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Heat Transfer in Non-Linear and Highly Anisotropic Systems

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Abstract: Various modern devices involve materials and structures that are highly anisotropic and/or non-linear, especially at the nanoscale. The heat transfer in such systems can deviate substantially from the traditional isotropic linear transport models such as Fourier's law of heat conduction. This talk will present several examples of these effects drawn from our recent work, such as a thermal diode based on asymmetric scattering of photons or phonons, and the effects of extreme bonding anisotropy on heat conduction and thermal contact resistance in layered materials.

Biography: Chris Dames received his Ph.D. in Mechanical Engineering from the Massachusetts Institute of Technology in 2006. His B.S. and M.S. are from UC Berkeley (1998, 2001). He was a faculty member at UC Riverside from 2006-2011 before joining UC Berkeley in 2011, and he also worked as a research engineer for Solo Energy Corp. (1998-1999). His research has been recognized with a DARPA Young Faculty Award (2009) and NSF CAREER award (2011). Dr. Dames' research interests emphasize fundamental studies of heat transfer and energy conversion at the nanoscale, using both theoretical and experimental methods. Some topics of current interest include graphene, nanocrystalline materials, mean free path distributions, thermoelectrics, biological systems, and highly anisotropic and nonlinear transport including thermal rectification.