

Dr. Jonathan C. Leiner

CONTACT INFORMATION	Oak Ridge National Laboratory One Bethel Valley Road Bldg 8600, MS-6466 Oak Ridge, TN 37830-6466	+1-574-339-0058 leinerjc@ornl.gov jleiner@alumni.nd.edu
CITIZENSHIP	United States of America	
RESEARCH INTERESTS	Neutron Scattering, Neutron Spin-Echo, Entangled Neutron Beams, Quantum Magnetism, Frustrated Magnetism, Strongly Correlated Electrons, Magnetic Materials, Transition Metal Oxides, Fe-Based Superconductors, Topological Insulators, Magnetic Semiconductors, Condensed Matter Physics. (Google Scholar Profile)	
PROFESSIONAL EXPERIENCE	Oak Ridge National Laboratory, Oak Ridge, Tennessee USA Neutron Optics and Polarization Scientist, January 2023 to present • Neutron Technologies Division, Neutron Sciences Directorate Forschungsreaktor München II (FRM II), Technical University of Munich Instrument Scientist, November 2019 to December 2022 • <i>Instrument</i> RESEDA (REsonant Spin-Echo for Diverse Applications) • Group Chair: Prof. Christian Pfleiderer IBS Center for Correlated Electron Systems, Seoul National University Research Assistant Professor, November 2015 to November 2018 • <i>Team Leader for Scattering (Neutron and X-ray) projects</i> • Group Chair: Prof. Je-Geun Park Oak Ridge National Laboratory, Oak Ridge, Tennessee USA Postdoctoral Research Associate, February 2013 to November 2015 • Quantum Condensed Matter Division, Neutron Sciences Directorate • Advisor: Prof. Collin Broholm	
EDUCATION	University of Notre Dame, Notre Dame, Indiana USA Ph.D., Physics, December 2012 • Thesis Topic: Exchange Coupling in the Ferromagnetic Semiconductor GaMnAs • Advisor: Prof. Margaret Dobrowolska M.S., Physics, May 2011	

Washington State University, Pullman, Washington USA

B.S., Physics, May 2007

B.S., Mathematics, May 2007

- WSU Honors College Certificate
- Undergraduate Thesis Topic: Searching for Braneworld Signals in Gravitational Wave Detectors
- Undergraduate Thesis Advisor: [Prof. Sukanta Bose](#)

RESEARCH BACKGROUND

Oak Ridge National Laboratory, Oak Ridge, TN: 2023 to present

- Assisting with experiments and development with neutron polarization capabilities, including magnetic Wollaston prisms and resonant spin flippers. Co-organized workshop on the "[Scientific Benefits and Applications of Resonant Spin Echo](#)" held in February 2024.

Research Neutron Source Heinz Maier-Leibnitz (FRM II), Munich: 2019 to 2022

- Local contact for assisting users with their experiments at the RESEDA instrument. Responsible for designing and implementing major upgrades to the MIEZE spectrometer arm at RESEDA to optimize it for the requirements of small-angle neutron scattering (MIASANS). These upgrades include: (i) installing new superconducting solenoids as part of the resonant flippers to significantly extend the dynamic range (ii) installation of a new detector on a new translation stage within a vacuum vessel to improve the precision and flexibility of data collection.

Seoul National University, Seoul, South Korea: 2015 to 2018

- Measurement and analysis of neutron and x-ray scattering data on strongly correlated electron systems. Specific focus on two topics: (i) magnon-magnon and magnon-phonon coupling in *multiferroic* non-collinear 2D triangular lattice antiferromagnets and (ii) Effects of interchain coupling on the spinon excitations in 1D *quantum spin chain* systems.

Oak Ridge National Laboratory, Oak Ridge, TN: 2013 to 2015

- Performing inelastic neutron scattering measurements to analyze spin dynamics of iron-based superconductors and strongly correlated electron systems, including topological Kondo insulators and Mott insulators with *frustrated magnetism*.

University of Notre Dame, Notre Dame, IN: 2008 to 2012

- Investigating the nature of interlayer exchange coupling (IEC) in GaMnAs-based multilayers (*utilizing magneto-transport, SQUID magnetometry, and polarized neutron reflectometry*) and establishing under what conditions the IEC between GaMnAs layers is antiferromagnetic or ferromagnetic.

Washington State University, Pullman, WA: 2005 to 2007

- WSU College of Sciences Summer Research mini-grants (Summer 2005 and 2006) for research on the detection of stochastic and braneworld gravitational wave signals with LIGO (Laser-Interferometer Gravitational-wave Observatory).

University of Alaska Fairbanks, Fairbanks, AK: 2004

- REU program grant for atmospheric physics project; modeling noctilucent clouds with [Prof. Scott Bailey](#).

MANUSCRIPTS
UNDER REVIEW

S. McKay, V.O. de Haan, **J. C. Leiner**, S. R. Parnell, R. M. Dalgliesh, P. Boeni, L.J. Bannenberg, Q. Le Thien, D. V. Baxter, G. Ortiz, R. Pynn “*Observation of a giant Goos-Hänchen shift for matter waves*” submitted to Physical Review Letters: [arXiv:2407.01190](https://arxiv.org/abs/2407.01190)

REFEREED
PUBLICATIONS



J. C. Leiner, S. J. Kuhn, S. McKay, J. K. Jochum, F. Li, A. A. M. Irfan, F. Funama, D. Mettus, L. Beddich, C. Franz, J. Shen, S. R. Parnell, R. M. Dalgliesh, M. Loyd, N. Geerits, G. Ortiz, C. Pfleiderer, and R. Pynn “*Spin-energy entanglement of a time-focused neutron*” [Physical Review Applied \(Letter\) **22**, L031005 \(2024\)](#)

M. Kleinhans, K. Eibensteiner, **J. C. Leiner**, J. Spallek, A. Regnat, and C. Pfleiderer “*Magnetocaloric properties of $(RE)_3Ga_5O_{12}$ ($RE=Tb, Gd, Nd, Dy$)*” [Physical Review Applied **19**, 014038 \(2023\)](#)

J. C. Leiner, C. Franz, J. K. Jochum, and C. Pfleiderer “*MIASANS at the longitudinal neutron resonant spin-echo spectrometer RESEDA*” [EPJ Web of Conferences **272**, 02008 \(2022\)](#)

P. Bender, D. Honecker, M. Bersweiler, R. Costo, T. Kahmann, F. Ludwig, **J. C. Leiner**, and J. K. Jochum “*Robust approaches for model-free small-angle scattering data analysis*” [Journal of Applied Crystallography **55**, 586-591 \(2022\)](#)

J. K. Jochum, L. Spitz, C. Franz, **J. C. Leiner**, C. Pfleiderer, and O. Soltwedel “*Optimized signal deduction procedure for the MIEZE neutron spectroscopy technique*” [Journal of Applied Crystallography **55**, 14-20 \(2022\)](#)

P.-J. Park, K. Park, J.-S. Oh, K.-H. Lee, **J. C. Leiner**, H.-S. Sim, T.-H. Kim, J.-H. Jeong, K. C. Rule, K. Kamazawa, K. Ida, T. G. Perring, H.-J. Woo, S.-W. Cheong, M. E. Zhitomirsky, A. L. Chernyshev, and J.-G. Park “*Spin texture induced by non-magnetic doping and spin dynamics in 2D triangular lattice antiferromagnet h -Y(Mn,Al)O₃*” [Nature Communications **12**, 2306 \(2021\)](#)

J. K. Jochum, A. Hecht, O. Soltwedl, C. Fuchs, J. Frank, E. Faulhaber, **J. C. Leiner**, C. Pfleiderer, and C. Franz. “*Oscillatory magnetic fields for neutron resonance spin-echo spectroscopy*” [Measurement Science and Technology **32**, 045902 \(2021\)](#)

T.-H. Kim, C.-H. Kim, J.-H. Jeong, P.-J. Park, K. Park, K.-H. Lee, **J. C. Leiner**, D. Ishikawa, A. Q. R. Baron, Z. Hiroi, and J.-G. Park “*Spin-orbit coupling effects on spin-phonon coupling in Cd₂Os₂O₇*” [Physical Review B **102**, 201101\(R\) \(2020\)](#)

K. Park, J.-S. Oh, K.-H. Lee, **J. C. Leiner**, H.-S. Sim, H. Nahm, T.-H. Kim, J.-H. Jeong, D. Ishikawa, A. Q. R. Baron, J.-G. Park “*Magnetoelastic excitations in multi-ferroic hexagonal YMnO₃ studied by inelastic x-ray scattering*” [Physical Review B **102**, 085110 \(2020\)](#)

T.-H. Kim, K. Park, **J. C. Leiner**, J.-G. Park “*Hybridization and Decay of Magnetic Excitations in Two-Dimensional Triangular Lattice Antiferromagnets*” [Journal of the Physical Society of Japan: Special Topics **88**, 081003 \(2019\)](#)

J. C. Leiner, H. O. Jeschke, R. Valenti, S. Zhang, A. T. Savici, J. Y.Y. Lin, M. B. Stone, M. D. Lumsden, Jiawang Hong, O. Delaire, Wei Bao, C. Broholm. “*Frustrated magnetism in Mott insulating $(V_{1-x}Cr_x)_2O_3$* ” [*Physical Review X* **9**, 011035 \(2019\)](#)

W. T. Fuhrman, **J. C. Leiner**, J. W. Freeland, M. van Veenendaal, S. M. Koohpayeh, W. Adam Phelan, T. M. McQueen, C. Broholm. “*Magnetic dichroism in the Kondo insulator SmB_6* ” [*Physical Review B \(RC\)* **99**, 020401 \(2019\)](#)

J. C. Leiner, T.-H. Kim, K. Park, J.-S. Oh, T.G. Perring, H.C. Walker, X. Xu, S-W Cheong, J.-G. Park “*Magnetic excitations in the bulk multiferroic two-dimensional triangular lattice antiferromagnet $(Lu,Sc)FeO_3$* ” [*Physical Review B* **98**, 134412 \(2018\)](#)

T.-H. Kim, **J. C. Leiner**, K. Park, J.-S. Oh, H.-S. Sim, K. Iida, K. Kamazawa, J.-G. Park. “*Renormalization of spin-excitations in hexagonal $HoMnO_3$ from magnon-phonon coupling*” [*Physical Review B \(RC\)* **97**, 201113\(R\) \(2018\)](#)

J. C. Leiner, J.-S. Oh, A. I. Kolesnikov, M. B. Stone, M. D. Le, E. P. Kenny, B. J. Powell, M. Mourigal, E. E. Gordon, M.-H. Whangbo, J.-W. Kim, S.-W. Cheong, J.-G. Park. “*Magnetic excitations of the Cu^{2+} quantum spin chain in Sr_3CuPtO_6* ” [*Physical Review B* **97**, 104426 \(2018\)](#)

K. Park, HS. Sim, **J.C. Leiner**, Y. Yoshida, JH. Jeong, S. Yano, J. Gardner, P. Bourges, M. Klicpera, V. Sechovsky, M. Boehm, JG. Park. “*Low-energy spin dynamics of orthoferrites $AFeO_3$ ($A=Y,La,Bi$)*” [*Journal of Physics:Condensed Matter* **30**, 23 \(2018\)](#)

T.-H. Kim, S.-M. Lim, J.-Y. Hong, S.-G. Kwon, J. Okamoto, Z.-Y. Chen, J.-H. Jeong, S.-M. Kang, **J. C. Leiner**, D.-J. Huang, T.-H. Hyeon, S.-C. Lee, J.-G. Park. “*Giant thermal hysteresis in Verwey transition of single domain Fe_3O_4 nanoparticles*” [*Scientific Reports* **8**, 5092 \(2018\)](#)

K. Park, J.-S. Oh, **J. C. Leiner**, J.-H. Jeong, K. C. Rule, M. D. Le, J.-G. Park. “*Magnon-phonon coupling and two-magnon continuum in the two-dimensional triangular antiferromagnet $CuCrO_2$* ” [*Physical Review B* **94**, 104421 \(2016\)](#)

W. A. Phelan, S. M. Koohpayeh, P. Cottingham, J. A. Tutmaher, **J.C. Leiner**, M.D. Lumsden, C.M. Lavelle, X.P. Wang, C. Hoffmann, M.A. Siegler, N. Haldolaarachchige, D.P. Young, T.M. McQueen. “*On the chemistry and physical properties of flux and floating zone grown SmB_6 single crystals*” [*Scientific Reports* **6**, 20860 \(2016\)](#)

W. T. Fuhrman*, **J. C. Leiner***, P. Nikolic, G. Granroth, M. B. Stone, M. D. Lumsden, L. DeBeer-Schmitt, P. A. Alekseev, J.-M. Mignot, S. M. Koohpayeh, P. Cottingham, W. A. Phelan, L. Schoop, T. M. McQueen, C. Broholm. “*Interaction Driven Subgap Spin Exciton in the Kondo Insulator SmB_6* ” *Both authors contributed equally. [*Physical Review Letters* **114**, 036401 \(2015\)](#)

J. C. Leiner, V. Thampy, A. D. Christianson, D. L. Abernathy, M. B. Stone, M. D. Lumsden, A. S. Sefat, B. C. Sales, Jin Hu, Zhiqiang Mao, Wei Bao, C. Broholm. “*Modified magnetism within the coherence volume of superconducting $Fe_{1+\delta}Se_xTe_{1-x}$* ” [*Physical Review B \(RC\)* **90**, 100501\(R\) \(2014\)](#) (Selected as Editor’s Suggestion)

- A. M. Alsmadi, Y. Choi, D. J. Keavney, K. F. Eid, B. J. Kirby, X. Liu, **J. C. Leiner**, K. Tivakornasithorn, M. Dobrowolska, J. K. Furdyna. “*Interfacial exchange coupling in Fe/(Ga,Mn)As bilayers*” [Physical Review B **89**, 224409 \(2014\)](#)
- W. A. Phelan, S. M. Koohpayeh, P. Cottingham, J. W. Freeland, **J. C. Leiner**, C. L. Broholm, T. M. McQueen. “*Correlation between Bulk Thermodynamic Measurements and the Low-Temperature-Resistance Plateau in SmB₆*” [Physical Review X **4**, 031012 \(2014\)](#)
- J. C. Leiner**, B. J. Kirby, M. R. Fitzsimmons, K. Tivakornasithorn, X. Liu, J. K. Furdyna, M. Dobrowolska. “*Magnetic depth profile of Mn-graded GaMnAs*” [Journal of Magnetism and Magnetic Materials, **350**, 135 \(2014\)](#)
- R.E. Pimpinella, D. Zhang, M.R. McCartney, D.J. Smith, K.L. Krycka, B.J. Kirby, B.J. O’Dowd, L. Sonderhouse, **J. C. Leiner**, X. Liu, M. Dobrowolska, J.K. Furdyna. “*Magnetic properties of GaAs/Fe core/shell nanowires*” [Journal of Applied Physics **113**, 17B520 \(2013\)](#)
- K. Tivakornasithorn, A.M. Alsmadi, X. Liu, **J. C. Leiner**, Y. Choi, D.J. Keavney, K.F. Eid, M. Dobrowolska, J.K. Furdyna. “*Exchange bias and asymmetric magnetization reversal in ultrathin Fe films grown on GaAs (001) substrates*” [Journal of Applied Physics **113**, 133908 \(2013\)](#)
- J. K. Furdyna, **J. C. Leiner**, X. Liu, M. Dobrowolska, S. Lee, J.-H.Chung, B. J. Kirby. “*Exchange Coupling in Magnetic Semiconductor Multilayers and Superlattices*” [Acta Physica Polonica A **121**, 973 \(2012\)](#)
- X. Liu, D. J. Smith, J. Fan, Y.-H. Zhang, H. Cao, Y. P. Chen, B. J. Kirby, N. Sun, S. T. Ruggiero, **J. C. Leiner**, R. E. Pimpinella, J. Hagmann, K. Tivakornasithorn, M. Dobrowolska, J. K. Furdyna. “*Topological Insulators Bi₂Te₃ and Bi₂Se₃ Grown by MBE on (001) GaAs Substrates*” [AIP Conference Proceedings **1416**, 105 \(2011\)](#)
- X. Liu, D. J. Smith, J. Fan, Y.-H. Zhang, H. Cao, Y. P. Chen, **J. C. Leiner**, B. J. Kirby, M. Dobrowolska, J. K. Furdyna. “*Structural properties of Bi₂Te₃ and Bi₂Se₃ topological insulators grown by molecular beam epitaxy on GaAs(001) substrates*” [Applied Physics Letters **99**, 171903 \(2011\)](#)
- J. C. Leiner**, K. Tivakornasithorn, X. Liu, J. K. Furdyna, M. Dobrowolska, B. J. Kirby, H. Lee, T. Yoo, Sanghoon Lee. “*Antiferromagnetic exchange coupling between GaMnAs layers separated by a nonmagnetic GaAs:Be spacer*” [Journal of Applied Physics **109**, 07C307 \(2011\)](#)
- J. C. Leiner**, H. Lee, T. Yoo, S. Lee, B. J. Kirby, K. Tivakornasithorn, X. Liu, J. K. Furdyna, M. Dobrowolska. “*Observation of antiferromagnetic interlayer exchange coupling in a Ga_{1-x}Mn_xAs/ GaAs:Be/ Ga_{1-x}Mn_xAs trilayer structure*” [Physical Review B **82**, 195205 \(2010\)](#)

- INVITED PRESENTATIONS “*Frustrated magnetism in Mott insulating $(V_{1-x}Cr_x)_2O_3$* ” Charles University Physics Department [Colloquium](#) April 21, 2021, Prague, Czech Republic
- “*Frustrated magnetism in Mott insulating $(V_{1-x}Cr_x)_2O_3$* ” Neutrons for Science and Industry [seminar series](#) at MLZ, May 4, 2020, Garching, Germany
- SELECTED CONFERENCE PRESENTATIONS “*Spin-Energy Entanglement of a Time-Focused Neutron*” APS March Meeting, March 4-8, 2024, Minneapolis, MN and American Conference on Neutron Scattering, June 23-27, 2024, Knoxville, TN
- “*MIASANS at the longitudinal neutron resonant spin echo spectrometer RESEDA*” MLZ User Meeting, December 8-9, 2020, Munich, Germany
- “*Magnetic excitations in bulk multiferroic two-dimensional triangular lattice antiferromagnet $(Lu,Sc)FeO_3$* ” APS March Meeting, March 5-9, 2018, Los Angeles, CA
- “*Magnetic Excitations of the Cu^{2+} Quantum Spin Chain in Sr_3CuPtO_6* ” International Conference on Neutron Scattering (ICNS) July 9-13, 2017 Daejeon, Korea
- “*1D spin chain of Cu^{2+} in Sr_3CuPtO_6 with possible Haldane physics*” APS March Meeting, March 13-17, 2017, New Orleans, LA
- “*Spin-orbital fluctuations in the paramagnetic Mott insulator $(V_{1-x}Cr_x)_2O_3$* ” APS March Meeting, March 2-6, 2015, San Antonio, TX
- “*Magnetic Excitation Spectrum of the Topological Kondo Insulator SmB_6* ” American Conference on Neutron Scattering, June 1-5, 2014, Knoxville, TN
- “*Quantitative Derivation of a Magnetic Component to the Superconducting Condensation Energy for $Fe_{1+\delta}Se_xTe_{1-x}$* ” APS March Meeting, March 3-7, 2014, Denver, CO
- “*Magnetic Properties of Heterojunctions between Ge and GaMnAs*” IEEE International Magnetism Conference, May 7-11, 2012, Vancouver, Canada.
- “*Magnetic properties of $Ga_{1-x}Mn_x/Ge$ heterojunctions*” APS March Meeting, Feb 27-Mar 2, 2012, Boston, MA
- “*Anisotropy variations in Mn-graded GaMnAs*” 56th Annual Conference on Magnetism and Magnetic Materials October 30-November 3, 2011, Scottsdale, AZ
- “*Magnetic depth profile of Mn-graded GaMnAs*” 53rd Electronic Materials Conference, June 22-24, 2011, UC Santa Barbara, CA
- “*AFM Interlayer Exchange Coupling in a GaMnAs/GaAs:Be/GaMnAs tri-layer*” American Conference on Neutron Scattering, June 26-30, 2010, Ottawa, ON, Canada
- “*Observation of AFM Interlayer Exchange Coupling in a GaMnAs/GaAs:Be/GaMnAs tri-layer*” APS March Meeting, March 15-19, 2010, Portland, OR

SELECTED POSTER PRESENTATIONS	“<i>Spin-Energy Entanglement of a Neutron with the MIEZE technique</i>” Munich Conference on Quantum Science and Technology, July 4-6, 2022, Sonthofen, Germany “<i>MIASANS at the longitudinal neutron resonant spin echo spectrometer RESEDA</i>” German Physical Society Fall Meeting, September 27 - October 1, 2021, Online “<i>Magnetic excitations in multiferroic 2D triangular lattice antiferromagnet (Lu,Sc)FeO₃</i>” Korean Physical Society Fall Meeting, October 25-27, 2017, Gyeongju, Korea “<i>Frustrated magnetism and Spin-Peierls like transition in Mott insulating V₂O₃</i>” Gordon Research Conference (GRC) on Strongly Correlated Electron Systems, June 26 - July 1 2016, Mount Holyoke College, MA “<i>Antiferromagnetic exchange coupling between GaMnAs layers separated by a nonmagnetic GaAs:Be spacer</i>” MMM 2010 November 14-18, 2010, Atlanta, GA
SERVICE AS REVIEWER	– Peer Reviewer: Nature Communications, NPJ Quantum Materials, Physical Review Letters, Physical Review X, Physical Review B, Physical Review Materials, Physical Review Research, Journal of Applied Physics, Journal of Applied Crystallography – Proposal Reviewer for allocating beamtime on the neutron scattering instruments at the NIST Center for Neutron Research and ANSTO Australian Center for Neutron Scattering
GRANTS AS PRINCIPAL INVESTIGATOR	– German BMBF ErUM Pro Project “Spatial-Intensity-Modulation-mode (SIM-mode) capabilities to polarized neutron beams at FRM II” ~ \$870,000 – U.S. National Science Foundation East Asia and Pacific Summer Institute (EAPSI) Grant No. OISE-0914013 (\$10,000) – ≈ 85 days of neutron & x-ray user facility instrument beamtime awarded at instruments listed below in Skills section.
TEACHING	Teaching Assistant, University of Notre Dame, 2007 to 2009 • Teaching Assistant: Physics I Laboratory (Fall 2007) • Tutorial Instructor: Mathematical Methods for Physics (Spring/Fall 2008, Spring 2009)
PROFESSIONAL ORGANIZATIONS	German Physical Society (2021-present) Korean Physical Society (2016-present) Neutron Scattering Society of America (2013-present) American Physical Society (2008-Present) LIGO Scientific Collaboration (2006-2007)

SKILLS

- Extensive experience with Inelastic Neutron Scattering:
 - Neutron Resonant Spin-Echo (MIEZE–Modulation of Intensity with Zero Effort– technique with the [RESEDA](#) instrument)
 - Time-of-Flight spectrometers (ORNL SNS, USA: [SEQUOIA](#), [ARCS](#), [HYSPEC](#)(polarized). RAL, UK: [MERLIN](#). J-PARC, JP: [4SEASONS](#))
 - Triple-Axis spectrometers (ORNL HFIR, USA: [HB-1](#)(polarized) & [HB-3](#). NIST NCNR, USA: [MACS](#)(polarized) and [BT7](#). ANSTO, AU: [TAIPAN](#))
- Extensive experience with Polarized Neutron Reflectometry at both:
 - Continuous neutron sources (NIST NCNR, [PBR instrument](#))
 - Pulsed neutron sources (ORNL SNS: [Magnetism Reflectometer](#) Lujan, Los Alamos: [Asterix](#))
- Extensive experience with X-ray Magnetic Circular Dichroism (XMCD) ([ANL](#)) and (non-resonant) Inelastic X-ray Scattering (IXS) ([Spring-8](#)) experiments
- Neutron Diffraction experience
- Resonant Inelastic X-ray Scattering (RIXS) experience
- X-ray reflectivity and X-ray diffraction experience
- Magnetometry and Magneto-transport experience
- Programming experience, in order of familiarity:
(Python, [McStas](#), [Mantid](#), MATLAB, Mathematica, IDL, C++)
- Nano-Fabrication and Molecular Beam Exptaxy (MBE) growth experience
- Reading and basic speaking competence in Korean and German (B2.2)