Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart

Max-Planck-Institute für Festkörper- und Metallforschung

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Dienstag, 29. Januar 2008	17.15 Uhr	Hörsaal V 57.01

Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Prof. Dr. Alejandro Muramatsu, Universität Stuttgart, Telefon: 0711-685-65203

Of magnetic monopoles and artificial photons: emergent particles in spin ice

Prof. Roderich Moessner, University of Oxford

Abstract

Electrically charged particles, such as the electron, are ubiquitous. By contrast, no elementary particles with a net magnetic charge have ever been observed, despit intensive and prolonged searches.

We pursue an alternative strategy, namely that of realising them not as elementary but rather as emergent particles, i.e., as manifestations of the correlations present in a strongly interacting many-body system. We show that magnetic monopoles do emerge in a class of exotic magnets known collectively as spin ice: the dipole moment of the underlying electronic degrees of freedom fractionalises into monopoles! This explains a mysterious phase transition observed experimentally in spin ice in a magnetic field, which is a liquid-gas transition of the magnetic monopoles. These monopoles can also be detected by other means, e.g., in an experiment modelled after the celebrated Stanford magnetic monopole search.

Reference: C. Castelnovo, R. Moessner and S. L. Sondhi, Nature 451, 42 (2008)

(Kolloquiums-Tee gibt es um 16.45 Uhr im Seminarraum des 4. Physikalischen Instituts, NWZ II, 4. Stock, Raum 4.319. Studenten sind herzlich eingeladen.)