Topologically localized phases

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In this talk I will show that fully-localized, three-dimensional, time-reversal-symmetry-broken insulators do not belong to a single phase of matter but can realize topologically distinct phases that are labelled by integers. The phase transition occurs only when the system becomes conducting at some filling. I will show that these novel topological phases are fundamentally distinct from insulators without disorder: they are guaranteed to host delocalized boundary states giving rise to the quantized boundary Hall conductance, whose value is equal to the bulk topological invariant. Finally, I will present a general classification of topologically localized phases in any dimension and symmetry class.

Based on [Phys. Rev. Lett. 129, 256401] and ongoing works with Titus Neupert, Piet Brouwer and Luka Trifunovic.