

## Photosynthetic proteins: structure and function

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Billions of years of evolution resulted in the development of a highly efficient photosynthetic apparatus that can serve as a template for future biomimetic devices. In this talk, I will describe the physical principles utilized by nature in Photosystem I (PS I) - a major photosynthetic pigment-protein complex that initiates photosynthesis in all green plants and numerous types of bacteria and algae. I will present the results of our optical time resolved experiments combined with structure based simulations, which reveal the dynamics and pathways of energy and electron transfer processes in PS I in real time. In the second part of my talk I will address one of the problems nature had to solve to develop oxygenic photosynthesis -- protection of chlorophyll molecules that can degrade within minutes if left unprotected under sunlight. In particular, I will discuss the novel photoprotection mechanism recently discovered by my group that possibly involves the formation of triplet excitons or eximers in strongly coupled photosynthetic antennae and appears to increase photostability of photosynthetic complexes by ~3 orders of magnitude.

