Introduction

Flow Cytometry is a method to count biological cells. When these cells are stained with dyes which bind specifically to certain cell types the same method by virtue of using lasers of different wavelength can be used to identify the cells as well. For instance from blood the different cell types can be identified. At the beginning this was bulky equipment but in the today’s state-of-the-art these can be table top instruments. Currently there are also microfluidic chips that contain the flow system of the flow cytometer, enabling further miniaturization. An important microfluidic flow function is to line up the cells into the center of a streaming liquid called the sheath flow, so the cells can be counted one at a time. However the sheath flow is a three dimensional construct and it requires a multistep fabrication protocol to realize such a design in a microfluidic chip. We invented a 2D microfluidic chip design that still creates a sample flow in the center of a 3D sheath flow. Consequently the chip can be produced for low cost and can be utilized as a disposable.

Project

The student master project is first about simulating the flow paths of the flow system, establishing the shear forces as experienced by cells and calculate the optimal liquid fluxes for sample and sheath flow. Secondly you will assemble the microfluidic chip, setting up the optics and finally realize results underpinning the usefulness of the design. Due to the multidisciplinary approach (microfluidic design, analytical set-up, fluid dynamics, simulations and optics) you will learn to concur a real life problem as you would encounter in industry. We judge this project as challenging and if successful may very well lead to your first official publication* in cooperation with Prof Den Toonder and Dr. Pelssers. The project will be carried out at the Microfab lab of the TU/e.

* Since Dr. Pelssers is part time fellow at the TU/e for Philips, pending agreement of Philips