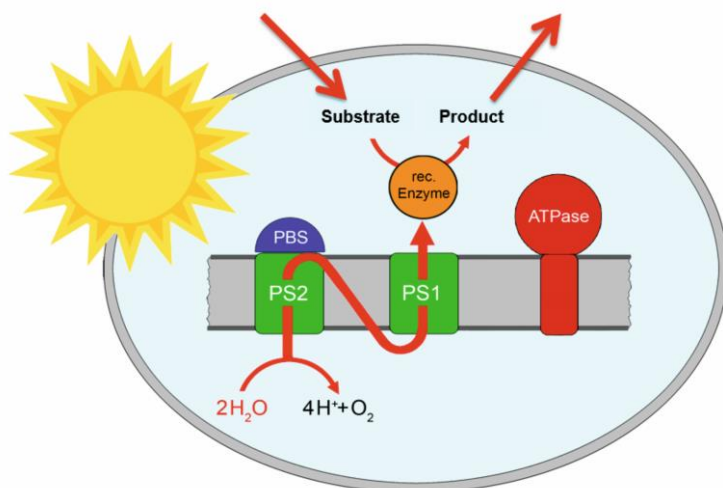


Project Marc Nowaczyk:

Light-driven lipid conversion with recombinant cyanobacteria

Background and preliminary work: Photosynthetic microorganisms like cyanobacteria generate NADPH through light-driven oxidation of water. We have recently coupled NADPH-dependent enzymes to the photosynthetic redox metabolism of cyanobacteria in collaboration with the group of Robert Kourist, TU Graz. This *in vivo* photo-biocatalytic platform was for example successfully applied for the enantioselective reduction of C=C bonds by a recombinant enoate reductase reaching product titers up to 2 g/L.



Work planned: In the proposed project, novel redox enzymes will be introduced into the previously established photo-biocatalytic platform. Main objective is the efficient coupling of oxidoreductases (e.g. fatty acid decarboxylases) to the cyanobacterial redox metabolism that will be realized in a two-step process. A) The electron transfer from photosystem 1 (PS1) towards the oxidoreductase will be optimized with our recently established modular toolbox for biophotoelectrochemistry with immobilized photosynthetic proteins. This setup mimics photosynthetic electron transfer *in vitro* and particularly, it enables engineering of individual electron transfer reactions. This approach will include scaffolding of redox partners via high affinity protein-protein bricks that have been recently developed by the Nowaczyk group. B) The optimized pathway will be introduced into selected host strains (e.g., engineered for enhanced electron supply) and the performance as well as changes in the cellular redox metabolism of the resulting producers will be characterized *in vivo*.

Selected references:

Nowaczyk MM & Kourist R (2016) Lichtgetriebene Ganzzellbiotransformation mit rekombinanten Cyanobakterien Biospektrum 22:765

Königer K, Gómez Baraibar Á, Mügge C, Paul CE, Hollmann F, Nowaczyk MM, Kourist R. 2016. Recombinant cyanobacteria for the asymmetric reduction of C=C bonds fueled by the biocatalytic oxidation of water. Angew Chem Int Ed Engl 55:5582-5585

Plumeré N, Nowaczyk MM. 2016. Biophotoelectrochemistry of photosynthetic proteins. Adv Biochem Eng Biotechnol, doi: 10.1007/10_2016_7