Consequences of the Fluctuations of the Topological State in Cuprates and its Possible Condensation

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Abstract

The Copper-Oxide lattice is capable of four distinct time-reversal breaking current patterns without changing translational symmetry. One of them is Haldane's topological Hall effect state. When uncondensed, it is the generator of rotations among the four configurations of the mangeto-electric loop ordered states, which have been discovered by neutron scattering in the cuprates. I will discuss the coupling generated to fermions in the Quantum critical regime by such fluctuations and show they give rise to one of the most puzzling paradoxes of the cuprates - a momentum dependent single-particle self-energy but D-wave pairing.

I will also discuss the peculiar Kerr effect to be expected in the topological states because they are chiral. With lattice symmetry breaking of the requisite kind, the topological state is required to accompany the magneto-electric state. Recent sensitive Kerr effect measurements by Kapitulnik et al. do have the peculiarity of such a state.

About the speaker

Chandra Varma moved to University of California in 2003 after 34 years at Bell Laboratories. He has contributed to topics in Correlated fermions, Magnetism, Superconductivity, and problems of disorder.