

**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING**  
**College of Engineering**

**SUMMER RESEARCH OPPORTUNITIES**  
**FOR UNDERGRADUATE WOMEN**

**APPLICATION DEADLINE: MARCH 3, 2003**

*The Department of Civil and Environmental Engineering is pleased to offer the following research project(s) for the summer of 2003. Interested students are urged to contact the faculty member(s) directing the project(s) that most interest 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.*

**CAREER: Challenging the Structure-Function Relationship of Nitrifiers and Nitrification Using Molecular Biology and Modeling Tools**

**Professor Daniel Oerther**

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**Project Summary.** The Water Quality Biotechnology Program, Department of Civil and Environmental Engineering, University of Cincinnati focuses upon research utilizing techniques from molecular biology to identify, enumerate, and measure the *in situ* growth activity of microorganisms in samples from environments of interest to Environmental Engineers and Scientists. For example, a current project being conducted by one women undergraduate student in the lab examines the effect of bioreactor configuration and operating conditions on the composition of the microbial communities within the bioreactors. In the Summer of 2003, the Water Quality Biotechnology Program will offer a woman undergraduate student the opportunity to work on a research project funded in part by a grant from the National Science Foundation. The project is entitled, "CAREER: Challenging the Structure-Function Relationship of Nitrifiers and Nitrification Using Molecular Biology and Modeling Tools." The objectives of this project include: linking the diversity of the microbial community inhabiting lab-scale wastewater treatment systems with system performance measured with conventional procedures as well as advanced molecular biology procedures to enumerate microorganisms.

These objectives will be met by completing the following tasks:

- Task 1* Set-up lab-scale wastewater treatment systems.
- Task 2* Operate lab-scale wastewater treatment systems to remove toxic ammonia from synthetic sewage. Sample the reactors for conventional procedures as well as advanced molecular biology procedures.
- Task 3* Determine the identity of nitrifying microorganisms in the samples removed from the lab-scale systems using advanced molecular biology procedures including 16S rRNA-targeted fluorescence in situ hybridizations and PCR amplification, cloning, and sequencing of amoA genes.
- Task 4* Prepare a summary report documenting the findings of the research.

The undergraduate student selected for this project is expected to have some familiarity with general laboratory techniques (e.g., to have previously performed well in lab courses such as general chemistry lab, organic chemistry lab, or microbiology lab). During the project, the progress of the student will be monitored by close contact with the Principal Investigator, Professor Dan Oerther, Department of Civil and Environmental Engineering. It is anticipated that the successful outcome of this work may include establishing a long term working relationship with the Water Quality Biotechnology Program. Thus, preference will be given to women undergraduate students at the Sophomore level with an interest in continuing work on independent projects throughout their academic careers (i.e., to follow up this summer program with supported research during the academic year).

## **Characterization Of Diesel Exhaust Emissions From Underground Mines And Development Of Novel Control Technologies**

**Professor Tim Keener**

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**and**

**Professor Mingming Lu**

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Diesel particulate matter (DPM) emissions in underground mines are much higher than ambient levels, which pose potential health threats to miners. This project is aimed at better characterization of DPM emissions in underground mines and development of a novel control technology to effectively mitigate DPM and other emissions. DPM emission measurements will be performed, and the technology will be implemented in a selected mine/mines for demonstration purposes. The student will be working on either the emission measurements portion or with the control technology development portion, depending on her qualifications and interest.