AKE 3: Pathways for Biological Photosynthesis and Carbon Fixation

Time: Monday 14:00–14:30 Location: B 0.014

Invited Talk AKE 3.1 Mon 14:00 B 0.014

CETCH me if you can - Bringing inorganic carbon into life with synthetic CO_2 fixation — •Tobias Erb — Max Planck Institut for Terrestrial Microbiology

Carbon dioxide (CO_2) is a potent greenhouse gas that is a critical factor in global warming. At the same time atmospheric CO_2 is a cheap and ubiquitous carbon source. Yet, synthetic chemistry lacks suitable catalysts to functionalize atmospheric CO_2, emphasizing the need to understand and exploit the CO_2 mechanisms offered by Nature.

In my talk I will discuss the evolution and limitation of naturally existing CO_2 fixing enzymes and pathways, present strategies for the engineering and design of artificial CO_2 fixation reactions and pathways (Peter et al. 2015), and outline how these artificial pathways can be realized and further optimized to create synthetic CO_2 fixation modules (Schwander et al. 2016).

An example for such a synthetic CO_2 fixation module is the CETCH cycle (Schwander et al. 2016). The CETCH cycle is an in vitro-reaction network of 17 enzymes that was established with enzymes originating from nine different organisms of all three domains of life and optimized in several rounds by enzyme engineering and metabolic proofreading. In its version 5.4, the CETCH cycle converts CO_2 into organic molecules at a rate of 5 nanomoles of CO_2 per minute per milligram of protein. This is slightly faster than the photosynthetic CO_2 fixation process in plants under comparable conditions and notably at 20% less energy per CO_2 fixed.