RUHR-UNIVERSITÄT BOCHUM
FAKULTÄT FÜR PHYSIK UND ASTRONOMIE

RUB

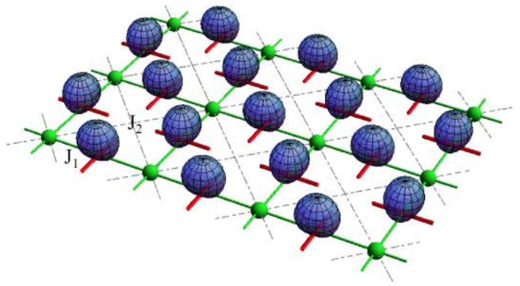
PHYSIKALISCHES KOLLOQUIUM

Wintersemester 2018/19

Montag, 12.11.2018, 12 Uhr c.t. HZO 20

An Introduction to Quantum Spin Nematics

Prof. Dr. Nic Shannon
Okinawa Institute of Science and Technology, Japan



Bond-centered spin-nematic order, of the type predicted in square-lattice frustrated ferromagnet BaCdVO(PO4)2

Liquid crystals, in which molecules align to break rotational symmetries of space --- without at the same time breaking translational symmetries --- are ubiquitous in nature, and form the basis for many modern display technologies. The idea that a quantum magnet might also act like a liquid crystal, breaking spin-rotation symmetry without breaking time-reversal symmetry, holds an abiding fascination. However, until recently, such "spin--nematics" were generally seen as objects of mathematical curiosity, with little connection to reality.
Happily, the last decade has seen great progess in the understanding of spin--nematics, and there is now good reason to believe that spin--nematic order should occur in a wide range of systems, including frustrated quantum spin chains in applied magnetic field, spin--1/2 frustrated ferromagnets, and thin films of 3He. Spin--nematic order has also been discussed in the context of materials as diverse as the layered triangular--lattice magnet NiGa2As4 the cubic spinel CdCr2O4, and the iron chalcoginide FeSe. None the less, making a definitive observation of spin--nematic order remains very challenging: because the ground state preserves time--reversal symmetry, it is invisible to the most widely--used probes of magnetic order.
In this talk we explore some of the progress which has been made in understanding quantum spin--nematics, addressing three simple questions: what are they, where should you look, and how would you know if you'd found one ? As a concrete example, we explore in more detail the spin excitations of spin-nematic states, and how these might be observed in experiment. We also discuss the most recent evidence for spin nematic order in the frustrated magnets Li2CuVO4, BaCdVO(PO4)2 and volborthite.

Einführung: Prof. Dr. I. Eremin

Die Fakultät lädt alle Interessierten herzlich ein.