



# EINLADUNG zum IFP-SEMINAR

Thema: **Topological Interacting Quantum states of Matter**  
VortragendeR: **Ronny Thomale**  
Universität Würzburg  
Host: Silke Bühler-Paschen  
Termin: **Mittwoch, 28. 01. 2015, 16:00**  
Ort: TU Wien, Institut für Festkörperphysik  
Freihaus Seminarraum 138B, Turm C, 7. OG (rote Leitfarbe)  
Wiedner Hauptstraße 8-10, 1040 Wien

## Abstract:

The era of topological insulators and integer quantum Hall effect has set the stage for the concept of topology emergent in condensed matter systems which can be understood at an effective single-particle level. Fractionalized states of matter, however, as pioneered by the fractional quantum Hall effect, do not necessarily allow for such a description, triggering the need for different methodological approaches to treat such systems. In this survey talk, we will highlight our recent progress in this field of condensed matter which combines symmetry, interactions, and topology.

We report on a coupled wire construction to build integer and fractionalized topological quantum states of matter on a universal footing, with a two-dimensional bulk and a one dimensional edge theory. We provide a complete classification (periodic table) of non-interacting topological phases and their interacting counterparts. Going one dimension up, we numerically investigate the 2d surface states of a 3d strong topological insulator in the presence of strong electron-electron interactions. For this, we choose a spherical topological insulator geometry to make the surface amenable to a finite size analysis. Assuming density-density contact interactions, we find superconducting and anomalous (quantum) Hall phases for attractive and repulsive interactions, respectively, as well as chiral fermion and chiral Majorana fermion boundary modes between different phases. Our setup is preeminently adapted to the search for topologically ordered surface terminations that could be microscopically stabilized by tailored surface interaction profiles.

