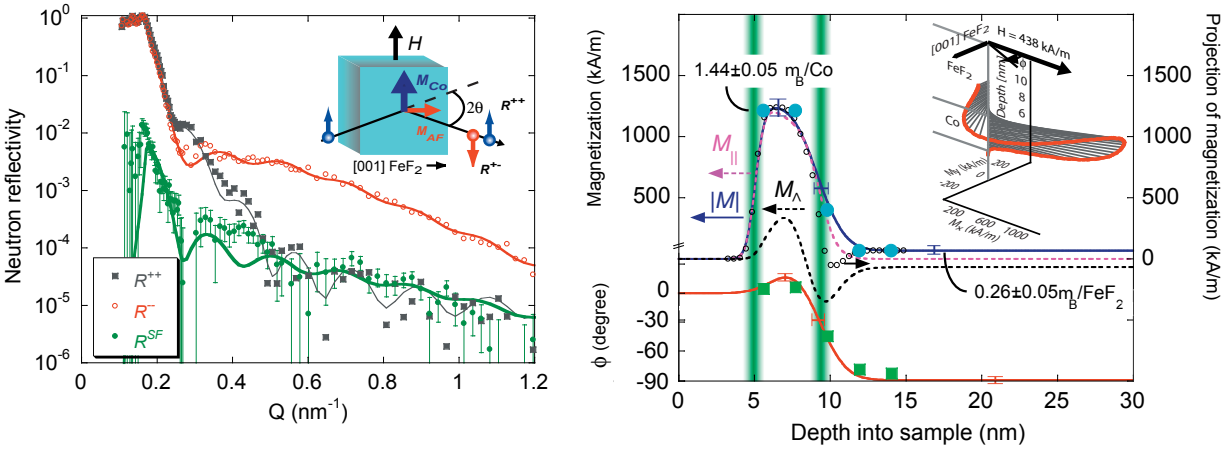
Mike Fitzsimmons
(505) 665-4045
fitz@lanl.gov

Asterix

Development of techniques to correlate driven fluctuations in samples and neutron scattering is essential for understanding a wide range of magnetic and related electron transport problems in the emerging class of complex materials, including, for example, nanostructure-engineered and adaptive materials. A detailed understanding of complex materials requires studies that use neutron beams to characterize the exotic magnetic and atomic structures of these materials under extreme conditions of high magnetic fields, high pressures, and very low temperatures.

A superb reflectometer and diffractometer in its own right, a special strength of the Asterix spectrometer is the ease with which a great variety of experimental requirements can be accommodated. Foremost, is the intense polychromatic neutron beam viewed through a 25 cm^2 neutron guide. Efficient polarization of the neutron beam over the full cross-section, wavelength range and divergence of the neutron guide is achieved using a state-of-the-art polarization cavity. The location of the instrument in the quiescent environment of ER-2, and robust neutron shielding greatly minimize instrumental background. Use of non-magnetic materials in the neutron shielding assure compatibility of the spectrometer with LANSCE's 11-T superconducting magnet, and has enabled the implementation of neutron spin-echo techniques. The 2-m long detector arm is readily configurable for polarization or energy analysis of the scattered neutron beam. Special sample environment capabilities exist, including, for example, the capability to simultaneously expose samples to infrared laser light, magnetic fields, and neutron beams in an "ILL orange" cryostat or 11-T superconducting magnet.



Polarized neutron reflectivity of a 1cm^2 exchange biased sample (left) and the magnetization depth profile (right) showing antiparallel alignment of ferromagnetic/antiferromagnetic magnetization.

Specifications	
Moderator	**Lower-tier coupled liquid-hydrogen moderator**
Beam cross-section **- polarized** **- unpolarized**	 **25 mm to 130 mm** **60 mm by 60 mm**
Beam polarization	**Unpolarized and polarized beams are routinely used. Two polarization analyzers and two spin flippers are available.**
Primary flight path	**Target to sample position ~ 18 m**
Secondary flight path	**Sample to detector position ~ 0.5 to 2.5 m**
Wavelength frames **- with Be filter** **- without Be filter**	 **4 to < 15 Å** **1 to < 11 Å**
Neutron detector (reflectometry)	**One-dimensional PSD on a detector arm with range of motion from -6° to 40°.**
Neutron detector (diffraction)	**Two-dimensional array of PSD tubes that can be placed anywhere inside the Asterix cave. Maximum scattering angle is 100°.**

View of the 11-T Oxford superconducting magnet. To the left is the Asterix one-dimensional position sensitive detector, polarization analyzer and detector arm.