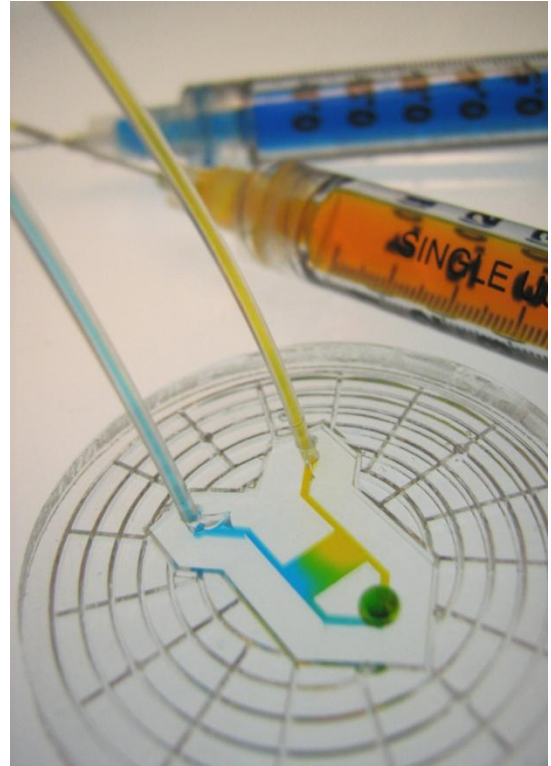


## Software development for automated tracking of unlabeled cells in advanced microfluidic cell culture systems

### *Background and project description*

Microfluidic technology has the potential to revolutionize experimentation with living cells *in vitro*, as it enables precise manipulations of cells together with high content analysis of cell responses. Microfluidic cell-based assays may in the future be widely used for clinical diagnostic applications, state-of-the-art drug development and basic medical research.

The current project is focused on developing software for analyzing cell behavior and cell migration in novel in-house developed microfluidic devices, which allow formation of predictable concentration gradients in advanced cell culture systems. In all living organisms gradients of signaling molecules control biological processes such as cell survival, signaling, activation, migration and differentiation. The ability of cells to respond to gradients is essential to all aspects of developmental biology, and important for physiological and pathological organ function.



Tracking of cell movements in various cell culture setups is essential to many researchers in the life science sector. We at Gradientech have developed a unique microfluidic system, CellDirector that academic researchers will use to study how concentration gradients of soluble proteins impact cell migration. Basically, the CellDirectors system allows the researcher to grow cells in stable concentration gradients in a three dimensional gel. Importantly, the cells are not normally labeled with fluorescence. The reason for this is that labeling of cells may impact cell behavior. Both cancer cells and endothelial cells isolated from blood vessels will be analyzed in the projects.

Gradientech will in the near future develop additional high-throughput microfluidic systems for the pharmaceutical industry. These systems will be used by companies to screen the effects of new drugs and chemicals on cells under very controlled cell culture conditions. The new high-throughput systems must be compatible with automated high quality imaging, an again the most common case will be that unlabeled cells are analyzed with regard to directionality of migration, speed, and acceleration. It is also necessary that cell death and cell division can be scored. Also for this application there is a great need to further develop software for high-content image analysis of cell responses.

***Dept. of Medical Biochemistry and Microbiology, Uppsala University***

Research carried out within the Dept. of Medical Biochemistry and Microbiology at the Uppsala Biomedical Center concerns the mechanisms, primarily at the molecular and cellular levels, that together enable life.

***Gradientech AB***

Gradientech AB is a Swedish biotech company developing unique microscale platforms for the cell biology research market. Gradientech AB was founded in 2009 and is a spinoff from Uppsala University.

The MSc work will be carried out at the Centre for Image Analysis in close collaboration with Gradientech AB and the Dept. of Medical Biochemistry and Microbiology, Uppsala University. If you are interested in this MSc project, please contact Carolina Wählby at [carolina@cb.uu.se](mailto:carolina@cb.uu.se)