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## Editorial

Dear AMPERE colleagues,  
the year 2010 has passed and many of us will remember it for the scientifically exciting and very well managed conference in summer in Florence. Several smaller conferences were also held under the auspices of AMPERE society. This issue contains reports on International Symposium on «Nuclear Magnetic Resonance in Condensed Matter 2010 (NMRCM 2010) in St. Petersburg, Russia (p. 2), the 5th EF-EPR Training School on Advanced EPR in Konstanz, Germany (p. 4), and the 10th International Bologna Conference of Magnetic Resonance in Porous Media (MRPM10) in Leizig, Germany (p. 7).

The next NMRCM is combined with a satellite meeting on «NMR in Life Sciences» and will take place at the end of June/ beginning of July again in St. Petersburg (p. 10). Please decide early on a possible participation, as visa procedures may take some time. The organizing Department of Quantum Magnetic Phenomena in the Faculty of Physics of St. Petersburg State University is highlighted on p. 14. If you want to present your department or the Center of Magnetic Resonance to which you are associated, we will happily include this presentation in our Bulletin. Please also note that the next AMPERE NMR School will be held in Zakopane, Poland, from 19th to 25th June 2011 (<http://www.staff.amu.edu.pl/~school/>). An overview of other future conferences is provided on p. 24.

Finally I want to remind you about the AMPERE mailing list, to which you can subscribe at <https://listes.sc.univ-paris-diderot.fr/sympa/subscribe/nmr>. Note that urgent communication between AMPERE officials and members proceeds via the mailing list rather than this Bulletin. I wish you all a peaceful, healthy and successful year 2011.



Gunnar Jeschke  
Secretary General of Groupment AMPERE

Report on the International Symposium and Summer School  
in Saint Petersburg

## **“Nuclear Magnetic Resonance in Condensed Matter” (NMRCM 2010)**

7th Meeting: “NMR in Heterogeneous Systems”

The Department of Quantum Magnetic Phenomena of the Saint Petersburg University continues a series of annual International Symposiums and Summer Schools in Saint Petersburg “Nuclear Magnetic Resonance in Condensed Matter” (an AMPERE event). The seventh meeting under the subtitle “NMR in Heterogeneous Systems” was opened on Monday, June 28, and was closed on Friday, July 02, 2010. The goal of the Meeting was to provide a platform to scientists and students for the use of all aspects of nuclear magnetic resonance methods and techniques as well as computational and theoretical approaches for the investigations of structure, dynamics and other properties of heterogeneous systems.

The Meeting was attended by 124 participants from 13 countries (Belarus, Czech Republic, England, France, Germany, Lithuania, Italy, Poland, Russia, Slovenia, Sweden, Ukraine, USA).

There were 14 lectures, presented by following speakers:

Ch. Aroulanda (Orsay, France)  
R. De Renzi (Parma, Italy)  
S. V. Dvinskikh (Stockholm, Sweden)  
E. B. Feldman (Cernogolovka, Russia)  
J. Fraissard (Paris, France)  
D. Fruchart (Grenoble, France)  
H. Haranczyk (Cracow, Poland)  
O. B. Lapina (Novosibirsk, Russia)  
V.V. Matveev (Saint Petersburg, Russia)  
D. Michel (Leipzig, Germany)  
P.M. Tolstoy (Berlin, Germany)  
V. V. Volkov (Moscow, Russia)  
K. Zick ( Rheinstetten, Germany)

Moreover, there were 23 contributed talks (20') and 74 poster presentations. The organizers published the Book of Abstracts.

Barbara and Uwe Eichhoff (Germany) instituted a prize (500 Euro) for the best poster report of students, post-graduated students or young scientists without Ph.D. under 35.

The prize and proper diploma were awarded by the Organizing Committee to Andrey Vinokurov (Saint Petersburg, Russia).

NMRCM 2010 took place at the Petrodvorets Campus of Saint Petersburg State University. Petrodvorets (the satellite-town of Saint Petersburg) is famous for its parks with fountains and palaces. The social program consisted of two excursions (in Pushkin and Saint Petersburg), a welcome-party, and a conference dinner.

The information on the NMRCM 2010 is available at:

<http://nmr.phys.spbu.ru/NMRCM-2010/>

The abstracts and photographs are available since the 1st of October, 2010.

The NMRCM 2010 was supported by:

- Russian Foundation for Basic Research
- Varian Inc and Trading House "Scientific Equipment", Ltd
- Bruker-BioSpin

## **5th Training School on Advanced EPR of the European Federation of EPR Groups**

Konstanz, Germany, September 5-12, 2010

The European Federation of EPR Groups (EF-EPR), which is associated as a subdivision with Groupement AMPERE, holds summer schools on Advanced EPR Spectroscopy since 1999. The first such school was organized in Caorle, Italy by Marina Brustolon from University of Padua. The schools in Retie, Belgium in 2002 (Etienne Goovaerts, Sabine Van Doorslaer, University of Antwerp; Daniella Goldfarb, Weizmann Institute), in Wiesbaden, Germany 2005 (Thomas Prisner, Goethe University Frankfurt/Main; Klaus-Peter Dinse, TU Darmstadt; Gunnar Jeschke, MPI for Polymer Research Mainz) and St. Andrews, Scotland, 2008 (Graham Smith, Olav Schiemann, University of St Andrews; David Keeble, University of Dundee) assembled about 80 students and 20 lecturers each on a triannual schedule. The 5th EF-EPR school was held in 2010 in Konstanz, Germany, only two years after the one in St. Andrews, to give all students an opportunity to attend such an event early in their scientific career. With 78 students coming to Konstanz attendance did not significantly decrease due to the biannual schedule.

The school was jointly organized by Malte Drescher, University of Konstanz, Germany and Gunnar Jeschke, ETH Zurich, Switzerland. The lectures and tutorials and many spectrometer practicals were held in Konstanz, while a specialized lab course was held in Zurich on September 5<sup>th</sup> for advanced students. The 29 lectures were given by 22 lecturers, mostly from Europe. Special focus was given to the application field of protein structure and dynamics, which was also treated from a non-EPR view by the crystallographer Kay Diederichs and by Elke Deuerling, who uses a large variety of biochemical and biophysical methodologies. Eight of the lecturers, two co-workers of Frank Neese and two tutors from the organizing groups held 27 afternoon tutorials (75 minutes each) on 12 special topics for groups of 10-12 students. Practical (150 minutes each, 3-4 participants) were taught by two postdoctoral co-workers and three advanced Ph.D. students of the organizing groups. The opening lecture on EPR and protein dynamics was given by Jack Freed (Cornell University) and a special lecture on metalloproteins by Prof. Dr. Brian Hoffman (Northwestern University).

The lectures with 45 minutes length covered basic aspects of EPR theory, instrumentation, and experimental techniques (14 lectures), quantum



chemical computation of EPR parameters (2), dynamic nuclear polarization, high-field EPR instrumentation, and important application fields (11 lectures). Special care was devoted to encourage lively discussions of about 15 minutes duration after each lecture. The school ended with a general question session and a feedback session chaired by one of the students.

Only very general previous knowledge of the students was supposed because of the expected heterogeneity of the students. Experience ranged from master level to PostDoc and the main application field was almost evenly distributed between physics (35.3%), chemistry (38.2%), and biology (26.5%). Students graded difficulty of the lectures as 3.30 (standard deviation 0.72) on a scale where 1 was too easy and 5 too difficult - a small deviation from the ideal result of 3.00.

Most students did have the opportunity to take part in one lab course and up to seven tutorials, in addition to the 29 lectures and the poster session on Tuesday evening. Due to such a condensed program many students took some time off on tutorial afternoons for informal discussions, often in front of their posters, which compensated somewhat for the too short time devoted to the poster session.

The poster prize was awarded to Philipp Spindler from Thomas Prisner's group at Goethe University Frankfurt/Main, Germany. The title of "Best Lecturer" was assigned by the students to Stefan Stoll (UC Davis, USA), who is a graduate of the 1<sup>st</sup> European EPR Summer School 1999 in Caorle, Italy.

For recreation a conference trip was inserted on Thursday afternoon with options for canoeing and hiking. After the last lecture on a very sunny Saturday there was some time for looking at the medieval town of Konstanz. Students and lectures then embarked on a small ship to beautiful flower island Mainau where the conference dinner was held. Thanks to all the lecturers, tutors, and the very active students this was a successful school.

## Final Report

### **10th International Bologna Conference of Magnetic Resonance in Porous Media (MRPM10)**

The 10th International Bologna Conference of Magnetic Resonance in Porous Media (MRPM10) was held from September 12 to 16, 2010 at the Physics building of the University of Leipzig, Germany. The meeting also incorporated the 10th Colloquium on Mobile NMR (CMMR10). The event was co-chaired by Petrik Galvosas (Victoria University, Wellington) and Jörg Kärger (University of Leipzig).

The conference in Leipzig represented a triple anniversary, not only being the 10th of its kind and also including the 10th Mobile NMR Colloquium, but also celebrating 20 years of dedicated conferences on NMR in porous media since the inaugural meeting in Bologna back in 1990, brought to life by Paola Fantazzini and the late Giulio Cesare Borgia. It thus gave ample opportunity to assess the state of the art in this research field, and to highlight visions into the future.

The total participation number of 194, just marginally lower than the previous record of MRPM9 in Cambridge, USA, proves the existence of a strong and healthy, yet dynamic, group of scientists who identify themselves with this area, and which has kept growing constantly over the last decade. Of this number, about one third had been students; more than 70% of attendants originated from European institutions, about half of them being from Germany. 39 attendees arrived from the Americas and 9 from Asia/Oceania. This fact, combined with an approximately reverse distribution during the 2008 conference, suggests a community of around 400 potential attendees worldwide, and encourages the organization of MRPM to continue holding its conferences on alternating continents, thus giving researchers and students from all countries the opportunity to contribute to the Bologna conferences. Suggestions from possible future conference hosts have already been given for the best part of the remaining decade. MRPM10's budgeting allowed to provide substantial student travel grants to all persons who applied; the Division plans to continue this strategy to facilitate travel and attendance particularly for young researchers in the years to come.

A promising future can also be foreseen in the growing field of application. Porous media are ubiquitous and determine our daily life; yet early MRPM conferences had mostly been confined to understanding molecular

dynamics in limited model systems, or were driven by the continuing interest of the oil industry. In 2010, MRPM presents itself as a much more mature area of science, covering disciplines within Physics, Chemistry, Engineering, Life and Medical Sciences, Mathematics, Computer Sciences, and Industrial Applications. MRPM10's list of contributions gives evidence for the broad and still expanding range of research areas connected to porous media.

In recent years, hardware developments have been instrumental in making new types of experiments possible, such as multidimensional techniques, ever faster methods for imaging and velocity imaging, applications to short-T<sub>2</sub> systems. The development and discussion of 2D ILT correlation type experiments was a major step forward in the non-destructive understanding of complex geometries and multicomponent systems, giving real access to previously unavailable information. This development is still ongoing, while conceptually new ideas about treating relaxation and diffusion data, describing the evolution of the magnetization from first principles, have entered the stage of MRPM, with excellent examples being presented in Leipzig.

Mobile NMR, mostly being synonymous with low-field NMR, is of growing visibility and importance in the field; no longer are desktop devices regarded as cheap supplements for mere routine investigations, but they are demonstrated to provide new and useful information not being available at high fields, such as enhanced relaxation contrast and Earth-field spectroscopy to name but a few. Again, a combination of hardware development and analysis techniques has justified the incorporation of CMMR as an integral part of the Bologna conference series which began in 2008; in odd years, CMMR is held as a part of the International Conference of Magnetic Resonance Microscopy (ICMRM) series.

Conference topics of 2010 included innovative experimental and analytical approaches for materials which have made up the main target of porous media research such as rocks, cements, wood, biological tissue, and sediments as well as various aspects of chemical reactors including zeolite catalysts. A growing interest was demonstrated in fabricated micro- and nanostructured systems as well as in food and environmental science. Medical applications represented a strong contribution to this meeting, as did hyperpolarization techniques. A balance of new and application-oriented developments in low-field sensors and examples of their application was part of the CMMR sessions within this Bologna conference.

With a growing diversity of applications but also of science disciplines, a strong tutorial session has been a traditional opening of MRPM conferences. In 2010, modern developments in petrophysical research, theoretical aspects of internal field gradients, and clinical applications were presented by Marc Fleury, Bill Price and Eric Sigmund, respectively. The introduction to the main application fields was completed by Plenary talks treating gas imaging of the lung and dynamics in microporous materials, presented by Mark Conradi and Brad Chmelka, respectively. Following an excursion to a former coal mining range, co-host Jörg Kärger gave an entertaining overview of the development of NMR in Leipzig from its early days to the present. In total, 57 oral and 109 poster contributions were given at MRPM10.

Another traditional part of the Bologna conference series is the recognition of outstanding scientific potential for young researchers and for students, based on an oral or poster presentation during the conference. The equal MRPM10 Best Poster Awards for students were awarded to Marjke Antonia Fagan (University of Cambridge), Martin Dabrowski (RWTH Aachen), and Alex Adair (University of New Brunswick). The Giulio Cesare Borgia Award, established in 2004 to commemorate the important scientific and organizational contribution to the field of porous media magnetic resonance of Prof. Borgia, and offering a sum of 3000,- € to "an emerging scientist who shows greatest promise for a future scientific leadership", was awarded to Denis Grebenkov (CNRS, École Polytechnique) "for his outstanding research on the theoretical framework underlying diffusion and relaxation measurement with important applications to a wide range of porous media".

The proceedings of MRPM10 will, as those of the previous conference, be published as a special issue of the AIP Conference series (Oral contributions) and a special issue of Diffusion Fundamentals (Poster Contributions): <http://www.uni-leipzig.de/diffusion/journal/>.

Siegfried Stapf, Petrik Galvosas  
Ilmenau/Wellington, January 2011

Saint Petersburg State University  
Department of Quantum Magnetic Phenomena

**International Symposium and Summer School  
in Saint Petersburg**

**“Nuclear Magnetic Resonance in Condensed Matter”**

**8th Meeting “NMR in Life Sciences”**

St. Petersburg, Petrodvorets, Russia  
27 June – 1 July 2011



an AMPERE event

**First Announcement**

Organising Institution: Saint Petersburg State University  
<http://nmr.phys.spbu.ru/nmrccm> | [nmrccm@nmr.phys.spbu.ru](mailto:nmrccm@nmr.phys.spbu.ru)

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### Invitation

Saint Petersburg State University continues Annual International Symposium and Summer School **"Nuclear Magnetic Resonance in Condensed Matter" (NMRCM)**. The eighth meeting under the subtitle **"NMR in Life Sciences"** will be opened on Monday, June 27, 2011 and will be closed on Friday, July 01, 2011. Day of arrival is June 26, day of departure is July 2.

The goal of the meeting is to provide a platform to scientists and students for use of all aspects of nuclear magnetic resonance methods and techniques as well as computational and theoretical approaches for the solving of various problems in life sciences. The Organising Committee kindly invites you and your colleagues to Saint Petersburg to participate in the International Symposium and Summer School **NMRCM 2011**.

### Location

**NMRCM 2011** will take place at the Petrodvorets Campus of Saint Petersburg University. Petrodvorets is a charming town, former summer residence of Russian Tsars, a place famous for its parks, palaces and fountains. Petrodvorets is located at the South Coast of the Gulf of Finland at a distance of 30 km from the centre of St. Petersburg. St. Petersburg is the cultural capital of Russia, world-famous for its architecture, monuments, museums, and art galleries as well as for its theatres and concert halls.

## **Main topics**

The eighth meeting NMRCM 2011 will cover all aspects of nuclear magnetic resonance in life sciences:

- biology and medicine
- MR imaging
- ecology and environmental research
- food science, cosmetics, etc.
- micellar systems and lyotropic liquid crystals
- novel NMR techniques
- computer simulations
- model systems

Scientists and students from all countries are invited to make plenary lectures, oral reports and poster presentations.

Organising Committee founds a prize for the outstanding poster report, made by a student, post-graduated student, or young scientist without Ph.D. under 35.

The official language of the Symposium and School is English.

The Book of Abstracts will be published and distributed to each participant of NMRCM 2011 on arrival.

## **Preliminary registration form**

On-line registration is opened on the Web-server of NMRCM 2011 at: <http://nmr.phys.spbu.ru/nmrcm/user/register>

## **Registration fee**

Active participants — 300 €, students — 150 €.

Members of the Groupement AMPERE have a discount of 25 €.

Accompanying persons — 150 €.

The fee includes organisation costs, NMRCM 2011 materials, visa support and registration, welcome-party, and coffee breaks.

Number of participants is limited to 150 persons.

## Important dates 2011

28 February	Deadline for Preregistration Form
01 March	Second Announcement and Call for Papers
20 April	Deadline for the receiving of Abstracts and visa applications
27 April	Letter of Acceptance
25 May	Deadline for the receiving of registration fee
01 June	Third Announcement
08 June	Programme
26 June	Arrival
27 June – 01 July	Symposium and School
02 July	Departure

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## **Department of quantum magnetic phenomena**

Faculty of physics, Saint-Petersburg State University

Head of Department: Prof. Vladimir I. Chizhik

In 1993 the Department of Quantum Magnetic Phenomena was established at the Academic and Research Center for Physics on the basis of the Laboratory of radiospectroscopy (since 1952). The Department of Quantum Magnetic Phenomena carries out investigations in the domain of the nuclear magnetic resonance (NMR) and electron spin resonance (ESR). Our scientific interests are:

- nuclear magnetic relaxation of various nuclei in liquids and especially in electrolyte solutions;
- NMR in low magnetic fields and in the Earth magnetic field; ESR in low magnetic field;
- liquid crystals (NMR spectra and relaxation);
- NMR in solids; particularly, in magnetics and nanocomposites;
- NMR in heterogeneous systems, particularly, in micellar systems;
- NMR tomography in low magnetic fields;
- NMR and ESR in biological objects;
- practical applications of NMR and ESR.

The main direction of the relaxation investigations is the study of peculiarities of NMR relaxation and microstructure in electrolyte solutions which are very interesting objects due to their important role in various physical, chemical, biological, and technological processes. V. I. Chizhik has developed the method of the determination of ion coordination numbers and solvent molecule reorientation times on the basis of the analysis of concentration and temperature dependences of the relaxation rates.

The results for the paramagnetic solutions has been obtained comparing the proton and deuteron relaxation data. The influence of the symmetry distortions on the quadrupole relaxation of the monoatomic ion nuclei was demonstrated by several experiments. M.S. Pavlova, A. V. Egorov and A. V. Komolkin apply methods of quantum chemistry and computer simulations for the explanation of experimental data.

The rather sharp change of the coordination numbers of the Cl<sup>-</sup> anions, which are widely presented in living system, was detected in the same temperature interval as the body temperature for the vast majority of

warm-blooded animals. Taking into account the temperature reversibility of the effect, the scheme of the body thermoregulation in the conditions of a living organism was formulated (V.I. Chizhik and A.V. Donets).

Yu.S. Chernyshev and M.V. Popova investigate self-assembly processes in systems, containing surfactants (micellar systems, adsorption).

The study of the NMR in geomagnetic field was started in 1956 when the first nuclear induction signals had been registered at the laboratory in the country. The Department has some priority results in this area. In 1957 the spin-generator with moving liquid in the Earth field was created by F. I. Skripov, the spin-echo signals in the Earth magnetic field were detected by Yu. S. Chernyshev. On the basis of the observation of free induction signals and so-called "kinematic spin-echo" in moving liquid the method of measuring of the stream velocity in the open water reservoirs was developed by P. M. Borodin and N. M. Vecherukhin.

It should especially be emphasized that the first in the world practice Fourier-transform of the nuclear free induction signal for the obtaining of the NMR spectrum was carried out by A. A. Morozov, A.V. Melnikov and F.I. Skripov in 1958.

Experiments in the area of the NMR imaging (MRI) in very low magnetic fields were started in 1979. The important directions of investigations are NMR imaging of porous media (statistic characterization of oil-bearing rocks and humidity resistance of construction materials). NMR imaging of flows through conduits of complicated configuration are studied. The applications of the NMR imaging to the mapping of polarization and radio-frequency fields are developed.

The investigation of the NMR in liquid crystals have been carried out since 1970. At the beginning the main direction was the interpretation of NMR spectra for the obtaining of information on molecular structure and mobility. One of the most important results is the development of the method of NMR-spectra calculation with the full dipole Hamiltonian for multi-spin system (A. V. Komolkin). Molecular dynamics simulation of liquid crystals was used for the investigation of conformational structure and mobility of liquid crystals and for calculation of NMR spectra. The study of NMR-relaxation and diffusion processes in liquid crystals is another important line of the investigations (S. V. Dvinskikh).

V. S. Kasperovich, M. G. Shelyapina, and N. A. Grigorieva investigate NMR in solids and solid solutions. They use the methods of quantum

chemistry for the interpretation of experimental data. The effect of the enhancement factor distribution in ordered magnetic substances on free induction decay and spin-echo characteristics has been investigated by V. V. Moskalev, V. V. Matveev, and V. S. Kasperovich. The spin-echo envelope as a function of power level, duration of pulses, and width of NMR spectra have been calculated and the results of the calculations have been compared with the experimental data. The activity of research group "NMR in novel magnetic materials" (V.V. Matveev) connects to zero-field NMR (spin echo) in some nanoscaled magnetics, namely,  $^{59}\text{Co}$ ,  $^{57}\text{Fe}$ , and  $^{61}\text{Ni}$  NMR in ferromagnetic nanocrystalline metals and their nanocomposites in different matrices,  $^{139}\text{La}$  NMR in lanthanum manganites, and in magnetics with colossal magnetoresistance. Another side of V.V. Matveev's activity is multinuclear NMR in ionic liquids and concentrated electrolyte solutions, particularly in the carbon nanomaterials filled by electrolyte solutions – basic part of modern energy storage devices, so called supercapacitors.

The equipment for detection of the ESR in very low magnetic fields (an operating frequency is 50 – 80 MHz) has been created and a number of the investigations of free radicals as spin-labels have been carried out by V. S. Baranov. The method of the separation of contributions to the total ESR line shifts due to the spin-exchange process and superfine interaction was developed using the nonlinear dependence of the electron energy levels in the magnetic fields. S.M. Soukharzhevskii investigates natural minerals using ESR in high magnetic fields.

The magnetic resonance methods mentioned above are used for practical applications. The applications of the NMR in the Earth magnetic field were extended for solving the archaeological problems ( P. M. Borodin, T. N. Smekalova, and A. V. Melnikov).

There are a few NMR methods for estimation of oil-deposit productivity. The measurements of the NMR signal amplitudes provide the information on the total, closed, and effective porosity of rock samples. The data on the NMR-relaxation rates give the information about the state of water or oil in rock core. The specialized pulse NMR equipment for analysis of rock samples (the sample diameter up to 30 mm) has been made (Yu. S. Chernyshov, V. I. Chizhik). The equipment is used for the investigation of the oil deposits in Tatarstan (about 10,000 analyses of rock-samples during a year).

The applications of NMR-relaxation method to oceanological investigations (analysis of pollutions, oxygen content; measurements of the velocity of sea current etc.) have also been realized.

**Three educational programs for Master of Science are realized at the Department:**

1. Magnetic resonance and its applications.
2. Tomography technologies in modern medical diagnostics.
3. Quantum radiophysics (different aspects of applications of radiospectroscopic methods).

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## Future conferences Ampere events

### 2011

AMPERE NMR School 2011	Poznan, (Poland)	June 19-25 2011
NMRCM 2011	St. Petersburg, Pet- rodvorets (Russia)	June 27-July 1 2011
ICMRM 2011	Changping, Beijing, (P.R. China)	August 14-18 2011
EUROMAR 2011	Frankfurt a. M., (Germany)	August 21-25 2011

### 2012

EUROMAR 2012	Dublin, (Ireland)	July 1-5 2012
MRPM11	Guildford, Surrey (United Kingdom)	September 9-13 2012

### Other events 2011

52 <sup>nd</sup> ENC	Asilomar, CA, (USA)	April 9-15 2011
19 <sup>th</sup> ISMRM Meeting	Montréal, Québec, (Canada)	May 7-13 2011
Spin Chemistry meeting 2011	Noordwijk (The Netherlands)	May 15-20 2011
38 <sup>th</sup> Annual Conference of the Federation of Analytical Chemistry and Spectroscopy Societies	Grand Sierra Resort, NV (USA)	October 2-6 2011