
epr
news
letter
2011
volume 21 number 2
ψ_7^{ABCO}
ψ_6^{ABCO}
INTERNATIONAL EPR (ESR) SOCIETY
EPR
ESR
IES
The Publication of the International
EPR (ESR) Society

Officers of the International EPR (ESR) Society

PRESIDENT
Jack H. Freed
Department of Chemistry and Chemical Biology
Director of ACERT
B52 Baker Laboratory
Cornell University, Ithaca, NY 14853, USA
phone: 607-255-3647, fax: 607-255-0595
e-mail: jhf3@cornell.edu
web: www.acert.cornell.edu

VICE PRESIDENTS
Americas
Michael Bowman
Department of Chemistry, Box 870336
The University of Alabama
Tuscaloosa, AL 35487-0336, USA
phone: 205-348-7846, fax: 205-348-9104
e mail: mkbowman@as.ua.edu

Asia-Pacific
Michael Davies
The Heart Research Institute
114 Pyrmont Bridge Road, Camperdown
Sydney, NSW 2050, Australia
phone: +61 2 8208 8900, fax: +61 2 9565 5584
e-mail: daviesm@hri.org.au

Europe
Thomas Prisner
Institut für Physikalische und Theoretische Chemie
J. W. Goethe-Universität Frankfurt
Max-von-Laue-Str. 7
60438 Frankfurt am Main, Germany
phone: 49 69 798 29 406, fax: 49 69 798 29 404
e-mail: prisner@chemie.uni-frankfurt.de
web: www.prisner.de

SECRETARY
Sushil K. Misra
Concordia University
1455 de Maisonneuve Boulevard West
Montreal (Quebec), H3G 1M8, Canada
phone: 514-848-2424 extension 3278
fax: 514-848-2828
e-mail: skmisra@alcor.concordia.ca
web: physics.concordia.ca/faculty/misra.php

TREASURER
Tatyana I. Smirnova
North Carolina State University
Department of Chemistry
Campus Box 8204, Raleigh, NC 27695-8204, USA
phone: (919) 513-4375, fax: (919) 513-7353
e-mail: tatyana_smirnova@ncsu.edu

IMMEDIATE PAST PRESIDENT
Wolfgang Lubitz
Max-Planck-Institut für Bioanorganische Chemie
Stiftstr. 34-36, Mülheim an der Ruhr
D-45470, Germany
phone: 49 208 306 3614, fax: 49 208 306 3955
e-mail: lubitz@mpi-muelheim.mpg.de

FOUNDER PRESIDENT
Harold M. Swartz
Dartmouth Medical School
Department of Radiology & EPR Center
7785 Vail Room 702
Hanover, NH 03755-3863, USA
phone: 1-603-650-1955
fax: 1-603-650-1717
e-mail: harold.swartz@dartmouth.edu

Fellows of the International EPR (ESR) Society

Anatole Abragam (1914–2011)
John Michael Baker
Brebis Bleaney (1915–2006)
James R. Bolton
Harvey A. Buckmaster
Anders Ehrenberg
Gareth R. Eaton
Sandra S. Eaton
George Feher
George Fraenkel
Erwin Hahn
Karl Hausser (1919–2001)
Noboru Hirota
Clyde A. Hutchison, Jr. (1913–2005)
James S. Hyde
Lowell Kispert
Daniel Kivelson (1929–2003)
Melvin P. Klein (1921–2000)
Harry Kurreck
August H. Maki (1930–2008)
Bruce R. McGarvey
Keith A. McLauchlan
Klaus Möbius
Yuriy N. Molin
James R. Norris
John R. Pilbrow
Charles P. Poole, Jr.
Aleksandr M. Prokhorov (1916–2002)
Tengiz I. Sanadze
Charles P. Slichter
Leslie H. Sutcliffe
Harold M. Swartz
Martyn C. R. Symons (1925–2002)
Yuri D. Tsvetkov
Joan H. van der Waals
George D. Watkins
John A. Weil (1929–2010)
Samuel I. Weissman (1912–2007)
David Whiffen (1922–2002)
Hans C. Wolf

epr newsletter

www.epr-newsletter.ethz.ch

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.

EDITOR
Laila V. Mosina
Zavoisky Physical-Technical Institute
Russian Academy of Sciences
Kazan, Russian Federation
mosina@kfti.knc.ru

ASSOCIATE EDITORS
Candice S. Klug
Medical College of Wisconsin
Milwaukee, WI, USA
candice@mcw.edu
Hitoshi Ohta
Molecular Photoscience Research Center,
Kobe University, Kobe, Japan
hohta@kobe-u.ac.jp
Thomas Prisner
Institute of Physical Chemistry, Frankfurt, Germany
prisner@chemie.uni-frankfurt.de

TECHNICAL EDITOR
Sergei M. Akhmin
Zavoisky Physical-Technical Institute
Russian Academy of Sciences
Kazan, Russian Federation
akhmin@kfti.knc.ru

FOUNDING EDITOR
R. Linn Belford
Illinois Research Center, University of Illinois
at Urbana, Urbana, IL, USA
rbelford@uiuc.edu

EDITORIAL OFFICE
Zavoisky Physical-Technical Institute
Russian Academy of Sciences
Sibirsky trakt 10/7, Kazan 420029
Russian Federation
phone: 7-843-2319096
fax: 7-843-2725075

Please feel free to contact us with items (news, notices, technical notes, and comments) or ideas for the *EPR newsletter*.

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 Takeji Takui, recipient of the 2009 IES Silver Medal for Chemistry. His research focuses on the establishment of organic high-spin chemistry underlying organic molecule-based magnetism and molecular spin devices such as synthetic electron spin qubits and organic molecular spin batteries with high speed charge and high current capacity. Figure shows the part of the crystal orbitals originating in the topological symmetry of a two-dimensional extended high-spin polymer. The background contrasting with the figure is the world-best Japanese garden, which gives us underlying ideas for life or science.

epr newsletter

The Publication of the International EPR (ESR) Society

volume 21 number 2 2011

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Editorial

Dear colleagues,

It was some three years ago when I realized that the EPR newsletter had not congratulated Erwin Hahn on his 85th birthday. Erwin, as kind as he is, told me that I should not dramatize the situation but I was quite uncomfortable about my absentmindedness. And of course it was unfortunate that nobody reminded me about Erwin's anniversary. However, here we are joining Dmitry Budker and Jean-Claude Diels, George Feher, Jack Freed, Alex Pines, and Hans Wolfgang Spiess to congratulate Erwin on his 90th birthday (pp. 5–9)! Good health, optimism and many years to come, dear Erwin! Our readers can also have a review of Erwin's contributions to the EPR newsletter which nicely illustrate the infinity of his fascinating personality and diverse talents (Erwin Hahn playing Rossini 14/3, p. 20; The Russell Varian Prize 2004 to Erwin L. Hahn 15/1, p. 3; Einstein Tidbits 15/1, p. 14; A Brief History of the Physics of Music 16/2-3, pp. 10–12; Felix Bloch Reminiscences 16/4, pp. 15, 16). I liked the Anniversaries column very much and as impatient as I am, sent its proofs to Erwin. I am happy to tell you that he liked the proofs but added that his students and collaborators deserve credit for enabling his career. Letters of praise and congratulations often neglect to mention this.

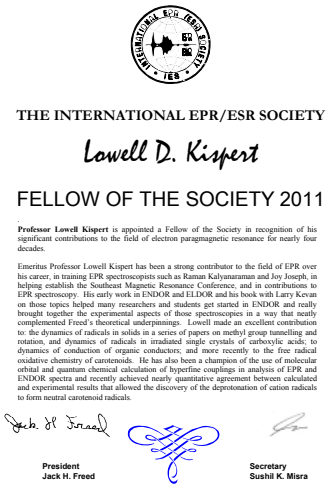
By now many of you know sad news that Anatole Abragam passed away this summer. This is a great loss. The letter of Hans Wolfgang Spiess, President of ISMAR, (p. 12) expresses the feelings of the whole international magnetic resonance community. Hopefully excerpts from an article by Maurice Goldman (pp. 12–14) allow you to feel the touch of Abragam's great personality once more, the same as previous publications in the EPR newsletter (90 years of Abragam 14/4, pp. 8–10; How I discovered EPR 15/2, p. 9; On Anatole Abragam's 95th birthday 19/4, pp. 7, 8). The last article by Anatole Abragam was published in the book "Le plus grand des hasards"* (Belin 2010) by Jean-François Dars and Anne Papillault.

Dear readers, last but not least, in August Dieter Schmalbein shared with me his brilliant idea that EVERY EPR spectroscopist worldwide, an IES member or not, should get a copy of one issue of the EPR newsletter per year. Bruker BioSpin agreed to cover the additional costs for printing and delivery. Now we have to set up a comprehensive address data base and we rely on your help with it. Please feel free to send us mailing addresses of your colleagues who are not yet IES members and also ask them to join the society.

Laila Mosina

* http://www.editions-belin.com/ewb_pages/f/fiche-article-le-plus-grand-des-hasards-16052.php

Awards



THE INTERNATIONAL EPR/ESR SOCIETY

Lowell D. Kispert

FELLOW OF THE SOCIETY 2011

Professor Lowell Kispert is appointed a Fellow of the Society in recognition of his significant contributions to the field of electron paragmagnetic resonance for nearly four decades.

Emeritus Professor Lowell Kispert has been a strong contributor to the field of EPR over his career, in training EPR spectroscopists such as Raman Kalyanaraman and Joy Joseph, in helping establish the Southeast Magnetic Resonance Conference, and in contributions to EPR spectroscopy. His early work in ENDOR and ELDOR and his book with Larry Kevan on those topics helped many researchers and students get started in ENDOR and really brought together the experimental aspects of those spectroscopies in a way that neatly complemented Freed's theoretical underpinnings. Lowell made an excellent contribution to: the dynamics of radicals in solids in a series of papers on methyl group tunnelling and rotation, and dynamics of radicals in irradiated single crystals of carboxylic acids; to dynamics of conduction of organic conductors; and more recently to the free radical oxidative chemistry of carotenoids. He has also been a champion of the use of molecular orbital and quantum chemical calculation of hyperfine couplings in analysis of EPR and ENDOR spectra and recently achieved nearly quantitative agreement between calculated and experimental results that allowed the discovery of the deprotonation of cation radicals to form neutral carotenoid radicals.

President
Jack H. Freed

Secretary
Sushil K. Misra

Michael Bowman (left) presents the IES Fellowship certificate to Kispert Lowell (right) at the 34th EPR Symposium at the Rocky Mountain Conference. Picture courtesy of Frederick Villamena.

For details, see the forthcoming newsletter.

Serving the scientific community for special and one-of-a-kind jobs

We have experience in designing computer interfaces for older scientific instruments, spectral analysis and image reconstruction as well as mapping and graphic layouts. Contact us for your specific needs.

- Installation services
- Parts replacement service contracts
- Consulting and programming
- Consulting, training, and modification services
- Experience in a number of computer languages including C, C++, FORTRAN, BASIC and assembly

S³ Products for Spectroscopists

EWWIN - EPRWare for Windows
EPR data acquisition, manipulation and line shape analysis software for Windows.

SpecMan4EPR
Software for control of pulse spectrometers.

See what we can do for you, download trial versions of our software. Visit our website for details

S³ SCIENTIFIC SOFTWARE SERVICES
www.scientific-software.com

IES EXECUTIVE ELECTIONS OFFICE BEARERS FOR 2011–2014

Call for Nominations

In 2011 the current IES Executive's three year term of office will end. Nominations are sought for the following posts:

– President
– Vice President Americas
– Vice President Asia Pacific
– Vice President Europe
– Secretary
– Treasurer

Our Constitution Article VIII. Elections, reads: "Nominations for all positions of Office Bearers shall be made by the Executive that shall have regard to geographical and international distribution of nominees. Nominations may also be made by at least ten paid-up members of the Society, in writing to the Secretary, and received by a date specified with appropriate notice in the official Bulletin or Newsletter of the Society. Where there are one or more nominations for any position, the Elections Committee shall conduct the election according to the provisions following in clauses 2 and 3."

There are thus two ways a person may be nominated for Office in the Society. The current Executive is required to make nominations for all positions. Nominations can also be made by 'at least ten paid-up members of the Society' for all elected positions: President, Vice-President Americas, Vice-President Asia/Pacific, Vice-President Europe, Secretary and Treasurer.

Nominations in writing should reach the Secretary, Dr Sushil K. Misra, Physics Department, Concordia University, 1455 de Maisonneuve Boulevard West, Montreal (Quebec) H3G 1M8, Canada (skmisra@alcor.concordia.ca) by post, email or fax (01-514-848-2828) before 15th December 2011.

Awards

The Bruker Prize 2011 to Thomas Prisner

From left to right: Mark Newton (Chairman RSC ESR Group), Jeremy Lea (Managing Director, Bruker UK Ltd), Thomas Prisner and Peter Höefer (Director for EPR at Bruker). Picture courtesy of Art Heiss.

For details, see this newsletter, pp. 16, 17.

Magnetic Test and Measurement Equipment

- Fluxgate Nanoteslameters for measurement of environmental fields with 1 nT (10 μG) resolution.
- Hall effect Teslameters for magnet field measurement and control with resolution to 0.1 μT (1 mG)
- NMR Teslameters with field measurement from as low as 1.4 μT (14 mG) up to 23.4 T.
- Digital Voltage Integrators for flux change measurements.
- Precision Current Transducers and Electromagnet Power Supplies.
- Laboratory Electromagnet & Helmholtz Coil Systems for spectroscopy and imaging.

GMW

955 Industrial Road, San Carlos, CA 94070
Tel: (650) 802-8292 Fax: (650) 802-8298
E-mail: sales@gmw.com Web: www.gmw.com

Peter Meadows of JEOL (UK) Ltd presents the JEOL prize to Petra Lüders. Picture courtesy of Tim Smith

For details, see this newsletter, pp. 16, 17.

Petra Lüders:

It is a great honour to have received the JEOL students lecture prize at the 44th Annual International Meeting of the ESR Spectroscopy Group of the Royal Society of Chemistry in York (April, 2011). I am very grateful that I could convince the committee with part of the scientific work I performed in the course of my PhD. With Ivan Krstić and Maxie Roessler the competition was very strong and I could enjoy two wonderful talks of young and ambitious scientists. The JEOL award gives me the chance to thank Prof. Gunnar Jeschke for the opportunity to work in his group with a delightful scientific atmosphere. My special thanks go to Dr. Maxim Yulikov who was teaching me about ESR and is always supporting my work. I also want to thank scientists and scientists-to-be with whom I could work and learn.

In the last decades, ESR in combination with site-directed spin labelling gained importance as a tool to obtain distance information in the nanometre range. This information can be of special interest in order to analyze structural changes of biomacromolecules and biomacromolecular complexes in a coarse grained manner. Nowadays, ESR techniques developed for nitroxide radicals are available to routinely obtain distances by DEER in the range from 1.5 to 6 nm or even up to 11 nm for special cases. The progress of distance determination by ESR now can proceed with the development of new spin labels and investigation of further methodological approaches.

Since a few years lanthanide ions attract attention as potential spin labels for ESR. My PhD thesis is devoted to the development of techniques for the determination of distance information. I am focusing on orthogonal spin pairs consisting of lanthanide ions and nitroxide radicals. The combination with nitroxide radicals opens up the possibility for more advanced measurement schemes and the investigation of different spectroscopic methods. This combination enables determination of distances in the nanometre range by detecting the dipolar coupling between the two paramagnetic centres. This interaction can be detected directly on Gd3+ - nitroxide spin pairs by DEER or indirectly via the enhancement of nitroxide radical relaxation due to the presence of a fast relaxing Dy3+ ion. In the JEOL students lecture I focused on the relaxation-based determination of distances. To date, this approach was applied mainly to metal containing proteins. On a synthetic α-helical polypeptide we were able to perform the first systematic determination of distances between a Dy3+ and nitroxide label.

The enjoyable experimental work on such an interesting and diverse combination of paramagnetic species covers many technical aspects of EPR like continuous-wave experiments, the optimization of measurement conditions for DEER and also relaxation measurements. Experiments at multiple frequencies help to improve fundamental understanding of the basic properties of the spin system. In this manner the experimental work involves theoretical engagement and promotes the hand-in-hand development of theory and experiment.

By participating in summer schools, meetings and conferences, like the annual RSC conference, I got to know many interesting people in the ESR community. If you are a student the opportunity to share and discuss your work and get experience in presenting all the acquired and analysed data can be provided by applying for student lectures like the JEOL contest. I can strongly recommend that you participate in such events because the reward for your work is not only a prize but also a great experience to communicate your developments to the community.

The Zavoisky Award 2011

Seigo Yamauchi
Tohoku University
Sendai, Japan

BRUKER

The 2012 Bruker Prize

Kev Salikhov
Zavoisky Physical-Technical Institute
Kazan, Russia

To Erwin Hahn on his 90th birthday

Dear Erwin,

When I think of you I have to smile. You and Anatole (Abragam) are my scientist friends with the best developed sense of humor and the funniest stories. Whenever we met – and there were too few of those occasions – I always enjoyed it greatly and look back on it with pleasure.

Actually, the first time I remember meeting you in the mid nineteen fifties we discussed a serious matter. I had just arrived at Bell Labs from UC Berkeley and you were working at IBM and had received an offer from UCB to join their faculty. You were weighing that offer and wanted to hear about UCB. I believe I conveyed to you my dismay with the rat-race atmosphere in Berkeley where the Assistant Professors (e.g. Kip, Knight, Jeffries) were frantically fighting for their academic life rather than enjoying their research. As I remember I advised you to hold out for a tenured position to avoid that fight. Did you? At any rate it seemed to have worked out well for you, a happy and very productive over half a century at UCB.

In 1958 we both participated in two international conferences. One in Paris on "Double Resonance and Multiple Quantum Transitions" (see photo) and the other in Holland on "Low Temperature Physics". There, one morning I met you at breakfast bleary eyed and you told me a horrible, yet funny, nightmare you had. You may no longer remember it, but it is too erotic to write about it; I will tell it to you when we meet next. You also told me at that time some hilarious incidents during your post-doc years with Felix Bloch (see EPR Newsletter, 2005, vol 15, no. 2) which were responsible for Felix losing some of his Swiss formality. A significant contribution on your part to "Mensch-heit".

I also remember – at least the introduction – of your colloquium at UCSD in the nineteen sixties. You had flown from S.F. to S.D. and were sitting next to a guy reading the "Christian Science Monitor". You looked over his shoulder at the paper and he asked "Oh, are you also a Christian Scientist?" and you replied "No, I am a Jewish Scientist". At which your neighbor said "That's funny, you don't look like a scientist at all". Who but Erwin Hahn could start a colloquium with such a story, especially in a WASPY place that La Jolla was at the time.

What a pity and injustice that you did not receive the Nobel Prize for the many contributions, including the spin-echo technique that is used in all NMR and MRI experiments. You surely deserve it at least as much, if not more, than the half a dozen NMR resonators that had received it. I wonder what joke you would tell the King of Sweden upon receiving the award. Start thinking about that, you may be getting it one day! But I suspect that you belong to the (alas, small) groups of scientists that do not clamor for the Prize but work for the sheer pleasure of research and whose reward is the thrill of the "Aha!" moment of discovery.

I shall finish with the motivation for writing this letter: To wish you a very happy 90th birthday and many more to come, in health, happiness and good humor.

With fond memories and admiration.

Yours,
George (Feher)

International Conference on Double Resonance and Multiple Quantum Transitions, Paris, July 1958. Left to right: W. E. Lamb, N. F. Ramsey, R. V. Pound, B. Bleaney, C. J. Gorter, E. L. Hahn, J. H. Van Vleck, A. Abragam.

ISMAR

Dear Erwin,

Warmest congratulations on behalf of the International Society of Magnetic Resonance to your 90th birthday.

What would Magnetic Resonance be without the Spin Echo?

We all benefit tremendously from your early discovery. In fact, I can hardly think of NMR experiments today, in liquids as in solids, which do not take advantage of refocusing of coherences you introduced in 1950 already. Likewise, in EPR echoes become more and more popular and have changed the applicability of pulsed techniques remarkably. Last, but not least, you have introduced concept from magnetic resonance into optics. Your publications are rather 'scarce', but of seldom met impact. As a specific example, I would like to mention Hartmann-Hahn cross-polarization.

I consider it a great privilege to know you in person and can even call you my friend. I'm glad that the International Society of Magnetic Resonance has recognized your outstanding achievements by the ISMAR Prize 40 years ago already and made you one of the first ISMAR Fellows, when this distinction was introduced by Paul Callaghan a few years ago.

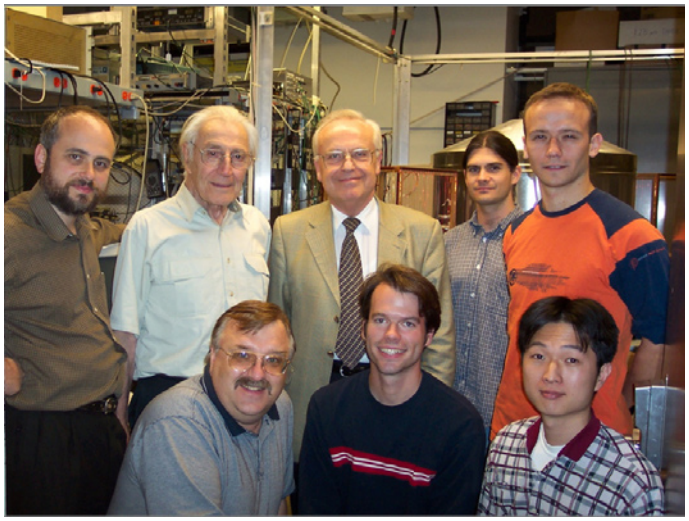
We miss you at our conferences and wish you all the best for years to come!

Yours, Hans Wolfgang Spiess
President

Erwin @ 90

It is a high honor and a humbling task to write a tribute to Erwin L. Hahn on the occasion of his 90th birthday.

We (the authors) are only a minuscule sampling of the numerous generations that have been deeply influenced by Erwin's intellect, personality, and ideas, and we have overlapped with him for only a few years of his incredibly productive life. Jean-Claude Diels is one of Erwin's fifty or so Ph.D. students. Erwin was his research advisor from 1970 to 1973. Dmitry Budker first met Erwin almost a quarter-century ago at Novosibirsk, USSR, and is presently a colleague of Erwin's at the University of California at Berkeley Physics Department. The photograph cited here shows Erwin with the members of Dmitry Budker's research group taken during a visit by a distinguished German colleague, Herbert Walther.



Group picture in the laboratory of one of the authors. From left to right, standing: Dmitry Budker, Erwin Hahn, Herbert Walther, Jason Stalnaker, and Alexander Sushkov; sitting: Valeriy Yashchuk, Derek Jackson-Kimball, and Chih-Hao Li. Photo by V. V. Yashchuk.

Recent picture of Erwin Hahn with Jean-Claude Diels, taken in his office at UC Berleley.

Jean-Claude Diels remembers the acknowledgment line of his Ph.D. Thesis, reading "The present work benefited from an eruption fragment of the ideas spread by Professor E. L. Hahn, whose tireless interest, criticism, encouragements, scepticism and teaching propelled me through ..." The volcano analogy was indeed appropriate, given the constant creativity and drive of the advisor. The Thesis acknowledgement did not, however, give credit to one of the most important Erwin's legacies – his sense of humor. This quality of Erwin's is much appreciated by his close colleagues, but bothers those devoid of the sense of humor. He was once heckled as a "sexist" for having applied the term "self-induced transparency" (one of Erwin's greatest discoveries in optics) to describing a female dress. Being a merciless reviewer, Erwin once critiqued a paper that claimed to measure optical-pulse duration by simple linear Michelson interferometry as: "the authors claim to have discovered something new, like sex...". This comment, no doubt, could be applied to numerous recent publications that "recycle" earlier papers. With a sense of humor comes ... sensitivity. Erwin does not like to be quoted as "E. Hahn" – that carries some non-intellectual phonetics!

These days, any student who wishes to learn about Erwin L. Hahn will google his name. The student might discover that Erwin has been faithful to UC Berkeley for over 50 years, and has a long list of prestigious awards and honorary degrees to his name. The most repeated line is that he is "a U.S. physicist, best known for his work on nuclear magnetic resonance (NMR)", and that "...in 1950 he discovered the spin echo." One also learns that other countries pay a greater tribute to the American scientist. Named after him is the Erwin L. Hahn Institute for Magnetic Resonance Imaging, founded in July 2005 by the University Duisburg-Essen (Germany) and the Radboud University Nijmegen (The Netherlands). This institute opened in 2006 in Essen, Germany, and boasts a 7 tesla whole-body magnetic-resonance imager (MRI). In contrast, typical medical MRI operate at a magnetic field strength of 1.5 tesla.

It is sad to see the near absence of tribute to Erwin's immense contributions to modern optics and atomic physics. The whole field of coherent optical interactions was pioneered and developed by him and his students, leading to the concepts of solitons, self induced transparency, photon echoes, frequency shifts with distance, etc... His growing role in this field was not met with enthusiasm by the National Science Foundation (NSF) that was reluctant to fund his efforts in any field other than magnetic resonance. Perhaps the NSF reviewers feared competition? Another uphill battle started in the early 70s, when Erwin and his fellow University of California faculty had to confront the then Governor Ronald Reagan who had "discovered" that university professors taught only 1-2 courses per semester and hence, in the eyes of a layman, worked only 4 hours per week! It has become increasingly harder for an individual investigator to obtain research funding at a time when illiterate cowboys and football players continue to be admired role models. Many scientists have had to seek funding by offering gizmos and promising fantastic applications to funding agencies. Erwin Hahn has never compromised himself and never stirred away from basic science, though arguably, his discoveries and findings are at the heart of uncountable applications. And these are not only in MRI, but also in numerous other areas, where nuclear quadrupole resonance (NQR) that Erwin literally wrote

a book on and which is used for explosives detection is but one example.

To this day he remains our role model, perhaps shooting from the hip, but not with guns, and a testimony to that there, in fact, exists a higher level of education than just being able to read and write.

We would like to include in this short tribute several anecdotes as told to us by Erwin's close friend and colleague (and D.B.'s PhD advisor) Eugene D. Commins about but a small part of Erwin.

When Erwin was a graduate student at Purdue (just prior to enlisting in the Navy during WWII) he was invited to a professor's home for evening coffee. When he rang the doorbell it was opened by a child of the family, who said: "What a big nose you have!" The mother immediately offered a profuse apology for the child's bad manners and scolded him for his behavior. Later she offered Erwin coffee, and said: "Will you have cream or sugar in your nose?"

Not many years ago, Erwin was walking on the Berkeley campus with another close friend and colleague of his, Alexander Pines, whose nose was bandaged and bloody because of an injury. They were encountered by a friend of Alex's who said: "What happened to your nose?" Alex began to explain but was cut short by the friend, who said: "Not you, Alex; I meant him!"

And here is one about a trip by Erwin to Israel: One morning in a hotel in Tel Aviv, Erwin called and asked if there was breakfast room service. Yes, replied the manager. "What would you like?" Erwin said: "I want orange juice but it must be rancid. I want toast, but it must be burnt black. And I want coffee that tastes like acid." The manager said: " I'm sorry sir, we can't do that." "Why not?" asked Erwin, "You did it yesterday."

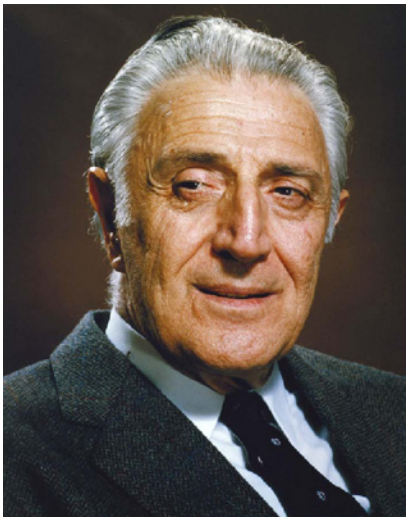
Happy Birthday, Erwin!

Dmitry Budker
Jean-Claude Diels

Erwin L. Hahn. Scientist, Mentor, Friend*

It is indeed a great privilege and pleasure for me to write some words about one of my mentors, a colleague, and dear friend, Erwin L. Hahn, one of the giants of modern physics.

A brief history – Hahn was born in Sharon, Pennsylvania, in 1921. He had several possibilities for a career, among them the navy, movie stardom, and music (many of us are aware that Hahn is an enthusiastic and gifted violinist). Well, we can be thankful that he turned toward science, in particular that he chose magnetic resonance and optics. He received his Ph.D. in physics from the University of Illinois. He was a research associate at the Universityof Illinois; a National Research Council fellow at Stanford University, where he worked with Felix Bloch; and a research physicist at IBM Watson Scientific Computing Laboratory before he came to Berkeley, where he has been on the faculty since 1955. Beyond



his famous published works, Hahn has always been a brilliant, provocative, and entertaining lecturer, raconteur, and teacher.

With his discovery of the spin echo, a phenomenon of monumental significance, Hahn launched a major revolution in physics with numerous implications to follow in many other areas of science. The occurrence of such a time reversal has far-reaching implications in the statistical physics of processes that approach equilibrium, and echoes were the first manifestation of the infamous "Loschmidt-Boltzmann paradox." Using spin echoes, Hahn also uncovered the indirect or scalar coupling of nuclear spins via hyperfine interactions. The use of spin echoes has also featured prominently in magnetic resonance imaging, one of the most important developments in diagnostic medicine in the last century.

It was Hahn who also obtained the first nuclear quadrupole resonance echoes in solids, and he is co-author of a masterful text on nuclear quadrupole resonance spectroscopy. With his students, he introduced the idea of double resonance in the rotating frame, a technique that allowed for the first time the detection of NMR for rare nuclear spins and is widely used today by solid-state physicists and chemists. In the area of coherent laser physics, Hahn and co-workers predicted and demonstrated "self-induced transparency," in which coherent optical pulses of particular shapes and areas propagate unattenuated through an otherwise resonantly absorbing medium, a type of "optical soliton." He provided a full theory using coupled Maxwell and Bloch equations for the phenomenon, together with experimental examples. This effect is a clear-cut manifestation of a many-particle vortex interaction, and its existence in other cooperative and statistical phenomena is the subject of much current research.

Although I wasn't one of his direct "academic offspring," I do feel that perhaps I am something like an academic nephew to Hahn, himself a direct academic descendant of Felix Bloch. Indeed having Hahn as a mentor, colleague, and friend has always been part of the pleasure and privilege of being at Berkeley. My own first indirect association with Hahn involved an experiment that Won-Kyu Rhim and I did at MIT in the laboratory of the great John S. Waugh, concerning the free induction decay of coupled spins in a crystal. The question then was whether the decay of magnetization under this complex Hamiltonian

* Some of the material in this editorial has been adapted from previous comments I have made about Hahn in speeches and award nominations, as well as my published comments upon his election as a Foreign Member of the Royal Society, my "Hahn Lecture" at the Gordon Conference, my "Bloch Lecture" (A. Pines, NMR in Physics, Chemistry and Biology: Illustrations of Bloch's Legacy, 1990, in: *Proceedings of the Bloch Symposium*, Editor W. Little, *International Journal of Modern Physics B* **4**, 1241–1267) and the Encyclopedia of NMR (A. Pines, Solid State NMR: Some Personal Recollections, 1996, *Encyclopedia of Nuclear Magnetic Resonance*, Editors D. Grant and R.K. Harris, Wiley).

This article was published in J. Magn. Reson. A, **179**, 5–7 (2006). Photo by G. Paul Bishop Jr.
© Copyright Elsevier, 2006.

was really irreversible – it turned out that you could, by applying an extended sequence of pulses called a "magic sandwich" after the total decay of order, bring back the magnetization. About that time, Waugh was going out to California and he planned to drop in on the father of the spin echo and tell him about our work. When he came back to the lab from the trip and we asked him what Hahn had to say, he replied that Hahn had remarked, "With that many pulses I could bring back the Messiah!"

Taking heart from this comment of his good friend, Waugh soon asked me to speak about the magic sandwich at the ISMAR conference held in Israel in 1971. Naturally, I was nervous, not only because this was one of my first public scientific speeches but also because both Bloch and Hahn were sitting there in the front row. So when Bloch's hand went up right at the end of the talk, and he said in his deep resonant voice, "I would like to ask a stupid question," I could only think to myself, "Goodbye Pines, it's been nice knowing you." I don't recall what Bloch asked, but Hahn reminded me of my surprised response – "Gee, that really *is* a stupid question." Bloch and Hahn both laughed delightedly, and Bloch said, "Yes, I know, but would you answer it anyway?"

The guest editor cross polarizing between Sven Hartmann and Erwin Hahn, with Charles Townes looking on.

As a further example of Hahn's influence, we contemplated an alternative to the multiple-pulse line narrowing of homonuclear abundant spins such as hydrogen or fluorine in solids, namely to capitalize upon the double-resonance scheme of Hartmann and Hahn, whereby two different resonant frequencies are matched in the rotating frame, allowing the exchange of magnetization between different spin species. The process which we termed "cross polarization" from abundant hydrogen to naturally dilute carbon-13, combined with spin decoupling, and subsequently magic-angle spinning, would make it possible to enhance both the sensitivity and the resolution of the directly observed carbon signal while retaining the vital anisotropic information. Indeed, this turned out to be a promising new approach to high-resolution solid-state NMR for systems from materials and chemistry to biology and medicine, again a direct beneficiary of the eternal innovations of Erwin Hahn.

My official association with Hahn began in 1972 when I was awarded a Miller Fellowship in physics to work with him at Berkeley. Shortly afterward, however, the Chemistry Department offered me a faculty position, which I accepted (despite Hahn's comment that endeared him to my chemistry colleagues – "Alex, you're too smart to be a chemist"). Since that time, one of the marvelous experiences of being at Berkeley has been the privilege of having Hahn as a colleague, scientific collaborator, and dear friend.

Some years ago, on the occasion of his 70th birthday, a symposium was organized in Hahn's honor at Berkeley. Listening to the speakers, among them many of the other luminaries and founders of NMR, as well as numerous colleagues and former students of Hahn, one could not help but be astounded by the breadth and depth of his impact as reflected on the generations of scientists whom he has educated and influenced. Telegrams and best wishes were read aloud, and the Chancellor of the University of California awarded Hahn our highest honor, the "Berkeley Citation."

The Hahn Symposium was also the occasion for what Erwin views as a compliment. Upon receipt of the symposium announcement, a colleague in Colorado called to say that he had an overseas visitor who was surprised; his response was, "My goodness, I thought that Hahn was dead!" "No," my friend explained to him, "Hahn is very much active and still working as creatively as always; in fact he is collaborating with Alex Pines, Walter Knight, and Mel Klein, the organizers of the symposium." "Pines!" the visitor exclaimed – I thought he was dead!"

Hahn's contributions to science are phenomenal. He has done so many creative and beautiful things, a fraction of any one of which could serve each of us for a lifetime. To remind us all, and to set things in perspective, let me mention again just four of his papers, the ones involving free precession, spin echoes, double resonance, and self-induced transparency!

Hahn has been an inspiration for generations of scientists, and we owe him a debt beyond words. For me, becoming acquainted with spin echoes and time reversal and becoming afflicted with the Hartmann-Hahn condition (from which I suffer to this very day) have been an unforgettable part of my scientific education and experience for which I am forever grateful. Certainly, Hahn is a genius, one of the greatest physicists of the last century and, moreover, he is an individual of enormous integrity in his scientific and personal life. He has been, and he remains, a shining light for all of us to follow.

Erwin, on behalf of us all in magnetic resonance, I'd like to say thank you, convey to you and your family our blessings, and hope that you will enjoy many more healthy and happy years of science, music, friendship, and humor.

Yours as always,
Alex Pines

notices of Meetings

EUROMAR 2012
Dublin, Ireland, July 1–5, 2012
http://euromar2012.org
General enquiries: info@euromar2012.org
Exhibition/sponsorship enquiries:
admin.euromar@ucd.ie
Scientific programme enquiries:
support.euromar@ucd.ie
(for details see forthcoming issues)

2nd International Symposium on Electron Spin Science (ISESS2012)
Matsushima, Japan, July 23–25, 2012
http://res.tagen.tohoku.ac.jp/ISESS2012
Contact: Seigo Yamauchi (Chair),
Hideto Matsuoka (Treasurer)
e-mail: isess2012@res.tagen.tohoku.ac.jp
(for details see forthcoming issues)

Memorable Interactions with Erwin Hahn

It is a great honor to provide some comments on behalf of the IES on the occasion of Erwin Hahn's 90th birthday.

Erwin has been a towering figure in the development of much of magnetic resonance. In the EPR newsletter we are reproducing the beautiful article by Alex Pines, who has been a close colleague of his for many years at Berkeley. Thus I will confine myself to a few of the memorable interactions I have had with Erwin through the years mainly in national and international magnetic resonance meetings.

My first contacts with Erwin were at Magnetic Resonance Gordon Conferences in the 1960's and 1970's when I was first starting out. Erwin would always give some of the most exciting talks, because the physics was innovative and important, and he always could provide humor. For example, a favorite lecture title was "Deuteronomy", about the spin physics of deuterons, but with ample humorous references to the biblical implications.

My first direct interaction with him was when he was Chairman of the 1973 Gordon Conference, and I was his Vice-Chairman. I was honored to be serving with him. When I asked how I could help, he indicated that he thought he could handle it, but would I attend the February meeting in NYC for the Gordon Conference Chairs. Indeed it was much easier for me to go down to the city from Ithaca, NY than for Erwin to fly from Berkeley, CA and relieve him of a less than exciting event. But I did get to run the 1975 Gordon Conference in my own right.

Going forward many years to the 2005 Gordon Conference, Erwin and I were presenting the two opening Sunday evening lectures, and I could jokingly comment that I am used to going after Erwin. His intriguing lecture reminded me of his more than 50 years of his great accomplishments in magnetic resonance and fundamental physics in general.

Erwin's towering achievements in magnetic resonance are most extensive in NMR. Yet the IES has made him a Fellow in 1996. What about his contributions to EPR? They certainly exist and are foundational to our field. Clearly, his discovery of the spin echo in 1950 in NMR has been carried over to and is essential in modern EPR. However, I will illustrate some of his EPR accomplishments with a little story. In July 2001 there was a meeting on Magnetic Resonance at High Fields in Stuttgart, Germany. It covered both EPR and NMR, and Erwin was the honored luminary. One evening during the meeting several of us were at an outdoor table at a restaurant drinking our beers and awaiting our dinners. The conversation started up about science relevant to the meeting. There was much talk back and forth about eseem. It was eseem this and eseem that. Erwin inquired what this eseem was about. People at the table then provided him with a short explanation, to which he replied: "but I did that years ago!" I immediately quipped "Erwin yes you did, but you didn't call it by the right name." I later checked on Erwin's classic 1965 Physical Review paper with Rowan and Mims entitled "Electron-Spin-Echo Envelope Modulation". Indeed, nowhere in this paper did he refer to ESEEM! As we know today, ESEEM has become a centerpiece in modern EPR.

It is a great pleasure to commemorate Erwin Hahn's 90th birthday and we wish him many more with many new physics discoveries.

Jack H. Freed
President of the IES

Five years after

Klaus Möbius: An Interview to the *EPR newsletter*

EPR newsletter: *Dear Professor Möbius, on behalf of the readers of the EPR newsletter we congratulate you on your 75th birthday. We are most appreciative that you agreed to answer the questions of this interview. Why did you start towards your career in science and why was it EPR?*

Books played a great role in my family during school and university time, and reading about far-away people and cultures, about near and distant cities and their exciting architecture, about the great discoveries in physics, chemistry and biology and the persons who made them, and about the dramatic developments of the history in Europe and other continents – that was all fascinating and asked for more reading and studying. History or architecture or science, all three subjects seemed equally appealing. But then I learned that history was traditionally recorded mainly as a not-ending chain of wars rooted in the abuse of power and the obstinate claims of ideologies. Hence, this discipline lost much of its appeal for me. As did architecture, when I realized how many compromises in innovation and style an architect has to make to fit the bureaucratic regulations of the local administrations and the profit interests of the building owners. Science, on the other hand, seemed still to be open for challenging problems to solve, still open – I thought – for uncensored thinking and one's own decisions on what to do in research and with its results, and what not to do. This assessment was somewhat naïve, I admit. But still I am convinced that working in science, in particular in basic research in academia, is distinguished by allowing for independent thinking, for keeping one's own moral standards, for interacting with many colleagues across political borders and ideologic incrustations.

In 1960, when I was looking for a diploma work in physics at the Free University Berlin, I first asked Prof. Richard Honerjäger whom I respected from his lecturing undergraduate courses. He offered me two options: either to join his established project on microwave spectroscopy of gas phase diatomic molecules, in which postdoctoral researchers were tutoring already several diploma students. Or to join a new project on building an EPR spectrometer from scratch, more specifically from surplus microwave components and an available electromagnet. I decided for the new EPR project, although only two other diploma students were involved, and no experienced postdoc for tutoring. I was just fascinated by EPR, this new branch of molecular spectroscopy which had been discovered only 15 years ago (by Zavoisky in Kazan). But during the following year, Honerjäger's moral support was badly needed in our daily fights with burn-outs of mediocre microwave sources and diodes and with horrendous instabilities of the magnet power supply. Nevertheless, this time was a wonderful experience of alternating frustration and excitement which I shared with the other two diploma students. And I will never forget the glorious feeling of success when ultimately my first EPR spectrum of DPPH appeared at the pen recorder.

What do you think about the young generation of EPR researchers and what is your message to them?

I am absolutely excited about the young EPR researchers growing up around the world who I had the chance and privilege to meet personally in the laboratory or at international meetings and workshops. Or for whom I am often asked to write evaluations concerning their PhD or habilitation theses, postdoctoral fellowships and appointments at the various stages of their academic career. Let's face it: In most laboratories it is the young researchers who are implementing new methodologies in advanced EPR spectroscopy, or applying sophisticated EPR and NMR techniques to more and more complex and challinging systems in material sciences, biochemistry and biophysics. And who are doing the laborious sample preparations and molecular-biology spin labeling. Sure, competent and innovative supervision of the graduate students by the group leader is one important ingredient for success in the field, but the students' doing the real laboratory work and developing their own creativity is the other one!

My message to the young generation of EPR researchers is:

Feel responsible for what you are doing, first of all towards humanity. Too many examples exist in the history of science when the actors didn't care a damn about the consequences of their scientific accomplishments. Don't bow to established thinking of the authorities, be it your professors, the authors whose papers you read in the scientific literature or in the public media, but speak up when you see alternatives. Don't trust those who tell you about the necessity of building up barriers between the "good guys" and the "bad guys" in the world. Perforate those barriers by ▶

the possibilities of our scientific community to personally meet people from around the world. Take up the chances for international contacts and cooperations, the field of EPR spectroscopy is flourishing just because of international networking. International cooperation is the best drug against ideology, from whatever side it may come.

If you have an option to choose between different projects to work on, opt for the difficult ones. In most cases in the long run they will turn out to be the most exciting ones. Find a good mentor and chose the best laboratory for your project. Be open and trustful in scientific discussions with your colleagues, even to your competitors. Be honest in your estimation of your own work and the work of others; in most cases we are standing on the shoulders of somebody else. Try to do science according to the highest international standards. This will only be possible if you do it with enduring excitement and full dedication. Allow joy and happiness about a successful experiment to dominate over frustration and disappointment from preceding failures. Such failures are unavoidable in challenging research, and modern EPR certainly belongs to this category. Work hard and don't stop thinking of your project, even when outside the laboratory. Unexpected solutions of a problem often appear under relaxed circumstances. Don't fall into dispair when the problems seem to get out of control, but keep in mind that you will be compensated: Your EPR research will ultimately lead to better knowledge and understanding in your field. Moreover, EPR spectroscopy also provides an excellent broadband training and qualification in a variety of scientific disciplines including microwave engineering and complex data analysis. This is highly attractive for subsequent appointments in academic, industrial and medical professions.

Get new inspirations and an infallible feeling for quality standards for your EPR research not only from the literature and your immediate scientific environment. Attend international summer schools, conferences and workshops and listen to the lectures of EPR experts from around the world and controversial discussions. Defend your own results with confidence in the quality of your work, but listen also to constructive criticism from outside. It is my conviction that the future of modern EPR in material science, chemical kinetics, molecular biology and medical applications is bright - and waits for young researchers to enter the field and to attack new tasks with new ideas and new enthusiasm.

What would you have done if given a different opportunity?

This is a difficult question, but I think I would have chosen the life sciences again. Not necessarily EPR or NMR spectroscopy, but most likely a subject at the borderline between molecular biology, supramolecular chemistry and molecular physics. Trying to understand some of the riddles Nature proposes to us, for example: How can we copy the photosynthetic activity of green plants to manufacture powerful photovoltaic cells? Trying to adhere to the obligation of disseminating insights for a wiser use of the resources Nature has provided to mankind. A wiser use than what is still being propagated by established economic powers and their "experts". And trying to go beyond academia playgrounds towards international bodies of sufficient assertiveness to implement scientifically sound rules for renewable energy consumption.

Wilmad-LabGlass A Name You can Trust
EPR Sample Tubes and Accessories
• The largest selection of Natural Quartz and Suprasil Sample Tubes and Capillaries
• Dewar Flasks and Inserts
• Tissue, Aqueous and Flow Cells
• Extensive custom Quartz glass capabilities
Wilmad LabGlass
Contributing Sponsor of the International EPR (ESR) Society
Tel: 800.220.5171, 856.697.3000, www.wilmad-labglass.com

NORELL®
eprtubes.com
• Natural Quartz EPR Tubes
• Suprasil® Quartz EPR Tubes
Custom Sizes Available
Supplied with PTFE Tapered Caps
PHONE: 1.800.519.3688 or 856.697.0020
FAX: 1.800.245.5932 or 856.697.0021
EMAIL: customerservice@nmrtubes.com

Molecular Specialties, Inc.
TPX Capillary
(Catalog No. TPX-2)
• Compatible with most resonators
• Accepts liquid and solid samples
• Ideal for oxygen-control studies
• Easily cleaned
Address: 10437 Innovation Drive, Suite 301, Milwaukee, WI 53226
Phone: 414–258–6724
Contact: Richard J. Stevens
E-Mail: rich.stevens@molspec.com
Web: www.molspec.com
Contributor to the International EPR Society

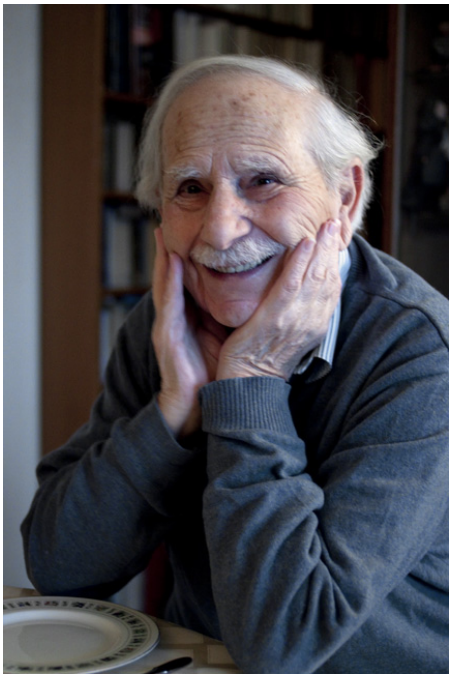
Rs Since 1978
S
Research Specialties
1030 S. Main St, Cedar Grove, WI 53013
920-668-9905 Phone / Fax
James R. Anderson
E-mail: Janderson36@wi.rr.com
Specializing in Scientific Instrumentation
Design | Manufacture | Upgrades | Repair
EPR | ENDOR | NMR etc.
Varian / Bruker – accessories – parts – service

Anatole Abragam (1914–2011)

Magnetic resonance at Saclay with Anatole Abragam*

M. Goldman

Service de Physique de l'Etat Condensé, DRECAM, DSM, CE-Saclay, 91191 Gif-sur-Yvette Cedex, France



Courtesy of Anne Papillault and Jean-François Dars

... At the foundation of the lab, Anatole had already a tremendous international prestige, from his achievements at Oxford and at Harvard. His lectures at Saclay on NMR (which I did not follow; I only read the notes) were not only a source of knowledge, but also a unique example of scientific rigour, profundity, and elegance. They were the seeds of his future book "The Principles of Nuclear Magnetism". To work under such an obviously great man was certainly intimidating but, at least with the people of the laboratory, he never was distant. He was used to visiting each one at his bench, every day or second day, and asking with a gentle smile: "What are you doing?" That was the ritual beginning of a fantastic performance. Each answer stimulated a new question that compelled us to be more explicit, more rigorous, that opened new ways of looking at our own work. He never accepted "à peu près". His questions concerned not only the theoretical or conceptual part of the work, but also each detail of the experimental setup, the exact way of retrieving information from the experimental results, and the physical significance of this information. This was not an examination, but a dialogue and a beautiful lesson of what scientists call "the scientific method". (The philosophers use the same expression with a different meaning, if only to claim that there is no such thing as a scientific method). He had a remarkable ability to discriminate between what is important and what is not (is it possible that he moulded our brains to follow his way of thinking about such matters?). He was particularly good at performing quick approximate calculations mentally, or on a blackboard corner or a piece of paper. I used to "help" him solve small additions or multiplications and I prompted him with wrong answers with such regularity that he once exclaimed: "I will kill him!" I am glad to inform the reader that at the time of writing Anatole has not followed up this threat yet. Lack of time? Change of mind?

We had also more collective discussions on general questions related to somebody's work or to his own ideas. I must say that in all occasions, he exhibited a total (and uncommon) intellectual honesty, in that he listened carefully to other people's arguments, he discussed them and he accepted them when he thought them good. It was in particular an intrinsic part of the laboratory's tradition that, once the basic knowledge acquired, everybody was on equal footing for having good ideas, irrespective of his age. Side by side with intellectual honesty stands intellectual integrity. I have a precise reminiscence of what I think to be the latter. A physicist in our lab, whose name I will not disclose, had made very curious and interesting experimental observations. Their exploitation required a double effort, an experimental one so as to investigate all aspects of the subject, and a theoretical one so as to provide it with a complete quantitative interpretation. He performed both in sequence. Years after, Anatole told me (I quote from memory): "While he was pursuing the experiments, I could have done the theory. We were both involved in the thing, and I am convinced I could have done the calculations more quickly and more compactly than what he did later. I refrained, because the initial idea was his, and I knew he had the capability of developing the theory. I then had no right to deprive him of the merit of doing it".

Equally remarkable was Anatole's performance in the "critical reading" of the articles

* An excerpt from M. Goldman: *Magnetic resonance at Saclay with Anatole Abragam*, in: *NMR and More in honour of Anatole Abragam* (M. Goldman, M. Porneuf, eds.) Les Editions de Physique, Les Ulis, France 1994. www.edpsciences.org. Reproduced with permission from EDP Sciences.

ISMAR

It is with great sadness that we learnt about the death of Anatole Abragam. He was a true giant of Magnetic Resonance and through his book on the 'Principles of Nuclear Magnetism' shaped this field of science more that anybody else. As early as 1955 he founded at the Saclay Center near Paris his Laboratory of Magnetic Resonance, which he directed for 30 years, throughout the evolution of his scientific responsibilities, Service Head, Department Head, and the Physics Director from 1965 to 1970. His laboratory, exclusively devoted to physics, came soon to be renowned in the Magnetic Resonance community as one of the "most productive in the world". Among its prominent achievements, personal or from (or with) members of the lab, are many that have been used ever since they were discovered and formulated, e.g., the formalism of nuclear relaxation, the development of Spin Temperature, theoretical and experimental, or dynamic nuclear polarization (Solid Effect, then DNP). His interests and achievements went far beyond NMR and included in particular EPR and other fields such as pseudo magnetic resonance of neutrons and muon spectroscopy.

The International Society of Magnetic Resonance mourns a most creative pioneer in NMR, EPR and their combination, the Recipient of the ISMAR-Prize 1983 and Fellow of our Society. We will keep him in highest honour and will find ways to express our special gratitude at International Conferences to come.

Hans Wolfgang Spiess
President

of the group. It was natural that everyone who had written a letter or an article on his work submit it first to Anatole, who considered it his duty to read it carefully and to comment it carefully to its author. I remember the case of my first "Note aux Comptes Rendus", which I confess I was not dissatisfied with when I handed it to Anatole. The next day, he called me to his office "to discuss it". When I staggered out two hours later, the article had been torn to shred. I seem to remember that not a single sentence of the text had been left intact. The technique was similar to that of the bench discussions: What does that mean? Is it entirely correct? Is there anything else to be said? What do you want to say? Then why not say it the way you just did? etc... The worst is that he was right, most of the time. The requirement was always the same: rigour, clarity, logics, elimination of useless comments. He insisted that the exposition of facts or ideas be direct and simple. When confronted with a contorted sentence, he had the gift of cutting it into two or three simpler ones which rendered immediately everything clear. Another important lesson derived from his remarks is that the final task in the writing of an article is to "clean the corners", so as to remove any speck of sloppiness. This applies not only to the scientific content, but also to the style. Until his retirement, Anatole read all pencil-written versions of my writings, and I have no example where this did not result in an improvement. To end up on this subject, I felt as one of the greatest compliments from Anatole his comment on a big article written by André Landesman and myself; he had come out of his office and exclaimed as if completely stunned: "But it's clear!"


Taken by Nina Abragam

I come now to the important question of the seminars. When the laboratory was young, there were not enough people for us to have our own seminar, and we used to go to the so-called "Kastler Seminar" every monday afternoon at Ecole Normale Supérieure in Paris, where I discovered that the concepts of atomic physics, as practiced in the prestigious Kastler-Brossel laboratory, and those of magnetic resonance had quite a lot in common. It is a few years later, when Anatole's lab had grown to sufficient size, that it had its own seminar at Saclay, as I discovered at my return from military service, in 1960. I discovered at the same time that "they" had decided I would be in charge of it. It took place every week, and it had a double character: description of personal work and "Journal Club", that is analysis of published articles or received preprints. Later on, we also had seminars at the Collège de France, companion to the formal course of Anatole. They were few in number and given mostly by guests from other laboratories, French or foreign. We always kept our "family seminar" at Saclay, most of the time of the Journal Club type. For a while, it took place in the room dedicated to coffee, and started as soon as everybody had his cup filled. These were known as "Coffee Seminars". I will not speak of the (numerous) seminars given by Anatole himself. Their description would not differ from that of his formal lectures, to which I will come later. I want to discuss rather the role of Anatole in the seminars given by other members of the lab. Anatole always sat in the front row, with the obviously watchful attention well known from all attendants to Magnetic Resonance conferences, which froze more than one. He machine-gunned the speaker with questions, never missing a "faux pas", an error of logics, a clumsiness of language, or a scientifically obscure statement. This behaviour, which has caused nightmares to so many conference speakers, was felt by us as very constructive. It was often evident that he understood perfectly well what we wanted to say, and the aggressive naïveness of his questions was only intended to compel us to improve the clarity of our discourse. At this point, I have an embarrassing confession to make. Being well aware by experience of his behaviour and vigilance at seminars, when I gave one I tried very hard to be as clear as possible, but I intensionally and shamelessly was careful to slip quickly across one or two delicate points. It never failed that it was on these points that he jumped with questions, which I had in advance carefully prepared myself to answer. That was not pure mischievousness: occasionally the point was actually delicate, and it had taken me weeks to solve it. I confessed this habit of mine to Anatole with about 30 years delay, and I still don't know how he feels about it.

I would like to sum up what we learnt from Anatole on the art of giving Journal Club seminars. First of all, never relate an article in the way and in the order the author(s) did it. It often happens that the authors are clumsy or stupid (or both), and anyway you are not a parrot. They seldom realize how good (or bad) their work is, and never had any training in the art of selling. There is no excuse in telling a lousy argument and saying, under reproach: "It's *verbatim* what is written!" When you read an article, you have to assimilate it so as to understand it better than its authors and then devise the best way to explain it, following your own intellectual logics and with no regards to how the authors did it. You have to turn their achievement ▶

into a piece of your own self, in the same way as the chicken eaten by Mr. So-and-So does not end up as pieces of chicken on Mr. So-and-So's hips, but as extra fat specific to Mr. So-and-So around his waist. In short, when describing other people's work, you have to deserve the appreciation given by the 17th-century French writer La Bruyère on one of his colleagues: "He has, in what he borrows from others, all the charm of novelty and all the merit of invention".

Anatole Abragam is a born lecturer, and I think he loves to teach and explain. This is already plainly clear in his scientific books, the most famous of which is "The Principles of Nuclear Magnetism" of 1961. Even in his memoirs, whose English version was published under the title "Time Reversal", he did not resist the temptation to explain a few things that had been done in the lab. However, the pleasure of writing clearly about complicated things, of leading gently the reader through intricate arguments until the solution jumps (hopefully) to his mind, is nothing compared with the exhilaration of delivering oral lectures. A speaker in front of an audience is like a lion tamer facing a horde of yawning or sleeping beasts. He has to capture their minds with the sole power of words, uttered by mouth or projected on a board, and to force with these means Enlightened Understanding to invade their brains (Whips no longer allowed). I would like to make a few personal comments, which I believe will meet with the experience of many lecturers or lecture attendants. The first one is about how wonderfully (and surprisingly) easy it is to feel if and how the audience responds to the "treatment" (A feeling probably even more acute for actual lion tamers, at least the good ones, those who survive). The second comment is that the generalized use of slides and overhead projectors has considerably improved the ease of lecturing, but at the same time it has decreased the efficiency of the lectures. The reason is that it makes it too easy for the listener's mind to wander. From the lion-tamer-point-of-view, writing on a blackboard – or even on a transparency – is much more efficient for keeping in hand the attention of the audience and feeling its reaction. Finally, it is more than evident that listening to oral lectures makes it much faster and much easier to learn things than merely by reading books. The subsequent reading serves mostly to anchor the acquired knowledge to the brain. ...

Sample Preparation
Tips for Beginners and Collaborators

Ralph T. Weber, David P. Barr, and Kalina Ranguelova

EPR Division Bruker BioSpin Corporation, 44 Manning Road, Billerica, MA 01821

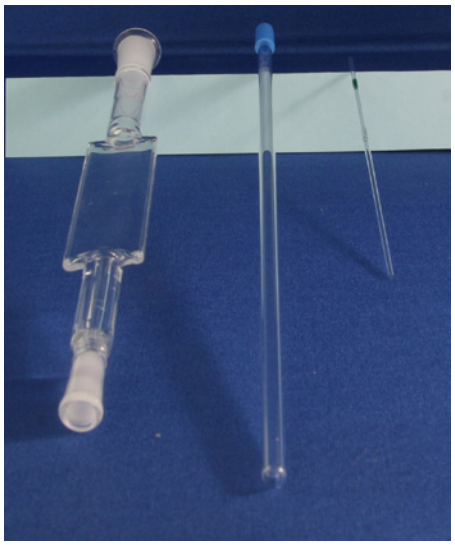
Many people visit our lab to perform experiments at Bruker BioSpin Corporation. We also run EPR experiments on a contract basis through Bruker Analytical Services. These activities have given us a great deal of experience dealing with samples from people who are new to EPR. Here is a collection of common questions and issues that we encounter regarding sample preparation.

Sample Tubes

The first and most obvious issue is sample tubes. In most cases it is best to use clear fused quartz. Borosilicate tubes such as Pyrex have an iron signal that can interfere with the EPR signal. The most intense signal, the $g = 4.3$ signal, occurs at low magnetic fields. If you are measuring organic radicals at $g = 2$, you may still obtain acceptable results with borosilicate tubes. There may be cases in which samples are irradiated with UV light that can cause the creation of E' centers. In such cases it may be necessary to use tubes made from synthetic quartz such as Suprasil to suppress these defects.

The next question is what size sample tubes do I need for the EPR experiments? This depends greatly on the dielectric properties of the sample. Polar liquids such as water, acids, and alcohols absorb microwaves, thereby making tuning difficult for large sample tubes. Typically an inner diameter of 0.9 mm will work for these samples. One common option for organic radicals in aqueous solution is a 50 µl borosilicate capillary that is available from many laboratory supply companies. These tubes work well down to concentrations of about 0.5 µM. For concentrations less than this, a specialized sample cell is required such as the multi-bore AquaX or an aqueous flat cell. These cells allow you to measure down to a concentration of 10 nM for a freely tumbling nitroxide.

Samples that contain nonpolar organic solvents such as toluene can be measured in larger sample tubes. The typical EPR tube



Typical sample holders for aqueous dilute samples, normal non-lossy samples and high concentration aqueous sample.

size is 4 mm outer diameter, 3 mm inner diameter and 250 mm long. These dimensions are compatible with liquid helium variable temperature experiments.

Solid samples allow the user more flexibility in choice of sample tubes. Most EPR cavities will allow a tube with a maximum 9.5 mm outer diameter. We have found large tubes can be useful in many material science applications (e.g., polymers or sheets of material that can be rolled). Another important consideration with powder-type samples is packing density. To obtain meaningful comparisons between

solid powder samples you need to make sure that the tube is packed consistently and reproducibly.

Most suppliers of EPR tubes offer tubes with two different dimensional tolerances, select and precision. Precision tubes are ground to specific dimension and have very tight dimensional tolerances. Needless to say these tubes are expensive. If you do not need the tight tolerances for experiments requiring very precise quantitation, it is more economical to purchase select tubes. These tubes are drawn and then selected for specific dimensions but with less stringent tolerances than for precision tubes. The variation in outer tube diameter in the select tubes can cause problems when the tube must fit in a specific size holder such as a pulse EPR sample holder or a top hat of a helium cryostat. One solution is to purchase in bulk and select for tubes that fit the sample holders. The others that are too large or small can be used for other experiments in which the tube does not need to fit in a specific size holder.

Concentration

Misconceptions regarding optimal spin concentration can range from too high to too low. In general, you do not want to have samples comprised of pure paramagnetic species as the lines often become broad and details disappear owing to spin-spin interactions. Most samples are diluted in a solvent or are co-crystallized in a diamagnetic host to regain the lost details.

Very strong signals can also cause problems with the spectrometer. Electronics can become saturated or clipped resulting in distortion of the EPR signal. Also strong EPR signals can "pull" the AFC (Automatic Frequency Control) resulting in distortion of the EPR signal.

For organic radicals, the concentrations should range from 10 nM on the low end to 1 mM on the high end. Note that the lower concentration limit depends on the sample tube as discussed in the previous. Higher concentrations can be measured but will exhibit broadening from spin-spin interactions.

Because of their much wider spectral width, transition metal complexes require higher concentration than organic radical samples. Typical ranges are from 10 μM to 10 mM.

Liquids naturally fill their vessels uniformly provided there are no bubbles. This is not true for powders and fibers. Here the concept of concentration needs to be extended with the concept of packing density: not all of the volume is sample but may be simply air. Knowing the mass and the density of the materials in the sample tube greatly helps when measuring the spin concentrations in such samples.

Cryogenics

Many EPR experiments are performed at temperatures lower than room temperature. The simplest reason is that often radicals can be short-lived and freezing the samples allows us the time to measure these transient species.

Relaxation times are also an important factor in performing experiments at low temperature. Many samples, transition metals and rare earth metals in particular, simply do not have a measurable EPR signal at room temperature. The most common reason for this is the interaction of the orbital angular momentum with the local vibrational modes. This is a hint to predict if you need to go to low temperature: an S state ion such as Gd^{+3} or Mn^{+2} has no orbital angular momentum. These samples are detectable at room temperature. The g matrix reflects contributions to the paramagnetism from the orbital angular momentum. The further the g-values departs from $g = 2$, the lower the temperature required to detect the EPR signal.

Cooling samples brings its own set of issues. Solvents for frozen solutions should be chosen to form a good glass upon freezing. Samples should usually be frozen as quickly as possible. This prevents aggregation that results in high local concentrations and high concentrations should be avoided as discussed in the previous section.

When measuring aqueous samples we also have the problem of sample tube breakage. 10–30% glycerol helps greatly to keeping sample tubes intact. Glycerol may change the chemistry or reactivity of your sample, therefore it is always prudent to verify that the glycerol does not interfere with your sample. Sample tube breakage is also an important reason to always pre-freeze samples. It is always easier to clean your nitrogen dewar compared to your variable temperature dewar. And remember to thaw your sample in a tube or beaker so that the sample can be recovered if the tube breaks.

Very low temperatures, (< 50 K) freezes most gases, other than hydrogen and helium. This leads to the phenomenon of cryo-pumping. If you have a sample with air in the tube, it is a little block of ice at low temperature. This also means that you have established a very low vacuum in the tube and this works as a cryostat between the cold gas in your cryostat and your sample. For frozen solutions this is seldom a problem because they adhere to the surface of the tube and there is very good heat conduction. If you have a powder, this is no longer the case. There is no longer good thermal contact and the powder may require hours before it is at the same temperature as the gas in your cryostat. Filling the sample tube with helium gas ensures that there is a conduction pathway to cool your sample. The helium gas does not freeze and therefore acts as a thermal transfer gas. Powder samples should be backfilled with helium gas to ensure proper thermal contact.

Sealing caps of sample tubes during cryogenic applications prevents the cap from popping off.

Last but not least we encounter the problem of the plastic caps popping off of tubes when they are removed from the cryostat, endangering the vision of anyone in the lab. This is why you should always wear safety glasses when removing samples from a cryostat. These caps do not seal very well. The cryo-pumping continues to accumulate air ice in the tube. When the sample is removed it all evaporates and pressurizes the tube, thus popping off the cap. Sealing the tube and cap by wrapping Parafilm or Teflon tape around them prevents the leakage. Remember despite this precaution to always point the top of the tube away from yourself and any other people in the lab.

Summary

Starting collaborations with people that are not versed in EPR can be initially problematic. With some guidance to the collaborators regarding sample preparations, many of these problems can be avoided. We hope that our suggestions and tips will aid you in your collaborations. We wish you many successful and fruitful collaborations.

44th Annual International Meeting of the ESR Spectroscopy Group of the Royal Society of Chemistry

The 44th Annual International Meeting of the ESR Spectroscopy Group of the Royal Society of Chemistry (RSC) was held at the University of York from 3rd to 7th April 2011. The meeting, attended by 126 delegates, was held in the National Science Learning Centre on the York campus. This made an excellent venue for lectures, posters, receptions and scientific discussions late into the night. York has hosted 7 conferences of the RSC ESR group between 1971 and 2011. Dick Norman, the founding Head of York Chemistry, and Bruce Gilbert (appointed a Lecturer in 1965), pioneered EPR research in York. One of their PhD students, Mike Davies, was appointed an academic at York in 1990s before moving to Australia. Victor Chechik, appointed at York in 1999, expertly organised, managed and ran the 2011 meeting; the great success of the meeting was in no small part due to his herculean efforts which were ably supported by the York team.

Since 1986 Bruker BioSpin has generously sponsored an annual Lectureship and Prize, given to a scientist who has made major contributions to the application of EPR spectroscopy. The Bruker Lectureship and Prize for 2011 was awarded to **Thomas Prisner** (University of Frankfurt), who lectured on *New developments in EPR and DNP and application to biomolecular research* (see p. 3). His entertaining and genuinely inspirational lecture, introduced by Fraser MacMillan (University of East Anglia) who reviewed many of the contributions Thomas had made to the field, was enjoyed by a packed lecture theatre. Fraser highlighted how many of the people that had been supervised and mentored by Thomas had subsequently gone on to do great work of their own.

At the RSC ESR Group meeting JEOL (UK) Ltd generously sponsor the young researcher lecture competition. The 2011 winner of the JEOL Prize, **Petra Lüders** (Laboratory of Physical Chemistry, ETH Zurich) talked on *Distance Measurements on Lanthanide Ion-Nitroxide Radical Spin Pairs in the Nanometre Range by Relaxation Enhancement* (see p. 4). The runners up, who both received a monetary prize, were Ivan Krstić (Institute of Physical and Theoretical Chemistry, Goethe University Frankfurt): *In-cell PELDOR on Nucleic Acids* and Maxie Roessler (Department of Chemistry, University of Oxford): *A Single Supernumerary Cysteine Adjacent to the Proximal Fe-S Cluster Confers Oxygen Tolerance on a [NiFe]-Hydrogenase.*

The British Biophysical Society (BBS) sponsored a poster competition prize at the 2011 RSC ESR Group meeting and the winners were Richard Ward (School of Biology, University of St Andrews): *PELDOR spectroscopy used to study histone chaperones* and Benesh Joseph (Laboratory for Physical Chemistry, ETH Zurich): *Transmembrane gating in the type II ABC importer BtuCD-F during nucleotide cycle*. Other meeting sponsors were the University of York and the RSC.

Peter Meadows of JEOL (UK) Ltd congratulates the runners-up of the JEOL prize Ivan Krstić and Maxie Roessler (right). Picture courtesy of Tim Smith.

Keynote lectures were presented by Victor Chechik (University of York): *Using spin traps in heterogeneous reactions*, Stephen Hill (Florida State University): *Molecular Magnetism and Multi-High-Frequency EPR at the National High Magnetic Field Laboratory*, Wayne Hubbell (University of California, ▶


BBS poster competition winners Richard Ward (left) and Benesh Joseph (right).

Los Angeles): *Exploring the energy landscape and dynamic modes of a protein with site directed spin labelling*, and David Collison (University of Manchester): *Electronic structure of large polymetallic molecules: a multi-frequency EPR approach*.

Invited lectures were presented by Snorri Sigurdsson (University of Iceland): *Non-covalent and site-directed spin labelling of nucleic acids*, Hassane Mchaourab (Vanderbilt University): *Protein Conformational dynamics from spin labelling EPR spectroscopy*, Eric McInnes (University of Manchester): *A spectroscopic study of exchange-coupled orbitally-degenerate ions: six-coordinate cobalt(II) dimers*, Howard Halpern (University of Chicago): *Spectral information from unexpected places: tumour physiology with in vivo EPR imaging*, Michael Davies (Heart Research Institute, Sydney): *Radical transfer reactions mediated by heme proteins and their prevention*, and Stefan Weber (Albert-Ludwigs-Universität Freiburg): *Origin of Light-Induced Spin-Correlated Radical Pairs in Cryptochromes and Related Blue-Light Active Proteins*.

Catering at the University of York was of a high standard but the excellent Conference Banquet was held in the Great Hall of the Merchant Adventurers' Hall which is a medieval guildhall in the city of York and was one of the most important buildings in the medieval city. The major part of it was built between 1357 and 1361 by a group of influential men and women who came together to form a religious fraternity called the Guild of Our Lord Jesus and the Blessed Virgin Mary. In 1430 the fraternity was granted a royal charter by King Henry VI and renamed 'The Mistry of Mercers'. It was granted the status of the Company of Merchant Adventurers (www.theyorkcompany.co.uk) of York by Queen Elizabeth I in the sixteenth century.

The 45th Annual International Meeting of the ESR Spectroscopy Group of the Royal Society of Chemistry will be held at the University of Manchester, from Sunday 25th to Thursday 29th March 2012. Information about the 2012 meeting, previous meetings and the RSC ESR group can be found at site esr-group.org.

Mark Newton

8th Asia-Pacific EPR/ESR Symposium (APES 2012)

Beijing, China, October 11–15, 2012

www.APES2012.org

APES 2012 is intended to stimulate discussions on the forefront of research in all aspects of EPR/ESR ranging from theoretical and experimental advances in CW EPR/ESR, pulsed EPR, high frequency and high field EPR, ENDOR, time resolved EPR, FMR, EPRI, CIDEP and ODMR to applications in medicine, biology, chemistry, materials science and nanotechnology. APES 2012 will be an excellent place for exchanging scientific ideas with strong friendship among the participants from Asia-Pacific region as well as other parts of the world. We sincerely hope that the scope of the symposium will serve the interest of the scientific community, as well as the industry and the general public.

Pre-registration & Nominations of plenary speakers: Before April 30, 2012
Abstract submission: May 1 – August 15, 2012

Contact: Prof. Yong Li, Chairman
Dr. Haijun Yang, Secretary General
APES 2012 Local Organizing Committee
Department of Chemistry,
Tsinghua University, Beijing 100084, China
e-mail: cyhj@tsinghua.edu.cn
phone/fax: +86-10-62788971

The 44th Annual International Meeting of the ESR Spectroscopy Group of the Royal Society of Chemistry. Picture taken outside Merchant Adventurers' Hall prior to the Conference Banquet. Picture courtesy of Art Heiss – who is missing from the ensemble!

Stefan Stoll became an Assistant Professor of Chemistry at the University of Washington in Seattle in August 2011. In parallel with his M.Eng. degree in chemical engineering from Graz University of Technology, he completed an M.A. degree in classical music. Stefan originally became interested in EPR as an undergraduate exchange student in the lab of Nicolai Yordanov at the Bulgarian Academy of Sciences in Sofia. After a short spell as a freelance musician, he joined Arthur Schweiger's group at ETH Zurich as a graduate student, working on advancing theory and algorithms for EPR spectral simulations. The initial versions of the popular simulation software EasySpin were a result of this work. After receiving his Ph.D. degree in 2003, he continued to work in the Schweiger lab, shifting his focus to pulse EPR methodology. In 2007, after Schweiger's untimely death, he moved to the University of California-Davis, where he joined R. David Britt's lab as a postdoctoral fellow. His interests there were mainly focused on structural and mechanistic studies of metalloproteins and radical enzymes. During this time, he received the IES's 2009 Young Investigator Award for his many contributions to the field of EPR spectroscopy. Stefan's current research centers not only on biostructural questions involving paramagnetic proteins, but extends to a variety of materials. In addition, Stefan remains interested in EPR methods development.

Reader's corner

Abstracts of past EPR Symposia at the Rocky Mountain Conference

Abstracts of past EPR Symposia at the Rocky Mountain Conference are available on-line via the University of Denver. The following is a link to the abstracts of prior Symposia:

http://adr.coalliance.org/codu/fez/collection/codu:17448

Alternatively, you can get to the abstracts by going to the University of Denver, Penrose Library web page, and searching for Rocky Mountain Conference on Analytical Chemistry abstracts. The abstracts are searchable.

Gareth Eaton

Market place

POSITIONS

Postdoctoral position at Physics Department, National Dong Hwa University, Taiwan

A postdoctoral position is available in the laboratory of Prof. Shyue-Chu Ke at the Physics Department, National Dong Hwa University, Taiwan.

The research will involve the application of EPR and pulsed EPR spectroscopy to understand the fundamental questions related to adenosylcobalamin-dependent enzymatic reactions.

Additional information about the laboratory is available at: www.phys.ndhu.edu.tw/teachers/ke/ke.htm.

Applicants should have experience in analytical techniques and continuous or pulsed EPR methods and data analysis. Experimental physical chemists with experience in cell culture or synthesis would be beneficial, but is not essential.

The position is available this summer and appointments are for up to 3 years.

If interested, please send a CV and summary of previous research experience to ke@mail.ndhu.edu.tw.

Fixed term position

There is a fixed term position available for an Applications Scientist/Senior Lecturer (AS/SL), to 30 September 2015, associated with the EPSRC EPR Research Facility & Service at The University of Manchester. The AS/SL position is funded jointly by the University and by Bruker, and the successful applicant will work on research and development projects across both Bruker and the Research Facility, and must have expertise in pulsed EPR. Please will you bring the attached advert and/or links below to the attention of any suitable candidates.

David Collison
School of Chemistry
The University of Manchester
Oxford Road
Manchester M13 9PL
U.K.
phone: 0161-275-4660(dir)/4653(sec)/4598(fax)
EPSRC EPR National Service:
www.epr.chemistry.manchester.ac.uk

EQUIPMENT

Design and construction of EPR electronics

The University of Denver can supply electronic design and construction services for EPR applications. Low-noise pulse amplifiers, low-noise 100 kHz preamplifiers, boxcar integrators, and pulse timing systems are available. We also supply a conversion kit to convert Varian field-control units to voltage-controlled scan operation. A 6-digit 1-ppm frequency counter is available in X-, C-, S-, L-band, or MHz versions. Complete microwave/RF bridges from 150 MHz to L-, S-, or C-band are available from designs previously built and tested at the University of Denver.

Please contact: Richard W. Quine, e-mail: rquine@du.edu, phone: 1-303-871-2419

For sale: Varian and ESR equipment

Resonance Instruments has available: (1) Replacement klystrons for Varian EPR bridges and some Bruker bridges (at reduced prices) and other klystrons; (2) Resonance Instrument's Model 8320A is a general purpose Hall-effect based magnetic field controller that provides direct control and precise regulation of the magnetic field between the pole pieces of an electromatnet. Its high resolution permits precise adjustment of the magnet's field either though the front panel keyboard or though an RS232 serial interface with your PC.

Please contact: Clarence Arnow, President, e-mail: 8400sales@resonanceinstruments.com, phone: 1-847-583-1000, fax: 1-847-583-1021.

Available: Used Varian EPR equipment

(1) Varian E-104 EPR spectrometer with vertical style bridge and e-line fieldial. (2) Varian E-9 EPR spectrometer. Both available with warranty and continued service support. (3) Varian TM cavity with flat cell holders and flat cells. (4) Varian E-257 variable temperature controller with heater sensor and insert holder. (5) Varian E-272B field/frequency lock accessory.

Please contact: James Anderson, Research Specialties, 1030 S. Main St., Cedar Grove, WI 53013, USA.

phone/fax: 1-920-668-9905

e-mail: janderson36@wi.rr.com

Model 8400 ESR/EPR Spectrometer

Sales and Service by

Resonance Instruments, Inc.

Portable • High Performance • Reliable • Versatile
Competitively Priced • PC Control Via COM Port
Accessories and Upgrades

9054 Terminal Avenue, Skokie, Illinois 60077
1-847-583-1000, FAX 1-847-583-1021

E-mail: 8400@ResonanceInstruments.com
www.resonanceinstruments.com

L&M EPR Supplies, Inc.

4152 W. Lisbon Ave., Milwaukee, WI 53208
Phone: (414) 324-1052; Fax: (262) 889-2368
www.lmepr.com sales@lmepr.com

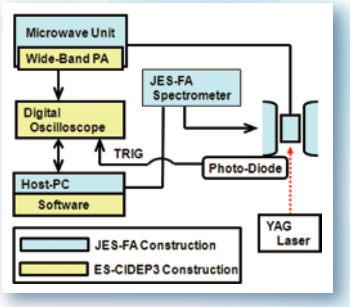
PRICES

TPX Capillaries	EPR Sampling Tubes
Quantity	Price/Part ($US)
1–19	60.00
20–99	50.00
100+	40.00

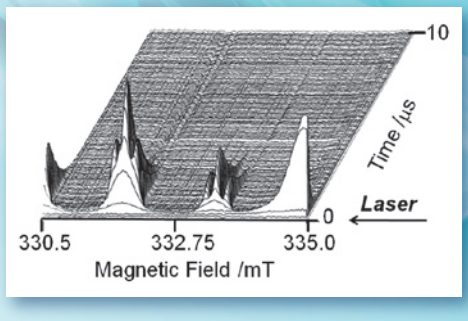
ES-CIDEP3 for JES-FA Series ESR

Chemically Induced Dynamic Electron Polarisation (CIDEP) facilitates sub-microsecond detection of spin-polarized paramagnetic intermediates as produced by laser excitation. This can yield unrivalled information on the spin dynamics and the chemical reaction.

The high sensitivity and high speed of the JEOL FA series ESR spectrometers fitted with a CIDEP attachment ensures simple and reliable measurements.



Block diagram of CIDEP attachment



2D TR-ESR of photo-polymerization process

JEOL
Serving Advanced Technology

JEOL Ltd. http://www.jeol.com/
1-2 Musashino 3-Chome Akishima Tokyo 196-8558 Japan
Sales Division Telephone:+81-42-528-3381 Facsimile:+81-42-528-3386

ISO 9001 & 14001 REGISTERED FIRM
JEOL ISO 9001 & ISO 14001 Certificated

Bruker BioSpin

EPR Field Service Engineer

Location
Billerica

Division
EPR

Job Description
We are looking for a highly motivated individual to join our EPR Service team to install and support high technology EPR Spectrometer Systems in research labs of pharmaceutical companies, universities and government research labs. The EPR Field Service Engineer will work with highly complex equipment which requires a basic understanding of the physics of the instruments serviced.

The Field Service Engineer will install and service our EPR Spectrometer Systems, familiarize/train customers for basic operation of the equipment and re-qualifies the entire instrument after service repair by running complex samples for verification.

The FSE organizes schedule in accordance with customer needs and determine which customers must be visited onsite, which can be attended to remotely and which ones need immediate attention; makes own travel arrangements; coordinates with customers WebEx Sessions, phone support, and lab facility inspection for new installs.

The FSE communicates/works closely with EPR service/support center and Management and attends in depth product training on new and updated Bruker products in German factory by product experts.

Qualifications:
The ideal candidate will possess a BS in electrical engineering, electronics or related fields or equivalent experience. Experience diagnosing and repairing mechanical, electromechanical and/or electronic equipment is required.

General understanding of analog electronics, digital electronics, high voltage circuitry/circuits, microwave technology, vacuum technology, cryogenics; strong technical skills on analytical instrumentation required.

Customer focus and interaction and ability to interact and communicate with scientists who typically possess a Ph.D. (or Master's Degree) in Biochemistry, Biophysics or Microbiology.

Excellent communication skills with the ability to communicate complex technical issues in an easy to understand manner are essential.

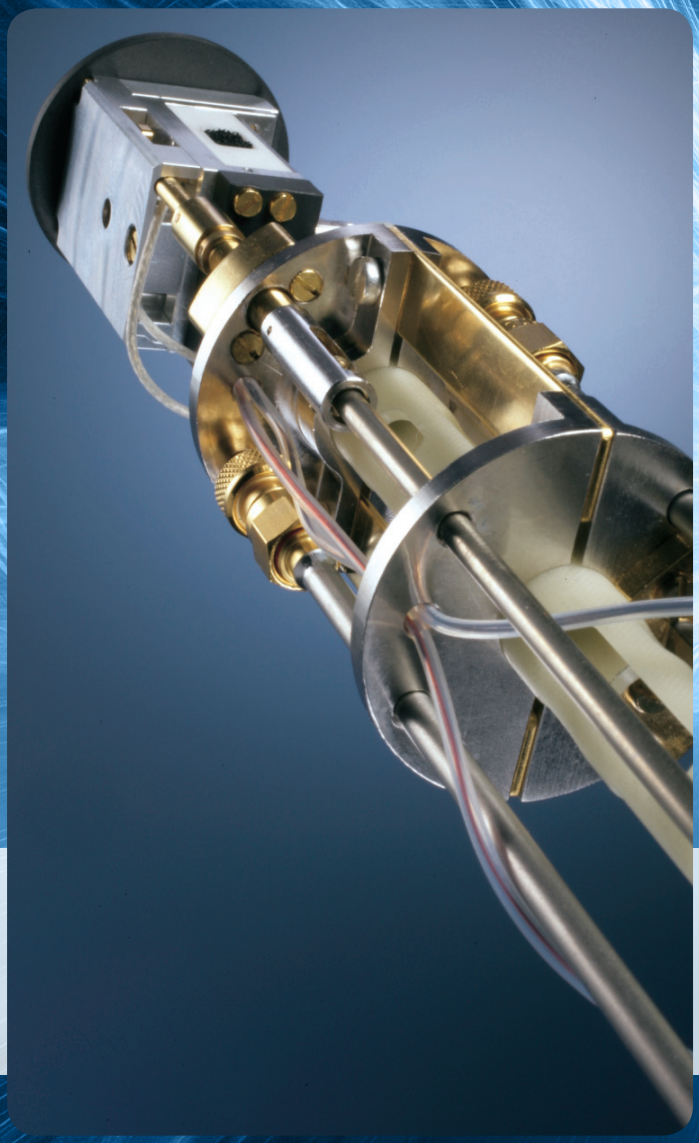
Strong organization and prioritizing skills, ability to work independently yet has a team focus, responsive and reliable are all key strengths of the ideal candidate.

Working knowledge of MS Office products and MS Windows and nderstanding of networking required; Linux and SAP knowledge is desired.

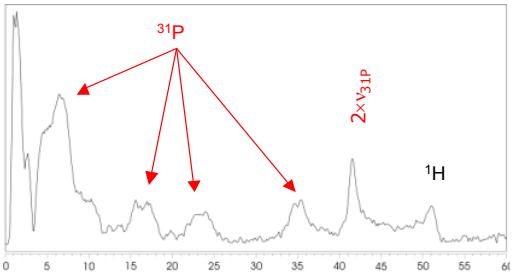
Ability and willingness to travel as travel is required along with a valid driver's license and passport.

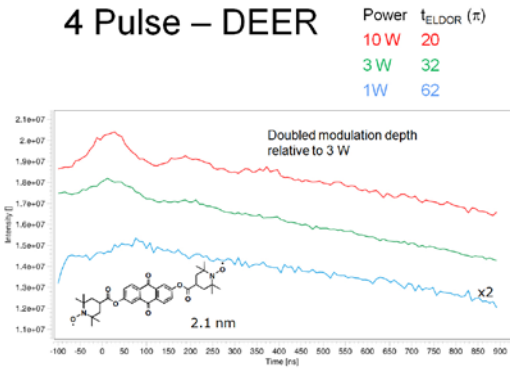
Contact
Please send resume, cover letter and salary requirements to bruker.jobseprfse0620@bruker-biospin.com
No agencies or phone calls please
Bruker BioSpin
Attention: HR
15 Fortune Drive
Billerica, MA 01450

Human Resources/Benefits Paragraph
Bruker BioSpin offers a comprehensive and competitive benefits package including medical, dental, 401(k), paid vacation, holidays and tuition reimbursement. Bruker Corporation is an Equal Employment Opportunity and Affirmative Action employer.



2-pulse ESEEM of a Cu complex containing ^{1}H, and ^{31}P nuclear spins measured with a 40 W TWT





Q-Band pulse power choices:

- **3 W standard**
- **10 W solid state amplifier option**
- **40 W TWT option**
- **150 W TWT option**

High Power SuperQFT

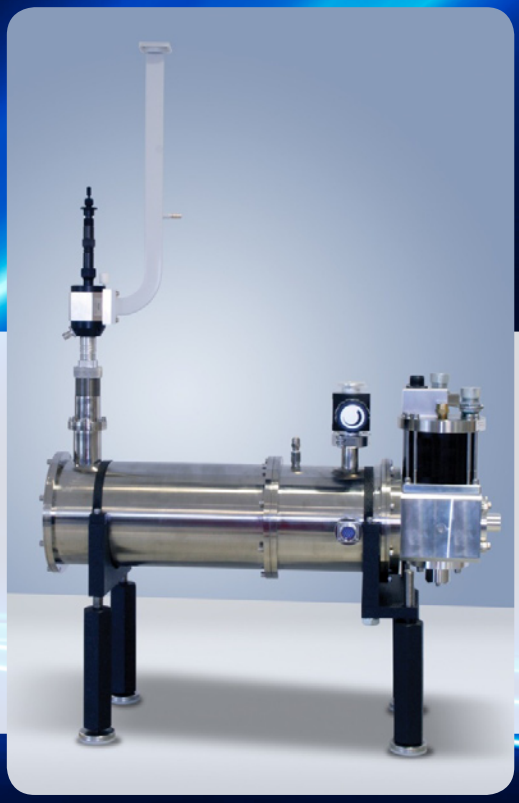
The demands from our customers have initiated the developments of various power options for Q-Band. The standard configuration features a 3 W solid state amplifier allowing π/2 pulses of 16 ns with the ER 5107D2 resonator. Even shorter pulse of 8 ns and 5 ns are achievable with the 10 W solid state and 40 W TWT amplifiers, respectively. Considerable performance enhancements in experiments like DEER and ESEEM are reached with the increased pulse power.

Contact us for more details: www.bruker.com/epr

CryoFree EPR VT Systems

Cryogen-free EPR sample cryostats for variable temperature operation are now available for X-Band waveguide cavities and for Flexline probes with base temperature options down to 4 K

Flexline cryostat



Waveguide cavity cryostat

- All systems allow rapid sample exchange
- Variable temperature range: base – 300K
- Rapid cool down (<60 min to base temperature)
- Optical access
- Vibration isolation for CW Spectroscopy
- Compatible with ER 073, ER 075 and ER 077 magnets

Explore our leading range of EPR systems and accessories:
www.bruker.com/epr