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Competing phases in the iron pnictides[1]

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In this work, we present a theoretical model that consistently describes the interplay between the magnetic, elastic, and superconducting degrees of freedom of the iron pnictides, comparing our results to several experimental observations. First, we show that the outcome of the competition between the antiferromagnetic (AFM) and the superconducting (SC) order depends on the symmetry of the pairing state. In particular, we demonstrate that a conventional phonon-mediated superconducting state cannot coexist microscopically with the itinerant magnetic phase [1,2]. We also show that the magneto-elastic coupling in these materials is mediated by Ising-nematic degrees of freedom, which emerge from the degeneracy of the magnetic ground state. As a result, in the tetragonal phase, nematic fluctuations lead to the *softening* of the lattice in the normal state but to its *hardening* in the SC state, due to the competition between SC and AFM [3]. Accordingly, in the orthorhombic phase, nematic order is suppressed below the SC transition temperature, causing the suppression of the orthorhombic order parameter [4].

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