

WICHITA STATE UNIVERSITY

Physics Seminar Presents Our Speaker:

Dr. Zhu Diao

University of Illinois at Urbana-Champaign

“Materials Physics with Micro-Machines”

Abstract: Measuring extensive physical properties of materials at the sub-microgram level is a nontrivial task. Signals diminish due to the unfavorable scaling and quickly fall below the sensitivity of nearly all instruments designed for bulk samples. Thankfully, rapid developments in the area of micro systems technology offer a promising solution to this long-standing problem. In this talk, I will introduce two types of micro-machines for materials physics research. One is nanomechanical torque magnetometer, a device measuring the sample magnetic moment through the magnetostatic torque it experiences in a uniform field [1, 2]. I will describe the device design and present examples on how it can be utilized to capture both magnetization statics and dynamics in submicrometer-scaled samples. The other is membrane-based nanocalorimeter which is capable of measuring heat capacity of samples at the sub-microgram level [3, 4], with both high resolution and outstanding accuracy. I will discuss the design and principles of operation of the device. On top of that, I will present an exemplary calorimetric study of the superconducting phase transition in sub-micrograms of metastable β -gallium ($T_c \sim 6$ K compared with $T_c \sim 1$ K for the stable α -phase) [5]. Our high-quality calorimetric data show unambiguously that β -gallium is a strong-coupling superconductor with an enhanced density of states at the Fermi level.

Day & time:

Wednesday, February 13, 2019

2:00 p.m., 128 Jabara Hall

Refreshments & Discussion Afterwards