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**Physics General Colloquium**  
**Thursday, February 14th**  
**PHYS 203 at 4:00 pm**

**Refreshments in PHYS 242 at 3:30pm**



## **Nanoscale electrothermal energy transport**

**Energy consumption in our society is increasing rapidly. More than 85% of the available energy is lost in the form of heat. In this talk we review the potential of thermoelectric devices that allow direct conversion of heat into electricity. Novel metal-semiconductor nanocomposites are developed where the heat and charge transport are modified at the atomic level [1]. Potential to increase the energy conversion efficiency and lower the cost will be discussed. We also describe how similar principles can be used to make high speed micro refrigerators on a chip. Thermoreflectance imaging is used to study Peltier cooling and Joule heating in devices with 800ps time and submicron spatial resolution. The ballistic heat conduction and the transition between energy and entropy transport in ultra short times and in thin film devices will be discussed. Finally a brief overview of new research initiatives at the Birck center will be presented.**

**[1] A. Shakouri, "Recent developments in semiconductor thermoelectric physics and materials," Annual Review of Materials Research, July 2011.**