

**Department of Physics
COLLEGE OF ARTS & SCIENCES**

**SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 1, 2011

The Department of Physics is pleased to offer the following research project for the summer of 2011. 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.

Advanced Computer Simulations of Superconducting Electron Fluids

**Professor C.J. Bolech
Department of Physics
427 Geol.-Phys. Building
Cincinnati, OH 45221-ML11
Tel: (513) 556-0501
Fax: (513) 556-3425
Email: cj.bolech@uc.edu**

Project Description

Superconducting materials are widely used in the fabrication of advanced medical-diagnostic devices and are also making inroads as viable components for electronic applications and electric-power-transmission technologies. Superconductor modeling, the numerical simulation of realistic superconducting systems, is considered a grand-challenge problem for high-performance computing (HPC). This project will explore the ways of implementing parallel solvers for the differential equations that describe the dynamics of the electron superfluid --the time-dependent Ginzburg-Landau equations (TDGL). Different parallel-computing paradigms will be considered (including MPI, openMP and GP-GPU computing). The project is at the interface between applied mathematics, computer science, electrical engineering and physics; it could be of interest to a student with background in any one of these areas and wanting to gain some acquaintance with the others.