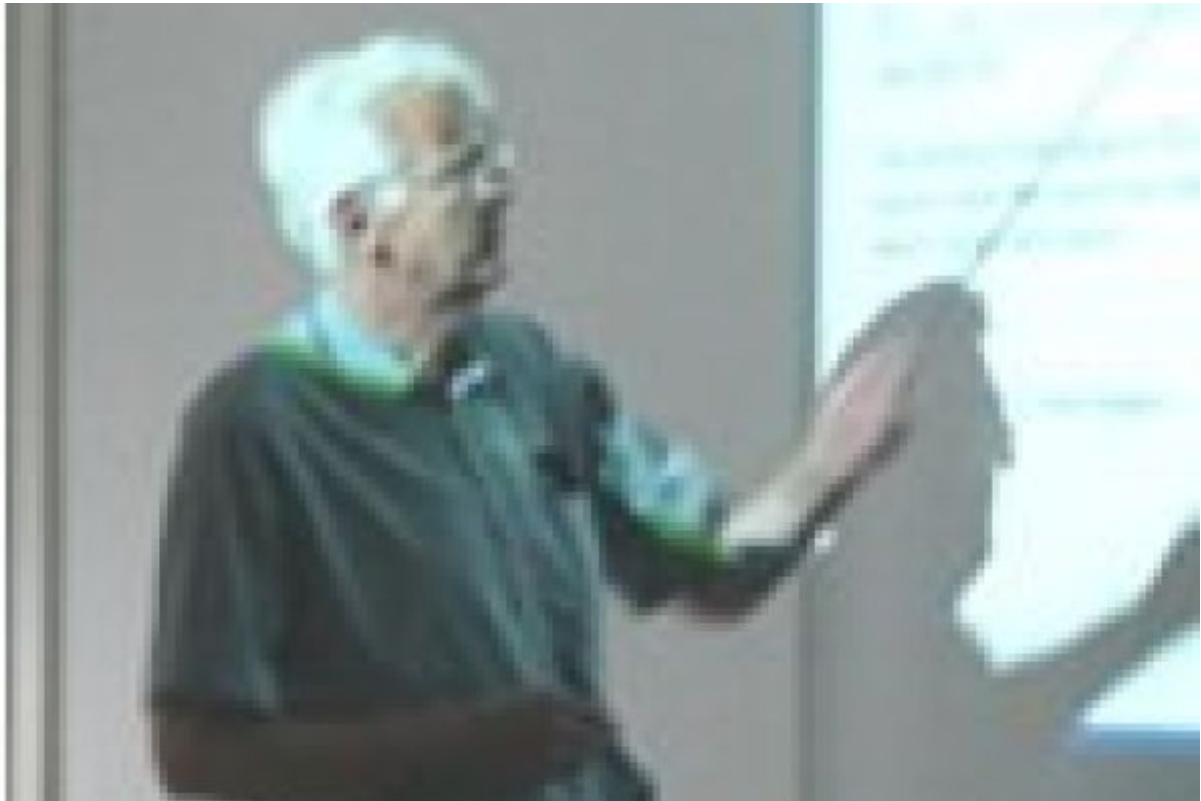




HANS-ULRICH EVERTS 'Quantum magnetism in two dimensions'

April 24, 2007

Lectures, April 24-26th, 16:00. UB - Faculty of physics (old building) 5th floor, room 507

Prof. HANS ULRICH EVERTS

Institut für Theoretische Physik, Leibniz

Universität Hannover

Hannover

GERMANY

Quantum effects in magnets which are described by the Heisenberg spin model are the subject of these lectures. It is well known that quantum effects become more important the lower the dimensionality of the system is.

The case of two dimensions is a borderline case between three dimensions, where quantum fluctuations yield in most cases small corrections to the classical behaviour, and one dimension, where the influence of quantum effects is dominant. The two dimensional case is therefore particularly interesting theoretically but it is also of relevance to many experimental studies which have focussed on two dimensional structures. In the first part of the lectures concepts and simple analytical methods will be introduced by the example of the square lattice ferro- and antiferromagnet. In the second part frustrated models, the antiferromagnet on the triangular and on the kagom'e lattice will be considered. From a combination of the semiclassical treatment of the triangular antiferromagnet with numerical studies it follows that frustration and quantum fluctuations do not destroy the classical magnetic order of this model. By contrast, the ground state of the kagom'e antiferromagnet shows no magnetic order of any kind. It appears to be a peculiar type of spin liquid. In the last part of the lectures I will return to the square lattice antiferromagnet. Following a review article by S. Sachdev (cond-mat/0401041) I will present a powerful field theoretical approach which elucidates the role of quantum effects particularly clearly. Berry phases appear as the most important ingredient in this description. It will be shown how these phases lead to the spontaneous formation of nonmagnetic spatially ordered spin structures, the valence bond solids (VBS).

Lectures, 24th, 25th and 26th of April, 16:00-18:00h. UB - Faculty of physics (old building) 5th floor, room 507.

Hosted by Prof. Maciej Lewenstein