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Interview With Prof. Oliver Speck

Interviewee
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How did you choose experimental physics and what do you enjoy about it?

I have always been fascinated by technology. As a kid I took all my toys apart to see how they worked. Also, I enjoyed maths and physics at school. After school, when it was time to select a topic for my diploma thesis, I was very lucky to stumble across Prof. Jürgen Hennig, the physicist in charge of MRI at the University Freiburg. Without knowing about his prominent position and seminal contributions to the field, I started to work with MRI and only later fully appreciated the tremendous support and training I received in his lab. When the first 3T human MR systems were installed I travelled to Hershey (U.S.) and Rouffach (France) to work on them, even before the first 3T MRI was installed at the University in Freiburg. This continued with my move to Magdeburg in late 2006 where the first European 7T system was operational since 2005. In addition to the 7T human system, we have access to 1.5T and 3T human research systems as well as to a 4.7T small animal system and 9.4 and 14T high resolution spectrometers, operated by cooperating institutions in Magdeburg.

As President of the ESMRMB what are your main duties?

The presidential track of the ESMRMB schedules two years of president elect, two years of presidency, and two years of past president, thus ensuring continuity, distribution of the workload, and "training on the job". During each of these phases, a number of ex officio duties arise. Among the more important for the president are the representation of the society, responsibility for the society's business and executive board meetings, leading relations with other societies and fundraising.

Tell us about the ESMRMB's current activities and projects.

Our society is Europe's representative body of radiologists and medical physicists with an interest in MR, gathering over 1,000 members throughout Europe. The next annual meeting is in leipzig on October 6 – 8, 2011. We are highly honoured that Prof. Richard Ernst, 1991 recipient of the Nobel Prize in Chemistry for his contributions to the development of methodology of high-resolution NMR spectroscopy, will deliver the inaugural Sir Peter Mansfield lecture.
In addition, the ESMRMB has established a very successful educational programme with the School of MRI focusing on clinical MR, lectures on MR targeting basic scientists and Hands-On MRI courses aimed at technicians and radiologists. The society is currently extending its clinical programme to beyond Europe with a European MRI Academy and ran two courses in the Middle East this year. Negotiations are underway with other societies and industry partners to ensure that less privileged areas, in particular Asia, receive adequate training in MR. Our society also joined the European Institute for Biomedical Imaging Research (EIBIR).

Is the ESMRMB involved in the Alliance for MRI?

The ESMRMB is a supporting member of the Alliance for MRI to help safeguard the future clinical and research use of MRI presently threatened by EU legislation to protect workers (EU Physical Agents 2004/40/EC EMF Directive). MRI has been used for over 25 years, imaging up to 500 million patients without evidence of harm to workers due to EMF exposure. The exposure limits in the current Directive have been proven to be detrimental to patient care, most notably restricting and limiting the use of MRI in interventional applications and in imaging vulnerable patients and children where closer patient contact is required. Furthermore, new research and developments in MRI will be severely restricted as will routine cleaning and maintenance of MRI equipment.
The Alliance for MRI is thus of utmost importance to ensure there are no infringements to the use of MRI in Europe. Signals from the European Commission indicate that the revised Directive expected for this autumn will ensure a solution for MRI, via an exemption for MRI from the binding limit values. The medical field will remain within the scope of the Directive and workers and patients will be adequately protected.

Please tell us a bit about your current research projects.

Much of the work at 7T is related to the development of methods that allow the use of the system for neuroscience and clinical research. We can now provide a multitude of methods for such studies. One focus lies in high resolution neuroanatomic imaging and functional MRI. In addition, a number of research projects aim at the exploitation of the full potential of high field imaging. With spatial resolution as high as 200 micrometer, involuntary motion of subjects becomes a significant problem. We continue with the development of methods that detect subject motion with automatic update of the scan volume to follow any displacement or rotation. Other projects include the development of novel RF coils, methods for data correction, e.g. for geometric distortions, and applications in neuroscience.

Do you collaborate with the industry? Does the industry think ultra high field MR will become more usable in the future?

We are collaborating with industry in multiple ways. We develop and optimise methods jointly with the system vendor, and provide expertise to the company with the potential that some developments may be introduced in future products. In return, we get access to the system architecture and measurement sequence, source code, information about the system infrastructure and hardware, and within specific projects hardware to be tested. Other collaborations are within joint research projects. In one such project (called INUMAC), we are developing methods for ultra high field MR together with the University Freiburg, Siemens and Bruker.
Although vendors first developed ultra-high field systems based on the demand from a few research centres, the situation is currently changing. About 40 7T systems are installed or to be delivered and the vendors are now developing the next generation systems that can be sited in a more standard hospital setting due the introduction of actively shielded magnets in this segment. This is a clear indication that industry counts on a wider proliferation of such systems for use in basic research and in the highend segment of clinical research and diagnosis. Ultra-high field MR is expensive and rare. Economic factors alone will prevent it being a widely applied modality for the diagnosis of common pathologies. However, understanding a disease aided by such equipment would not just help the individual patient but a much broader population.

What are the goals of researching ultra-high-field MR in humans, as opposed to in animals?

The selection of human rather than animal MR is half choice and half fate. Apart from the fact that I learned MR on a human MR system, I am not generally against research involving animals, but neither am I eager to do animal experiments myself. I prefer research on human subjects for two reasons: They can end the experiment any time if they feel uncomfortable and the results can possibly be applied immediately to the diagnosis of disease. MR is an ideal modality for such research since it is safe and repeatable. I have never done any experiment on a subject that I would not be a volunteer for myself. Indeed, I have perhaps been in the 7T magnet more times than any other volunteer.
To our current knowledge, the health consequences at ultra-high field are not very different from lower magnetic field strength. However, the highest risk, as with any MR instrument, is carelessness in daily routine. Any magnetic object brought close to the magnet is very dangerous and all severe accidents in MR have been related to such objects that turned into projectiles close to the magnet. We therefore hold mandatory regular safety briefings with all staff and research partners that enter the magnet room.

The possibilities offered by fMRI of the brain are some of the most exciting within medical imaging — which of these areas most fascinates you and why?

Both brain imaging and the detection of brain function fascinate not only neuroscientists but also a broader audience. This can be seen at any public event we host. Regularly hundreds of visitors are "attracted" by the magnet and the possibilities in brain research. Personally, I am fascinated by the complexity in structure and function of the brain. Although I have a technical background and am more an interested layman than an expert in neuroscience, the abilities and sometimes limitations of our brains are astonishing. One could say that the human brain is the only entity in the universe (that we know) that tries to understand itself. This may raise the philosophical question of whether that may be possible at all. However, from what we know, e.g. about the processes involved in learning and memory, we may be able to design strategies and therapies in the treatment of dementia, one of the largest problems our ageing population is facing.

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