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 progress 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.

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Die Fakultät lädt alle Interessierten herzlich ein.