

Chez Pierre

Presents ...

Monday, March 11, 2019

12:00pm Noon

MIT Room 4-331



Chez Pierre Seminar

Mikito Koshino – Osaka University

“Physics of twisted bilayer graphenes and van der Waals heterostructures”

When 2D materials having different periodicities are overlaid with each other, the interference pattern of the lattice mismatch often leads to unusual electronic properties.

In this talk, I will introduce some of our recent works on such incommensurate van der Waals bilayer systems showing interesting physics. First I will discuss twisted bilayer graphene, which exhibits dramatic angle-dependent phenomena such as the flat band formation and emergent superconductivity. Here I introduce a theoretical framework to reduce the complex systems with huge number of atoms into a simple effective lattice model by constructing the localized Wannier orbitals. Then I argue about the 30-degree rotated twisted bilayer graphene, where we describe its 12-fold quasicrystalline nature with nearly flat bands in terms of the quasi-band picture. Lastly, I discuss the proximity spin-orbit coupling in graphene on transition-metal dichalcogenides monolayer stacked with arbitrary twist angles. I will show that the relative rotation greatly enhances the spin splitting of graphene's electron, typically by a few to ten times compared to the non-rotated geometry.