SFB 1078

Protonation Dynamics in Protein Function

Mon, **October 26,** 2020

16:00 – 17:00

Freie Universität Berlin

via WebEx

Colloquium

Dr. Jan Schuller

SYNMIKRO Research Center and Philipps University Marburg

Structural snapshots of the dynamic photosynthetic machinery

Where does life on Earth get its energy? It can all be traced back to one process: photosynthesis. Plants, algae and cyanobacteria convert light energy into chemical energy using highly optimized pigment-protein complexes that are embedded in specialized membrane compartments called thylakoids. A focus of my lab is to understand the dynamic photosynthetic machinery - the mechanism how the core photosynthetic machinery adapts to external environmental cues. I will present two highlights of the latest work done in my laboratory.

For cyanobacteria that live in aqueous environments the bioavailability of dissolved inorganic carbon is severely growth limiting. To survive under low CO2 conditions, cyanobacteria have evolved active and facilitated uptake systems which as a whole build up the highly effective carbon-concentrating mechanisms (CCM) to enhance photosynthetic CO2 fixation. We show here how modular adaptations enabled the cyanobacterial photosynthetic complex I to concentrate CO2 using a redox-driven proton-pumping machinery.

Another important environmental stress-factor is photodamage, the oxidative damage of the D1 core subunit of PS II. This leads to constant turnover, repair and de-novo biosynthesis of the PSII complex. While a solid knowledge base about the mechanism of the core photosynthetic machinery emerges, nearly nothing is known how these complicated molecular machines are assembled from numerous single proteins and non-protein cofactors. We present here the high-resolution cryoEM structure of a key PSII biogenesis intermediate with several assembly factors bound and reveal how nature's water splitting catalyst is assembled, protected and prepared for photoactivation. Our work allows us to describe for the first time a comprehensive and mechanistic model for the molecular assembly line of a membrane-bound bioenergetic machine.

www.sfb1078.de