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BuildMoNa

UNIVERSITÄT LEIPZIG
Fakultät für Physik und Geowissenschaften
Institute für Physik

Physik-Kolloquium

Dienstag, den 05.07.2011, 17:00 Uhr

Prof. Dr. Bertrand I. Halperin

Department of Physics, Harvard University

Defects with character – Majorana states in condensed matter systems

Theory has predicted a variety of peculiar quantum-mechanical phases for condensed matter systems at zero temperature, with some very surprising features. In some phases, extra degrees of freedom appear, with extremely low energy, when localized "defects" of various types are introduced. In the simplest class of these phases, when there are N defects present, the number of states in the low energy Hilbert space is of order $2^{N/2}$, in contrast to 2^N, which would be the case if there were a conventional two-level system associated with each defect. Here, we find associated with each defect a localized zero-energy state for a "Majorana fermion", which is a realization in condensed matter systems of a concept introduced originally in elementary particle physics. Moreover, the localized defects exhibit the property of "non-Abelian statistics": if defects can be moved around each other, or if two identical defects can be interchanged, one can produce unitary transformations in the low-energy Hilbert space, which can depend on the order in which operations are performed. In my talk, I will try to explain these various concepts and show how they may be realized in condensed matter systems.

Ort: Hörsaal für Theoretische Physik, Linnéstraße 5

Alle Teilnehmer sind ab 16:30 Uhr zu Kaffee vor dem Hörsaal eingeladen.