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Beyond-Hermitian Quantum Physics

Wednesday, September 10, 2025 1:00 PM (1 hour)

Isolated quantum systems are described by Hermitian Hamiltonians. However, when they are open to surrounding environments or subject to quantum measurements, one should go beyond the Hermitian framework. Beyond-Hermitian physics has recently attracted a great deal of attention due to remarkable advances in experimental techniques and theoretical methods in AMO, condensed matter and nonequilibrium statistical physics. Complete knowledge about quantum jumps allows a description of quantum dynamics at the single-trajectory level. A subclass thereof without quantum jumps can be described by a non-Hermitian Hamiltonian. Here, symmetry, topology and many-body effects are fundamentally altered from Hermitian physics. In this talk, I will discuss what new potentials can be liberated once we go beyond the Hermitian framework. I will illustrate them in the context of the quantum speed limit, intermediate-state engineering, continuous quantum phase transitions and non-Hermitian topological phases. I will also discuss applications of beyond-Hermitian quantum physics to statistical physics and condensed matter physics, such as Yang-Lee zeros, nonunitary critical phenomena and non-Hermitian BCS superconductivity.

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