

**Department of Biological Sciences
MCMICKEN COLLEGE OF ARTS AND SCIENCES**

**SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 1, 2013

Project Title: Molecular genetics of geothermal extremophiles

Dr. Dennis Grogan
Dept. Biological Sciences
grogandw@ucmail.uc.edu
1408 Crosley
556-9748

Project Description:

The Grogan lab analyzes genetic processes in *Sulfolobus* species, which are archaea adapted to the extremely hot and acidic environments produced by geothermal activity. A participant in the WISE program may consider several projects, all of which involve adapting basic techniques of molecular genetics to "extremophilic" micro-organisms.

1. Effect of DNA damage on genetic exchange

Cells of at least one *Sulfolobus* species (*S. acidocaldarius*) can transmit chromosomal DNA to another cell of the same species; the transferred DNA can then replace the corresponding region of the recipient chromosome by recombination. In normal cells, this transfer of genes does not seem uniform or predictable as a function of location. To determine whether the observed pattern requires intact DNA, one of the two parental cells will be gamma-irradiated to break its chromosome into small segments before allowing DNA transfer. A set of the resulting recombinants will then be analyzed to determine the pattern of genetic transfer and compare it to cells with initially intact chromosomes.

2. Diversity and diversification of simple genomes

Certain lytic viruses, commonly called "phage", have been found to infect *Sulfolobus islandicus*. So far, no two of these phage have been found to have identical (or even highly similar) genome sequences; this raises questions about how many different "species" or "families" may occur in natural populations, and how quickly the phage mutate. Investigating these questions will involve developing appropriate genotyping tests, then applying them to detect different genotypes in natural populations and laboratory strains.