

Proteomics-On-Chip: Combining Droplet Microarrays and Mass Spectrometry for Single-Cell Proteomics

Position: PhD

Field of research: cell and molecular biology, high throughput cell-based screenings, proteomics

Starting date: 01.01.2021

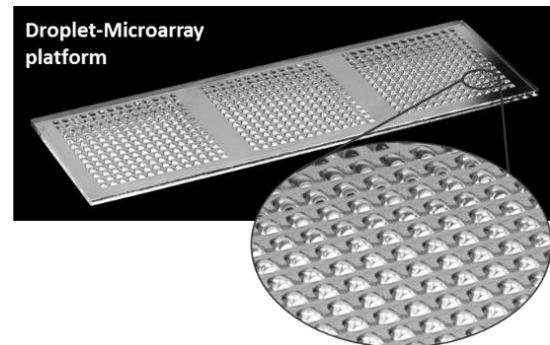
Research group of Prof. Pavel Levkin

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We are searching for an enthusiastic PhD candidate that holds a major in biology, biochemistry, biotechnology or similar.

Description of the project:

Traditional techniques that determine gene or protein expression in bulk cell populations only produce an average molecular pattern, and therefore they are not suitable to assess cellular heterogeneity in biological systems. This has been changed with the advent of single-cell RNA-seq methods, transforming the field of genomics by determining gene expression across multiple individual cells, having a profound impact in mechanistic biology and the clinic. At the protein level, mass spectrometry-based proteomics allows for the unbiased characterization of protein expression in cells and tissue, now reaching the sensitivity to enable proteome profiling at the single-cell level, with the potential to revolutionize the field mirroring what single-cell sequencing has done in genomics. Yet, many steps remain to be optimized to replace existing workflows in bulk-proteomics by miniaturized sample handling procedures, to achieve the sensitivity and throughput demanded by single-cell analysis.

In this project, we will combine expertise in functional materials and interface systems (KIT) with the top expert in mass spectrometry and proteomics (Prof. Krijgsveld, Uni Heidelberg), aiming to establish an integrated platform for single-cell proteome analysis. The project is collaborative and close interaction with PhD students from Prof. Krijgsveld's group is anticipated. In addition, we will closely interact with the existing single-cell community in Heidelberg, and apply single-cell proteomics in many areas of synthetic biology and biomedicine, including cell plasticity during differentiation and reprogramming, disease diagnostics, and ultimately individualized therapy.

