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## **Natural Superlattices for High-Temperature Thermoelectrics**

Thermoelectric materials offer many attractive features for energy conversion: they are solid-state, they have no moving parts requiring maintenance and so they should be able to operate for dozens of years, thereby enabling their cost to be recouped over many years of productive use. However, although the semiconductor physics underlying the thermoelectric effect has been known for several decades, identifying which materials will exhibit the best thermoelectric performance is a challenge for two main reasons. The first is that almost all materials, with the exception of highly conducting metals, exhibit some thermoelectric response when placed in a temperature gradient so there are a huge number of candidate materials to explore. The second is that the physical parameters that enter into the generally accepted figure of merit,  $ZT$ , for a material are contra-indicated. This, in turn, has led to the development of nanostructuring of existing materials in order to increase  $ZT$  by decreasing phonon thermal conductivity; a highly successful strategy except for long-term applications.

In this seminar, I will introduce two approaches to these challenges: the use of data mining to compare different classes of materials, and the exploration of compounds that have a natural superlattice structure to produce a coarsening-resistant microstructure so that the thermoelectric properties will not degrade over time.

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