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## Preface

Interdisciplinary discussions provide a much needed vehicle for the development of new technologies in the complex field of life sciences. The founders of the bi-yearly Magnetic Carriers Conference, whose 2010 meeting generated the articles in this issue, believe that it is precisely the interdisciplinary nature of this conference that has made it so successful. A brief history attests to the increasing appeal of this meeting: In 1996, the founders planned what they expected to be a small workshop about the in-vivo guidance of radionuclides by means of magnetic carriers. However, only four months after an announcement in the journal "Nature", the workshop expanded to become our first conference in Rostock attended by 75 participants from 25 countries. After this successful meeting, we accumulated enough material to edit a book of peer-reviewed articles covering the fields of synthesis, characterization and biomedical and clinical application of magnetic nano- and micro-carriers (published by Plenum, New York, 1997). For the following meetings in Cleveland, Rostock, Tallahassee, Lyon, Krems, Vancouver and now this year again in Rostock, we have had the pleasure of welcoming an ever increasing number of physicists, chemists, material scientists, engineers, molecular and cell biophysicists, clinicians and company representatives (for a total of 370 participants from 43 countries in Rostock 2010).

In addition to their interesting interdisciplinary scientific program, the Magnetic Carriers Conferences have many other attractive features including a location near a river or lake (so that the traditional conference dinner boat cruise is possible), an interesting social program including concerts and sightseeing, a low conference registration fee allowing young scientists and students to participate, and a linear conference program that promotes participation in all the talks. Ample time is provided for large poster sessions that create a lively forum of informal interactions and discussions. All these features combined to draw our Rostock 2010 participants to actively participate in the 96 scientific lectures and 228 poster presentations, and to exchange ideas with the specialists from all relevant fields. Also, with the help of the sponsors represented by leading companies in the field of magnetic particles, we were able to offer support to young scientists and students who required financial assistance.

The high percentage of participants returning to this conference year after year creates a friendly environment while adding a sense of excitement and energy. The common interest in coming together has a synergistic effect on communication, cooperation and the transfer of information about new developments in nanobiotechnology and their effect on clinical and scientific biomedical applications.

The last conference has highlighted that currently, the key accepted clinical applications of magnetic particles are the *in vitro* separation of stem cells for transplantation, the use of modified nanobeads for contrast enhancement in the nuclear magnetic resonance imaging, and local hyperthermia treatment of cancer. The development and application of drug-carrier systems for magnetic guidance and for the controlled delivery of drugs, genetic material, stem cell or radioactivity to biological targets are the most exciting new topics in the magnetic carrier applications. The improvement of biocompatibility and enhancement of the circulation time of the magnetic carriers have been identified as key areas of research required to reach a breakthrough in their use for in-vivo applications. The potential of the magnetic carriers to enable single molecule and single cell separation, detection, modification and manipulation has been identified as the basis for the upcoming, new generation of lab-on-chip technologies.



Finally, a few statistics: the breakdown of the Rostock 2010 conference program by topic is as follows: Nano- and microsphere syntheses including the magnetic liposomes and their characterization (20%), separation and analytical methods (15%), biological and biophysical applications (15%), biosensors and lab-on-chip systems (10%). Clinical in-vivo applications rounded out the program and included magnetic imaging and contrast enhancement (10%), local magnetic hyperthermia (10%) and controlled drug delivery (20%).

Following the tradition of daily tutorials on the basics of magnetic carrier science and technology, the physical background of the magnetic carriers' properties was presented in a three-part series of lectures "Magnetic Things We All Should Know" by Prof. Kannan Krishnan, who holds a US award for best didactics in science.

The highlight of the Rostock 2010 conference was the lecture by Prof. Ivar Giaever, USA/Norway, the 1973 Nobel Prize laureate, who gave us insight into his contributions to the field of nanophysics and shared his experiences as an inventor, a biotech company start-up founding member and a scientific advisor.

For additional information about the scientific field of magnetic carriers, we would like to refer the interested reader to our website [www.magneticmicrosphere.com](http://www.magneticmicrosphere.com). Last but not least, we would like to invite you to attend our next meeting that will take place in Minneapolis, USA, May 22-26, 2012.

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