

The Puzzling Boundaries of Topological Quantum Matter

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Insulators, by definition, cannot conduct electric current in their interior. However, some insulators — most famously, the recently discovered “topological insulators” — possess the unusual property that they conduct at their surfaces or edges. This conduction occurs through modes that travel along the boundary of the insulator, like waves moving on the surface of the ocean. Particularly interesting is that these modes are essentially indestructible and guaranteed to exist independent of the detailed structure of the boundary. This phenomenon raises basic questions: In general, which systems have these protected modes, and which do not, and what explains their incredible stability? While these questions have largely been answered for non-interacting systems, the far richer case of interacting systems still poses numerous challenges. In this talk, I will discuss my work on these interacting systems, as well as some of the puzzles that remain.

Wilson Hall, One West