# CONDENSED MATTER SEMINAR


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# Topologically protected states in van der Waals heterostructures


**The ability to create arbitrary stacking configurations of layered two-dimensional materials has opened the way to the creation of designer band structures. Graphene on hexagonal boron nitride (hBN) is the simplest example of such a van der Waals heterostructure where the electronic properties of the composite material can be different from either individual material. These van der Waals heterostructures can be formed using a wide variety of layered materials including transition metal dichalcogenides, graphene and topological insulators. This talk will mostly focus on creating topologically protected states in graphene devices by breaking inversion symmetry. The lattice mismatch and twist angle between layers in the heterostructure produces a moiré pattern which affects its electronic properties. For graphene on hBN, the moiré pattern creates a new set of superlattice Dirac points. In addition, applying pressure leads to changes in the preferred stacking configuration and favors a commensurate stacking with topological bands. In twisted bilayer graphene, the combination of a long-wavelength moiré pattern and an electric field leads to the formation of an array of topologically protected states on the domain walls of the moiré pattern. In this talk, I will discuss our fabrication of these heterostructures and measurements using scanning probe microscopy.**


**Tuesday, September 19**
**4:00 pm**
**Room 334 JFB**