Department of Physics
COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: March 1, 2010

The Department of Physics is pleased to offer the following research project for the summer of 2010. 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.

PROJECT TITLE: *In Vitro* Evaluation of the Electrostimulation of Neurite Outgrowth on Carbon Nanotube Threads for Neurite Regeneration

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Project Description

Injury to the nervous system, consisting of a loss of either the long neuronal processes (neurites), or those plus the nerve cell bodies, represents a significant cause of chronic and debilitating neurological impairment. Spinal cord injury is perhaps the most dramatic example, with approximately 11,000 new injuries being reported each year, but traumatic brain injury is increasingly recognized as a significant problem in its own right. Strategies for improving neural regeneration and function following injury generally 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, because significant basic biological work is still needed to understand the mechanisms of neurite outgrowth before clinical applications can be successful. **The research outlined here proposes to use carbon nanotube (CNT) materials and neuronal culture systems to design scaffold materials and systems that will be used to address fundamental mechanistic questions about enhancing neurite outgrowth. The long-term goal is to use novel CNT-based methods of encouraging neurite outgrowth to address functional regeneration in both the PNS and the CNS.**

We propose that the electrical conductivity of CNT materials will promote neurite outgrowth. To test the electrical properties of CNT materials in culture, we will first devise appropriate chambers that will allow placement of neuronal cell bodies in one fluid compartment and outgrowth of the neurites along CNT materials into a second fluid compartment. This chamber isolation allows analysis of the electrical activity along CNTs and neurites without actually doing intracellular recordings. This will also allow us to use the CNT materials as biosensors because the neurite growth along the CNT material should alter the electrical properties of the CNTs. Finally, these will allow us to test neurite outgrowth while electrical current is applied to the threads.