Abstract:
Thermal conductivity is a basic and familiar property of materials: silver spoons conduct heat well and plastic does not. In recent years, the combined efforts of materials scientists, engineers, physicists, and chemists have succeeded in pushing-back long-established limits in the thermal conductivity of materials and have made exciting progress on methods for dynamic control of thermal conductivity. In this lecture, I will highlight three topics that I consider to be important unsolved problems in thermal conduction in materials: 1) ultralow thermal conductivity in hard and soft matter; 2) heat transport by magnetic excitations; and 3) solid-state approaches for thermal regulators and thermal switches.

Bio:
David Cahill is the Willett Professor of Engineering and Professor of Materials Science and Engineering at the University of Illinois at Urbana-Champaign. He joined the faculty of the Department of Materials Science and Engineering at the U. Illinois after earning his Ph.D. in condensed matter physics from Cornell University, and working as a postdoctoral research associate at the IBM Watson Research Center. His current research program focuses on developing a microscopic understanding of thermal transport at the nanoscale; extremes of low and high thermal conductivity in materials; the interactions between phonons, electrons, photons, and spin; and the kinetics and thermodynamics of aqueous and electrochemical interfaces with materials. He received the 2018 Innovation in Materials Characterization Award of the Materials Research Society (MRS); the 2015 Touloukian Award of the American Society of Mechanical Engineers; the Peter Mark Memorial Award of the American Vacuum Society (AVS); and is a fellow of the MRS, AVS, APS (American Physical Society), and AAAS. Prof. Cahill received the 2020 Tau Beta Pi Daniel C. Drucker Eminent Faculty Award from the Grainger College of Engineering.

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