Most experts agree that oil production will peak within the next thirty years after which time the use of oil as a political tool will dramatically increase. Furthermore, an intergovernmental panel on climate control warns of a catastrophic increase in the earth’s surface temperature if the use of fossil fuels is not curbed before the year 2050. To circumvent such disastrous environmental change there exist a critical worldwide need for renewable energy on the terawatt scale. Solar energy stands as the only renewable that can provide this level of power.

This talk will provide an overview of our group’s efforts to understand and quantify the properties of molecular compounds that absorb visible light and initiate electron transfer reactions relevant to solar energy conversion. Particular emphasis will be placed on interfacial electron transfer at sensitized TiO2 nanocrystallites, formation of I-I bonds, and multi-electron transfer reactions with inorganic coordination compounds. Fundamental aspects of these studies will be described as well as the potential for practical applications in solar fuel and/or electrical power generation.