

Seminar series: Selected research topics in Biomedical Engineering

Location: DBE Lecture Room 14.03.002

6. December, 13:00-14:30, host Najat Salameh:

Hyperpolarized ^{13}C Magnetic Resonance - Enabling Real-time Metabolic Imaging

Dr. Arnaud Comment

University of Cambridge

Abstract: Hyperpolarization by dynamic nuclear polarization (DNP) can increase magnetic resonance (MR) sensitivity by several orders of magnitude offering the opportunity to perform real-time in vivo MR imaging (MRI) experiments. Numerous preclinical applications have demonstrated the enormous potential of hyperpolarized ^{13}C MRI for in vivo metabolic imaging and several research hospitals are currently performing studies on patients. Unpaired electron spins are used as polarizing agents to increase the nuclear spin polarization of ^{13}C nuclei located on molecules that can be injected to follow metabolic processes. To take advantage of this technology, a DNP polarizer has to be placed in the vicinity of an MRI scanner and the hyperpolarized ^{13}C -labeled metabolic substrates need to be produced a minute or less prior to the injection. This delay as well as the required synchronization between the production and the injection limits the type and number of in vivo metabolic imaging experiments that can be done. In this lecture, I will present the most recent preclinical and clinical results as well as novel methods that open new opportunities to perform hyperpolarized ^{13}C MRI through the circumvention of some of the limitations of the current hyperpolarization technology.

Curriculum: After having studied physics at EPFL, Arnaud Comment joined the group of Prof. Charles P. Slichter at the University of Illinois, Champaign-Urbana, for a PhD in the field of solid-state nuclear magnetic resonance (NMR). He then spent the following one and half years working in condensed matter physics at the Grenoble High Magnetic Field Laboratory (CNRS/Max Planck Institute). In 2005, he launched a dynamic nuclear polarization (DNP) project at EPFL and continued his research at the Faculty of Biology and Medicine of the University of Lausanne to lead the developments of biomedical applications of hyperpolarized MRI in Lausanne. In 2011, he was awarded a professorship grant from the SNSF and became assistant professor at EPFL. In 2015, he joined General Electric Healthcare as senior scientist to further develop the clinical applications of hyperpolarized ^{13}C imaging. Since 2016, he has also been working on a project supported by an ERC Consolidator grant hosted by the University of Cambridge at the Cancer Research UK Cambridge Institute (CRUKCI). Dr. Comment is the author of over 70 publications, owner of 5 patents. He is a Bye Fellow of St Edmund's College, University of Cambridge. His main research interest is to break new grounds in metabolic and molecular imaging and to lead novel methods and technologies towards clinical applications.