BP 13: Photobiophysics

Time: Tuesday 12:30–13:15 Location: H44

BP 13.1 Tue 12:30 H44

Fluorescence spectroscopy of single peridinin - chlorophyll a - protein light - harvesting complexes — •Stephan Wörmke[1], Sebastian Mackowski[1], Tatas Brotosudarmo[1], Christoph Bräuchle[1], Hugo Scheer[2], and Eckhard Hofmann[3] — [1]Department of Chemistry and Biochemistry and Center for Nanoscience, Ludwig-Maximilian-University, D-81377 Munich, Germany — [2]Department of Biology, Ludwig-Maximilian-University, D-80638 Munich, Germany — [3]Department of Biology, Ruhr-University Bochum, D-44780 Bochum, Germany

We report on single molecule spectroscopy studies of native and reconstituted peridinin - chlorophyll a - protein (PCP) light - harvesting complexes. In its native form PCP is a trimer of protein subunits, while the artificial complexes are of predominantly monomeric structure; they contain only two chlorophylls. We find that native PCP features better photostability and emits approximately 3 times more photons. The fluorescence trajectories detected for reconstituted complexes feature two intensity steps, each attributable to single chlorophyll fluorescence. During the consecutive bleaching of the chlorophylls, we do not observe any change in either the fluorescence frequency or the intensity of the remaining chlorophyll. This implies that the interaction between the fluorescing chlorophylls within the PCP monomer is extremely weak. The quite unique property allows us to independently monitor fluorescence of each of the chlorophylls and obtain valuable information about the energy splitting, spectral dynamics of the fluorescence and energy transfer from peridinins to chlorophyll.

BP 13.2 Tue 12:45 H44

Resonante Ramanspektroskopie an Photosystem I und II — •Katharina Brose[1], Norman Tschirner[1], Christian Thomsen[1], Athina Zouni[2] und Peter Hildebrandt[2] — [1]Institut für Festkörperphysik, TU Berlin, Deutschland — [2]Institut für Physikalische und Theoretische Chemie, TU Berlin, Deutschland

Pflanzen wandeln Photonenenergie mit Hilfe zweier photochemischer Komplexe, genannt Photosystem I und II, in chemische Energie um. Das Licht wird dabei von Pigmentkomplexen absorbiert und die Energie über Elektronenübergänge in das Reaktionszentrum des Photosystems geleitet. Dort wird die Energie zur Oxidation von H_2O zu O_2 und zur Reduktion von $NADP^+$ zu NADPH verwendet.

An belichteten und unbelichteten Proben wurden im sichtbaren und nahen infraroten Wellenlängenbereich resonante Ramanspektren aufgenommen und mit Hilfe einer Differenzmethode[1] ausgewertet. Ziel war die Untersuchung des Einflusses einzelner Pigmente (vornehmlich Carotine und Chlorophylle) innerhalb des Reaktionsablaufs für die verschiedenen Photosysteme.

[1] A. P. Shreve, N. J. Cherepy and R. A. Mathies, Appl. Spectrosc., 46, 707 (1992)

BP 13.3 Tue 13:00 H44

Light Guidance by Living Cells — •Kristian Franze[1,2], Jens Grosche[1], Serguei Skatchkov[3], Stefan Schinkinger[2], Detlev Schild[4], Ortrud Uckermann[1], Kort Travis[2], Andreas Reichenbach[1], and Jochen Guck[2] — [1]Paul-Flechsig-Institute of Brain Research, Universität Leipzig — [2]Soft Matter Physics, Universität Leipzig — [3]CMBN, Universidad Central de Caribe, Bayamon, USA — [4]DFG Research Center, Universität Göttingen

While cells are mostly transparent they are phase objects that differ in shape and refractive index. Any image that is projected through layers of cells will normally be distorted by refraction, reflection, and scattering. Strangely, the retina of the vertebrate eye is inverted with respect to its optical function and light must pass through several tissue layers before reaching the light-sensitive photoreceptor cells, with each photon having a chance of being scattered. Here we report how nature has optimized this apparently unfavourable situation. We investigated the optical properties of retinal tissue and individual Müller cells, which are radial glial cells spanning the entire thickness of the retina. We found that these cells act as optical fibers and guide light that would otherwise be scattered from the retinal surface to the photoreceptor cells. Their parallel arrangement in the retina is reminiscent of fiber-optic plates used for low-distortion image transfer. Thus, Müller cells seem to mediate the image transfer through the vertebrate retina with minimal distortion and low loss. This finding explains a fundamental feature of the inverted retina as an optical system and it ascribes a new function to glial cells.