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Topological Antiferromagnetic Spin-orbitronics

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Antiferromagnetic spintronics considers the active manipulation of the antiferromagnetic order parameter in spin-based devices. An additional concept that has emerged is that antiferromagnets provide a unifying platform for realizing synergies among three prominent fields of contemporary condensed matter physics: Dirac quasiparticles and topological phases. Here spintronic devices made of antiferromagnets with their unique symmetries will allow us to control the emergence and to study the properties of Dirac/Weyl fermion topological phases that are otherwise principally immune against external stimuli. In return, the resulting topological magneto-transport phenomena open the prospect of new, highly efficient means for operating the antiferromagnetic memory-logic devices. We discuss how these topological phases emerge and how their robustness depend on the relative orientation of the Neel order parameter that can be manipulated by Neel spin-orbit torques. If time allows, we will further discuss the generation and excitation of skyrmionic textures in simple geometries.

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