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Vestigial nematicity from spin and/or charge order in the cuprates LAIMEI NIE, AKASH MAHARAJ, Stanford University, EDUARDO FRADKIN, University of Illinois at Urbana-Champaign, STEVEN KIVELSON, Stanford University — Nematic order (C4 rotation symmetry breaking) has manifested itself in a variety of materials in the cuprates family, yet its origin remains debatable, with possible links to lattice, charge, and spin degrees of freedom across different doping regimes. We propose an effective field theory of a layered system with incommensurate, intertwined spin- and charge-density wave (SDW and CDW) orders, each of which consists of two components related by C4 rotations. Using a variational free energy approach, we study the growth of the associated nematicity from partially melting those density waves by either increasing temperature or adding quenched disorder. Under the assumption that the zero-disorder, zero-interaction SDW transition temperature is higher than CDW at small doping (and vice versa for large doping), we find that for the general case with finite disorder and interactions there is a universal nematic transition across the entire doping range, accompanied by SDW and CDW transitions (or strong fluctuations at large enough disorder) at lower temperatures. We also discuss the issues concerning the difference between La-based materials and the other hole-doped cuprates.

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