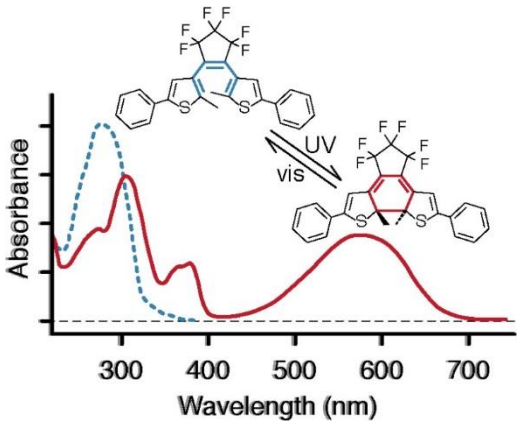
Reaction dynamics of molecular switches (*Prof. Chris Elles*)

Chemical reactions are the making, breaking, and rearranging of bonds. In the Elles Group, we use ultrafast laser spectroscopy to study the details of those transformations at the molecular scale. By watching what happens *during* a reaction, we will ultimately learn how to *control* chemistry with light. We are especially interested in the dynamics of color-changing molecular switches that reversibly convert between open-ring and closed-ring isomers upon photo- excitation. The isomerization reaction involves dynamics on multiple electronic states, and it is the transitions between those states, called non- adiabatic transitions, that determine the outcome of the reaction.



REU students will help design and perform experiments that explore the reversible reactions of a variety of photo-switchable molecules. For example, UV/vis spectroscopy and ultrafast laser techniques will be used to measure conversion yields and to probe the role of the solvent. This work will be closely related to ongoing research in the Elles group. Through hands-on participation, students will learn how to prepare samples, use the instruments, and analyze the results of these exciting experiments.

References

C. L. Ward and C. G. Elles, Controlling the excited-state reaction dynamics of a photochromic molecular switch with sequential two-photon excitation, *J. Phys. Chem. Lett.*, **3**, 2995 (2012).

A. L. Houk, I. L. Zheldakov, T. A. Tommey, and C. G. Elles, Two-photon excitation of trans-stilbene: Spectroscopy and dynamics of electronically excited states above S_1, *J. Phys. Chem. B*, **119**, 9335 (2015)

T. J. Quincy, M. S. Barclay, M. Caricato, and C. G. Elles, Probing Dynamics in Higher-Lying Electronic States with Resonance-Enhanced Femtosecond Stimulated Raman Spectroscopy, *J. Phys. Chem. A*, **122**, 8308 (2018).