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Flux penetration in mesoscale samples of multi-component unconventional superconductors DAVID GEORGE FERGUSON, PAUL GOLDBART, University of Illinois at Urbana-Champaign — Multi-component unconventional superconductors bring the possibility of unusual magnetic phenomena. Examples include spontaneous zero-field magnetization, and penetration by magnetic flux not only through one-dimensional vortices but also through two-dimensional domain walls in which superconductivity persists. How flux penetrates, both in and out of equilibrium, depends on the way in which the order parameter distorts—vortex versus domain wall—particularly in view of the fact that flux quantization is required for vortices but not for domain walls that traverse the sample. We study these issues in the setting of mesoscale samples, in which domain walls are more stable and any discreteness of flux penetration should be more readily observable, predicting an unusual variation of the magnetization with the applied magnetic field. The observation of such effects in Sr_2RuO_4, a proposed unconventional superconductor, via techniques such as cantilever torque magnetometry, should shed light on important issues such as the pairing symmetry and the prevalence of domain walls in bulk samples.

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