Topological materials exhibit exotic properties such as dissipationless 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$_2$Se$_3$ 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.