Magnetic studies using high angle neutron diffraction at the Bragg Institute

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High angle neutron diffraction (HAND) when carried out on a triple-axis neutron spectrometer allows for the study of magnetism in magnetically ordered thin films. Neutrons are very sensitive to the magnetic moment of the electron and may be used to unambiguously study antiferromagnetism in a material because of the unique magnetic Bragg reflections produced by antiferromagnetic ordering. Magnetically active thin-films as thin as 10nm may be studied using HAND. Given that neutrons probe bulk material well, HAND allows for the characterisation of the entire thin film, providing a good indication of how the entire thin film structure behaves. Thus both the magnetic and structural character of the thin film can be completely determined through magnetic phase boundaries, such as through the Curie or Neel temperatures. In this paper, the triple axis spectrometer at the Bragg Institute is briefly described along with the important and fascinating work done on magnetically ordered thin films, multilayers and heterostructures, such as multilayers and bilayers of $FePt_3$ and many other materials. Pushing the limits of the technique in order to study films as thin as 1nm and less as well as allowing for small(ish) spot scanning will be described.