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Flow around eukaryotic flagella

This talk will focus on different aspects of flagellar locomotion of green algae *Chlamydomonas* on the micrometric scale. First, we will discuss recent experimental attempts to externally control the beating dynamics of eukaryotic flagella by means of generating external flow fields around the flagellated cell. In these experiments, we dynamically interact with flagellated microorganisms in real time, by generating an externally controlled periodic forcing of hydrodynamic origin. The conditions under which we can externally control the beating frequency of the organism will be detailed. Second, we will focus on the flow velocity field generated by the motion of the flagella and characterize the hydrodynamic forces acting on the flagella. An experimental flow velocimetry technique based on the use of optical tweezers is developed to measure the unsteady flow velocity around a living organism. This study highlights the importance of an often forgotten term in the Stokes equation: the unsteady term.