SFB 1078

Protonation Dynamics in Protein Function

Colloquium

Mon, **Apr. 29,** 2024

15:15 – 17:30

Freie Universität Berlin
SupraFAB, Room 201
(Altensteinstr. 23a, 14195 Berlin)

Dr. Nataliya Archipowa – Institute of Biophysics and Physical Biochemistry, University of Regensburg, DE

Animal type I cryptochromes from migrating and non-migrating species. Are they alike and can they function as photomagnetoreceptors?

One of the major unanswered questions in biology is how animals navigate over long distances using the Earth magnetic field. Although much effort was made in the last decades to unravel this remarkable feat, the primary sensory mechanism and subsequent signal transduction is still unclear. Currently, Cryptochromes (CRY) are discussed as the most promising photomagnetoreceptor candidates in animals. The fruitfly Drosophila melanogaster became a model organism for magnetic field studies due to the ease of generating genetically modified fly strains whose magnetosensitivity can be studied on the organismal level. Although many reports confirmed the involvement of CRY in magnetoreception direct evidence that CRY are indeed the photomagnetoreceptors is still missing. Since a small subgroup of insects also migrate including the well-known monarch butterfly Danaus plexippus which responds to magnetic fields in vivo and in which Type I CRY is suggested to act as photomagnetoreceptor, we investigated the generality of the Type I reaction mechanism on a molecular level by studying, the CRY from the migrating monarch butterfly and compare it with the non-migrating Drosophila melanogaster CRY by means of stationary and time-resolved absorption spectroscopy as well as theoretical approaches. The results are discussed in the context of the widely proposed radical pair mechanism.

Dr. Roger-Jan Kutta – Institute of Physical and Theoretical Chemistry, University of Regensburg, DE

Two examples of Photoreception in Nature & Magnetic field on flavin based photo-catalytic oxidations with implications for photo-magnetoreception *in vivo*

Nature uses light either as energy source or as a signal carrier. In part one the first evidence of a stepwise hydride transfer in a biological system is presented by reporting the detailed light triggered stepwise hydride transfer within the light-dependent NADPH:protochlorophyllide oxidoreductase (LPOR) that catalyzes the stereospecific hydration of the C17-C18 double bond of protochlorophyllide to produce chlorophyllide. In part two the mode of action of the coenzyme B12-dependent photoreceptor, CarH, is discussed with emphasis on the role of molecular oxygen on its activation triggering carotenoid biosynthesis only under high light intensity conditions and photo-oxidative stress. Finally, the tuning of the reactivity of spin correlated radical pair reactions by external magnetic fields in the mT range is demonstrated on a model photocatalytic reaction employing natural flavin to photo-catalyze the oxidation of benzyl alcohols to the corresponding aldehydes. These magnetic field effects (MFE) on the flavin reactivity is discussed in terms of investigated MFEs *in vivo*.

Coffee and tea will be available during the break at 16:15

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