Moiré and beyond: van der Waals materials as laboratories for many-body physics

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Partly inspired by graphene, materials scientists have identified a remarkable library of materials consisting of few atom thick atomic layers with very weak (typically van der Waals bonded) interlayer coupling, permitting exfoliation down to the monolayer limit and twisting and stacking, creating a range of materials exhibiting a wide range of physics with tunable carrier concentration and band and interaction parameters, and enabling studies of fundamental correlated electron physics and its connection to topology, while the small energy scales enable access to "matter under extreme conditions" of temperature, magnetic field, pressure, etc. This talk will review the basic physics and chemistry that makes the materials possible and then discuss applications ranging from two dimensional heavy fermion physics (CeSiI and MoTe2/WSe2) and novel superconductivity to topological correlated states as well and the correlation-driven metal-insulator transition and its extension to high temperatures and fields.