Talk Title /Abstract

"Manipulating spins and valleys in monolayer graphene quantum: even denominator fractional quantum Hall states and Skyrme solids"

Monolayer graphene is a versatile and increasingly pristine platform for studying the physics of correlated electrons in Landau levels.
I will present recent work from my group probing electrical and spin transport in ultra-clean monolayer graphene devices.
In the first part of the talk, I will describe how inter-sublattice potentials can be used to engineer a phase transition between valley polarized and antiferromagnetic insulators at charge neutrality. This transition is accompanied by the observation of a new, even denominator fractional quantum Hall state we ascribe to the formation of a "331" type state encoding correlations between electrons on the two carbon sublattice. In the second part, I will describe an experiment to directly probe spin order using nonlocal injection and detection of spin waves. By measuring the 'spin-wave conductivity' for Ising-type spin waves as they propagate through an arbitrarily doped sample bulk, we directly access whether the bulk is spin-conserving. Our measurements reveal spin electrically insulating, spin non-conserving phases near filling factor one, which we ascribe to Skyrme solids, as well as unexpected spin relaxation in a variety of fractional quantum Hall phases.