universität innsbruck

Department of Theoretical Physics

Theory Colloquium

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"Quantum Materials and Frustrated Magnetism"

Abstract

Quantum materials are physical systems in which the interactions between electrons and ions lead to cooperative behaviors that are difficult to anticipate from the constituent particles' individual properties. Due to the combinatorial richness of the periodic table, these materials present a wide range of exotic phases, some with promising technological applications. Key ingredients in these systems are strong electronic correlations and the macroscopic manifestations of the unusual quantum behavior of the electrons.

In this colloquium, I will discuss an exciting class of quantum materials, the so-called frustrated Mott insulators. In these systems, the electrons' charge degree of freedom is frozen due to the strong Coulomb repulsion between them, but their spin degree of freedom remains active. However, magnetic frustration might suppress long-ranged magnetic order at low temperatures, opening the door for novel phases to appear. As an emblematic example, I will discuss Kitaev's spin liquid and its possible experimental manifestations in transition metal oxides composed of heavy ions, taking into account relevant perturbations likely to be present in real materials.

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SR 1 | ICT building