Adventures in Phonon-Land: One Nuclear Engineer’s Travels

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Abstract:

Computational modeling of heat transfer across multiple scales has distinct similarities with neutron transport in nuclear reactors. Phonons, the pseudo-particle carrying the energy in the heat transfer system, can be rigorously modeled using a non-linear Boltzmann transport equation, or approximated with a linear BTE or with a diffusion equation for temperature (proportional to the zeroth moment of the photon distribution function).

In this talk I’ll illustrate the similarities between phonons and neutrons, present some recent research leveraging the long history of clever approaches to computational neutron transport, and show some example applications of this modeling capability to predict the thermal conductivity in materials with evolving micro-structures.

Bio:

Dr. Todd Palmer is a Professor in the School of Nuclear Science and Engineering and Associate Dean for Faculty Advancement in the College of Engineering at Oregon State University (OSU). He has a BS degree from Oregon State in 1987, and MS (Nuclear Engineering, 1988) and PhD degrees (Nuclear Engineering and Scientific Computing, 1993) from the University of Michigan. He joined OSU as an Assistant Professor in 1995, after spending four years as a Physicist in A-Division at Lawrence Livermore National Laboratory. His research interests include computational radiation transport, reactor physics, high-performance computing and general numerical methods development. Dr. Palmer is the recipient of the COE Loyd Carter Teaching Award (2001) and the COE Alumni Professor Award (2009), which carries the same distinction as an endowed chair. He is an active researcher with over $14.3 million in research funding while at OSU, and more than 100 peer-reviewed journal articles, full-papers and short abstracts.