Title:	Imaging electric and magnetic orders using scanning probe microscopy
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Abstract:	In this thesis, we employ different scanning probe microscopic techniques to probe electric and magnetic orders in different samples. In the first chapter, we try to examine the prin- ciples and components of atomic force microscopy. This involves exploring the hardware components and modes of operation involved in the AFM technique. In the next chapter, we employ Piezoresponse force microscopy to study local ferroelec- tric polarization in rhombohedral p-type GeSe crystal, which is a thermoelectric material. The thermoelectric performance of this sample is induced by ferroelectric instability in the material. Here we show the presence of local ferroelectricity in this material by imaging ferroelectric domains and performing switching spectroscopy PFM. In the third chapter, we try to image magnetic orders in two different materials namely, a Co/Pt/Fe hall bar device and Fe 2 O 3 nanoparticles by performing magnetic force mi- croscopy. The ability of MFM to image these samples at very high resolution have a wide variety of application in storage, logic computing gates, non conventional devices, and dif- ferent biological applications. In the final chapter, we try to image artificial spin ice using magnetic force microscopy. Artificial spin ice consists of complex nanosized arrays of ferromagnetic islands arranged on specific lattice fabricated using lithographic techniques. It has enabled the experimental investigation of a variety of fascinating phenomena such as frustration, disorder, and phase transitions. Here we look at fabrication and imaging of these artificial spin ice material which has enormous future research prospects.
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