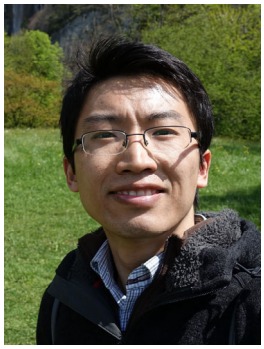
THE CHINESE UNIVERSITY OF HONG KONG

Department of Physics

COLLOQUIUM

Beyond Spiral Spin-Liquids: Novel Spin Correlations Probed By Neutron and X-Ray Scattering

by



Dr. Shang GAO (高尚博士)
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Date: January 4, 2022 (Tuesday)
Time: 10:00 - 11:00 a.m.
Join ZOOM Meeting: https://bit.ly/3FHgzJQ

ALL INTERESTED ARE WELCOME
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Abstract

As two novel spin correlations in the strongly correlated electronic systems, magnetic skyrmions and spin liquids have received enormous attentions for their own merits. The former sees the introduction of topology into real-space magnetic orders and gives birth to a variety of topological spintronic devices [1,2], while the latter overcomes conventional magnetic orders through quantum fluctuations and/or geometrical frustrations [3,4], and has been the pursuit of generations of physicists. In this presentation, we will see how these two seemingly unrelated correlated states come together in a spiral spin-liquid, where the spins are fluctuating collectively as spirals [5]. Using the scattering techniques, we confirm the existence of a spiral spin-liquid state in the diamond-lattice compound $MnSc_2S_4$ [6]. At lower temperatures where $MnSc_2S_4$ enters a long-range ordered spiral state, the application of a magnetic field is found to re-mix the spiral orders, leading to the emergence of a fractional antiferromagnetic skyrmion lattice [7]. Very recently, we reveal that a spiral spin-liquid state can also be stabilized in the van der Waals material $FeCl_3$ [8], which represents a crucial step in the quest for quantum spin liquids and topological spin textures on the honeycomb lattice.

[1] *M. Hirschberger et al. Nat. Commun. 10, 5831 (2019)* [2] *N. D. Khanh et al. Nat. Nanotech. 15, 444 (2020)* [3] *S. Gao et al. PRL 120, 137201 (2018)* [4] *S. Gao et al. PRB 102, 024424 (2020)* [5] *D. Bergman et al. Nat. Phys. 3, 487 (2007)* [6] *S. Gao et al. Nat. Phys. 13, 157 (2017)* [7] *S. Gao et al. Nature 586, 37 (2020)* [8] *S. Gao et al. arXiv2112.11327 (2021)*

Biography

Shang Gao received his doctoral degree in physics from University of Geneva in Switzerland in 2017. After that, he continued his research on frustrated magnetism at RIKEN (Institute for Physical and Chemical Research) in Japan (2018-2020) and the Oak Ridge National Laboratory in USA (2020-now). His research concentrates on using neutron and x-ray scattering to study novel spin correlations in solids with potential applications for the next-generation electronic devices. He received the Young Scientist Award of the Swiss Neutron Scattering Society in 2018 for his works on frustrated magnets.

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