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Nematic order and its implications to the iron pnictides: pseudogap behavior, orbital order, and magneto-structural phase diagram R.M. FERNANDES, Columbia University and Los Alamos National Lab, A.V. CHUBUKOV, University of Wisconsin-Madison, J. KNOLLE, Max-Planck-Institut fur Physik komplexer Systeme, Dresden, I. EREMIN, Institut fur Theoretische Physik III, Ruhr-Universitat Bochum, J. SCHMALIAN, Institut fur Theorie der Kondensierten Materie, Karlsruher Institut fur Technologie — We present an electronic model for the emergence of nematic order in the iron pnictides. In particular, we show that the degeneracy of the magnetic ground state, allied to spin fluctuations, gives rise to a state that spontaneously breaks the tetragonal symmetry of the system, but preserves its spin-rotational symmetry. The nematic state displays several anisotropic properties, inducing a weak orbital polarization as well as a small orthorhombic distortion of the lattice. Nematic order also enhances the magnetic fluctuations and facilitates the magnetic phase transition, leading to a joint magnetic and meta-nematic transition, as well as to a pseudogap behavior due to magnetic precursors. Finally, we discuss the characters of the magnetic and structural phase transitions, showing that electron doping tends to split both transitions, whereas pressure and lattice softness tend to make them simultaneous. Our model provides a simple framework to understand the interplay between the different degrees of freedom present in the iron pnictides, shedding light on the primary role played by magnetism in these materials.

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