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Pairing symmetry and Antiferromagnetic Exchange Coupling in Fe-Based Superconductors[1]

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I discuss the existence of strikingly identical paradigms applicable to both cuprates and iron-based superconductors in understanding magnetism, superconductivity and the interplay between the two. The magnetic states and transitions in iron- based superconductors are well described by a $J_1 - J_2 - J_z$ magnetic exchange model where J_1, J_2 and J_z are nearest neighbour, next nearest neighbour and inter-layer couplings respectively. Differing from the t-J model for cuprates where d-wave pairing symmetry is favored, the magnetic exchange in the iron based superconductors predicts an unconventional s-wave $cosk_x cosk_y$ pairing. I will show that the predicted pairing symmetry is supported by many experimental results, and also discuss new predictions associated with the pairing symmetry.

References:
[1]: Chen Fang, Hong Yao, Wei-Feng Tai, Jiangping Hu and S. Kivelson "Theory of Electron Nematic Order in LaOFeAs"; Phys. Rev. B 77 224509 (2008).
[2]: Kangjun Seo, A. B. Bernevig and JiangPing Hu, "Pairing Symmetry in a Two-Orbital Exchange Coupling Model of Oxypnictides"; PRL 101, 206404 (2008) ArXiv: 0805.2958.
[3]: Meera M. Parish, Jiangping Hu and B. Andrei Bernevig "Experimental Consequences of the S-wave cos(kx)cos (ky) Superconductivity in the Iron-Pnictides", Phys. Rev. B 78, 144514 (2008) ArXiv:0807.4572.
[4]: Chen Fang, B. Andrei Bernevig, Jiangping Hu,"Theory of Magnetic Order in $Fe_{1+y}Te_{1-x}Se_x$", arXiv:0811.1294 (2008).

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