

State-of-the-Art in Magnetic Resonance:

Methods and Clinical Applications

International lecture series organized by the Translational Imaging Center @ sitem-insel in Bern on recent progress and current applications of MR imaging and spectroscopy at standard and ultrahigh fields

Deuterium Metabolic Imaging (DMI), a novel MR-based method to map metabolism in 3D

Prof. Dr. Robin A. de Graaf

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Professor of Radiology and Biomedical Imaging, Yale University

Non-invasive imaging of metabolic pathways in neurological disease has been a long-standing goal to monitor disease progression or therapy efficacy. Positron emission tomography (PET) in combination with $2\text{-}^{18}\text{F}$ -fluoro-2-deoxy-D-glucose (FDG) is currently the only clinically viable metabolic imaging method. However, the high uptake of FDG by normal brain drastically reduces the image contrast and the usefulness of FDG-PET in studying neurological disease. MR-based methods (^1H , ^{13}C , hyperpolarized ^{13}C MRS) are promising but have failed to reach clinical significance due to technical complexity and lack of robustness and/or sensitivity. Deuterium metabolic imaging (DMI) is a novel MR-based method that uses the favorable MR characteristics of deuterium to map metabolism in vivo in 3D. The low intrinsic sensitivity of ^2H NMR is offset by favorable T_1 and T_2 relaxation times, a large nuclear spin and a sparse NMR spectrum devoid of strong water and lipid signals. By combining ^2H NMR with deuterated glucose administration (oral or intravenous), MR spectroscopic imaging and signal quantification through spectral fitting we were able to generate deuterium metabolic images of brain, brain tumor and liver metabolism in vivo.

Our first-in-human DMI maps of glucose metabolism in healthy brain and in patients with high grade brain tumors illustrate that DMI has the potential to become a robust and widely applicable brain imaging method with strong clinical utility.

Wednesday, June 15 2022, 17:00

The lecture will be held as a zoom meeting, please connect using:

<https://unibe-ch.zoom.us/j/66256483922?pwd=aE1kTFg5aUZza1JmWEJxZDVsdnV5dz09>

and **do spread the word** to anybody potentially interested. (for further info: karin.zwygart@insel.ch)



Short biopic of Prof De Graaf:

Robin de Graaf is Professor of Radiology and Biomedical Imaging at Yale University. During his 25-year career he has covered many of the technical aspects of *in vivo* NMR, including RF pulse design, shimming, spectral editing and isotope-based metabolic studies. He has published over 120 scientific papers and is the author of a popular textbook on *in vivo* NMR. His current research focus is on magnetic field shaping in MRI and MRSI and on Deuterium Metabolic Imaging

Preview of **next items on the program**

(to be held by zoom and in real life at sitem-insel, room O2.211):

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|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| July 4 2022, 14:30, | Prof Dr. Harald Möller,
Max-Planck-Institut für Kognitions- und Neurowissenschaften
Brain Iron and Tissue Structure - Information from the MRI Signal Phase |
| July 4 2022, 15:30, | Prof Dr. Arend Heerschap,
Radboud University Nijmegen Medical Center,
Metabolism of Prostate and Skeletal Muscle: New MR Spectroscopic Results with
Clinical Relevance |