



Proposition d'un stage M2 printemps 2020

Can fluorescent proteins be further improved ?

Fluorescent proteins like the well-known GFP (green fluorescent protein) serve as genetically encoded biological fluorescent markers of unequaled selectivity. They allow to observe the localization and number of individual proteins in the cell. This amazing performance has, however, its limits: being “soft matter”, most FPs show unexpected/undesired side reactions and only moderate photo-stability (as compared, e.g., to organic dyes or quantum dots). On the upside, the “softness” of FPs holds the key for their adaptability to ever newer functions such as, e.g., use in sensors, for sophisticated tracking techniques or advanced microscopy modalities.

Few mutations can introduce changes in a whole row of photophysical properties, such as absorption wavelength (color), emission wavelength (fluorescence color), quantum yield (brightness), but also the possibility of photo-induced changes (photo-activation, photo-commutation), opening the way to optogenetics (artificial light-inducible biological switches). Every new variant first needs to be thoroughly characterized. To this end, we developed a dedicated instrument for simultaneous absorption and fluorescence spectroscopy under a wide range of environmental physico-chemical conditions, such as temperature, pH or oxygen concentration.

The aim of this M2 internship is to further evolve the instrument (named “cal(ai)²doscope) to even larger possibilities, notably faster time resolution, and to use it for testing of new FP variants recently developed in the lab. We are looking for a student that is eager to apply her physical expertise to a fancy but capricious (class of) proteins that still hold ready the most interesting surprises.

The project consists of:

- learning to pilot the Cal(ai)2doscop, a versatile homebuilt fluorescence microspectrometer,
- measuring fluorescence kinetics in various protein samples under a range of conditions (illumination, environment)
- data treatment using Origin,
- and, in a feedback-loop manner, reflections on how to overcome the observed limitations.

Finally, in the team, the competences are available for mutagenesis and/or crystallography, if interest meets needs. There exists a possibility to apply for a PhD fellowship.

If you are interested, don't hesitate to contact

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