Department of Physics
McMICKEN COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: March 1, 2012

The Department of Physics is pleased to offer the following research project for the summer of 2012. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and, if possible, develop a timetable for the twelve-week research period.

The Use of Nanomaterials in Bio-Physics and Bio-Medical Applications

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Project Description

I am working on two bio-physics projects investigating different nanomaterials for bio-medical applications of:

1) *In Vitro Evaluation of the Electrostimulation of Neurite Outgrowth on Carbon Nanotube Threads for Repair of Central Nervous System Trauma*
2) *Influence of Magnetic Nanoparticles on the Electrical Properties of Normal and Malignant Tissues for in vivo Detection of Cancer*

Project 1) Strategies for improving post trauma neural regeneration and function follow two strategies: 1) minimizing the initial consequences of injury and, 2) promoting repair of the damaged tissue, particularly neurites. We are focusing on the latter. ***This research uses carbon nanotube (CNT) materials and neuronal culture systems to investigate enhancing neurite outgrowth by direct electrical stimulation. The long-term goal is to use novel CNT-based scaffolds to address functional regeneration in both the PNS and the CNS.***

Project 2) Surgical removal of suspected malignant tissue is the cornerstone treatment of almost all cancers. However, it is sometimes extremely difficult for surgeons to differentiate malignant form normal healthy tissues. ***This research is focused on using functionalized magnetic nanoparticles for the enhancement of in vivo tissue differentiation via electrical impedance measurements.***

Students should consider one of these projects or the other. As such, students will carry out electrical measurements on either Project 1) neurons in cell cultures, or Project 2) biological materials (tissue phantoms and cell cultures). Electrical transport models for ionic and electronic conduction will be compared to these current/voltage measurements.