

# Towards Synthetic Biology of Photosynthesis

Prof. Dr. Dario Leister

*Ludwig-Maximilians-University Munich, Faculty of Biology, Munich, Germany*

Oxygenic photosynthesis is imperfect and the evolutionary patchwork nature of the light reactions of photosynthesis in plants provides ample scope for their improvement. In fact, only around 1-2% of the incident solar energy is used in photosynthesis and obvious measures to decrease energy loss are to expand the solar spectrum used by photosynthesis and to shift saturation of the process to higher light intensities. Indeed, even slight enhancements of the efficiency or stress resistance of the light reactions of photosynthesis should positively impact on biomass production and yield. Therefore, the light reactions of photosynthesis are a prime target for genetic engineering, synthetic biology approaches and laboratory evolution. Strategies include (i) enhancement of the process per se in vivo to increase light use efficiency, (ii) coupling the light reactions of photosynthesis with previously unconnected pathways to directly utilize the reducing power of the light reactions to produce high-value compounds, and (iii) use of photosystem I in hybrids with biotic or abiotic components to produce in vitro for instance hydrogen or electricity. In this talk, examples of such approaches from our laboratory will be presented.