Introduction to Exploratory Projects

In addition to deep research into high-risk, high-impact fundamental science and technology, GCEP also funds smaller exploratory efforts. These exploratory projects can be funded for up to one year, and have budget limits of up to $100,000 each. The goal of these projects is to quickly evaluate the feasibility of a novel concept. If such an investigation proves successful, the investigators may apply for regular GCEP funding.

In 2008, six exploratory efforts were underway.

Professor Dick Zare, of Department of Chemistry, Stanford University received funding towards Development of an Immobilized Enzyme System for Lignocellulosic Biomass Saccharification.

Dmitry V. Yandulov, of Stanford University is investigating Electrocatalytic water oxidation to dioxygen in molecular PdII/IV coordination environment. In this project a new mechanistic approach to electrocatalytic water oxidation based on well defined coordination complexes of PdII/IV was designed. Its experimental studies to date included the development of a robust quantitative dioxygen assay suitable for screening target Pd complexes for catalytic activity in water oxidation.

Professors Gordon Brown, Dennis K. Bird, Kate Maher, and Wendy Mao, at Stanford University are carrying out an exploratory study of the mechanisms and kinetics of CO_2 reaction with Mg-silicates aimed at developing a more fundamental understanding of the long-term sequestration of CO_2 via mineral carbonation reactions.

Professor Paul McIntyre of Stanford University is undertaking research on the topic of Multijunction Nanowire Solar Cells for Inexpensive and Highly Efficient Photoelectricity. This project is currently focused on the preparation of highly textured (111)-oriented polycrystalline Ge films on glass substrates, as a method of producing inexpensive substrates for aligned nanowire or microwire photovoltaic device array deposition.

Professor Thomas Jaramillo is investigating the use of Nanostructured MoS_2 and WS_2 for the Solar Production of Hydrogen. So far, Jaramillo has synthesized a number of different sized MoS_2 nanoparticles and supported them onto fluorine-doped tin oxide substrates for opto-electronic and electrochemical characterization. The investigator has also laid the groundwork for the synthesis of other quantum confined nanostructures in various shapes and sizes, and aims to characterize the electronic properties and viability of these structures for solar water-splitting in the near future.