The Different Magnetic Resonance Communities Join Forces for Progress in DNP: an Editorial for the Special Issue on DNP

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This special issue of *Applied Magnetic Resonance* is the result of an attempt to show the very broad range of current research activities revolving around the central theme of dynamic nuclear polarization (DNP) and the impact DNP is currently making in many different scientific disciplines. It is fascinating to see how an idea that is almost as old as the whole field of nuclear magnetic resonance (NMR) is now revolutionizing the way people think about the maximal sensitivity that can be achieved in NMR experiments. Nowadays, scientists try to produce fully polarized nuclear spin systems for use as highly sensitive probes in medical diagnostic imaging or to generate high spin polarization on surfaces to investigate conformation of molecules in the boundary layers. In particular, two developments have tremendously stimulated the recent progress in DNP research. First, through the continuous and persistent efforts of Prof. R Griffin at the Massachusetts Institute of Technology, Boston US, robust hardware and experimental strategies are now available for solid-state magic angle spinning NMR experiments in conjunction with DNP. The second development was the use of low-temperature DNP followed by a fast rise in temperature to produce solutions containing highly polarized spin systems. This technique is now commonly referred to as dissolution DNP and has been conceived and developed by Prof. K Golman and Prof. J.-H. Ardenkjær-Larsen in Malmö, Sweden. The impact that these two major achievements are currently generating on the design of novel strategies for NMR spectroscopy and MR imaging and on increasing the range of applications cannot be rated highly enough. On the other hand, it is clear that the idea of using the electrons to generate

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highly polarized nuclear spin ensembles had been developed many years back, in the early days of magnetic resonance, by a number of pioneers in magnetic resonance such as Albert Overhauser, Anatole Abragam, Maurice Goldman and others. As a great loss for the scientific community, both Albert Overhauser and Anatole Abragam passed away in 2011 and for this reason we should remind ourselves about the solid theoretical foundations that were laid out by these two great scientists and on which we are building today. The first article in this special issue is written by Charles Slichter and devoted to the memory of Albert Overhauser. We would also like to remind in this special issue of the progress made in understanding the fundamental principles of DNP during the 60s and 70s of the last century. The second paper tries to summarize these historical achievements.

The special issue contains articles about DNP theory, hardware and experimental strategies, as well as applications of a wide variety, ranging from materials sciences to biomedical diagnostics. The articles originate from an interesting mixture of different disciplines and as such truly reflect the current state of the DNP community. One important achievement of the ongoing DNP research efforts has already become apparent: the hunt for better sensitivity and more exciting applications has unified many branches of magnetic resonance. Previously, very little cross talk and exchange took place between the electron paramagnetic resonance community, the NMR solid-state and liquid-state spectroscopy communities and the magnetic resonance imaging community but it is currently interesting to observe how these communities moved together to join forces for achieving even better progress in DNP.

We very much hope that this special issue will serve the DNP community, and also any other scientist who wants to enter this field, as a source for interesting, ideas and information. Certainly for us as Guest Editors the task of putting together this issue has been highly enjoyable and rewarding.