Thermodynamic sensing of correlated phases in twisted transition metal dichalcogenides
Ben Feldman, Stanford University

The twist angle between adjacent two-dimensional layers provides a powerful tuning knob to tailor electronic properties. When two materials have similar lattice constants and low interlayer twist, a moiré superlattice develops and can lead to flat electronic bands which host a variety of interaction-driven phases. In this talk, I will describe electronic compressibility measurements with a scanning single-electron transistor that reveal novel ground states and excitations in twisted semiconducting transition metal dichalcogenides. In twisted double bilayer WSe$_2$, probing the energy gaps of the correlated insulating states as a function of magnetic and electric field allows us to determine their spin and valley character as well as identify itinerant spin polaron excitations. I will also present recent measurements of a device with a long moiré wavelength which reveal an intricate phase diagram of correlated states as a function of carrier density and magnetic field. I will discuss how these findings reflect the interplay between electronic interactions and the nature of the underlying moiré bands.