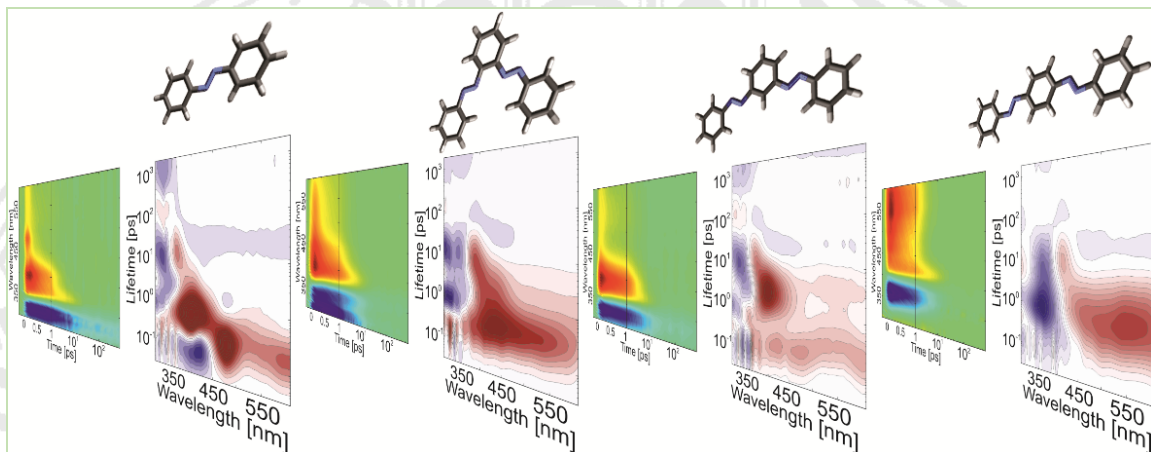


PHYSIKALISCHES KOLLOQUIUM

AM 2. JULI 2018 UM 17 UHR C.T.

IM GROßEN HÖRSAAL



TRIGGERING MOLECULAR PROCESSES WITH LIGHT

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Molecular systems that can be remotely controlled by light are gaining increasing importance in biosciences. High spatial and temporal precision is achievable with short laser pulses and in principle there are three approaches for light regulation. Chromoproteins with built in photoswitches like rhodopsins can be directly photoactivated. The entire emerging field of optogenetics deals with genetically encoded light-sensitive proteins like channelrhodopsins that allow to specifically address even single neurons. Alternatively, one can use photolabile protecting groups to irreversibly trigger processes (uncaging) or photoswitches for reversible switching. My talk will focus on our recent progress in these fields.

Caged puromycin represents an efficient photoactivatable antibiotic for in-cell applications that interferes with the translation process at the ribosome. UV illumination recovers the antibiotic activity of puromycin, the translation inhibition and polypeptide release triggered by uncaged puromycin are equivalent to the commercial compound. We investigated the photodecarboxylation mechanism of the uncaging reaction by means of fs-IR spectroscopy and quantum chemical calculations and derived a reaction model that may serve as general guideline for improved ortho-nitrobenzyl cages. Two-photon uncaging in a cellular context offers the advantage of higher penetration depth due to the longer excitation wavelength and a high spatial confinement of the photolysis area (1 fL). In biocompatible hydrogels, the two-photon activation of photoactivatable glutathione triggers the interaction with glutathione S-transferase and leads to a three-dimensional assembly of protein networks with high spatial resolution.

Azobenzenes (AB) are a major class of photoswitches with photochromism based on the *trans* ↔ *cis* isomerization of their N=N bond. Suitably connected to biomolecules, azobenzenes can act as light trigger for initiation of conformational transitions. Time resolved spectroscopy provides a certain degree of structural information and allows following the kinetics of photoinduced conformational changes by investigating the transient, interconverting structures. Recent developments of light-responsive secondary and tertiary structures of peptides, RNA and foldamers will be presented. Conformational dynamics of RNA can be followed with C_m^(f), a bifunctional RNA fluorescent / spin label.