

Graz, 17.03.2025

BSc, MSc and PhD thesis projects in Biochemistry

Topic - Red light control of phosphatase activity

Almost all organisms on earth need to respond to changes in environmental light conditions. This is accomplished by specialized proteins, so called photoreceptors, that allow sensing of different light qualities from the UV to the near-IR. Red-light sensing phytochromes are one interesting photoreceptor group because of their central role in many naturally occurring adaptation processes, but also promising properties for applications in the field of optogenetics [1]. In the past, we have characterized one bacterial system fused to an enzymatic functionality in quite some detail [2], which enabled us to highlight the functional importance of a characteristic linker element that integrates the light signal from the sensory domain and also regulates the activity of the downstream effector domain.

To expand our understanding of allosteric signal integration in phytochromes we are now focusing on a different enzymatic output functionality: metal-dependent phosphatases. Since the corresponding phosphatase activity might not require dimerization of the phytochrome it will be interesting to address signal integration in this so far uncharted phytochrome terrain by means of biochemistry, structural biology and functional mass spectrometry. A recently granted FWF-project (DOI: [10.55776/PAT6932824](https://doi.org/10.55776/PAT6932824)) provides funding for a PhD and Post-Doc position, but also interesting BSc and MSc theses can be conducted in the framework of this new project. For further information, please contact Andreas Winkler (andreas.winkler@tugraz.at)

[1] Hughes and Winkler (2024) New insight into phytochromes: connecting structure to function. *Annual review of plant biology*. **75** (1), 153-183

[2] Gourinchas, *et. al.* (2017) Long-range allosteric signaling in red light-regulated diguanylyl cyclases. *Science Advances*. **3**, e1602498

