THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT COLLOQUIUM SERIES PRESENTS:

Joseph P. Heremans

Ohio Eminent Scholar and Professor in the Mechanical and Aerospace Engineering Department, Ohio State University

Entropy transport in Weyl Semimetals

The last decade has seen a research focus on the electronic properties of materials with topological qualities. The spectrum of the electron excitations in these materials is characterized by topological invariants. Topological invariants are properties that do not change under continuous changes of quantities, such as interaction strengths, except when some symmetry or related transition occurs. These invariants control the number and nature of the surface and edge states in topological insulators (TIs) and bulk states in Weyl and Dirac semimetals.

Convincing evidence for the existence of these states comes from angular resolved photoelectron spectroscopy (ARPES), but real applications must involve electronic transport properties. Electrical conductivity and Hall Effect measurements face experimental difficulties. In this talk, emphasis will be put on thermal transport properties, namely electronic thermal conductivity and the Seebeck and Nernst effects. We posit that thermal transport provides some of the simplest and most convincing evidence of the effect of chirality and protection on the transport properties of Weyl semimetals.

Heremans is an Ohio Eminent Scholar and Professor in the Mechanical and Aerospace Engineering Department at the Ohio State University, with appointments in the Materials Science and Engineering Department and the Department of Physics. He is a member of the National Academy of Engineering, and a fellow of AAAS and the American Physical Society. He joined OSU after a 21 year career in the automotive industry at the General Motors Research Laboratories, where he was the section manager for Semiconductor Physics, and at the Delphi Research Laboratories. His research interests focus on energy conservation and recovery, and lie at the intersection between experimental condensed matter physics and thermodynamics. In the last decade, he worked on the transport of heat, charge, and magnetization in solids.

Tuesday, February 19 • 4 pm | Tech L211

Northwestern | McCORMICK SCHOOL OF ENGINEERING