

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

**SUMMER RESEARCH OPPORTUNITIES  
FOR UNDERGRADUATE WOMEN**

**APPLICATION DEADLINE: March 1, 2010**

*The Department of Chemistry is pleased to offer the following research project for the summer of 2010. 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.*

**PROJECT TITLE: NEW MOLECULES FOR SOLAR ENERGY**

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**Project Description**

A significant challenge in achieving sustainable development is the development of effective strategies for converting sunlight energy into chemical energy. One example reaction is the use of sunlight to split water into oxygen and hydrogen fuel. Achieving this objective requires the development of new molecules, known as catalysts. These molecules undergo changes in oxidation state by two or more electrons. The activation of substrate molecules (e.g., water) to produce chemical fuel involves coupling the changes in oxidation state of the catalyst to those of the substrate (e.g., water). How to achieve this kind of reactivity is not yet known. We have developed a new class of molecules that undergo cooperative changes in oxidation state, meaning that transfer of one electron makes transfer of a second electron more favorable. These molecules offer a promising new approach to designing catalysts. This research project is focused on understanding how these molecules transfer electrons. Our long-term objective is to learn to exploit this extraordinary behavior in photocatalysis. A student working in this area will synthesize and identify new molecules. In addition, she will use spectroscopic techniques to determine the how the molecular structure changes during electron transfer. She will have the opportunity to learn various synthetic and analytical methods that are useful in chemistry, including absorption and emission spectroscopies, X-ray crystallography and NMR spectroscopy. There is flexibility for the student to take the project in any of a variety of directions, depending on her interests and background. No prior research experience is required. Interested students are encouraged to meet with Professor Connick to learn more.