

Department of Physics
COLLEGE OF Arts and Science

**SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 1, 2014

The Department of Physics is pleased to offer the following research project for the summer of 2014. 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.

**NEW METHODS FOR FABRICATING SINGLE NANOWIRE ELECTRONIC DEVICES / CALCULATING
QUANTUM WAVEFUNCTIONS IN NANOWIRE QUANTUM WELL TUBES**

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Project Description

This undergraduate Summer research project could be in one of two areas, depending on the interests of the student:

The first project involves developing new methods for fabricating single nanowire electronic devices which have a 5 to 10 kHz frequency response so that they can be used for high sensitivity spectroscopic photocurrent measurements. We have recently succeeded in fabricating nanowire heterostructures which exhibit strong quantum confinement: "Optical, Structural, and Numerical Investigations of GaAs/AlGaAs Core–Multishell Nanowire Quantum Well Tubes," Melodie Fickenscher et al, Nano Letters 13, 1016 (2013). This work has been recently extended to transport of photo excited carriers in such quantum well tubes, but we require higher frequency response to implement high resolution spectroscopic measurements.

The second project involves developing new methods for calculating the quantum wavefunctions in the nanowire quantum well tubes described in the above paper which includes the coulomb attraction of the quantum confined electrons and holes. This work involves developing methods for rapid calculation of wavefunctions using the eigenfunction expansion technique and making direct comparison with experimental results.