

Abstract Submitted
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Unified theory of Kitaev-based spiral magnetism in the harmonic-honeycomb iridates α, β, γ -Li₂IrO₃ ITAMAR KIMCHI, University of California, Berkeley, RADU COLDEA, University of Oxford, JAMES ANALYTIS, ASHVIN VISHWANATH, University of California, Berkeley — We review the recent theoretical developments triggered by the experimental discovery of remarkable 3D polymorphs of Li₂IrO₃, where J=1/2 moments form two new 3D lattices which generalize the 2D honeycomb lattice. Measurements on both compounds found that they magnetically order into remarkably similar spiral phases, exhibiting a pattern of non-coplanarity and counter-rotation. We examine magnetic Hamiltonians for this family and show how a trio of nearest-neighbor exchanges, which arise from strong spin-orbit coupling, are sufficient for reproducing this spiral order on both lattices. We analyze the origin of this phenomenon by presenting a simple 1D model, transparently demonstrating how the counter-rotating spiral is stabilized by strong Kitaev exchange. We also discuss proximate quantum spin liquid phases which arise from spin-orbit coupling.

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