

Physik-Kolloquium

Dienstag, den 20.01.2015, 16.00 Uhr

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and
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Topology in Physics: From Standard Model of particle physics to room-temperature superconductivity

We start with magnetic monopoles, quantized vortices and other topological objects, and then move to the topological media - quantum vacuum, which can be represented as topological objects in momentum space. Topological media are gapped or gapless fermionic systems, whose properties are protected by topology, and thus are robust to deformations of the parameters of the system and generic. The gapless topological media include normal metals, chiral superfluid, graphene, cuprate superconductors, Weyl semimetals and quantum vacuum of Standard Model in its symmetric phase. These media have topologically protected zeroes in energy spectrum, which form Fermi surfaces (quantized vortices in p-space), Weyl points (p-space monopoles), and other objects in momentum space. Topological media with Weyl points serve as a source of effective gravity and relativistic quantum fields which emerge at low energy. Some topological media experience a dispersionless fermionic spectrum – the flat band: all electrons within the flat band have exactly zero energy. This property crucially influences the critical temperature of the superconducting transition in such media. While in all the known superconductors the transition temperature is *exponentially* suppressed as a function of the pairing interaction, in the flat band the transition temperature is *proportional* to the pairing interaction, and thus can be essentially higher. So topology gives us the general recipe for the search or artificial fabrication of room-temperature superconductors.

Ort: Hörsaal für Theoretische Physik, Linnéstraße 5

Alle Teilnehmer sind ab 15.30 Uhr zu Kaffee vor dem Hörsaal eingeladen.