



# Old Dominion University

## Department of Physics

### Colloquium

**Tuesday February 20, 2018**

### **"Membrane-based AC Nanocalorimetry for Characterizing Superconductors in Sub-microgram Amounts"**

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**Abstract:** High quality heat capacity measurements play an important role in modern condensed matter physics research. However, measurements involving samples of sub-microgram in mass or energies in the sub-nanojoule scale are extremely difficult to perform. Conventional calorimeters are marked by the large heat capacity contribution of the calorimeter cell (addenda), thus, not suitable for such applications. We developed a SiN<sub>x</sub>-membrane-based differential AC nanocalorimetry platform, which enjoys drastically reduced addenda as well as excellent isolation between the sample and the environment. It is capable of measuring sub-microgram samples with both ultrahigh resolution and outstanding accuracy.

In the first part of the talk, I will describe the design and operation principles of our AC nanocalorimeter. The focus will be on our unique fixed-phase, variable frequency measurement scheme, which allows accurate determination of sample heat capacity at any given temperature. In the second part of the talk, I will discuss how our nanocalorimetry platform can be utilized to characterize two types of novel superconducting materials, namely, the metastable beta phase of gallium and the phosphorous-substituted Ba-122 compound (one of the recently discovered iron-based superconductors). Our heat capacity data provide a wealth of information on the superconducting states of both materials, allowing insight into their electronic structures and pairing mechanisms.

Presentation: **OCNPS 200 @ 12:30 pm**  
Refreshments: **OCNPS Atrium @ 12:15 pm**

**All interested persons are cordially invited to attend.**