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Yan Wu, Ph.D.

Neutron Scattering Scientist

Chair of NSD High Pressure Sample Environment Steering Committee

Neutron Scattering Division, Oak Ridge National Laboratory

Webpage: https://www.ornl.gov/staff-profile/yan-wu

Research Interest

My research interests are on studying the crystal structure and magnetic structure with X-ray diffraction and neutron scattering techniques, illustrating the coupling between electron and magnetic moments in quantum materials and complex magnetic materials including multiferroics, molecular magnets, itinerant magnets etc., and understanding materials behavior changes under the extreme conditions of high pressure.

Work Experience

- 06.2016-06.2019, ORNL, Postdoc Associate carrying 25% of the HB-3A beamline local contact tasks.
- 06.2019-present, ORNL, Neutron scattering scientist working on HFIR neutron instruments DEMAND and WAND2.
- 08.2024-present, ORNL, Neutron scattering scientist working on HFIR neutron instruments DEMAND.

Education

- 09.2002-07.2006, Northwest University, China, bachelor's degree in physics
- 09.2006-12.2008, Fujian Institute of Research on Structure of Matters, Chinese Academy of Science, China, master's degree in Condensed Matter Physics
- 01.2009-05.2016, Louisiana State University, Ph.D. degree in Physics

Professional activities

- Lead instrument scientist for local contacting, instrument developments and upgrades at DEMAND instrument, HFIR, ORNL (2024-)
- Instrument scientist for local contacting, instrument developments and upgrades at DEMAND and WAND2 instruments (2019-2024)
- Chair of the NSD high pressure sample environment steering committee at ORNL(2019-present)
- Co-organizer of the NSD high-pressure interest group seminar series(2019-present)
- Lab space manager of the HFIR high pressure lab at ORNL (2020-present)

- Server as member and in the leadership team of the “Matter under extreme” new NSD science initiative
- Host the “Advanced Software Tools for Single Crystal Diffraction” in the American chemistry associate meeting of 2024
- Participant in the TITAN proposal team for the Second Target Station (2020-2021)
    - Develop the instrument proposal
    - Prepare town hall meetings
- Serve as the strategy planner in WINS and host the NXS vs WINS session for career development in neutron world (2022)
- Contribute to workshops and schools for the developments of the neutron community every year including:
    - National school on neutron and X-ray scattering
    - ORNL neutron user meetings
    - Quantum materials young investigators workshops
    - JAEA - US-Japan workshops
    - SHUG EC onsite meeting for sample environments
    - Magnetic structure determination from neutron diffraction data using GSAS-II

Professional Affiliations

- American Physical Society(APS)
- American Crystallographic Association(ACA)
- Neutron Scattering Society of America (NSSA)
- American Ceramic Society

Awards

- 2022 ORNL NSD Best Experiment Award

- 2020 ORNL NSD Best Experiment Award

- 2013 LaSigma Leadership Graduate Student Supplement Award

- 2009 Louisiana State University Graduate School Enhancement Award

Mentoring experiences

Mentoring postdoctoral associate: Dr. Mary-Allen Donnelly, Neutron Scattering Division (2019-2022)

Research Skills

Neutron Instrument related skills

- Expert in neutron diffraction and X-ray diffraction.

- 8 years experiences in communicating with users and supporting teams at neutron facility instruments, contributing to diffraction beamline upgrades and sample environment developments in neutron collimation, high pressure, magnet and polarizer.

- Experience on various neutron instruments including single crystal diffractometer, neutron powder diffractometer, triple axis spectrometer and TOF spectrometer.

- Experience with different pressure systems including the Paris-Edinburgh presses, gas pressure cell, clamp cells and Diamond Anvil cells

- Practical experience of cryogenic materials, cryogenic system developing and engineering including dilution refrigerator and other cryostats.

- Familiar with serial and GPIB communication electronics in physics and chemistry lab.

Data acquiring and analysis related skills

- Data processing software:

Crystal refinement tools including Fullprof, WinGX and GSAS-II.

Data reduction programming with Mantid, IDL and MATLAB.

- Programming language: c, Fortran, LabView and Python

Material synthesis and bulk characterizing

Synthesis experiences: arc-melting, RF-induction melting, chemical vapor transport method, metallic flux method and floating zone method

Bulk measurements including resistivity, susceptibility, specific heat measurements with PPMS, MPMS and so on.

Language

Chinese(Native Proficiency), English(Full Professional Proficiency)

Reference

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Selected presentations:

- "Exploring Fe1−yCoySi near the insulator-to-metal transition", APS March meeting, Mar 3-7th, 2014, Denver, CO.
- "Non-Fermi liquid behavior and the undersceened Kondo effect in Fe1−yCoySi" , APS March meeting, Mar 2-6th, 2015, San Antonio, TX.
- "Incommensurate Spin Density Wave state in metamagnetic Fe3Ga4", Mar 14-18th, 2016, Baltimore, MD.
- "Investigation on a giant magnetoelectric effect hexaferrite via neutron scattering techniques", International Meeting on Ferroelectricity, Sep 4-8th, 2017, San Antonio, TX.
- "Coupled evolution of magnetic and ferroelectric states in (NH4)2FeCl5・H2O under pressure", MAGNA 2020, February 21-24th, 2020, Southern Georgia, invited.
- "Pressure-induced ferroelectric reentrance in a molecular magnet", CNMS Seminar Series, ORNL, July 7th 2020, virtual, invited.
- An overview over high pressure development and high-pressure neutron studies at Oak Ridge National Laboratory, ACNS, July 12-16th, 2020, virtual, Invited.
- "High pressure neutron study on magnetic phases in a Y-type hexaferrite," EHPRG meeting, September 5-8th, 2022, virtual.
- "An overview over high pressure development and high-pressure neutron studies at Oak Ridge National Laboratory", 2023 Quantum Materials Young Investigators Workshop, June 22-23rd, 2023, Oak Ridge, TN, invited.
- "High Pressure Neutron Diffraction at Ultra-Low Temperature" , Gordon Research Conference: Research at High Pressure, New Hampshire, July 17th, 2024, invited.
- "High Pressure Neutron Scattering at ORNL" Sep. 5th 2024 at Tokai, Japan, invited.

Publications:

1. **Y. Wu**, Kun Zhai, Shipeng Shen et al., Giant magnetoelectric effects achieved by tuning spin cone symmetry in Y-type hexaferrites, Nature Comm., 2017, 8(519).
2. **Y. Wu** et al., Spin density wave instability in a ferromagnet, Scientific reports, 2018, 8(5225).
3. **Y. Wu**, Interactions Between Local Magnetic Moments and Itinerant Charge Carriers in Fe-based systems, Ph. D Thesis, Louisiana state university, 2016.
4. **Y. Wu** et al., Theoretical studies on the bonding of Cd^{2+} to adenine and thymine: Tautomeric equilibrium and metalation in base pairing, Chem. Phys. Lett. 2010, 467(387).
5. J. H. Mendez, C. E. Ekuma, **Y. Wu** et al., Competing magnetic states, disorder, and magnetic character of Fe3Ga4, Phys. Rev. B, 2015, 91(144409).
6. Z.Y. Zhao, **Y. Wu** et al., Three-dimensional magnetic interactions in quasi-two-dimensional $PdAs_2O_6$, J. Phys.: Cond. Mat., 2017, 29(235801).

7. Bianca Haberl, Sachith Dissanayake, **Y. Wu** et al, Next-generation diamond cell and applications to single-crystal neutron diffraction, Review of Scientific Instruments, 2018, 89(092902).
8. Huibo Cao, Bryan Chakoumakos, Katie Andrews, **Y. Wu** et al, DEMAND, a Dimensional Extreme Magnetic Neutron Diffractometer at High Flux Isotope Reactor, Crystals, 2019, 9(5).
9. C. Heikes, I-Lin Liu, T. Metz, C. Eckberg, P. Neves, **Y. Wu** et al, Mechanical control of crystal symmetry and superconductivity in Weyl semimetal MoTe2, Phys. Rev. Materials,2018, 2(074202).
10. S. Turksen-Selcuk, C. Rosu, A. Blake, E. Soto-Cantu, J. H. Qiu, **Y. Wu**, J. F. DiTusa, A. Steffens, and P. S. Russo, Langmuir, 2019, 35(14248)
11. Xudong Shen, Long Zhou, Yisheng Chai, **Y. Wu** et al., Large Linear Magnetoelectric Effect and Field-Induced Ferromagnetic Ferroelectricity with Huge Magnetic Moment in $DyCrO_4$, NPG Asia Materials, 2019, 11(50)
12. J.-Q. Yan, S. Okamoto, **Y. Wu**, Q. Zheng, H. D. Zhou, H. B. Cao, and M. A. McGuire, Magnetic order in single crystals of $Na_3Co_2SbO_6$ with a honeycomb arrangement of $3d^7$ Co^{2+} ions, Phys. Rev. Materials, 2019, 3(074405)
13. J. Y. Liu, P. F Liu, K. Gordon, E. Emmanouilidou, J. Xing, D. Graf, B. C. Chakoumakos, **Y. Wu**, H. B Cao, D. Dessau, Q. H. Liu, and Ni Ni, Nontrivial topology in the layered Dirac nodal-line semimetal candidate $SrZnSb_2$ with distorted Sb square nets, Phys. Rev. B, 2019, 100(195123)
14. S. K. Karna, F. N. Womack, R. Chapai, D. P. Young, M. Marshall, W.W. Xie, D. Graf, **Y. Wu**, H.B. Cao, L. DeBeer-Schmitt, P. W. Adams, R. Jin, and J. F. DiTusa, Consequences of magnetic ordering in chiral $Mn_{1/3}NbS_2$, Phys. Rev. B, 2019, 100(184413)
15. J.-Q. Yan, Y. H. Liu, D. S. Parker, **Y. Wu**, A. A. Aczel, M. Matsuda, M. A. McGuire, and B. C. Sales, A-type antiferromagnetic order in MnBi4Te7 and $MnBi_6Te_{10}$ single crystals, Phys. Rev. Materials, 2020, 4(054202)
16. L. Ding, M. Lee, E. S. Choi, J. Zhang, **Y. Wu** et al, Large spin-driven dielectric response and magnetoelectric coupling in the buckled honeycomb $Fe_4Nb_2O_9$, Phys. Rev. Materials, 2020, 4(084403)
17. B. Haberl, M.-E. Donnelly, **Y. Wu**, E. Kroll, M. Frontzek, J. Molaison and G. Granroth, Synthesis and characterization of metastable crystalline st^{12} germanium, Acta Cryst., 2020,76(131)
18. M.-E. Donnelly, B. Haberl, **Y. Wu**, E. Kroll, M. Frontzek and J. Molaison, High-pressure neutron diffraction on WAND2 in a Paris–Edinburgh press, Acta Cryst., 2020, 76(190)
19. K. Lu, D. Sapkota, L. DeBeer-Schmitt, **Y. Wu** et al, Canted antiferromagnetic order in the monoaxial chiral magnets $V_{1/3}TaS_2$ and $V_{1/3}NbS_2$, Phys. Rev. Materials, 2020, 4(054416).
20. Y. H. Liu, L. L. Wang, Q. Zheng, Z. L. Huang, X. P. Wang, M. F. Chi, **Y. Wu** et al, Site Mixing for Engineering Magnetic Topological Insulators, Phys.Rev. X, 2021, 11(021033)

21. S. K. Karna, D. Tristant, J. K. Hebert, G. Cao, R. Chapai, W. A. Phelan, Q. Zhang, **Y. Wu** et al., Helical magnetic order and Fermi surface nesting in noncentrosymmetric ScFeGe, Phys.Rev. B, 2021, 103(014443)
22. T. Hong, T. Ying, Q. Huang, S. E. Dissanayake, Y. M. Qiu, M. M. Turnbull, A. A. Podlesnyak, **Y. W**u et al, Evidence for pressure induced unconventional quantum criticality in the coupled spin ladder antiferromagnet $C_9H_{18}N_2CuBr_4$, Nature Comm., 2022, 13(3073)
23. M-E. Donnelly, **Y. Wu**, E. Kroll, J. J. Molaison, M. Frontzek and B. Haberl, High pressure neutron diffraction on WAND2 with a Paris-Edinburgh press, High Pressure Research, 2022, 42(213)
24. J.T. Wu, J.S. Li, Z. Zhang, C.L. Liu, Y. H. Gao, E.X. Feng, ..., **Y. Wu**, et al, Magnetic field effects on the quantum spin liquid behaviors of $NaYbS_2$, Quantum Frontiers, 2022, 1(22)
25. Y. Wan, J. L. Jiao, G. T. Lin, **Y. Wu** et al, The Orbital Effect on the Anomalous Magnetism and Evolution in $La_xY_{1-x}VO_3$ ($0 \leq x \leq 0.2$) Single Crystals, Journal of Alloys and Compounds, 2023, 932(167526)
26. C. Dhital, R. L. Dally, R. Ruvalcaba, R. Gonzalez-Hernandez, J. Guerrero-Sanchez, H. B. Cao, Q. Zhang, W. Tian, **Y. Wu** et al, Multi-k magnetic structure and large anomalous Hall effect in candidate magnetic Weyl semimetal NdAlGe, Phys.Rev. B, 2023, 107(224414)
27. Y. M. Xu, **Y. Wu**, H.B. Cao, Sh. Guo. J.Q. Yan, Single crystal growth and thermoelectric properties of Nowotny chimney-ladder compound Fe_2Ge_3, Phys.Rev. M, 2023, 7(125404).
28. Y. M. Gu, Z.U. Kao, Y.Q. Hao, **Y. Wu** et al., Non-coplanar magnetic order in the breathing kagome lattice compound $Pb(OF)Cu_3(SeO_3)_2(NO_3)$, Phys.Rev. B, 2024, 109(024402)
29. Han, Tianxiong, Pakhira, Santanu, Sangeetha, N. S., Riberolles, S. X. M., Heitmann, T. W., **Y. Wu**, Johnston, D. C., McQueeney, R. J. and Ueland, B. G., Europium c-axis ferromagnetism in $Eu(Co_{1-x}Ni_x)_{2-y}As_2$: A single-crystal neutron diffraction study, Phys.Rev.B, 2024, 109(174428)
30. J. Wu, Y. Lin, M. Shu, Y. Liu, Y. Ma, G. Lin, **Y. Wu** et al., uncovering the phonon spectra and lattice dynamics of plastically deformable InSe van der Waals crystals, Nat. Comm., 2024,15(6248)
31. R. R. Ullah, J.S. Harvey, H. Jin, **Y. Wu**, H.B. Cao, J.R. Badger, P. Klavins, and V. Taufour, Avoided Quantum Tricritical Point and Emergence of a Canted Magnetic Phase in $LaCr1_xFe_xSb_3$, Phys. Rev. Lett. 2024, 133(096701) – **editorial suggestion.**
32. Brassington; Q. Ma; G. Sala; A. I. Kolesnikov; K. M. Taddei; **Y. Wu**; E. S. Choi; H. Wang; W. Xie; J. Ma et al., Magnetic properties of the quasi-XY Shastry-Sutherland magnet Er2Be2SiO7, Phys. Rev. Materials, 2024, 8(094001)

33. Xiao Hu, **Yan Wu**, Matthias D. Frontzek, Zhixiang Hu, Cedomir Petrovic, John M. Tranquada, Igor A. Zaliznyak, Spin waves in Dirac semimetal Ca0.6Sr0.4MnSb2 investigated with neutrons by the diffraction method, Phys. Rev. Lett., 2025, 134, 116504.
34. Yu Li, Jared Coles, Xin Gui, Hyowon Park, **Yan Wu**, Xinglong Chen, Jing-han Chen, Xiaoping Wang, Huibo Cao, Shane Stadler, Omar Chmaissem, David P. Young, Stephan Rosenkranz, John F. DiTusa, Structural and magnetic properties of CoTeMoO6, Phys. Rev. B, 2025, 111,104434, **editors' suggestion**.
35. Blake S. Dastrup, Zhuquan Zhang, Peter R. Miedaner, Yu-Che Chien, Young Sun, **Yan Wu**, Huibo Cao, Edoardo Baldini, and Keith A. Nelson, Electromagnon signatures of a metastable multiferroic state, Phys. Rev. Lett., 2025, 134, 086706