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Heat under the microscope: towards a microscopic understanding of thermal transport in solids

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The thermal conductivity of a solid is typically the observable quantity used to study heat conduction. While knowledge of thermal conductivity is important, a wealth of microscopic information remains obscured because the thermal conductivity represents an average over a thermal distribution. Recent efforts have demonstrated that this microscopic information, in the form of the phonon mean free path distribution, can in fact be measured directly by systematically observing the transition from the diffusive to the ballistic transport regimes. In this talk, I will describe our recent efforts to develop this thermal conductivity spectroscopy technique as a general tool, as well as how the technique is giving a detailed picture of phonon heat conduction in a variety of solids.