

CONDENSED MATTER THEORY SEMINAR

Subject: **Topological Anderson insulators**
Speaker: **Prof. Dr. Alexander Altland (Universität Köln)**
Date & time: **Friday, July 14th, 2017 at 3:15 p.m.**
Venue: **Seminar room 1.114**

Insulating materials are ‘topological’ if their band structure encapsulates a non-trivial topological index. While the bulk properties of topological insulators are not remarkable (a fact that has prevented their discovery for decades), their most striking signature is the presence of conducting *surface* states — the celebrated bulk/boundary correspondence of topological matter. How do topological insulators respond to the inevitable presence of static disorder? Given that, by definition, topological structures are protected against ‘weak deformations’, a tentative answer might be: not by much. In this talk, we will argue that the contrary is true and that disorder takes an unexpectedly strong influence on the properties of topological matter: in the bulk, even weak amounts of impurities compromise the insulating band gaps crucial to our understanding of topological matter. We will discuss how this band closure is accompanied by the emergence of the *topological Anderson insulator*, a material class characterised by distinct types of bulk quantum critical phenomena, and highly universal surface properties. The talk will start with a concise but self contained introduction to topological insulators, first from a clean, then from a disordered perspective. We will introduce the topological Anderson insulator and explore its bulk and boundary properties. A number of concrete ramifications of the presence of disorder, notably with regard to the current search for Majorana fermions states in semiconductor quantum wires will be addressed.