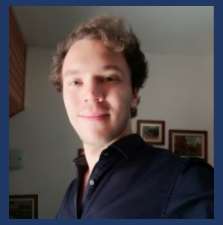
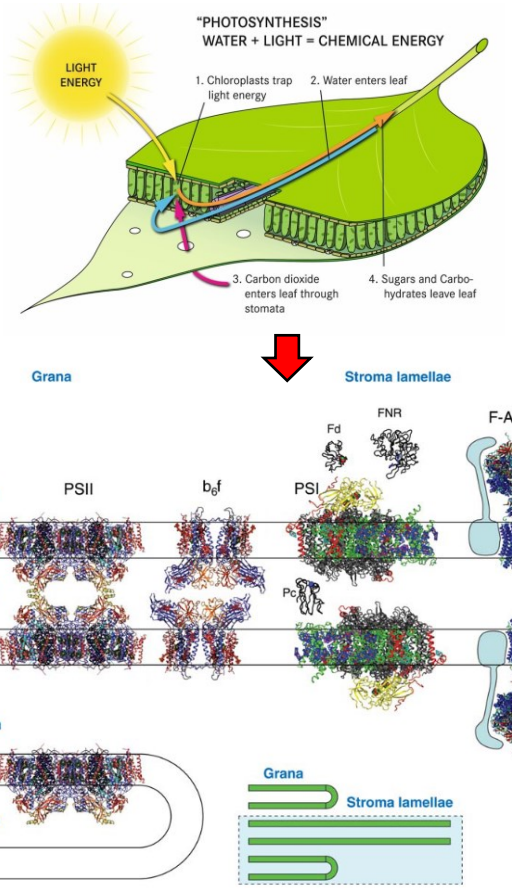


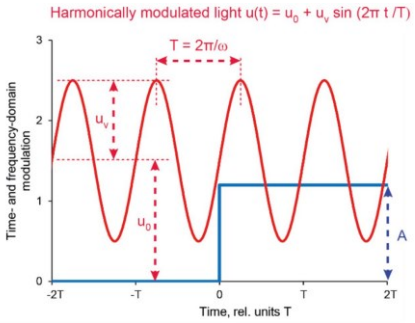
Andrea Lodetti

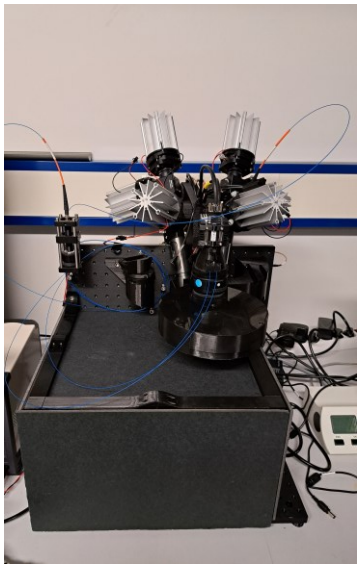
Probing dynamics of photosynthesis regulation in plants by forced oscillation light

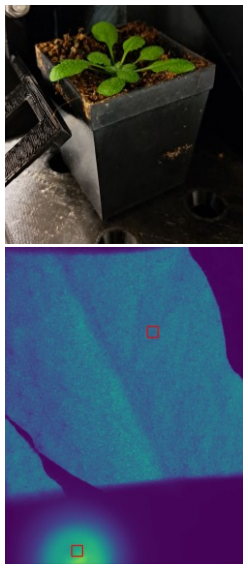
Shizue Matsubara, Uwe Rascher, Oliver Ebenhöh



Rationale: light intensity in nature is fluctuating and can be considered as the sum of single-frequency sinusoidal waveforms (harmonics). The use of sinusoidally oscillating light as actinic light source is a promising method (compared to the traditionally used constant light) to better understand how photosynthesis operates in plants' natural habitats.



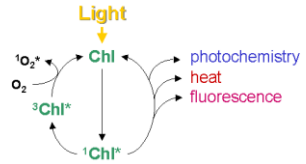


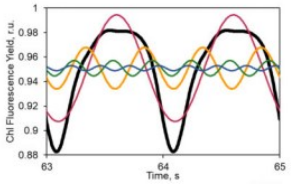


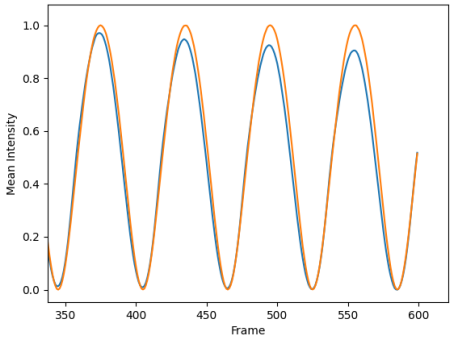
Experimental approach: exciting photosynthesis dynamically in *Arabidopsis thaliana* through harmonic modulation of light intensity, varying its frequency and amplitude. The chlorophyll fluorescence response is often non-linear and presents upper harmonics, indicating that regulation mechanisms are active.

The new macroscope prototype (DREAM) is a flexible instrument that can operate with multiple wavelengths and light modulations.

Overview: Photosynthesis in higher plants is orchestrated by different protein complexes and regulation mechanisms, the latter operating on different time scales.







The fluorescence intensity (blue) phase and amplitude are different compared to the actinic light (orange), indicating the presence of active regulation.

References: European Space Agency; Nelson et al. (2006), Annu. Rev. Plant Biology; Nedbal et al. (2021), Plant Physiology; www.photosynthesis.ch

dream

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