

**McMICKEN COLLEGE OF ARTS AND SCIENCES
Department of Chemistry**

**SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 1, 2006

The Department of Chemistry in the College of Arts and 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.

Enzyme-mediated Protein-peptide(protein) Ligation Strategy

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Project Description

A common theme of our research involves elucidating the structure versus function relationships of biomolecules such as proteins and nucleic acids in order to characterize their *in vivo* function. To study the structure of multi-domain proteins by NMR, the ability to selectively observe one protein domain at a time is crucial. One approach we are developing towards this involves enzymatic ligation of different protein domains together using the *St. aureus* sorting enzyme, sortase A. The specific protein system we have begun testing this with is human lysyl aminoacyl tRNA synthetase which consists of the following protein domains: catalytic, tRNA anticodon binding and an extension. To better understand the specific function of the extension domain, we wish to selectively label and therefore observe it while it is part of both truncated as well as intact forms of the synthetase enzyme. Since there is no structural information regarding this extension domain, we hope to establish how it interacts with the other synthetase domains as well as the tRNA molecule using solution NMR techniques. This first requires successful production of suitably labeled forms of the enzyme where only one domain is labeled (with ¹³C or ¹⁵N) at a time. Development of the sortase enzyme ligation strategy will be explored in this project. This research will involve the use of protein expression (using *E. coli*) and purification techniques (affinity chromatography, protein electrophoresis) as well as spectroscopy methods including CD, fluorescence and NMR.