SC3.3 - Source-sink regulation of photosynthesis in single-cell derived lineages of cyanobacteria

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Photosynthesis is regulated in response to many diverse stimuli including light intensity and wavelength, nutrient availability, and temperature. Understanding how photosynthesis is regulated is critical if we are to increase photosynthetic efficiency for the benefit of society and the environment. To investigate how photosynthesis is regulated in single-cells, we utilized long-term, quantitative time-lapse fluorescence microscopy to visualize the growth dynamics of wild-type and mutant cyanobacterial strains while controlling temperature, light, nutrient, atmospheric composition, and growth-substrate properties. Quantitative image processing with custom algorithms enabled us to track individual cells and single-cell derived lineages for multiple generations and monitor cellular physiology at sub-cellular resolution. These studies provide insight into how photosynthetic organisms navigate the physical environment and a new perspective on source-sink regulation of photosynthesis.