200903

KEX-project at Scilifelab (next to Karolinska Institutet), Department of Applied Physics, KTH:

"Building a Fluorescence Correlation Spectroscopy (FCS) instrument followed by testing the boundaries of FRET-FCS"

FCS is a technique that analyzes concentrations, sizes, fluctuations and interactions of biomolecules (usually proteins), in solution or in living cells. As the biomolecules diffuse through a focused laser beam (~0.4 μm diameter) they give rise to fluorescence bursts, which are analyzed by auto- or cross-correlation to give information about the concentration, sizes etc.

The task is to build an instrument for Fluorescence Correlation Spectroscopy (FCS). When this is done the instrument will be used to test the boundaries of a newly developed variant called FRET-FCS (Förster Resonance Energy Transfer). The task will thus involve a little bit of research.

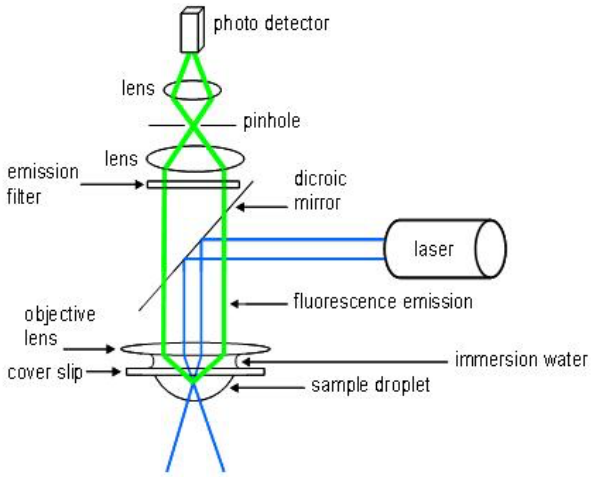


Figure 1. Principle of an FCS setup. The laser light (blue) is reflected by a dichroic mirror into a microscope objective (depicted by an objective lens in this figure) which focuses the laser light inside the sample droplet. Fluorescence light (green) is generated from (for example) dye-labeled protein molecules during the short time that they reside in the laser focus, and is detected by an APD detector after passing through a pinhole in the image plane.

Building the instrument is not very difficult and a good way of getting acquainted with the technique. Research on FRET-FCS is needed for us to understand the capacity of this new FCS-variant. We know already that it has a unique ability to detect rare peptide oligomers of Amyloid Beta in solution (Alzheimer's disease) when they are FRET-active (Wennmalm et al, *Analytical Chemistry*, 2015). We would now like to know the detection limit of FRET-FCS, i.e. how small fractions of FRET-active oligomers that can be detected.

The students will be free to design the FCS setup as they like as long as they can make it work effectively. Also during testing of the FRET-FCS technique the students will be given much freedom.

You are welcome to call me, Stefan Wennmalm 073 712 14 39, and ask any questions you may have about this KEX-jobb.