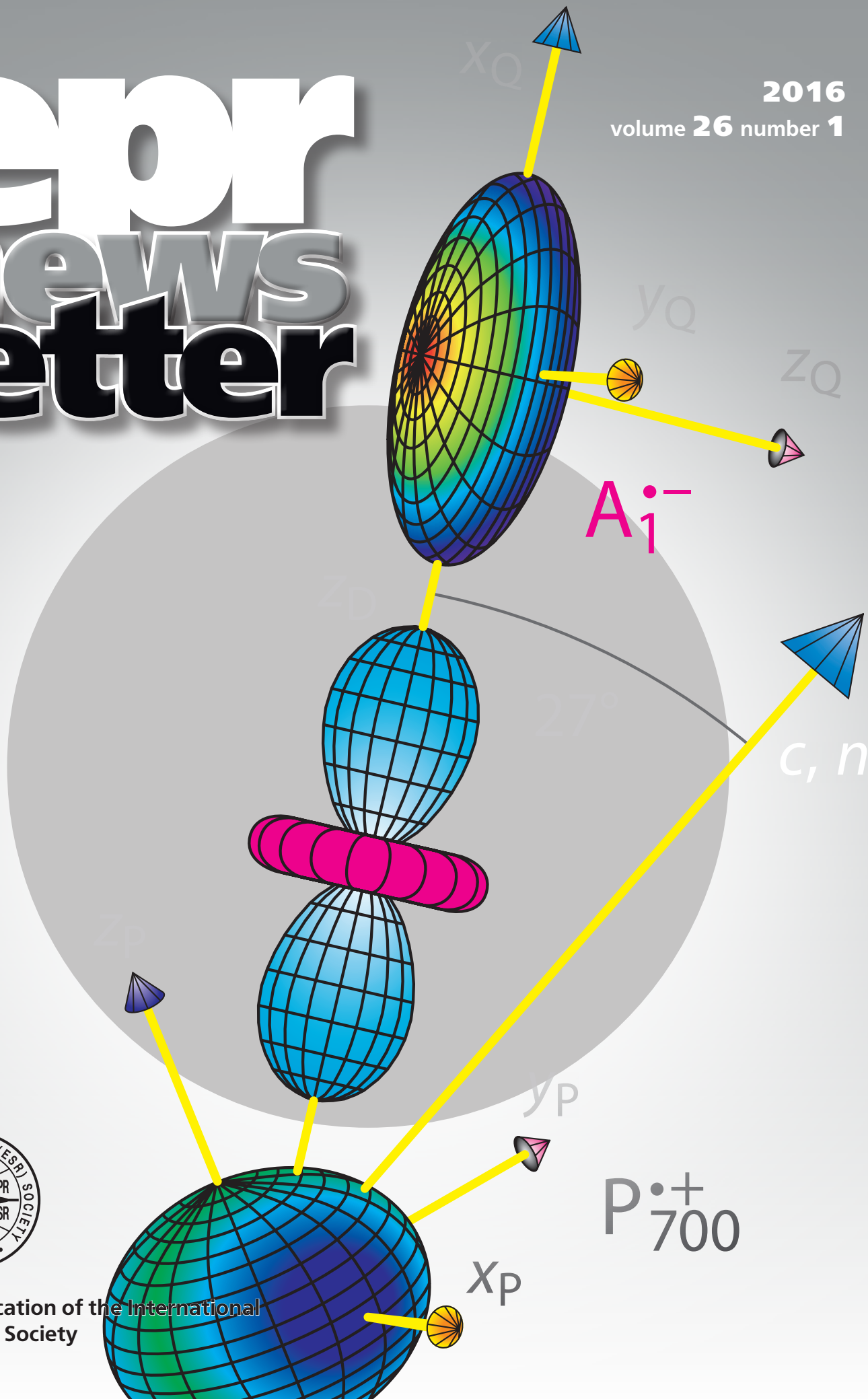


epr news letter

2016
volume 26 number 1



The Publication of the International
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The official publication of the International EPR (ESR) Society is supported by the Society, by corporate and other donors, the Zavoisky Physical-Technical Institute of the Russian Academy of Sciences, Kazan, Russian Federation, and the Swiss Federal Institute of Technology, Zürich, Switzerland.

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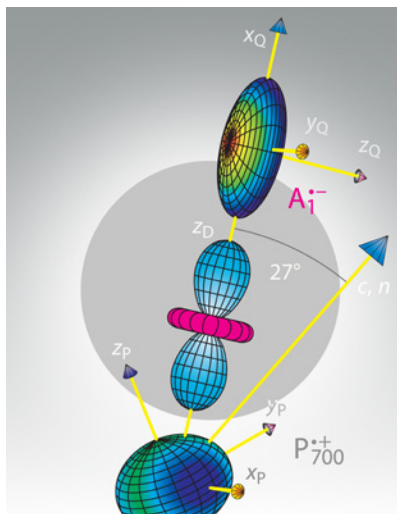
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The *EPR newsletter* is published quarterly by the International EPR (ESR) Society and is available in electronic and printed form to all members of the Society. The deadlines for submission of news for upcoming issues: Spring March, 15; Summer June, 15; Fall September, 15; Winter December, 15.

ISSN 1094-5571



PRINTING: LaPlume and Sons Printing, Inc.
One Farley Street, Lawrence MA 01843 USA
phone: (978) 683-1009, fax: (978) 683-4594



The cover picture illustrates aspects of research carried out by Robert Bittl, recipient of the Bruker Prize 2015. It shows the position of the quinone acceptor A_1 relative to the primary donor P_{700} within photosystem I (PSI) as determined by pulsed dipolar spectroscopy (out-of-phase ESEEM) on the charge separated state $P_{700}^{*+}A_1^{-}$ in PSI single crystals and the orientation of the respective g -matrices determined by transient EPR.

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Editorial

Dear colleagues,

By now many of us know about passing away of Linn Belford, an outstanding researcher, a great mentor, a terrific personality and founding editor of the *EPR newsletter*. The In Memoriam column is devoted to Linn Belford featuring contributions from his colleagues and friends: Lawrence J. Berliner, Dennis Chasteen, Gideon Fraenkel, Mark Nilges, John R. Pilbrow, Alexander Scheeline, Alex I. Smirnov, and Harold M. Swartz (in alphabetical order), and pays tribute to his talents and activities (pp. 10–14). Special thanks to Alex Smirnov. One may also find detailed information about Linn Belford's professional career at www.chemistry.illinois.edu/news/in-memoriam/2015belford-linn.html.

All contributors to the In Memoriam column strongly emphasized Linn's activity as founding editor of the *EPR newsletter*. In my feeling, it is appropriate to reproduce here an extract from Letter From the Editor (12/4, p.1), in which Linn Belford recalls the history of this publication: "Sixteen years ago, when I started this effort, there was no vehicle like this newsletter to provide the international EPR community with a common medium for news and exchange of information. As we started the Illinois EPR Research Center (IERC) here, we saw a need for such a bul-

letin and decided to undertake it as a service. What we had in mind was very modest – just a few photocopied sheets that would come out once a year or so, and I undertook to start it as an 'Electron Spin Resonance Center's Newsletter'. But the EPR community of several thousand scientists around the world also had no international organization, and Hal Swartz, then director of the IERC, made a strong case to many of our colleagues from several countries to start one. So the International EPR (ESR) Society was born, with the fledgling Center's newsletter to serve as our Society publication. Soon, under its new name 'EPR Newsletter', this little pamphlet grew to a substantial and time-consuming professional publication with announcements and reports on both local and international conferences, news items, want ads, and equipment exchange section, information on experimental techniques, computer programs and methods, exchanges of opinion through letters to the editor, guest columns, sponsors' ads, a lot of news about the International EPR Society, and an extensive annual directory of members and other EPR scientists. This has been a very major effort, not only on my part, but also that of our former IERC secretary, Martha Moore, and especially of Becky Galivan, whose organizational skills, dedication,

and hard work as Assistant Editor made my editorship job possible. I thank them profusely. To our many colleagues around the world who provided material and helped in other ways, I am grateful. And I sincerely thank the IES for recognizing my starting and developing this Newsletter with a medal. I'm not sorry to lose all the effort, time, and attention that editing this Newsletter has required, but I will miss the many interactions with colleagues and the making of new acquaintances and friends that it has occasioned."

Arthur Schweiger put together all twelve volumes edited by Linn Belford on a CD. Four issues of vol. 12 are available at www.epr-newsletter.ethz.ch. Please feel free to contact me if you would like to get volumes 1–11.

I agree with Larry Berliner (p.10) that our newsletter still bears Linn's imprint. When in 2002 the Editorial office of the *EPR newsletter* was moved to Kazan and I became its editor, it was very helpful and instructive to be acquainted with all previous material produced by Linn and his team. I hope Linn liked the transformations we introduced.

Rest in peace, Dear Colleague, and our grateful memory will keep you alive for the years to come.

Laila Mosina

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Interview with Robert Bittl on the Occasion of His Bruker Prize 2015

EPR newsletter: *Dear Professor Bittl, on behalf of the readers of the EPR newsletter we congratulate you on your Bruker Prize 2015. We are most appreciative that you agreed to answer the questions of this interview. Why did you start towards your career in science?*

This probably boils down to the question, 'why did you choose to study physics?' The questions asked in physics were always and still are attracting my interest. After graduating, I wanted to learn more, went on as a graduate student and PostDoc.

Who introduced you into magnetic resonance?

That happened in several steps at different occasions and by various people. The earliest encounter I can clearly remember is a seminar about EPR in membrane biophysics I had to give as a student in the framework of an "Experimental Biophysics" class taught by Prof. Helmut Möhwald at Technische Universität München. Later, Prof. Klaus Schulten, my "Doktorvater", made me aware of a study by Prof. Dietmar Stehlik and coworkers on transient EPR of radical pairs in photosynthesis, a topic related to my thesis on the theory of magnetic field effects in doublet pair reactions. This study led me to the work of Prof. Gerd Kothe whose magnetic resonance group I joined later as a PostDoc for calculating



transient EPR of radical pairs. There, I had the luck to meet the person who introduced me into experimental EPR, Prof. Stefan Weber, who at that time just had started as a graduate student in the group. Finally, after moving to Berlin, Profs. Dietmar Stehlik and Wolfgang Lubitz gave me the opportunity to switch from theory to experiment.

What part of your research is most dear to your heart and why?

Always the topics we are working on at a time. Topics to which we could provide helpful contributions are nice, but nothing to stay dear to my heart. Those for which we failed for longer times, I put eventually aside and only few of them catch my interest again later.

What is the driving motivation for you in your research?

Curiosity, certainly not "applications", a key reason for staying in basic research.

Nearly twenty years ago (in 1997) you were awarded the IES Young Investigator Award. What was the impact of this award on your research?

I received the award at a very decisive moment in my career. After having moved from theoretical physics into experimental EPR only as a PostDoc, it was more than time to make up my mind whether I see a perspective in research and to look beyond.

What is your message to the younger generation of the magnetic resonance researchers?

Think twice, and if you are still convinced, do the experiment your advisor discourages you from.



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PRESENT MEETS FUTURE

Edited by
Sabine Van Doorslaer

In each 'Present meets future' feature, I am confronting the dreams and expectations of a young EPR scientist with those of his/her mentor, and although the questions are more or less the same, each interview brings different stories and viewpoints. This time, we go

to the International Tomography Center, Siberian Branch, Russian Academy of Sciences in Novosibirsk, where we meet two enthusiastic EPR spectroscopists: Dr. Olesya Krumkacheva and her 'PhD mother' Prof. Dr. Elena Bagryanskaya.

How and when did you start your career? Was it a childhood's dream to become a scientist, or was it a consequence of fortuitous choices? What attracted you to EPR?

Elena: In many cases the choice of the profession is strongly affected by teachers. I was very lucky to have very good teachers in physics and mathematics in high school. In USSR schools competitions in different subjects were very popular and teachers gave additional lessons for pupils, who liked relevant subjects. I am not sure if this system still exists in Russia now. These additional lessons were much more interesting for me, because the tasks, which teachers gave to us, were very interesting. Novosibirsk State University has the so-called postal tuition school. Special tasks are sent to children to study fields of physics and mathematics, which are not in the school program. I joined this postal school and, for three years, was busy with solving tasks, which I received by mail. Probably that was the point when my dream to be a scientist and to enter Novosibirsk State University was conceived. My Diploma and PhD theses were concerned with the development and application of a new technique – Stimulated Nuclear Polarization (SNP) which requires using both NMR and EPR. SNP is based on the saturation of the EPR transition in radical pairs (RPs) whose lifetime in liquids is in the order of fractions of nanoseconds, and is aiming to induce singlet-triplet transitions. Since this saturation is performed separately for RPs with different nuclear spin orientations, it induces the polarization of the diamagnetic products of these RPs and can be detected by NMR. Our main instruments were NMR spectrometers and mw and rf generators in the range from 2 GHz to 100 MHz. Together with Yuri Grishin we developed several different rf and mw cavities allowing sample flow and light irradiation. In spite of its high sensitivity and high time resolution, SNP has disadvantages – it requires a large volume of expensive deuter-

ated solvents and the SNP spectrum has a low resolution due to the very short lifetime of RPs. Nevertheless we obtained a lot of interesting information concerning short-lived radical biradicals, RPs in homogeneous solutions and micellized RPs and the formation of DNP in short-lived radicals in photochemical reactions, and published a series of papers. In the meantime Time-Resolved EPR and especially pulse EPR techniques were developing so fast and intensively that it became clear to me that it could be much more productive and interesting to use EPR. Moreover, SNP and CINDP experiments were limited to their application to photochemical reactions only, while a much wider range of problems could be solved using EPR. I have to say that, recently, I returned to NMR and use it as an addition to EPR, especially for biological systems.

Olesya: During my school years I was strongly attracted by natural subjects, especially physics. My teachers at school and my parents helped me to develop my interest in natural sciences. When I finished school and it was time to choose a university for higher education, I definitely knew that I would like to be a scientist. My scientific career started when I joined the Laboratory of Magnetic Resonance headed by Elena Bagryanskaya. I enjoy the nice and stimulating atmosphere in the laboratory and it is very comfortable and interesting to work there. During the time of my diploma and PhD theses, I studied photochemical reactions in supramolecules using spin chemistry techniques (CIDNP, TR EPR, CW EPR, ESEEM and laser flash-photolysis). In this study I used TR EPR in cooperation with Malcolm Forbes and Seigo Yamauchi. Discussions of experimental results with them were very exciting and fruitful and extended my knowledge in EPR. I also learnt to use pulse EPR for the measurements of electron spin relaxation times of radicals in cyclodextrines. This experience gave me an

understanding of what kind of information can be obtained using EPR. But definitely to study biopolymers using pulse EPR seems to me a much more interesting perspective, and therefore, I decided to continue my research in this direction.

What accomplishment in your (short or long) scientific career are you very proud of?

Olesya: From my point of view, my main achievements during my short scientific career are my results on trityl radical application as spin labels in dipole EPR spectroscopy. We managed to perform distance measurements of ~4.6 nm in duplexes of oligonucleotide at room temperature and physiologically relevant temperature of 310 K for the first time. The results were published in JACS. These results were obtained due to the fruitful collaboration with several laboratories from different institutes in Novosibirsk – Institute of Organic Chemistry, Institute of Chemical Biology and Fundamental Medicine, and the International Tomography Center. It is nice to work in such a team of highly qualified scientists like Viktor Tormushev, Igor Kirilyuk and Matvei Fedin. I accumulated a lot of knowledge in different fields of chemistry and biology. We now continue this study using different immobilizers like trehalose sucrose, agarose, and others, trying to optimize conditions and perform measurements of larger distances. We also plan to apply this approach to real biological problems. Another interesting result concerns a new approach for spin labeling of long RNA. The aim of this study is to understand the mechanism of hepatitis C. This work is in progress and I hope to obtain interesting results in the future.

Elena: Together with Renad Sagdeev and Yuri Grishin we developed a number of new techniques for the detection of short-lived radical species (SNP, DNP of short-lived RPs, CIDNP with one and twice switching magnetics fields). In spite of the fact that



Olesya Krumkacheva (°1987) studied Physics at the Novosibirsk State University and worked during her Diploma and PhD study in the Laboratory of Magnetic Resonance, headed by Elena Bagryanskaya. In 2013 she obtained her PhD on “EPR study of supramolecular complexes of photoactive molecules and nitroxide radicals”, and she is currently pursuing exciting research in the field of distance measurements with EPR at room temperature on biologically relevant systems.

these techniques are not used nowadays, these effects were observed for the first time and contributed a lot to the understanding of spin chemistry. Together with Matvei Fedin, who was my PhD student at that time, we studied electron spin relaxation and spin polarization in zero field. I hope that these papers will be useful for those, who study spin polarization in the low field. I also like a series of papers concerning the EPR study of thermally and light-induced spin transitions in molecular magnets (copper II complexes with nitroxides), which we published during the last decade and the most recent paper where we performed the first EPR distance measurements in the DNP duplex at room temperature.

Can you describe one of the most enjoyable moments in your (short or long) scientific career?

Olesya: I remember the day when I attempted to measure the DNA duplex at room temperature. We prepared this experiment for several weeks and performed preliminarily experiments optimizing their parameters and conditions, while our colleagues were busy with the synthesis of spin-labeled duplexes. All our preliminary studies and estimates

Elena Bagryanskaya (°1958) studied Physics at the Novosibirsk State University. In 1985 she obtained her PhD thesis at the Institute of Chemical Kinetics and Combustion on the “Stimulated Nuclear Polarization and new methods of registration of short-lived radical intermediates”. From then on, she became a researcher at the same Institute. She obtained her habilitation in 1998, and in 2002 she got the title of Full Professor of Chemical Physics of the Russian Academy of Science. She is currently Director of the Novosibirsk Institute of Organic Chemistry. Besides her many scientific merits, Elena is recognized for her successful efforts to bring together many excellent scientific research groups in Novosibirsk and her many efforts to promote EPR. Exemplary of this, is the fact that she is currently the vice president of the International EPR Society for the Asia-Pacific region.

showed that we can hardly succeed to measure distances in room temperature. When I got the spin-labeled sample and started the experiments, I was not sure if I would succeed, but fortunately nature surprised us and the experiments turned out to be successful. We were very happy because, in spite of all planning and preparation of this experiment, we did not feel certain that it would work out.

Elena: My main task for my Diploma and PhD theses was to create the technique of Stimulated Nuclear Polarization and to observe it for the first time. This effect was predicted theoretically by Renad Sagdeev, Yuri Molin and Kev Salikhov, while most of scientists in the Institute of Chemical Kinetics and Combustion, Siberian Branch of the Russian Academy of Sciences, where I worked at that time, did not believe that this effect

could be observed. The main concern was the very short lifetime of RPs of ~ 0.1 ns. When I reported at the Institute about the progress in the development of the experimental setup, I was asked what I would do if we failed to observe the SNP effect. Since I was young, this option scared me and I worried if I could defend my Diploma thesis at all. So I was really happy when, after one and half year of work on developing the setup, we observed the SNP effect for the first time. Another very enjoyable moment was when we detected strong polarized EPR transition in RPs in zero fields for the first time. It was in Chapel Hill in the laboratory of Malcolm Forbes. I convinced him to perform these experiments, because we predicted the existence of strong polarization in zero magnetic fields based on our SNP and CIDNP study. In one month together with Haruhiko Yashiro we created an experimental setup based on a JEOL L-band EPR spectrometer and observed very intense spin polarization in the zero magnetic field. I was really happy that our predictions worked well. In the following month, we worked hard and observed the very long electron spin relaxation in radicals, since the triplet state became the eigenstate in the zero field. This observation led to a series of papers concerning polarization and electron spin relaxation in low magnetic fields. The happiest moments for me are when I get new and sometimes unexpected results. And if these data are not in agreement with what I expected, it may be the most interesting and nice cases.

Choosing a scientific career is not always an easy road to go. What were the problems that you met (or are still having) in pursuing your scientific career and your EPR dream?

Elena: The main problem in Russia is a low financial support of science, especially for purchasing of equipment and good instruments, and a very long delay in delivering chemicals. We live in Siberia, which is quite far from other scientific centers. In Europe, the scientific cooperation is very strong and scientific collaborations are supported by many different grants. When my interest in EPR arose, it took about five years until we got money from the Russian Foundation for Basic Research and could purchase a pulse EPR X-Q-band Elexsys spectrometer for my group at the International Tomography Center (ITC) thanks to Renad Sagdeev. Fortunately, we had (and have) the possibility to cooperate with scientists in Europe and USA. The best way to do science in 1990s for me was to arrange an agreement with a scientist abroad

and provide a short visit of my postdoc or PhD student to perform experiments, which were interesting for us. The first experience was the collaboration with Arthur Schweiger, who agreed to apply for an INTAS grant for young scientists – Matvei Fedin performed high-field EPR experiments on our molecular magnets. Later we continued the collaboration on this subject with Daniella Goldfarb (Sergey Veber got the INTAS grant for young scientists and spent four months in Rehovot) and Wolfgang Lubitz (Matvei and Sergey visited his laboratory in the framework of Humboldt and DAAD fellowships), Takeji Takui and Kazunobu Sato (Matvei visited their group in the frame of a JSPS fellowship). Visits of young scientists were very fruitful for our group, because in addition to the nice results which they obtained, and the publication of joint papers, they expanded their knowledge in the field of EPR and got new insights. I am very grateful to all my foreign friends for supporting this collaboration.

Furthermore, keeping a balance between science and family is not very easy. Fortunately, my husband is a scientist in plasma physics and he is very successful in his field (recently a note about his achievements ap-

peared in USA Physics Today). Therefore he always supports me and helps me very much. Only following his advice, I agreed to become Director of Novosibirsk Institute of Organic Chemistry three years ago. It really gives me a new opportunity to perform many new experiments and to have new samples with trityl and nitroxide spin labels and nuclear acids and proteins.

A lot of my friends left science in the 1990s, when the salaries of scientists in Russia were not enough for living. This was not the case for me. Fortunately, at that time I already had good collaborations abroad and money, which I got as a salary for a month or two, which was then enough for the one-year living expenses in Russia due to the very high exchange rate. I spent two months in Japan in the laboratory of Tohru Azumi and two months in Oxford as a Fellow of Merton College working in the laboratory of Keith McLauchlan, several times I worked at the University of Zurich in the laboratory of Hans Fischer performing experiments on TR EPR with Henning Paul and also I am most appreciative of the collaboration with Klaus Moebius on the application of 360 GHz EPR for nitroxides in calixarenes.

Olesya: Every profession has its own difficulties but if you like your work, you overcome them. As a rule, the scientific research requires full immersion and 100% time output. Therefore, the opinion that the scientific career is not compatible with family is quite popular, but I see a lot of opposite examples around me, in particular, the families of Elena Bagryanskaya and Matvei Fedin. Thus, I think that it is possible to find a balance between family duties and a scientific career. As a rule, my work in the Institute is never terminated at 18.00 and I work in the Institute much longer. I think about my current investigation and plan experiments all over the working day and also at home. Fortunately, my husband understands and respects the specificity of my work and I am very grateful to him for that.

What are your passions outside of science and how does this combine with your scientific career?

Olesya: My main passions outside science are dancing and physical training. My husband and I have been attending a special school for dancing during the last several years and we have participated in dance competitions a few times. I try to do physical training regularly



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- Bioinorganic chemistry and more

as it helps me not only to keep good health, but also positively affects the productivity in the scientific work. Quite often the most interesting ideas came to me exactly during physical training.

Elena: My passion outside science is music. In former times, I played piano and sang romantic music. During the last twenty years, my husband and I attended all symphonic and chamber concerts and operas and ballet in Novosibirsk. When I am abroad, I try to visit opera and symphonic concerts if I can. Another passion is grandchildren. I have two granddaughters and two grandsons. Unfortunately, I spent not so much time with them and feel very bad that I cannot do my grandmother's duties properly, since during the last three years, my life became extremely busy because I had many administrative duties in addition to research.

Olesya, what expectations and plans do you have for your further career? Do you want to continue in academia?

Olesya: At the moment I would like to continue my scientific career, in particular in the field of EPR application to biological systems. We start the cooperation with several biochemical laboratories on different problems, in particular the study of the structure of natural RNA – proteins complexes and others. These investigations need a lot of efforts but the understanding of the implications of expected results helps to overcome disappointment from unsuccessful experiments. Our collaboration with biologists started several years ago and it was a long way to find common points between real biological problems and EPR approaches. I hope that some of our successful projects with biologists will be successful and that the most interesting scientific results are waiting for me in the future.

Elena, are their specific expectations that you cherished as a young researcher that have come true? Or did your career take turns that you never anticipated at the start, but that have been fulfilling nevertheless? Is there an old scientific dream that you still want realize?

Elena: I am so greatly grateful to fate that my life is so interesting and gave me so many different possibilities to enjoy my work and to meet many outstanding scientists and very nice people. I am absolutely sure that science is an extremely interesting profession and gives many enjoyable and happy moments in life. Nevertheless I believe that there will be more exciting and interesting moments in the future

and I hope that my main discovery will be in future, as now I have more chances to realize my plans and have a strong collaboration with my previous group which is led now by Matvei Fedin.

How do you see the future of EPR and your role in this?

Olesya: The future development of EPR applications could be in those fields of science, which now seems to be impossible, like it was with EPR distance measurements of biomolecules at room temperatures or inside cells. I expect an increase in the number investigations concerned with EPR applications for large biological complexes such as ribosomes.

We are actively working in this direction and I hope that we will succeed. I admire recent research on the EPR detection of a single protein. It is a very perspective study and I hope to take part in similar experiments.

Elena: I think that EPR has a great future. Recently an impressive progress was achieved in the development of the EPR technique (SpinJet AGW, Rapid Scan EPR tomography, high-field EPR, single-spin EPR, etc.) as well as in the synthesis of different functional spin labels and spin probes. These achievements create a strong basis for future EPR applications in the field of materials science and biology. World leaders in the synthesis of trityls and nitroxides work at the Novosibirsk Institute of Organic Chemistry. My group collaborates with them, stimulating the development of special spin labels and spin probes for our experiments at the Novosibirsk Institute of Organic Chemistry and ITC. In return, I try to help them to cooperate with EPR groups all over the world. I also initiated the collaboration with biologists from the Institute of Chemical Biology and Fundamental Medicine and Institute of Cytology and Genetics, Siberian Branch of the Russian Academy of



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Sciences. I expect many interesting results on both SDSL EPR and EPR tomography application to biological systems in the future.

Are there matters that you think the EPR community should pay more attention to?

Elena: As I already said, it would be very helpful to have more opportunities for short exchange visits of young scientists like the former INTAS grants for young scientists. Young scientists very rarely return to Russia after a postdoc or PhD time abroad. It would be also nice to have the possibility to apply for the financial support of projects on expensive high-field EPR spectrometers.

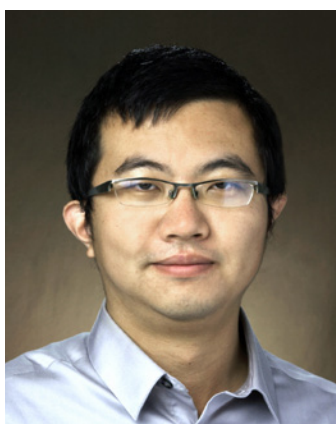
Olesya: From my point of view, it is very important for the future of EPR to support young scientists and to involve them into the active life of the EPR community. It is also important to increase the number of programs for the support of young scientists. It is reasonable to support not only the participation of young scientists in EPR conferences, but also short international scientific visits of young scientists to EPR laboratories to broaden their view on EPR and its applications.



Jessica Sarver became an Assistant Professor of Chemistry and Biochemistry at Westminster College in New Wilmington, PA in August 2016. Jessica obtained her B.S. in Chemistry at Penn State Erie where she conducted undergraduate research measuring the mercury levels in snapping turtles from the Erie area using atomic absorption spectroscopy. This research sparked Jessica's initial interest in spectroscopy. Upon attending the University

of Pittsburgh for graduate school, Jessica became attracted to EPR through exposure to the technique in her first graduate course on

spectroscopy taught by who would later become her PhD advisor and mentor, Sunil Saxena. Jessica joined the Saxena lab with an interest in using EPR as a physical tool to investigate biosystems. While in the Saxena lab Jessica used CW and pulsed EPR methods to investigate the specificity of protein-DNA complexes as well as MD simulations to model the behavior of the nitroxide R1 spin label. After receiving her PhD in 2012, Jessica joined David Cafiso's lab at the University of Virginia as a postdoctoral researcher where she switched her focus to probing the structure and function of primarily membrane proteins using CW EPR and DEER. In 2014, Jessica accepted a position as a visiting physical chemistry professor at Swarthmore College where for two years she taught and conducted undergraduate research with a focus on determining the effect of membrane curvature and charge on the binding of membrane-associated proteins using EPR. Jessica will be continuing her work on membrane-associated proteins at Westminster College.



Zhongyu Yang became an assistant professor of chemistry at the North Dakota State University in August 2015. As an undergraduate student at the University of Science and Technology of China, Zhongyu's initial interest in science was centered on using computational modeling tool kits to investigate protein folding. After completing his B.E. degree in 2004, Zhongyu was admitted by the graduate program at the University of Pittsburgh, wherein he joined Dr. Sunil Saxena's group and became interested in EPR theory and methodology. His thesis was focused on developing an experimental method with a data analysis program in order to determine distances between

Cu^{2+} electron spins in metalloproteins. In May 2010 he completed his PhD and moved to the University of California, Los Angeles to continue his academic career as a postdoctoral researcher in the research laboratory of Dr. Wayne Hubbell. At UCLA his research interests were to develop EPR methods in order to measure interspin distances at physiological temperatures and to determine protein structure and dynamics at high pressure. His current research is focused on using the developed EPR methods to investigate biomolecular interactions in biological systems and in materials science.

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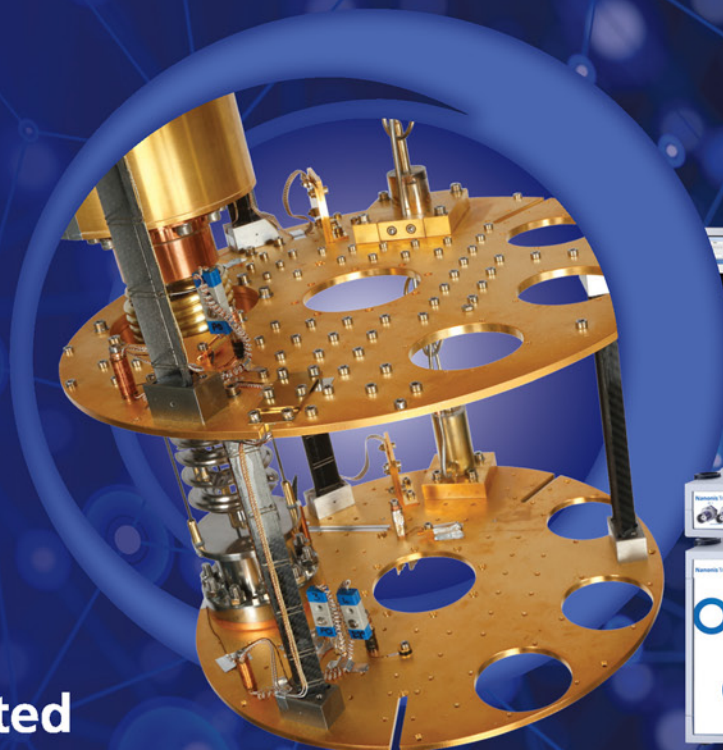
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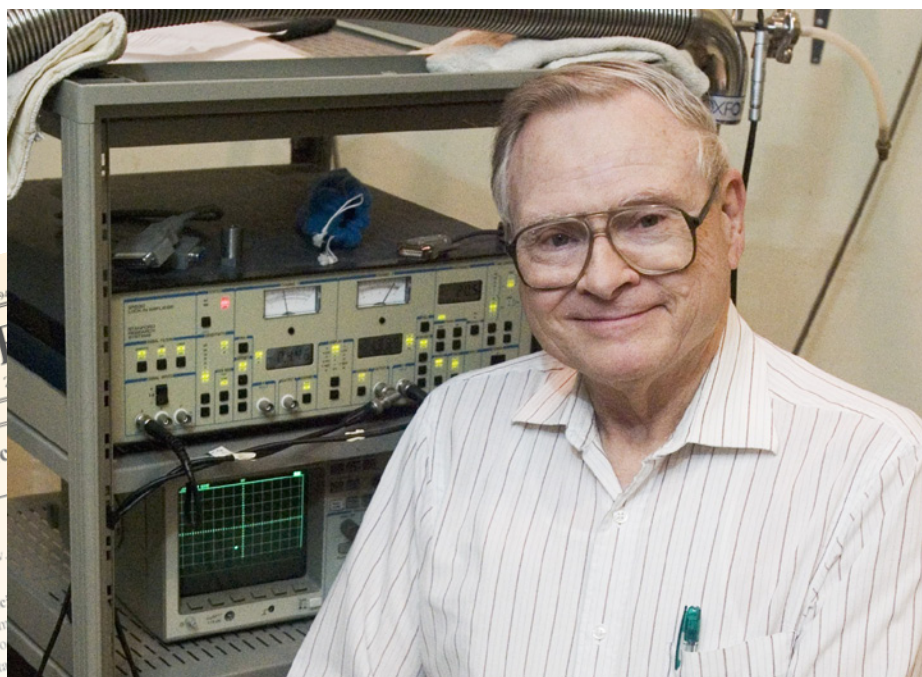
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R. Linn Belford (1931–2015)



COURTESY OF L. BRIAN STAUFFER, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN NEWS BUREAU

EPR NEWSLETTER
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are sad to report that Prof. Karl H. Hauser, Heidelberg, many, died at the age of 82 on Feb. 11, 2001. He served as President of the IES from 1991 to 1996. To quote a brief message from Prof. Klaus Möbius, "I am very sad about this because he was not only a good scientist, but also an impressive personality who has positively influenced many generations of students. The Society has lost a Fellow, and many members of the Society have lost a friend."

From the Editor— This, the public issue, is posted on the web for all to view and download. Paid members of the International EPR Society (IES) receive four copies per year. We strongly urge all nonmembers who have an interest in EPR spectroscopy to join the IES. Please find the necessary information at the end of this issue or on the Society's web page. We may establish a faster delivery system for members by a direct link to the web version is well received.

My friendship/professional relationships with Linn started somewhat later in my professional life when I was at The Ohio State University Chemistry Department. My PhD research and subsequent projects didn't involve metalloproteins/metallocomplexes until much later. However, several of my colleagues, particularly Russell Hille, then in the Physiological Chemistry/Medical Biochemistry Department in the OSU Medical School, routinely used Linn's software/simulation analyses for both his postdoctoral and ongoing research. Additionally, a good friend and colleague, John Pilbrow, studied copper systems intensively and had spent part of a sabbatical with Linn. It wasn't until I was appointed to the Advisory Committee of the Univ. of Illinois NIH EPR Center, of which I was Chair for many years. Somehow, after spending almost a decade at Ohio State, I'd visited many 'Big Ten' universities, but I did not visit Illinois until the inception of the biological/medical EPR Center with co-directors Linn Belford and Hal Swartz. I hadn't realized how many seminal magnetic resonance research discoveries were all happening in the same institution, even though I was familiar with many of the well-known NMR and EPR faculty residing there. And, of course, there was Linn Belford, a fantastic resource in transition metal EPR, theory, simulation and other areas. In addition, he was a key mover, together with Hal Swartz, in both forwarding the biological/medical advances there as well as encouraging his biochemical and chemical research colleagues to join the Center.

IES Medalists Announced Year 2001

GOLD MEDAL:

Prof. Klaus Möbius, Free Univ.

SILVER MEDALS:

Silver Medal in Biology/Medicine
Prof. Balaraman Kalyanaram
Medical College of Wisconsin

Silver Medal in Instrumentation
Dr. Tadeusz Walczak
Dartmouth College, USA

Dr. Tadeusz Walczak
Dartmouth College, USA

But this reminiscence is about Linn the person. As noted by my OSU colleague Gideon Fraenkel in his comments on Linn, when they were both undergraduates at Univ. Illinois, he was as genuine and kind a person as anyone could meet. What I like about Linn was 'what you saw was what you got': no arrogance, no impressing people, a great teacher, a deep interest in undergraduate and graduate education, helping people no matter their rank or level, taking a personal interest in one's life. Everytime I interacted with him, he was always animated and jovial. I'll never forget him as the Founding Editor of the *IES Newsletter*. It was printed on plain paper in black and white, didn't contain a very fancy logo (if any), but it was 'chock full' of data, stories and technical information. We all awaited each issue with anticipation and it carried many of the same stories that are within it today. The evolution of the fancy printed booklet, under Laila Mosina's leadership is a first class publication that still bears Linn's imprint.

But the times that I cherish were the strictly social interactions. My wife and I will never forget arriving in Urbana early on a Sunday afternoon prior to the EPR Center Advisory Board Meeting. We were invited to Linn's home, together with the late long-time friend Bob Clarkson, where we scientists and spouses dined on Papa Del's pizza, a well-known restaurant in Illinois and known around the world by Univ. of Illinois visitors. It was a special time that will never leave my mind. Unfortunately, as the years progressed, Bob Clarkson suddenly passed away and Linn

became quite weak and ill over a period of time. It's memories of our interactions years ago that keep old, dear friendships fresh in one's mind. Linn was the University of Illinois in my mindset. We'll never forget him.

Lawrence J. Berliner

* * *

In January 1965, I started my graduate work at Illinois and joined the Belford group a few months later. In those early years, Linn's research was largely focused on high temperature kinetics of gases in the shock tube and on UV/visible spectroscopy of ligand-field transitions in single crystals of vanadium(IV) and copper(II) complexes. The Belford group's efforts soon shifted to EPR studies of their electronic structures. The small cadre of budding EPR spectroscopists included Mike Hitchman, Bob Tapscott, Brian Moores, Hyunsoo So and me. I was fortunate to be a part of that early effort, publishing some of the first metal ion EPR papers to come out of Linn's lab.

Back then, the only EPR spectrometer available to us was an old Varian V4500 belonging to the Chemistry Department and shared by several research groups. This instrument was a far cry from the modern facilities of the Illinois EPR Research Center of today which Linn helped found. Contamination of the cavity of the V4500 was a frequent problem and accusations over who was responsible flew back and forth between the different user groups. I recall being accused by another faculty member of being the cause of the

contamination. He had “seen” me the night before using the spectrometer right after the cavity had been meticulously cleaned for the *n*’th time. Linn stood by me in this delicate matter as he always supported and cared for his students – that was his way. Examining the logbook revealed the true “culprit”. It was a fellow from another group who bore some resemblance to me, in other words a Chasteen “lookalike”. I was quite relieved to be exonerated. From that point on, I was especially fastidious about cleanliness in the EPR lab, something I later instilled in my own graduate students and postdocs.

Linn was a hands-off research advisor but was always there for you should you need help. He enthusiastically welcomed you into his office whenever you sought advice or had some data to share. His approach to mentoring students fostered independence and, while not for everyone, was immensely helpful to me in developing my own research program. He also really taught me how to write. The draft of my first manuscript came back from his office covered in red. Although I was disheartened, I appreciated the considerable time he had spent critiquing my writing. Drafts of subsequent manuscripts had fewer and fewer of Linn’s edits. My fourth manuscript came back from his office without change, as did the draft of my dissertation. His mentoring helped to ensure the success of my own proposals and papers in later years.

Linn was more intellectually gifted than most of us. He received his B.S. degree in chemistry at Illinois in 1953, his undergraduate research with Peter Yankewich resulted in three major kinetics papers – quite a feat for an undergraduate. Also, Linn never received a grade lower than an A in any course, graduating *summa cum laude* and valedictorian. Linn then worked with Nobel Laureate Melvin Calvin, completing his PhD at Berkeley in only two and a half years before returning to Illinois to join the faculty.

A case in point particularly illustrates Linn’s intellectual prowess. In 1972, renowned fluorescence spectroscopist Gregorio Weber approached Linn with a long-standing problem in the literature, namely the need for a theoretical description of the effects of molecular dynamics on fluorescence (de)polarization of biomolecules in solution. Others had tried to solve the problem but only succeeded in arriving at approximate solutions. That night Linn took the problem home and he and Geneva returned in the morning with the complete master equation. That equation was subsequently published in PNAS and became known in the fluorescence literature as the BBW (Belford, Belford & Weber) equation.

Unfortunately Linn was taken from us too soon. I wish I had made a point to fully express my appreciation to him for all he did for me during my years as a graduate student in his lab. I owe much professionally to Linn and for that I am forever grateful. I think that in his heart, he sensed my appreciation, but here it is in words. Goodbye my mentor and friend.

Dennis Chasteen

* * *

I first met Linn in Second Semester Physical Chemistry 1951 at the University of Illinois (Urbana) taught by Herb Gutowsky. Herb spoke very quietly. We were among the few who got A’s because we sat in the front where we could hear him properly. Evenings Linn and I compared our p-chem. homework in his basement room rented from a retired teacher. After we graduated we were hired by Peter Yankewich to work with him on isotope effects in the decarboxylation of molten malonic acid. We were paid \$1.50/hr which was pretty good for 1952 not to mention what the great fun it was.

The lab was simply marvellous: air conditioning, ordinarily unheard of in the university labs and his own mass spectrometer with

somebody to run it. Peter Yankewich also had all kinds of elaborate vacuum lines. The reigning expert on isotope effects at that time was Jacob Bigeleisen, then at the Brookhaven Labs. Our results were different from his. We figured out that their decarboxylation kinetics were monitored while the samples were melting. We were proud of ourselves to correct the expert.

Linn and I did one study entirely on our own. I had been working with E. J. Corey on decarboxylation kinetics of alpha-cyancinnamic acid. We used the available equipment to study how amines catalyzed decarboxylation of malonic acid. After two weeks or so we took the completed manuscript to Corey’s apartment. He had just come out of the shower. E. J. told us to sit on the manuscript to see if it needed any changes. Peter Yankewich helped put it in shape and we published. The two publications came out of that summer. A third one described my Senior Research thesis.

After we graduated, Linn went off to Berkeley to work with Melvin Calvin, while I moved to Harvard where, for several years, I unraveled the kinetics of addition of iodine to styrene. Linn became a leader in electron paramagnetic resonance. He ran the lab at the University of Illinois. I got interested in theory and chemical applications of NMR first at Cal. Tech. and then at Ohio State University.

I last saw Linn at my father’s funeral I in 1984. He didn’t look any different from when he was an undergraduate student at the University of Illinois back in 1951.

Gideon Fraenkel

* * *

I have known Linn Belford since I was a graduate student in his lab. Linn was a very good mentor who advised more than 50 PhD students over his career. As one fellow graduate student would say: “Linn is knowledgeable not just about science but about everything”. While Linn gave his students ideas, he let the

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students to plan the research on their own. Linn was generally "hands-off", but he was always ready and willing to discuss or help a student, no matter what the problem was. Lunch was the time the group got together for an informal discussion on scientific and any other matters.

Linn had several and quite diverse areas of research interests. One was the determination of nuclear quadrupole coupling constants from EPR spectra. This led to his pioneering work in the areas of spectral simulation and high frequency/multi-frequency EPR. Linn found that one needed not only spectral simulation, but also matrix diagonalization to extract quadrupole coupling constants from the EPR spectra. Together with his wife, Geneva Belford, who was a mathematics/computer science professor at the University of Illinois, he developed an eigenfield method to properly calculate field-swept EPR spectra. Linn and Geneva were inseparable. Linn also found that Q-band EPR spectra were much more sensitive to effects of the quadrupole coupling than the standard X-band spectra. This observation led to an idea of going to even higher frequencies and culminated in building of W-band spectrometers at the NIH Illinois EPR Center.

Linn was not only a scientist and a mentor, but also a good friend who will be missed dearly by all of us.

Mark Nilges

* * *

I was shocked to learn recently of Linn Belford's death. Regrettably we had lost touch in recent years and I was unaware that he had been ill.

I had the privilege of spending seven months of my 1971 sabbatical with Linn at the University of Illinois (U of I). A colleague at Monash University had met him at a conference in the USA in 1969 where he learned of the semi-

nal paper by Hitchman, Olson and Belford (J. Chem. Phys. **50**, 1195, 1969) concerning the orientation of 'in-plane' g -values for copper complexes with monoclinic (C , C_2 , C_{2h}) symmetry. Using a crystal field model they found that the rotation of the out-of-plane $|xz\rangle/|yz\rangle$ orbitals responsible for the g -shifts caused by the low symmetry crystal field produced an opposite rotation of the 'in-plane' principal g -factors (HOB Model).

I pricked up my ears as this was consistent with an observation I had made early in 1970 when trying to simulate the Co(II) EPR spectra from B12_r. Here the 'in-plane' g and A axes required a non-coincidence of 50° (or 40°) suggesting approximate C_2 symmetry. In the meantime, de Boer's group at Nijmegen had found something similar for Cu-di-selenocarmates. This was in the face of the claim in Abragam and Bleaney's 1969 classic text (p. 751) that "Experimentally the tensors (in EPR) ... have so far always been found to have the same principal axes".

During the Summer Term at U of I, Linn usually taught Physical Chemistry 342. However to enable me to help cover the costs of the sabbatical, as we had travelled with our large family from Australia, he generously arranged for me to teach this course while he undertook a different summer role as an Enrolment Advisor. Phys. Chem. 342 was a 3rd year undergraduate course that could also be taken by 2nd year and final year students. The text book, interestingly enough, was *Physical Chemistry* by Walter Moore, an American who had moved to be Professor of Physical Chemistry at Sydney University!

Linn and I quickly established a great working relationship and I embarked on extending the HOB theory to copper hyperfine structure. Within the terms of the HOB model i.e. monoclinic local symmetry, and the usual $|x^2-y^2\rangle$ ground state, what we found was that the hyperfine 'in plane' principal axes tended to lie along the lobes of the ground state or-

bital whereas the 'in-plane' principal axes had already been shown to lie somewhere between the lobes. Upon returning to Australia, I set my student Barry Harrowfield the task of exploring the matter in greater depth and this resulted ultimately in a joint paper with Linn (Belford, Harrowfield and Pilbrow, J. Magn. Reson. **28**, 433, 1977). Actually Harrowfield discovered that the HOB model had to be modified by incorporating an extra rotation of the out-of-plane $|xz\rangle$, $|yz\rangle$ orbitals due to spin-orbit coupling. The resulting outcome was in fact much more complicated. While these days one would most likely use DFT calculations, the insights from Belford and his team which provided a 'picture' of what was actually going on should not be lightly discarded.

Most mornings, I would join Linn for coffee in the Chemistry Department Common Room, sitting around a long table and surrounded by blackboards on all sides. It was not uncommon for Linn to be drawn into discussions on a blackboard about some current research challenge. Quite often it seemed to me that he made critical suggestions that ended up in published papers but I fear Linn got very little credit for his help. But that was typical of his generosity. He didn't seek the highest place and was one of those special academics that every department needs.

Around 4 pm he'd look into the office I shared with a post-doc and asked: "Want a break?" We'd walk a block to a little café and have donut and coffee. Actually I think Linn drank tea rather than coffee.

On my last afternoon at U of I, early in January 1962, Linn and I spent a couple of hours playing around on the blackboard seeking to establish, amongst other things, what was the invariant in the hyperfine interaction for $S = 1/2$ in monoclinic symmetry. It turned out to be $\text{Tr}(\mathbf{A})$ in any representation. This led to a short paper that was a lot of fun to prepare (Belford and Pilbrow J. Magn. Reson. **11**, 381, 1973).

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At the time of my 1971 sabbatical at Urbana, in addition to EPR, Linn was also involved in Shock Wave research, a program that was eventually wound down.

Other recollections are of Linn playing backyard cricket with our older children and another occasion having a picnic at a lake near the Belford's home at Mahomet. The latter included my Oxford Doctoral Supervisor, Bill Hayes, his wife and baby daughter, as Bill was on sabbatical in the U of I Physics Dept at the time.

As we planned a few days in Boulder Colorado and about 10 days in California on our way back to Australia, Linn helped arrange visits to some key labs. Thus I met Harden McConnell for the first time and also Gus Maki, amongst others.

We kept in touch for many years and I still recall the hand-written letter I received from Linn c. 1973 where he outlined the Eigenfields approach. This involved coupling the $n \times n$ spin Hamiltonians for pairs of states in a transition, leading to an $n^2 \times n^2$ super-operator whose eigenvalues were in fact the transition magnetic fields in \pm pairs. Belford and Mark Nilges pursued this approach for several years. The work of my last PhD student, Dr Simon Drew, exploited the eigenfields approach in simulating spectra due to Fe^{3+} and Gd^{3+} in glasses.

During a later sabbatical with Jim Hyde in Milwaukee, I became involved in sorting out a simulation issue raised by Linn concerning the role of the copper quadrupole interaction in frozen solutions of $^{63}\text{Cu}(\text{dte})_2$ (Liczewski, Belford, Pilbrow and Hyde, J. Phys. Chem. 87, 2509-12, 1983).

During subsequent conference visits to the US, I nearly always managed a day at Urbana where I was always made very welcome.

With the setting up of the Illinois EPR Center at the instigation of Hal Swartz, Linn served as Director but also established what became the *EPR Newsletter*. He had a vision

for communication within the EPR community that avoided our being swamped by the much larger NMR community. The original *Newsletter* was produced by Linn and staff at the EPR Centre for many years until it was taken over by Laila Mosina in late 2002. We are all in his debt.

As Linn's father worked in the Oil Industry the family made many frequent moves and I think he told me he attended a new school roughly every year until he graduated from High School and went to the U of I. I asked how he coped with the frequent changes and he commented: "Tough until I made a friend". I think that ability to make friends turned out to be a real asset in the academic world where he showed excellent personal skills and a great capacity to get on with both colleagues and students.

While he met his wife, Geneva, when both were graduate students at Berkeley, from memory I am sure he told me that he and Geneva had actually been at the same high school for a year or so before his final year (in US parlance, his Junior Year)! Sadly, Geneva passed away in March of 2014; they had been married for 60 years. Geneva was a most distinguished academic in her own right, trained in Mathematics but working for much of her career as a Professor of Computer Science.

The last time I saw Linn was in 2004 when my wife and I visited Urbana where one of our sons and his wife were teaching Anthropology at the U of I. Linn, Geneva, Susan and I took Becky Gallivan out to lunch to say thankyou for her contribution in managing IES and the *EPR Newsletter*. It was not really part of her job at the Illinois EPR Center but she contributed well above and beyond the call of duty. That visit in August 2004 was saddened by reading in the local newspaper of the untimely death of Robert Clarkson, who had been an important member of the Centre for a good many years. Susan and I attended the funeral with Linn and Geneva

in the same Episcopal Church that we had attended as a family back in 1971!

A modest man, Linn never sought the limelight and was content for others to be honoured. Most would not know that he graduated from U of I as 'top of the class' in 1953, that is, with the highest grade point average of any student in any discipline. (One can find his name on a list of those within the top 3% for 1953). He then moved to do his PhD under Nobel Laureate Melvin Calvin at Berkeley, in the days when there was no coursework requirement for a PhD. He told me that Calvin would make about 20 suggestions every day. However he learned to focus and not be distracted by trying to follow up all of his Advisor's suggestions. He completed his PhD in 1953 after two years and returned to Urbana, eventually becoming a Full Professor.

We shall all miss a genuine friend and colleague.

John R. Pilbrow
Professor Emeritus

* * *

R. Linn Belford and I had coffee together almost daily for 3 decades; it was at his instigation that I joined the EPR Society. My image of Linn is of an energetic dynamo, coffee cup in hand, skittering down the hall at a fast walk, quicker than many people's jogging. He was always in a hurry. Considering the amount of service work he did, he had to be. When he wasn't running a Faculty Senate committee or editing the *EPR Newsletter*, he was advising students, advising the School of Chemical Sciences Placement Office, or heading off to play violin in the Champaign Urbana Symphony, a life-long joy he shared with Geneva. In fact, he shared almost everything with Geneva, they were able not only to complete each others' sentences, but in some cases to START them!

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He wasn't just into EPR; he did much of his early work in shock tubes. He was well known for research into clean coal. While he didn't tell as many shaggy dog stories as John Bailer, he did laugh at them. For so convivial a colleague, he was rather private, until he and Geneva had extensive health problems, I didn't know where they lived, let alone have the privilege of stepping inside their home. Linn was a packrat. Most of his career was spent in Noyes Lab, but he moved to Roger Adams Lab (RAL) when his Noyes space was needed for the Business Office. When we cleaned out his RAL office (he was only the third occupant, after Howard Malmstadt and Tim Nieman), we found notes in stacks going back decades. Books he bought new were, by then, rare antiques. And he had course notes going back decades as well.

Linn had infinite patience, even with marginal students. When I was mired in extended associate professorship, I could look to Linn to see that service and decency, while insufficient to warrant promotion to full professor, were entirely adequate for living a rewarding, admirable, and satisfying life. Eventually, he shed the dreaded "associate" adjective, and was a tenure track faculty member in the Illinois Department of Chemistry longer than anyone before him (he was only the longest serving faculty member on campus for one year, Geneva beat him out a year later!).

Alexander Scheeline
Professor of Chemistry Emeritus

* * *

The first time I was introduced to R. Linn Belford was in November 1990 on my very first day as a Postdoctoral Researcher at the IERC – the Illinois EPR Research Center at the University of Illinois at Urbana-Champaign. Just the night before I took an Aeroflot

flight from Moscow to JFK that included a refueling stop in Newfoundland, Canada, and then two US Airways flights to get me to Urbana. Linn was one of many people I was introduced on that day and I did not know that I will be collaborating closely with him for the next 10 years. Back in Moscow I had just defended a PhD on EPR Imaging in the Yakov Lebedev lab at the Institute of Chemical Physics and was virtually unaware of Linn's great contributions to the EPR of metalloenzymes and many other areas.

In 1990–1991 with Hal Swartz and Linn Belford co-directing an NIH Resource grant, we had weekly meetings of an extended group of EPR enthusiasts with all kinds of things being discussed: from in vivo EPR and oximetry to matrix diagonalization and the frequency-to-field conversion problem for simulating EPR spectra. What struck me at that time was the active but unassuming participation of Linn in these discussions. He was ready to provide delightful insights into almost any EPR topic but without even a hint of dominance. He was always more interested in what other people would say rather than establishing his own intellectual superiority. That was his style, that of a great mentor.

Only later I have realized that the first time I met Linn was during his "walk" through the labs – a daily routine to stay in touch with his group, to seed some new ideas, and also to provide some valuable advice but only when asked. He would always carry a coffee mug in his hand and he could literally run up a staircase after a staircase with the mug being completely full but without spilling up any coffee! I think the story behind his coffee habit was that during his graduate studies at Berkeley he had a few migraine-like headaches and found that continuous coffee consumption would cure it once and for all. Because IERC was located in the two neighboring

buildings – the historic Noyes Lab and the basement of the Medical Sciences Building – finding Linn during this the pre-iPhone era was not a trivial task. However, the fellow members of IERC gave me a great hint – just follow the mugs and paper cups with some coffee left by Linn sometimes in unexpected places. If a cup is still warm – you have missed Linn by just a few minutes.

A lot of things was said by my distinguished colleagues about the Linn's trademark – a "hands-off" mentoring style. It happened that my PhD advisor, Yakov Lebedev, was another "hands-off" practitioner, at least based on my experience. After defending my PhD, Yakov told me that initially he had some concerns whether he would ever see me again after he asked me to work on digital deconvolution and image reconstruction from projection problems and I disappeared in a library. But at the end the problem was solved, software was written, and papers were published. While not always successful, the "hands-off" style could be very beneficial for both the student and the advisor: the student would learn how to work on his/her own and the advisor would also learn from the student. I was very fortunate to repeat my undergraduate and graduate "hands-off" advisor experience in Moscow with Linn Belford in Urbana. It certainly allowed me to explore completely new areas of EPR and be very productive scientifically. At Illinois, we were very lucky of Linn being receptive to our ideas and providing us with a great intellectual freedom to research and explore. When needed, he was ready to help and steer you in the right direction. At one point, Prof. Robert Clarkson brought aqueous solutions of some clinical Gd^{3+} contrast agents to record continuous wave EPR spectra at different magnetic field/frequencies, including W-band. We managed to measure EPR spectra from liquid aqueous solutions

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at all frequencies and observed not only tremendous linewidth narrowing with frequency but also some shift in the apparent g-factor. During one of his walk-throughs the lab in the morning, Linn stopped by and mentioned that it must be a second order effect due to zero-field splitting that would appear even in the solution EPR spectra. He also said that "you should be able to figure this out" as everything was already clear for him. The result of this was the first-of-its-kind measurement of the effective zero field splitting from solution EPR spectra that was published in JACS (120, 5060–5072, (1998)) and several other publications that followed.

Together with research, another life-long passion of Linn was mentoring. He loved talking to students. This is why every summer he was signing up to advise incoming freshmen even though he was overwhelmed with his duties of directing IERC and editing the *EPR Newsletter*. Every time he was stopping in the lab on the way to or from his office in another building, his bag was full of manuscripts, grant proposals, and *EPR Newsletter* articles that he was constantly editing. Personally, I have learned a great deal about scientific writing from Linn and so did everyone at IERC. Linn was a concentrate of energy and his drive for science, life, and his overall cheerfulness and the optimism were incredible.

The last time I saw Linn was about 6 years ago when I happened to visit University of Illinois for just one short day. Linn knew that I was coming and he suggested we get together for a quick dinner in the evening. We met in the lobby of the University Hampton Inn where I was staying and had a dinner in an unassuming restaurant nearby. Geneva Belford, his wife, also came even though she was walking with a cane. She said that was a minor problem, she is recovering, and Linn is

taking excellent care of her. We set at a table and talked about everything, science, families, and plans for the future. Linn did not change since I met him the first time back in 1990. He was full of plans and ideas and he was not slowing down no matter what. That is how I will always remember him.

Alex I. Smirnov

* * *

With the recent passing of Linn Belford, we all have lost an outstanding scholar, wonderful person, and a very important supporter of our EPR Society. My first opportunity to interact extensively with Linn came when I arrived at the University of Illinois in Urbana-Champaign in 1980 as the Associate Dean of the medical school but not willing to give up my laboratory activities. I was introduced to Linn who already had a substantial and excellent program in EPR in the department of Chemistry. Linn was unstinting in his helpfulness in getting my research restarted at Illinois. He shared his equipment and worked diligently with me as we put together an application of a new EPR Center, building on the excellent reputation of EPR at the U. of Illinois and my experience with the first NIH-supported EPR Center that Jim Hyde and I had set up at the Medical College of Wisconsin in 1975. Drawing on our complementary expertise we were able to convince the reviewers that the Center at Illinois would be a valuable addition to their investment in EPR and for the next 10 years Linn and I ran the EPR Center, which had substantial programs in both biological applications and Chemistry. During this time I had ample opportunity to observe what a great and dedicated teacher Linn was, in addition to being a very talented chemist. We also had many opportunities to enjoy the warm friend-

ship of Linn and Geneva (Geneva was also a very highly regarded Professor at Illinois who took on very substantial administrative duties as well). The years together with Linn in the EPR Center were very productive with a number of excellent publications and some very useful advances in instrumentation on both the biological side and in physical chemistry, especially in high field EPR. We had the advantage of excellent colleagues in the EPR Center including Mark Nilges and Bob Clarkson and some very creative young scientists including Alex Smirnov who is contributing an additional piece of this tribute to Linn. When I left Illinois in 1992 to go to Dartmouth, Linn, Bob and Mark successfully continued the EPR Center for several years (and I started a third EPR Center at Dartmouth based in part on equipment and ongoing research that I had started at Illinois for which Linn generously shared key pieces of equipment, etc. so the start of the EPR Center at Dartmouth had a substantial boost from our Center at Illinois).

During and after the time at Illinois, Linn had a major role in the success of the EPR Society. Initially, as President of the EPR Society I had also tried to establish and run the *EPR Newsletter* but this was an overwhelming task and Linn enthusiastically and successfully took over the responsibility for the newsletter and ran it successfully for many years. The high quality and value of the newsletter, now so ably run by Laila, grows from the very substantial base that Linn provided.

We all will miss Linn, with his excellent research and cheerful demeanor. But his spirit and excellence also will continue on, in the work and capabilities of the many students and post-docs and colleagues with whom he interacted and passed on his excellent characteristics.

Harold M. Swartz



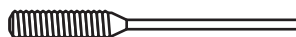
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Contributor to the International EPR Society

2nd International EPR Society Symposium and the Meeting of the International Association of Biological and EPR Dosimetry

The second International EPR Society Symposium took place in October 2015 at Dartmouth, integrated into and greatly enhancing the meeting of the International Association of Biological and EPR Dosimetry, providing a synergistic enhancement for all attendees. With about 150 attendees from many countries and more than 100 oral and poster presentations, the science was exciting and often cutting edge. As might be anticipated the most extensive EPR presentations were on EPR dosimetry, a field that makes a unique and valuable contribution to the important task of establishing means to determine whether someone has received a potentially life-threatening exposure to ionizing radiation from an accident or act of terrorism. Many reports, ranging from the physics of the basic phenomenon to summaries of measurements made with EPR of radiation dose from radiation induced free radicals in teeth and finger/toenails and also in objects in the environment such as cell phones. There also were several excellent papers on the use of radiation-induced



Left to right: Laurence Roy accepting award for Sandrine Roch-Lefevre, Stephen Barnard awardee, Philippe Voisin former President, Maciej Kmiec, awardee; Harold Swartz, new President; and Angela Kinoshita, awardee.

free radicals for archeological dating. One of the highlights of the meeting was the awarding of poster awards to young investigators, including two sponsored by the EPR society. The president of the EPR Society, Hitoshi

Ohta, came for the meeting both presenting an outstanding talk and also participating in the judging of the poster presentations. The awardees are shown in the figure.

Harold M. Swartz

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The position requires the willingness and ability for frequent domestic and international traveling. Strong communication skills are essential as well as fluent English. Knowledge of German is an advantage.

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Interested applicants should send their cover letter and resume to Dr Peter Hoefer (peter.hoefer@bruker.com) or Dr Ruediger Weisemann (ruediger.weisemann@bruker.com)

Position of a W2-Professor for EPR Spectroscopy

The Max Planck Institute for Chemical Energy Conversion in Mülheim an der Ruhr has been re-established in 2012 and the field of research has been aligned with the conversion of energy. Our scientists are engaged in basic processes that are essential within the storage and conversion of energy.

The institute has an opening for the position of a W2-Professor for EPR Spectroscopy

This is a tenure track position for five years that can become permanent after positive evaluation.

The appointed scientist will head the EPR facility and thus become responsible manager of one of the central units of the Institute including the technical personnel. To date 10 modern cw/pulse EPR spectrometers exist that allow experiments over a large frequency, magnetic field and temperature range at liquid, solid and single crystalline samples; at X-, Q-, and W-band multiple resonance experiments

(ELDOR, ENDOR) can be performed. The EPR facility has access to sample preparation laboratories and to the workshops of the institute with long standing experience in maintenance and construction of scientific instrumentation.

The further development of EPR instrumentation and methodology as well as applications in the field of homogeneous and heterogeneous catalysis and the processes of chemical energy conversion and storage should be in the focus of the research. Furthermore, an intense collaboration with the experimental and theoretical research groups of the institute and the chemistry campus in Mülheim is expected.

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Postdoctoral Fellow

The Magnetic Resonance Spectroscopy group at Rensselaer Polytechnic Institute (RPI) is conducting cutting-edge research in the fields of solar energy transduction in natural and artificial systems and the development of novel materials and solar technologies. By performing fundamental and applied research, we work on sustainable solutions for major challenges facing energy and the environment. RPI is committed to the training of future scientists and engineers and is one of the oldest science and engineering universities in the United States.

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For further information please contact:

Prof. K. V. Lakshmi

Department of Chemistry and Chemical Biology and The Baruch '60 Center for Biochemical Solar Energy Research Rensselaer Polytechnic Institute

Troy, NY 12180

e-mail: lakshk@rpi.edu

lakshmi@baruch60center.org

phone: (518) 698 7976

Please send your application materials to Prof. K. V. Lakshmi through e-mail correspondence.

Cryogenic EPR Postdoctoral Position

A postdoctoral position is available immediately for a collaborative project between Professor Cory's lab at The Institute for Quantum Computing (IQC) and a local startup. The project uses superconducting resonators and Optimal Control Theory (OCT) to increase the sensitivity of pulsed electron spin resonance at cryogenic temperatures. The goal of the project is to also demonstrate applications to molecularly thin samples. This program is expected to reveal new and interesting results of EPR of biochemical processes.

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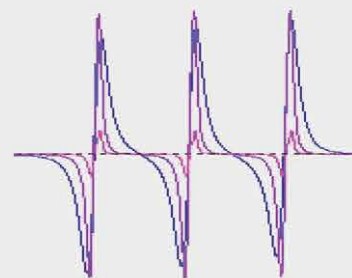
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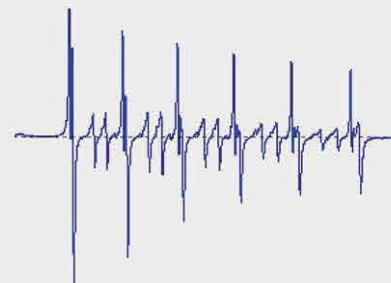
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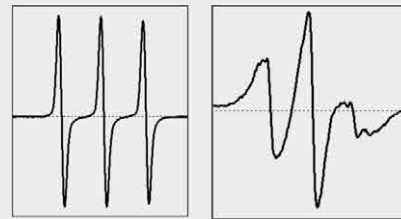
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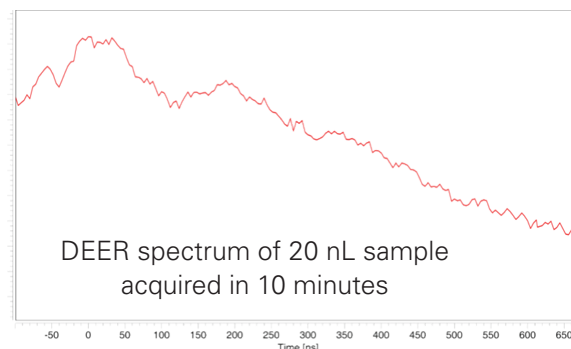
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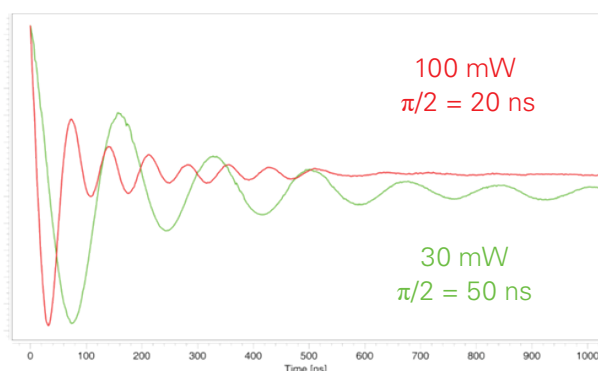
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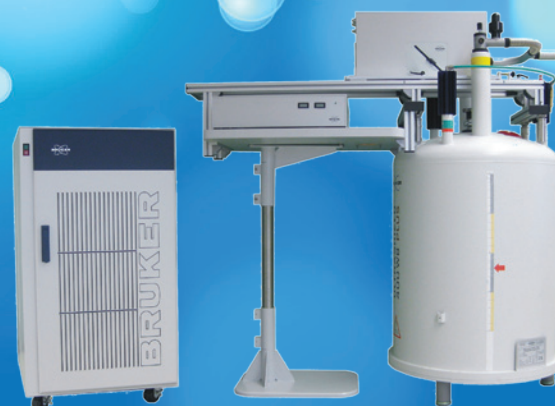


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