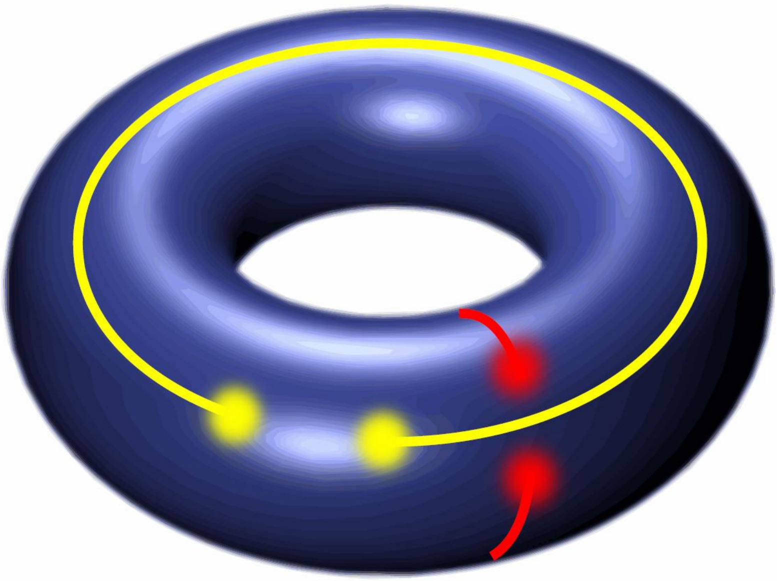
Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

SONDERKOLLOQUIUM

AM 17. NOVEMBER 2015 UM 15:30 UHR
IM HÖRSAAL HERMANN-HERDER-STR.6



TOPOLOGICAL ORDERS IN QUANTUM MATTER

DR. FRANK POLLMANN

MPI FÜR PHYSIK KOMPLEXER SYSTEME, DRESDEN

Condensed matter is found in a variety of phases, the vast majority of which are characterized in terms of symmetry breaking. A notable exception was provided by the discovery of the quantum Hall effects which exhibit new kinds of topological orders not associated with any symmetry breaking.
In my talk, I will discuss recent advances in the understanding of these topological orders and their stability in physical systems. First, I will consider so-called symmetry protected topological phases, which are distinct quantum phases of matter in the presence of certain symmetries. For these phases, I will introduce a mathematical framework allowing for their classification. Second, I will demonstrate how characteristic properties of topological excitations can be extracted from numerical simulations of quantum many-body systems. Using these novel techniques, I will show that a realistic model Hamiltonian gives rise to a particular kind of anyonic excitations that might be ideal for universal topological quantum computation.