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Correspondence address:
ETH Zurich, Laboratory of Physical Chemistry, HCI F 227
Vladimir Prelog Weg 2, 8093 Zurich, Switzerland
Mail: contact@ampere-society.org
Publisher: Gunnar Jeschke, ETH Zurich, Switzerland

Editorial

Dear members of Groupement AMPERE,

if you have been a true follower of the EUROMAR conferences or if you publish in the Journal of Magnetic Resonance, you have benefited from the work of Lucio Frydman, past Chairman of the EUROMAR Board of Trustees. In case you wonder what he does if he does not edit a journal and does not help to organize conferences, our interview with Lucio is a must read. Regarding the Gentner symposium in Eilat in 2005, the Editor of this Bulletin still fondly remembers the mostly empty swimming pool in the middle of a park at this resort hotel, which was indeed splendid.

Just in case that you, too, want to combine the intellectual luxury of a high-level conference with travel to somewhere off the beaten path, I can recommend Kazan in Tatarstan. If you want to get an impression, you find the report of the 2017 Conference on Modern Development of Magnetic Resonance as well as the announcement of the 2018 conference in this issue. If you are more into hyperpolarization, the HYP-18 in Southampton beckons in September.

The scientific content in this issue relates to magnetic resonance in porous media. Did you know that there is a catalyst for transfer of hyperpolarization from para-hydrogen to water? And would you have imagined that people from Florida call this phenomenon SWAMP?

Many of you know Charlie Slichter by his textbook Principles of Magnetic Resonance, probably still the top choice when you want to get a feeling about the physics behind our art. Some of you may have had the privilege meeting him. I remember his presence at a Gordon Conference and the kindness radiated by this scientific giant. Sadly, Charlie passed away last month. His legacy will continue to inspire.

In case you have not yet planned your participation in EUROMAR 2018 in Nantes, France: The event is only about three months ahead when you read this issue. Abstract submission is open until April 23rd. I hope I will see all of you there on July 1st 2018.

Gunnar Jeschke
Secretary General of Groupement

Portrait: Prof. Lucio Frydman

• why magnetic resonance and why NMR and MRI?
The depth and neatness of quantum mechanics has led to numerous achievements, and these come most elegantly into play in NMR, MRI and EPR. What could be nicer than combining this elegance with advanced engineering and data processing, for the sake of serving as eyes for the chemist, biologist and physician?

• what is your favorite frequency?
After a PhD on a notoriously unstable 100 MHz electromagnet, I could not believe how easy life became upon building my first 300 MHz solids NMR spectrometer. Today, as we are on the verge of porting our human MRI research from 3 T into 7 T, my hopes and bets are with 300 MHz again (I just hope good ideas will follow).

• what do you still not understand?
A most fascinating mystery is the "eureka moment": the discovery or the creation of something that's out there for all of us to capture –be it in science or in art– but which only a few can clearly discern.

• luckiest experiment you have ever done.
During a departmental trip in 2005, I proposed to a M.Sc. student exploring a new form of MRI – a field in which neither of us had any prior training. We started with a 5 mm water tube with little idea of what we were doing; today this experiment is leading to beautiful images on animals and humans. That was one lucky bus ride…

• what was the worst mistake you have made during your lab time?
In 6th grade I took charge of my elementary school's very basic science lab – with its human skeleton and desiccated insects. In my eagerness to add physics to it, I managed to plunge the whole school into darkness, in an electrical explosion whose smell I still recall. The teachers were so relieved to see me alive that they decided not to expel me (that would happen, but later).

• most memorable conference story
I have been to many conferences, but probably none more surreal than the Gentner symposium that together with Marc Baldus we cochaired at Eilat in 2005. The organization took place during the thickest of the 2nd intifada. Hotels in Israel were empty, and with a modest budget we managed to

reserve the best hotel spa in town, a full tower with all concierges and chefs, and still had left overs for a cruise and dinner in the Red Sea. By the time the meeting was held suicide bombings were no longer daily occurrences – and we enjoyed great science in a dream location.

• with whom (historical person) would you like to meet?
Galileo – at his place, and if possible at his table.

• when do you get your best ideas?
When thinking intensely on a specific problem –be it in front of a blackboard, a poster, or in conversations with my students.

• if you had just one month time for travelling - where would you go to?
I'd bike with my son Ruta Nacional 40, from Bolivia to Tierra del Fuego

• your idea of happiness.
The sounds and smells of home when opening the door after a long journey or a tough day.

Positions:
Professor and Head, Department of Chemical and Biological Physics, Weizmann Institute of Sciences and Chief Scientist in Chemistry and Biology, The US National High Magnetic Field Laboratory, Tallahassee, Florida
Homepage: http://www.weizmann.ac.il/chemphys/Frydman_group/home.html

Awards:
Third place overall, Ocala ironman-distance triathlon (2016); Tianjuan Wang Lecturer, Chinese Academy of Sciences (2014), Russell Varian Prize (2013), Sir Paul T. Callaghan Lecturer, ISMAR (2013), Outstanding Immigrant Scientist, State of Israel (2010), Advanced Grant Awardee, European Research Council (2010), Honorary Member, NMR Society of India (2010), Kimmel Award, Weizmann Institute (2009), Fellow, International Society of Magnetic Resonance (2008), Vaughan Lecturer, Rocky Mountains Conference (2006), Arthur D. Little Lecturer, MIT (2006), Sir Peter Mansfield Senior Visiting Fellow, University of Nottingham (2005), Israel Chemical Society Young Investigator Award (2005), Chemistry Awardee, Weizmann Institute Scientific Council (2004), Laukien Prize (2000), Alfred P. Sloan Fellow (1997), University of Illinois Scholar (1996), Beckman Young Investigator (1996), Camille Dreyfus Teacher-Scholar (1996), CAREER Awardee, US NSF (1995), Camille and Henry Dreyfus New Faculty Awardee (1992), Graduate Research Fellow, National Research Council of Argentina (1986).

Education:
BS in Chemistry, University of Buenos Aires, Argentina, 1982-1986.
Ph.D. in Physical Chemistry, University of Buenos Aires, Argentina, 1986-1990.

Interests:
Science, history, and hiking, running or biking in the company of family and friends

Report on the 10th Alpine Conference on Solid-State NMR
September 10-14, 2017

Scientific committee: Gaël De Paëpe (Grenoble), Amir Goldbourt (Tel Aviv), Sophia Hayes (St Louis, MO), Christopher Jaroniec (Colombus, OH) and Leonard Mueller (Riverside, CA - chairman)

Organizing committee: Lyndon Emsley (Lausanne), Stefano Caldarelli (Marseille), Anne Lesage (Lyon), Michel Bardet (Grenoble), Sabine Hediger (Grenoble) and Nicolas Giraud (Orsay)

The 10th edition of the Alpine Conference on Solid-State NMR took place in Chamonix, France, from Sunday 10 to Thursday 14 September 2017. The conference gathered over 210 participants from more than 20 different countries, for 4 intense days of scientific exchanges on all aspects of Solid-State NMR, with over 140 submitted abstracts.

The talks given at the conference were organized in four plenary sessions and a prize lecture. They covered a broad range of topics including structural and dynamics studies of biological solids, the characterization of materials such as metal-organic framework, catalysts or battery materials,

with a balance of methods developments and applications. There were 8 invited lectures and 16 promoted talks selected from the abstracts.

For the 10th edition, the traditional poster session was replaced by a series of rotating "roundtables", during which small groups of participants engaged in focused discussions on the basis of someone's abstract and pitch presentation. All the participants enthusiastically took part in this successful experiment, resulting in two afternoons of lively scientific discussions.

The Regitze R. Vold Memorial Prize was awarded to Dr Björn Corzilius, for his work on "Novel mechanisms of polarization propagation under MAS DNP. The Vold Prize is awarded to an outstanding contribution by a younger scientist selected from the abstracts. Dr Corzillius gave the prize lecture on Tuesday evening, after a free afternoon during which participants had the opportunity for a walk or a hike.

The conference was held at the centre des congrès de Chamonix, in the familiar setting of the Majestic building. Industrial and academic sponsors were present and contributed to the scientific content and exchanges, as well as to the social dimension of the conference. An aperitif was organised by Bruker Biospin on the evening of the third day.

During the conference, the organizing committee, who had created the conference in 1999 and organized it since, announced their intention to retire from their role. The next organizing committee gave a presentation on the future of the conference.

The next edition of the Alpine Conference will take place in Chamonix from Sunday 15 to Thursday 19 September 2019. The scientific committee is composed of Tatyana Polenova (Newark, DE), Arno Kentgens (Nijmegen) and Lucio Frydman (Rehovot).

The organising committee is very grateful to the sponsors: Bruker, CEA, Barthel, CortecNet, Doty Scientific, Jeol, NMR Service, Phoenix NMR, Rototec/Spintec, Spin- Doc, and Springer-Nature, for supporting the conference. The contribution of Bruker, whose major support is essential to the conference, is especially acknowledged. The organising committee would also like to thank the scientific committee and all the participants for their active participation. The dedication of Ms. Roudier and the personnel of the centre des congrès is warmly acknowledged.

2017 KAZAN * RUSSIA MODERN DEVELOPMENT OF MAGNETIC RESONANCE

Report on the Annual International Conference MDMR2017
September 25-29, 2017
Kazan, Russia

In September 2017, Kazan welcomed 120 participants from Belgium, China, France, Germany, Israel, Japan, the Netherlands, Russia, Sweden, and the United States in order to discuss achievements and new tendencies in applications of magnetic resonance within the Annual International Conference "Modern Development of Magnetic Resonance 2017" dated to the Zavoisky Award 2017 ceremony. Professor Takeji Takui (Osaka City University, Japan) got the Zavoisky Award 2017 for his outstanding contributions to the development of organic high-spin and open-shell molecules and their EPR-based quantum spin technology.

The conference was organized by the Zavoisky Physical-Technical Institute of the Russian Academy of Sciences and the Kazan Federal University under the auspices of the Groupement AMPERE. It included eight plenary lectures, fifty-two invited and oral talks, and sixty posters within the following sections: Theory of magnetic resonance; Low-dimensional systems and nano-systems; Electron spin based methods for electronic and spatial structure determination in physics, chemistry and biology; Molecular magnets and liquid crystals; Spin-based information processing; Strongly correlated electron systems; Chemical and biological systems; Medical physics; Magnetic resonance imaging; Other applications of magnetic resonance; Modern methods of magnetic resonance; Magnetic resonance instrumentation; Related phenomena. A special session was devoted to the 110th anniversary of Evgeny K. Zavoisky, who discovered the phenomenon of electron paramagnetic resonance in 1944.

The Zavoisky lecture of Takeji Takui "Topological High-Spin Organic Chemistry and Molecular Spin-Qubit Quantum Technology Underlain by Electron Magnetic Resonance" was devoted to multispin molecules, which are of great interest from the point of view of the creation of monomolecular magnets and spin based quantum computing. Impressive results on the

development of terahertz EPR spectroscopy were highlighted by Hitoshi Ohta in his plenary lecture "Multi-Extreme THz ESR: Developments and Future Biological Applications". The plenary lecture of Aleksandr I. Smirnov "Spinon Magnetic Resonance in a Quasi 1D $S = {}^{1}/_{2}$ Antiferromagnet with a Weak Exchange Interaction" was concerned with model objects of great fundamental importance for physics of macroscopic quantum phenomena.

Plenary lectures by Martina Huber "EPR Methods to Determine Properties of Intrinsically Disordered Proteins" and Robert Bittl "Insight into Protein Function by EPR" demonstrated the applications of EPR spectroscopy in biology.

From left to right: Alexey A. Kalachev, Director of the Kazan Physical-Technical Institute, Il'shat. R. Gafurov, Rector of the Kazan Federal University, Takeji Takui, Zavoisky Awardee 2017, Myakzyum Kh. Salakhov, President of the Academy of Sciences of the Republic of Tatarstan, Kev M. Salikhov, Chairman of the Zavoisky Award Selection Committee, and Endel' N. Fattakhov, Deputy Prime-Minister of the Republic of Tatarstan.

The lecture "Soft Spins and Higgs Mode in Ruthenates" was given by Giniyat Khaliullin, and Michael K. Bowman et al. presented the lecture "The Different Faces of Free Radical Spin Dynamics in Frozen Solution". The plenary lecture of Valery F. Tarasov was devoted to studying dimer self-organization of rare-earth impurity ions in synthetic forsterite, while Elena G. Bagryanskaya in her lecture "Pulse Dipole EPR-Based Distance Measurements at Ambient Temperatures" discussed recent developments and perspectives in the field of EPR spectroscopy of spin labels.

The conference demonstrated the increasing interest in magnetic resonance studies in diverse fields of science. The financial support of the Government of the Republic of Tatarstan, the Russian Foundation for Basic Research, and Bruker BioSpin is gratefully appreciated.

Kev M. Salikhov
Co-chairman of the MDMR 2017 conference
Violeta K. Voronkova
Scientific Secretary of the MDMR 2017 conference

The Giulio Cesare Borgia Award, MRPM 14

Stefan A. Hertel

Fast spatially-resolved T_2 measurements with constant gradient CPMG

Stefan A. Hertel[a], Benjamin Anger[a], Matthias Appel[a], Hilko de Jong[a], Daan de Kort[b], Andrew J. Sederman[b], Lynn F. Gladden[b]

[a]Shell Technology Center, 3333 Highway 6 S, 77077 Houston TX, USA; [b]Magnetic Resonance Research Centre, Department of Chemical Engineering and Biotechnology, University of Cambridge, Philippa Fawcett Drive, Cambridge, CB3 0AS, UK

Magnetic Resonance is commonly used in the hydrocarbon industry as a non-invasive tool for measuring the fluid distribution in porous rocks and catalyst supports. Among the applications are enhanced oil recovery (EOR) experiments, where one is interested in the displacement efficiency of hydrocarbons by EOR agents as a function of time and location inside reservoir rock core plugs [1]. In such studies, the transverse relaxation time (T_2) distribution of pore fluids may provide quantitative fluid typing based on the dependence of T_2 on fluid viscosity and interactions with the pore walls. For acquisition of spatially resolved fluid distributions, several techniques exist that combine the Carr-Purcell-Meiboom-Gill (CPMG) pulse sequence [2, 3] with pulsed magnetic field gradients for spatial encoding [4]. However, for dynamic EOR applications, the temporal and spatial requirements on the pulse sequence are high and include a short total acquisition time, short spin-echo times and millimeter-scale resolution [5]. Typical pulse sequences based on phase encoding gradients increase the total acquisition time with increasing resolution beyond several minutes [4]. Although the use of frequency encoding reduces acquisition times compared to experiments based only on phase encoding, the shortest spin-echo time and ease of implementation suffer from the ramping of the magnetic field gradients [4]. Those obstacles can be overcome by using CPMG in the presence of a constant magnetic field gradient.

In this study, we present experiments with constant-gradient CPMG applied to T_2 phantoms as well as a polymer flood of an oil-saturated sandstone. The time resolution with our approach was on the order of 20 seconds if 4 scans were averaged and a recycle delay of 5 seconds was applied. Additionally, the minimal echo spacing can be reduced to t_E = 0.4 ms, which is comparable to downhole NMR logging tools and low compared to current spatial T_2 techniques.

Constant gradient CPMG does not suffer from eddy currents caused by the ramping of gradient pulses, which may distort the NMR signal in other frequency encoded techniques. We provide the operating envelope for this kind of experiment, which is restricted due to the slice selectivity of the radio frequency (rf) pulses when the constant magnetic field gradient is increased. We show that the effects of self-diffusion in the applied magnetic field gradient and the mixing of T_1 and T_2 contributions are negligible. Theoretical calculations based on spin dynamics [6], reveal a viable window where even the T_2 of viscous fluids can be measured undistorted by stimulated pathways. A detailed analysis of the coherence pathway spectrum with Phase Incremented Echo Train Acquisition (PIETA) [7] confirms these findings.

Figure 1 shows spatial-T_2 images at three time points after starting the injection of a viscous paraffin into a brine-saturated Bentheimer sandstone. In this experiment, the highest resolution without distortion of the 1D-MRI profile was 2.79 mm; less than what could be achieved using phase imaging methods such as SE-SPI [4], but sufficient to observe end-effects and core plug heterogeneities. As an outlook, we discuss the potential of applying variable spin-echo time CPMG experiments with spatial encoding, which additionally would reduce sample heating due to a significant reduction in the number of rf-pulses.

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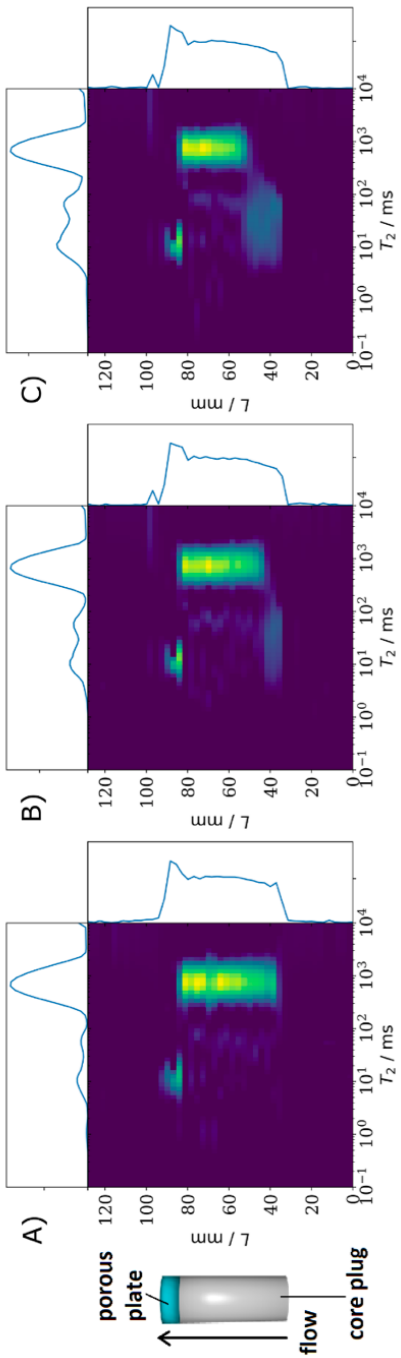

Figure 1: Spatial-T_2 images showing the displacement of brine (T_2 = 100 ms – 1 s) by paraffin (T_2 = 1 ms – 100 ms) on a 2 MHz Oxford Instruments spectrometer. The sketch is showing the flow direction of paraffin and the location of the porous plate, which is commonly used to ensure the homogeneous saturation of the fluid phases after a core flood. A) Fully brine-saturated core plug, B) Shortly after the start of paraffin injection at 1cc/min (flow from bottom to top) C) Paraffin front moving upwards, displacing the brine.

First Poster Prize Award, MRPM 14

Evan M. Forman

Transport Properties of Crystals of Zeolitic Imidazole Framework-11 (ZIF-11) Embedded in Polymers to Form Mixed-Matrix Membranes

Evan M. Forman[a], Amineh Baniani[a], Lei Fan[a], Kirk J. Ziegler[a], Erkang Zhou[b], Ryan P. Lively[b], Sergey Vasenkov[a]
[a]Department of Chemical Engineering, University of Florida, Gainesville, Florida 32611, USA, [b]School of Chemical & Biomolecular Engineering, Georgia Institute of Technology, Atlanta, GA, 30332, USA

Mixed-matrix membranes (MMMs) consist of molecular sieve particles embedded in a polymer matrix. MMMs have piqued interest because such membranes are easy to fabricate and their separation performance can be much better than that of pure polymeric membranes. Recently, zeolitic imidazole frameworks (ZIFs) have been studied to be incorporated into polymer matrices as molecular sieves.

Our recent ^{13}C pulsed field gradient (PFG) NMR studies of sorbate diffusion in aN MMM where ZIF-8 crystals are embedded in 6FDA-DAM polymer revealed a difference in the embedded ZIF-8 transport properties. An explanation has been that the confinement of the ZIF particles leads to a reduced flexibility in the framework [1,2]. Here we report ^{13}C PFG NMR studies of diffusion of ethylene inside different ZIF-11-based MMMs at equivalent loading pressures. By utilizing a high magnetic field (17.6 T) and high field gradients (up to 30 T/m), we can achieve sufficiently large signal-to-noise ratios, while observing molecular displacements on length scales smaller than the crystal size. PFG NMR allows obtaining the mean square displacements ($<r^2(t)>$) and the corresponding diffusivity D of molecular ensembles by measuring the PFG NMR signal attenuation (Ψ)

$$\Psi = \frac{S(g)}{S(g \approx 0)} = \exp\left(-\frac{<r^2(t)>q^2}{6}\right) = \exp(-q^2 Dt), \qquad (1)$$

where S is the PFG NMR signal intensity measured by the 13-interval PFG NMR sequence and $q = 2\gamma g\delta$, where γ is the gyromagnetic ratio, g is the gradient amplitude strength, and δ is the effective gradient pulse length.

Fig.1 shows examples of the PFG NMR attenuation curves measured for intra-ZIF ethylene diffusion in two ZIF-11 based MMMs and in a bed of ZIF-11 crystals. For both MMMs the intra-polymer diffusion does not contribute to the measured attenuation curves because of the SHORT T_2 NMR relaxation times in the polymer phases. Fig. 1A shows that the slopes of the attenuation curves for the intra-ZIF diffusion in ZIF-11/Torlon MMM (MMMT) are smaller than those in the ZIF-11 bed, indicating lower intra-ZIF diffusivities in MMMT than in the bed by a factor of around 2 (Eq. (1)). At the same time, the slopes and the corresponding diffusivities in ZIF-11/ Matrimid MMM (MMMM) are the same, within uncertainty, as those in the bed. These results indicate that the ZIF confinement effects leading to lower intra-ZIF diffusivities are stronger in MMMT than in MMMM.

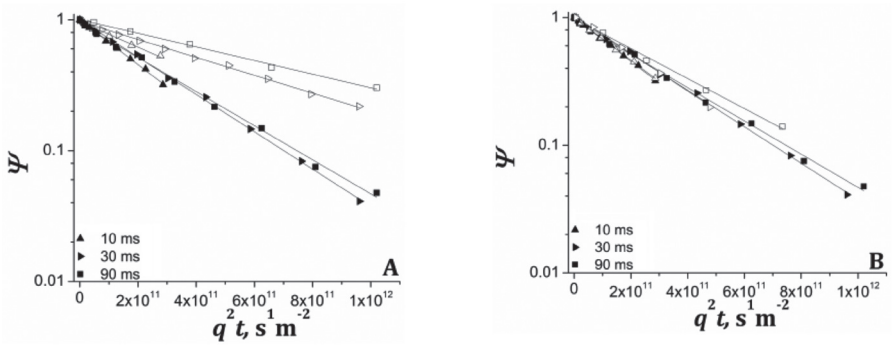

Figure 1 – ^{13}C PFG NMR attenuation curves measured in ZIF-11 / Torlon (A) and ZIF-11 / Matrimid (B) MMMs (hollow symbols) loaded with ethylene at 296 K. Solid lines show the best fit of the attenuation data to Eq. (1). Also shown for comparison are the PFG NMR attenuation curves for ethylene loaded in a ZIF-11 particle bed (filled symbols). All samples have equivalent loading pressures 0.8 Bar.

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Second Poster Prize Award, MRPM 14

Artur Lozovoi

The role of porous asphaltene aggregates in relaxation properties of crude oil

Artur Lozovoi, Kevin Lindt, Carlos Mattea, Bulat Gizatullin, Siegfried Stapf
FG Technische Physik II / Polymerphysik, Technische Universität Ilmenau, 98684 Ilmenau, Germany

Crude oil comes in a wide variety of viscosities and compositions, with NMR relaxometry and diffusometry being partially successful in separating and quantifying essential data about oil for the purpose of production and procession [1-8]. In particular, correlations of these quantities with each other in two- or three-dimensional maps have been employed to estimate molecular size distributions in bulk. When confined in rocks, these parameters are additionally affected by the presence of the solid-liquid interface, but some findings remain valuable, especially for oils of high viscosity where relaxivity is already high in the bulk.

The next step in refining what is essentially a semi-empirical approach does include dynamic modelling and requires field-dependent relaxation data, chemical resolution and a discussion of alternative relaxation mechanisms beyond simple intra- and intermolecular dipolar interaction of the maltene nuclei. Furthermore, a paucity of high-temperature data, which would correspond to actual reservoir conditions, is evident from the literature due to certain limitations of currently available laboratory hardware.

In this study, field-cycling relaxometry distribution functions at elevated temperatures are obtained for several different crude oils, and are combined with a systematic study of the origin of relaxation processes with a particular focus on asphaltene-containing oils. The motivation of this work originates from earlier findings that aromatic dopants in crude oil show a much more pronounced relaxation dispersion than saturated hydro- or fluorocarbons of similar molecular weight [5-7]. This effect was absent for asphaltene-free oils, and it was suggested that strong interaction of aromatic maltenes with the polyaromatic core of asphaltenes, possibly by a tendency towards π–π stacking, can explain this behavior qualitatively. In addition to enhanced nucleus-nucleus dipolar relaxation mechanisms, nucleus-electron relaxation via free radicals in the asphaltenes is a contributing factor, and was even expected to dominate.

The study of five dead oils at temperatures up to 443 K revealed mostly

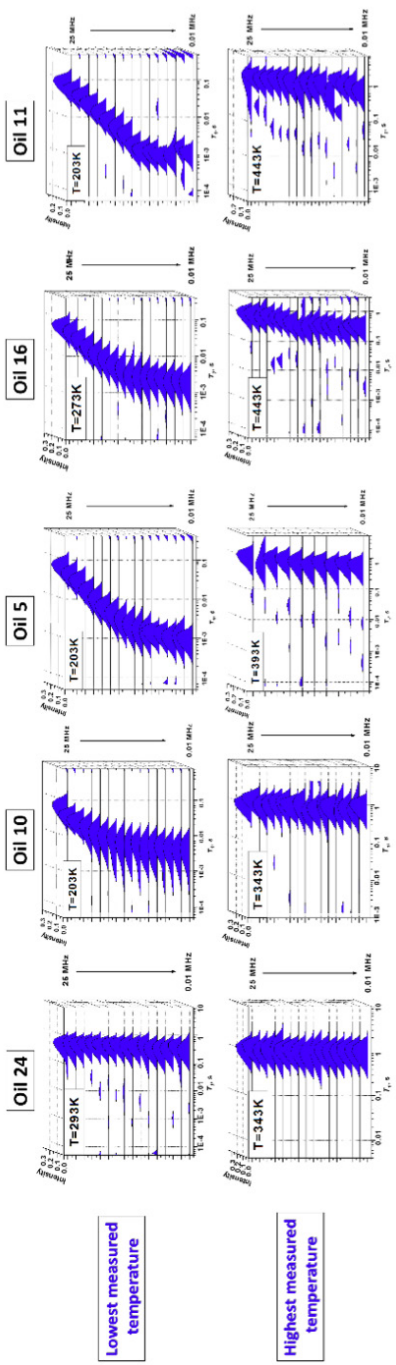

Figure 1: Longitudinal NMR relaxation times T_1 distributions for 5 crude oil samples obtained with use of inverse Laplace transformation algorithm [2].

narrow T_1 distributions of the spectrally unresolved maltenes and the disappearance of a pronounced dispersion towards high temperatures, as viscosity decreases [8]. It has been possible to generate master curves for the majority of these oils. At high asphaltene content, however, the observed data cannot be matched to such a master curve any more, and a small but statistically significant short relaxation component becomes apparent.

The interaction of individual molecule types with asphaltenes was further investigated with a series of diluted samples where, however, no direct information about aggregation size was available. The difference between aromatic and saturated molecules remained obvious, and the relaxation properties of ^{19}F nuclei were generally found much more affected than those of ^{1}H. Assuming coronene as a suitable model for the asphaltene core, and increasing its complexity stepwise by the addition of side chains and the use of dimeric and trimeric cores, DFT simulations were employed for determining interaction energies and relative conformations of different maltene molecules. Finally, NMR relaxation combined with EPR spectroscopy clearly demonstrated that nuclear relaxation does by no means correlate simply with radical concentration, but that considerable differences hint to an importance of asphaltene chemistry. We suggest the relevance of acidity and aggregation behavior and the relative amount of delocalized free radicals and vanadyl centers as possible origins for the different influence of asphaltenes on crude oil relaxation distributions.

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Third Poster Prize Award, MRPM 14

Yong Du

Parahydrogen Induced Polarization of Water and other Neat Liquids by Heterogeneous Catalysis

Evan Wenbo Zhao,[a] Raghu Maligal-Ganesh,[b] Yong Du,[a] Tommy Yunpu Zhao,[a] Wenyu Huang,[b,c] and Clifford R. Bowers[1,*]
[a]Department of Chemistry, University of Florida, Gainesville, Florida, 32611 USA; [b]Department of Chemistry, Iowa State University, Ames, Iowa, 50011, USA; [c]Ames Laboratory, U.S. Department of Energy, Ames, Iowa 50011, USA.

We have discovered a catalyst for the alignment of proton magnetic moments in water molecules (as well as methanol and ethanol molecules) from parahydrogen, the metastable singlet spin isomer of dihydrogen. After simply bubbling para-enriched H_2 gas through a suspension of the solid catalyst particles in water, the water protons yield intense stimulated emission NMR signals, corresponding to a negative spin temperature. The phenomenon is dubbed SWAMP (**S**urface **W**ater **A**re **M**agnetized from **P**arahydrogen). Parahydrogen induced polarization (PHIP) of water by heterogeneous catalysis has not been previously reported in the past three decades of PHIP research.

Details about the catalyst and the molecular mechanism for the interfacial process, including a density operator model for the spin dynamics, will be presented. SWAMP is a fast and scalable method for producing hyperpolarized pure liquid water, free from polarizing radicals or catalyst residues, which could be transformative to the advancement of MRI and other applications.

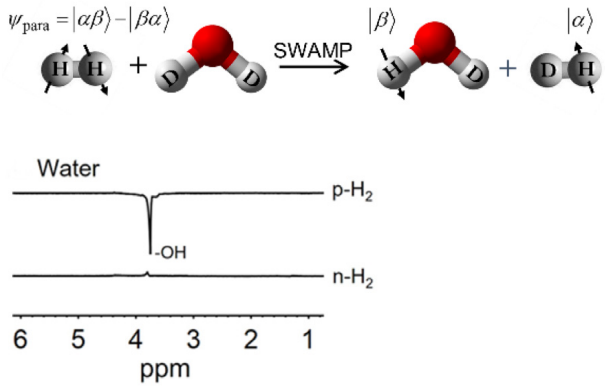


Figure 1 – Liquid hyperpolarized water produced by the SWAMP effect.

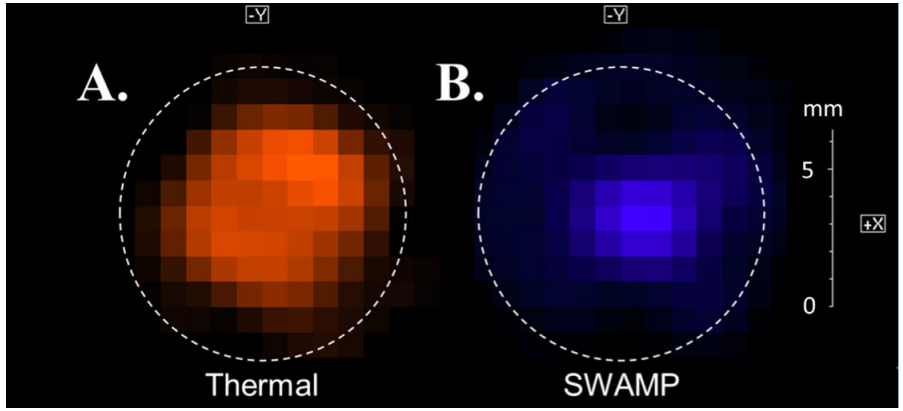


Figure 2 – ^{1}H images of a medium-wall 10mm O.D. NMR tube containing a mixture of 900μL D_2O, 900μ CD_3OD, and 100mg secret SWAMP catalyst, recorded at 750 MHz using the SPIRAL-EPI pulse sequence
A. Thermally polarized; B. world's first SWAMP-hyperpolarized image. Orange = absorption, Blue = emission (negative phase).

First announcement

2018 KAZAN * RUSSIA

MODERN DEVELOPMENT OF MAGNETIC RESONANCE

We are pleased to welcome you to the annual International Conference "Modern Development of Magnetic Resonance 2018" and the Zavoisky Award 2018 ceremony supported by the Government of the Republic of Tatarstan which will be held in Kazan, Russia
on September 24-28, 2018.

The conference is organized under the auspices of the Groupement AMPERE, the official language of the conference is English.
Theory of magnetic resonance

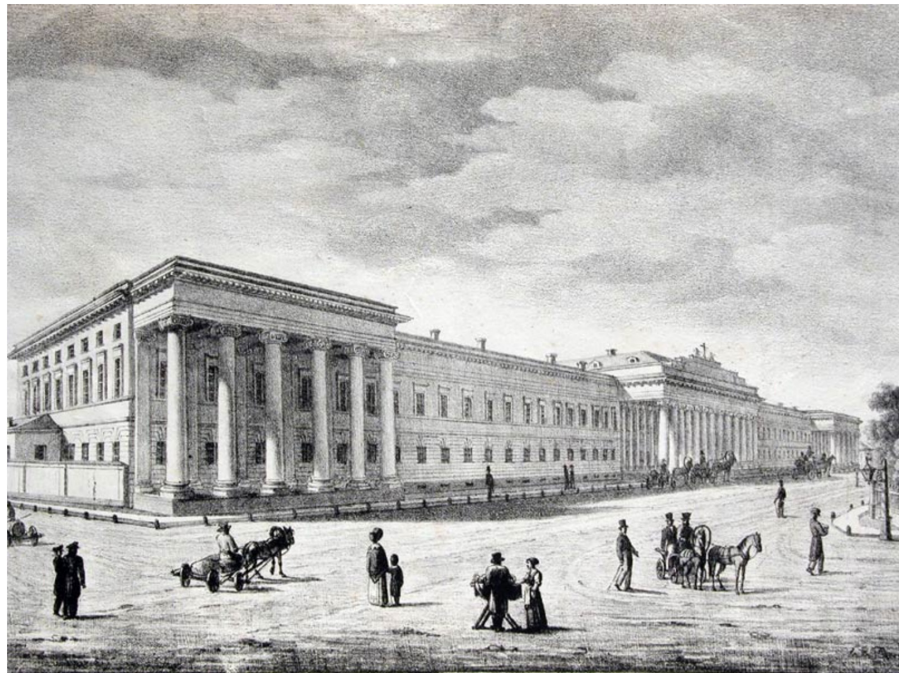
Topics:
- Low-dimensional systems and nano-systems
- Electron spin based methods for electronic and spatial structure determination in physics, chemistry and biology
- Molecular magnets and liquid crystals
- Spin-based information processing
- Strongly correlated electron systems
- Chemical and biological systems
- Medical physics
- Magnetic resonance imaging
- Other applications of magnetic resonance
- Modern methods of magnetic resonance
- Magnetic resonance instrumentation
- Related phenomena

Important Dates:

• Deadline for the registration and submission of abstracts:	June 30, 2018
• Notification of the report acceptance:	July 15, 2018
• Opening of the conference:	September 24, 2018
• Zavoisky Award 2018 ceremony:	September 24, 2018
• Closing of the conference:	September 28, 2018

Online registration and abstract submission will be opened:
www.kfti.knc.ru/mdmr/2018

Chairmen
Alexey A. Kalachev, Professor
Kev M. Salikhov, Full Member of the Russian Academy of Sciences



Main building of Kazan University, 1832

First announcement

Dear NMR Community,
On behalf of the Organizing Committee it's my great pleasure to invite you to attend the next AMPERE NMR School 2018, an annual event organized since the early 90th in Zakopane under the auspices of the Groupment AMPERE. It will be organized from June 10th to 16th 2018 in Zakopane, Poland.
www. zakopane.pl

The traditional topics given in the School:
Solid State and Soft Matter NMR
NMR diffusometry and relaxometry
Application of NMR in biology and medicine
Magnetic resonance imaging and spectroscopy
NMR and quantum information
Theoretical and experimental aspects of dynamic nuclear spin polarization
NMR methodology and techniques.

The School is addressed to PhD students of various fields of physics, chemistry, biology and medicine and is focused on theoretical and experimental aspects of NMR methods and their applications. The lectures are expected to contain a basic (tutorial) introduction and the research of your interest.

The conference fee (450 Euro) includes full board, accommodation and the conference proceedings.

We will be able to provide a financial support for selected participants of the AMPERE NMR School 2018. For PhD students, achieving the best results in scientific work (confirmed by the recommendations), the fee and the accommodation costs will be reduced (up to 250 EUR). The grants will be funded by Groupement Ampere.

The organizers kindly ask you to register on the our website and provide us a brief description of your scientific interests and the progress achieved in the field. Please attach a letter of recommendation in support of your application and send it by e-mail to: centrum@amu.edu.pl

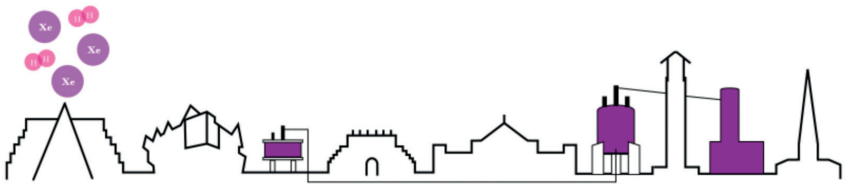
The Organizing Committee will select the best PhD students, who receive grants.
Please see: http://www.staff.amu.edu.pl/~school/fee.html

I am more than convinced that you will enjoy your stay in Poland, bringing home unforgettable memories - Zakopane is a beautiful town, located in the south of Poland at the foot of the Tatra mountains, about 100 km from Cracow. (www.zakopane.pl/en)

With my best wishes

Prof. Stefan Jurga
Director

First announcement



HYP18

An International Conference on Nuclear Hyperpolarization, Sep 2-5 2018

Southampton, UK, Sep 2-5, 2018.
hyp18.com

This conference will cover the main areas of nuclear hyperpolarization and some other methods for sensitivity enhancement in NMR and MRI, including:

- several variants of dynamic nuclear polarization (DNP)
- optical pumping
- quantum-rotor-induced polarization
- parahydrogen-induced polarization
- diamond magnetometry

and key applications such as clinical imaging, materials science, and molecular structure determination.

Registration opened February 1st 2018

The confirmed plenary speakers are:

- Kevin Brindle, Cambridge, UK
- Bob Griffin, MIT, USA
- Sami Jannin, ENS Lyon, France
- Fedor Jelezko, Ulm, Germany
- John Kurhanewicz, San Francisco, California, USA
- Anne Lesage, ENS Lyon, France
- Leif Schröder, Berlin, Germany
- Thomas Theis, Durham, North Carolina, USA

The confirmed invited speakers are:

- Stephan Appelt, Aachen, Germany
- Peter Blümler, Mainz, Germany

• Arnaud Comment, Cambridge, UK
• Meghan Halse, York, UK
• Mathilde Lerche, Copenhagen, Denmark
• Gaël de Paëpe, Grenoble, France
• Marek Pruski, Iowa, USA

Organizers:
• Malcolm H Levitt, Southampton, UK (conference chair)
• Giuseppe Pileio, Southampton, UK

Scientific Committee:
• Malcolm Levitt, Southampton, UK (Chair)
• Jan-Henrik Ardenkjaer-Larsen, Copenhagen, Denmark
• Marc Baldus, Utrecht, The Netherlands
• John Blanchard, Mainz, Germany
• Konstantin Ivanov, Novosibirsk, Russia
• Thomas Meersman, Nottingham, UK

For further information, see the hyp18.com

Grand Harbour Hotel, Southampton

First announcement

AMPERE Biological Solid-State NMR School 2018

The next Ampere Biological Solid-State NMR School will take place at the Universitat de les Illes Balears in Palma de Mallorca, Spain,
October 21-26, 2018.

The School is aimed at advanced students who have a good knowledge of the basics of NMR. The School has the purpose of teaching the students a broad range of topics required to understand modern solid-state NMR experiments which are used in biological applications: Hamiltonians in NMR, isotropic and anisotropic interactions, tensor description of NMR, spherical tensors and tensor rotations, time-dependent Hamiltonians, average Hamiltonian and Floquet theory, principles of recoupling and decoupling under MAS, spin-dynamic simulations using SIMPSON, basic principles and applications of MAS DNP, EPR and paramagnetic NMR, characterization of dynamic processes, protocols for the assignment of

protein spectra and protein structure determination, the basics of solid-state NMR instrumentation as well as sample preparation and isotope-labelling techniques. In addition, two „outside" talks will highlight complementary techniques for structure determination in biological samples.

The following scientists have agreed to teach at the school:
- Marc Baldus (Utrecht University)
- Anja Böckmann (CNRS/ Université de Lyon)
- Enrica Bordignon (Ruhr Universität Bochum)
- Bettina Böttcher (Universität Würzburg)
- Frank Engelke (Bruker Karlsruhe)
- Matthias Ernst (ETH Zürich)
- Bob Griffin (MIT Boston)
- Huub de Groot (Universiteit Leiden)
- Beat H. Meier (ETH Zürich)
- Hartmut Oschkinat (FMP Berlin)
- Bernd Reif (TU München)
- Carolin Seuring (Center for Free-Electron Laser Science Hamburg)
- Thomas Vosegaard (Aarhus)

The registration for the school starts in March 2018.
More information and the registration link can be found at:
biosolidnmr-school.org/school-2018/

The scientific committee:
- Anja Böckmann (CNRS/Université de Lyon, France)
- Matthias Ernst (ETH Zürich, Switzerland)
- Beat Meier (ETH Zürich, Switzerland)
- Hartmut Oschkinat (FMP Berlin, Germany)

Obituary

Charles P. Slichter
January 21, 1924 - February 19, 2018

October 2010, Leipzig

Charlie Slichter was a pioneer of magnetic resonance as well as condensed matter physics. He was highly respected by both communities as he shaped magnetic resonance by using it in the most fundamental way to prove or disprove new condensed matter theory. He originated from the Harvard strand (Purcell) of magnetic resonance, and accomplished most of his discoveries and inventions at the University of Illinois at Urbana-Champaign which he joined already in 1949, the year he received his PhD. Today, perhaps more than ever before, a large magnetic resonance community knows about his proof of Overhauser's theory of DNP with the first electron-nucleus double resonance experiments, with his student Carver in 1953. Another early, fundamental contribution concerned the determination of the absolute value of the spin susceptibility of metallic electrons which Pauli had calculated. By using a sequential version of the DNP double resonance experiment, together with his student Schumacher they measured the electronic spin contribution in 1954. When Bardeen was thinking that a gap in the electronic density of states must be behind superconductivity (that had evaded explanation since 1911), Slichter concluded that this must show up in nuclear relaxation. But superconductivity was known to break down in even small magnetic fields, so how to do NMR? I must admit that I studied his 1957 paper only in 1997, after I had spent more than a year in Slichter's lab trying to prove or disprove the so-called stripe-model (spatial modulations of spin and charge) in high-temperature superconductors. I emerged totally

discouraged from reading, and I told him. It was about field cycling, spin-temperature, and relaxation by superconducting electrons when they break up, all accomplished in 1957 the year Bardeen, Cooper, Schrieffer formulated their famous BCS theory of superconductivity. This brings up the other side of Charlie Slichter. He was able to make you feel important within a minute, up and fit for the next experiment that could change the world.

Of course, the discovery of the indirect spin-spin coupling with Gutowsky, surface studies of platinum, the invention of the coherent NMR spectrometer, we all use today, McMillan‘s charge-density waves, the Kondo-effect, ultraslow motion, relaxation in the rotating frame, color centers, and many more discoveries or inventions in physics and chemistry carry his mark. With the discovery of high-temperature superconductivity by Bednorz and Müller in 1986, NMR spectrometers all over the world were searching for the Hebel-Slichter peak - to no avail. Slichter started a few years late, but with the most careful experiments in the field he contributed fundamental evidence, in lack of theory. These were the gold rush years, but he stayed close to the experiments and away from assuming theory. For example, he never trusted the NMR shift analysis that was used in major conclusions, and he pushed me not to give up on decisive experiments when most regarded the problem solved. He was right, as we found out not long ago, although the clues for the theory may not be telling enough. He enjoyed our recent progress during long discussions, but also became more and more interested by recent progress with DNP, again.

Students must know, that, of course, not all envisioned experiments succeeded. What about those who failed, for whatever reasons, at the frontiers of science? Perhaps nobody knows all details, but Mansfield belongs to that group, and he valued his time in Urbana the most, before he went on to change magnetic resonance imaging forever. Charlie Slichter received many honors for his ground breaking work, among them the Buckley Prize in 1996, and the National Medal of Science in 2007. He served on a number of boards, among them the President‘s Science Advisory Committee, and the Harvard Corporation.

Of course, we all know his book, Principles of Magnetic Resonance, to a certain degree, designed as a text book for physics graduate students. And if we really want to understand some topics it offers perhaps the deepest advice there is. With hardly a paragraph not thought over many times, it remains a fundamental reference even for us insiders, and I know, also for hard-core theorists.

At the ‚50 years of condensed matter‘ celebration in Urbana in 2005, Leo Kadano (University of Chicago), and during this honorable doctor celebration in Leipzig 2010 (the picture), Alex Müller (University of Zurich), made it clear why, today, international science has lost so much. One of the deepest thinkers of his generation, with nearly infinite enthusiasm, the kindest and warmest person one can know, committed to the highest standards in all respects of life. A scientist who was concerned about content, not where it was published.The hardest work paired with joy. Laughter and fun in the lab were not rare, neither at the many parties at his family home where he indulged in serving us all.

Jürgen Haase
Leipzig University

Executive Officers and Honorary Members of the AMPERE Bureau

The AMPERE BUREAU includes the executive officers (which take the responsibility and the representation of the Groupement between the meeting of the committee), the honorary members of the Bureau and the organizers of forthcoming meetings.

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B. BLÜMICH
Macromolecular Chemistry, RWTH Aachen University, D-52074 Aachen, Deutschland
Tel. +49 241 802 64 20, Fax +49 241 802 21 85, e-mail: bluemich@itmc.rwth-aachen.de
J. DOLINŠEK
Institute Jozef Stefan, Department F5, Jamova 39, SI-1000 Ljubljana
Tel. +386 1 4773 740, Fax +386 1 4263 269, e-mail: jani.dolinsek@ijs.si
A. BÖCKMANN
Institute of Biology and Chemistry of Proteins, IBCP, F-69367 Lyon, France
Tel. +33 472 72 26 49, Telefax +33 472 72 36 04, e-mail: anja.bockmann@ibcp.fr
G. JESCHKE
Laboratorium für Physikalische Chemie, ETH Zürich, CH-8093 ZURICH, Switzerland
Tel. +41 44 632 5702, Fax +41 44 633 1448, e-mail: Gunnar.Jeschke@phys.chem.ethz.ch
M. ERNST
Laboratorium für Physikalische Chemie, ETH Zürich, CH-8093 ZURICH, Switzerland,
Tel. +41 44 632 4366, Fax +41 44 632 16 21, e-mail: maer@nmr.phys.chem.ethz.ch
S. VAN DOORSLAER
University of Antwerp, Departmet of Physics, Campus Drie Eiken, Universiteitsplein 1, 2610 Wilrjik, Belgium, e-mail: sabine.vandoorslaer@uantwerpen.be
M. M. BRITTON
University of Birmingham, Birmingham, B15 2TT, UK
office: +44 121 4144391, e-mail: m.m.britton@bham.ac.uk
Y.Q. SONG
Schlumberger-Doll Research, 1 Hampshire Street, Cambridge, MA 02139-1578 USA
Phone: +1 617 768 2333, e-mail: ysong@slb.com
J. VAN DUYNHOVEN
Unilever N.V., 100 Victoria Embankment, London EC4Y 0DY, United Kingdom, e-mail: john-van.duynhoven@unilever.com
G. BODENHAUSEN
ENS - Département de chimie, 24, rue Lhomond, 75005 Paris, France,
e-mail: geoffrey.bodenhausen@ens.fr
T. PRISNER
Goethe University Frankfurt, Institute of Physical and Theoretical Chemistry, 60438 Frankfurt am Main, Germany, Tel: +49 (0) 69-798-29406, Fax: +49 (0) 69-798-29404 , e-mail: prisner@chemie.uni-frankfurt.de
C. REDFIELD
Department of Biochemistry, University of Oxford, South Parks Road OX1 3QU, United Kingdom, Tel. +44 (0)1865 613200, e-mail: christina.redfield@bioch.ox.ac.uk
B.H. MEIER
Laboratorium für Physikalische Chemie, ETH Zürich, CH-8093 ZURICH, Switzerland,
Tel. +41 44 632 44 01, Fax +41 44 632 16 21, e-mail: beme@nmr.phys.chem.ethz.ch
H.W. SPIESS
Max-Planck Institut für Polymerforschung, Ackermannweg 10, POB. 3148, D-55021 MAINZ, Germany, Tel. +49 6131 379120, Fax +49 6131 379320, e-mail: spiess@mpip-mainz.mpg.de
ST. JURGA
Instytut Fizyki, Uniwersytet im. A. Mickiewicza, Zaklad Fizyki Makromolekularnej, Umultowska 85, PL-61-614 POZNAN, Poland
Tel. ++48 61 829 5290, Fax ++48 61 829 5290, e-mail: stjurga@main.amu.edu.pl

AMPERE Committee

S. ASHBROOK
School of Chemistry, University of St. Andrews, North Haugh, ST. ANDREWS, KY16 9ST, United-Kingdom
J. BANYS
Vilnius University, Department of Radiophysics, Saulétekio 9 2040 VILNIUS, Lithuania
R. BOELENS
Bijvoet Center for Biomolecular Research, Utrecht University, Padualaan 8, NL-3584 CH UTRECHT, The Netherlands
V. CHIZHIK
University of St. Petersburg, Quantum Magnet.Phen.,Fac.of Physics, RU-198504 ST. PETERSBURG, Russia
J. DOLINŠEK
Institute Jozef Stefan, Jamova 39, SI - 1000 LJUBLJANA, Slovenia
I. FELLI
Department of Chemistry and Center for Magnetic Resonance (CERM), University of Florence Via L. Sacconi 6 50019 SESTO FIORENTINO, (FI), Italy
P. GIRAUDEAU
Université de Nantes, Faculté des Sciences et Techniques, 2 rue de la Houssinière, 44322 NANTES Cedex 03, France
D. GOLDFARB
Chemical Physics Department, Weizmann Institute of Science, 76100 REHOVOT, Israel
R. KONRAT
Max F. Perutz Laboratories, Campus Vienna Biocenter 5, 1030 VIENNA, Austria
W. KOZMINSKI
Biological and Chemical Research Center, University of Warsaw, Krakowskie Przedmieście 26/28, 00-927 WARSAW, Poland
M. PONS
Biomolecular NMR group. Department of Inorganic and Organic Chemistry. University of Barcelona. Baldiri Reixac, 10-12, 08028 BARCELONA, Spain
F. SIMON
Budapest University of Technology and Economics, Müegyetem rkp. 3, 1111 BUDAPEST, Hungary
J. SPEVACEK
Inst. of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, 162 - 06 PRAGUE 6, Czechia
G. SPYROULIAS
Department of Pharmacy, School of Health Sciences, University of Patras, Panepistimioupoli – Rion, 26504 PATRAS, Greece
V.V. TELKKI
Department of Physics, University of Oulu, P.O. Box 3000, 90014 OULU, Finland
C. THIELE
Technische Universität Darmstadt, Alarich-Weiss-Strasse 16, 64287 DARMSTADT, Germany
D. TPOGAARD
Physical Chemistry, Lund University, Box 124, 221 00 LUND, Sweden
S. VAN DOORSLAER
SIBAC Laboratory, University of Antwerp, Universiteitsplein 1, B-2610 WILRIJK, Belgium

Emeritus members

L. KIMTYS
Department of Physics, Vilnius University, Universiteto Str. 3, VILNIUS 2734, Lithuania
F. MILIA
NRC Demokritos, Physics Department, Aghia Paraskevi Attikis, GR - 15310 ATHENS, Greece
J. HENNEL, Inst. of Nucl. Phys. Ul. Radzikowskiego 152, PL - 31342 KRAKOW 23, Poland

Honorary members

R.R. ERNST
Laboratorium für Physikalische Chemie, ETH Zürich, CH-8093 ZURICH, Switzerland
J. JEENER
Université Libre - Plaine, CP 223, Bld. du Triomphe, B - 1050 BRUXELLES, Belgium
K.A. MÜLLER
IBM Zurich Research Laboratory, Säumerstrasse 4, CH - 8803 RÜSCHLIKON, Switzerland
K. WUETHRICH
Inst. f. Molekularbiologie u. Biophysik, ETH Zürich, CH-8093 ZURICH, Switzerland

Guest members

A. PINES
Dept. of Chemistry, University of California, BERKELEY CA 94720, USA, Delegate of ISMAR
J.A. NORRIS
Dept. of Chemistry, University of Chicago, South Ellis Ave. CHICAGO IL 6037-1403, USA
Delegate of the International EPR Society
K.A. McLAUCHLAN
Physical Chemistry Laboratory, Oxford University, South Parks Road, OXFORD OX1 3QZ, UK
Delegate of the International EPR Society
D. AILION
Dept. of Physics, Univ. of UTAH, 304 J. Fletcher Building, SALT-LAKE-CITY 84112, Utah, USA
J. BJORKSTAM
Electrical Engineergin (FT-10), University of Washington, 98195 SEATTLE WA, USA
S.H. CHOH
Department of Physics, Korea University, SEOUL 136-701, Republic of Korea
D. FIAT
University of Illinois, Dept. of Physiology and Biophysics, POB 6998, CHICAGO IL 60680, USA
E. FUKUSHIMA
ABQMR, 2301 Yale Blvd., SE, Suite C2, ALBUQUERQUE, NM 87106, USA

Future conferences

Ampere Events 2018

15th International Youth School-Conference ‚Magnetic resonance and its applications, Spinus 2018	Saint Petersburg (Russia)	1-6 April 2018
Ampere NMR School 2018	Zakopane (Poland)	June 17-23, 2018
Euromar 2018	Nantes (France)	July 1-5, 2018
‚HYP18' Hyperpolarized Magnetic Resonance 2018	Southampton (UK)	September 2-5 2018
FoodMR 2018	Rennes (France)	September 17-21 2018
Modern Development of Magnetic Resonance 2018 and Zavoisky Award Ceremony	Kazan (Russia)	September 24-28 2018
Ampere Biological Solid-State NMR School	Palma de Mallorca (Spain)	October 21-26 2018

Other Events 2018

SciX2018	Atlanta (USA)	October 21-26 2018

Ampere Events 2019

15th ICMRM	Paris (France)	August 18-22 2019
ISMAR / Euromar 2019	Berlin (Germany)	August 25-30 2019
11th Alpine Conference on Solid-State NMR	Chamonix	September 15-19 2019