

Master Thesis Project: Nanofluidic-Based Approaches to Study DNA-Protein Interactions on the Single Molecule Level.

Background:

During the last two decades, methods to study DNA and DNA-protein interactions on the single molecule level have become tremendously popular. A vast majority of these methods rely on the anchoring of the DNA molecule to a surface or a bead.

We are developing methods for single molecule DNA analysis, based on nanofluidics, where there is no need for any anchoring of the molecule. Injecting a DNA-molecule into a channel with dimensions down to 100×100 nm will lead to that the molecule stretches out along the channel. Studies of DNA in nanochannels have been used to understand the polymer physics of DNA and for investigating DNA-protein interactions.

Project:

We wish to use fluorescence microscopy and nanofluidic channels to explore both the formation of and physical properties of DNA-protein complexes on the single DNA molecule level. We will use nanochannels that change in width gradually to expose one single DNA/protein complex to different degrees of confinement in one single chip. Studies in nanofluidic channels are of extra relevance since the forces the DNA is exposed to can be compared to the forces that are present inside living cells. Initial focus will be on recombination proteins since they form long and stiff filaments on DNA that change the physical properties of DNA significantly. Such proteins are of relevance since they are involved in DNA repair and in maintaining genetic diversity.

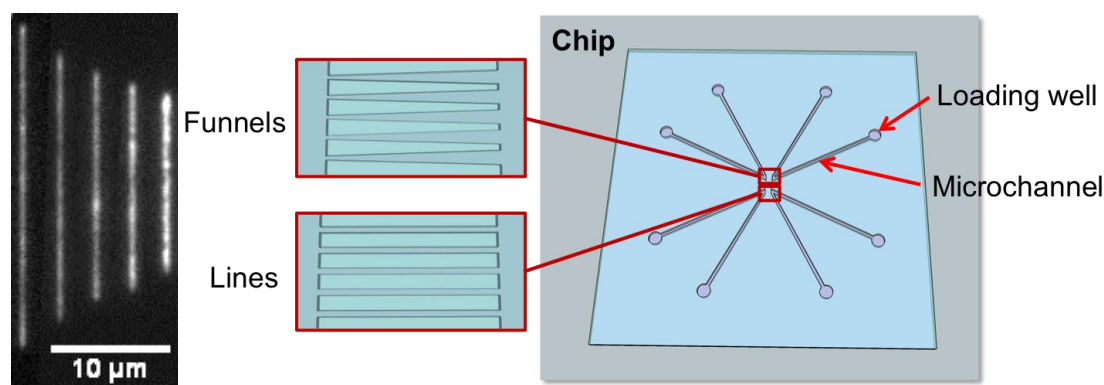


Figure: Left: fluorescently labeled DNA at different positions along a nanofluidic funnel. As the funnel gets wider the DNA is less and less extended. Right: A schematic of a nanofluidic chip.

Person:

We are looking for highly motivated student with an interest in interdisciplinary research on the borders of biophysics and nanotechnology. The project can be either 30 or 60 credits.

Contact:

If you are interested in the project or have any further questions please contact:

Fredrik Westerlund, Assistant Professor

Chemical and Biological Engineering, Chalmers University of Technology

fredrik.westerlund@chalmers.se, Tel: 031-772 3049