

Department of Biological Sciences  
MCMICKEN COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES  
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: March 1, 2006

*The Department of Biological Sciences is pleased to offer the following research project for the summer of 2006. 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.*

**MOLECULAR BIOLOGY OF HYPERTHERMOPHILIC ARCHAEA**

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In geothermal environments, a group of diverse and unusual prokaryotes thrive under environmental conditions that rapidly kill all well-studied organisms. These hyperthermophilic archaea represent a source of extremely thermostable enzymes for biotechnology, as well as molecular clues to the early evolution of cellular life. The Grogan lab has been able to develop basic genetic techniques for two species of these micro-organisms (see [www.biology.uc.edu/faculty/grogan/grog.htm](http://www.biology.uc.edu/faculty/grogan/grog.htm)) and continues to investigate fundamental genetic processes that support their cellular functions. A WISE participant would have a choice of projects that investigate DNA repair or genetic engineering. Depending on the project chosen, the experimental techniques would include DNA purification and analysis, PCR, genetic selections for mutants or recombinants, assays of DNA damage, molecular cloning, and related techniques.

**Repair of DNA Damage**

There is biological evidence of generalized, "dark" repair of DNA lesions in *Sulfolobus acidocaldarius*, but not of genes encoding the proteins that normally initiate this process.

*Questions:*

Are cisplatin adducts of DNA mutagenic in *S. acidocaldarius*?

Can genetic selection detect particular mutations caused by such DNA adducts?

**Genetic Engineering of *Sulfolobus***

The novel genes and novel metabolism of hyperthermophilic archaea create a need for a general methods to inactivate or alter genes to reveal their biological functions.

*Questions:*

What biosynthetic genes provide selectable markers for *S. acidocaldarius*?

How can these genes be used as "targeted mutagens" to inactivate other genes?

Can oligonucleotides be adapted to mutate *Sulfolobus* genes?

Do vectors based on a naturally occurring plasmid replicate stably in *Sulfolobus*?