Talk title: "Magnetism in the Ultrathin Limit"

Abstract: Recently, the family of layered 2D crystalline materials has expanded to include the chromium trihalides (CrX_3), a class of insulating magnets. We first employ the magneto-optical Kerr effect to probe the magnetic ordering of CrI_3 down to the monolayer limit. Beyond optical techniques, we present a new approach to probe the layer-dependent magnetic ordering of these materials using electrical transport. We fabricate spin-filter magnetic tunnel junctions from two graphite contacts separated by a few-layer crystal of CrX_3 that serves as the insulating tunnel barrier. By measuring the differential conductance across the junction, we can electrically detect the magnetic ordering as a function of applied magnetic field and bias voltage. These results reveal interesting magnetic properties in ultrathin CrX_3 differing from the bulk crystals. This new concept of magnetic tunnel junctions constructed by stacking 2D materials paves the way for discovering novel magnetic phenomena in the many unexplored layered magnetic insulators, as well as integration of these junctions in the spintronics community due generation of highly spin-polarized currents and large magnetoresistances.

Bio: Dahlia Klein is a physics PhD candidate at MIT studying two-dimensional magnets in the group of Professor Pablo Jarillo-Herrero. She received her undergraduate degree in physics, chemistry, and biochemistry and a master's degree in chemistry from the University of Pennsylvania in 2015. She is a recipient of the NSF Graduate Research Fellowship and the Whiteman Fellowship from MIT Physics.