

MCMICKEN COLLEGE OF ARTS AND SCIENCES

**SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 1, 2007

The Department of Chemistry is pleased to offer the following research project for the summer of 2007. 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.

Two-Electron Reagents: New Molecules for Harvesting Solar Energy

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Project Description

The goal of this research is to building new and better molecules for converting sunlight energy to chemical fuel. When a molecule absorbs light, an electron is excited from a low-energy orbital to a high-energy orbital. The resulting excited molecule is very reactive, and it is now much more favorable for the excited electron to “jump” to another molecule. This light-induced electron-transfer chemistry is essential if we want to use sunlight energy to drive chemical reactions. One problem is that the excited molecule usually releases only one electron, whereas the kinds of reactions we want to tackle require multiple electrons (e.g., splitting water to make H₂ and O₂). We have developed a strategy for overcoming this problem by designing inorganic molecules (called metal complexes) that are capable of releasing two electrons when excited by light. A student working on this project will help to design these new two-electron reagents and explore their extraordinary reactivity. She will learn various synthetic and analytical methods that are useful in chemistry, including absorption and emission spectroscopies, cyclic voltammetry and NMR spectroscopy. There also is flexibility in the project that will allow a student to take the project in any of a variety of directions, depending on her interests and background. No prior research experience is required.