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MAX PLANCK LECTURE ON NON-EQUILIBRIUM QUANTUM PHENOMENA

Moiré superlattices: a new Hubbard model simulator?

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The Hubbard model, first formulated by physicist John Hubbard in the 1960s, is a simple theoretical model of interacting quantum particles in a lattice. The model is thought to capture the essential physics of high-temperature superconductors, magnetic insulators, and other complex emergent quantum many-body ground states. Although the Hubbard model is greatly simplified as a representation of most real materials, it has nevertheless proved difficult to solve accurately except in the one-dimensional case.
Physical realization of the Hubbard model in two or three dimensions, which can act as quantum simulators, therefore have a vital role to play in solving the strong-correlation puzzle. In this talk, I will discuss a potential experimental realization of the two-dimensional triangular lattice Hubbard model in angle-aligned heterobilayers of semiconducting transition metal dichalcogenides, which form moiré superlattices because of the difference in lattice constant between the two semiconductors.

Hosts:
Andrea Cavalleri,
Angel Rubio

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