Title	**Extending the red limit of oxygenic photosynthesis: basic principles and implications for biotechnological applications to improve crops and photobioreactors**
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Research Group	EPR spectroscopy/Biophysics– DiSC
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Project description:

Photosynthetic organisms developed highly diversified strategies to optimise light harvesting and photochemical conversion in response to the spectral characteristics of environmental lights. Some of the most challenging conditions are those combining low photon fluxes and high enrichment in Far Red/Near-Infrared (FR/NIR) radiation. An increasing number of cyanobacterial species were found to possess the far-red light photoacclimation (FaRLiP) response, which involves a large re-shaping of the photosynthetic apparatus accompanied by the replacement of about 15% of the oth-erwise ubiquitous Chlorophyll (Chl)a with the intrinsically red-shifted Chlf and Chld, thereby extend-ing the FR/NIR absorption cross-section. This response however sets a general problem: whereas it increases FR/NIR absorption, it also estab-lishes a competition for excited state localisa-tion with the photochemical reaction centre (RC).

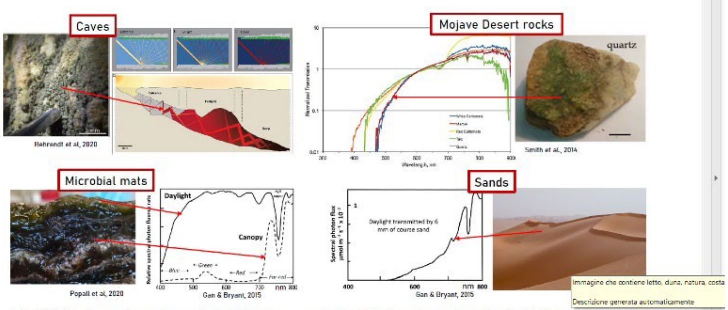

Fig. 1. Light spectra experienced by cyanobacteria living in caves, rocks, microbial mats, sands or soils are characterized by a weak component in the short VIS wavelengths and by a strong enrichment in the NIR, for wavelengths between 700 and 800 nm.

The FaRLiP response has only recently been discovered and the underlying mechanisms by which the photosynthetic efficiency is retained remain to be fully understood. In collaboration with biologists, the project aims at addressing some key questions by understanding the basis of FaRLiP energetics and the functionality of ChlF-synthase, which is of paramount importance for the transferability of this response to NON-FaRLiP organisms, and for its potential biotechnological exploitation to improve crops and photobioreactors In the EPR LAB we use advanced Electron Paramagnetic Resonance to study the photinduced radical pairs and get insight into molecular requirements for efficient photoconversion.

Hosting group(s) for the period abroad (tentative list, may change):

RNDr. Radek Litvín, Ph.D. Institute of Plant Molecular Biology, České Budějovice
Dr. Alice Bowen, Department of Chemistry, Manchester UK
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