization for Oxide Spintronics”, IEEE International Magnetism Conference 2015, Beijing, China, May 11th, 2015
6. “Emergent Spin-Filter at the interface between Ferromagnetic and Insulating Layered Oxides”, APS March Meeting 2014, Denver, CO, March 6th, 2014
7. “Effect of Interface-Induced Exchange Fields on Cuprate-Manganite Spin Switches”, 12th Joint MMM-Intermag Conference, Chicago, IL, January 16th, 2013
8. “Understanding the Interface Properties of Magnetic Heterostructures”, XXII Congress and General Assembly, International Union of Crystallography, Madrid, Spain, August 29th, 2011

Professional Award

- Smart System for Neutron Crystallography (ORNL LDRD, team member, 2023-2026)
- ORNL’s Top 10 neutron scattering achievements, 2017, 2022
- Supplemental Performance Award, Oak Ridge National Laboratory, 2018
- Excellence in Research Award, First Place, AIP | APL Materials, 2016
- Top reviewers for Physics and Astronomy, Web of Science, 2016
- SPOT Safety Award, Argonne National Laboratory, “*For behavior that not only contributes to a better workplace, but keeps us going strong*”, 2009

Professional Services

- Panelist, DOE Basic Research Needs Workshop for Accelerator-based Instrumentation
- Reviewer, scientific journals (~ 200 times, <https://orcid.org/0000-0002-5867-5065>):
 - o American Physical Society, American Chemical Society, AIP Publishing, American Association for the Advancement of Science, Institute of Physics, Royal Society of Chemistry, American Association for the Advancement of Science, Elsevier
- Reviewer, Research proposals:
 - o National Science Foundation, Gordon and Betty Moore Foundation, Institute of International Education, ORNL LDRD program, Argonne LDRD program, Neutron beam time for the NIST Center for Neutron Research
- Workshop organizer:
 - o STS Cross-directorate Workshop on Hydrogen Fuel, January 30, 2024, Oak Ridge, TN
 - o STS/PSD/ESTD Workshop on Batteries and Energy Storage, September 20, 2023, Oak Ridge, TN
 - o Workshop on Symmetry and Superspace Approach to Modulated Crystal Structure, October 23-24, 2019, Oak Ridge, TN
 - o US School on Total Scattering Analysis, May 8-12, 2017, Oak Ridge, TN
- Session Chair of Conferences:
 - o 2D Materials: Magnetism, APS March Meeting 2023, March 5-10, 2023, Las Vegas, Nevada
 - o Plasmons in 2D materials, APS March Meeting 2023, March 5-10, 2023, Las Vegas, Nevada
 - o Microscopy, Imaging and Characterization II, Intermag 2018 Conference, April 23-27, 2018, Singapore.
 - o Controlling Magnetism in Oxide Heterostructures II, APS March Meeting 2018, March 5-9, 2018, Los Angeles, California.

- Magnetic Instrumentation and Characterization I, 62nd Annual Conference on Magnetism and Magnetic Materials, November 6 - 12, 2017, Pittsburgh, Pennsylvania
- Magnetic Nanostructures and Thin films, 2014 American Conference on Neutron Scattering
- Scattering and Diffraction, 2014 APS March Meeting
- Complex Oxides: films and heterostructures, the 58th Annual Conference on Magnetism & Magnetic Materials (2013).