

Tutorial Abstracts

The 12th Conference on Magnetic Resonance in Porous Media

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Tutorial Abstracts

T-01

Bill Price

T-02

MRI AND PFG: AN INTRODUCTION AND SOME PRACTICAL OBSERVATIONS

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This educational session talk will consider the use of magnetic field gradients as employed by both MRI and PFG techniques to detect NMR signal position and motion respectively. The basic theory and implementation methodology will be described, along with methods to (i) increase the overall speed of acquisition and (ii) increase the range of (magnetically heterogeneous) samples that can be considered. This collectively will focus on the use of MRI/PFG in a materials characterisation capacity.

The advantages and disadvantages of MRI/PFG compared to alternative imaging / motion detection technologies will be outlined in detail. Finally we will discuss the true limitations on these MRI/PFG techniques in terms of their ability to be quantitative and the true (spatial or motion) resolution that they deliver.

T-03

NMR AND MRI APPLICATION TO THE ENVIRONMENTAL SCIENCES

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NMR AND MRI APPLICATIONS TO THE ENVIRONMENTAL SCIENCES

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Plant growth is dependent on a whole array of parameters among which are the availability of water and nutrients in soil. Water uptake by the plant is to a large extent driven by the water potential difference in the soil and in the leaves; the plant itself functions as a buffer for water. It is rather clear from ecological observations that plants have developed different strategies to cope with varying levels of water-induced stresses in order to survive. With increasing local shortages of water for agriculture, understanding and quantifying plant responses to water stress will gain in importance. NMR and MRI are well-suited to address water stress induced plant responses due to NMR's sensitivity to water and its mobility, e.g. redistribution within a plant. Well-known applications in this field have been sap flow measurements, or changes of the water content during night and day cycles over extended periods. This work has become more relevant by the introduction of cheap mobile NMR equipment such that work can be performed on a larger number of plants. Due to the large biological variation between plants at least 4 plants per environmental condition and genotype should preferably be measured. However, most NMR measurements cannot easily accommodate higher number of plants, one of the exceptions being imaging of plant roots in soil. MRI allows the observation of the first step in the water balancing process of a plant; water uptake by the roots, in about 20 plants per day. Also, MRI studies on living plant roots in soil can increase our understanding of the influence of heterogeneous nutrient distributions on root growth. Several NMR/MRI approaches and tools, and their limitations, that can be applied to environmental sciences will be discussed.