Single-cell orchestration of N_2 fixation and photosynthesis in *Trichodesmium*

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Since the N_2-fixing enzyme nitrogenase is inhibited by O_2, all diazotrophic cyanobacteria have to separate N_2 fixation from photosynthesis either in time or in space. For the globally important, filamentous cyanobacterium *Trichodesmium*, it is not resolved how this is accomplished, as previous work has yielded contradictory findings on the existence of specialized cells as well as indications for a partial separation over the diel cycle and short-term dynamic changes in photosynthesis. In this project, we investigate how these different mechanisms are coordinated to protect nitrogenase from O_2. I will present first results on the single-cell separation of photosynthesis and N_2 fixation on the level of gene expression (based on mRNA FISH) and C and N_2 fixation rates (based on nanoSIMS). Also, I will discuss single-cell differences in photosynthesis based on preliminary results from confocal microscopy and FLIM.