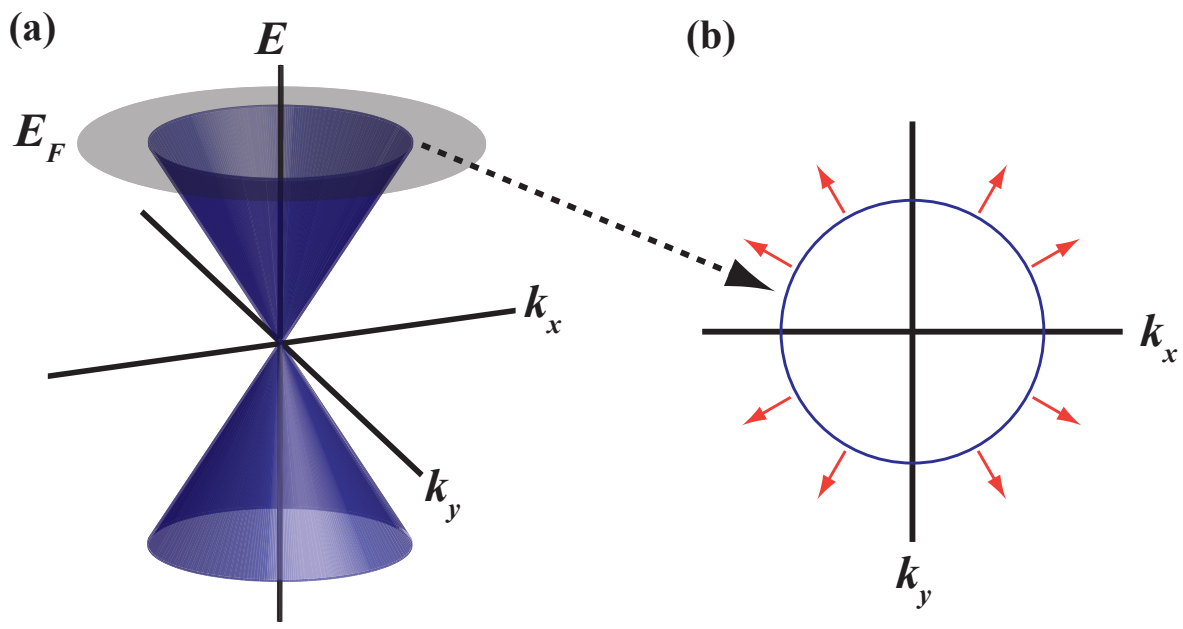
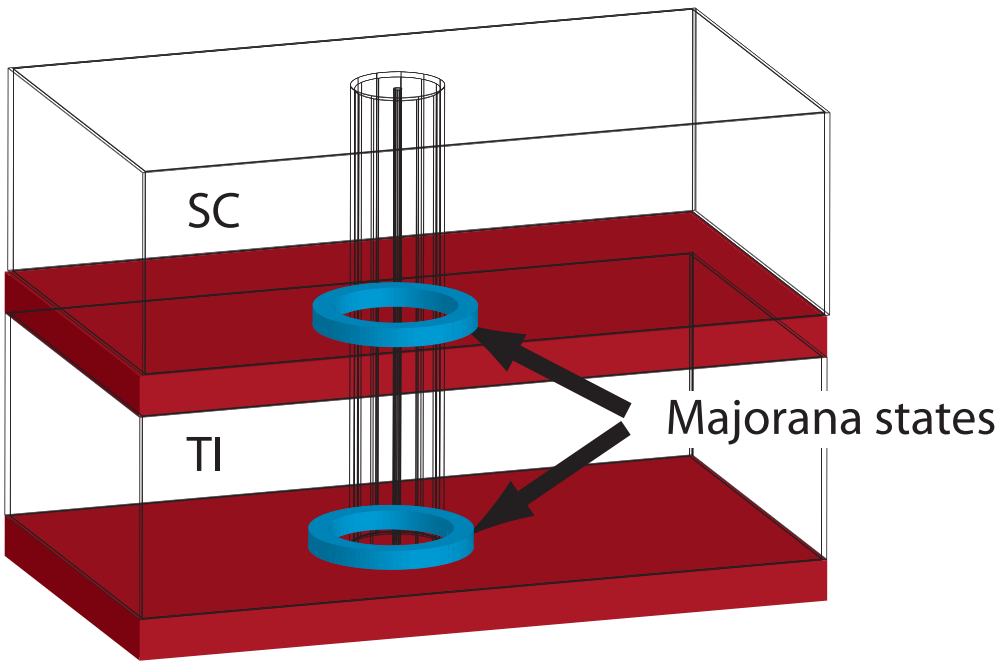
Boston University Physics Colloquium





The Birth of Topological Insulators

Much of condensed matter physics is concerned with understanding how different kinds of order emerge from interactions between a large number of simple constituents. In ordered phases such as crystals, magnets, and superfluids, the order is understood through "symmetry breaking": in a crystal, for example, the continuous symmetries of space under rotations and translations are not reflected in the ground state. A major discovery of the 1980s was that electrons confined to two dimensions and in a strong magnetic field exhibit a completely different, "topological" type of order that underlies the quantum Hall effect.

In the past few years, we have learned that topological order also occurs in some three-dimensional materials, dubbed "topological insulators", in zero magnetic field. Spin-orbit coupling, an intrinsic property of all solids, drives the formation of the topological state. This talk will explain what topological order means, how topological were predicted and discovered, and how they realize the "axion electrodynamics" studied by particle physicists in the 1980s. Two possible applications of these new materials are discussed in closing.

Joel E. Moore

University of California, Berkeley

September 21, 2010 (Tuesday) at 3:30pm (Refreshments at 3:15pm)

SCI 107, Metcalf Science Center, Boston University

Call: Winna Somers (wsomers@bu.edu) (617) 353-9320

Host: So-Young Pi