复旦大学物理系 Colloquium

Time: 14:00, Tuesday, 2023.11.28

Location: C108, Jiangwan Physics Building

Symmetry and Correlation Aspects of Quantum Dynamics

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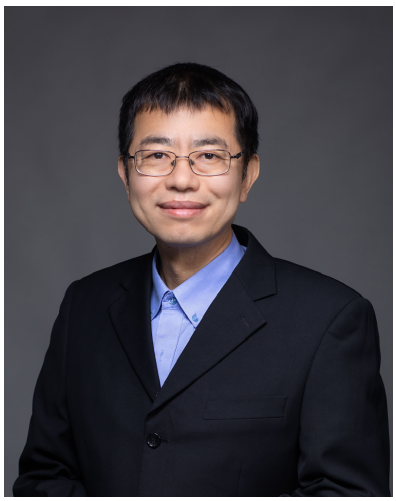
Abstract: Symmetry and correlation are two fundamental aspects of condensed matter studies. A solid-state textbook typically starts with crystals – static periodical structures in space. We provide a symmetry framework dubbed "dynamic crystal" for studying a variety of dynamic systems (e.g., laser-driven solid-state lattices, dynamic photonic crystals, and optical lattices, etc). Dynamic crystal extends to systems with neither spatial nor temporal periodicities but exhibiting inter-twined space-time symmetries. We constructed a new mathematic group structure "space-time group", a dynamic counterpart of space group, to classify space-time crystal. It contains new symmetry operations of "time-screw rotation", "time-glide reflection", and "time-rotary-reflection", which are dynamic generalizations of nonsymmorphic symmetries. Classifications on the 1+1 D and 2+1D dynamic crystals (groups) are completed, for which we have found 13 and 275 space-time groups, respectively. We also studied the real frequency responses at high energies in strongly correlated systems, which is a hardcore problem of condensed matter phys-ics. The dominant role of the exotic Bethe string states in quantum spin dynamics is identified when spin chains are close to the field-tuned criticality. These states have been observed for the first time in the electron-spin-resonance spectroscopy measurement on $SrCo_2V_2O_8$, and we identified their appearance as a series of characteristic spectra lines.



Biography: Congjun Wu received his Ph.D. in physics from Stanford University in 2005 and did his post-doctoral research at the Kavli Institute for Theoretical Physics, University of California, Santa Barbara, from 2005 to 2007. He became an assistant professor in the Department of Physics at the University of California, San Diego in 2007, an associate professor in 2011, and a professor in 2017. In 2021, he became a Chair Professor at School of Science, Westlake University. He was selected as a New Cornerstone Investigator in 2023, elected to a Fellow of American Phys-ical Society in 2018, and awarded Sloan Research fellowship in 2008. His research interests are exploring new states of matter and reveling their organizing principles, including quantum magnetism, superconductivity, topological states, mathematical physics, and the numerical method of quantum Monte Carlo simulations.