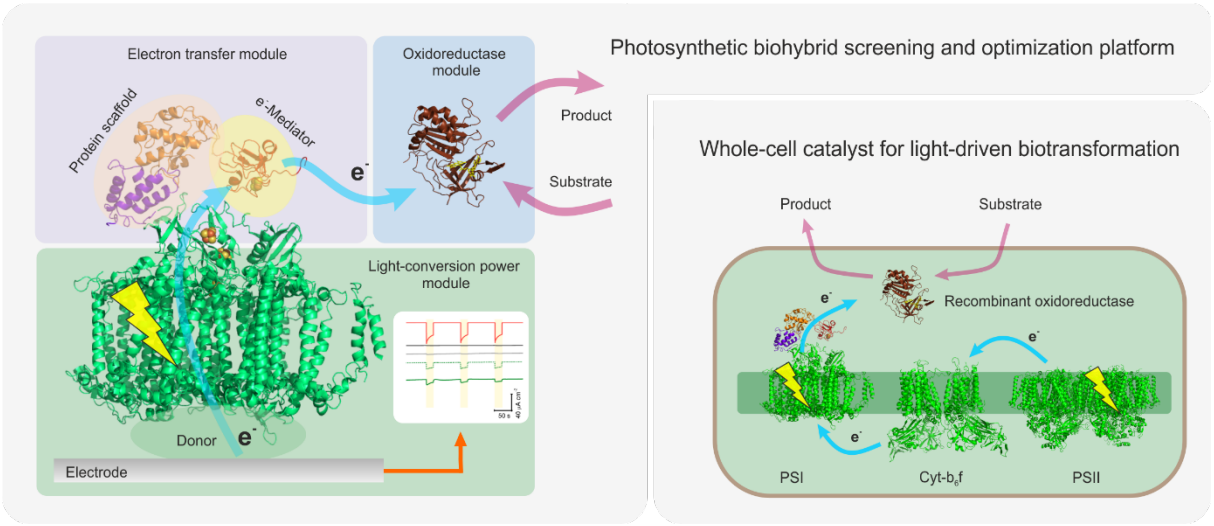
Marc Nowaczyk: Light-driven redox biotransformation with recombinant cyanobacteria

The process of oxygenic photosynthesis leads to the formation of redox equivalents, which can be used to drive whole-cell biotransformations. In this concept, recombinant oxidoreductases are coupled to photosynthetic electron transport for light-driven conversion of externally supplied substrates, with water as the primary electron donor. We have shown in a pilot study that overexpression of an ene-reductase from *Bacillus subtilis* in *Synechocystis* sp. PCC 6803 leads to high conversion rates and product titers. Further investigations revealed that this system is limited by electron supply due to the strong artificial electron sink, which can be optimized by streamlining of the electron transfer. Additionally, we have developed a universal screening platform based on isolated proteins and protein complexes to mimic and optimize electron transfer, which was also successfully tested as light-driven NADPH recycling systems to fuel double-bond or ketone reductases in vitro. Moreover, the IM7/E7 protein scaffold system was established to fuse components of the chain for confined electron transfer. These tools are now available to further facilitate the development of light-driven redox biotransformations in vitro or in vivo.



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