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Dynamic Phases of Skyrmions in Chiral Magnets Driven over Random and Periodic Pinning Arrays CHARLES REICHHARDT, SHIZENG LIN, CRISTIAN BATISTA, CYNTHIA OLSON REICHHARDT, DIPANJAN RAY, Los Alamos National Laboratory — Skyrmions in chiral magnets have been generating tremendous excitement since their recent discovery, both for the intrinsic science and for possible applications of skyrmions. Skyrmions can be driven with an applied spin-polarized current and appear to have many similarities to vortices in type-II superconductors. Here we numerically simulate skyrmions driven over random and periodic arrays of defects or pinning using a combination of particle-based models and continuum models. We find that for weak pinning, the skyrmions depin elastically, while for strong pinning, the skyrmions depin plastically. In both cases, there are distinct features in the resulting transport curves and we show that in the presence of pinning the Hall angle continuously changes as a function of drive. In samples where plastic depinning occurs, at high drives there is a transition to a dynamically ordered state which we compare to the dynamical reordering observed for driven vortices in type-II superconductors. With periodic pinning, the Hall angle changes in discrete steps for increasing drive as the skyrmion motion locks to different symmetry directions of the underlying pinning array.

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