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Magnetic force microscopy studies of vortex states in type II superconductors and ferromagnetic microstructures JEFFREY WRIGHT, UCLA Department of Physics and Astronomy, EVGUENI NAZARETSKI, Los Alamos National Laboratory, P.C. HAMMEL, Ohio State University department of Physics, ROMAN MOVSHOVICH , Los Alamos National Laboratory — A variable temperature, high sensitivity Magnetic Force Microscope (MFM) was used to study vortices in a superconducting niobium thin film, as well as ferromagnetic microstructures, whose magnetization forms a vortex ground state. The highly sensitive interferrometric detection of the cantilever displacement allowed for detailed measurements of the magnetic field profile produced by individual vortices. The MFM's variable temperature ability and superconducting magnet allowed for field cooling of the niobium sample in an external magnetic field either parallel or antiparallel to the orientation of the cantilever magnetic tip. MFM studies of 50 nm thick and 4 μm diameter permalloy microstructiures were performed at room temperature and at 4.2K. At room temperature, the sample's magnetization exhibited the dipole structure while at 4.2 K it showed the evidence for the vortex state. By bringing the MFM tip close to the sample we were able to reverse the orientation of individual vorteces.

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