CFEL SCIENCE

SEMINAR

3rd September 2015 - 10:00 h

CFEL – Building 99, seminar room I+II (ground floor)

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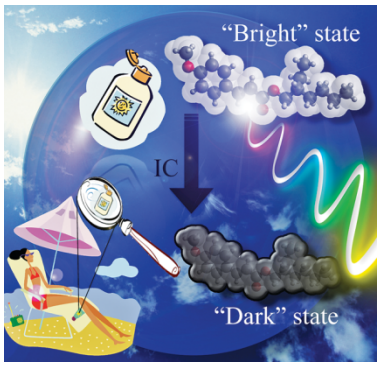
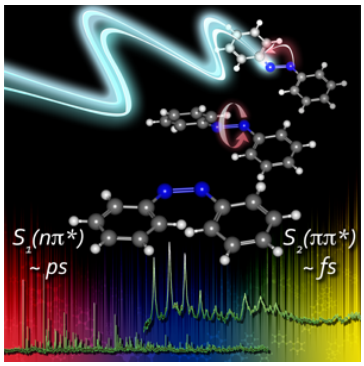
High-resolution spectroscopy of the complex, fast and furious

Light is energy. As such, it is used extensively in Nature and man-designed technological applications to drive out-of-equilibrium processes. Key to understanding these photodynamics are the potential energy surfaces of photoactivated molecules. High-resolution laser spectroscopy provides in principle the means to obtain characteristic fingerprints of these surfaces and thereby relate molecular structure and dynamics to functional properties. Such studies have for a long time been restricted to small, isolated molecular systems, and to systems where photodynamics occur on nanosecond and longer timescales. In reality, however, it is increasingly recognized that complex molecular systems give rise to unique properties that are thus impossible to study in simple, covalent molecular systems. Similarly, photoactivity is normally associated with much faster relaxation processes for which high-resolution spectroscopy would thus appear a contradiction in terms.





In this seminar I will show how in recent years we have been able to meet such opposing requirements. High-resolution spectroscopic studies on artificial sunscreens elucidate pertinent electronic relaxation channels, and illustrate how such studies have the potential to tailor electronic structure for commercial application. Similar studies have been employed to unravel the complex electronic structure of the Photoactive Yellow Protein (PYP) and its structural dynamics, as well as the far-reaching influence of the biological environment. Finally, I will discuss recent studies on azobenzene, one of the most widely used building blocks for light-activated materials. We determine the forces that are imparted on the molecular framework by electronic excitation, how these forces drive the molecule over the potential energy surface and ultimately lead to photoisomerisation, and the time scales on which these processes take place ("*how to flash 170 femtoseconds with 10 nanoseconds*").

Host: Terry Mullins / CFEL Molecular Physics Seminar