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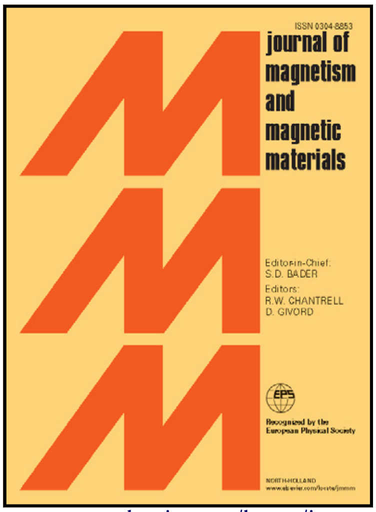

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Magnetism and Magnetic Materials probed with Neutron Scattering

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Abstract
Neutron scattering techniques are becoming increasingly accessible to a broader range of scientific communities, in part due to the onset of next-generation, high-power spallation sources, high-performance, sophisticated instruments and data analysis tools. These technical advances also advantageously impact research into magnetism and magnetic materials, where neutrons play a major role. In this Current Perspective series, the achievements and future prospects of elastic and inelastic neutron scattering, polarized neutron reflectometry, small angle neutron scattering, and neutron imaging, are highlighted as they apply to research into magnetic frustration, superconductivity and magnetism at the nanoscale.

Keywords
Neutron scattering; magnetic frustration; superconductivity; nanostructures; nanocomposites

Introduction
There is no doubt that neutron scattering plays a significant role in determining and consequently understanding the properties and physical phenomena of materials. This impact is illustrated by recent literature and books that give overviews of neutron scattering [1] as applied to studying condensed matter physics [2] with a focus on magnetism and magnetic systems [3]. The impact of neutron scattering in modern science was recognized through the awarding of the 1994 Nobel Prize in Physics to Bertram N. Brockhouse and Clifford G. Shull, specifically for the development of neutron spectroscopy and the neutron diffraction technique, respectively. A major area of research where these techniques have been applied and proven to be of great use is magnetism, a prospect that was recognized early on. In fact, Clifford Shull published *Detection of Antiferromagnetism by Neutron Diffraction* [4] in 1949, only a year after the first publication on neutron diffraction [5]. This work showed that magnetic moments can order antiferromagnetically. It was the first direct experimental evidence for this new state of matter and the first confirmation of the theory developed in the 1930s by Louis Néel [6] who received the Nobel Price in 1970. Shull and Smart published the now well-known, low temperature (80 K) diffraction pattern of MnO, illustrating an additional diffraction peak absent in the pattern taken at room temperature. They argued it was at a position not allowed by the crystal structure and could be indexed to be consistent with a