

LENS/CMP Seminar

February 7, 2020

Speaker: Brian Skinner, The Ohio State University

Title: “The Unprecedented Thermoelectric Properties of Nodal Semimetals in a Magnetic Field”

Abstract: The thermoelectric effect is a phenomenon in which a temperature difference applied to a conducting material induces a voltage difference. This effect has a range of important applications, since it allows one to convert waste heat into useful electric power. In conventional metals and semiconductors, however, the strength of the thermoelectric effect faces fundamental limitations. In this talk I consider whether these same limitations apply to the three-dimensional nodal semimetals. I show that, surprisingly, the electron-hole symmetry of nodal semimetals allows for a thermopower that grows without bound under the application of a strong magnetic field. This nonsaturating thermopower can be understood in terms of quantum Hall-like edge states, and the corresponding thermoelectric Hall conductivity achieves a universal plateau value at large magnetic field. These effects have been observed experimentally, and they may enable the development of thermoelectric devices with record efficiency.