

RICE QUANTUM GROUP MEETING SEMINAR SERIES



Date: July 29, 2022, Friday

Time: 3PM - 4PM

Venue: SST 300

Research Group: Prof. Pengcheng Dai's Group

Presenter: [Dr. Chunruo Duan](#)

Title: [Resonance from antiferromagnetic spin fluctuations for spin-triplet superconductor candidate UTe₂](#)

Abstract: Superconductivity originates from the formation of bound (Cooper) pairs of electrons that can move through the lattice without resistance below the superconducting transition temperature T_c . Electron Cooper pairs in most superconductors form antiparallel spin singlets with total spin $S = 0$, although they can also form parallel spin-triplet Cooper pairs with $S = 1$ and an odd parity wavefunction. Spin-triplet pairing is important because it can host topological states and Majorana fermions relevant for quantum computation. Because spin-triplet pairing is usually mediated by ferromagnetic (FM) spin fluctuations, uranium-based materials near an FM instability are considered to be ideal candidates for realizing spin-triplet superconductivity. Indeed, UTe₂, which has a $T_c \approx 1.6$ K, has been identified as a candidate for a chiral spin-triplet topological superconductor near an FM instability, although it also has antiferromagnetic (AF) spin fluctuations. Here we use inelastic neutron scattering (INS) to show that superconductivity in UTe₂ is coupled to a sharp magnetic excitation, termed resonance, at the Brillouin zone boundary near AF order. Because the resonance has only been found in spin-singlet unconventional superconductors near an AF instability, its observation in UTe₂ suggests that AF spin fluctuations may also induce spin-triplet pairing or that electron pairing in UTe₂ has a spin-singlet component.

Short Bio: Chunruo Duan graduated with B.S. in Physics from Peking University in 2013. He got his PhD in Physics from University of Virginia in 2019 with my neutron scattering work on Fe-based SC $KFe_{2-x}Se_2$, multiferroics $LuMnO_3$, and Weyl semimetal $MoTe_2$. Now working as postdoc with professor Pengcheng Dai at Rice University on the spin-triplet SC candidate UTe₂ since 2019.

Note: Snacks and Coffee will be served during the event.