Electronic control of magnetism in magnetic Chern insulators

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A variety of intrinsic magnetic Chern insulators have been discovered in moiré superlattice systems, including in both graphene and transition metal dichalcogenide heterostructures. Unlike in previously discovered magnetic Chern insulators, fabricated by adding magnetic dopants to thin films of topological insulators, these systems have magnetism supported entirely by electronic interactions intrinsic to the topological bands. This fact helps limit disorder in these systems by removing the need for magnetic dopants, but it also intimately ties the magnetic order to electronic properties of the system, and thus facilitates electronic control of magnetism. I will discuss electronic switching of magnetization in Chern insulators through two different mechanisms: topological contributions to magnetization and intrinsic spin-orbit torques. I will explain how these mechanisms work in practice in twisted monolayer/bilayer graphene and in AB-WSe2/MoTe2 using transport measurements and magnetic imaging performed with our nanoSQUID microscope.