



Thursday, 13th June 2024, 17.15 h
Lecture Hall III, Department of Physics, Garching

Emergent states of interacting electrons in triangular-lattice organics: quantum spin liquid, charge glass, and unconventional superconductivity

Prof. Dr. Kazushi Kanoda

Department of Applied Physics, the University of Tokyo,
Hongo 7-3-1, Bunkyo-ku, Tokyo 113-8656, Japan

Abstract:

Coulomb interactions among electrons have huge impacts on their behavior through competition of charge localization/delocalization and spin order/disorder. Layered organic compounds host flexible lattice geometries and appreciable Coulomb interactions, both of which are varied by pressure or chemical substitution to display diverse emergent phenomena like a showcase of correlation physics. In this colloquium, I review a variety of electron correlation-derived phenomena that show up on the molecular triangular lattices, which exert geometrical frustration on the spins and charges of interacting electrons. These include quantum-critical Mott metal-insulator transition [1], quantum spin liquid [2], BEC-like superconductivity in a doped spin liquid [3], charge glass [4], and massless Dirac electrons with dynamic mass generation [5]. Some of these phenomena have links to soft-matter physics and particle physics beyond the conventional discipline of solid-state physics.

- [1] F. Kagawa *et al.*, *Nature* **436**, 03806 (2005); T. Furukawa *et al.*, *Nat. Phys.* **11**, 221 (2015).
- [2] Y. Shimizu *et al.*, *Phys. Rev. Lett.* **91**, 107001 (2003); Y. Zhou *et al.*, *Rev. Mod. Phys.* **89**, 025003 (2017).
- [3] Y. Suzuki *et al.*, *Phys. Rev. X* **12**, 011016 (2022); H. Oike *et al.*, *J. Phys. Soc. Jpn.* **93**, 042001 (2024).
- [4] F. Kagawa *et al.*, *Nat. Phys.* **9**, 419 (2013); T. Sato *et al.*, *Science* **357**, 1378 (2017); H. Murase *et al.*, *Nat. Commun.* **14**, 6011 (2023); H. Murase *et al.*, arXiv:2205.10795.
- [5] M. Hirata *et al.*, *Nat. Commun.* **7**, 12666 (2016); *Science* **358**, 1403 (2017); *Rep. Prog. Phys.* **84**, 036502 (2021).

There will be coffee, tea, and cookies in front of the lecture hall at 17.00 h