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Do theoretical calculations really predict nodes in Fe-based superconductors? IGOR MAZIN, Naval Research Laboratory — It is well established that calculations based on the LDA band structure and the Hubbard model, with the parameters $U \sim 1.3 - 1.6$ eV, and $J \sim 0.2 - 0.3J$ (a "UJ" model), yield strongly anisotropic, and sometimes nodal gaps. The physical origin of this effect is well understood: the two leading terms in the model are $\sum U n_{i\uparrow} n_{i\downarrow}$ and $\sum' U n_i n_j$. The former ensures that the coupling to spin fluctuations proceeds only through the like orbitals, and the latter, not being renormalized by the standard Tolmachev-Morel-Anderson logarithm, tends to equalize the positive and the negative order parameters. Both these features are suspect on a general physics basis: the leading magnetic interaction in itinerant systems is the Hund-rule coupling, which couples every orbital with all the others, and the pnictides, with the order parameter less than 20 meV, should have nearly as strong renormalization of the Coulomb pseudopotential as the conventional superconductors. I will argue that, instead of the UJ model, in pnictides one should use the "I" model, derived from the density functional theory (which is supposed to describe the static susceptibility on the mean field level very accurately). The "I" here is simply the Stoner factor, the second variation of the LSDA magnetic energy. Unfortunately, this approach is very unlikely to produce gap nodes as easily as the UJ model, indicating that one has to look elsewhere for the nodes origin.

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