Graduation in fluid mechanics : HYDRODYNAMICS OF FLAGELLAR MICROMOTILITY

Masters graduation project

Delft University of Technology

Laboratory for Aero & Hydro Dynamics

HYDRODYNAMICS OF FLAGELLAR MICROMOTILITY

Probing flagellar motility: Development of a micropipette experimental set-up

Problem:

Motile cilia and flagella are micron sized hair-like cell projections and are central to a variety of physical processes such as locomotion, fluid transport, mixing and mechanical signal transduction. The ability of cilia to generate micron-scale flow patterns well suited to a variety of biological processes is of tremendous interest in micro-system engineering and a source of inspiration for biomimetic microfluidic devices. The capacity of cilia to manipulate, mix and transport fluid relies on its unique ability to interact with the surrounding fluid by spontaneously *beating and synchronizing* - two key phenomena, which stand unresolved

Project:

The goal of this project is to develop an experimental platform allowing the detailed investigation of fluid-structure interactions between moving flagella and a surrounding fluid. These interactions are at the heart of the synchronization mechanism. You will develop a micropipette set up and a flow chamber to integrate under an inverted microscope. This will allow you to investigate the fluid-structure interaction problem, by holding the motile cells fixed via micropipette aspiration and visualizing the cell and the surrounding flow. Our goal is to gain fundamental understanding on the dynamical mechanisms at play and identify the minimal mechanical ingredients allowing flagella to beat.

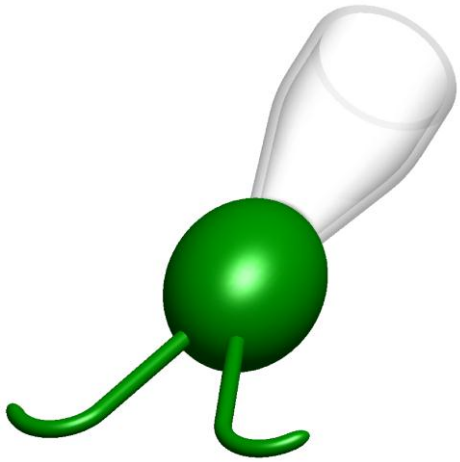

Figure 1: Schematic representation of the experimental set up. A motile algae is held fixed at the tip of a glass micropipette via aspiration.

This project can be used to finish your M.Sc.-study Mech.Eng. in “SFM”, “SPET” or “PME”. For more information you can contact Daniel TAM.

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