CONDENSED MATTER SEMINAR

CORRELATED CHERN INSULATOR IN TWO-DIMENSIONAL MATERIALS

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A Chern insulator is a special type of insulator with a robust chiral edge model as a consequence of its nontrivial topology. It is a cousin of the more familiar integer quantum Hall effect realized in two-dimensional electron gas under a strong magnetic field. Chern insulators have many important applications ranging from quantum metrology and topological quantum computation. However, experimental realization of the Chern insulator remains a challenge, and only a few materials are known to host the Chern insulating state. In this talk, I will present a new generic routine to achieve the Chern insulators by placing a massive Dirac fermion in a periodic potential. The band folding due to the periodic potential causes hybridization of the Dirac spectrum and stabilizes a Chern band. I will discuss the applications of our theory to two-dimensional transition metal dichalcogenide (TMD) heterostructures. Finally, I will present our theoretical prediction of the fractional Chern insulating state in twisted MoTe2 homobilayer moiré structure in the limit of strong Coulomb interaction, and the subsequent experimental realization. If time permits, I will discuss our recent work on designing topological flat Chern bands in 2D materials using periodic strain.

THURSDAY DECEMBER, 14TH || IN THE READING ROOM
2PM-3PM

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