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Time-reversal symmetry breaking Pomeranchuk instabilities in hexagonal systems: emergence of the β phase[1] AKASH MAHARAJ, RONNY THOMALE, SRINIVAS RAGHU, Stanford University — We show how nematic order that breaks time reversal symmetry can be stabilized by longer-range repulsive interactions in a variety of hexagonal systems. For the triangular, honeycomb and Kagome lattices at the van Hove filling, we show how spinful fermions can enter the so called β phase, in analogy to the B phase in superfluid ^{3}He. This Pomeranchuk instability in the spin channel involves a splitting of the Fermi surface into two parts, with the spin direction winding in momentum space. This is possible for angular momentum $l = 2$ nematics, since these form a doubly degenerate irreducible representation of the C_{6v} point group symmetry of the lattices in question. We demonstrate how our results are exact in the weak coupling limit, although separate numerical studies have shown that these phases can persist at stronger coupling.

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