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Spontaneous Symmetry Breaking in a Ferromagnetic Spinor Condensate

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Spinor condensates are multicomponent quantum fluids with a spin degree of freedom and are predicted to exhibit a variety of phenomena including complex spin textures, highly correlated spin states and domain formation. The talk will present a brief overview of spinor condensates and a recently demonstrated technique of nondestructive imaging of the magnetization of spinors. This technique enables the in situ study of spinor dynamics such as the nucleation and growth of spin textures. I will elaborate on recent observations of spontaneous symmetry breaking in a F=1 Rb spinor condensate as it is quenched past a "polar" to ferromagnetic quantum phase transition. During this process, phase contrast images reveal the spontaneous formation of ferromagnetic domains with a characteristic length scale of 6 microns, much smaller than the size of the condensate. Concurrent with the formation of these domains, we also observe the spontaneous formation of topological defects which we characterize as singly charged spin vortices.