SMART BioSyM Seminar

Integration of High-resolution Nuclear Magnetic Resonance Spectroscopy with Lab-on-a-Chip Devices

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5pm – 6pm
SMART Enterprise Wing Level 5,
Perseverance Rooms 1 & 2

Nuclear magnetic resonance spectroscopy is one of the most versatile tools for the study of molecular structure and dynamics and the analysis of complex mixtures. It is generic (any molecule containing protons or other NMR active nuclei will yield a distinctive spectrum), and non-invasive. NMR would therefore be an ideal readout technique for microfluidic lab-on-a-chip devices, particularly ones that are designed to support live systems such as cells or tissue slices. However, the integration of NMR spectroscopy with microfluidics is challenging due to the inherently limited sensitivity of magnetic resonance experiments, and due to the requirement for extremely homogeneous magnetic fields. In this talk, I will briefly review the state of the art in this field, and present some of our recent contributions to the design of high-resolution and high-sensitivity NMR detectors and NMR-compatible lab-on-a-chip devices. We have recently succeeded in directly observing the metabolism of a population of human adenocarcinoma cells supported on a chip in a volume of only 4 µL.

Marcel Utz obtained his PhD at the Swiss Federal Institute of Technology (ETH) Zürich, under the guidance of Prof R. R. Ernst and Prof. U. W. Suter. After a postdoc at Princeton University, he joined the faculty at the Institute of Materials Science and Department of Physics at the University of Connecticut in 2000. In 2006, he moved to the University of Virginia, where he was Associate Professor of Mechanical Engineering and of Chemistry. He moved to the University of Southampton in 2012, where he currently holds a Personal Chair in Magnetic Resonance in the School of Chemistry. His research interests are focused on microfluidics, magnetic resonance, and complex materials.