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Possible suggestions for order parameter phase-sensitive experiments in the superconducting iron pnictides

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The iron pnictide superconductors have undergone intensive study since the original discovery by Kamihara et al early in 2008, with maximum T_c's exceeding 50 K. Despite this, the most basic questions such as pairing symmetry and mechanism have not been definitively settled. For the cuprates, the SQUID loop and tricrystal phase-sensitive experiments were instrumental in finally determining the d-wave gap symmetry; similar experiments were designed and implemented for triplet p-wave superconductivity. However, the main challenge in pnictides is to distinguish between two superconducting states, the sign-changing "$s_{\pm}$" and single-sign "s_{++} states, which belong to the same point symmetry class. This means that while designing a Josephson loop one needs to invent a recipe to filter out different types of carriers at the two different contacts. By definition this is a *quantitative* rather than *qualitative* effect, and involves the relative amplitude of the order parameter, density-of-states and Fermi velocity, and the character of the electronic wavefunctions. Presently proposed methods either attempt to determine an optimal angle (i.e., non-90°) for a SQUID junction, use different barrier characteristics in different directions, or exploit 'sandwich' junctions employing two or more superconductors. In this talk, I discuss several recent proposals for phase-sensitive experiments which could help resolve the pairing symmetry controversy, as well as experimental work in this area.