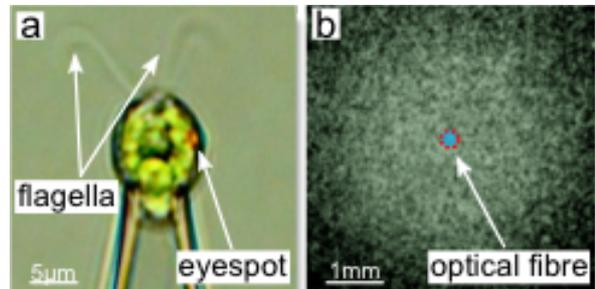


How do microorganisms move towards light?

Photosynthetic microorganisms are fundamental primary producers: they are at the base of major food webs (e.g. in the oceans), and contribute about half of the global oxygen production. They are also one of the most promising systems for biofuel development, with unparalleled conversion rate of solar energy to carbon-rich molecules and negligible pressure on arable land. Many of these organisms -including biotechnologically important species- are motile, and adapt their motility in response to light in a poorly understood process known as phototaxis. Phototaxis will in turn modulate the intensity and spectral composition of light captured by the chloroplast, thereby determining its photosynthetic activity. At the same time, with natural light conditions easily leading to lethal stress on the photosynthetic apparatus, these microorganisms are also capable of biochemical photoprotection, commonly known as non-photochemical quenching (NPQ). Activating NPQ can be thought -to first approximation- as being equivalent to lowering light intensity. Phototaxis, photosynthesis, and photoprotection are interconnected, and can be thought of as the three main components of a -possibly complex- dynamical system whose behaviour has a profound impact on the fitness of photosynthetic microorganisms.

This system, however, *has not been studied before*.



The aim of this Ph.D. project is to begin exploring specific aspects of this connection quantitatively, through experiments and modelling, as part of a wider, comprehensive plan to develop a realistic model of phototaxis. The student will receive training in both experimental biophysics at the cellular level (micromanipulation, video microscopy, image analysis), and cell biology with a focus on chloroplast activity (as part of the establishment of a new collaboration with a Life Sciences group).

The ideal Ph.D. candidate will have a strong interest in experimental biophysics, and the will to be challenged and step out of the comfort zone. A solid physics background especially in statistical physics is important. Programming experience, previous training in soft matter, biophysics, light microscopy are desirable.

For more informations and informal discussions, please contact Dr. Marco Polin (m.polin@warwick.ac.uk). See also mpolin.wordpress.com).