

# nanoSeminar Series 2014

Institute for Materials Science and Nanotechnology

**Prof. Dr. Piotr Garstecki**

Institute of Physical Chemistry of the  
Polish Academy of Science, Poland

## **“Droplet microfluidic tools for microbiology and biochemistry”**

**Thursday, January 30**

**13:00 – 14:00**

Seminar Room 115, Hallwachsstr. 3 (HAL)

Droplet microfluidic systems use microdroplets as miniature reactors and embody the most acclaimed promises of microfluidics: ultra-miniaturisation and throughput. The exquisite control over the micro-reactors is based on the characterization of the fundamental processes of generation and transport of droplets in microchannels. Construction of microfluidic tools for research in chemistry and microbiology requires the additional engineering of automation.

We will demonstrate systems that are remarkably simple in contrast to the complexity and scaling of the number of processes that they perform. We developed a technology for handling processes in microdroplet reactors that provides the flexibility of standard glassware for chemists. In particular, it is possible to i) produce hundreds of individual microdroplet reactors and address each one individually; ii) manipulate the chemical environments of the microdroplet reactors in time and over prolonged intervals; and iii) monitor the chemical processes in each of the microdroplets in parallel.

We will also describe a class of micro-droplet systems that are almost completely passive in the sense that they do not require precise control in order to execute precisely even complex protocols. The combination of the automation and the passive modules allows for expanding the range of applications in chemistry, biochemistry and microbiology. I will present a range of applications ranging from optimization of reaction conditions, incubation of microorganisms and studies of emergence of drug resistance, determination of solubility diagrams of proteins and studies of electrical measurements of transport through membrane proteins.

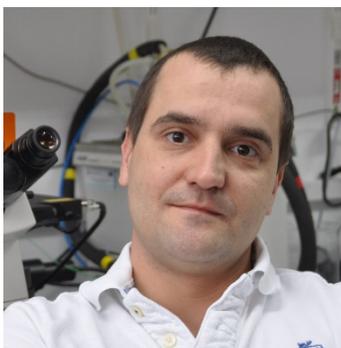


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### Short CV:

Piotr Garstecki is an Associate Professor at the Institute of Physical Chemistry of the Polish Academy of Science, in Warsaw, Poland. He obtained MSc in Theoretical Physics from the College of Science of the Polish Academy in 1998 and PhD in Chemistry from the Institute of Physical Chemistry PAS. He later conducted research as a postdoctoral fellow in the group of Prof. George Whitesides at the Chemistry and Chemical Biology Department at Harvard University.

He currently leads the Research Group of Microfluidics and Complex Fluids at the Institute of Physical Chemistry, Polish Academy of Sciences. The research group conducts research on fundamental aspects of the physics of soft matter systems and of microscale flow and develops microfluidic tools for chemistry and biology. Garstecki coauthors more than seventy scientific publications in the leading journals and few dozens of patent applications in the area of microfluidics.