The effects of temperature on topological materials

Bartomeu Monserrat

Topological materials exhibit exotic properties such as dissipantionless charge currents or Majorana fermions that could form the basis for novel technological applications such as low-power electronics or quantum computers. However, many topological materials become trivial upon increasing temperature, thus hampering practical applications.

In this talk I will describe the interplay between topology and temperature, showing how both thermal expansion and electron-phonon coupling drive the temperature dependence of topological materials. Using the Bi_2Se_3 family of topological insulators as an example, I will explain why increasing temperature tends to *kill* topological order. However, I will argue that this is not a fundamental constraint on topological materials, and I will show how it is also possible to design materials in which the opposite behaviour is observed. Using PbO_2 as an example, I will describe how temperature *promotes* a topological nodal line semimetallic phase in this compound.