Condensed Matter Physics Seminar Series

Tuning the itineracy and topology of correlated states in semiconductor moiré lattices

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When two materials with similar lattice constants are stacked with a small interlayer twist, the resulting moiré superlattice can generate flat electronic bands which host a variety of interaction-driven phases. In this talk, I will describe single-electron transistor microscopy of moiré systems composed from semiconducting transition metal dichalcogenides. By modifying the constituent materials, twist angle, and applied electromagnetic fields, we demonstrate control over correlated ground states and excitations, and identify the spin, valley, and real-space character of these states. Our technique enables study in the limit of long moiré wavelength, where we observe intricate phase diagrams of competing electron solids and topological fluids. I will discuss how these findings reflect the interplay between electronic interactions and the nature of the underlying moiré bands.

Ben Feldman is an Assistant Professor at Stanford University. His research interests include study of emergent correlated and topological phases in reduced dimensional systems as well as the development of nanoscale scanning probe techniques. His work has been recognized with an Alfred P. Sloan Fellowship and a National Science Foundation CAREER award. Previously, he was a Dicke postdoctoral fellow at Princeton University, where he used scanning tunneling microscopy in the group of Ali Yazdani to study nematic phases in bismuth. He received his PhD from Harvard University working in the lab of Amir Yacoby, where he investigated broken-symmetry states in monolayer and bilayer graphene.

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4-330 PAB