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Photosystem I from the thermophilic cyanobacterium *Thermosynechococcus elongatus* for photobiotechnology

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Oxygenic photosynthesis is the energetic basis of virtually all life on earth. Photosynthetic organisms employ two large pigment-protein supercomplexes (so called photosystems) to drive the light reactions. Photosystem I (PSI) catalyses the light-induced electron transfer from plastocyanin or cytochrome (cyt)$c_6$to ferredoxin (ultimately to NADP). The X-ray structure of PSI from *T. elongatus* at 2.5 Å resolution revealed a trimeric protein consisting of 12 peptide subunits and 127 cofactors per monomer[1]. The high stability of PSI from *T. elongatus* renders it suitable for biotechnological applications. Our focus is on biophotoelectrodes[2]. Coupling cyt *c*from horse heart to a gold electrode and letting PSI bind to the coupled cyt *c* aligns the PSI, producing a unidirectional photocurrent[3]. Interestingly,horse heart cyt *c* is a better electron donor to PSI than the native cyt c_6. Until today, there is no clear localization of the binding site of cyt *c* on PSI.We have been able to construct a biophotoelectrode with cyt *c* and PSI[2] and further improved it by introducing a DNA-scaffold[3]. To further elucidate the cyt *c* binding site, we have measured the interaction between horse heart cyt *c* and *T. elongatus* PSI and found low pH and low salt concentrations to be beneficial for the formation of a stable complex. Crystallization of PSI in the presence of cyt *c* gives crystals with a ~1:1 ratio of both proteins. Knowledge about the binding site will help to improve biotechnological applications and the understanding of the interaction in nature.

Biography:

Prof. Dr. Athina Zouni studied chemistry at the Free University of Berlin. After receiving her doctorate in biophysical chemistry, she broadened her knowledge in biophysical methods at the Max Planck Society`s Fritz Haber Institute in Berlin. In 1995, she signed up for the glorious adventure of photosynthesis research at the Technical University of Berlin involving work on the crystallization, X-ray structure analysis and function of photosystem II. Her successes in the field of photosynthesis led in 2009 to her habilitation and appointment as a Visiting Professor in the Chemistry Faculty at Technical University in Berlin. In 2012, she relocated her lab to the Department of Biology at Berlin`s Humboldt University, where the focus of her research is now the “Biophysics of Photosynthesis”. In the last years, she has invested her energy in the field of biotechnology applications of photosystem I as an important model for approaches to artificial photosynthesis.