

Massachusetts Institute of Technology  
Department of Physics

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**Condensed Matter Theory Seminar**

**“Topological Insulator Nanowires —  
from Kramers, via Berry, to Majorana”**

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Matter*

**Abstract:** Topological insulators are a state of matter that is protected by time reversal symmetry. In 3D, it has an insulating bulk but a conducting surface which low energy electronic properties are well described by Dirac fermions. In this talk I will discuss what are the characteristic properties of this material when the surface is curved, such as in a cylindrical or rectangular nanowire. In particular, how can one observe these features in a transport experiment. I will then discuss what changes ones these wires are interfaced with superconductors.

In the talk, I will focus on then fundamental quantum aspects of these materials, namely, the role of time reversal symmetry in quantum mechanics and Kramers degeneracy; geometric phases such as the Berry phase and its interplay with Aharonov-Bohm phases; and finally, possibilities of creating and observing Majorana modes in these systems.

For more information on my research and references, see the website of my group “Quantum matter — Transport and Dynamics”[qm.pks.mpg.de](http://qm.pks.mpg.de) .

**12:00 noon**  
**Tuesday, December 3, 2013**  
**Duboc Seminar Room (4-331)**