

# EPR NEWSLETTER

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Spring/Summer, 1994

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*All these Centers, Research Resources sponsored by the National  
Institutes of Health, cooperate to facilitate research involving EPR.  
Prospective users may contact the staff at any of the Centers.*

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Please direct communications about the EPR Newsletter or prospective material for publication to the Editorial Office at the IERC address above.

## FROM THE EDITOR

A reminder to you, the readers, to keep on furnishing interesting material for the EPR Newsletter - articles, notices, letters, advertisements. Send us your contributions, please! **Please:** When you notice announcements of pertinent meetings, books, conference proceedings, or the like, please inform us; otherwise, we may not see these announcements soon enough for timely listing in the Newsletter.

Special thanks to some of our most faithful contributors - Chris Bender, Jim Anderson, Reef Morse, Keith Madden, and Dick Cammack. Chris, who has regularly contributed useful and interesting technical essays, (two of them in this issue in the Tips and Techniques section), has agreed to produce a regular column on construction of EPR-related equipment. He calls the column *Building the Perfect Beast*; it will start in the next issue, and he will welcome guest contributions to it. Jim has been sending miscellaneous practical equipment tips. Reef, Keith, and Dick started and keep on producing the *Computer Corner*. They need your contributions for every issue.

Have you paid your dues to the International EPR(ESR) Society (IES) for this year? It's easy to overlook - I did! And please help recruit some new members, individuals and companies. We are delighted to keep welcoming new corporate sponsor/members to the IES. This support from companies offers your Society the best hope of having the resources to support activities that benefit all the members. We want to thank all the corporate supporters. The first, and faithful continuing Patron-class member is, of course, Bruker, whose contributions to the Society this year far exceeded the minimum for a Patron.

Linn Belford

1944 1994  
50 YEARS OF EPR

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## ◆ IES AFFAIRS ◆ ANNOUNCEMENTS AND REPORTS FROM THE INTER- NATIONAL EPR SOCIETY

### *From the President —*

High summer has reached Oxford! It has not rained more than a few hours a day for at least a week. With it arrives a feeling of contentment that our heavy teaching load no longer oppresses us, and that we can once again immerse ourselves in our research. But the feeling is illusory, since we are also in high conference season, and the hours in the laboratory will be fewer than we should like.

The conferences this year are unusually significant in that two, in Kazan and Denver, are in celebration of the discovery of electron resonance, 50 years ago. This was the independent accomplishment of Zavoisky in Kazan and Bleaney in Oxford, and I am delighted to tell everyone that Brebis Bleaney remains as enthusiastic as ever, is very much still active in research, and remains the amused and fond observer of the world that he ever was. We are very sorry that he has made one concession to growing older (I almost said "age," but it never seems appropriate with him). This is that he has decided that he will not travel as much in the future, and this has prevented him from accepting invitations to both Kazan and Denver. Magnetic fields are obviously good for longevity in research and besides Brebis many of the "greats" still contribute. We hope as a Society soon to institute a category of Honorary Vice Presidents to provide a little of the recognition they deserve, and to honour our own debts to them.

The anniversary year finds EPR/ESR at its most healthy. I confess that at one stage I thought it was reaching an un-exciting middle age after the first bloom of youth in which not only the experiment was performed but also such an intellectual breakthrough as the spin Hamiltonian was made. I failed, however, to recognise the significance of the period that followed. This saw applications in all three phases of matter, extraordinarily sophistication in early solid state studies, the ability to observe transient free radicals in solution, first in the steady state and then as true transients, spin trapping, applications to biology, etc. etc. The applications

expanded so rapidly that a period of consolidation became inevitable, and we came to accept what had once seemed miraculous as routine. I heard comments that the field was moribund, and that no fundamentally new ideas were appearing.

What was not obvious was the sheer range of the problems being worked on or the progress being made. Rather than being a technique valuable to a few specialists, EPR/ESR became indispensable in biology, biochemistry, medicine and materials science, besides solid state physics and chemistry. Now the necessity for having EPR/ESR facilities available to laboratories in many different disciplines is fully apparent, and our anniversary year coincides with a period of new advances in technology and technique. The demand for expertise and facilities is increasing from grass-root scientists across many fields of research, and the next 50 years will see spectacular use of the foundations so painstakingly laid. The picture is one of growing application and excitement in a research field entering a lively middle age.

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We therefore honour our pioneers, to whom we owe all. But we also take this opportunity to thank our manufacturers (and sponsors of the Society), Bruker and JEOL, for producing the equipment that they have, and we should not forget Varian before them. For most of us, this has been what has actually made our work possible.

Keith McLauchlan, President of IES  
Oxford University, Oxford, UK

## **OLDEST EPR SPECTROMETER CONTEST** —

In the Fall 1991 EPR Newsletter (Vol 3 #3), a contest was announced to find who had the oldest still-working commercial EPR Spectrometer. It has taken a long time for this contest to play out, but it has finally concluded, as is fitting in the fiftieth anniversary year of

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Zavoisky's discovery of EPR in Kazan. It appears that Prof. John Weil (Univ. of Saskatchewan) takes the prize. Not surprisingly, all the finalists in this contest entered old-timer instruments produced by Varian Associates. Consultation with Dick Kelley at the Instrument Division of Varian, Palo Alto, CA, confirms that Weil's instrument is a truly venerable example of the first commercial EPR instrument which Varian began producing in 1955. The serial number places it among the first 50 produced. Other old instruments were entered, several of which are among the first 200 produced by Varian, but none was as old as Prof. Weil's Methuselan entry. Congratulations to Prof. Weil and his group! He points out to us that even though properly maintained older EPR gear can be a useful component of a laboratory, the new EPR equipment on the market can help you accomplish wonderful things that the older models simply couldn't do. As promised in the original contest announcement, the International EPR Society awards Prof. Weil's laboratory a prize of \$250 to help defray the cost of sending a student to participate in a scientific conference.

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### RESPONSE FROM DR. WEIL

We are very honored to receive the prize for operating the world's oldest commercial EPR spectrometer, a Varian 4500 system dating back to 1958, as a research instrument active still today. It continues to be capable of detecting  $^{17}\text{O}$  hyperfine structure in natural abundance! The major credit must go to our excellent electronics shops personnel, Mr. John Fisher and Mr. George Rogers. Lest anyone feel too sorry for us, I must add that our group also possesses and greatly enjoys the use of a state-of-the-art Bruker 300E spectrometer, fully computer-wised and ENDOR capable.

John A. Weil  
Professor of Chemistry, Univ. Saskatchewan

**AWARDS COMMITTEE** — To propose names for any of the following IES awards, please send your suggestion(s), or preferably full nomination(s), to the appropriate Disciplinary Awards Subcommittee(s): *For Physics and Instrumentation* - Jim Hyde, Chair; John Pilbrow; George Feher; & Jan Stankowski. *For Chemistry* - Bruce Gilbert, Chair; J. Sohma; Jim Bolton; & Kev Salikhov. *For Biology/Medicine* - Larry Berliner, Chair; Marjeta Sentjunc; Hideo Utsumi; & Tadeusz Sarna.

**Gold Medal:** One Gold Medal per year, recognizing benchmark contributions to EPR spectroscopy as a whole;

**Silver Medals:** Silver Medals each year, one each in the general areas of Chemistry, Physics/Instrumentation, and Biology/Medicine;

**IES Awards Committee Chair:** Keith McLaughlan, Oxford University, Physical Chemistry Laboratory, South Parks Road, OX1 3Q2 Oxford, United Kingdom. — e-mail: kamcl@physchem.ox.ac.uk; FAX: 4-865-275410.

**IES Sponsored Meetings** — The Society will co-sponsor two international conferences in 1995: The EPR-95 IES Workshop, July 13-15, Sydney, Australia and The IV International Symposium on ESR Dosimetry and Applications, May 15-19, Munich, Germany.

## LETTER TO THE EDITOR

Dear Sir:

Instead of "electron paramagnetic resonance," consistently used in this laboratory and elsewhere since its discovery by E. Zavoisky at Kazan in 1944, Dean E. Wilcox of Dartmouth College (EPR Newsletter, Winter, 1993-4) may wish to adopt the nomenclature "electron magnetic resonance." But does he appreciate that this would also include ferromagnetic resonance, anti-ferromagnetic resonance, and ferrimagnetic resonance?

B. Bleaney

University of Oxford, Department of Physics

Dear Sir:

During the annual meeting of the ESR Group of the Royal Society of Chemistry in University of Wales, Cardiff, 21-25 March 1994, the implementation of a database of spectra was discussed. There has been previous discussions about this at the 1992 Rocky

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Mountain Conference, in terms of setting up a centralized database. We have an alternative proposal for how the database might be started, using the present rapidly burgeoning Internet facilities. There are two possible routes. One solution would be to set up an "ftp" site and then to rely upon the facilities at present available with programs such as "Gopher" and "Veronica" to provide the indexing and searching facilities needed for the spectra. However a rather more attractive (longer term?) solution might be to use the hypertext facilities provided by the World Wide Web, together with a link to a suitable database index to the spectra. In both instances we suggest that the actual spectra should be held at local sites, rather than in one central location, to decrease the work load on any one individual, and that only the index should be (initially) held at one site. This is a distributed database, where the local sites could be University based, with the ESR/EPR community 'hitching a ride' on their local computer information system. As with the present database of protein sequences (Genbank/EMBL), we would then ask anybody publishing papers with ESR/EPR data to submit spectra to the archive, either at their site or at another. Obviously common formats, a suitable indexing system for the spectra, and criteria for inclusion have to be agreed upon and worked out and a network of volunteers established. To start this formidable venture we are seeking funding for a pilot scheme, the aim of which will be to establish the index together with some initial spectra examples. Our subject definitely needs an easy-to-use set of spectra examples to assist (particularly new researchers and students) in the analysis of new spectra; we also have a duty to properly index and archive our work, now that the means are available.

We would like to hear from others in the ESR/EPR community who wish to join in a pilot project, and who would like to contribute - with assistance, or financially.

John Maher

Dept. Chemistry, Univ. Bristol  
john.maher@uk.ac.bristol

## INFORMATION FROM EPR CENTERS

*FROM THE UNIT OF SPECTROSCOPY OF THE  
INSTITUTE OF MATERIAL SCIENCES OF ARA-  
GON, JOINT CENTER OF THE UNIVERSITY OF  
ZARAGOZA AND THE HIGH COUNCIL FOR THE  
SCIENTIFIC RESEARCH (CSIC), Zaragoza, Spain:*

### EPR LABORATORY

- Varian E-112 EPR spectrometer working in X-band CW mode (16 years old). Facilities of operation between LHeT and 300°C. This equipment supports an ENDOR system which was built in cooperation with the group of Prof. Spaeth, Paderborn University Germany.
- Bruker ESP380E spectrometer (fully installed in 1993), X and Q band in CW mode. X band in pulsed mode (EPR-FT). Variable temperature facilities: between LHeT and RT in all modes, between LHeT and 350°C in X band CW mode.

### MAIN RESEARCH LINES INVOLVING EPR

- Characterization of insulators with application in photonic. That includes some study on fluoride glasses and single crystal of fluoride or oxides either pure or doped with transition and rare earth ions.
- Studies of mixed halides crystal doped with optically active ions. The main goal is to follow the changes introduced by local disorder on spectroscopic parameters of 3d and 4f ions as well as the influence of the composition in the phase transitions.
- Investigation of paramagnetic metallorganic liquid crystal. The influence of the different magnetic interactions as well as the diverse mode of molecular motion and their relationship with the topological order in the mesophases is also analyzed.
- Dynamics of defects associated with light impurities in ionic material.

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magnets, and other accessories.

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Telephone: 49-721-5161-141; FAX: 49-721-5161-237

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- Influence of thermal treatment in different atmospheres on the properties of fluorite-like crystals.
- Absorption of microwaves in single crystals of HTE superconductors. Study of the dynamics of fluxons.

## STAFF

**PERMANENT POSITIONS:** 2 people from the University of Zaragoza (1 full professor, R. Alcalá, 1 associate professor, R. Cases, and 3 people from the CSIC, 2 research professors, P.J. Alonso and V.M. Orera, and 1 research coworker, M.L. Sanjuán.

**NON PERMANENT POSITIONS:** 6 graduate students (two of whom will be obtaining their Ph.D. this year).

For further information, contact Prof. Dr. Pablo J. Alonso, UEI Espectroscopía de Sólidos, Facultad de Ciencias, 50009 Zaragoza, SPAIN. ☎: 34-76-560741; FAX: 34-76-553773.

## THE COMPUTER CORNER

*Edited by Philip D. Morse II, Keith P. Madden, and Richard Cammack*

The EPR Software Corner is a regular feature of the EPR Newsletter. It is managed and edited by Reef (Philip D., II) Morse ([reef@xenon.che.ilstu.edu](mailto:reef@xenon.che.ilstu.edu)), Richard Cammack ([udbc033@hazel.cc.kcl.ac.uk](mailto:udbc033@hazel.cc.kcl.ac.uk)), and Keith Madden ([madden@marconi.rad.nd.edu](mailto:madden@marconi.rad.nd.edu)). Submissions for this column can be sent to any of the above authors. Submissions may be edited; on request, substantially edited versions will be sent to the sender for approval prior to publication.

This issue's column is a mix of letters, editorial

comments, reports, and instructions. This is representative of the kind of material we receive for this column. We welcome your contributions.

We call your attention to John Maher's suggestion ("Letters to the Editor" section) about a database of spectra.

Articles describing how to use two EPR software and information servers - the anonymous ftp server in the Illinois EPR Research Center (IERC) at the University of Illinois and the epr-list server at Illinois State University (ISU) - have appeared in recent issues of the Newsletter (Vol. 5, Nos. 1 & 3). As this column is being written, these services are being coordinated. Logging in to either server will give access to a file telling users how to use the other one, and explaining what kinds of information is to be found on each. Both of these servers have been updated recently. At this time (July, 1994), there are 95 subscribers to the epr-list list server. Briefly, you can subscribe by sending to [epr-list-request@xenon.che.ilstu.edu](mailto:epr-list-request@xenon.che.ilstu.edu) the single word SUBSCRIBE. You will get back a response that shows you have been added to the list and some of the commands that allow you to obtain information about the list. Subjects range from software questions through discussions on file formats to the availability of new Varian klystrons. Please contact Reef Morse for more detailed instructions about how to subscribe.

### *epr-list archives by Reef (Philip D., II) Morse*

The archives of the epr-list at ISU are available by anonymous ftp from [xenon.che.ilstu.edu](ftp://xenon.che.ilstu.edu). Just log in to [xenon.che.ilstu.edu](ftp://xenon.che.ilstu.edu) via ftp, use anonymous as the login and either guest or your actual E-mail address for the password. The archives are stored in ASCII format, so they should be downloaded as ASCII files, not binary files.

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Here is an example of a session to download the archives from March of this year:

```
220 xenon.che.ilstu.edu MultiNet FTP Server
Process 3.2(14) at Sun 19-Jun-94 10:
14AM-CDT
user anonymous
331 anonymous user ok. Send real ident as
password.
230-Guest User REEF@XENON.CHE.ILSTU.EDU logged
into $USERS:[ANONYMOUS] at Sun 19-Jun-94 10:14,
job 20c03069.
230 Directory and access restrictions apply
dir
200 Port 181.84 at Host 138.87.128.125 accepted.
150 List started.
$USERS:[ANONYMOUS]
EPR-LIST.1993-09;1 14 23-SEP-1993 09:39
[ANONYMOUS] (RWED,RWED,RE,)
EPR-LIST.1993-10;1 13 1-OCT-1993 04:47
[ANONYMOUS] (RWED,RWED,RE,)
EPR-LIST.1993-11;1 8 9-NOV-1993 17:18
[ANONYMOUS] (RWED,RWED,RE,)
EPR-LIST.1994-01;1 66 10-JAN-1994 14:02
[ANONYMOUS] (RWED,RWED,RE,)
EPR-LIST.1994-02;1 23 2-FEB-1994 14:53
[ANONYMOUS] (RWED,RWED,RE,)
EPR-LIST.1994-03;1 94 1-MAR-1994 07:33
[ANONYMOUS] (RWED,RWED,RE,)
EPR-LIST.1994-04;1 128 12-APR-1994 09:31
[ANONYMOUS] (RWED,RWED,RE,)
Total of 346 blocks in 7 files.
226 Transfer completed.
get epr-list.1994-03
200 Port 181.83 at Host 138.87.128.125 accepted.
150 ASCII retrieve of
$USERS:[ANONYMOUS]EPR-LIST.1994-03;1 started.
226 Transfer completed. 47556 (8) bytes
transferred.
46563 bytes received.
bye
```

This process transferred the March 1994 archive list to my Macintosh (138.87.128.125), which I can now open up using any word processor.

If you have questions about obtaining these files or use of the anonymous ftp, please contact Reef Morse at the E-mail address listed in the first paragraph of this column. We would also like to know what other files you would like to have available on this anonymous ftp server.

## *EPR Software in Cardiff, 1994. Report by R. Cammack*

The 1994 Software Session was held at the ESR Group meeting in Cardiff, Wales. The main events were:

- 1) A demonstration of user-written software along with the poster session.
- 2) Two talks on computer analysis of EPR spectra (Phil Rieger and Virgilio Beltran).
- 3) A discussion session on future developments in the use of computers.

We discussed the future of the software database. We are seeing fewer new user-written programs. The main developments are in making existing programs more general and user-friendly. There was some interest in getting a "core" collection of reliable programs and a list of people who were programming for special applications. We also discussed the possibilities for a worldwide list of

EPR spectra. Though seen as desirable, there were questions as to who would run this database and whether spectroscopists could be persuaded to provide spectral data. John Weil, who had previously offered to help with a database of spectra, has now withdrawn due to other commitments. John Maher had ideas about making the spectra available from file-servers on the Internet. These could be accessed directly by users through networks such as the World-Wide Web. All that would be needed centrally would be some sort of index. John is preparing a consultation paper for the Newsletter. I gave the participants of the conference the E-mail address of the EPR list server at the Chemistry department of Illinois State University (epr-list@xenon.che.ilstu.edu) so I hope it will be getting more subscribers soon.

*"Any... Software You Like" - A Letter from Dr. Alexander I. Shames, Dept. of Physics, Ben Gurion University of the Negev, P.O.B. 653, Beer-Sheva, Israel*

I am writing to focus on a software issue: what type of EPR Software should diverse users, for example, in coordination chemistry and experimental medicine, like to get from EPR Software producers.

As I see it, complete EPR Software includes three main blocks: acquisition, manipulation (experimental spectra processing) and simulation programs. Both the acquisition and the simulation parts converge in the manipulation program (what I call here the Monitor) and this must be at the center of Software producer's attention.

# JEOL

EPR

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There are two ways to obtain information from EPR spectra. The first one is to process the experimental spectrum in real time to get as much physical data as possible and then to simulate the spectrum with optimization of one (or at most two!) spectral parameters. The second way is to simulate the initial spectrum according to the chosen paramagnetic model and then to

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produce multiparameter spectral optimization. I guess the idea of the Monitor will sound nice for people who prefer the physical approach.

The Monitor ought to unite all of the acquisition and simulation programs, to convert different data formats to a united format which will be chosen as a standard for EPR spectral database and ftp-ing. Such data format will save a 3D EPR spectrum to a 1D linearized one written in "absolute" (i.e. independent of the recording conditions) g-factor space. This feature gives the ability to link a lot of laboratories and databases and to unify spectra for paper and book presentations.

Principles of the interaction between the researcher and the Monitor are the most important problems in creating EPR Software. A user-friendly interactive shell as well as high-quality multicolored graphics with fast display window operations must be characteristic features of the Monitor. The Monitor should not ask you a million useless questions about points, arrays, pages, strings, tags etc. All math must be hidden inside the Monitor. The obligatory feature of the interactive shell is the detailed on-screen "Help" on all of the Monitor commands (including physical expressions and mathematical algorithms), service options, prompts and error reports.

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What physical objects do we wish to operate with? During processing of spectra the researcher has to see on the screen spectrum (spectra), displayed in the usual coordinates of intensity (1st or 2nd derivative, absorption, integral) and magnetic field for CW EPR, frequency for ENDOR, or time for pulse EPR. Only physical parameters (not spectra point numbers or any other non-spectral ones) should be displayed - for example, spectral lines (groups of lines, picked out in accordance with the hierarchy of

interactions, number of magnetically non-equivalent magnetic centers or other user's demands), g-factors, line widths, peak-to-peak amplitudes, moments (zero, second, forth) splittings (fine, hyperfine and others group splittings), integral intensities (absolute and relative to the standard sample) etc. The user should be able to work with a large number of lines (or named line groups). Lines could be marked in the experimental spectra automatically (according to given signal-to-noise ratio) or by the user in the dialogue mode. Every line would be marked by three static line markers (beginning, center, end). Positions of all markers are stored in the spectrum passport for following physical parameter calculations.

Finally, the Monitor has to help us in correct processing of the large volumes of similar EPR spectra which were recorded during long time measurements (for example, in biological and medical experiments or exact temperature dependencies). The second problem is "to teach" the Monitor to produce the definite sequence of Monitor commands either through macro commands or through real time processing of any "model" spectrum whereby the Monitor will memorize all of the commands from the keyboard and "play" the command sequence for future calculations.

I feel that we need Software like the described Monitor as the common language for computer communication between devices, laboratories and databases. We need an equivalent of the Monitor as a software reference for best and most effective work.

*BRIEF REPORT ON THE EPR DATABASE PROJECT  
by Czeslaw Rudowicz, City Polytechnic of Hong Kong,  
Department of Physics and Materials Science, Kowloon,  
Hong Kong; FAX: (852) 788-7830*

The readers of the EPR Newsletter, especially those who do not subscribe to the EPR-LIST, may be interested to learn the results of the survey of the EPR community on the EPR database and related projects conducted in 1991-1993. Several useful ideas concerning the EPR database generated by the discussion on the EPR-LIST network in early 1994 will be taken into account during the further work on the project. Although this report is somewhat overdue because of the author's other commitments, it is hoped that it will nevertheless generate a positive feedback that will help to advance the EPR database project. Briefly, two sets of questionnaires have been worked out and dispatched, starting in late 1991, to

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about 900 EPR researchers from 40-plus countries.

The questionnaires comprise, among other things, questions on the preferred spin Hamiltonian notation, the axis systems, zero-field splitting parameters notations and units, most useful data types, important compounds/materials, ions/species as well as technical questions on the database structure and organisation. The potential users' requirements have thus been investigated.

Full analysis of 70 plus valid responses received (to be published in Bull. Magn. Resonance) deals with the questionnaires (A) The Future of EPR Spectroscopy of Transition Ions, (B) Planning EPR-database structure, and (C) IEPRS Membership Aspects. Here only the responses to the major questions pertaining to the feasibility of the EPR database are presented.

The numbers in brackets for the questions A1 to A8.1 give the percentages (%) of answers: (yes, no, and no opinion/no answer), respectively.

- A1. Would you find it useful if there were internationally accepted standards on EPR nomenclature and conventions? (94, 0, 6);
- A2. Do you feel the need for a glossary of terms used in EPR, containing precise definitions of basic notions? (90, 3, 7);
- A6.1 Would you find it useful if an all-purpose user-friendly EPR computer programme package for analysis, simulation and fitting EPR spectra was available? (89, 1, 10);
- A8.1 Would you welcome establishment of an EPR Documentation Centre? (76, 0, 24).
- A7.1 How do you perceive the usefulness of a comprehensive computerized EPR database? - the percentage pattern is: very useful (42), useful (49), of minor use (6), no answer (3).
- A7.2 If you would find a comprehensive EPR database

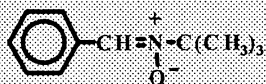
useful or very useful, do you think your institution would subscribe to release of the EPR database information? - the percentage pattern is: very likely (14), probably (65), not likely (17), no answer (4).

The crucial question on the preferred zero-field splitting (ZFS) Hamiltonian notation yields the following results (in the descending order of preference): the extended Stevens operators (49%), no answer (27%), the Buckmaster/Smith-Thornley operators (8%), the normalized Stevens operators (7%), others (5%), the Koster-Statz/Buckmaster-Chatterjee-Shing operators (4%). The preferred units for the ZFS parameters are 10-4cm-1 or cm-1 followed (at half the frequency of mention) by MHz and Gauss, while K, erg, eV received little interest.

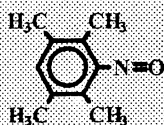
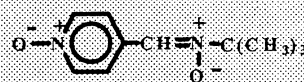
Summarizing, there is strong need for the EPR database among the EPR researchers who participated in the present survey. However, further progress of the EPR database project hinges on the greater support from the EPR community and organisations. It is indispensable to establish an EPR Documentation Centre (or EPR Spectroscopy Data Centre) since a project of this magnitude cannot be successfully carried out by a few enthusiasts.

Assuming that our sample of respondents is fully representative, it appears that a coherent consensus on the ZFS Hamiltonian notations and on the unit for the ZFS parameters exists within the EPR community. The question of unification and standardization of notations used in EPR can be solved by setting up a Nomenclature Committee by IES. The internationally accepted standards on EPR nomenclature and conventions are essential both for the future of the EPR area and for successful development of a full-scale EPR database. Comments on the EPR database and related matters as well as requests

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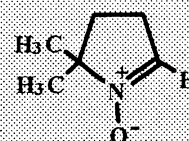


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 $\alpha$ -PHENYL N-TERT-BUTYLNITRONE-<sup>13</sup>C NITRONE (PBN-<sup>13</sup>C)  
DEUTERATED  $\alpha$ -PHENYL N-TERT-BUTYLNITRONE (PBN-d14)  
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for more information can be sent directly by electronic mail to apceslaw@cphkvx.cphk.hk or apceslaw@cphkvx.bitnet.

## *Report on data acquisition development*

*by Keith Madden*

Recent contributions to the Computer Corner have centered upon the software portion of the computer / EPR interface; we've said relatively little concerning the hardware aspects involved. For the lucky purchaser of a new instrument, this is of little concern, since it will have accompanying software and hardware. The addition of a data acquisition system to the older Varian, Bruker, and JEOL spectrometers is probably best accomplished by purchase of a complete PC-clone based hardware/software solution from independent sources, since there is no point in reinventing the wheel. On the other hand, one retrofitting a lab-built or unusual commercial instrument for computer operation must make a number of choices concerning the level of automation desired, the spectrometer functions selected for computer control, and the choice of an operating environment. I'd like to start a discussion of such considerations for those embarking on such a project. Of course, many choices are dictated by one's tastes in computers and software -- these remarks necessarily will reflect my prejudices.

First, the selection of the computer. I think that nothing competes with the price / performance ratio of the IBM PC clone although that may be changing. The good availability and low price of digital and analog input/output boards, and the wealth of documentation available, makes the PC the current platform of obvious choice (fans of Motorola CPU-based computer systems will be given equal time for rebuttal...). Secondly, the choice of software environment. MS-DOS is not designed to be a real-time operating system, but its deficiencies can be masked by selection of an appropriate software host environment. The availability of the real-time host environments (such as National Instruments' Labview and LabWindows, or MicroCal Origin with data acquisition modules) has made the task of interfacing much more straightforward than the previous practice of coding in BASIC, FORTRAN, or C and interacting directly with the I/O card through memory or I/O space addressing. Indeed, these packages feature pre-written driver for many of the commercially available combination digital/analog I/O boards (Data Translation, Keithley Metrabyte, Computer Boards, National Instruments). If one uses a supported I/O board, and is

happy with moderate speed (~10 samples / second) data acquisition, this may be as much as is necessary to implement an interface to one's lab-built instrument. In the happiest possible case, two connections to the spectrometer will be necessary: the output of signal-channel routed to the I/O board's DAC, the field sweep input connected to the I/O board ADC, and all hard copy output routed through the PC's serial and parallel port to an attached printer and /or plotter.

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EPR spectrometers, components, accessories, and microwave equipment. Model 8320 Magnet Field Controller for replacing older controllers, *i.e.* Varian Mark I & II and other types. Includes keyboard or controlled by external computer.

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If faster data acquisition is required, the limitations of MS-DOS and MS Windows as a real-time environment become significantly more confining, in that the latency interval of program - I/O device interaction can become unacceptably high. The practical solution to this problem is the use of an I/O card with local intelligence: the instructions for data collection can be downloaded to the I/O card, and the card can make measurements as dictated by its internal clock, instead of relying on the busy host CPU for convert start commands. The use of an autonomous microcontroller in a PC-based I/O card is not new, as several manufacturers have been doing this for years (Data Translation comes to mind immediately). The difference in some newer designs in that the microcontroller and its implementation are not proprietary, but are commercially available designs with documented interface architecture, made accessible through the manufacturer provided control software. At the Radiation Laboratory we have been developing some experiments using the United Electronic Industries WIN-30 I/O board. This board is based upon the Analog Devices ADSP-2105 DSP (digital signal processor). There is program memory and data memory on the board, as well as a FIFO-buffered interface to the host computer. There is a clock generator for triggering of the A/D and D/A converters of the board.

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External digital communication is available via a parallel port that emulates the operation of an i8255 PPI chip. This hardware relieves the host PC of the burden of direct control of the conversions, and much faster conversion rates become practical (1 Msamples/second). For the EPR spectroscopist this board possesses the potential to be a complete direct-digital signal channel; the A/D is fast enough to directly digitize the preamplifier output of the microwave bridge, and the DSP is capable of rapid FFT at the modulation frequency and its harmonics, capturing the multiple derivatives of the EPR spectrum simultaneously. Two types of software are provided with this board: DOS and MS-Windows applications for recording waveforms, and DOS drivers and MS-Windows DLLs for controlling the board from one's own applications. The hardware and software provided should make quick data acquisition for the PC a reality for many EPR users.

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The other extreme concerning data acquisition for the EPR spectroscopist would be high accuracy, high dynamic range recording of slowly-varying signals from a traditional signal channel -- for example, the situation where one would like to record carbon-13 satellite lines at natural abundance simultaneously with the main lines. Bruker addressed this situation in their ER023M signal channel using an A/D converter composed of a VCO and a binary counter chain. For those fabricating their own data acquisition system, extremely high resolution / high accuracy A/D conversion is the premier feature of the Thaler ADC180 26 bit measurement A/D converter. This hybrid circuit continuously samples and digitizes the input signal at rates up to 4 kHz. The microprocessor within the chip continuously averages the converted values between output operations, giving the advantage of a long time constant low pass filter but with a linear, as opposed to exponential, response. The chip has an internal crystal for

clocking its conversions, and a microprocessor interface. This performance is realized without the necessity of user calibration, since autocalibrate routines are built into the chip. Perhaps this device is the ultimate tool for slow-speed data acquisition in a lab-built EPR data acquisition system.

Of course, there are other parameters to control and measure for a lab-built EPR data acquisition system. In subsequent columns, we'll discuss strategies for field control. Comments to Keith Madden, Univ. Notre Dame, Radiation Lab, 237 Radiation Research Bldg., Notre Dame, IN 46556-0768, USA.

e-mail: madden@marconi.rad.nd.edu.

## TIPS & TECHNIQUES

### SPURIOUS ECHO SUPPRESSION IN ESE-ENDOR FROM AMPLIFIER NOISE: REMEDICATION USING BLANKING AND PULSE SHAPING

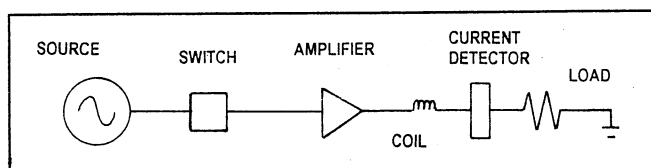
*Chris Bender*

*Biotechnology Resource for Pulsed EPR*

*Albert Einstein College of Medicine*

*1300 Morris Park Avenue, Bronx, NY 10461, USA*

Spectra obtained by using pulsed EPR methods that rely on the electron spin echo are derived from variations in the echo amplitude. Electron spin echo ENDOR (ESE-ENDOR) is a variant of the cw method in which the echo amplitude is a measured response to a swept radiofrequency field (delivered as a pulse). Echo amplitude is governed by a complicated choreography of spin dynamics that can be influenced by imposed experimental conditions, and this leaves ESE-ENDOR vulnerable to artifacts in much the same way as cw-ENDOR. A spurious suppression of the electron spin echo has been identified and attributed to noise from the rf amplifier. This noise can lead to artifacts in the ESE-ENDOR spectrum, but there are simple remediations that will eliminate the noise.



**Figure 1.** Schematic diagram of ESE-ENDOR apparatus.

The instrumental arrangement that is used in our



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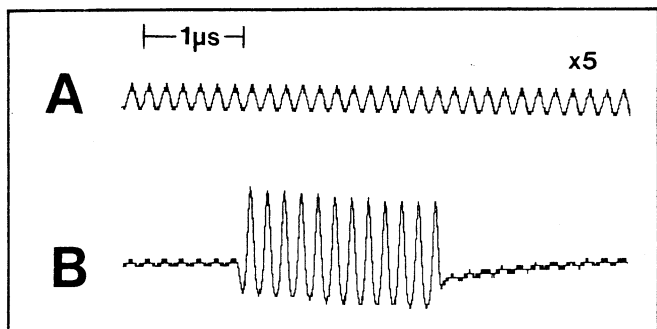
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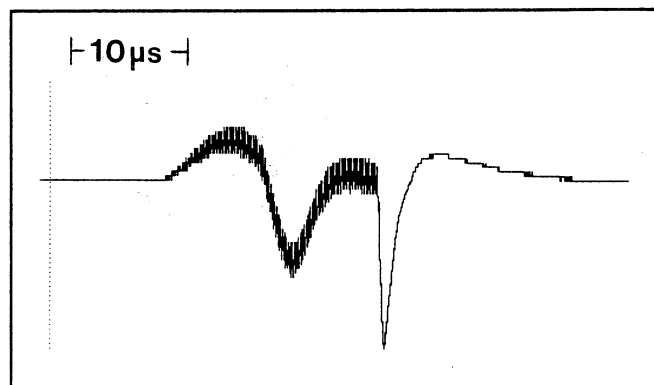
laboratory for ESE-ENDOR is a simple modification of the cw-ENDOR apparatus and is depicted in Figure 1. The rf energy is delivered as a pulse that is interspersed among the microwave pulses. A gated integrator/averager records the echo amplitude while the rf carrier frequency is swept, thereby generating the ENDOR spectrum. Conventional ESE-ENDOR is a three (microwave) pulse experiment in which a single rf pulse is delivered between pulses 1 and 2 (Davies ENDOR), or pulses 2 and 3 (Mims ENDOR). These and other forms of ESE-ENDOR are well described in a review by Gemperle and Schweiger.<sup>1</sup> My preliminary trials with the spectrometer were conducted with -irradiated sucrose, copper tetraphenylporphyrin, and azurin (a copper protein). Mims transmission line and cylindrical  $TM_{110}$  cavity resonators were used with wire coil rf probes. A low power rf pulse generated by a Minicircuits GaAs FET switch was passed to the high power rf amplifier. I used a dedicated Pearson (fast) current probe just prior to the  $50\Omega$  load as a monitor of the rf circuitry; one can also use an oscilloscope current probe (Tektronix) or build an in-line monitor from transistors. In practice, I try to set up my experiments with minimal rf pulse duration because the echo amplitude declines as the temporal spacing between the pulses (especially 1 and 2) increases.



**Figure 2.** Output of rf amplifier without blanking. a) pulse off, b) pulse on.

At first I operated the high power rf amplifier (200W cw/400W pulsed) without the blanking feature (described further below) because there was no low-end limit to the pulse duration. Unfortunately, operation without blanking led to a very obvious attenuation of the electron spin echo when the amplifier was put into the "operate" mode, regardless of the status of the amplifier input. I switched to a low power (25W) cw amplifier, and the echo was suppressed to a lesser degree. A typical rf pulse of  $2\mu\text{s}$  duration, as delivered by the high-power amplifier, is shown in Figure 2, and it is evident that a background signal is

present during the "pulse off" condition. The root mean square current amplitude of the background signal is  $\sim 100\text{mA}$ , and it persists after the amplifier input is disconnected from the source. Apparently, this is amplifier-derived noise (and inherent, as the units all meet specifications). For lack of a low-frequency spectrum analyzer, the amplifier output was filtered and fed to a counter. The counter indicated frequencies ranging from 2 - 75 MHz, depending on the combination of filter and attenuator used (suggesting a dispersion of signal frequencies - the scope trace in Figure 2 seems to indicate that a 6 MHz, the carrier frequency I used, component dominates).<sup>2</sup> In any event, low-pass filters were ineffective in removing the background signal.



**Figure 3.** Blanking transient associated with a  $2\mu\text{s}$  driver pulse.

The rf amplifier has a blanking feature, which is an inductive cut-off switch. The blanking mode eliminates the background noise and the spurious echo suppression, although the switching time is long and the inductor introduces a transient, as shown in Figure 3. The switching time and transient are not problematic if one can work with long rf pulses and large separations between the microwave pulses.<sup>3</sup> However, many of the samples that we receive do not provide adequate signal to allow for further compromising of the spectrometer's sensitivity. In short, I would still like to be able to work with pulses of duration  $\leq 20\mu\text{s}$ .

I found that I was able to isolate the transient and shape the blanked rf pulse by adding a pulse transformer to the transmission line. Figure 4 illustrates the effect of the transformer on the rf pulse and the ability to reduce the pulse duration without suffering from distortion. The transformer is simply a 1:1 pair of windings on a toroidal core with a capacitor shunt on both ends. The unit that gave these

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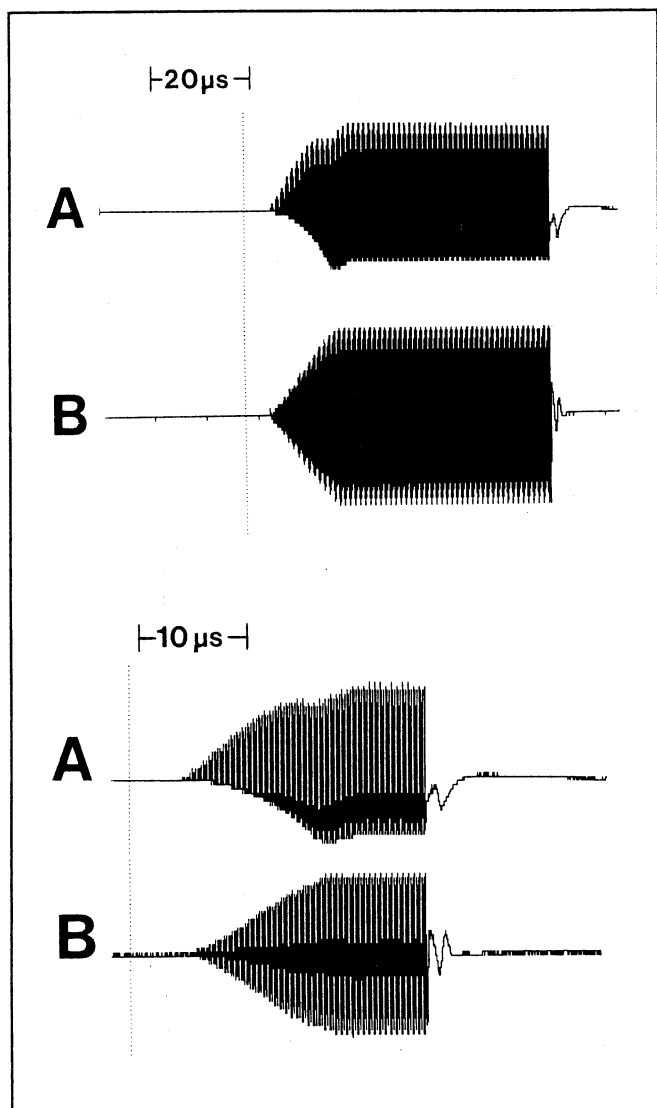
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results is not the result of a long optimization procedure with regard to ferrite permeability and capacitor rating: it just happened to be on my bench as a leftover from another project. The remediation is not the result of correcting a mismatch; the switching transient occurs even when a matched  $50\Omega$  load is solely connected to the amplifier output.



**Figure 4.** Shaping of blanked pulse by transformer.

An impressive feature of the Mims transmission line resonator is that apparently very low powers were effective in producing proton ESE-ENDOR. According to Mims, the design of these ENDOR resonators allows one to produce a very strong rf field with relatively low current (necessary to drive  $^{14}\text{N}$  ENDOR transitions), and this is apparently the reason why the amplifier noise becomes problematic. There

was no comparable effect with the  $\text{TM}_{110}$  cavity resonators, whose coil dimensions are more than 10 times greater than the coil in the Mims unit. Therefore, any high rf field that coincides with the microwave pulses scrambles the spins and affects the phase memory of the system, squelching the echo phenomenon.

One final comment concerning the low-power efficacy of the Mims resonator; it seems as though this resonator permits one to perform ESE-ENDOR without massive amplifiers, affording the experimenter with the opportunity to improve S/N by working on shorter time scales (i.e., rf pulse duration and microwave pulse separation). Lines tentatively assigned to  $^{14}\text{N}$  transitions in Cu-TTP and azurin have been seen using the 25W amplifier (I have not yet measured individual pulse powers), raising the question as to whether some improvement in performance can be had with an optimized low power (tetrode or solid-state) device. Short pulses free of background would greatly facilitate multi-pulse ENDOR (e.g., coherence transfer) experiments (see ref. 1).

**ACKNOWLEDGEMENT** - I am grateful to Bill Mims for helpful discussions on the design considerations of his resonators for ESE and ESE-ENDOR.

## REFERENCES AND NOTES

1. Gemperle, C.; Schweiger, A. (1991) *Chemical Reviews*, **91**, 1481-1505.
2. Switches are inherently leaky to a certain extent. For example, the common PIN diode switch is a series of diode shunts that attenuate an incoming rf signal. The amount of attenuation afforded by the diodes in the switch open condition (controlled by a DC bias) depends on the number of diodes in the series. The situation described in this report is independent of switch leakage because it is observed when a  $50\Omega$  load is put on the amplifier input.
3. With unmediated blanking I find that I need a 10-15 $\mu\text{s}$  spacer between the rf and microwave pulses.

## FREQUENCY STABILIZATION USING AN OPTICAL DISCRIMINATOR: A LITERATURE REPORT

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A requirement of all EPR spectrometers is that their source oscillator (e.g., klystron, Gunn, YIG) must be stabilized with respect to frequency drift, and this is usually achieved by a feedback loop. A recent invention by Ron Logan of the Jet Propulsion Laboratory is a novel method of

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locking a voltage controlled oscillator (e.g., a YIG) with a significant improvement in bandwidth when compared to the method of mode-locking to a high Q resonator, while retaining a comparable level of phase noise.<sup>1</sup> Before proceeding with a description of the fiber optic discriminator, however, the basic principles of phase locking are outlined.

## GENERAL FEATURES OF THE PHASE-LOCKED LOOP

The basic example of a source locking device is the so-called phase-locked loop (Figure 1). The phase-locked loop (PLL) consists of three components: a voltage-controlled oscillator (VCO) that is to be stabilized, a phase detector or comparator, and a low pass filter. The phase detector is typically a device that produces a voltage whose magnitude depends on the (phase) difference between two signals. A familiar example is the mixer in a homodyne receiver of an EPR spectrometer. A mixer combines frequencies  $f_1$  and  $f_2$  as  $f_1 \pm f_2$ ; therefore, in a homodyne receiver the signal channel is compared to the reference arm giving output at DC and  $2f_1$  (depending on the quality of the mixer you also get some fundamental,  $f_1$ ). A filter allows only the DC component to pass, and the DC voltage output corresponds to the phase shift between the reference arm and sample channel.<sup>2</sup>

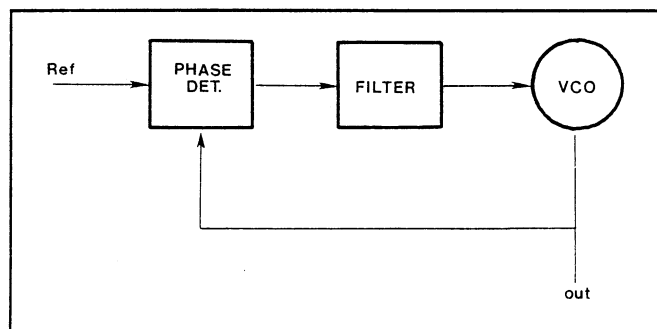


Figure 1. Schematic diagram of the phase-locked loop. VCO - voltage-controlled oscillator.

Another example<sup>3</sup> of a phase detector is the exclusive-OR logic gate, which goes to the "high" state only when neither input is the same. As illustrated in Figure 2, a 50% duty cycle square wave input to ports A and B of an exclusive-OR gate will trigger a gate output whose duration depends on the degree of overlap (with a maximum at half overlap or a phase lag of 180°). The time-averaged voltage detected at the gate output will be determined by the output pulse duration, and thereby constitutes the detection scheme.

The second component of the phase-locked loop is the filter, which is sometimes also an amplifier stage. The filter

is of a low-pass type, and its purpose is to ensure that only the DC voltage is used as the feedback driver. Common examples are the RC shunt and the op-amp follower. The principal design considerations when fabricating a loop filter are the requisite drive voltage (and current) and the response time (see ref. 3).

In many applications, the phase-locked loop is used as a method to stabilize a tuneable low stability oscillator by locking it to a very stable frequency standard. For example, one might want to build a frequency generator using a voltage controlled oscillator. The output frequency of the oscillator is determined by a variable input voltage, whereas the stability of the output is regulated by constructing a phase-locked loop with a precision oscillator (i.e., a quartz crystal) as a reference. For those readers unfamiliar with the design of crystal oscillators, these units are based on the piezoelectric properties of quartz. Commercially available components vary in quality and price; however, they are essentially thin slices of quartz cut from a single crystal. Figure 3 illustrates the types of cuts for oscillators. In general, the angle of the cut and its location determines the frequency of oscillation and intrinsic stability. The final product is constructed by placing electrodes on the broad faces of the crystal slice and applying longitudinal stress. The bulk acoustic waves generate an electrical signal at the crystal slices given resonant frequency.

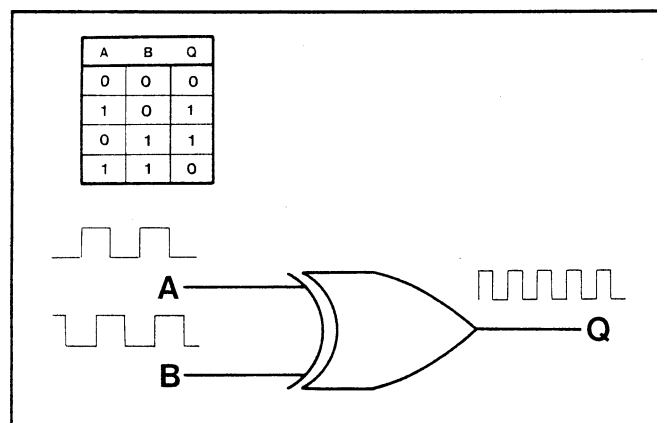


Figure 2. A digital phase detector based on an exclusive-OR gate. Out of phase inputs at points A & B yield a gate output duty cycle that gives a  $V_{rms}$  commensurate with the overlap of the waveforms (adapted from ref. 3).

High-stability crystal oscillators for reference reach a high-end limit of approximately 25 MHz for the fundamental, although the weaker overtones (typically up to 200 MHz) may be used. One can, in principle, use these reference oscillators to stabilize a high-frequency oscillator

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by using a frequency divider as an intermediate stage before the phase detector. However, the preferred method relies on mode-locking the source to a high-Q resonator. One rejects the frequency divider approach because of inherent phase noise of the divider (one can use another mixer stage, but this requires another stable tunable source and added complexity).

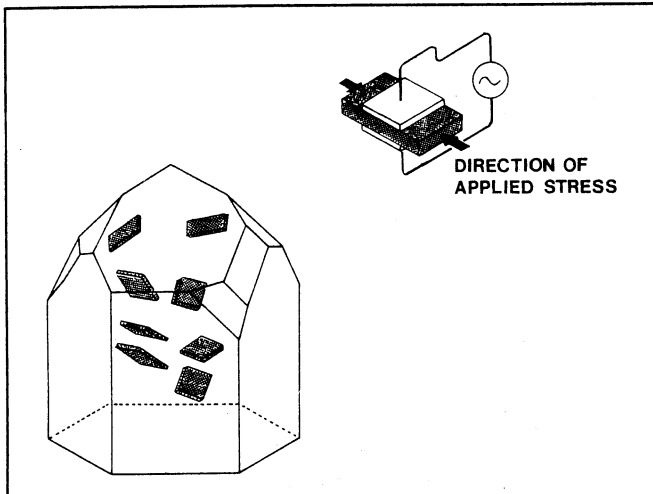


Figure 3. The basics of crystal oscillators and the origins. Slices cut closer to the crystal's apex resonate at higher frequencies. Those from the base are typically used as filter elements (adapted from ref. 3).

The use of a high-Q resonator for conventional mode-locked AFC is described in Poole's treatise.<sup>5</sup> The high-Q resonator gives the familiar "pip" in a reflected voltage vs. frequency plot, and this pip is very sharp because of the high quality factor. At exact tune (i.e.,  $f_c$ ) the reflected voltage is minimum and increases as the frequency deviates from  $f_c$ . If one modulates the oscillator's output frequency at a lower ( $\sim 70$  kHz) intermediate frequency, one gets an AC error voltage. The AC error voltage is minimum when the carrier (oscillator) frequency is  $f_c$  and increases as the carrier deviates from  $f_c$ . This error voltage supplants the mixer output of the phase-locked loops described above.

## THE FIBER OPTIC DISCRIMINATOR

A drawback of the conventional AFC method is the tuning range of the high Q element. Usually, because the tune is controlled by adjusting the physical dimensions of the element, tuning is possible only on a narrow band. Furthermore, long-term stability is affected by temperature fluctuations that affect resonator dimensions. The fiber optic discriminator was devised as an alternative to the mode-locked AFC circuit. It achieves comparable phase stability over much wider bands and is less prone to thermal fluctuations.

Figure 4 is a schematic diagram of the fiber optic discriminator. The VCO output is divided with quadrature (at  $90^\circ$  the voltage output of a mixer is minimum) and one channel is subjected to a delay of  $\sim 30 \mu\text{s}$ . The unique feature of the delay line is that it is driven optically. A laser

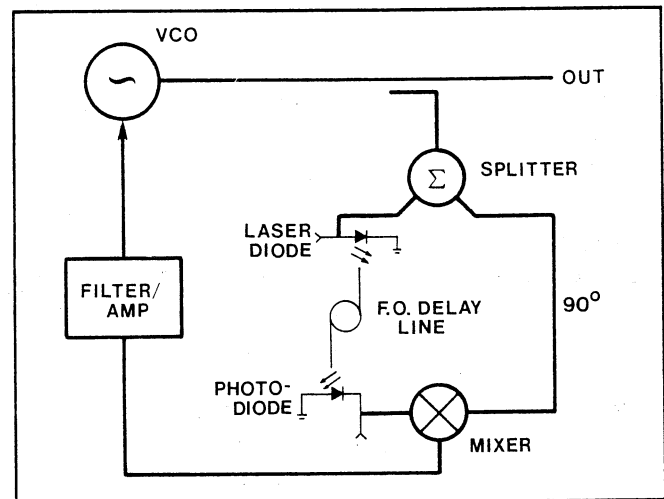


Figure 4. Schematic diagram of the F.O. discriminator source lock (adapted from refs. 1 & 6).

diode is modulated at the microwave carrier frequency, and the light pulses are propagated along a fiber optic delay line and received by a photodiode/detector. With the fiber optic line one gets a  $5 \mu\text{s}$  delay per kilometer of cable; the advantage of the fiber optic delay line over a coil of conventional coax line is that the fiber optic line has a smaller diameter and the loss is much reduced.<sup>7</sup>

Operation of the fiber optic discriminator is identical to the homodyne receiver example described above. The mixer converts a frequency/phase mismatch into an error voltage that serves as a feedback to the VCO. The difference between this circuit and the homodyne receiver is the magnitude of the delay;  $\sim 30 \mu\text{s}$  for the discriminator vs. a fraction of a cycle ( $\sim 30 \text{ps}$ ) for the receiver. In other words, the feedback voltage is a response to changes that might occur on the time scale of the delay line. Frequency discrimination is therefore inversely proportional to the delay time.

The fiber optic delay line is remarkably compact because of the small diameter of the fiber optic cable. A complete unit consisting of laser diode, delay line (up to  $100 \mu\text{s}$ ), and photodetector is commercially available from the Ortel Corporation in a  $2.5 \times 6 \times 9$ -inch package. The diode operates at  $1310 \text{ nm}$ , and the units function at bandwidth in excess of  $15 \text{ GHz}$ . The phase noise of F.O. stabilized oscillators

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match those oscillators that are mode-locked to a high-Q resonator, plus the added advantage of tunability in steps corresponding to the inverse of the delay time.<sup>1</sup> I was chagrined to find that the current price for a single 15 GHz bandwidth unit is \$29000, which renders the design uncompetitive with commercial sweepers. However, it is a neat idea, and one can always hope that prices drop as the technology (used in high bandwidth communications systems) becomes more common.

**ACKNOWLEDGEMENT** - I am grateful to Ron Logan of the Jet Propulsion Lab for information and useful discussions on his invention.

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5. Poole, C.P. *Electron Spin Resonance* 2nd ed. Wiley, NY 1983. p87-91.
6. Grimes, G. *Microwave Journal*, August 1992.
7. A characteristic of all transmission lines (waveguide, coax lines, etc.) is a level of attenuation expressed in dB/ft. For a 6-10km delay line these losses become significant.

## REPLACEMENT TRANSFER LINES FOR EPR/ENDOR CRYOSTATS

N. Dennis Chasteen  
Department of Chemistry, Parsons Hall  
University of New Hampshire  
Durham, NH 03824 USA

Liquid helium transfer lines often fail after extended use due to blockage or crimping of the stainless steel capillary tube which carries the helium or to the inability of the line to hold a good vacuum. We have been faced with failed APD transfer lines (Air Products - Advanced Products Department) on three occasions due to these problems. Most recently the transfer line for our old Heli-Tran Model LTD-3-110 became irreparably blocked. A replacement costs

\$3,350. Instead we obtained a transfer line of simpler design from Cryo Industries of America which was custom modified to fit our Heli-Tran cryostat at a cost of \$1,300. The Cryo transfer line differs from the original line in that it lacks a helium flow-heat shield intended to give an additional cold barrier to the outside world. However, in our experience, this feature was just one more thing to plug up. We have used the Cryo line for over a year now and have found it to be superior to the original APD line in several aspects:

- Helium consumption is at least 50% less. When running at 10 K with our Heli-Tran cryostat, a 30 liter storage dewar usually lasts 12 hrs with some helium to spare.

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- We can achieve 4.8 K with the new line versus 6.0 K with the old.

- Cool-down time is only 15-20 minutes versus 45-60 minutes with the old line. The more rapid cool-down appears to be due to the much larger (1.75 mm) inner diameter of the thin-walled capillary in the Cryo design, a design which greatly reduces impedance to He flow and the heat capacity of the line. The lower attainable temperature is probably a consequence of the larger diameter as well.

- With the large 1.75 mm diameter capillary, the danger of blockage is greatly reduced. The capillary of the APD line has an inner diameter of only ~0.25 mm.

- The Cryo line is much more flexible and can be inserted into the storage dewar and cryostat by one person.

- The control valve is located at the storage tank end of the line and is more accessible. The APD line required stooping behind the magnet to adjust the flow.

- The removable delivery tip disperses a fine spray of liquid helium through tiny orifices at right angles to the heater block, giving a more uniform temperature and eliminating pulsation in gas flow through the dewar when high flow rates are employed with the Cryo line.

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The Cryo transfer line can also be modified for use with other cryogenic systems. They are available at a cost of \$1,300 from Cryo Industries of America, 11 Industrial Way, Atkinson, NH 03811, USA ☎: 1-603-893-2060; FAX: 1-603-893-5278.

## Miscellaneous Tips for EPR Users

James R. Anderson  
Research Specialties  
5629 N. Maplewood, Chicago, IL 60659  
☎/FAX: 1-312-728-6570

The Varian magnet power supply on the older 9" and larger systems has a potential trouble spot involving the large electrolytic capacitors (C101 & C102) which are mounted upside down, suspended via a mounting clamp from above. If these clamps loosen or were improperly installed at the factory, or were disturbed in the field due to capacitor replacement, the possibility exists for the capacitor to slip out of its mount and fall into other circuitry, causing considerable damage.

One particular case of this stems from a replacement made in the field with a mechanically smaller unit in which electrical tape was used to enlarge the diameter to fit the clamp. Over time aided by gravity, the tape telescoped, enabling the capacitor to slip out; and, guided by the rear cover and other parts, made contact with one of the interlock relays which turned the unit on and proceeded to melt the magnet and magnet power supply. Imagine the surprise to find your magnet melted when you come in after a weekend.

This unit was off and the water shut down, but the interlock circuitry still is powered as long as the primary power is still on. Primary power can be shut down using a wall circuit breaker. This will insure that failures will occur only while you are around to sense the smoke.

This unfortunate episode was precipitated by a faulty repair. The smaller diameter should have been built up using a machined insert, or the proper mounting clamp could have been obtained.

Certainly inspection of these parts is warranted on other units to confirm tightness of the mounting clamps, particularly involving similar style repairs made by previous or current owners, etc.

*(On a recurring basis, Mr. Anderson shares with us technical tips gleaned from his 20+ years of experience in EPR instrumentation. His business, Research Specialties, helps support the IES and provides EPR services - troubleshooting, repair, system upgrades, supplying of critical replacement parts, fabrication of specialized application modules, rebuilding and replacing cavities.)*

## BOOKS & PROCEEDINGS

*Computational Biomedicine* (Editors: K.D. Held, Harvard Medical School, C.A. Brebbia, Wessex Inst. of Technology, R.D. Ciskowski, IBM, and H. Power, Wessex Inst. of Technology), is available from Computational Mechanics Publications. This book contains the edited proceedings of papers presented at the Second International Conference on Computers in Biomedicine held in Bath, UK, in September 1993. It presents and discusses advances in the application of computing to analyse numerically biomedical processes and medical data.

**Partial Contents:** *Simulation of Physiological Processes, Computational Fluid Dynamics in Biomedicine, Electrical and Magnetic Simulation, Orthopaedics/Bone Mechanics, and Data Acquisition and Analysis.* 663 pp., ISBN: 1853122386; 1562521624 (US, Canada, Mexico) £97.00/\$145.00.

Order from: Computational Mechanics Publications, Ashurst Lodge, Ashurst, Southampton, UK; ☎: 44-703-293-223, FAX: 44-703-292-853, e-mail: cmi@uk.ac.rl.ib (Intl. e-mail: cmi@ib.rl.ac.uk) or Computational Mechanics, Inc., 25 Bridge St., Billerica, MA 01821, USA; ☎: 1-508-667-5841, FAX: 1-508-667-7582.

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## NOTICES OF MEETINGS

### EUROPEAN ESR MEETING ON RECENT ADVANCES AND APPLICATIONS TO ORGANIC AND BIOORGANIC MATERIALS, Paris, September 5-9, 1994.

Organized by the European Federation of ESR Groups presently consisting of: ESR Group of the Royal Society of Chemistry (UK), Gruppo Italiano di Risonanza di Spin Elettronico (I), Nederlandse EPR Discussie Groep (NL), Polish ESR Group (PL), Bulgarian ESR Group (Bul), and Groupe d'Application de la Résonance Paramagnétique Electronique (F). *Organizing committee:* Pr. J. Raffi (CEA/Univ. Marseille), Dr. B. Catoire (ENSAM - Paris), Dr. A.M. Riquet (INRA - Jouy-enb-Josas), Dr. J.M. di Meglie (Coll. France), Dr. J. Viret (CRSSA - La Tronche), Dr. C. Giannotti (ICSN-CNRS - Gif-sur-Yvette), Dr. Soulié (CEA - Saclay), Pr. A. Rassat (ENS - Paris), and Pr. J. Verdu (ENSAM - Paris). *Steering & Scientific Program Committee:* Pr. Klaus Möbius, *Chairman*, (Freie Univ. Berlin), Dr. B. Catoire (ENSAM Paris), Pr. J. Raffi (CEA/Univ. Marseille), Dr. A. Alberti (ICOCEA-CNR Bologna), Pr. M. Brustolon (Univ. Padova), Dr. D. Beckert (Max Planck Group Leipzig), Pr. H. Kurreck (Fr. Univ. Berlin), Pr. A.G. Davies (Univ. London), Dr. C.C. Rowlands (Univ. Cardiff), Pr. H. Ambros (Ins. Nucl. Chem. Lodz), Pr. A. Hoff (Univ. Leiden), Pr. E. de Boer (Univ. Nijmegen), and Pr. N.D. Yordanov (Bulg. Acad. Sci.). *Secretariat:* Dr. Bernard Catoire, GARPE, ENSAM, 151 Boulevard de l'hôpital, 75013 Paris, FRANCE. ☎: 33-1-24-62-99; FAX: 33-1-44-24-63-82. The European Symposium will be held at the Ministère de l'Enseignement et de la Recherche, 1 rue Descartes, 75005 Paris "Carré des Sciences"; the entrance to the lecture Hall "Poincaré" is 25 rue de la Montagne-Sainte Geneviève, 75005 Paris. The registration will be open on Monday morning September 5th at 8:30 am and the meeting will close on Friday the 9th. The accommodations will be in hotels in the city and can be chosen from a number of hotels of various categories. A limited number of individual rooms in the Cité Universitaire de Paris, 19 Boulevard Jourdan, close to the Parc de Montsouris, will be available.

*Contact:* GARPE - Dr. Bernard Catoire - ENSAM - 151, blvd. de l'Hôpital - 75013 Paris, FRANCE. ☎: 33-1-44-24-62-99; FAX: 33-1-44-24-63-82.

### III INTERNATIONAL SYMPOSIUM ON MAGNETIC FIELD AND SPIN EFFECTS IN CHEMISTRY AND RELATED PHENOMENA, Chicago, Illinois, USA, September 25-30, 1994.

Scope of the conference: Spin chemistry and magnetokinetics originated in the late sixties with the discoveries of the radical pair mechanisms of CIDNP (chemical induced dynamic nuclear spin polarization) and CIDEP (chemical induced dynamic electron spin

polarization). Currently spin chemistry covers a diverse scope of subjects ranging from natural photosynthesis to artificial photosynthesis, from magnetobiology to isotope separation. The subjects of CIDNP and CIDEP are now powerful spectroscopies for the unraveling of chemical reaction mechanisms and are based on an advanced understanding of spin chemistry. That small to large magnetic fields can affect the outcome of chemical reactions remains a fascinating topic today and is pursued by workers worldwide.

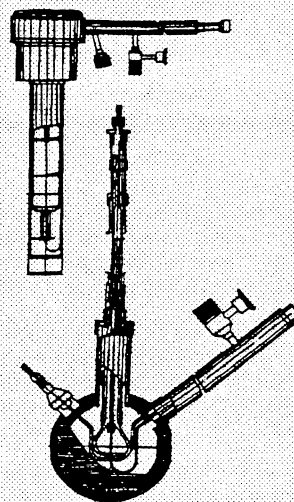
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MA ): 508 369 9933(FAX 6616); West: 415 578 0202]



#### Topics to be covered:

- Magnetic Field Dependent Processes: in Solution, in the Gas Phase, in Solid State, on Surfaces, in Micellar Systems, in Supramolecular Aggregates, in Photosynthesis, in Enzymatic Reactions
- Magnetic Isotope Effects and Separation
- Spectroscopic Applications: Novel Developments in: CIDNP, CIDEP, RF and MW Stimulated CIDNP, RYDMR, ParaHydrogen Spin Labeling
- Magnetokinetic Theory
- Spin Chemistry and Magnetobiology
- Nuclear Spin Statistics Chemistry.

To receive further information regarding this meeting, please contact Dr. James R. Norris, Argonne National Laboratory, Chemistry Div., Argonne, IL 60439, USA; ☎: 1-708-252-3544; FAX: 1-708-252-9289; E-mail [norris@anlchm.chm.anl.gov](mailto:norris@anlchm.chm.anl.gov).

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## XXVI SOUTHEASTERN MAGNETIC RESONANCE CONFERENCE, Univ. of N. Carolina at Chapel Hill, NC, October 23-25, 1994.

Organizing Committee: Malcom D.E. Forbes, Univ. N. Carolina (Chairman), Gary J. Peilak, Univ. N. Carolina, Charles S. Johnson, Univ. N. Carolina, Ronald P. Mason, NIEHS, Barbara Ramsay-Shaw, Duke Univ.

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Preliminary List of Speakers: James S. Hyde (*Medical College of Wisconsin*), Daniel P. Weitekamp (*California Inst. of Technology*), James R. Norris, Jr. (*Argonne Natl. Laboratory*), Sharon Campbell-Burke (*Univ. N. Carolina*), Paul Agris (*N. Carolina State Univ.*), Ed Janssen (*OMRF*), Wallace Brey (*Univ. Florida*), Hans van Willigen (*Univ. Mass. Boston*), Ned Jackson (*Mich. State Univ.*), Ronald Mason (*Natl. Inst. Environmental Health Sciences*), Rick McCullough (*Carnegie Mellon Univ.*), David Schultz (*N. Carolina State Univ.*), Tom Pochapsky (*Brandeis Univ.*), Keith Madden (*Notre Dame Radiation Laboratory*), Art Rodriguez (*East Carolina Univ.*), Paul Lahti (*Univ. Mass.*), Andrzej Rajca (*University of Nebraska*), John Dawson (*Univ. S. Carolina*), Barbara Ramsay-Shaw (*Duke Univ.*), Martin Bakker (*Univ. Alabama*), Robert Weisskopf (*Mass. Gen. Hospital*), Weiguo Zhang (*Carnegie-Mellon Univ.*), John McCracken (*Mich. State Univ.*), Ron Crouch (*Burroughs-Wellcome, Inc.*), Ffranco Williams (*Univ. Tennessee*), Judith Bonicamp (*Middle Tenn. State Univ.*), Graig Ogle (*Univ. N. Carolina Charlotte*), David Westmoreland (*Rohm & Haas Corp.*), Rob Tycko (*AT&T Bell Laboratories*), David Singel (*Montana State Univ.*), Dave Doetschman (*SUNY-Binghamton*), Betty Gaffney (*Johns Hopkins Univ.*), Brian Hoffman (*Northwestern Univ.*), Steve Brown (*Glaxo, Inc.*), Regitze Vold (*Univ. California San Diego*), and Lon Knight (*Furman Univ.*).

Session topics include:

- Protein and Nucleic Acid Structure by NMR
- *In Vivo* NMR and Functional MRI
- Solid State NMR of Semiconductors and Polymers
- Organic Magnetic Materials
- EPR Spectroscopy
- Electron Transfer and Photosynthesis

The deadline for registration and abstracts is September 15, 1994. To receive further information, contact Joy Carter,

Univ. of N. Carolina, Dept. of Chemistry, CB#3290, Chapel Hill, NC, 27599, USA. ☎: 1-919-962-6197; FAX: 1-919-962-2388.

## INTERNATIONAL SOCIETY FOR FREE RADICAL RESEARCH, 7th BIENNIAL SCIENTIFIC MEETING, Sydney, Australia, November 7-11, 1994.

The conference will be held at the spectacular new Sydney Convention Centre, overlooking Sydney Harbour and adjacent to Sydney's central business district.

The Scientific programme will include the application of free radical research in chemistry, biology, nutrition and medicine as well as environmental issues. Leading international and local experts will address such topics as cardiovascular diseases, cancer, aging, arthritis, vitamins and many other subjects in which the relevance of free radicals is being increasingly recognised. Chemistry of radical reactions, biochemistry, physiology and pathology and new topics not previously covered by SFRR meetings will be discussed, both in lectures and workshops held on each section.

For further information, contact Margaret Blackwell, ISFRR '94 Secretariat, Abacus Management Pty Limited, Box 77 PO, Pymble NSW 2073, AUSTRALIA; ☎: 61-2-983-9330; FAX: 61-2-983-9307.

## XXVIIIth INTERNATIONAL MEETING OF THE ELECTRON SPIN RESONANCE GROUP OF THE ROYAL SOCIETY OF CHEMISTRY, Univ. of Surrey, UK, March 27-31, 1995.

The subject of the meeting will be "ESR Spectroscopy of Radicals in Organic and Bio-Organic Systems." Secretary, ESR Group, Royal Society of Chemistry: Dr. C.C. Rowlands, Univ. of Wales College of Cardiff, P.O. Box 912, Cardiff CF1 3TB, UK; ☎: 44-222-874073, FAX: 44-222-874030.

## IV INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY AND APPLICATIONS, Munich, Germany, May 15-19, 1995.

The meeting will be held under the sponsorship of GSF. Topics to be covered will be similar to past symposia and will include dose measurements of various types of ionizing radiation, radiation accidents and other biomedical applications including radiation therapy, development of standards and instrumentation (modern EPR, pulsed EPR, double resonance), imaging and dating of archaeological and geological materials. Other topics may be added depending on the interests of participants. The proceedings will be published in a special issue of the *International Journal of Applied Radiation and Isotopes*. A detailed announcement will be forthcoming. In the meantime, the organizers invite interested parties to contact any of the following: Dr. Dieter Regulla, GSF-Institut für Strahlenschutz, Neuherberg, D-85758, Germany; ☎: 49-89-387-2517; FAX: 49-89-3187-2517; Dr. Anne Skinner, Williams College, Dept. Chemistry,

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Williamstown, MA 01267, USA; FAX: 1-413-597-4116; e-mail: anne.r.skinner@williams.edu; or Prof. Harold Swartz, Dartmouth Medical School, Dept. Radiology, Hanover, NH 03755-3863, USA; FAX: 1-603-650-1935; e-mail: harold.swartz@dartmouth.edu.

## **EMARDIS-95, Sofia, Bulgaria, June, 1995.**

The aim of the workshop is to cover all aspects of recent development in the theory, methodology, experimentation, instrumentation, etc. of the qualitative and quantitative aspects of Electron Magnetic Resonance (EPR, ENDOR, ESE) spectroscopy of disordered systems through lectures, posters and round-table discussions. Participants will be limited to about 40 persons. The official language of the workshop will be English.

For information, contact: N. D. Yordanov (Convener) or M. Zdravkova (Sci. Secretary), Institute of Kinetics and Catalysis, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria; ☎: 35-92-724-917 or 35-92-713-2546 (Yordanov) or 35-92-713-3917 (Zdravkova); FAX: 35-92-756-116 or 35-92-720-038; telex 22729 echban; e-mail: banchem@bgearn. A first circular will be distributed in September of 1994.

## **FIRST NSR WORKSHOP ON ADVANCED EPR SPECTROSCOPY, Nijmegen, The Netherlands, June 1995.**

This 2-day workshop is organized on the occasion of the retirement of Prof. Dr. E. de Boer as a professor at the University of Nijmegen. With this meeting we would like to honour his extensive contributions to the field of EPR. Several aspects of modern EPR spectroscopy will be covered. In particular: Pulsed EPR, high frequency EPR and applications to bio-inorganic systems. Lectures on these subjects will be presented by invited speakers. Participants are invited to present their research in two poster sessions. The number of participants will be limited to approximately 75 persons.

A first circular was distributed in July/August of 1994. For information contact: E.J. Reijerse or D.D. van der Wey, Dept. of Molecular Spectroscopy, University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands. ☎: 31-80-653105 or 31-80-652004; FAX: 31-80-553450; Telex: 48228 wina. email: rey@sci.kun.nl or desiree@sci.kun.nl.

## **BIOMED 95 3rd ANNUAL CONFERENCE, SIMULATIONS IN BIOMEDICINE, Palazzo delle Stelline, Milan, ITALY, June 21-23, 1995.**

The objective of this Third International Conference on Computers in Biomedicine is to bring together different scientists who work on the application of computers to simulate biomedical phenomena, as well as to develop numerical algorithms to analyse, manage and visualise biomedical data. This conference is specifically aimed at scientists throughout the world working on the application of

computers to simulate and analyse biomedical phenomena but who may not be fully aware of each other's developments.

The Conference Chairmen are: Prof. C.A. Brebbia (Wessex Inst. Technology, UK), Prof. R.T. Hart (Tulane Univ, New Orleans, USA) and Dr. H. Power (Wessex Inst. Technology, UK). The International Scientific Advisory Committee are: Prof. M.W. Collins (City Univ., UK), Dr. P.R. Johnston (Univ. Tasmania, Australia), Dr. M. Karlsson (Linkoping Univ., Sweden), Dr. L.J. Leon (Univ. Montreal, Canada), Prof. C.J. Lumsden (Univ. Toronto, Canada), Prof. M.D. Nowak (Univ. Connecticut, USA), Dr. M. Tanaka (Osaka Univ., Japan), Mr. A. Urbaszek (Univ. Erlangen-Nurnberg, Germany) and Dr. Y. Xu (City Univ., UK).

### *Conference Topics:*

- Simulation of Physiological Processes
- Computational Fluid Dynamics in Biomedicine
- Orthopaedics/Bone Mechanics
- Electrical and Magnetical Simulation
- Imaging Processing
- Data Acquisition and Analysis

*For information, contact:* Jane Evans, Conference Secretariat *Biomed 95*, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA UK. ☎: 44-703-293-223; FAX: 44-703-292-853; e-mail: cmi@uk.ac.rl.ib; Intl. e-mail: cmi@ib.rl.ac.uk.

**EPR-95 IES WORKSHOP, Sydney, Australia, July 13-15, 1995.** More information in Vol. 6 #2 or Contact Dr. Graeme Hanson e-mail: epr-95@cmr.uq.oz.au

## **ISMAR-95, TWELFTH CONFERENCE OF THE INTERNATIONAL SOCIETY OF MAGNETIC RESONANCE, Sydney, Australia, July 16-21, 1995.**

This international conference will have sessions covering all major areas of magnetic resonance, including:

- Advances in imaging and microscopy
- Inorganic and multinuclear NMR
- Chemical applications of NMR
- EPR and applications (joint with IES)
- Proteins and nucleic acids: structure and dynamics
- Developments in multidimensional spectroscopy
- *In vivo* spectroscopy and clinical applications
- Solid state NMR
- Membranes and liquid crystals
- New technology and experimental methods
- Advances in theory and computational methods

Presentations will be via plenary lectures, invited lectures, colloquia and poster sessions, with special invited lectures from some of the pioneers of NMR to commemorate the 50th anniversary of its discovery. A comprehensive trade exhibition will be held in conjunction with the conference. Companies

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wishing to display magnetic resonance hardware, software or accessories should contact the conference chairman. The social program will give delegates and their companions opportunities to meet informally and to get to know this magnificent harbourside city. We will be suggesting pre- and post-conference tours for those who wish to travel more extensively around Sydney or to other parts of Australia.

For more information, contact Dr. L.D. Field, Chairman ISMAR-95, Department of Organic Chemistry, University of Sydney, Sydney NSW 2006 AUSTRALIA, ☎: 61-2-692-2060; FAX: 61-2-692-3329; E-mail: ISMAR-95@biochem.su.02.au

### 3rd MEETING OF THE SOCIETY OF MAGNETIC RESONANCE, Nice, France, August 19-25, 1995.

For information, *Contact:* Society of Magnetic Resonance, 1918 University Avenue Suite 3C, Berkeley, CA, USA. ☎: 1-510-841-1899; FAX: 1-510-841-2340. SMR can now be reached by e-mail at [info@smrm.org](mailto:info@smrm.org).

### VII INTERNATIONAL CONFERENCE on BIOINORGANIC CHEMISTRY (ICBIC 7), Lübeck, Germany, September 3-8, 1995.

The Scientific Program will be organized around eight plenary lectures, which will introduce topics to be expanded by invited speakers in two parallel sessions and additional microsymbiosia, and by two poster sessions. Tentative topics include:

- Redox reactions
- Hydrolic and group transfer
- Energy transfer, bioenergetics
- Transport, storage, and assembly of metals
- Metals and nucleic acids
- Gene regulation
- Metals in medicine
- Environmental chemistry
- Spectroscopy and specific applications
- --- and more

The plenary lectures are: Stephen Lippard (Cambridge), *Synthetic models for and mechanistic studies of methane monooxygenase*; Ken Raymond (Berkeley), *The coordination chemistry of biological iron transport: Iron and disease*; Dieter Sellmann (Erlangen), *Modelling the reactivity of metal-sulfur oxidoreductases*; Britt-Marie Sjöberg (Stockholm), *Ribonucleotide reductase - an ancient enzyme with radical mechanism*; Rolf Thauer (Marburg), *Metalloenzymes involved in methanogenesis*; Andy Thomson (Norwich), *Magneto-optics and metalloproteins*; Anthony Wedd (Melbourne), *Oxo-molybdenum enzymes*; Raymond Weiss (Strasbourg), *Advances in modelling the high-valent iron intermediates of heme proteins*.

Call for posters: Formats required to prepare posters and to publish abstracts will be sent with the second

announcement. Abstracts will be accepted for publication in the *Journal of Inorganic Biochemistry* only after receipt of conference fee.

Social events will include a get-together party on Sunday evening, September 3; an organ concert at Marienkirche, Tuesday evening, September 5; optional excursions to the old City of Lübeck, to Mecklenburg, to Schleswig-Holstein, to Hamburg, etc. on Wednesday afternoon, September 6. The official conference dinner will be held on Friday evening, September 8. There will also be a panorama of daytime events for accompanying persons who are not engaged in the scientific program.

For further information, contact either one of the Conference Chairs: Alfred X. Trautwein, Institut für Physik, Medizinische Universität, Ratzeburger Allee 160, D-23538 Lübeck, GERMANY. ☎: 49-451-500-4200; FAX: 49-451-500-4214; e-mail: [icbic7@miraculix.physik.mu-luebeck.de](mailto:icbic7@miraculix.physik.mu-luebeck.de) OR Karl Wieghardt, ☎: 49-234-700-4153; FAX: 49-234-700-4109.

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Franklin, NH 03235-6125

### VII INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE (ISMRCIS VII), Madrid, Spain, September 11-15, 1995 (*Preliminary*).

This Symposium, to be held at the central premises of the Consejo Superior de Investigaciones Científicas (CSIC) in Madrid, Spain, September 11-15, 1995, is a continuation of the previous triennial conferences on the same subject started in San Francisco, USA (1976) and followed on in Menton, France (1979), Torun, Poland (1983), Muenster, Germany (1986), Newark, Delaware, USA (1989) and Firenze, Italy (1992). These symposia have become a major event whose aim is to provide a forum for physicists, chemists, and biologists at which to present and discuss their recent research in the field. The program will include plenary and invited lectures as well as oral and poster presentations. The official language is English. The proceedings will be published as full articles in an archival scientific journal.

*Topics:* Among the topics to be covered are:

- Adsorption, Catalysis and Surface Chemistry
- Interfacial Coordination Chemistry

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- Molecular Sieves, Zeolites and Silicate Surfaces
- Intercalation Compounds
- Advanced Materials, Ceramics and Composites
- Surfaces, Interfaces and Nanostructures of Magnetic and Electronic Materials
- Dispersed Systems (including colloids, polymers and gels)
- Ordered Systems (including liquid crystals, self-assembling materials and micelles)
- Biological Systems, Membranes and Interfaces
- New Magnetic Resonance Techniques
- Other topics to be included depend upon the response.

*Organizing and Program Committee Officers:* Javier Soria, Chairman, CSIC; José L. De Segovia, Co-Chairman, CSIC; José C. Conesa, Secretary, CSIC.

*Accommodations:* The scientific activities will be held on the Campus of the CSIC located close to downtown Madrid. Information on accommodations and social programs will be published later.

*Deadlines:* Call for papers will be distributed by November 1994, with details about work presentation and relevant deadlines. If you are interested in attending this symposium and receiving next circulars, please supply the following preliminary-registration information to Dr. José Conesa, Inst. de CCatal. y Petroleoquímica, CSIC, Campus Univ. de Cantoblanco, 28149 Madrid, Spain; Fax 34-1-5854760; e-mail: mrcis@icp.csic.es: *Name, Title, Affiliation, Address, Telephone, Fax, e-mail, Telex, Field(s) of interest, Suggestions for specific Conference topics, Tentative title of paper if you plan to submit one.*

## POSITIONS WANTED

**EPR and NMR Spectroscopist Seeks an Academic or Industrial Position.** Biophysicist-solid state physicist, Ph.D. '87, research/teaching experience. Now research worker/teacher at Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University. Research experience: A) liquid- and solid-state EPR spectroscopy of biological, organic and inorganic materials (Bruker 200D SRC NMR Spectrometer with Aspect 2000 Computer). Special research experience: membrane biophysics, drug-membrane interaction, spin-label EPR spectroscopy (International Training Course, Hungarian Academy of Sciences, Szeged, Hungary). Also sol-gel or glass solid-state EPR spectroscopy; transition-metal spin labels. B) liquid- and solid-state NMR spectroscopy of biological, organic, and inorganic materials (Varian 300 MHz VXR spectrometer). Special research experience: 1D, 2D, and pseudo-3D multinuclear NMR spectroscopy of biopolymers, using Varian Unity 500 MHz spectrometer (postdoctoral fellowship at McGill

University, Pulp and Paper Research Center, Montreal, Canada). Also sol-gel or glass multinuclear NMR spectroscopy. **Wanted:** faculty or research post, or opportunity to teach basic principles of resonance spectroscopy or biophysics. Please contact:

Dr. Milan Mazur, Department of Physical Chemistry  
Faculty of Chemical Technology,  
Slovak Technical University  
Radlinskeho 9, CS-812 37 Bratislava, SLOVAKIA  
FAX: 42-7-493-198

**EPR Spectroscopist seeks a Postdoctoral Fellowship Position.** Semiconductor physicist, 32 years old, Ph.D. '88, research worker of the Institute of Semiconductor Physics (Novosibirsk, Russia). Research experience: EPR of defects in irradiated semiconductors, spin-dependent transport in semiconductors, EPR of paramagnetic centers in quantum size semiconductor structures. Please contact:

Dr. A.A. Karanovich  
Inst. Semiconductor Phys.  
Russian Acad. Sci., Siberian Branch  
pr.Lavrenteva 13, 630090 Novosibirsk, RUSSIA  
☎: 38-32-354255; FAX: 38-32-354265; Telex: 133243  
FONON SU; e-mail: lab24@isph.nsk.su

## EQUIPMENT & SUPPLIES EXCHANGE

**FOR OWNERS OF VARIAN EPR SPECTROMETERS:**

- (1) FIELD SCAN POTENTIOMETERS
- (2) REPLACEMENT KLYSTRONS

(1) Varian E-3, E-4 and E-9 and early E-109 users: I have arranged for a custom group order of replacement field scan potentiometers using Varian's specifications and the original vendor part number. These Model #3406 are 30 ohm, 0.06% linearity 3,0 turn pots with a center tap and have infinite resolution. This replacement can solve field stability problems arising from a noisy wiper. If you would like to participate and make this opportunity possible, please contact me regarding your interest. The price would be \$723.00 each with a \$35.00 handling fee per order plus shipping charges (we need to get 25 to get this price). They have a long shelf life. A purchase order would be required. The expected delivery time is about 160 days. There can be no returns on this order, but a vendor's 1-year warranty would apply.

I can also rebuild these parts, but the turn-around time would be long due to batch requirements. So I recommend an order of at least one new pot, which will allow the old one to

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be recycled at some later date at a price of around \$525.00 depending on the batch size at that time (I would expect most pots are suitable for rebuilding). Please indicate your interest.

(2) Varian V-4500, E-3, E-4, E-9, E-104, and E-109 users: I am also arranging with Varian one large order for replacement Varian X-Band Klystrons. If we have a sufficient quantity, Varian will supply us with possible volume pricing. So I need to know your needs and that you would be willing to commit to a purchase order (at a later date). The pricing would probably be in the \$6000 range, and I would extract a \$100.00 handling fee per klystron; shipping/ insurance costs are additional. Varian would warranty these for 3 years from purchase date. Delivery times may be long term (~6 months). If you need Q-Band klystrons, let me know, as I expect that these also can be supplied. Prompt response will help in determining the Varian's pricing.

Contact: James R. Anderson at Research Specialties, 5629 N. Maplewood, Chicago, IL, USA 60659.  
☎/FAX: 1-312-728-6570.

## PARTS FOR VARIAN E-256 ELECTROLYTIC CELL

I have the following parts to the Varian E-256 electrolytic cell, unused in factory wrappings: Varian PN 908721-02 Reference Bridge, with protective container; Varian PN 908721-01 Potential Bridge, with protective container; Varian PN 908723 Flat cell; Varian PN 908732 Reservoir upper half; Varian PN 908717 Reservoir lower half.

Call for pricing: James R. Anderson, Research Specialties, 5629 N. Maplewood, Chicago, IL 60659,  
☎/FAX: 1-312-728-6570.

## WANTED: VARIAN MAGNET COIL

We are looking for a magnet coil for a Varian V-3400 9-inch magnet. We need the coil on the right-hand side (from the front). Please contact Shen or David at E-mail address "gashe@ttacs.edu" or call 1-806-742-3764. Jimmiao Shen, Physics Dept., Texas Tech Univ., Lubbock, TX, 79409, USA.

## WANTED: HALL EFFECT SENSOR

We are seeking a Hall effect sensor for a Varian V-4500 EPR (V-2100 B power supply). Please contact: Eliane Wajnberg, Centro Brasileiro de Pesquisas Fisicas, R Xavier Sigaud 150, 22290-180 Rio de Janeiro Brazil. E-mail: ElianeW@brlncc.bitnet.

## WANTED: HALL PROBE

We urgently need a Varian E-4 magnet Hall Probe - P/N - 908742-05 and an E-112 magnet Hall Probe - P/N - 929279-02B. If available, please contact or send to Prof. P.T. Manoharan, RSIC, IIT, Madras - 600 036, India.

## WANTED: USED EPR/NMR ELECTROMAGNET

We are looking for a used 12" (or bigger) NMR/EPR electromagnet in a good operating condition. A used MRI imaging resistive magnet is also desirable. Please contact: Michael Chzhan, EPR Labs, Johns Hopkins University, Baltimore, MD, USA; ☎: 1-410-550-2438, FAX: 1-410-550-2448, e-mail: kppu@welchlink.welch.jhu.edu.

## REQUEST FOR ASSISTANCE - MANUAL OR TECHNICAL INFORMATION NEEDED FOR HILGER-WATTS SPECTROSPIN.

Our Department of Physics has received a Hilger-Watts Microspin Spectrometer through the generosity of Louvain University. We have Microspin Amplifier and Detector Type FA 206, Nr. 008, Microspin X Band Generator Type W 903, Nr. 960 H and Newport Pagnoll, England, Electromagnet Type D. We did not receive a technical manual for the spectrometer and urgently need one to complete the setup (we also received no resonance cavity or connection guides). Can anyone, please, help us to obtain copies of the proper manuals for the above items? Please contact Prof. Dr. Ioan Ința, Department of Physics, Transilvania University, Str. Colina Universității, Brașov 2200, ROMANIA.

## OFFERED: HELP IN THE DESIGN AND CONSTRUCTION OF EPR ELECTRONICS

The University of Denver is able to provide design and construction services for EPR-related electronics such as low noise signal pre-amplifiers, timing systems for pulsed EPR, or complete microwave bridges. Contact: Richard Quine at the University of Denver, Denver, CO 80208 USA. E-mail: rquine@diana.cair.du.edu ☎: 1-303-871-2419.

## WANTED TO BUY: USED EPR SPECTROMETER

A unit such as a Varian E-4 or E-9 would be ok. Electromagnet (or cavity) is not necessary. If you know of an available unit please contact Mark Rubinstein, Naval Research Laboratory, Washington, DC, 20375, USA; ☎: 1-202-747-4207.

## FIELD SCAN CARDS AVAILABLE FOR COMPUTER CONTROL OF VARIAN FIELD CONTROLLERS

Any Varian magnetic field controller can be modified to permit control of the magnetic field by a computer. An improved scan card design with better documentation at a lower cost is available from the University of Denver. Contact Richard Quine at the University of Denver, Denver, CO 80208 USA; e-mail: rquine@diana.cair.du.edu; ☎: 1-303-871-2419.



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## ANNOUNCEMENT

The National Academy of Sciences Office for Central Europe and Eurasia is offering the following support to American scientists interested in visiting the former USSR or Eastern Europe in 1994 or 1995: *Collaboration in Basic Science and Engineering (COBASE): Long-Term Grants and Short-Term Project Development Grants With the Former USSR and Eastern Europe*. To apply, contact the National Academy of Sciences Office for Central Europe and Eurasia (F0 2014), 2101 Constitution Avenue, NW, Washington, DC, 20418, USA; ☎: 1-202-334-3680.

## MAILING LISTS FOR SCIENTIFIC MEETINGS

If you are planning a scientific conference, you may contact an officer of the International EPR Society or the IERC to obtain a list of the 1,000+ Society members for use in issuing invitations. If you would like to have preprinted mailing labels, Martha Moore, who provides secretarial support for the Society, can do this at cost -- approximately \$50.00 (includes cost of labels, postage and, if you wish, a disk copy of the list in ASCII format). Labels for the entire database (3,500+ members and non-members) would cost approximately \$175.

### Officers of the IES:

President	Keith McLauchlan Oxford University South Parks Road Oxford OX1 3QZ, UK
Vice President	Karl Hausser Max-Planck Institut Jahnstraße 29 D-69120 Heidelberg Germany
Secretary	Arthur Schweiger ETH Zentrum CH 8092 Zurich Switzerland
Treasurer	David Greenslade University of Essex Colchester CO4 3SQ, UK
Past President	Harold M. Swartz Dartmouth Medical School HB 7252, Strassenburgh Hall Hanover, NH 03755-3863, USA
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## CORRECTED & NEW ENTRIES FOR THE ADDRESS DIRECTORY

(Published for IES Members in  
Volume 5, No. 2, Summer, 1993)

(A new directory will be distributed to  
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**Prof. Dean Wilcox**  
Dartmouth College (not Univ.)

# EPR NEWSLETTER

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Page 1

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Editor: R. Linn Belford, Urbana, IL (address below).  
Assistant Editor, Becky Gallivan, Urbana, IL (address below).  
This publication is the official newsletter of the INTERNATIONAL  
EPR(ESR) SOCIETY. It is supported by the Society, by corporate  
and other donors, and by three national EPR/ESR centers in the  
USA:

**National Biomedical ESR Center**, Prof. James S. Hyde, Director  
Medical College of Wisconsin, MACC Fund Research Center  
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E-Mail: cfelix@mis.mcw.edu

**Biotechnology Resource in Pulsed EPR Spectroscopy**, Prof.  
Jack Peisach, Director. Albert Einstein College of Medicine,  
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Bronx, New York 10461, USA. ☎: 718-430-2175.  
FAX: 718-829-8705. E-mail: peisach@aecom.yu.edu

**Illinois EPR Research Center (IERC)**, Prof. R. Linn Belford,\*  
Director; Prof. Harold M. Swartz,<sup>†</sup> Co-Director; Prof. Robert B.  
Clarkson,\* Assoc. Director; Prof. Peter G. Debrunner,\* Co-  
Principal Investigator; other senior staff: Prof. Mark J. Nilges,\*  
Dr. Alex Smirnov,\* Laboratory Manager at Urbana, Dr.  
Tadeusz Walczak,<sup>†</sup> and Dr. Jim Liu,<sup>†</sup> Laboratory Manager. at  
Dartmouth  
\*University of Illinois at Urbana, 190 MSB, 506 South  
Mathews, Urbana, IL, 61801, USA. ☎: 217-244-1186. FAX:  
217-333-8868. E-mail: ierc@uiucvmd.bitnet or  
rbelford@uiuc.edu  
IERC also operates a satellite site for EPR *in vivo* at  
<sup>†</sup>Dartmouth College, Hanover, New Hampshire; ☎: 603-650-  
1955; FAX: 603-650-1935. E-mail:  
harold.swartz@dartmouth.edu

All these Centers, Research Resources sponsored by the National  
Institutes of Health, cooperate to facilitate research involving EPR.  
Prospective users may contact the staff at any of the Centers.

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## NORRIS, LEBEDEV, & MÖBIUS WIN 1994 ZAVOISKY AWARD—

The Zavoisky Award was established in 1991 by the Kazan Zavoisky Physical-Technical Inst., Springer-Verlag Wien, New York, the Kazan State University, and the Academy of Sciences of the Tatarstan Republic under the auspices of the international EPR community, for the purpose of recognizing outstanding contributions to the development of EPR. Zavoisky Laureates of previous years are Dr. William Mims (USA), Prof. Brebis Bleaney (UK), and Prof. A. Schweiger (Switzerland). The Zavoisky Laureates for 1994 are Prof. Dr. James R. Norris, Jr. (Argonne), Prof. Dr. Yakob S. Lebedev (Moscow) and Prof. Dr. Klaus Möbius (Berlin).

Prof. Dr. J. R. Norris, Jr., Zavoisky Laureate, is distinguished for his work in electron paramagnetic resonance and, in particular, his innovative contributions to the elucidation of molecular structure of paramagnetic species in photosynthetic reaction centres.

Prof. Dr. Ya. S. Lebedev and Prof. Dr. K. Möbius, Zavoisky Laureates, are distinguished for their work in electron paramagnetic resonance and, in particular, for their contributions to the development of new EPR methods and their applications in chemistry.

The presentation was made by the President of the Tatarstan Republic M. Shaimiev. The President of the Tatarstan Academy of Sciences M. Khasanov, Prof. A. Schweiger, the general secretary of the International EPR (ESR) Society. The Rector of Kazan University, Prof. Yu. G. Konoplev, warmly congratulated the laureates.

## PROF. E. LIPPMAA AWARDED THIS YEAR'S AMPÈRE PRIZE—

The AMPÈRE Prize, established in 1990, is awarded for the most significant development in magnetic resonance technique. Former prize winners are Prof. R. Ernst (1990) and Prof. J. Jeener (1992). Prof. H. W. Spiess announced the decision of the Ampère Society that the 1994 Ampère Prize winner is Prof. E. Lippmaa (Tallinn). He is distinguished for his contributions to the development of solid state high-resolution magnetic resonance.

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## *FROM THE EDITOR*

This is the second annual EPR Newsletter Directory issue, giving addresses, scientific interests, and contact information on recipients of the Newsletter and on International EPR (ESR) Society members. Many of you have reported that you find this list very useful. But please let us know if you find errors, out-of-date entries, or omissions. Also, tell us if you know of others who should be added to our mailing list for the annual public issue, or who should be invited to join the Society. (Please note: This list is published for the exclusive use of members of the IES and may not be used for other purposes without written permission.)

I reiterate a message from the last issue: Have you paid your dues to the International EPR(ESR) Society (IES) for this year? It's easy to overlook! And please help recruit some new members, both individuals and companies. The latest corporate supporter to join is Varian. Welcome!

Linn Belford

## ◆ *IES AFFAIRS* ◆ *ANNOUNCEMENTS AND REPORTS FROM THE INTER- NATIONAL EPR SOCIETY*

### *From the President —*

As I write, the celebrations for the 50th anniversary are over, following very successful meetings in Kazan and Denver. In Kazan, three of our members received the Zavoisky awards for the year--Jim Norris, Yakov Lebedev and Klaus Möbius; no more worthy trio could be imagined and their many friends will be delighted. The meeting saw the establishment of a Russian ESR group, affiliated to the IES. The Denver meeting not only was exciting scientifically, but Sandra and Gareth Eaton organised an evening of sheer nostalgia following an excellent dinner and reception. Some who had been in the research field for over 30 years reminded us of early difficulties and breakthroughs. Jim Hyde even produced a photograph of Yevgeny Zavoisky himself, whilst Michael Baker described life as an early research student in Brebis Bleaney's laboratory where he had to make his own oscilloscope before he could see a resonance. Sandra and Gareth were warmly thanked for a truly delightful

evening.

I attended another excellent meeting, the second official joint meeting of the (now nine) EPR/ESR groups in Europe, which was held in Paris. This meeting saw the maturing of this confederation from an ad hoc arrangement run by a steering committee under the Chairmanship of Klaus Möbius to a fully organised one under the Presidency of Marina Brustolon. As she said, the word President is nicely asexual. We congratulate her upon her deserved appointment. I am delighted to report that the IES will in the future be associated with the meetings of this group, held every three years in a different country, the next in Leipzig, Germany, in 1997.

Throughout the summer, the response I have received as President of the Society on its affairs has been extremely gratifying. Its role has become more defined in people's eyes. Through not arranging meetings itself (rather adding its support to existing ones) it is not seen as a competitor by the national societies, whilst the Newsletter (and all it contains) and the database are seen to provide unique and increasingly useful services to the community. Our international nature and position have been firmly established. We owe debts to all who have brought us to this position, and especially to Hal Swartz, Linn Belford and Becky Gallivan for all their generous work.

A well-attended business meeting was held in Denver in which several recommendations were made which have now been put to the International Council for ratification. These include recommendations on awards and the establishments of Fellowships both of which are described in more detail elsewhere in this Newsletter. They also include a less popular proposal to increase our subscriptions by \$5 a year from next year. This is sad, but necessary if the Society is to continue to prosper. Once again, may I ask that anyone with industrial or publishing contacts could help in increasing our sponsorship income if they have the opportunity? This is more attractive now that we have tax-exempt status. Other vitally important Society matters decided recently are covered under separate headings in the rest of the Newsletter.

May I remind everyone that we welcome comment of any kind concerning the Society through the columns of the Newsletter, or by direct contact with the President.

Keith A. McLauchlan, President of IES  
Oxford University, Oxford, UK

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## Japanese Treasurer

We are delighted to announce that Dr. Hiroaki Ohya-Nishiguchi of the Division of ESR Technology of the Institute for Life Support Technology of the Yamagata Technopolis Foundation in Yamagata has kindly agreed to become the Regional Treasurer for the Society in Japan. This will allow our Japanese colleagues to pay their subscriptions inside Japan, and we hope that this will help to increase our membership there. Members will be aware of the great and growing contribution to ESR now coming from Japan across many areas of applications, and we look forward very much to establishing closer contacts with them.

## Fellowships of the Society

For some time the Committee has been exercised by the thought that many very distinguished EPR/ESR scientists who are either retired or about to retire have not received the recognition to which they are due from their colleagues simply because most international awards in the subject have only recently been made. Whilst not wishing to exclude them from consideration now, our inclination is to ensure that they are properly recognised independently of the award system.

A proposal was therefore made, and accepted, at the Denver meeting that we should create Fellowships of the Society to recognise truly outstanding achievements in electron paramagnetic/spin resonance amongst these scientists (hopefully members). The highest international standards are to be applied to the recognition of those worthy of this distinction, and their formal connection with the Society will enhance its own image.

Nominations should be made in confidence to Keith

McLauchlan before March 1, 1995, and will be considered by the Committee, afforded as appropriate.

## Awards

We are pleased to announce that agreement has been reached between the British and Russian Groups and ourselves to co-operate in the award of the Bruker and Zavoisky Prizes and our Gold Award each year, with each group invited to make input into the selection of each, but with the final choice left to each group. The area of research interest is to rotate between the groups each year, with the loosely-interpreted categories, chemistry, physics and instrumentation, and biology and medicine; these are expected to be interpreted liberally and not to be restrictive.

In the coming year, the IES award will be in Chemistry, the Bruker in Biological Chemistry and the Zavoisky in physics/instrumentation. Prof. Larry Berliner continues as Chairman of the Gold Award committee, and will welcome nominations for this. The Bruker prize-winner was chosen before the agreement was made, and will be Prof. H.M. McConnell (although we cannot imagine any quarrel with this!).

The existing Silver Awards of the Society are to continue, and the Young Research Worker's Award is to be re-instated.

All awards carry small monetary prizes (\$500, \$300 and \$200 respectively) which may be used as meeting expenses, if wished. The Society does not provide separate travel/accommodation expenses to the meetings where they are awarded. It is regretted that the Society is also unable to make travel grants to its members, and the policy of providing them to our younger members is suspended. We hope to re-introduce the policy as our finances improve.

Nominations for all awards are required by March 1, 1995. Awards are not restricted to IES members, but the awards committees may take membership into account when deciding the award winners.

**Gold Medal:** 1995 Gold Medal, recognizing benchmark contributions to EPR spectroscopy in chemistry. Nominations to Prof. Larry Berliner.

**Silver Medals:** One each in the general areas of Chemistry, Physics/Instrumentation, and Biology/Medicine. To propose names, please send your suggestion(s), or

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## OXFORD INSTRUMENTS

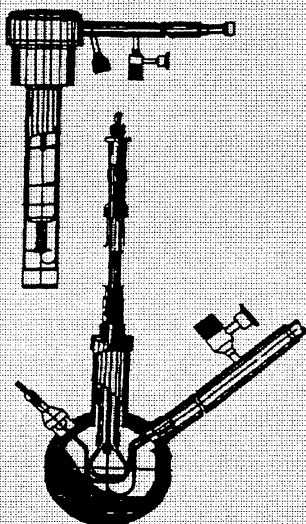
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preferably full nomination(s), to the appropriate Silver Awards Subcommittee(s): *For Physics and Instrumentation* - Jim Hyde, Chair; John Pilbrow, George Feher, & Jan Stan-kowski. *For Chemistry* - Bruce Gilbert, Chair; J. Sohma, Jim Bolton & Kev Salikhov. *For Biol./Medicine* - Harold M. Swartz, Chair; Marjeta Sentjurc, Hideo Utsumi & Tadeusz Sama.

**Young Investigator Awards:** One Young Investigator award each year; "young" is defined as less than 7 years since the Ph.D. degree. Nominations to Prof. Keith McLauchlan.

### Software Committee

After several years of work on our behalf, Dick Cammack has decided to pass on the Chairmanship of the Software Committee to another. We are extremely grateful for all that he has done, along with Reef Morse and Keith Madden. Software and computing, together with the database to which Peter Gast has contributed so much, has been an outstanding success of the Society and the Newsletter, and the two have played a major part in the international acceptance of the Society as useful to the EPR/ESR community. Reef's list-server is also growing in reputation and usefulness daily.

We are extremely pleased to announce that Reef (Philip D.) Morse II has taken over as the new Chairman of the Section.

Keith A. McLauchlan

### From the New Chair of the IES Software Committee

Greetings to all of you. As the new chair of the Software Committee of the International EPR Society, I'd like to take this opportunity to thank Professor Richard Cammack for his tireless efforts in making this committee an important element of the Society. Prof. Cammack has developed the software database and contributed to the Computer Corner in the EPR Newsletter, as he will continue to do. There is probably much that he has done of which I am unaware; it seems strange to condense years of his efforts into a single paragraph. He has helped positioned the Society to truly participate in the networking and information revolution.

We are embarking on several new projects. I wish to emphasize that much of this has occurred simply through the volunteer efforts of interested persons. This is exactly the kind of effort we need; dedicated, interested people who can contribute their resources (both computational and temporal) to developing information databases which we all can use. In particular, there is a growing effort to establish a spectral database which actually will include spectral data as well as a description of the spectra themselves. We even have pictures of spectra available. While that may sound trivial at this point, we are working to convince ourselves that the actual distribution and accession of this data is possible over the Internet. For further information on this project, see the Computer Corner in the next issue, Vol 6 #3.

My job, as I see it, is to serve you, the developers and users of computational facilities related to EPR. Please let me know what you need. The best way to contact me is by electronic mail addressed to reef@xenon.che.ilstu.edu. We are looking for others who are interested in contributing to this work, so let me know what your interests are. Also, we are always on the lookout for contributions to the Computer Corner of the EPR Newsletter. You may send your contributions to me if you wish.

I look forward to serving you for the next year(s) as your chair. I'd also like to thank all of you who have been contributing on a regular (and irregular) basis to the Newsletter and to the various projects which we are undertaking. It is a pleasure to interact with such a dynamic and enthusiastic group of colleagues.

Reef (Philip D., II) Morse

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## From the Treasurer

On paying your subscription - a message from the treasurer:  
From experience it seems that not everyone in the EPR community is aware of some of the snags encountered in paying sums of money to another country. If you wish to send money to the U.S.A. from another country, you must use a draught or international money order drawn on a U.S. bank. If you just write a cheque (or check!) in dollars drawn, for instance, on a German bank, it will cost about \$25 to collect the funds in the U.S. The same rule applies elsewhere. That is why we have a Eurocheque-paying facility in the U.K. If you write a Eurocheque for seventeen pounds, then I can pay it into the society's account here in the U.K. and be credited with seventeen pounds. You will have to pay a relatively small charge when the amount of the cheque is debited to your account. Incidentally, when writing a Eurocheque, please fill in the guarantee card number on the back of the cheque - it causes the money immediately to be credited to our account. If you cannot pay in Eurocheques or U.S. dollars easily and cheaply, then think of forming a local payment collective, as the same transfer charge is levied on ten dollars as on a hundred! Please contact me if you wish to make such an arrangement for a local or regional group.

We welcome Dr. Hiroaki Ohya-Nishiguchi of The Institute of Life Support Technology Yamagata Technopolis Foundation, 683 Kurumanomae, Numagi, Yamagata 990 as our Japanese area treasurer. Japanese members can now pay their membership fee direct to him in the Yen equivalent of the dollar membership fee.

Since I took office in mid-year, we have been attempting to come to grips with the problems associated with transoceanic transfer of responsibility for the central accounts and an intercontinentally distributed set of regional treasury accounts. The largest account is in the U.S.A. This is, of course, sensible since our largest expenditure is on the Newsletter, so ably produced by the staff at the IERC at Urbana, Illinois, and the records maintenance and other office operations that they carry out for the Society. On your behalf I thank them for what most people I have spoken to believe to be most worthwhile services. I also thank Dr Chris Felix for his work as U.S. treasurer - a time-consuming task. It appears that the financial transition has finally been accomplished and that the associated accounts problems are cleared up now. The modest increase in membership fee (US\$5, starting next year) will help a great deal, as our resources were becoming inadequate to meet our expenses. However, we shall continue to keep monitoring the balance between expenses and income in an effort to maintain the financial health of your Society.

David J. Greenslade, IES Treasurer  
University of Essex  
Dept. Chem. & Biol. Chem.  
CO4 3SQ Colchester, UK  
e-mail: greed@essex.ac.uk

## Treasurer's Financial Report

Accounts of the Society for January 1 - December 31, 1993:

### INCOME:

Membership fees:	
Collected by S.S.E. ....	\$3,607.00
(includes \$500 transfer from D.J.G.)	
Collected by C.F. ....	\$6,007.77
Sub-Total <sup>(note 1)</sup> .....	\$9,614.77
Industrial Sponsorship:	
Collected by S.S.E. ....	\$1,100.00
Collected by C.F. ....	\$3,400.00
Sub-Total .....	\$4,500.00
Interest:	
Collected by S.S.E. ....	\$323.25
Total Income .....	\$14,438.02

### EXPENDITURE:

University of Illinois (Newsletter/database) <sup>(note 2)</sup> (staff costs, supplies and services)	
S.S.E. ....	\$4,879.88
C.F. ....	\$2,080.59
Sub-Total .....	\$6,960.47
Denver Workshop proceedings (S.S.E.) .....	\$418.19
Gold medal award (S.S.E.) .....	\$1,013.44
Bank Charges &	
Currency Exchange Fees - C.F. <sup>(note 3)</sup> .....	\$377.99
Treasurer Postage .....	\$151.00
Student Travel Awards Bursaries C.F. ....	\$1,450.00
Total .....	\$10,371.09
Reserves: Brought forward from 1992 .....	\$18,288.96
Excess of Income over Expenditure 1993 .....	\$4,066.93
Total .....	\$22,355.89
\$22,355.89 on deposit as of 12/31/93 in the following accounts:	
S.S.E. ....	\$17,007.70
C.F. ....	\$5,348.19

### Notes:

1. Funds collected by the former treasurer, S.S. Eaton and by the Regional U.S. treasurer, C. Felix, and in the U.K. (in sterling) by D. J. Greenslade, (see below).
2. Some 1993 expenditures at the University of Illinois for services were reimbursed in 1994 so are not shown here.
3. Currency exchange fees can be reduced greatly if members will heed the suggestions in "From the Treasurer" on this page.

### U.K. Account

#### INCOME:

Membership fees .....	£941-50
Interest on bank account .....	£1-11
Total .....	£942-61

#### EXPENDITURE:

Student Travel Awards .....	£170-65
Transfer to U.S.A. (\$500 to S.S.E, see above) ....	£346-91
Total .....	£517-56
Reserves: Brought forward .....	£128-78
Excess of Income over expenditure .....	£425-05
Total .....	£553-83



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## THE COMPUTER CORNER

*Edited by Philip D. Morse II, Keith P. Madden,  
and Richard Cammack*

The Computer Corner is a feature of the EPR Newsletter. Currently it is edited by Reef Morse, Keith Madden, and Richard Cammack with assistance from Graeme Hanson. Submissions can be sent to any of the editors, whose e-mail addresses are, respectively: (reef@xenon.che.ilstu.edu), (keith.p.madden.1@nd.edu), (udbc033@hazel.cc.kcl.ac.uk), (graeme@cmr.uq.oz.au). Submissions may be edited; on request, substantially edited versions will be sent to the sender for approval prior to publication.

### *The Illinois Servers*

As described in previous EPR Newsletters there are two EPR software servers located in central Illinois but accessible worldwide – the Anonymous FTP server in the Illinois EPR Research Center at the University of Illinois at Urbana/Champaign, and the EPR-List server maintained by Reef Morse at Illinois State University (ISU) in Normal. The managers of these systems keep in close contact. For the most part, they do not duplicate material, so you may want to check both. We have agreed that the IERC Anonymous FTP server will concentrate on listing non-commercial EPR software (spectral simulation routines, etc.), while the commercial software will be listed on the ISU EPR-List server. Both will entertain appropriate EPR-related electronic-bulletin-board conversations. Recently, the ISU EPR-List server has been used quite heavily for discussions on how to organize EPR spectral databases.

### *Anonymous FTP Server at IERC*

To get initial access, you should issue the *ftp* command to *rlb6000.scs.uiuc.edu*. When prompted for a password, enter your full E-mail address. Retrieve the file *README.1ST* and read it. It explains the organization of the server, from which you may retrieve the material you want and on which you are invited to place information. Dick Cammack's EPR Software listings, recently updated, are there.

### *EPR-List Server at ISU*

For those of you who are not yet subscribers to the epr-list, you can sign on as follows. Send an E-mail letter to *epr-list-request@xenon.che.ilstu.edu* with the single word *SUBSCRIBE* somewhere in the body of the letter. You will receive a response from the list server saying that you have been enrolled and describing the commands that you can use to get information from the requestor. To send letters to the list, use the addresses *epr-list@xenon.che.ilstu.edu*. The list is available to anyone interested in or using EPR and related techniques. (We beg our colleagues' indulgence in using just one term - EPR - to refer to the resonance phenomena known variously as EPR, EMR, and ESR and also ENDOR, TRIPLE, ESEEM, ferromagnetic resonance, etc. We just want to keep our prose

simple.) Often, initial contacts made through the epr-list server establish connections for future help, information, or repair questions. The major EPR manufacturers as well as many repair and advice personnel, both from the manufacturers and independents, and many software consultants, subscribe to the epr-list server. Chances are, your questions can be answered quickly and efficiently through this server.

Currently, most conversation centers around the development of EPR spectral databases..

### *Coming in the Next Issue*

At last, EPR has made it onto the Internet and the World Wide Web! Look for details in the Computer Corner in the next issue of the EPR Newsletter. That issue will contain the following:

"Discussions Regarding the Establishment of an EPR Spectral Data Base and Access to Trial Databases over the Internet" by Reef Morse & Graeme Hanson and including comments from Alexander Shames, Richard Cammack, Francisco Jent, and Czeslaw Rudowicz;

"Preliminary Test of a World Wide Web Electron Paramagnetic Resonance Spectral Database." by Richard Partridge, John Maher, Reef Morse, & David Duling;

## *Building The Perfect Beast*

*Chris Bender*

*NIH Biotechnology Resource  
for Pulsed EPR*

Springer-Verlag recently published an electronics textbook entitled 'Electronics via Waveform Analysis'<sup>1</sup>, which purports to be a guide to and text of circuits by illustrating typical output waveforms of various circuits common to instrumentation. I like the book and its premise (although I would recommend Horowitz and Hill's book<sup>2</sup> as a primary text for autodidacts), and it provided the inspiration for this article, which I hope to be a regular Newsletter feature that complements Cammack, Morse & Madden's Computer Corner.

I plan to divide the coverage between short practical guides to relevant circuits and their behavior, on the one hand, and interesting emerging trends in electrical engineering, as culled from IEEE journals, on the other. To set the stage, and perhaps issue a cautionary disclaimer, I just want to mention at the onset that I have been able to learn the engineering basis of EPR through epic struggles with our home-built spectrometer, 'dissecting' some old equipment of Blumberg and Mims, and annihilating a few Heathkit trainers. I'm formally trained as a theoretical chemist, so take much of what I write here in the spirit of what they really are: rainy weekend projects and on-the-job training. It is all an adventure.

It makes sense to mention at this point that I have found numerous electronics books that are invaluable for practical

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information. In the laboratory situation, these types of books are the best texts, instead of the traditional electrical engineering textbooks which tend towards the theoretical. I have listed them as a bibliography at the end of this article.

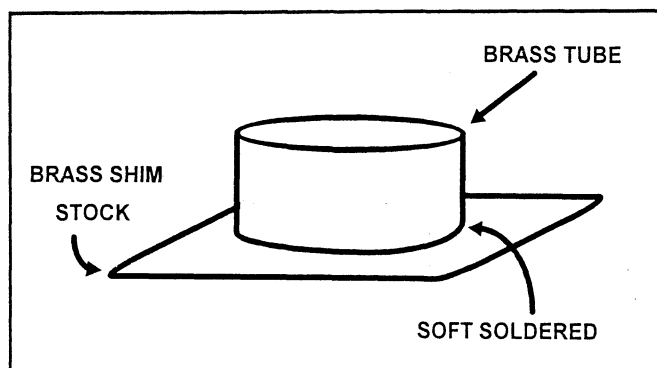


Figure 1: Quick and dirty cavity for prototyping. Telescoping brass tubing is soldered to brass shim stock as two nesting pieces. Concentric tubes yield a quick prototype of coaxial or reentrant cavities.

1. E.C. Craig, *Electronics via Waveform Analysis*, Springer-Verlag, Berlin 1993. There is also a laboratory manual for this text and by the same author.
2. P. Horowitz and W. Hill, *The Art of Electronics, 2nd. ed.*, Cambridge University Press, NY 1989. ditto on the lab manual.

## QUICK AND DIRTY CAVITY PROTOTYPING

It is possible to prototype cavity resonators for EPR cheaply and easily. The principal aim was to avoid the machine shop during prototyping, and thereby avoid shop costs and turnaround time wasted on designs that don't work. In short, I buy telescoping brass tube from Small Parts from which I make 'half cavities' that slide together. The tubing can be obtained in cylindrical sizes from 1/16" to 1" (telescoping) and up to 3" (if you don't need the telescopic feature). Rectangular tubing is not available, but the technique I use is readily adapted for sections of waveguide. The material is cheap and easy to cut with either a hacksaw or a pipe cutter. In moments of desperation, shipping cans from Aldrich can be used.

To prepare a proto-cavity, I solder a piece of brass shim

stock onto one face of the brass tube and drill into this an aperture for coupling. Figure 1 depicts one half of a cavity prototype. Two such pieces are nested during assembly to yield a complete resonator. The ability to open the thing up has the added advantage of making it easy to alter the interior (loading, physical deformation, etc.) and study its effect on the resonance properties.

Coupling to the cavity during the test is achieved via a 0.141" coax section fashioned as a loop or open ended probe. For testing, I use an old HP8650B sweep oscillator with several tubes to cover frequency range of 4-18 GHz. This equipment can be found on the used equipment market for about \$1000 and is sufficiently accurate for hashing out a cavity design. My bench setup is schematically illustrated in Figure 2, and it consists of an isolator, wavemeter, circulator, and crystal detector. I find an attenuator unnecessary because power control of the oscillator is adequate; however, one could use a 0-20dB attenuator (HP\_375 series; the \_ is meant to designate the operating frequency band: J, H, X, etc.).

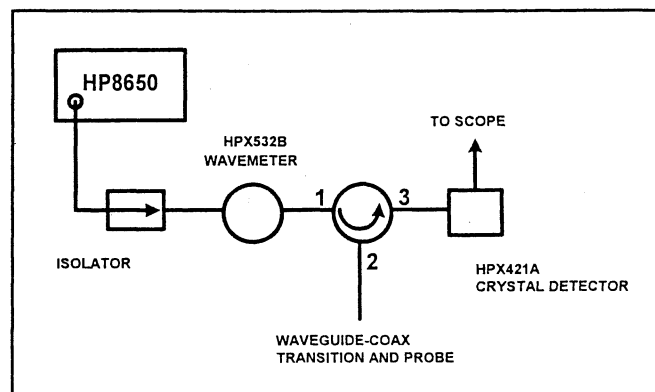


Figure 2: Apparatus for testing cavities. With this relatively setup one can measure resonant frequency, Q, and coupling efficiency.

Data are displayed on an oscilloscope. I usually just connect the detector output to one channel of a TEK 475 scope with the timebase synch'd with the 8650B sweeper. The sweeper has a ramp output, however, and can be used to drive a scope that has both X and Y inputs (or, alternatively, one can use an x-y

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recorder). The wavemeter 'pip' provides the frequency reference.

Small Parts, Inc., 13980 N.W. 58th Court, P.O. Box 4650, Miami Lakes, FL 33014-0650 Phone: 305-557-8222 FAX 800-423-9009.

## BIBLIOGRAPHY OF USEFUL ELECTRONICS GUIDES

Besides the books cited above, I recommend:

Gottlieb, I.M. *Practical RF Power Design Techniques*. Tab Books, Blue Ridge Summit, PA 1993.

Carr, J.J. *The Secrets of RF Design*. Tab Books, Blue Ridge Summit, PA 1991. This book contains some very useful information amidst a lot of junk; its more of a 'what' than 'why' guide.

## MICRO-NOW INSTRUMENTS

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EPR spectrometers, components, accessories, and microwave equipment. Model 8320 Magnet Field Controller for replacing older controllers, i.e. Varian Mark I & II and other types. Includes keyboard or controlled by external computer.

8260 N. Elmwood, PO Box 1488, Skokie, IL 60076, USA. ☎: 708-677-4700. FAX: 708-677-0394

DeMaw, M.F. *Ferromagnetic Core Design and Application Handbook*, Prentice-Hall, NJ 1980. Doug DeMaw has written a number of books (occasionally popping up in ARRL catalogs) for the ham radio enthusiast; all are very good in the sense that I found them readable and informative.

ARRL Handbook An annual book published by the Amateur Radio and Relay League. It is a comprehensive guide to radio and is useful with regard to basic rf design. My one complaint is that the writers do a nice job of leading you through the basics, but as soon as the subject gets complicated you are left hanging (this is true of many ARRL books).

Sevick, J. *Transmission Line Transformers, 2nd ed.* Amateur Radio and Relay League, Newington CT 1990.

Fredericksen, T.M. *Intuitive Operational Amplifiers*. McGraw-Hill, NY 1988. Back at Michigan State, I found this McGraw Hill series in intuitive IC electronics in the university's bookstore. They are the textual equivalent of macaroni and cheese; immediately comfortable reading.

Villanucci, R.S.; Avtgis, A.W.; Megow, W.F. *Electronic Technique: Shop Practice and Construction, 4th ed.* Prentice-Hall, Englewood Cliffs, NJ 1991.

Johnson, H.; Graham, M. *High Speed Digital Design: A Handbook of Black Magic*, Prentice-Hall NJ 1993.

Ott, H. *Noise Reduction Techniques in Electronic Systems, 2nd ed.*, Wiley NY 1988.

Barnes, J. *Electronic System Design: Interference and Noise Control Techniques*. Prentice-Hall NJ 1987.

Davies, E.R. *Electronic Noise and Signal Recovery*. Academic Press, London 1993. (yes, this is the guy of ESE-ENDOR fame)

Huxley, L.G.H. *A Survey of the Principles and Practice of Waveguides*. Macmillan, NY 1947.

Reintjes, J.F.; Coate, G.T. *Principles of Radar*. McGraw-Hill, NY 1952.

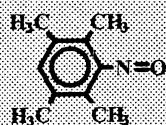
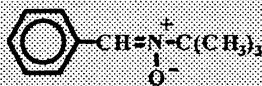
Barlow H.M.; Cullen, A.L. *Microwave Measurements*. Constable & Co., London 1950.

Slater, J.C. *Microwave Transmission*. McGraw-Hill, NY 1942. A very readable intro to the theory.

Smith, P.H. *Electronic Applications of the Smith Chart*. Krieger, Malabar, FL 1983.

Caron, W.N. *Antenna Impedance Matching*. ARRL Press, Newington, CT 1989. The Smith and Caron books are the only decent books on how to use a Smith chart that I have been able to find.

MIT Radiation Laboratory Series. This is a compendium of the WWII radar research conducted at MIT. The information is dated, but you will not find better reading for learning about nuts and bolts microwave engineering. In particular, you will find cutaway drawings of those mysterious waveguide components that are so intriguing. Its 28 volumes (many volumes, such as CRT design, are of considerably less use than others) are now out of print and occasionally appear in used book stores (for some odd reason, I found many in a dingy store in New Orleans). The Reintjes and Huxley books cited above are excellent one-volume substitutes.

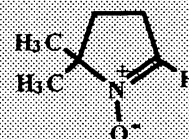
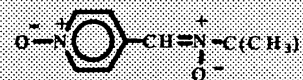


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Chang, K. *Handbook of Microwave and Optical Components*, in 4 Vols (skip 3 & 4 unless optics is a passion). Wiley NY 1990.

Smith, B.L.; Carpentier, M.-H. *The Microwave Engineering Handbook*, in 3 Vols (skip vol. 3). Van Nostrand-Reinhold, NY 1992.

These two series are the modern equivalent to the Rad Lab series and their emphasis is on solid state microwave devices. In other words, they're great if you want to know what is inside those hermetically sealed devices and how to design them, but you will find only a limited discussion of waveguide design. Volume 1 of the Chang series is the most generally useful for EPR. Both series require a second mortgage.

Another good source of information are design guides published by various manufacturers of components. A sampling:

- Amplifier Applications Guide
- Mixed Signal Design Seminar
- High Speed Design Seminar
- Nonlinear Circuits Handbook (all from Analog Devices)
- Data Acquisition Databook (National Semiconductor)
- Applications of Operational Amplifiers: Third Generation Techniques (Burr-Brown)

Finally, I have consulted several books while trying to come to grips with signal processing. None of these are exactly readable (and a couple left me catatonic), but they are useful if you are at all interested in FFTs and their ilk.

Fante, R.L. *Signal Analysis and Estimation*. Wiley NY 1988.  
Oppenheim, A.V.; Schaffer, R.W. *Discrete Time Signal Processing*, Prentice-Hall, Englewood Cliffs, NJ 1989. Part of an extensive series on signal processing.

Shiavi, R. *Introduction to Applied Signal Analysis*. Irwin, Homewood, IL 1991.

Proakis, J.G.; Manolakis, D.G. *Introduction to Digital Signal Processing*. Macmillan, NY 1988.

## TIPS & TECHNIQUES

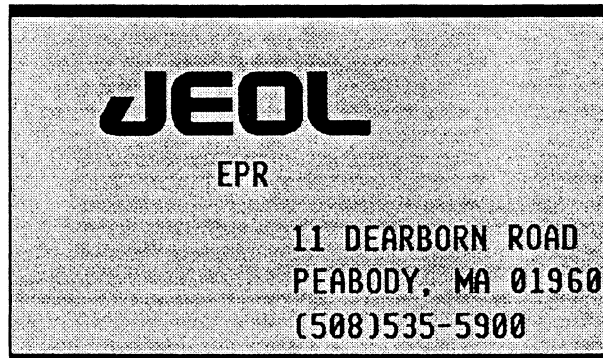
### Miscellaneous Tips for EPR Users

James R. Anderson  
Research Specialties  
5629 N. Maplewood, Chicago, IL 60659  
☎/FAX: 1-312-728-6570

1) Extending klystron life is possible by running the filament voltage slightly lower than normal. This is particularly useful when installing a new klystron. The filament voltage can start as low as 5.5-5.75 volts and can be incremented up as the klystron ages to compensate for lowered emission. This item has been discussed with the Varian tube division and is routinely done on high power tubes.

2) The Varian recorder stepper drive toothed pulley sometimes slips, yielding altered scan times or other erratic

behavior. Tightening the clamp screw will solve this problem.



3) Additional caution on the Varian hall probe regarding its fragile nature: The hall element is supported by a small patch of foam rubber which presses the element against the mylar taped copper mounting plate. The fine wire connections to the element allow for the pressure of the foam rubber to position and maintain thermal contact to the plate as well as establish the required parallel position to the pole face. The main problem is the small patch of foam rubber is deteriorating from age and the stability of the hall element position is at risk if the hall probe is disturbed. In the worst case, this could enhance the breakage of leads or minimally allow the element to shift, reducing thermal contact and permitting an out of parallel condition to exist, changing the calibration of the probe. So don't disturb the probe unless absolutely necessary and if the magnet system is moved, minimize mechanical shock, which should be the case in general. (If you check the foam rubber in the wooden cavity cases that came with your spectrometer you can get an indication of the deterioration since this foam rubber appears to degrade in a similar fashion.)

## CONFERENCE REPORTS

This year, the International EPR(ESR) Society (IES) co-sponsored two major celebrations of the 50th anniversary of the demonstration of EPR. The first, held July 31-August 1 at the 17th International EPR Symposium in Denver, USA, featured many brilliant lectures by renowned EPR specialists from several continents, gala social events, presentations of IES awards (to Profs. J. Freed, K. McLauchlan, W. Froncisz, and H. Swartz; cf. EPR Newsletter Vol. 5 #3, 1993), and a gala program with fascinating reminiscences by some of those who were there in the early days of EPR. The next, held August 21-28 in Kazan where it all began, was the 27th Congress Ampère (Conveners: Drs. Kev Salikhov and Nail Suliemanov). Nearly 500 scientists from 28 countries participated. The 50th anniversary celebration included presentation of the 1994 Zavoisky Award to Profs. J.R. Norris, Jr., Ya. S. Lebedev, and K. Möbius (see this issue, page 1). Look for an extensive report on this Congress Ampère in the next EPR Newsletter (Vol. 6 #3).

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## NOTICES OF MEETINGS

**2nd WORKSHOP ON LOOP-GAP RESONATORS, NATIONAL BIOMEDICAL ESR CENTER, BIOPHYSICS RESEARCH INSTITUTE, MEDICAL COLLEGE OF WISCONSIN, MILWAUKEE, WI, May 12-13, 1995.**

This workshop is supported by the National Center for Research Resources of the National Institutes of Health, and marks the 20th year of funding for the National Biomedical ESR Center by NCCR. The first day will consist of lectures, while the second day will be devoted to "hands-on" demonstrations, discussions, and tours of the National Biomedical ESR Center. The budget for the workshop is limited, but it is expected that a portion of the living expenses while attending the Conference will be covered. Also, a limited number of travel awards for students may be available. If you are interested in attending, please contact Christopher C. Felix, Ph.D., Scientific Administrator, Natl. Biomedical ESR Ctr., Biophysics Research Inst., Medical Coll. Wisconsin, 8701 Watertown Plank Road, P.O. Box 26509, Milwaukee, WI 53226-0509. ☎: 1-414-456-4000; FAX: 1-414-266-8515; e-mail: cfelix@mis.mcw.edu (INTERNET).

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**IV INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY AND APPLICATIONS, Munich, Germany, May 15-19, 1995.**

The meeting will be held under the sponsorship of GSF. Topics to be covered will be similar to past symposia and will include dose measurements of various types of ionizing radiation, radiation accidents and other biomedical applications including radiation therapy, development of standards and instrumentation (modern EPR, pulsed EPR, double resonance), imaging and dating of archaeological and geological materials. Other topics may be added depending on the interests of participants. The proceedings will be published in a special issue of the *International Journal of Applied Radiation and Isotopes*. A detailed announcement will be forthcoming. In the meantime, the organizers invite interested parties to contact any of the following: Dr. Dieter Regulla, GSF-Institut für Strahlenschutz, Neuherberg, D-85758, Germany; ☎: 49-89-387-2517; FAX: 49-89-3187-2517; Dr. Anne Skinner, Williams College, Dept. Chemistry,

Williamstown, MA 01267; FAX: 1-413-597-4116; e-mail: anne.r.skinner@williams.edu; or Prof. Harold Swartz, Dartmouth Medical School, Dept. Radiology, Hanover, NH 03755-3863, FAX: 1-603-650-1935; e-mail: harold.swartz@dartmouth.edu.

**6th CHIANTI WORKSHOP ON MAGNETIC RESONANCE: NUCLEAR & ELECTRON RELAXATION, San Miniato (Pisa), Italy, May 27-June 2, 1995.**

This well-established series of magnetic resonance meetings in San Miniato will have its 6th edition in 1995. In continuation of the spirit of this series, the present Workshop aims at bringing together scientists involved in theoretical and experimental aspects of nuclear and electron spin relaxation to study the structure and dynamics of molecules.

The main topics to be discussed by NMR and EPR scientists will deal with:

- structure determination of biomolecules
- spin polarization phenomena and processes
- relaxation in paramagnetic systems
- quasi-ordered phases
- spin imaging
- new methodologies

The program will consist of invited lectures and poster presentations. A first circular containing more details will be distributed in due course. Participants are asked to present posters on work related to the topics of the Workshop. They should submit an abstract (max. 1 page A4 format typed single-spaced) of the proposed communication not later than April 15, 1995. Since the total number of participants is limited, acceptance will be on a "first come, first served" basis.

The registration fee is 250,000 Italian Lira for active participants and 120,000 Italian Lira for accompanying persons. The cost of the accommodation, based on sharing a twin-bedded room, plus all meals (including Chianti wine!) will be 700,000 Italian Lira per person.

For further information, please contact one of the following: Prof. Riccardo Basosi (Organizer), Dept. of Chemistry, Univ. Siena, Pian dei Mantellini, 44, 53100 Siena, Italy, ☎: 39-577-295040, FAX: 39-577-280405; Prof. Claudio Luchinat, c/o Dept. Chemistry, Univ. Florence, Via G. Capponi, 7, 50121 Florence, Italy, ☎: 39-55-2757563, FAX: 39-55-2757555; Prof. Carlo A. Veracini (Organizer), Dept. Chemistry, Univ. Pisa, Via Risorgimento, 35, 56100 Pisa, Italy, ☎: 39-50-918266, FAX: 39-50-918260, or the Program Chairman: Prof. Klaus Möbius, Dept. Physics, Free Univ. Berlin, Arnimallee 14, D-14195 Berlin, Germany, ☎: 49-30-8382770, FAX: 49-30-8386046.

**FIRST NSR WORKSHOP ON ADVANCED EPR SPECTROSCOPY, Nijmegen, The Netherlands, June 1-2, 1995.**

This 2-day workshop is organized on the occasion of the retirement of Prof. Dr. E. de Boer as a professor at the University of Nijmegen. With this meeting we would like to honour his



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extensive contributions to the field of EPR. Several aspects of modern EPR spectroscopy will be covered. In particular: Pulsed EPR, high frequency EPR and applications to bio-inorganic systems. Lectures on these subjects will be presented by invited speakers. Participants are invited to present their research in two poster sessions. The number of participants will be limited to approximately 75 persons.

A first circular was distributed in July/August of 1994. For information contact: E.J. Reijerse or D.D. van der Wey, Dept. of Molecular Spectroscopy, University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands. ☎: 31-80-653105 or 31-80-652004; FAX: 31-80-553450; Telex: 48228 wina. email: rey@sci.kun.nl or desiree@sci.kun.nl.

**IV INTERNATIONAL WORKSHOP ON ELECTRON MAGNETIC RESONANCE OF DISORDERED SYSTEMS followed by I INTERNATIONAL SEMINAR ON APPLIED EPR, Sofia, Bulgaria, June 12-19, 1995.** These conferences are organized by the Bulgarian EPR Society in collaboration with Institute of Catalysis, Bulgarian Academy of Sciences and Department of Chemistry, Sofia University. English is the language of these conferences.

a. The aim of the **EMARDIS Workshop** is to cover all qualitative (structural-reactivity, kinetics, etc.) aspects of recent development in theory, experiment, methodology, instrumentation, etc. of EMR (EPR, ENDOR and ESE) spectroscopy of disordered systems through lectures given by the top specialists, selected applicants and round-table discussions. Lecturers scheduled so far include: R. L. Belford, A. Bencini, M. K. Bowman, L. C. Brunel, R. Cammack, A. Colligiani, J.-M. Dance, J. Freed, C. Friebel, J. Forrer, E. Giamello, D. Goldfarb, A. Hoff, M. Iwaizumi, L. Kevan, H. Kurreck, Ya. S. Lebedev, W. Lubitz, G. Martini, S. K. Misra, O. Ohba, M. F. Ottaviani, J. Pilbrow, E. J. Reijerse, B. S. Prabhananda, A. Rockenbauer, J. Stankowski, B. S. Tsukerblat, H. van Willigen, Yuanzhi Xu.

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b. Topics in the **APPLIED EPR Seminar** will include: Fundamental aspects of Quantitative EPR (standards, calibration, metrology and methodology of quantitative measurements, instrumentation - new methods, advanced techniques,

automatization, etc.); EPR Dosimetry (monitoring of high energy radiation effects, high energy radiation processing control in food preservation and sterilization, dating of archeological and geological samples, etc.); EPR in medicine (clinical and biomedical studies); EPR in environmental control; EPR in the petrol industry; EPR and fossil fuels; EPR in polymer chemistry, etc. Expected specialist-lecturers include: B. Catoire, M. Che, S. Duber, K. Dyrek, M. Ikeya, V. Nagy, B. Nickel-Pepin-Donet, K. Ohno, D. Regulla, J. Raffi, R. Sayfutdinov, D. Schmalbein, M. H. Stevenson, H. Swartz, Yu. Tsvetkov, A. M. Wasserman, J. Weil.

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Lectures from the organizers will also be scheduled in the programmes of both events. Original communications will be presented orally or as posters. An abstract book will be available at the meeting. Proceedings with full-text lectures will be published at the end of the year. The deadline for receiving abstracts is February 15, 1995 (high-quality black type single-spaced on white A4 paper in an area limited with 25 mm margins on all four sides; alternatively, send by E-mail if plain text with no formulas, symbols, figures, etc.); the deadline for confirmation of attendance is February 28, 1995. A Second circular of the EMARDIS meeting with some more details including the provisional programmes of the events will be distributed at the end of February, 1995 only to those who respond to the present announcement. *The next EPR Newsletter will contain more detailed information on these conferences (costs, housing, starting and ending events, social programme, publications, etc).*

For further information, contact: N.D. Yordanov (Convener) or M. Zdravkova (Sci. Secretary), Institute of Catalysis, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. E-mail: banchem@bgearn.bitnet. ☎: 359-2-713-2546 or 713-3917 or 724-917; fax: 359-2-756-116 or 720-038; telex: 22729 echban.

**BIOMED 95 3rd ANNUAL CONFERENCE, SIMULATIONS IN BIOMEDICINE, Palazzo delle Stelline, Milan, ITALY, June 21-23, 1995.**

The objective of this Third International Conference on Computers in Biomedicine is to bring together different scientists who work on the application of computers to simulate biomedical



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phenomena, as well as to develop numerical algorithms to analyse, manage and visualise biomedical data. This conference is specifically aimed at scientists throughout the world working on the application of computers to simulate and analyse biomedical phenomena but who may not be fully aware of each other's developments.

The Conference Chairmen are: Prof. C. A. Brebbia (Wessex Inst. Technology, UK), Prof. R. T. Hart (Tulane Univ, New Orleans, USA) and Dr. H. Power (Wessex Inst. Technology, UK). The International Scientific Advisory Committee are: Prof. M. W. Collins (City Univ., UK), Dr. P. R. Johnston (Univ. Tasmania, Australia), Dr. M. Karlsson (Linkoping Univ., Sweden), Dr. L. J. Leon (Univ. Montreal, Canada), Prof. C. J. Lumsden (Univ. Toronto, Canada), Prof. M. D. Nowak (Univ. Connecticut, USA), Dr. M. Tanaka (Osaka Univ., Japan), Mr. A. Urbaszek (Univ. Erlangen-Nurnberg, Germany) and Dr. Y. Xu (City Univ., UK).

#### Conference Topics:

- Simulation of Physiological Processes
- Computational Fluid Dynamics in Biomedicine
- Orthopedics/Bone Mechanics
- Electrical and Magnetical Simulation
- Imaging Processing
- Data Acquisition and Analysis

For information, contact:

Jane Evans, Conference Secretariat *Biomed 95*, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA UK; ☎: 44-703-293-223; FAX: 44-703-292-853; e-mail: cmi@uk.ac.rl.ib; Intl. e-mail: cmi@ib.rl.ac.uk.

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**EPR-95 IES WORKSHOP, Sydney, Australia, July 13-15, 1995.**

On behalf of the organising committee and the Australian EPR community we would like to invite you to a workshop, supported by the International EPR Society, on innovative methods and applications of both continuous wave and pulsed EPR. The workshop will be held at the University of Sydney and is designed to bring together specialists in EPR spectroscopy and users of this technique to allow communication and provide solutions to users' problems. The meeting will be comprised of a series of invited lectures, a poster session Friday night and a

Bruker Users meeting on Sunday. *Conveners:* John R. Pilbrow and Graeme R. Hanson. For a copy of the registration brochure please send your name, address, fax, e-mail and area of interest to Dr. Graeme Hanson, EPR-95, Center for Magnetic Resonance, Univ. Queensland, St. Lucia, Queensland, 4072 Australia; FAX: 61-7-365-3833 or e-mail: epr-95@cmr.uq.oz.au. or to Prof. John R. Pilbrow, Monash Univ, Dept. Physics, Clayton, Victoria 3168, Australia, FAX: 61-3565-3637, e-mail: j.pilbrow@monash.edu.au. All names and addresses will automatically be added to the ISMAR mailing list.

#### ISMAR-95, TWELFTH CONFERENCE OF THE INTERNATIONAL SOCIETY OF MAGNETIC RESONANCE, Sydney, Australia, July 16-21, 1995.

This international conference will have sessions covering all major areas of magnetic resonance, including:

- Advances in imaging and microscopy
- Inorganic and multinuclear NMR
- Chemical applications of NMR
- EPR and applications (joint with IES)
- Proteins and nucleic acids: structure and dynamics
- Developments in multidimensional spectroscopy
- *In vivo* spectroscopy and clinical applications
- Solid state NMR
- Membranes and liquid crystals
- New technology and experimental methods
- Advances in theory and computational methods

Presentations will be via plenary lectures, invited lectures, colloquia and poster sessions, with special invited lectures from some of the pioneers of NMR to commemorate the 50th anniversary of its discovery. A comprehensive trade exhibition will be held in conjunction with the conference. Companies wishing to display magnetic resonance hardware, software or accessories should contact the conference chairman. The social program will give delegates and their companions opportunities to meet informally and to get to know this magnificent harbourside city. We will be suggesting pre- and post-conference tours for those who wish to travel more extensively around Sydney or to other parts of Australia.

For more information, contact Dr. L.D. Field, Chairman ISMAR-95, Department of Organic Chemistry, University of Sydney, Sydney NSW 2006 AUSTRALIA, ☎: 61-2-692-2060; FAX: 61-2-692-3329; E-mail: ISMAR-95@biochem.su.02.au

#### EIGHTEENTH INTERNATIONAL EPR SYMPOSIUM at the 37th Annual Rocky Mountain Conference, Denver, CO, USA, July 25-28, 1995.

For more information contact: Prof. Sandra S. Eaton, Univ. Denver, Dept. Chemistry, Rm. 153 Seely G. Mudd Science Bldg., Denver, CO, 80208, USA; ☎: 1-303-871-3102; FAX: 1-3-3-871-2254; e-mail: seaton@ducair or Prof. Gareth R. Eaton, Univ. Denver, Dept. Chemistry, Denver, CO, 80208, USA; ☎: 1-303-871-2980; FAX: 1-303-871-2254; e-mail: geaton@ducair.

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## 3rd MEETING OF THE SOCIETY OF MAGNETIC RESONANCE, Nice, France, August 19-25, 1995.

For information, *Contact:* Society of Magnetic Resonance, 1918 University Avenue Suite 3C, Berkeley, CA, USA. ☎: 1-510-841-1899; FAX: 1-510-841-2340. SMR can now be reached by e-mail at [info@smrm.org](mailto:info@smrm.org).

## VII INTERNATIONAL CONFERENCE on BIOINORGANIC CHEMISTRY (ICBIC 7), Lübeck, Germany, September 3-8, 1995.

The Scientific Program will be organized around eight plenary lectures, which will introduce topics to be expanded by invited speakers in two parallel sessions and additional microsymbiosia, and by two poster sessions. Tentative topics include:

- Redox reactions
- Hydrolic and group transfer
- Energy transfer, bioenergetics
- Transport, storage, and assembly of metals
- Metals and nucleic acids
- Gene regulation
- Metals in medicine
- Environmental chemistry
- Spectroscopy and specific applications
- — and more

The plenary lectures are: Stephen Lippard (Cambridge), *Synthetic models for and mechanistic studies of methane monooxygenase*; Ken Raymond (Berkeley), *The coordination chemistry of biological iron transport: Iron and disease*; Dieter Sellmann (Erlangen), *Modelling the reactivity of metal-sulfur oxidoreductases*; Britt-Marie Sjöberg (Stockholm), *Ribonucleotide reductase - an ancient enzyme with radical mechanism*; Rolf Thauer (Marburg), *Metalloenzymes involved in methanogenesis*; Andy Thomson (Norwich), *Magneto-optics and metalloproteins*; Anthony Wedd (Melbourne), *Oxo-molybdenum enzymes*; Raymond Weiss (Strasbourg), *Advances in modelling the high-valent iron intermediates of heme proteins*.

Call for posters: Formats required to prepare posters and to publish abstracts will be sent with the second announcement. Abstracts will be accepted for publication in the *Journal of Inorganic Biochemistry* only after receipt of conference fee.

Social events will include a get-together party on Sunday evening, September 3; an organ concert at Marienkirche, Tuesday evening, September 5; optional excursions to the old City of Lübeck, to Mecklenburg, to Schleswig-Holstein, to Hamburg, etc. on Wednesday afternoon, September 6. The official conference dinner will be held on Friday evening, September 8. There will also be a panorama of daytime events for accompanying persons who are not engaged in the scientific program.

For further information, contact either one of the Conference Chairs: Alfred X. Trautwein, Institut für Physik, Medizinische Universität, Ratzeburger Allee 160, D-23538 Lübeck,

GERMANY. ☎: 49-451-500-4200; FAX: 49-451-500-4214; e-mail: [icbic7@miraculix.physik.mu-luebeck.de](mailto:icbic7@miraculix.physik.mu-luebeck.de) OR Karl Wieghardt, ☎: 49-234-700-4153; FAX: 49-234-700-4109.

**II INTERNATIONAL WORKSHOP ON *IN-VIVO* ESR AND ESR IMAGING, L'Aquila, Italy, September 10-13, 1995.** It will cover the following topics: EPR instrumental development, new technologies, EPR imaging, low frequency EPR, *In-Vivo* EPR, Spin Trapping, Oxymetry and Advances in Biophysical Applications. For further information and to be included in the mailing list please contact: Prof. Antonello Sotgiu, Dept. STBB, University of L'Aquila, Via Vetoio, Coppito, 67100-L'Aquila, Italy. Fax: 39-862-433-433, E-Mail: [sotgiu@vxscqaq.aquila.infn.it](mailto:sotgiu@vxscqaq.aquila.infn.it).

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## VII INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE (ISMRCIS VII), Madrid, Spain, September 11-15, 1995 (Preliminary).

Consejo Superior de Investigaciones Científicas (CSIC) in Madrid, Spain, September 11-15, 1995, is a continuation of the previous triennial conferences on the same subject started in San Francisco, USA (1976) and followed on in Menton, France (1979), Torun, Poland (1983), Muenster, Germany (1986), Newark, Delaware, USA (1989) and Firenze, Italy (1992). These symposia have become a major event whose aim is to provide a forum for physicists, chemists, and biologists at which to present and discuss their recent research in the field. The program will include plenary and invited lectures as well as oral and poster presentations. The official language is English. The proceedings will be published as full articles in an archival scientific journal.

*Topics:* Among the topics to be covered are:

- Adsorption, Catalysis and Surface Chemistry
- Interfacial Coordination Chemistry
- Molecular Sieves, Zeolites and Silicate Surfaces
- Intercalation Compounds
- Advanced Materials, Ceramics and Composites
- Surfaces, Interfaces and Nanostructures of Magnetic and Electronic Materials

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- Dispersed Systems (including colloids, polymers and gels)
- Ordered Systems (including liquid crystals, self-assembling materials and micelles)
- Biological Systems, Membranes and Interfaces
- New Magnetic Resonance Techniques
- Other topics to be included depend upon the response.

*Organizing and Program Committee Officers:* Javier Soria, Chairman, CSIC; José L. De Segovia, Co-Chairman, CSIC; José C. Conesa, Secretary, CSIC.

*Accommodations:* The scientific activities will be held on the Campus of the CSIC located close to downtown Madrid. Information on accommodations and social programs will be published later.

*Deadlines:* Call for papers will be distributed by November 1994, with details about work presentation and relevant deadlines. If you are interested in attending this symposium and receiving next circulars, please supply the following preliminary-registration information to Dr. José Conesa, Inst. de CCatal. y Petroleoquímica, CSIC, Campus Univ. de Cantoblanco, 28149 Madrid, Spain; Fax 34-1-5854760; e-mail: [mrcis@icp.csic.es](mailto:mrcis@icp.csic.es); Name, Title, Affiliation, Address, Telephone, Fax, e-mail, Telex, Field(s) of interest, Suggestions for specific Conference topics, Tentative title of paper if you plan to submit one.

## POSITIONS WANTED

An EPR-spectroscopist with biophysical/biochemical background seeks a position in an EPR-lab after February 1, 1995. Experience: working on Bruker ER 220D and ER 200D-SRC spectrometers, plus Aspect 2000 or Aspect 3000. Measurements at 77-300 K. Background in some basic biochemical techniques and in working with animals. General interests: Paramagnetic centres in biological and biochemical systems including whole human and animal blood and its components, whole animal tissues; biochemical reactions involving free radicals and non-free-radical paramagnetic species. Paramagnetic centres induced by ionising radiation at 77 K in whole biological tissues and in cell cultures. Computer assistant decomposition of the gross EPR spectrum of an irradiated at 77K sample into separate EPR signals of different paramagnetic centres (using the subsequent annealing technique). ESR dosimetry in tooth

enamel. A new approach in measuring reproducible spectrum of a whole solid sample with a great anisotropy of the resonance absorbance. Present research: the mechanism of reaction of MethB with hydrogen peroxide; nature of the free radical intermediate.

### EDUCATION:

- 9/75-5/81 Dept. Molec. Biophysics, Moscow Inst. Physics and Technology, Moscow, Russia. Diploma (graduate certificate) in Physics and Engineering.
- 9/81-5/84 Post-graduate courses, Dept. Chim. Bio., Inst. Chem. Physics, Moscow, Russia.
- 1986 Ph.D. (Physics & Mathematics), Dept. Chim. Bio., Inst. Chem. Physics, Moscow, Russia.

### WORK EXPERIENCE:

- 8/84-2/94 Junior Researcher, Researcher, Senior Researcher, Dept. Chim. Bio, Inst. Chem. Physics, Moscow, Russia.
- 12/89-5/90 Visiting Scholar, N. Bethune Univ. Med. Sci., Changchun, China.
- 2/94-present Visiting Research Scientist, Royal Society Fellowship, Chemistry Dept., Univ. Essex, UK.

Full resume and references available on request. Dr. Dimitri A. Svistunenko, Department of Chemistry and Biological Chemistry, University of Essex, Wivenhoe Park, Colchester, Essex CO4 3SQ, United Kingdom; ☎: 44-206-872183 ; FAX: 44-206-873598; Telex: 98440 (UNILIB G); E-mail: [svist@essex.ac.uk](mailto:svist@essex.ac.uk).

**EPR and NMR Spectroscopist Seeks an Academic or Industrial Position.** Biophysicist-solid state physicist, Ph.D. '87, research/teaching experience. Now research worker/teacher at Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University. Research experience: A) liquid- and solid-state EPR spectroscopy of biological, organic and inorganic materials (Bruker 200D SRC NMR Spectrometer with Aspect 2000 Computer). Special research experience: membrane biophysics, drugs-membrane interaction, spin-label EPR spectroscopy (International Training Course, Hungarian Academy of Sciences, Szeged, Hungary). Also sol-gel or glass solid-state EPR spectroscopy; transition-metal spin labels. B) liquid- and solid-state NMR spectroscopy of biological, organic, and inorganic materials (Varian 300 MHz VXR spectrometer). Special research experience: 1D, 2D, and pseudo-3D multinuclear NMR spectroscopy of biopolymers, using Varian Unity 500 MHz spectrometer (postdoctoral fellowship at McGill University, Pulp and Paper Research Center, Montreal,

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Canada). Also sol-gel or glass multinuclear NMR spectroscopy. Wanted: faculty or research post, or opportunity to teach basic principles of resonance spectroscopy or biophysics. Please contact: Dr. Milan Mazur, Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University, Radlinskeho 9, CS-812 37 Bratislava, SLOVAKIA; FAX: 42-7-493-198.

**EPR Spectroscopist seeks a Postdoctoral Fellowship Position.** Semiconductor physicist, 32 years old, Ph.D. '88, research worker of the Institute of Semiconductor Physics (Novosibirsk, Russia). Research experience: EPR of defects in irradiated semiconductors, spin-dependent transport in semiconductors, EPR of paramagnetic centers in quantum size semiconductor structures. Please contact: Dr. A.A. Karanovich, Inst. Semiconductor Phys. Russian Acad. Sci., Siberian Branch, pr.Lavrenteva 13, 630090 Novosibirsk, RUSSIA; ☎: 38-32-354255; FAX: 38-32-354265; Telex: 133243 FONON SU; e-mail: lab24@isph.nsk.su.

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Send resume to: Prof. Michael Hendrich, Department of Chemistry, Mellon Institute, Carnegie Mellon University, 4400 5th Ave., Pittsburgh, PA 15213, USA.

### EQUIPMENT & SUPPLIES EXCHANGE

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Micro-Now Instrument Company now has available replacement klystrons (new) for Varian 4500, E3, E4, Century Series and some Bruker spectrometers available at attractive prices. Contact Clarence Amow, ☎: 1-708-677-4700, FAX: 1-708-677-0394; 8260 N. Elmwood St., P.O. Box 1488, Skokie, IL 60076, USA.

#### FOR OWNERS OF VARIAN EPR SPECTROMETERS:

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- (5) VARIAN E-3, 9 12 & E-104, 9, 12 CRT's

(1) Varian E-3, E-4 and E-9 and early E-109 users: I have arranged for a custom group order of replacement field scan potentiometers using Varian's specifications and the original vendor part number. These Model #3406 are 30 ohm, 0.06% linearity 3,0 turn pots with a center tap and have infinite resolution. This replacement can solve field stability problems arising from a noisy wiper. If you would like to participate and make this opportunity possible, please contact me regarding your interest. The price would be \$723.00 each with a \$35.00 handling fee per order plus shipping charges (we need to get 25 to get this price). They have a long shelf life. A purchase order would be required. The expected delivery time is about 160 days. There can be no returns on this order, but a vendor's 1-year warranty would apply.

I can also rebuild these parts, but the turn-around time would be long due to batch requirements. So I recommend an order of at least one new pot, which will allow the old one to be recycled at some later date at a price of around \$525.00 depending on the batch size at that time (I would expect most pots are suitable for rebuilding). Please indicate your interest.

(2) Varian V-4500, E-3, E-4, E-9, and E-104,9,12 users: I am arranging one large order for Varian X-Band Klystrons with Varian. If we have a sufficient quantity, Varian will supply with volume pricing. So I need to know your needs, that you would be willing to commit a purchase order to (at a later date). The pricing would probably be in the \$6000 range. I would extract a \$100.00 handling fee per order plus shipping for my time. Warranty period from Varian would be a 2-year shelf life plus a 3-year 12,000-hour prorated warranty (typical life 50,000 hours). Delivery times would be long term (6 months). If you need Q-Band or E-3 klystrons, let me know; these should be available as well. Prompt response will help in determining the Varian's pricing on this one-time order. Varian's quoted introductory pricing is \$7,000 for unit quantities and is subject to change. The volume price will only be available for a short period of time.

(3) I have the following parts to the Varian E-256 electrolytic cell, unused in factory wrappings: Varian PN 908721-02 Reference Bridge, with protective container; Varian PN 908721-01 Potential Bridge, with protective container; Varian PN 908723 Flat cell; Varian PN 908732 Reservoir upper half; Varian PN 908717 Reservoir lower half.

(4) I have arranged for a custom order of replacement microwave diodes using Varian's specifications and vendor part number (pill style case). If you would like to participate, please contact Research Specialties regarding your interest. Each dispersion bridge uses two microwave diodes. Fortunately, the diodes don't fail often because of the diode protection circuitry; however, failures have occurred, with replacements difficult to obtain. The price would be \$150.00 each. Since this is a custom order, there would be no returns possible. The suitability of the

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diode for this purpose is based on Varian's prior usage of this vendor part number for this part. A purchase order would be required. Second part of this order date to be December 1, 1994.

(5) I have a possible source for rebuilding E-3 crt's for the oscilloscope module. Let me know your needs in this area both now and for the future (I would like to know how many E-3's are still in operation). I will have one crt rebuilt shortly. Don't discard or break the old crt.

E-4:9; 12, E-104:9;12 crt's for the oscilloscope modules and the Varian NMR Gaussmeter are currently available new at \$255.00 ea. Buy one now for stock before they are discontinued.

Stringing kits for the Varian recorder are available.

For information, contact James R. Anderson at Research Specialties, 5629 N. Maplewood, Chicago, IL, USA 60659.

☎/FAX: 1-312-728-6570.

## WANTED: VARIAN MAGNET COIL

We are looking for a magnet coil for a Varian V-3400 9-inch magnet. We need the coil on the right-hand side (from the front). Please contact Shen or David at E-mail address "gashe@ttacs.edu" or call 1-806-742-3764. Jinmiao Shen, Physics Dept., Texas Tech Univ., Lubbock, TX, 79409, USA.

## WANTED: HALL PROBE

We urgently need a Varian E-4 magnet Hall Probe - P/N - 908742-05 and an E-112 magnet Hall Probe - P/N - 929279-02B. If available, please contact or send to Prof. P.T. Manoharan, RSIC, IIT, Madras - 600 036, India.

## WANTED: USED EPR/NMR ELECTROMAGNET

We are looking for a used 12" (or bigger) NMR/EPR electromagnet in a good operating condition. A used MRI imaging resistive magnet is also desirable. Please contact: Michael Chzhan, EPR Labs, Johns Hopkins University, Baltimore, MD, USA; ☎: 1-410-550-2438, FAX: 1-410-550-2448, e-mail: kppu@welchlink.welch.jhu.edu.

## REQUEST FOR ASSISTANCE - MANUAL OR TECHNICAL INFORMATION NEEDED FOR HILGER-WATTS SPECTROSPIN.

Our Department of Physics has received a Hilger-Watts Microspin Spectrometer through the generosity of Louvain University. We have Microspin Amplifier and Detector Type FA 206, Nr. 008, Microspin X Band Generator Type W 903, Nr. 960 H and Newport Pagnoll, England, Electromagnet Type D. We did not receive a technical manual for the spectrometer and urgently need one to complete the setup (we also received no resonance cavity or connection guides). Can anyone, please, help us to obtain copies of the proper manuals for the above items? Please contact Prof. Dr. Ioan Inȃ, Department of Physics, Transilvania University, Str. Colina Universităȃtii, Braşov 2200, ROMANIA.

## OFFERED: HELP IN THE DESIGN AND CONSTRUCTION OF EPR ELECTRONICS

The University of Denver is able to provide design and construction services for EPR-related electronics such as low noise signal pre-amplifiers, timing systems for pulsed EPR, or

complete microwave bridges. Contact: Richard Quine at the University of Denver, Denver, CO 80208 USA. E-mail: rquine@diana.cair.du.edu ☎: 1-303-871-2419.

## WANTED TO BUY: USED EPR SPECTROMETER

A unit such as a Varian E-4 or E-9 would be ok. Electromagnet (or cavity) is not necessary. If you know of an available unit please contact Mark Rubinstein, Naval Research Laboratory, Washington, DC, 20375, USA; ☎: 1-202-747-4207.

## FIELD SCAN CARDS AVAILABLE FOR COMPUTER CONTROL OF VARIAN FIELD CONTROLLERS

Any Varian magnetic field controller can be modified to permit control of the magnetic field by a computer. An improved scan card design with better documentation at a lower cost is available from the University of Denver. Contact Richard Quine at the University of Denver, Denver, CO 80208 USA; e-mail: rquine@diana.cair.du.edu; ☎: 1-303-871-2419.

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## ANNOUNCEMENT

**Members – both individual and corporate:** Have you paid your dues for 1994? If you are not sure, it will save the Society the expense of mailing late notices if you will take a moment to ascertain the status of your membership according to our records. To do this, we ask that you please check the lower right hand corner of your mailing label. In that area there will be four dashes ("-- --"). If only the four dashes "-- --" or "--0--" appear, no dues have been recorded for you for the 1994 year. If dues have been paid, either a numeric value or a letter "R" or "C" (for soft currency countries) will appear, i.e. "--25--." If you have disposed of your label please contact the IERC (address on page 1) and we will check to see if dues have been recorded. Your prompt payment of dues will be appreciated!

If you can identify any companies that you feel would benefit from becoming affiliated with the Society, please encourage them to look over the benefits of company membership (included with the payment information on the last two pages of this Newsletter).



# EPR NEWSLETTER

Publication of the International EPR (ESR) Society

Volume 6, Number 2

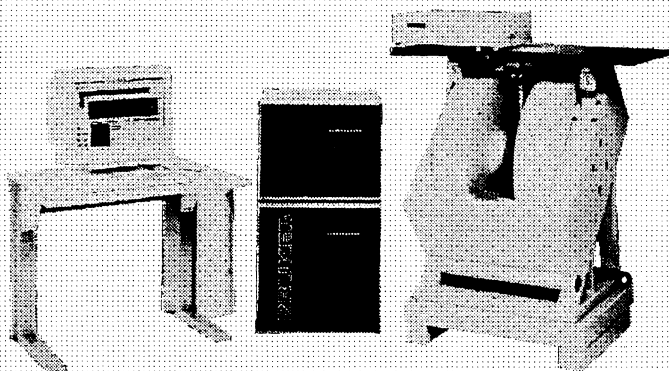
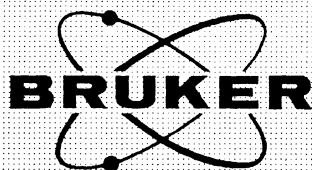
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Summer/Fall, 1994

## APPENDIX: ON THE FOLLOWING PAGES IS THE CORRECTED AND UPDATED DISTRIBUTION LIST FOR THE EPR NEWSLETTER (TAKEN FROM INTERNATIONAL EPR(ESR) SOCIETY, EPR NEWSLETTER, AND IERC DATABASES)

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This list is provided as a service to the Members of the International EPR Society (IES). This list is copyrighted and may not be used in whole or part for commercial purposes without written permission from the Illinois EPR Research Center or the Editor of the EPR Newsletter. The list includes names of members and nonmembers of the IES. For each individual who has supplied us with information on his or her main interests, up to five interest codes are included. On the last page of this edition is a list with an interpretation of those codes. We appreciate the efforts of Dr. Peter Gast, University of Leiden, who first suggested printing such a list and has converted the copy into a form suitable for reproduction. Please report errors, including incomplete or out-of-date entries or apparent duplications, to Ms. Rebecca J. Gallivan in the editorial office at IERC (address on front page of Newsletter.) We are especially interested in corrected addresses for scientists with whom we have lost contact. These are indicated in the Directory by an asterisk (\*) following their names. For the convenience of IES Members who wish to pay dues and/or provide updated information and of others who wish to join the IES, we have included a membership registration form as the last page.



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The BRUKER worldwide group of companies are proud to be a PATRON of the International EPR Society. For information on products and to determine the sales and service representative for your country, contact Dr. Dieter Schmalbein, BRUKER Analytische Messtechnik, Division IX - EPR, D-76287 Rheinstetten, am Silberstreifen, Germany. Telephone: 49-721-5161-141; FAX: 49-721-5161-237

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# EPR NEWSLETTER

Volume 6, Number 3

Page 1

Fall/Winter, 1994

Editor: R. Linn Belford, Urbana, IL (address below).  
Assistant Editor, Becky Callivan, Urbana, IL (address below).  
Typography: Martha Moore.  
*This publication is the official newsletter of the International EPR(ESR) Society. It is supported by the Society, by corporate and other donors, and by three EPR/ESR centers:*

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FAX: 414-266-8515. E-Mail: cfelix@mis.mcw.edu

#### **Biotechnology Resource in Pulsed EPR Spectroscopy,**

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☎: 718-430-2175. FAX: 718-829-8705.  
E-mail: peisach@aecom.yu.edu

#### **Illinois EPR Research Center (IERC),**

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[IERC also operates a satellite site for EPR *in vivo* at †Dartmouth College, Hanover, New Hampshire;  
☎: 603-650-1955; FAX: 603-650-6525.  
E-mail: harold.swartz@dartmouth.edu]

*All these Centers, Research Resources sponsored by the National Institutes of Health, cooperate to facilitate research involving EPR. Prospective users may contact the staff at any of the Centers.*

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Please direct communications about the EPR Newsletter or prospective material for publication to the Editorial Office at the IERC address above.

## **FREED & NORRIS ELECTED FELLOWS OF THE AMERICAN ACADEMY OF ARTS & SCIENCES**

We are very pleased to report that on March 10, 1994, James R. Norris, Jr. & Jack H. Freed, both charter members of the IES, were elected Fellows of the American Academy of Arts & Sciences in Cambridge, Massachusetts. Congratulations to both!

Founded in 1870, the Academy is a learned society that honors achievements in science, scholarship, the arts, and public affairs, and conducts a varied program of studies that reflects the interests of its members and is responsive to the needs and problems of society and of the intellectual community. New members are elected by the current membership in recognition of distinguished contributions in their chosen fields.

Prof. Norris, Argonne National Laboratory, Argonne, IL, and Prof. Freed, Cornell University, Ithaca, NY, were inducted into the Academy in the field of Chemistry, along with six others, during a special ceremony held October 12 at the House of the Academy in Cambridge, MA.

## **MESSAGE FROM THE EDITOR**

Our next issue will be the public one - the one that goes out to nearly 4000 colleagues - not only us IES members, but also many others with related interests. You might point this out to potential corporate affiliates, who can get advertising to a particularly large focused audience by joining the IES now. Any material to be printed in the next issue must arrive in our editorial offices before January 31, 1995. Once again, I remind you that the EPR Newsletter is worth putting out only so long as you, the readers, keep furnishing interesting material - articles, notices, letters, advertisements, etc. Send us your contributions, please. Send contributions to the *Computer Corner* and *Building the Perfect Beast* directly to the respective editors of those columns. When you notice announcements of pertinent meetings, books, conference proceedings, or the like, please inform us. Please help us spot such material and inform us just as soon as possible to enable us to publish dated material in a timely fashion.

Linn Belford

◆ **IES AFFAIRS** ◆  
**ANNOUNCEMENTS AND  
 REPORTS FROM THE INTER-  
 NATIONAL EPR SOCIETY**

### *From the President —*

When the International Society was founded it was felt that it should have a Newsletter, mainly at that time for keeping members in touch with one another. No one knew quite what it would contain but it seemed worthwhile to find out what our members wanted. The first editions were a few pages long but then, "like Topsy it just growed and growed" (the English is the author's original, and should not be blamed on me!), to the extent that the last edition was our longest yet. But it was also our most useful, packed with information of direct use to the community. It has been quite remarkable to witness its shaping in the hands of our members and contributors.

The Newsletter is directly targeted at the EPR community and is seen by a high proportion of those working in our field. This provides unique advertising opportunities to our industrial sponsors and subscribers, and we are very pleased that so many now see the advantages of this, although we should still like to increase their number. EPR spectroscopists are unusual in that they often use more than one form of spectroscopy in their research, and a whole variety of techniques for making paramagnetic species, and for observing them under different conditions. Advertising to them reaches a much wider range of scientists than would first be imagined, and with our modest rates this must be the most cost-effective scientific and publishing advertising available anywhere. I should be grateful if members could maintain their efforts to bring this to the attention of prospective advertisers.

Exactly when you will read this I am not sure, for as the Newsletter grows so do the demands on the few people involved in its publication multiply. If I take this opportunity on behalf of the Committee and Linn and Becky to wish you all the joys of the Christmas Season and all success in the New Year now, I hope that you will know it is heart-felt whenever you read it!

Keith McLauchlan  
 President, IES

### *Letter to the President*

Dear Sir:

You were present, on behalf of the International EPR(ESR) Society, at the birth of the European Federation of EPR groups, which took place on September 7th in the magnificent frame of the Carré des Sciences, Paris, during the second EPR European meeting (*European ESR Meeting on Recent Advances and Applications to Organic and Bioorganic Materials*, 5-9 September 1994). I want to thank you for your kind words of welcome for the newborn Federation in that occasion, and at the

same time I want to do some considerations on the relationships between the International Society and the European Federation.

The national groups belonging to the European Federation are presently the following: ESR Group of the Royal Society of Chemistry, UK; Gruppo Italiano di Risonanza di Spin Elettronico; Groupe d'Application de la Resonance Paramagnetique Electronique, France; Benelux EPR Society; Polish ESR Group; Bulgarian ESR Group; German ESR Discussion Group; Russian Federation ESR Group; Romanian ESR Group. The presidents and past presidents of the groups form the Committee of the EFEG. The Federation will organize an EPR meeting every three years; the first was in Padova, Italy in 1991. More than 170 scientists from 15 different countries (Europe and USA) attended the second one in Paris.

As pointed out by the past President of the Steering Committee of the EFEG, Klaus Möbius (*EPR Newsletter*, Vol. 5 #4, p.3), the EFEG was conceived since the very beginning (Padova 1991) as an institution complementary to the IES. The only purpose for the European Federation is allowing fast and efficient communication between the national groups, making possible common activities. In pursuing this aim the Federation will face the specific problems of the scientific communities in Eastern and Western Europe, and will work to make easier the scientific cooperation through all Europe.

In accordance with this spirit, the venue chosen for the third EPR European meeting, in September, 1997 is Leipzig, Germany. The chairman of the German ESR Discussion Group, Dr. Dieter Beckert, will be the main organizer.

On behalf of all the European Federation of the ESR groups I will do my best for the organization of common activities and meetings between the IES and the EFEG, and I am sure that a fruitful collaboration will be realized.

With my best regards,

Marina Brustolon, President of the Committee  
 of the European Federation of EPR Groups

### *Awards*

We are pleased to announce that agreement has been reached between the British and Russian Groups and ourselves to co-operate in the award of the Bruker and Zavoisky Prizes and our Gold Award each year, with each group invited to make input into the selection of each, but with the final choice left to each group. The area of research interest is to rotate between the groups each year, with the loosely-interpreted categories, chemistry, physics and instrumentation, and biology and medicine; these are expected to be interpreted liberally and not to be restrictive.

In the coming year, the IES award will be in Chemistry, the Bruker in Biological Chemistry and the Zavoisky in Physics/Instrumentation. Prof. Larry Berliner, continuing Chairman of the Gold Award committee, will welcome nominations for this.

**Gold Medal:** 1995 Gold Medal, recognizing benchmark contributions to EPR spectroscopy in chemistry. Nominations to Prof. Larry Berliner.

**Silver Medals:** One each in the general areas of Chemistry, Physics/Instrumentation, and Biology/Medicine. To propose names, please send your suggestion(s), or preferably full nomination(s), to the appropriate Silver Awards Subcommittee(s): *For Physics and Instrumentation* - Jim Hyde, Chair; John Pilbrow, George Feher, & Jan Stankowski. *For Chemistry* - Bruce Gilbert, Chair; J. Sohma, Jim Bolton & Kev Salikhov. *For Biol./Medicine* - Harold M. Swartz, Chair; Marjeta Sentjurc, Hideo Utsumi & Tadeusz Sarna.

**Young Investigator Awards:** One Young Investigator award each year; "young" is defined as less than 7 years since the Ph.D. degree. Nominations to Prof. Keith McLauchlan.

Nominations for all awards are required by March 1, 1995. Awards are not restricted to IES members, but the awards committees may take membership into account when deciding the award winners.

### **Fellows of the Society**

For some time the Committee has been exercised by the thought that many very distinguished EPR/ESR scientists who are either retired or about to retire have not received the recognition to which they are due from their colleagues simply because most international awards in the subject have only recently been made. Whilst not wishing to exclude them from

consideration now, our inclination is to ensure that they are properly recognised independently of the award system.

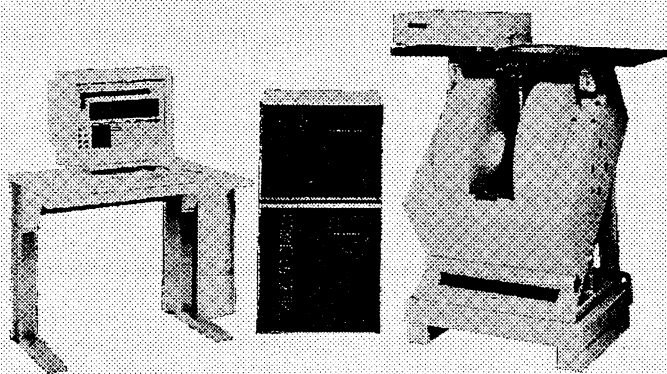
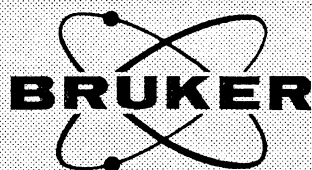
A proposal was therefore made, and accepted, at the Denver meeting that we should create Fellowships of the Society to recognise truly outstanding achievements in electron paramagnetic/spin resonance amongst these scientists (hopefully members). The highest international standards are to be applied to the recognition of those worthy of this distinction, and their formal connection with the Society will enhance its own image.

Nominations should be made in confidence to Keith McLauchlan before March 1, 1995, and will be considered by the Committee, afforded as appropriate.

### **THE COMPUTER CORNER**

*Edited by Philip D. Morse II, Keith P. Madden,  
and Richard Cammack*

The Computer Corner is a feature of the EPR Newsletter. Currently it is edited by Reef Morse, Keith Madden, and Richard Cammack with assistance from Graeme Hanson. Submissions can be sent to any of the editors, whose e-mail addresses are, respectively: (reef@xenon.che.ilstu.edu), (keith.p.madden.1@nd.edu), (udbc033@hazel.cc.kcl.ac.uk),



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(graeme@cmr.uq.oz.au). Submissions may be edited; on request, substantially edited versions will be sent to the sender for approval prior to publication.

*Discussions Regarding the Establishment of an EPR Spectral Data Base and Access to Trial Databases over the Internet -- by Reef (Philip II) Morse and Graeme Hanson*

There has, in the past and present, been considerable discussion about establishing a database of EPR spectra. Czeslaw Rudowicz has discussed this (Bull. Magn. Res., 1994, vol. 16, issue 3/4) and sent out requests for information. It has been a common theme on the epr-list server. We thought that it would be useful to include in this discussion those of you who are currently not enrolled on the epr-list server, but may be interested in the availability of EPR data over the Internet.

In the following discussion, we use the term database to include not only information about the spectra (instrument parameters, spectral information, sample, and so forth) but the actual spectrum itself.

There are several important points that need to be addressed concerning:

- 1) access to the database itself: what software package should be employed and how should we handle user access,
- 2) the choice of one or multiple sites for the storage of the database and for computer security, and
- 3) the structure, content and format of the database.

We do not have all of the answers to these questions at the moment, but several energetic people have begun to establish spectral databases.

The following paragraphs represent an attempt by the Editors of this column to construct an overall picture of the issues listed above concerning the proposed EPR database. The purpose of this summary is to provide a basis for continued discussions concerning the database.

As a start, there are several energetic people who have begun establishing EPR spectral databases, namely Richard Partridge at Univ. Aberdeen (E-mail: mph407@biomed.abdn.ac.uk) and Dave Duling (E-mail: duling@niehs.nih.gov). A description of how to access these databases across the Internet is also given. (There are other databases — for example, the free-radical database at the University of Notre Dame, which we shall not describe here).

1) *The Database Software Package to be Employed*

Since Internet is now world wide and is the "accepted" networking protocol for accessing and transferring information, a database suited to this protocol is an obvious choice.

The World Wide Web ("WWW", or "the web") is a global network of information servers that supply documents in hypertext format. A hypertext document contains "links" to other hypertext documents, as well as to sound, images, video and a host of other multimedia resources. Typically the WWW is accessed via a "browser" program which displays, locally, documents requested from a remote machine.

Depending on your local setup, your browser can start programs to display images, play audio, or show movies. It is important to realize that you may need other software, as well as your browser, to fully explore the web. Fortunately, there is plenty of free software available that will let you speed down the "information superhighway"!

Details on where browsers and WWW server software for various platforms (Mac, PC, X-windows) can be obtained from the FAQ (frequently asked questions) in the news group "comp.infosystems.www.providers" on the Internet. The FAQ also provides a lot of general information about the World Wide Web. A more recent version is stored on the WWW at this address: "<http://sunsite.unc.edu/boutell/faq/www-faq.html>". We suggest you obtain a web browser called Mosaic, which is written by the National Center for Supercomputing Applications at the University of Illinois. You can obtain a copy of Mosaic by anonymous ftp to zaphod.ncsa.uiuc.edu. The appropriate software for your platform is located in an appropriately named directory under Web/Mosaic. Installation can be rather tricky; you may need the assistance of a local computer expert. For an example of running Mosaic, read the section entitled "Preliminary Test of a World Wide Web Electron Paramagnetic Resonance Spectral Database."

2) *One or Multiple Sites for the Storage of the Database And Computer Security.*

A distributed environment is possible and convenient compared to storage at a single site since Mosaic can bring you information from anywhere with just the click of a mouse. A specifically designed "robot" to search the various EPR database sites could be developed, probably from the modification of existing "robots".

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Security is an important consideration which must be addressed in the creation of single or distributed sites. Apart from transferring viruses and destroying operating systems/hard disks there are potentially legal implications. There have been a number of court cases involving computer hackers and/or sites which have been damaged or compromised. This issue will be addressed in an upcoming IES newsletter for those of us who have become system managers.

3) *The Structure, Content and Format of the Database* (Alexander Shames, Richard Cammack, Francisco Jent, Czeslaw Rudowicz)

There are two main issues here, namely the structure of the database and secondly the format and content of the records. The database will only be valuable if the 'spectral' and 'spin Hamiltonian (SH)' information is present in one or linked databases. A relational database might contain records (data files) that could be classified (or grouped/stored) by the type of sample. The records themselves may then consist of EPR Spectra Passports (or Descriptions) and EPR Spectral Vectors (the data, in 1D, 2D, 3D etc. arrays). Both the form of spectral file (ASCII, binary) and the standardization of notations will be the subject of future discussions. However, the structure of the Passport should at least contain the following:

1. Spectrum type (CW-EPR, FT-EPR, ESE, LI-EPR, ENDOR, ELDOR, 2D-EPR, EPR-Imaging etc.)
2. Spectrum origin (experimental, simulated or both)
3. Paramagnetic center type - for example:
  - a) paramagnetic ion
  - b) free radical
  - c) spin label (I think this should be a separate category from free radicals in general because of its special application)
  - d) defects
  - e) free electrons
 Presumably there will be subclasses - for instance
  - a) ion and its valence state
  - b) type of free radical
  - c) type of spin label
4. Substance (chemical formula, name, paramagnetic center concentration)
5. The state of the substance in which the spectrum was obtained (single crystal, liquid crystal, glass, frozen solution, oriented powder, powder, solution, gas, in-vitro biological sample, in-vivo biological sample):
  - a) point and space group, number of magnetically non-equivalent centers and sample orientation for crystalline samples
  - b) order parameters for glasses, liquid crystals, oriented powders, etc.
6. Spin Hamiltonian, in terms of which the spectrum was described
7. Static parameters of SH (g-factors, fine, hyperfine and superhyperfine parameters, quadrupole splittings etc.), calculated according to the chosen SH (including average parameters for non-oriented samples) with error bars

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8. Dynamic parameters of system (T<sub>1</sub>, T<sub>2</sub> and T<sub>2</sub>' relaxation times, lifetimes for transient paramagnetic centers, (an-) or isotropic rotation correlation times, diffusion parameters)
9. Line widths (individual for single crystals, spin labels or simulated spectra, averaged for unresolved structured, broadened or narrowed lines)
10. Spectrum recording parameters (frequency, magnetic field range, power, modulation frequency, modulation amplitude, pulse sequence, pulse width, delays, gain, sample temperature, goniometer parameters, irradiation parameters, field gradients etc.)
11. Remarks (device type, sample name, comments, etc.)
12. Establishment of origin (When spectra can be exchanged so easily over networks, and may be compared and plotted together, there should be a method of acknowledging the spectroscopists who provided the data. Ideally each spectrum would be indelibly tagged with the details of its origin and any manipulations made to the data subsequently. No system is foolproof, but at least the possibility of establishing the pedigree of a spectrum ought to be built in.)
13. References

This is a rough and incomplete set of information for the spectrum description file. There does not seem to be (nor should there be) a limit to the amount of information that can or should be supplied as users of the database may wish to search for something like "Q-band EPR spectrum parameters of TEMPO in frozen water-ethanol-glycerol solution", as one used to do in Chemical Abstracts.

Instead of defining the format of a *single* file containing all of the information, we might consider using a structured standard, which uses a single, descriptive file containing (optional) keywords that reference other files. This method allows for future expansion and modification to include new data types and information that inevitably will be discovered in the future. Also, we are not forced to define the complete format initially, but we can begin with some basic descriptions like dimensionality, axis names and units, data, etc. We could then add keywords and possibly also corresponding files (e.g. images, PASSPORT-Files) as requirements come up. One could also imagine that one organization defines the PASSPORT file structure, while another one attends to the descriptor file.



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The BES3T standardized format for EPR spectra, proposed by the EPR division of Bruker operates on this philosophy (and in the Editors' opinion is a logical choice) and may be a good format to adopt for the database. Conversion programs to convert data to and from the BES3T data format are already available, and even more efficient versions will be released shortly.

**PRELIMINARY TEST OF A WORLD WIDE WEB ELECTRON PARAMAGNETIC RESONANCE SPECTRAL DATABASE.** — Richard Partridge, John Maher, Reef (Philip D., II) Morse, David Duling

If we have held your interest in the database issue, keep reading. Now, we'll provide specific instructions on how to access a trial spectral database set up at the University of Aberdeen and at the Laboratory of Molecular Biophysics at NIEHS. We are going to access this database with Mosaic. If you don't know how to start Mosaic, please contact a local computer expert for help.

*University of Aberdeen Database* --Once Mosaic has started, click on the "Open" button at the bottom of the screen. This will pop up a requestor into which you can type a URL (Uniform Resource Locator). The URL tells your browser what document you want and where to get it from. Try typing this into the box in the requestor: <http://www.biomed.abdn.ac.uk/>

Now click on Open and the requestor should disappear. You should get some messages about making connections, sending requests and transferring data. Soon (how soon depends on how

busy the network is!) you should get the Welcome page for the Medical Physics Dept. at the University of Aberdeen in the UK. Feel free to move around by clicking on any of the links on the page; links are usually colored blue and underlined. They often change color once they have been activated (e.g. blue to red). Whenever the pointer is on a link, the URL for that link is displayed in your browser. You can move backwards and forwards through pages you have visited using the buttons at the bottom of the page. You might wish to add this page to your "hotlist" so that you can easily find it again.

To access the beginnings of the EPR database, go to the bottom of the Medical Physics page and click on "Dr. Richard Partridge"; this will take you to his home page. When his home page appears, click on the icon next to his "Research Interests". When that page appears, click on the icon labelled "Information on the epr mailing list and the 1st ESR spectrum on the web!". That page has two icons. The first connects you to the anonymous ftp server on [xenon.che.ilstu.edu](http://xenon.che.ilstu.edu) that has the archives of the epr-list service. The second will bring up an example of an EPR spectrum and a description of how it was placed on the web. Clicking on the spectrum will call up a full-sized version of the spectrum and clicking on the icon below the spectrum will transfer a postscript file of the spectrum. If you copy any of the files to your local machine you must select "load to local disk" from the options menu of your browser.

If you think that you would like to contribute spectra to the project, you can ftp them to the Aberdeen site. Currently the best format for submissions is two files, firstly an ASCII text file describing the spectrum and secondly an ASCII file containing the X,Y data points. Richard will then convert the data to a spectrum and postscript file linked to your text description of the spectrum.

Ftp the data to [ftp.biomed.abdn.ac.uk](http://ftp.biomed.abdn.ac.uk) and upload to the directory `/incoming/esr`. Then e-mail Richard Partridge ([mph407@biomed.abdn.ac.uk](mailto:mph407@biomed.abdn.ac.uk)) to let him know what you have uploaded.

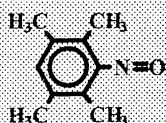
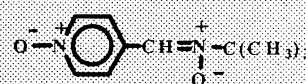
*Database at the Laboratory of Molecular Biophysics at NIEHS* --Dave Duling at The Laboratory of Molecular Biophysics at NIEHS has announced the beta test phase of a WWW EPR Database on spin traps and other EPR information. This project began as a conversion of the 9900+ record Spin

## OMRF SPIN TRAP SOURCE

RESEARCH QUALITY SPIN TRAPS!

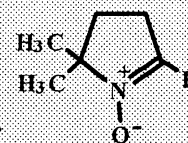


5,5-DIMETHYL-1-PYRROLINE N-OXIDE (DMPO)  
 $\alpha$ -PHENYL N-TERT-BUTYLNITRONE (PBN)  
 $\alpha$ -PHENYL-N-TERT-BUTYL-NITRONYL-<sup>13</sup>C NITRONE (PBN-<sup>13</sup>C)  
 DEUTERATED  $\alpha$ -PHENYL N-TERT-BUTYLNITRONE (PBN-d14)  
 $\alpha$ -(PYRIDYL-4-OXIDE) N-TERT-BUTYLNITRONE (4PYOBN)  
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Trap Data Base from a DOS program to an Internet service. The data are contained in a relational database with the journal reference and published results of Spin Trap experiments from the early 1970s through the 1990s. Dave has now expanded the data format to include other forms of EPR data, although he expects he will be changing the format as needed. As a bonus, the new data format can include the actual spectrum file as well as an image file. Right now, you can query the 9900+ record database and view results. You can also try out 'Submit new data' form and tell us what you think. Simulations are also available for simple aN and aH systems. In fact, from the results of the Spin Trap query a simulation can be automatically generated.

The only requirement is an Internet connection and a Mosaic level 2 client (the Mosaic software). The WWW address for the NIEHS database is: <http://lmb.niehs.nih.gov/home.html>.

The server is currently a 60 MHz Pentium computer with 32MB RAM and 2GB of disk space running Windows NT. On our local subnet access times are very good. The Institute has a T1 line to NIH in Bethesda, Maryland. Please e-mail comments concerning this database to [epi-list@xenon.ilstu.edu](mailto:epi-list@xenon.ilstu.edu), as we want this to be as useful as possible.

*Other places to look on the net.*

To see what other chemists are up to try Henry Rzepa's information at Imperial College, London, e.g: <http://www.ch.ic.ac.uk/talks>.

If you cannot run Mosaic but have access to ftp, you can download all the files associated with this first attempt from <ftp.biomed.abdn.ac.uk> in the directory /pub/esr.

If you want to see some of the things Mosaic does, but cannot use the hypertext browser, then try one of the Lynx programs. For example, DOSLynx is available from <ftp2.cc.ukans.edu> by anonymous ftp. Lynx will give the text from the document but not the pictures (at present). However, you can get the postscript spectrum file.

Obviously this is just a first attempt to show what can be achieved in a few hours. We envisage that the final version would supply much more information about the EPR conditions.

*We need to hear from you!* The database project is being undertaken currently by Dave Close, Dave Duling, John Maher, Reef Morse, Richard Partridge, and others. Many others are contributing to aspects of this project; space does not permit

listing them here. There is plenty of room for other members of the "database team". We would like to know what you, the potential users of this information, think about:

- the usefulness of this facility;
- whether you would like to see spectra displayed as image within Mosaic;
- whether you would/can contribute spectra to this project;
- what extra information should accompany spectrum files;
- whether there is other EPR related information that should be made available on the World Wide Web.

Please respond by E-mail through the EPR List Server at ISU: [epi-list@xenon.che.ilstu.edu](mailto:epi-list@xenon.che.ilstu.edu). Many thanks to those of you who continue to participate in this discussion.

*Special Program for Output from EPRware* – Fls2ps is a program which enables you to plot the contents of .fls data files (output from Reef Morse's EPRWare) on a PostScript printer. The program reads .fls files and outputs a PostScript page description of a plot of the spectrum and spectral parameters contained in the .fls file. Fls2ps runs under MS-DOS, with some UNIX workstation versions under development. On the command line the user supplies the name of the file containing the EPR data and optionally a name for the text file which will hold the PostScript page description. If no output filename is supplied, the output goes to the console and may, for example, be piped to the print device or a file.

An executable demonstration version of fls2ps for the PC/clone is available free of charge. This version has limited capabilities, but does demonstrate the essential feature of the program which is the ability to create PostScript plot files of .fls data from the MS-DOS command line. For more information or a copy of the free PC version of this program, contact Dwight Schwartz at the Illinois EPR center by calling 217-333-3776 or sending e-mail to [schwartz@rlb6000.scs.uiuc.edu](mailto:schwartz@rlb6000.scs.uiuc.edu). You may also get a copy of the PC program by looking at the following World Wide Web page: <http://www.biomed.abdn.ac.uk/ftp/home/pub/esr/schwartz/schwartz.html> and clicking on the button labeled "A Demonstration version of fls2ps."

*The Illinois Servers* – To reach anonymous FTP Server at IERC, issue the *ftp* command to [rlb6000.scs.uiuc.edu](ftp6000.scs.uiuc.edu). At the password prompt, enter your full e-mail address.

*EPR List Server at ISU* – To get on the list server, send an e-mail letter to [epi-list-request@xenon.che.ilstu.edu](mailto:epi-list-request@xenon.che.ilstu.edu) with the

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### REFLEX KLYSTRONS, WITH NOTES ON ALTERNATIVES. Part I

#### 1. Introduction

One of the basic needs of a spectrometer for EPR is a source of microwave radiation, and until recently, klystron tubes have been the microwave source of choice and pretty much universally found in commercial spectrometers. The klystrons that we use are correctly called reflex klystrons, which typically put out powers less than one watt and were historically used as the local oscillator in radar receivers; a true klystron is a high power device capable of delivering several kilowatt and is used as a radar transmitter by itself. At one watt, reflex klystrons have always been overkill on a radar receiver, and therefore they have become increasingly difficult to obtain as new solid state devices have appeared. The solid state sources are apparently easier to make, and the market pressures now dictate that YIG and Gunn oscillators are the low power frequency source of choice. Despite the trend there are compelling reasons to continue using klystrons, and this article is the first in a series on the reflex klystron and alternative sources for EPR.

The disadvantage of using the VCOs for EPR is that their power output is low, typically a maximum of +10 dBm (10 mW), although power outputs tend to creep upward as the years pass and technology improves. This low power is adequate for driving a receiver or test and measurement applications, but it is not suitable for an EPR bridge (essentially transmitter and receiver) by itself. Just to drive this point home, the LO input of a mixer used in homodyne detection typically requires about +7 dBm power for optimum performance.<sup>1</sup> A spectrometer will therefore require at least one amplifier stage on the bridge. For example, when I use our Gigatronics unit on the pulsed spectrometer in our lab, I have to include a Narda GaAs FET or a cw traveling wave tube amplifier in the circuit.

Because of their higher power output, klystrons at first seem the less costly option, although I am less confident of that statement today than I was a year ago. To digress briefly, I'll explain why and outline non-klystron options. I used to buy the X-12 and X-13 klystrons from Varian for about \$1500 apiece and used HP power supplies for about \$800, which gave me a reliable power source covering 8 - 17 GHz for a decent price. Unfortunately, Varian no longer makes klystrons that feature a mica window (i.e. X-12 or 13; however, contact Clarence Arnow of Micro-Now for remainders), but they do sell narrow

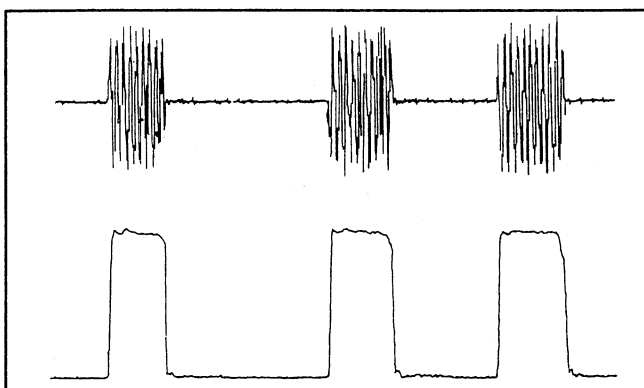


Figure 1: Three pulse sequence generated directly on a synthesizer and amplified. Response is flat across 2 - 20 GHz and  $t_r = t_f < 2$  ns.  $t_w = 50$  ns.

band versions (~500 MHz) to cover some of the two bands. The price for each klystron, however, is \$6000, which is no way to set up a broadband spectrometer.

Now consider the alternative. The Cadillac option is a synthesized source (Gigatronics, HP, etc.) that gives you 2 - 20 GHz for \$20 - 30k, plus a broadband amplifier that boosts you up to 1 watt (cw) for another \$18k (the HP 83020A). At \$6000 per 500 MHz per klystron, it is obvious that even the Cadillac option is cost effective if I want to retain the broadband capability of my spin echo spectrometer. Figure 1 illustrates a three pulse sequence obtained by directly driving an HP 836xxA synthesizer. I used an HP 71500A Transition Analyzer as a receiver for this demo, but conceivably, I could have simply used my RHG mixer. The synthesizer is capable of pulse widths as small as 20 ns, so it can drive the TWTA input directly on our pulsed spectrometer. In other words, I could pretty much ditch my entire home-built bridge. The only drawback is that, if I directly pulse modulate my synthesizer, I don't get a cw source at the LO (if I choose to stick with my cheap RHG mixer).

The cheaper alternatives are more do-it-yourself. An Avanteq/HP YIG synthesizer costs about \$1500 and gives you pretty much an entire band at +10 dBm, so it's a lot like the old klystron story. Subash Gedam and I wrote a Newsletter feature<sup>3</sup> a while back on how to lock the thing to a modern counter (and you need a counter anyway) that can be found on the used market for about \$3000 - 4000; the other option is to lock it to a high Q cavity using some AFC techniques (see Poole's book,<sup>4</sup> or contact the Milwaukee ESR Center and get info on the frequency lock that they use - if my memory serves - on the saturation recovery spectrometer). Finally, bandwidth GaAs FETs are now coming in at under \$1000, so, overall, the solid state route is the destiny of EPR.

Our receivers, by modern standards, are somewhat piggish on power. There are now decent mixers that operate under so-called 'power starved' conditions (<0 dBm). These tend to be constructed of Schottky diodes that are biased during operation. I have a few mixer quads in my lab for trials now, but rather than digress too far from my original topic I will describe them in a future installment of this series.

As I wrote somewhere above, I use several Varian klystrons to span our operating range, models VA-259A (6-7 GHz), X-13B (7-11 GHz), X-13 (8-12 GHz), and an X-12 (12.4-17

GHz)<sup>2</sup>. I have a few other X-band units that have unknown pedigree and are used on the test bench. The klystrons are all powered by a Hewlett-Packard 716B klystron power supply; we also have a Micro-Now dual klystron supply that I use on the test bench because its high voltage output is lower than the HP unit. The desired features and requirements (regarding ripple, etc.) of klystron power supplies is covered in Poole's treatise<sup>4</sup>. I will leave the subject of power supply as a 'reading assignment' and return to it in the next issue, but for now I will describe the details of setting up a klystron with a commercial supply and making sure that it works properly.

## 2. Reflex Klystron Anatomy and Functional Properties<sup>5-7</sup>

The reflex klystron is a type of self-oscillator and is analogous in operation to the triode. The operation of a self-oscillator is determined by its two component features, namely, an electronic discharge and a resonator (i.e. tank) circuit. The electronic discharge induces currents in the resonator. The currents, in turn, induce an oscillatory voltage, which occurs at

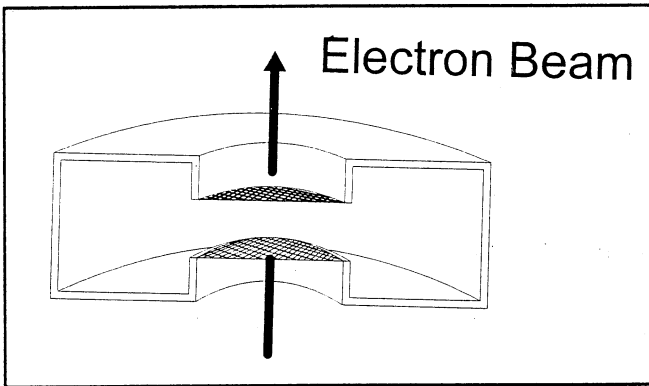


Figure 2: Cutaway view of coaxial cavity, as used in a klystron. Portion of wall through which electron beam passes is a grid (after 4).

a frequency that is fixed by the resonator and also helps maintain the electronic discharge. A cavity serves as the resonator in a conventional klystron and the idea of wall currents should be familiar from waveguide theory (cf. Poole,<sup>4</sup> chapter 2). An electron beam runs through the wall of the cavity (Figure 2) and induces a current in the wall. The oscillatory voltage (i.e. weak rf field) is thus set up with a frequency determined by the cavity dimensions. The induced rf field within the cavity then acts as a feedback on the electron beam, causing the electrons to bunch as their velocity is adjusted by the voltage oscillations.

The induced rf field is relatively weak. If the electron beam were simply allowed to pass through, there would be no usable rf from this thing. In a conventional (high power) klystron more cavities are added as 'receivers' of the high power modulated electron beam and you can tap into these for a greatly amplified rf source. The reflex klystron does much the same thing by reflecting the modulated electron beam back into the original cavity. If the high energy bunched electrons of the beam are returned to the cavity in phase with the standing voltage oscillations there is a net amplification of the signal and one can obtain useful rf powers by tapping into the cavity. The reflector voltage is what determines the return velocity of the electron bunches and therefore the phase.

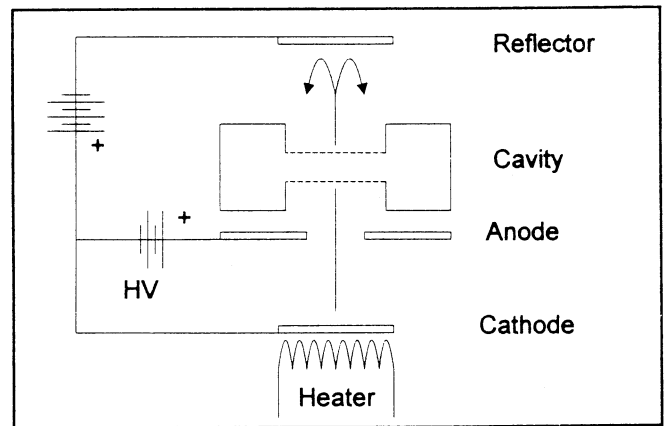


Figure 3: Schematic diagram of a reflex klystron. Beam voltage is indicated by HV.

## 3. Setting Up The Tube

The Varian klystrons have two points for hook-up. At the top is a steel cylindrical post that is the connection point for the reflector voltage. At the opposite end is a phenolic multi-pin plug. The X-13s and X-12 each have three pins to the plug; the 259A has six (of which four are used). The spec/data sheet tells you what's what, so I will not belabor that. I will mention that finding the right socket for these plugs was an adventure. The parts were formerly made by the Bendix division of Amphenol, but are now made by Wire Pro Inc. and carried by Newark (the WPI part number is 78-88-8 for an octal plug - Varian 259 tube; 91-MPF3S for three pin klystrons - Varian X-12/13).

The HP power supply also has an Amphenol 20-17 type receptacle (that is still manufactured by Amphenol, mercifully), and the pin description is embossed on the back panel of the instrument (in case, like me, you buy a used supply without documentation). All hook up wire should be 16 gauge in order to adequately handle the current load, and the rough wiring guide for X-13 and 259A are illustrated in Figure 4.

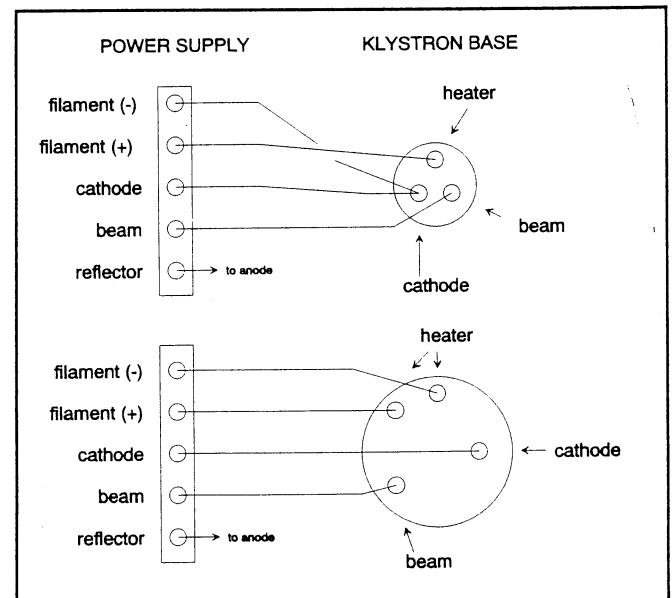


Figure 4: Wiring diagram for 3-pin (e.g. X-12/13, top) and 4-pin (V259A, bottom) klystrons.

The beam voltage for a given tube is typically specified by the manufacturer (appears in a spec sheet that accompanies the tube) and is usually somewhere near 400 V for an X-band tube; My C-band tube operates at about 200 V higher. The heater voltage is likewise specified as ~6.5 V. So, having wired up the klystron to the supply, one can set the beam voltage at the front panel potentiometer and expect to go. One can do this on the bench using an arrangement analogous to what I described in the last article in this series, however, because of the higher powers involved, I put my detector off on a directional coupler branch and pass the bulk of the power to a termination (Figure 5).

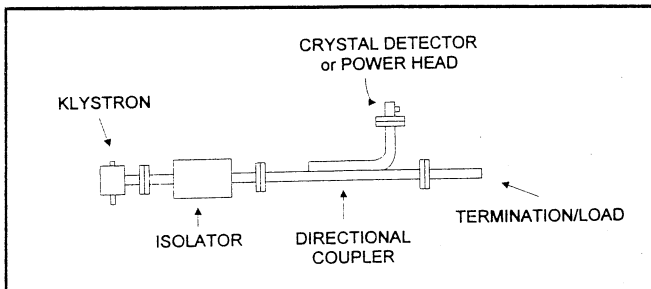


Figure 5: Set-up for testing the klystron and experimenting to determine its properties. Termination is 50  $\Omega$  load capable of handling 1 W.

The reflector voltage control on both of my power supplies is a multi-turn potentiometer dial, and as you turn it through its entire range you should see multiple indications of power delivered to the detector, in other words, several reflector voltages at which the klystron is tuned. This is normal. As I described above, the transit time of the electron bunches varies with reflector voltage, so the different voltages that tune the klystron correspond to electron velocities that bring the electrons back to the klystron cavity in phase with the interior voltage oscillations. The higher power (for a given tuning voltage) tuning modes correspond to fewer oscillations of the rf voltage during the electron bunch transit time; the maximum is usually around three oscillations.

The procedure for setting up a klystron is this: 1) hook it up to the supply (and source lock accessory - next issue); 2) switch the supply on to 'filament' to engage heater; 4) after warm-up (say, 30 min) turn on beam power; 5) adjust frequency mechanically by using the vernier, which adjusts the cavity dimensions. You must also simultaneously adjust the reflector voltage to maintain power output. 6) At the desired frequency, adjust the reflector voltage to give the maximum power output. The locking circuits are engaged after the klystron frequency and the reflector voltages are set.

There are a couple of factors to consider with klystrons, as with any microwave source. These are frequency stability and phase noise. These were somewhat confusing terms to me, so I will try to explain what they mean as best I can. They are important features because you need the source to remain locked at the desired frequency while you (for example) try to set new endurance records for signal averaging. The set-up described in the preceding paragraph just won't cut it for spectroscopy because both the power supply and tube will drift. So you need a lock circuit. The power supply and lock circuit will be the next part of this series, and I'll finish this up with some comments on

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spectral purity and how it is defined.

#### 4. How to Talk to an Engineer about Spectral Purity

No source of electromagnetic radiation is truly monochromatic. If you think about your typical visible light source, you may recall that it generally comes with an output spectrum of intensity vs. frequency. Oscillatory circuits likewise have an output spectrum, although it differs from that of a lamp. Oscillators will emit spurious signals due to unwanted resonances and modes, and they are affected by the electronic discharge that enables them to function.

In general, sources of signal corruption are single-sideband (SSB) phase noise, residual frequency modulation, and spurious signals. Spurious signals are the most conceptually easy of the noise sources: these are the harmonics, subharmonics, or inexplicable frequencies emitted by a source. They are specified as power intensity relative to the carrier (dBc). The other two noise types are somewhat more difficult to grasp.

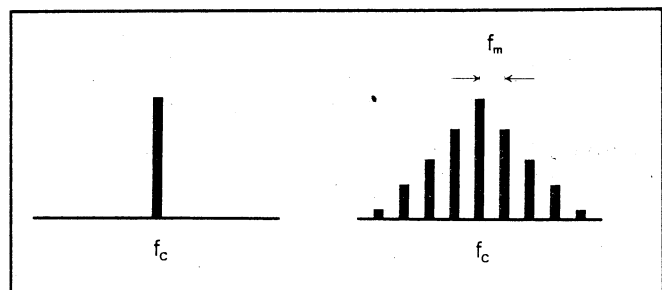


Figure 6: Power spectrum of a pure carrier  $f_c$  (left) modulated at a lower frequency  $f_m$  (right).

The easiest descriptive route is to consider a scenario in which we intentionally modulate a pure carrier. Suppose we frequency modulate a carrier of 8 GHz by  $\pm 1$  MHz (the so-called modulation depth) at a rate of 1 kHz; this means we vary the source output from 7.999 to 8.001 GHz every millisecond. A spectral output of this hypothetical system is the carrier frequency plus sidebands at  $f_c \pm n f_m$ .  $f_m$  is the modulation frequency, that is, 1 kHz (not the deviation 1 MHz). The magnitude of the sidebands is determined by the frequency deviation.

The same principle applies to generating noise. If the source (e.g. a klystron) is voltage controlled, then variation in the voltage is going to jostle the carrier frequency the same way as an intended modulation. So the microwave source will have sidebands with frequencies corresponding to the noise spectrum, and the amplitude of the sidebands will depend on the magnitude



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of the voltage swings. This information is typically plotted as a power intensity vs. frequency: zero is taken as  $f_c$  and the power is expressed as dB relative to the carrier frequency power (i.e. dBc). The specs you see for a typical synthesizer will read something around  $<-80$  dBc/Hz SSB noise at 10 kHz offset. This means the power measured at  $f_c \pm 10$  kHz was attenuated by greater than 80 db relative to the carrier power. The /Hz part is due to the nature of the measurement; power levels are measured over a finite bandwidth by us of a filter.

Residual FM is another type of phase noise, but is not due to an external modulation. If you consider a square wave generator of some clock rate and think about what might happen if the leading and falling edges of the square wave were subject to 'jitter' (a slight variation in temporal location). The clock rate is still okay, but you have these random fluctuations of phase due to deterministic or statistical factors of the circuit. Because phase variations are identical to frequency variations, it is another form of frequency modulation as described in the preceding paragraphs.

Does the phase noise matter much in EPR? It can. Most of us really don't have to worry much about its effect on linewidth, since our field modulation or narrow microwave pulse broadens the microwave spectrum anyway. Phase noise is more likely to affect EPR spectral quality in S/N, for example in the reference arm, since the minimal discernable signal (i.e. sensitivity) usually depends on the LO purity. I have not done a search of the literature to determine how fully anyone has studied the effects of phase noise on spectroscopy; I welcome information.

Next Issue: As covered in Poole's treatise, there are certain desirable properties of klystron power supplies. One can buy a commercial supply, however the trend these days is to build

power supplies (in general) out of optimized modules. One such manufacturer of modules is Vicor, and these modules appear to have specs suitable for klystrons. I ordered a prototype kit and, depending on the outcome of the 'adventure', will describe how to build a klystron power supply next time. I also recently managed to borrow an HP 83020A system amplifier and plan to describe the outcome of a head-to-head competition of spectral purity vs. an X-13 klystron using a pulsed spectrum/network analyzer. Lastly, I can be reached for comments/corrections, questions, or (dis)abuse via e-mail: [bender@spin.aecom.yu.edu](mailto:bender@spin.aecom.yu.edu)

#### REFERENCES AND NOTES

1. I plan a forthcoming column devoted to the mixer and its use in detection. It will include a description of alternative mixer diodes (biased Schottkys) that allow one to work with 'power starved' ( $<0$  dBm) conditions. The RHG (double balanced) mixer that I mention is now sold by MA/COM.
2. Unlike the VA-259s and X-13s, the X-12 is a low power tube (we use it for its tunability). At 25 mW, its power output is not much better than a YIG or Gunn, and I tend to rip out all the amenities (counter, power meter, second pulse-forming channel) from our spectrometer when I use it.
3. Bender, C.J.; Gedam, S. EPR Society Newsletter, 4(1), 7-8 (1992).
4. Poole, C.P. Electron Spin Resonance, A Comprehensive Treatise on Experimental Techniques. 2nd Ed. John Wiley, New York 1983. pp 85-91.
5. Slater, J.C. Microwave Electronics. Van Nostrand, Princeton 1950. Chapters 4, 9, 10.
6. Gilmour, A.S. Microwave Tubes. Artech House, Norwood 1986. Chapters 8 & 9.
7. Pierce, J.R.; Shepard, W.G. Bell System Technical Journal, 26, 460-681 (1947).

SOURCES OF KLYSTRON TUBES & STUFF (as listed in *Physics Today* 11th annual buyer's guide)

- Albacom, Microwave Tube Division, Dunsinane Ave., Dundee DD2 3PN UK; 44-382-89311; FAX: 44-382-832148.
- EEV Ltd., Waterhouse Lane, Chelmsford Essex CM1 2QU UK; 44-245-493493/FAX: 44-245-492492; USA 1-914-592-6050; Canada 1-416-745-9494; France 33-1-4790-5400; Germany 49-8041-41676 or 49-89-1490020.

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- Thomson Tubes Electroniques, 13, ave. Morane Saulnier, Bat. Chavez-Velizy Espace, BP-121, F-78148 Velizy France; 33-30-70-35-00/FAX: 33-30-70-35-35; USA 1-201-812-9000 FAX: 1-201-818-9050 FAX; Germany 49-89-78-79-0; Italy 39-6-02-48; Japan 81-3-3264-63-46; Singapore 65-227-83-20; Sweden 46-8-742-02-10; UK 44-256-84-33-23.

(If your native language, like mine, is not French, here is a chance to practice your school French! *Je voudrais un petite klystron rouge, s'il vous plait.*)

Formerly listed:

- Litton Electron Devices, 1035 Westminster Drive, Williamsport PA 17701 1-717-326-3561 (only offers a C-band tube).
- Varian Associates 1-415-424-6032. (C-band, V259x; X-, low end Ku, and Q- band; all narrow tuning range)

(The number of reflex klystron types among these folks seems to be rather meager.)

## TIPS & TECHNIQUES

### Miscellaneous Tips for EPR Users

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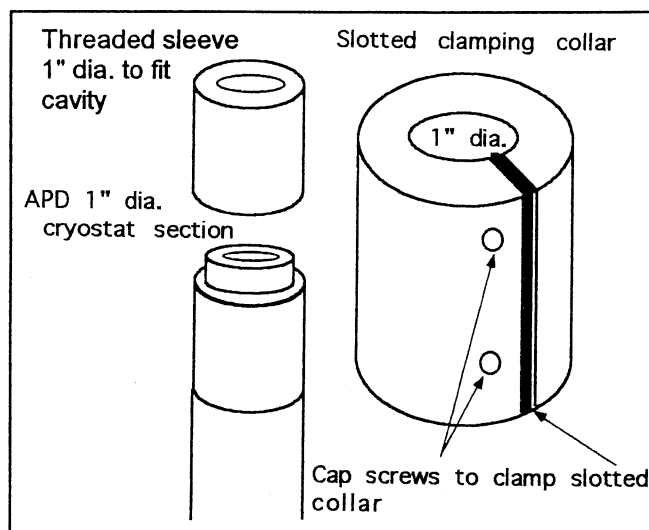
\*The Varian Century Series high-frequency receiver module requires periodic lubrication on the receiver gain switch front panel bushings. The actual switches are remotely located on the circuit board and are driven by flexible shafts that protrude through the front panel and are supported by brass bushings. A drop of oil (synthetic will last longer) will keep these sliding smoothly and minimize metal particles spilling on the internals of the receiver. If roughness still exists the switch shafts can be lubricated if the internal cover is removed.

\*Varian recorder track mechanisms (round rods for X-axis, square bar for Y-axis) respond well to cleaning with the aid of WD-40 or LPS 1.

\*Varian microwave bridges E101 and E102 need lubrication (again, synthetic oil is best) on the gear and gear-driven vertical shaft that drives the calibrated attenuation tape mechanism.

\*Oxford transfer lines need a heavy-duty lubricant on the threaded adjustment collars. A graphite based anti-seize (there is also a copper loaded anti-seize available) might be suitable or a heavy grease (with teflon additive) to prevent galling.

\*Air Products APD cryostats have a quartz breakage problem if the cavity mounting nut loosens while removing the assembly or possibly inserting the transfer line (\$800 or more). This can be avoided by replacing the mounting nut with a 1" diameter sleeve mounted to the cavity stack and by making a clamping collar to clamp to both the 1" diameter cavity sleeve



and the 1" diameter tube that is part of the APD cryostat. This gives a rigid mount that will help prevent the cavity from tipping off axis and breaking the dewar.

## INFORMATION FROM EPR CENTERS

*FROM THE CHEMICAL PHYSICS INSTITUTE in CHERNOGOLOVKA, of the RUSSIAN ACADEMY of SCIENCES, Chernogolovka, Russia:*

The staff of our research group, including three scientists and one technician, is mostly involved in studies of spin dynamics and charge transfer mechanisms in various biological and organic conjugated polymer systems.

We have available an analog high-frequency (D-band, 2-mm wavelength) EPR5-01 spectrometer supplied by the super-conductive solenoid (B~5T) and a completely digitally controlled PS100 X-band (3-cm wavelength) EPR spectrometer.

At higher frequencies, both the absolute point sensitivity and the spectral (g-tensor) resolution are increased considerably. As a result of resolution enhancement, the components of EPR spectra of organic radicals with a low spin-orbit coupling are registered separately at D-band. Our preliminary results show that D-band EPR gives the qualitatively new information on the spin dynamics in condensed systems.

Our group has developed several methods utilizing D-band EPR for more complete investigation of condensed systems<sup>1</sup>. One of the methods is based on a steady-state saturation of individual spin-packets. This technique was found useful in separate measurements of spin-lattice and spin-spin relaxation times and determination of the intra- and inter- molecular spin diffusion rates.

The method of spin label and probe, as well as the saturation transfer EPR (ST EPR), also applied in investigation of slow and super-slow molecular dynamics in biological and organic

conjugated polymers at D-band. Our group has the experience and appropriate equipment for chemical and electrochemical synthesis of both doped and undoped conjugated polymers, including polyacetylene, poly(p-phenylene), polythiophene, and their derivatives as powders and films.

For further information, contact Dr. V. I. Krinichnyi, Russian Academy of Sciences, Chemical Physics Institute, Chernogolovka, 142432 Russia, FAX: 7-095-265-57-14; e-mail: kincat@icph.sherna.msk.su.

[1] V.I. Krinichnyi, *2-mm Wave Band EPR Spectroscopy of Condensed Systems*, CRC Press, Boca Raton, Florida (in press).

**FROM the NATIONAL BIOMEDICAL CENTER for SPIN TRAPPING and FREE RADICALS, Oklahoma City, Oklahoma, USA:**

The National Biomedical Center for Spin Trapping and Free Radicals (NBC/STFR) currently includes the following staff and personnel: Drs. Edward G. Janzen, Yashige Kotake, Coit M. DuBose and J. Lee Poyer. Mrs. Michelle Evans is the secretary and Mrs. Melinda West is the technician. In addition, there are three post-doctoral associates; Drs. Hong Sang, Nagaraju Sankuratri and Ruixin Xu.

Anyone interested in information or help can contact us by letter, FAX or e-mail at the address below. We will acknowledge your inquiry immediately. However, an answer to your question may take more time depending on the nature of the inquiry. It would be useful for us to know your level of expertise in spin trapping. Perhaps the following categories may be appropriate: 1) Full expert in EPR Spectroscopy and Spin Trapping, 2) Expert in EPR Spectroscopy, but still learning about Spin Trapping, 3) No knowledge in EPR Spectroscopy but some knowledge about Spin Trapping and Free Radicals, 4) Little experience in EPR Spectroscopy and still learning about Spin Trapping and Free Radicals, or 5) No knowledge of EPR Spectroscopy, Free Radicals or Spin Trapping.

We can recommend reading materials at all levels for beginners and experts.

For information, contact Edward G. Janzen, Director, National Biomedical Center for Spin Trapping and Free Radicals, Oklahoma Medical Research Foundation, 825 NE 13th, Oklahoma City, OK, 73104, USA; FAX: 1-405-271-3980; E-mail: michelle-evans@omrf.uokhsc.edu.

## CONFERENCE REPORTS

**THE 27TH CONGRESS AMPÈRE**, dedicated to the 50th anniversary of the discovery of EPR by E.K. Zavoisky, was held August 21-28, 1994 at the Kazan State University Cultural Centre in Kazan - the capital of the Tatarstan Republic. 479 participants from 28 countries attended. The two volumes of the book of abstracts had been published by the Kazan Zavoisky Physical-Technical Institute of the Russian Academy of Sciences and were given to the participants upon registration.

*Organizing Committee:* Kev Salikhov - Chairman, Nail Suleimanov - Scientific Secretary. *Program Committee:* A. Aganov (Kazan), Yu. Molin (Novosibirsk), V. Atsarkin (Moscow), I. Ovchinnikov (Kazan), E. Hahn (Berkeley), K. Salikhov (Kazan), B. Kochelaev (Kazan), D. Stehlik (Berlin), and E. Lippmaa (Tallinn). *Executive Committee:* I. Aksenov, V. Khramov, M. Spector, V. Efimov, R. Malikova, E. Turiyansky, V. Gafurova, and R. Safin, assisted by the International Advisory Board. *The members of the Committee Ampère:* D. Ailion, O. Jardetzky, K. Salikhov, E. Andrew, J. Jeener, J. Schmidt, J. Baker, R. Kind, Y. Servant, G. Bene, B. Kochelaev, P. Servoz-Gavin, J. Bjorkstam, E. Lippmaa, C. Slichter, R. Blinc, A. Losche, J. Spevacek, B. Bluemich, Z. Luz, H. Spiess, A. Borovik-Romanov, B. Maraviglia, J. Stankowski, D. Brinkmann, M. Martinelli, H. Sterk, S. Clough, A. Martins, J. Strange, A. Dulcic, M. Mehring, I. Svare, R. Ernst, F. Milia, J. Tegenfeldt, J. Fayet, K. Mueller, K. Tompa, D. Fiat, H. Pfeifer, I. Ursu, R. Freyman, A. Pines, L. van Gerven, M. Goldman, M. Punkkinen, A. Weiss, K. Hausser, G. Raoult, H. Wolf, J. Hennel, A. Rigamonti, A. Zheliaskova, S. Hoffmann, R. Sagdeev.

During the Congress the Ampère Prize 1994 and the Zavoisky Awards 1994 were presented. The Ampère Prize was established in 1990 and is awarded for the most significant development in magnetic resonance technique. Former prize winners are Prof. R. Ernst (1990) and Prof. J. Jeener (1992). The Zavoisky Award was established in 1991 by the Kazan Zavoisky Physical-Technical Institute, Springer-Verlag Wien, New York, the Kazan State University, and the Academy of Sciences of the Tatarstan Republic under the auspices of the international EPR community, for outstanding contributions to the development of EPR. Former prize winners are Dr. W. Mims (USA), Prof. B. Bleaney (UK), and Prof. A. Schweiger (Switzerland).

The participants had the opportunity to visit a presentation of the journal, "Applied Magnetic Resonance" by the Editorial Board. Instruments by various companies (Bruker, Varian, etc.) were presented. The participants visited the laboratories of the Kazan Physical-Technical Institute of the Russian Academy of Sciences and Kazan State University.

On the morning of August 22, the opening of the Congress in the Opera and Ballet Theatre took place. The ceremony was chaired by Prof. K. M. Salikhov. The President of the Tatarstan Republic, M. Sh. Shaimiev, greeted the participants and the guests of the Congress. Prof. Yu. N. Molin, the member of the International Zavoisky Award Committee, announced that following the extensive nominations from the International

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Community of EPR scientists the Zavoisky Awardees 1994 are Prof. Dr. J. R. Norris, Jr. (Argonne), Prof. Dr. Ya. S. Lebedev (Moscow) and Prof. Dr. K. Möbius (Berlin).

Prof. J. R. Norris, Jr. is distinguished for the laureate's work in electron paramagnetic resonance and in particular, his innovative contributions to the elucidation of molecular structure of paramagnetic species in photosynthetic reaction centres.

Prof. Ya. S. Lebedev and Prof. K. Möbius are distinguished for the laureates' work in electron paramagnetic resonance and, in particular, the laureates' contributions to the development of new EPR methods and their applications in chemistry.

The presentation was made by the President of the Tatarstan Republic, M. Sh. Shaimiev. The President of the Tatarstan Academy of Sciences, M. Kh. Khasanov, Prof. A. Schweiger, the General Secretary of the International EPR (ESR) Society, and the Rector of Kazan University, Prof. Yu. G. Konoplev, warmly congratulated the laureates.

Prof. H. W. Spiess announced the decision of the Ampère Society that the Ampère Prize winner 1994 is Prof. E. Lippmaa (Tallinn), distinguished for his contribution to the development of solid state high resolution NMR.

After this ceremony the special session to honour the 50th anniversary of the discovery of Electron Paramagnetic Resonance by E. K. Zavoisky took place. It was chaired by Prof. A. S. Borovik-Romanov. The following lectures were presented: B. I. Kochelaev, Yu. V. Yablokov, "Fifty Years of Paramagnetic Resonance," and the Zavoisky Award Lectures: J. R. Norris, Jr. "A Magnetic Perspective of Photosynthesis," K. Möbius, "High-Field EPR - A Powerful New Tool in Photosynthesis Research," Ya. S. Lebedev, "Very-High-Field EPR and Its Applications."

During lunch the Meeting of the Bureau of the Ampère Committee took place. After lunch the scientific program of the Congress continued.

Symposium: *New Methods and New Developments in EPR* (Chair: Yu. Tsvetkov): L. Brunel, "Recent Developments in High Frequency EPR"; M. Bowman "Coherent Raman Beat Detection of Electron Spin Echo Envelope Modulation"; N. Romanov, P. Baranov, "ODMR, Level-Anticrossing and Cross-Relaxation in GaAs/AlAs Superlattices"; O. Poluektov, J. Disselhorst, L. Prevo, J. Schmidt, "Pulsed EPR and ENDOR Spectroscopy at 95 Ghz."

Symposium: *Spin and Molecular Dynamics* (Chair: V. Atsarkin): M. Warden, J. Simonet, E. Brun, "Progress in Understanding Non-Linear Dynamics in Spin Systems"; G. Karnaukh, T. Kulagina, B. Provotorov, "A New Approach to the Analysis of Broad, Saturated NMR Lines"; A. Gul'ko, F. Dzheparov, S. Stepanov, S. Trostin, "Fundamental Problems in Spin Dynamics, Disordered Systems and beta-NMR"; E. Fel'dman, "Dynamics of Nuclear Spins at High Spin Polarization."

In the evening of August 22 the Congress reception on behalf of the Government of the Tatarstan Republic took place in the Opera and Ballet Theatre. It was followed by the concert of the Tatarstan Republic Song and Dance Company. The performance was a success and was enjoyed by the participants and guests of the Congress. The Congress reception was preceded by the Zavoisky Awards 1994 celebration where the laureates were

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presented the memorable gifts from the Kazan Physical-Technical Institute of the Russian Academy of Sciences.

On Tuesday, August 23rd, 1994 the scientific program was as follows: Plenary Lectures (Chair: J. Jeener): R. Ernst, B. Meier, R. Meyer, M. Baldus, T. Bremi, S. Hediger, T. Levante, P. Robyr, M. Tomaselli, R. Wiedenbruch, "Spin Dynamics and Molecular Dynamics in Solids," M. Mehring, "Magnetic Resonance Spectroscopy of Electron-Nuclear Interaction in Solids."

Symposium: *EPR Applications* (Chair: C. Rudowicz): M. Ikeya, "ESR Dating Dosimetry and Microscopy," M. Brustolon, U. Segre, "Radicals in Solids: Motions and Spin Relaxation," R. Clarkson, K. Mattson, W. Shi, W. Wang, R. L. Belford, "Electron Magnetic Resonance of Aromatic Radicals on Active Surfaces," A. Il'yasov, "ESR of Phosphorus Containing Nitroxyl and Iminoxyl Free Radicals."

Symposium: *Modern Developments in NMR and NQR* (Chair: Yu. Ustynyuk): G. Bodenhausen, C. Zwahlen, S. Vincent, S. Nicula, J. Huth, G. Esposito, V. Ermakov, N. Kurur, V. Varma, J. Sachleben, "Selective Approaches to the Investigation of Scalar Coupling Networks and Cross-Relaxation Processes," C. Griesinger, H. Schwalbe, J. Schleucher, M. Sattler, M. Schwendinger, V. Bellinger, M. Maurer, P. Schmidt, R. Markert, T. Prasch, O. Schedletsky, B. Reif, A. Rexroth, J. Quant, S. Glaser, S. Brockage, R. Wechselberger, P. Schulte, J. Marino, W. Samstag, M. Wolter, J. Engels, W. Bermel, R. Weismann, G. King, O. Sorensen, "New Sensitivity Enhanced NMR Experiments on Isotopically Labelled Oligonucleotides and Proteins for Assignment and Determination of Coupling Constants," M. Buess, A. Garroway, J. Yesinowski, J. Miller, "Pure  $^{14}\text{N}$  NQR of Large Specimens," D. Suter, T. Blasberg, "Optically Enhanced Magnetic Resonance."

Symposium: *Conducting Materials. Metal Complexes* (Chair: S. Choh): E. Hahn, "A Novel Model of ESEEM Coherent Raman Scattering," R. Stoesser, G. Scholz, U. Calov, M. Hofz, "Temperature and Strain Induced Structural and Spin Relaxation in  $\text{Cu}(\text{H}_2\text{O})_6\text{MF}_6$  Compounds," N. Pislewski, T. Grabias, Yu. Yablokov, V. Voronkova, "The Proton Relaxation Times  $T_1$  in Binuclear Complex of Copper," S. Mronga, Ch. Thijssen, G. Mueller, E. Hoffmann, "Solution Structure of the Ionophore Metal Complex Monensin-Na Determined by NMR and MD Calculation," J. Hunziker, J. Gavilano, H. Ott, "NMR Studies of Some Heavy-Electron Metals."

Symposium: *Polymers, Liquid Crystals and Glasses* (Chair: F. Devreux): Symposia Lectures (Invited): R. Kimmich, N.

Fatkullin, "Field-Cycling NMR Relaxation Spectroscopy and Supercon Fringe-Field Diffusion Studies of Polymer Melts;" St. Pfaendler, R. Kind, "On the Heterogeneity of T1 in the Polymer Glass PMMA at Low Temperatures;" Yu. Gotlib, G. Golovachev, "The Short- and Long-Range Network Relaxation Effects in NMR of Polymer Networks;" N. Domracheva, Yu. Galyametdinov, R. Manapov, A. Prosvirin, I. Ovchinnikov, K. Griese, W. Haase, "Structural and Magnetic Properties of an Iron Mesogenic Complex;" J. Dolinsek, R. Blinc, "Two-Dimensional Exchange NMR in Glasses and Incommensurate Systems."

On the afternoon of August 23 was a reception for a group of participants of the 27th Congress Ampère by the President of the Tatarstan Republic M. Sh. Shaimiev. In the evening of August 23 the Ampère Society Committee meeting took place. The President of the Ampère Society, Prof. R. Blinc, and the Secretary General, Prof. R. Kind, presented their reports, which the Ampère Society Committee unanimously approved. Prof. B. Maraviglia (Rome) was elected the new President of the Ampère Society.

On Wednesday, August 24th, 1994 the scientific program was as follows: Plenary Lectures (Chair: J. Strange): J. von Schuetz, D. Bauer, W. Bietsch, H. Wachtel, "The Fascinating Processes and Their Dynamics in the Organic Metals of DCNQI with Metallic Counterions;" M. Teplov, O. Bakharev, A. Dooglav, A. Egorov, E. Krjukov, O. Marvin, V. Naletov, A. Volodin, D. Wagener, "Phase Separation in 1-2-3 Compounds as Seen from Rare-Earth Magnetic Resonances."

Symposium: *Biological Systems* (Chair: R. Kaptein): E. Andrew, M. Kempka, J. Radomski, "Relaxation and Molecular Dynamics in Two Solid Steroids: Cortisone and Testosterone;" A. Arseniev, V. Orekhov, I. Maslennikov, K. Pervushin, A. Sobol, L. Mosina, "NMR Study of Structure and Dynamics of Bacteriorhodopsin;" H. Fujii, B. Zhao, J. Koscielniak, L. Berliner, "In Vivo EPR Studies of Nitrosobenzene in the Mouse."

Symposium: *Phase Transitions* (Chair: A. Kessel): D. Bauer, J. von Schuetz, H. Wachtel, H. Wolf, "Hysteresis and Reentry Effects of Deuterated and Alloyed Cu-DCNQI-Switching of Susceptibility and Conductivity with Light and Pressure;" M. Glinchuk, V. Laguta, I. Bykov, "The Investigation of Ferroelectrics with Diffused Phase Transition by NMR and ESR Methods;" A. Debaud-Minorel, G. Silly, J. Buzare, "Critical Behaviour of Mixed (Rb,K)CaF<sub>3</sub> Crystals Under External Stresses;" M. Augustyniak, S. Hoffmann, "EPR of CrO<sub>4</sub><sup>3-</sup> Radical in (NH<sub>4</sub>)<sub>3</sub>H(SeO<sub>4</sub>)<sub>2</sub> Single Crystal;" Yu. Ivanov, O. Falaleev, E. Petrakovskaya, E. Zeer, "Influence of the Molecular Motion on Phase Transition in ATiF<sub>6</sub>·6H<sub>2</sub>O Crystals."

In the afternoon of August 24 a general meeting of the Ampère Society was held. New members of the Ampère Society Committee were elected. In the evening of August 24 the participants and the guests enjoyed a boat trip on the Volga river.

On Thursday, August 25th, 1994 the scientific program was as follows: Plenary Lectures (Chair: D. Stehlik): H. Spiess, "2D NMR and EPR Studies of Heterogeneous Polymers;" A. Hoff, "Magnetic Resonance Studies of Solar Energy Conversion in Photosynthetic Preparations."

Symposium: *Photosynthetic Systems* (Chair: J. R. Norris, Jr.): G. Kothe, "Quantum Beats as Probes of the Spin Dynamics in Photosynthesis;" D. Stehlik, R. Bittl, A. van der Est, A.

Kamlowski, "Spin Coherence Phenomena in Primary Processes of Photo-synthesis: Quantum Beats; Transient Nutations and Nuclear Modulations as Detected by Time Domain EPR;" A. Angerhofer, "Absorption Detected Magnetic Resonance of Modified Photosynthetic Reaction Centers;" H. Kaess, P. Fromme, F. Lendzian, B. Boenigk, L.-E. Andreasson, H. Witt, W. Lubitz, "ENDOR and ESEEM Experiments on Radical Cations in Plant Photosystem I and Related Model Systems."

Symposium: *Microimaging* (Chair: B. Maraviglia): B. Bluemich, C. Fuelber, F. Weigand, H. Spiess, "Characterization of Elastomers by Spatially Resolved NMR;" F. De Luca, N. Luger, G. Cammisà, S. Motta, B. Maraviglia, "T<sub>2</sub> Sensitivity in Solid State Imaging by the Indirect-MARF Method;" P. Bluemler, J. Moore, M. Sherwood, C. Wade, G. Collins, E. Mapoles, "NMR Imaging of Hydrogen Isotopes below 20 K;" H. Thiele, "New Software Concepts for Evaluation of NMR and Other Spectroscopic Data."

Symposium: *Photochemistry-Spin Polarization* (Chair: K. Möbius): E. Bagryanskaya, R. Sagdeev, "Time-Resolved SNP and DNP Investigations of Short-Lived Radical Intermediates;" G.-H. Goudsmit, H. Paul, "Time-Resolved EPR Cidep Study of Azoalkane Photolysis and Triplet Spin Relaxation in Solution;" C. Corvaja, "Spin Polarization of Doublet State Species in Solids Caused by Triplet-Doublet Interaction;" G. Buntkowsky, A. Privalov, H.-M. Vieth, "Studies of Alternative Polarization Transfer Techniques in Solid State NMR."

Symposium: *NMR Applications* (Chair: U. Haeberlen): J. Strange, S. Alnaimi, "Molecular Motion in Nanocrystalline Cyclohexane;" R. Mazitov, K. Enikeev, A. Il'yasov, R. Hasel-

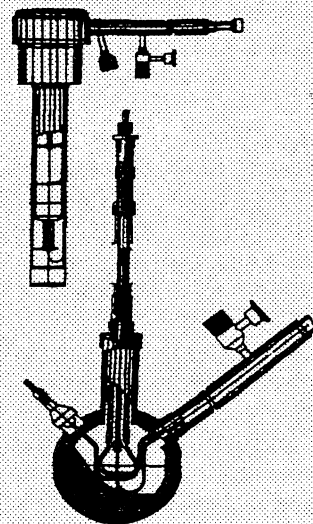
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maier, M. Holz, R. Seydoux, P. Diehl, "Magnetic Resonance of Noble Gas Atoms Dissolved in Condensed Substances;" H. Glaetli, "Neutrons and Nuclei: K-Space versus Real Space;" C. Jaeger, G. Kunath, P. Rehak, M. Feike, "Structure and Dynamics in Solids: Recent Progress by  $^{27}\text{Al}$  Satellite Transition Spectroscopy and 2D Correlation NMR;" C. Rossi, C. Bonechi, D. Renzoni, A. Donati, "NMR Relaxation: Theoretical and Experimental Approaches in Conformational Analysis."

On Friday, August 26th, 1994 the scientific program was as follows: Plenary Lectures (Chair: Yu. Molin): R. Kaptein, "Multi-Dimensional NMR Studies of Protein-Nucleic Acid Interaction;" J. Baker, M. Newton, "Nitrogen in Diamond Studied by Magnetic Resonance."

Symposium: *High-Tc Superconductors, Fullerenes* (Chair: J. Roos): H. Alloul, "Magnetic Properties of the Cuprates in Their Antiferromagnetic, Semiconducting, Metallic and Superconducting State;" F. Borsa, P. Carretta, M. Corti, A. Rigamonti, "Motions of the Flux Lines in High-Tc Superconductors from NMR Line Width, Relaxation and Spin Echo Dephasing;" V. Kataev, N. Knauf, W. Braunisch, R. Mueller, R. Borowski, B. Roden, D. Khomskii, "Field Dependent Microwave Absorption in Bi-Based High-Tc Superconductors with the Paramagnetic Meissner Effect;" V. Atsarkin, G. Vasneva, V. Demidov, "Electron Spin-Lattice Relaxation of Copper Ions in  $\text{YBa}_2\text{Cu}_3\text{O}_6^{*x}$ ."

33 Symposium: *Time Domain EPR-2D EPR* (Chair: J. Pilbrow): A. Ponti, A. Schweiger, "Echo Phenomena in Electron Paramagnetic Resonance;" H. Thomann, "Nuclear Coherence in Pulsed ENDOR Spectroscopy;" K.P. Dinse, M. Plueschau, "2D-EPR Study of Photo-Excited Radicals in Solution;" A. Mar'yasov, Yu. Tsvetkov, "Dipole-Dipole Interactions of Spin Probes and High Spin Paramagnetic Centres in Disordered Systems."

Symposium: *High-Tc Superconductors, Fullerenes* (Chair: J. Stankowski): I. Reid, "Muon-Spin Spectroscopy of the Fullerenes C60 and C70;" J. Stankowski, "EPR of Isolated C60 Ions and Paramagnetic Centers in Alkali Doped Fullerenes;" M. Eremin, S. Varlamov, S. Solovjanov, D. Brinkmann, M. Mali, R. Markendorf, J. Roos, "Low Energy Excitation Spectrum and Susceptibility Related NMR Properties, Determined from the Singlet Correlated Band, in  $\text{YBa}_2\text{Cu}_3\text{O}_8$ ;" B. Kochelaev, B. Elschner, A. Loidl, L. Kan, J. Sichelschmidt, "Magnon Bottleneck in High-Tc Superconductors as Revealed by the EPR Study;" H. Drulis, N. Suleimanov, A. Shengelaya, "Hydrogenation of the  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  System. EPR, NMR and Magnetic Studies."

Symposium: *Time Domain EPR-Developments in EPR* (Chair: M. Romanelli): T. Sanadze, "Multihole Burning Spectroscopy in EPR;" A. Niang, G. Ablart, J. Pescia, Y. Servant, R. Duplessix, N. Chanh, T. Marys, "EPR and Spin Lattice Relaxation in 2D Systems;" L. Aminov, "Impurity Ions and Their Influence on Magnetic Properties of Rare-Earth Compounds."

In the evening of August 26 the Congress dinner took place in the Restaurant TATARSTAN.

On Saturday, August 27th, 1994 the scientific program was as follows: Symposium: *Related Problems* (Chair: F. Waldner): R. Blinc, P. Cevc, D. Arcon, J. Dolinsek, D. Mihailovic, P. Venturini, "Pulsed ESR and NMR of the Organic Magnet TDAE-C60;" I. Garifullin, Yu. Goryunov, G. Khaliullin, "Spin-Wave Resonance in a Superconductor with Paramagnetic Impurities;" J. Jeener, A. Vlassenbroek, P. Broekaert, "Collective Effects in High-resolution NMR: "Radiation Damping" and Dipolar Field;" A. Smirnov, "Observation of the Antiferromagnetic Stark Effect in  $\text{Gd}_2\text{CuO}_4$  and  $\text{Nd}_2\text{CuO}_4$ ;" G. Neyens, R. Coussement, P. Bodchand, W. Bresser, "Prospects for Amplification of Gamma Radiation."

Symposium: *Recent Progress in Magnetic Resonance* (Chair: H.-M. Vieth): U. Haeberlen, "Deuterium NMR of  $\text{CD}_3$  Groups in the Tunneling and High Temperature Regimes;" J. Wrachtrup, C. von Borczyskowski, M. Orrit, R. Brown, J. Bernard, "Detection of Single Spins: Spin Coherence;" J. Zwanziger, K. Olsen, S. Tagg, R. Youngman, "Determining of Glass Microstructure with Two-Dimensional NMR;" D. Fiat, "Oxygen-17 Magnetic Resonance Imaging at Natural Abundance Using Projection Reconstruction and Gradient Recalled Echo Pulse Sequences;" J. Pilbrow, "Transition Metal Ion EPR - Past, Present and Future."

Plenary Lectures (Chair: E. Hahn): C. Yannoni, D. Rugar, O. Zueger, S. Hoen, J. Sidles, H.-M. Vieth, R. Kendrick, "Force Detection and Imaging in Magnetic Resonance;" J. Freed, "Two-Dimensional Fourier Transform and Far Infrared ESR Studies of Molecular Dynamics in Fluids."

In the afternoon of August 27 the Congress was closed. The closing of the Congress was followed by a farewell coffee/tea.

All posters of the 27th Congress Ampère were displayed in the Congress Building from the Monday morning, August 22 through Saturday morning, August 27 1994.

The weather, although nice enough to display the beauty of Kazan and environs, was not so glorious as to lure the congress participants away from the excellent lectures, posters and discussions.

The participants and the guests of the 27th Congress Ampère enjoyed an interesting social program including a tour of Kazan with its mosques and churches, and other places of religious and cultural significance, visits to museums (Museum of the Kazan State University, Department of Rare Manuscripts, Museum of Fine Art and the Lenin Museum) and exhibitions (an exhibition of Tatarstan's folk art and jewelry at Kazan State Museum, an exhibition of furs and fur manufacture at "Melita", a celebration of local fabric work and culinary expertise at Scholars's House), excursion to the Raifa National Park and Monastery, etc.

The organizers gratefully acknowledge the financial support of the following Governmental Institutions, Sponsors and Companies: Zavoisky Physical-Technical Institute, The Govern-



ment of the Tatarstan Republic, The Russian Academy of Sciences, The Russian Foundation for Fundamental Researches, The Ministry of Sciences of the Russian Federation, Kazan State University, The Academy of Sciences of the Tatarstan Republic, Fort-Invest Kazan, Bruker Analytische Messtechnik GMBH, Varian, Nuclear Magnetic Resonance Instruments (Donator for the Ampère Prize), Otsuka Electronics, Abak Tatuos.

The organizers are thankful to their magnetic resonance colleagues from the Free University of Berlin, Swiss Federal Institute of Technology Zurich, and the International Tomography Centre in Novosibirsk for support and encouragement.

The 28th Congress Ampère is expected to be held in 1996 in Canterbury (U.K.).

Submitted by Dr. Laila V. Mosina  
Executive Secretary, Zavoisky Award Committee  
Scientific Secretary, Applied Magnetic Resonance

## NOTICES OF MEETINGS

### GORDON CONFERENCES, WINTER, SPRING and FALL, 1995.

January 22-27, Doubletree Hotel, Ventura, California, "Metals in Biology," Elizabeth C. Theil; January 29-February 3, Holiday Inn, Ventura, California, "Nitric Oxide in Biochemistry and Biology," J.R. Lancaster, Jr., W. Jean Payne; February 5-10, Doubletree Hotel, Ventura, California, "Carotenoids," James A. Olson; February 19-24, Doubletree Hotel, Ventura, California, "Quinone and Redox-Active Amino Acid Cofactors," David Dooley; September 24-29, Schwaebisches Bildungszentrum, Irsee, Germany, "Solid State Chemistry," Kenneth Poepplmeier, Gerd Meyer.

*Program Information:* The complete program for the Winter and Spring 1995 Gordon Research Conferences is published in *Science*, October 14, 1994. General information on all of the Gordon Research Conferences is available on e-mail: via **gopher**, hackberry.chem.niu.edu port 70; via **world-wide web**, <http://hackberry.chem.niu.edu:70/0/webpage.html>; via **anonymous ftp** to hackberry.chem.niu.edu (in the pub/Conferences/GordonConferences directory).

*Mailing Address:* Conference Application, Gordon Research Conferences, University of Rhode Island, P.O. Box 984, West Kingston, RI 02892-0984, USA.

### MAGNETIC RESONANCE and the ENVIRONMENT CONFERENCE/WORKSHOP, Richland, Washington, USA, April 19-20, 1995.

This event will occur at a new scientific collaborative user facility, the Environmental Molecular Sciences Laboratory (EMSL), which is under construction at Pacific Northwest Laboratory (PNL). Full operation is scheduled to begin in late 1997. The primary mission of this DOE-sponsored laboratory is to develop, refine, and use state-of-the-art research methods to

investigate molecular processes that control complex environmental processes. It is expected that the research at EMSL will contribute significantly to a safe, effective, and efficient cleanup of hazardous waste sites.

Part of the EMSL will be a major magnetic resonance facility, which together with a mass spectroscopy facility constitutes the EMSL Macromolecular Structure and Dynamics (MS&D) group. The research in this group will focus on the following topics:

- the effects of exposure to toxic chemicals and/or ionizing radiation on the molecular, cellular, and tissue level
- catalytic destruction and conversion of chemical and radioactive wastes
- characterization of the processes that control the biological degradation of contaminants
- *in situ* and *ex situ* characterization of highly toxic stored waste and contaminated groundwater.

The MS&D group will be equipped with a large variety of liquid- and solid-state NMR spectrometers, operating at different fields, including a 1-GHz, high-resolution NMR and state-of-the-art EPR spectrometers.

On April 19-20, 1995, a conference/workshop entitled "Magnetic Resonance and the Environment" will be held at PNL. The purpose of this event is twofold:

- In the scientific part of the meeting, lectures will be held on the MS&D research program and invited speakers will give seminars on related topics.
- The workshop part of the meeting will explore possibilities for the NMR facility as a user's facility. Up to 50% of the operational time of EMSL facilities and equipment will be available to external scientists; realizing collaborative work and establishing a user's review committee will be discussed.

*Preliminary Program:* Wednesday, April 19—Morning, Introductory and keynote lectures; Afternoon, Tour of the NMR facility and the Hanford site; Evening, Informal dinner. Thursday, April 20—Morning/Afternoon, Specialized lectures; Evening: User's Session/Discussion.

For registration information, contact Ginny Woodcock, Pacific Northwest Laboratory, P.O. Box 999, MSIN P7-55, Richland, WA, 99352, USA; ☎: 1-509-372-3878; FAX: 1-509-376-2303; E-mail: [vd\\_wind@pnl.gov](mailto:vd_wind@pnl.gov).

For technical information, contact Robert A. Wind, ☎: 1-509-376-1115; e-mail: [ra\\_wind@pnl.gov](mailto:ra_wind@pnl.gov).

### 2nd WORKSHOP ON LOOP-GAP RESONATORS, National Biomedical ESR Center, Biophysics Research Institute, Medical College of Wisconsin, Milwaukee, WI, May 12-13, 1995.

This workshop is supported by the National Center for Research Resources of the National Institutes of Health, and marks the 20th year of funding for the National Biomedical ESR Center by NCR. The first day will consist of lectures, while the second day will be devoted to "hands-on" demonstrations, discussions, and tours of the National Biomedical ESR Center. The budget for the workshop is limited, but it is expected that a portion of the living expenses while attending the Conference will be covered. Also, a limited number of travel awards for students may be available. If you are interested in attending, please contact Christopher C. Felix, Ph.D., Scientific Administrator, Natl.



Biomedical ESR Ctr., Biophysics Research Inst., Medical Coll. Wisconsin, 8701 Watertown Plank Road, P.O. Box 26509, Milwaukee, WI 53226-0509. ☎: 1-414-456-4000; FAX: 1-414-266-8515; e-mail: cfelix@mis.mcw.edu (INTERNET).

**IV INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY AND APPLICATIONS, Munich, Germany, May 15-19, 1995.**

The meeting will be held under the sponsorship of GSF. Topics to be covered will be similar to past symposia and will include dose measurements of various types of ionizing radiation, radiation accidents and other biomedical applications including radiation therapy, development of standards and instrumentation (modern EPR, pulsed EPR, double resonance), imaging and dating of archaeological and geological materials. Other topics may be added depending on the interests of participants. The proceedings will be published in a special issue of the *International Journal of Applied Radiation and Isotopes*. A detailed announcement will be forthcoming. In the meantime, the organizers invite interested parties to contact any of the following: Dr. Dieter Regulla, GSF-Institut für Strahlenschutz, Neuherberg, D-85758, Germany, ☎: 49-89-387-2517; FAX: 49-89-3187-2517; Dr. Anne Skinner, Williams College, Dept. Chemistry, Williamstown, MA 01267; FAX: 1-413-597-4116; e-mail: anne.r.skinner@williams.edu; or Prof. Harold Swartz, Dartmouth Medical School, Dept. Radiology, Hanover, NH 03755-3863, FAX: 1-603-650-1935; e-mail: harold.swartz@dartmouth.edu.

**6th CHIANTI WORKSHOP ON MAGNETIC RESONANCE: NUCLEAR & ELECTRON RELAXATION, San Miniato (Pisa), Italy, May 27-June 2, 1995.**

This well-established series of magnetic resonance meetings in San Miniato will have its 6th edition in 1995. In continuation of the spirit of this series, the present Workshop aims at bringing together scientists involved in theoretical and experimental aspects of nuclear and electron spin relaxation to study the structure and dynamics of molecules.

The main topics to be discussed by NMR and EPR scientists will deal with:

- structure determination of biomolecules
- spin polarization phenomena and processes
- relaxation in paramagnetic systems
- quasi-ordered phases
- spin imaging
- new methodologies

The program will consist of invited lectures and poster presentations. A first circular containing more details will be distributed. Participants are asked to present posters on work related to the topics of the Workshop. They should submit an abstract (max. 1 page A4 format typed single-spaced) of the proposed communication not later than April 15, 1995. Since the total number of participants is limited, acceptance will be on a "first come, first served" basis.

The registration fee is 250,000 Italian Lira for active participants and 120,000 Italian Lira for accompanying persons. The cost of the accommodation, based on sharing a twin-bedded room, plus all meals (including Chianti wine!) will be 700,000 Italian Lira per person.

For further information, please contact one of the following:

*Prof. Riccardo Basosi* (Organizer), Dept. of Chemistry, Univ. Siena, Pian dei Mantellini, 44, 53100 Siena, Italy, ☎: 39-577-295040, FAX: 39-577-280405; *Prof. Claudio Luchinat*, c/o Dept. Chemistry, Univ. Florence, Via G. Capponi, 7, 50121 Florence, Italy, ☎: 39-55-2757563, FAX: 39-55-2757555; *Prof. Carlo A. Veracini* (Organizer), Dept. Chemistry, Univ. Pisa, Via Risorgimento, 35, 56100 Pisa, Italy, ☎: 39-50-918266, FAX: 39-50-918260, or the Program Chairman: *Prof. Klaus Möbius*, Dept. Physics, Free Univ. Berlin, Arnimallee 14, D-14195 Berlin, Germany, ☎: 49-30-8382770, FAX: 49-30-8386046.

**FIRST NSR WORKSHOP ON ADVANCED EPR SPECTROSCOPY, Nijmegen, The Netherlands, June 1-2, 1995.**

This 2-day workshop is organized on the occasion of the retirement of Prof. Dr. E. de Boer as a professor at the University of Nijmegen. With this meeting we would like to honour his extensive contributions to the field of EPR. Several aspects of modern EPR spectroscopy will be covered. In particular: Pulsed EPR, high frequency EPR and applications to bio-inorganic systems. Lectures on these subjects will be presented by invited speakers. Participants are invited to present their research in two poster sessions. The number of participants will be limited to approximately 75 persons.

A first circular was distributed in July/August of 1994. For information contact: E.J. Reijerse or D.D. van der Wey, Dept. of Molecular Spectroscopy, University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands.

☎: 31-80-653105 or 31-80-652004; FAX: 31-80-553450; Telex: 48228 wina. email: rey@sci.kun.nl or desiree@sci.kun.nl.

**IV INTERNATIONAL WORKSHOP ON ELECTRON MAGNETIC RESONANCE OF DISORDERED SYSTEMS followed by I INTERNATIONAL SEMINAR ON APPLIED EPR, Sofia, Bulgaria, June 12-19, 1995.** These conferences are organized by the Bulgarian EPR Society in collaboration with Institute of Catalysis, Bulgarian Academy of Sciences and Department of Chemistry, Sofia University. English is the language of these conferences.

a. The aim of the **EMARDIS Workshop** is to cover all qualitative (structural-reactivity, kinetics, etc.) aspects of recent development in theory, experiment, methodology, instrumentation, etc. of EMR (EPR, ENDOR and ESE) spectroscopy of disordered systems through lectures given by the top specialists, selected applicants and round-table discussions. Lecturers scheduled so far include: R. L. Belford, A. Bencini, M. K. Bowman, L. C. Brunel, R. Cammack, A. Colligiani, J.-M. Dance, J. Freed, C. Friebel, J. Forrer, E. Giamello, D. Goldfarb, A. Hoff, M. Iwaizumi, L. Kevan, H. Kurreck, Ya. S. Lebedev, W. Lubitz, G. Martini, S. K. Misra, O. Ohba, M. F. Ottaviani, J. Pilbrow, E. J. Reijerse, B. S. Prabhananda, A. Rockenbauer, J. Stankowski, B. S. Tsukerblat, H. van Willigen, Yuanzhi Xu.

b. Topics in the **APPLIED EPR Seminar** will include: Fundamental aspects of Quantitative EPR (standards, calibration, metrology and methodology of quantitative measurements, instrumentation - new methods, advanced techniques, automatization, etc.); EPR Dosimetry (monitoring of high energy radiation effects, high energy radiation processing control in food preserva-

tion and sterilization, dating of archeological and geological samples, etc.); EPR in medicine (clinical and biomedical studies); EPR in environmental control; EPR in the petrol industry; EPR and fossil fuels; EPR in polymer chemistry, etc. Expected specialist-lecturers include: B. Catoire, M. Che, S. Duber, K. Dyrek, M. Ikeya, V. Nagy, B. Nickel-Pepin-Donet, K. Ohno, D. Regulla, J. Raffi, R. Sayfutdinov, D. Schmalbein, M. H. Stevenson, H. Swartz, Yu. Tsvetkov, A. M. Wasserman, J. Weil.

Lectures from the organizers will also be scheduled in the programmes of both events. Original communications will be presented orally or as posters. An abstract book will be available at the meeting.

**Publications**—In the tradition of the EMARDIS meetings there will be two kinds of publications - short abstracts and full length of the invited lectures. A one-page abstract of each presentation should be typed either with good (carbon) ribbon, or printed with a letter-quality matrix or laser printer. Please use white paper and type single-spaced in the area limited with 25 mm margins on both sides, top and bottom of the standard A4 sheet. The abstracts should be sent to the Convener by February 15. Alternatively, if no formulas, symbols, figures, etc. are present in it they may be sent by E-mail up to the above date. In this case the organizers will print the abstract but at the author's responsibility. The book with abstracts will be available at the meeting. As done for previous meetings, the full text of the lectures will be published in special proceedings at the end of the year. In view of this, manuscripts prepared in camera-ready form will be collected during the workshop. Instructions for preparing of the manuscripts will be given in the second circular.

**Schedule/Attendance** — The meeting will commence with dinner on Monday (June 12) and will finish Monday (June 19) after breakfast. From Monday the 12th to Friday the 16th, EMARDIS problems will be discussed. The last two days (Saturday/Sunday, June 17-18) will be devoted to the "Applied EPR" Seminar. Friday (June 16) will be leaving/arrival day for those who wish to attend only one of the events or free (excursion) day for those who will attend both the events. The meetings will be limited to about 50 participants to facilitate scientific interactions. Those interested in attending should contact us for applications and send prospective abstracts to arrive before February 15, 1995. Acceptance into the meetings (on a first-come, first-served basis) will be sent by February 28, 1995.

**Social Program** — Welcome party, half-day sightseeing tour in Sofia and traditional farewell dinner are planned. In addition, an excursion to some places of regional historical and cultural interest will also be offered (Friday, June 16).

**Location, Accommodations, and Costs** — The meetings will be held June 12-19, 1995 near Sofia. The accommodation of all participants will be arranged in two-bed rooms. The cost of accommodation, including all meals, is US \$250 for EMARDIS and US \$200 for APPLIED EPR. In addition, there is the registration fee (US \$150 for the EMARDIS meeting, US \$120 for the APPLIED EPR Seminar, or US \$250 for both).

The deadline for receiving abstracts is February 15, 1995, and the deadline for confirmation of attendance is February 28, 1995. A Second Circular of the EMARDIS meeting with more details will be distributed at the end of February, 1995, only to those who

respond to the present announcement.

**For further information**, contact: N. D. Yordanov (Convener) or M. Zdravkova (Sci. Secretary), Institute of Catalysis, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. E-mail: [banchem@bgearn.bitnet](mailto:banchem@bgearn.bitnet). ☎: 359-2-713-2546 or 713-3917 or 724-917; fax: 359-2-756-116 or 720-038; telex: 22729 echban.

**BIOMED 95 3rd ANNUAL CONFERENCE, SIMULATIONS IN BIOMEDICINE, Palazzo delle Stelline, Milan, ITALY, June 21-23, 1995.**

The objective of this Third International Conference on Computers in Biomedicine is to bring together different scientists who work on the application of computers to simulate biomedical phenomena, as well as to develop numerical algorithms to analyse, manage and visualise biomedical data. This conference is specifically aimed at scientists throughout the world working on the application of computers to simulate and analyse biomedical phenomena but who may not be fully aware of each other's developments.

The Conference Chairmen are: Prof. C. A. Brebbia (Wessex Inst. Technology, UK), Prof. R. T. Hart (Tulane Univ, New Orleans, USA) and Dr. H. Power (Wessex Inst. Technology, UK). The International Scientific Advisory Committee are: Prof. M. W. Collins (City Univ., UK), Dr. P. R. Johnston (Univ. Tasmania, Australia), Dr. M. Karlsson (Linkoping Univ., Sweden), Dr. L. J. Leon (Univ. Montreal, Canada), Prof. C. J. Lumsden (Univ. Toronto, Canada), Prof. M. D. Nowak (Univ. Connecticut, USA), Dr. M. Tanaka (Osaka Univ., Japan), Mr. A. Urbaszek (Univ. Erlangen-Nurnberg, Germany) and Dr. Y. Xu (City Univ., UK).

**Conference Topics:**

- Simulation of Physiological Processes
- Computational Fluid Dynamics in Biomedicine
- Orthopedics/Bone Mechanics
- Electrical and Magnetical Simulation
- Imaging Processing
- Data Acquisition and Analysis

For information, contact:

Jane Evans, Conference Secretariat *Biomed 95*, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA UK; ☎: 44-703-293-223; FAX: 44-703-292-853; e-mail: [cmi@uk.ac.rl.ib](mailto:cmi@uk.ac.rl.ib); Intl. e-mail: [cmi@ib.rl.ac.uk](mailto:cmi@ib.rl.ac.uk).

**EPR-95 IES WORKSHOP, Sydney, Australia, July 13-15, 1995.**

On behalf of the organising committee and the Australian EPR community we would like to invite you to a workshop, supported by the International EPR Society, on innovative methods and applications of both continuous wave and pulsed EPR. The workshop will be held at the University of Sydney and is designed to bring together specialists in EPR spectroscopy and users of this technique to allow communication and provide solutions to users' problems. The meeting will be comprised of a series of invited lectures, a poster session Friday night and a Bruker Users meeting on Sunday. **Conveners:** John R. Pilbrow and Graeme R. Hanson. For a copy of the registration brochure please send your name, address, fax, e-mail and area of interest to Dr. Graeme Hanson, EPR-95, Center for Magnetic Resonance, Univ. Queensland, St. Lucia, Queensland, 4072 Australia; FAX: 61-7-365-3833 or e-mail: [epr-95@cmr.uq.oz.au](mailto:epr-95@cmr.uq.oz.au). or to Prof. John

R. Pilbrow, Monash Univ, Dept. Physics, Clayton, Victoria 3168, Australia, FAX: 61-3565-3637, e-mail: j.pilbrow@monash.edu.au. All names and addresses will automatically be added to the ISMAR mailing list.

**ISMAR-95, TWELFTH CONFERENCE OF THE INTERNATIONAL SOCIETY OF MAGNETIC RESONANCE, Sydney, Australia, July 16-21, 1995.**

This international conference will have sessions covering all major areas of magnetic resonance, including:

- Advances in imaging and microscopy
- Inorganic and multinuclear NMR
- Chemical applications of NMR
- EPR and applications (joint with IES)
- Proteins and nucleic acids: structure and dynamics
- Developments in multidimensional spectroscopy
- *In vivo* spectroscopy and clinical applications
- Solid state NMR
- Membranes and liquid crystals
- New technology and experimental methods
- Advances in theory and computational methods

Presentations will be via plenary lectures, invited lectures, colloquia and poster sessions, with special invited lectures from some of the pioneers of NMR to commemorate the 50th anniversary of its discovery. A comprehensive trade exhibition will be held in conjunction with the conference. Companies wishing to display magnetic resonance hardware, software or accessories should contact the conference chairman. The social program will give delegates and their companions opportunities to meet informally and to get to know this magnificent harbourside city. We will be suggesting pre- and post-conference tours for those who wish to travel more extensively around Sydney or to other parts of Australia.

For more information, contact Dr. L.D. Field, Chairman ISMAR-95, Department of Organic Chemistry, University of Sydney, Sydney NSW 2006 AUSTRALIA, ☎: 61-2-692-2060; FAX: 61-2-692-3329; E-mail: ISMAR-95@biochem.su.02.au

**EIGHTEENTH INTERNATIONAL EPR SYMPOSIUM at the 37th Annual Rocky Mountain Conference, Denver, CO, USA, July 25-28, 1995.**

For more information contact: Prof. Sandra S. Eaton, Univ. Denver, Dept. Chemistry, Rm. 153 Seely G. Mudd Science Bldg., Denver, CO, 80208, USA; ☎: 1-303-871-3102; FAX: 1-303-871-2254; e-mail: seaton@ducair or Prof. Gareth R. Eaton, Univ. Denver, Dept. Chemistry, Denver, CO, 80208, USA; ☎: 1-303-871-2980; FAX: 1-303-871-2254; e-mail: geaton@ducair.

**3rd MEETING OF THE SOCIETY OF MAGNETIC RESONANCE, Nice, France, August 19-25, 1995.**

For information, Contact: Society of Magnetic Resonance, 1918 University Avenue Suite 3C, Berkeley, CA, USA. ☎: 1-510-841-1899; FAX: 1-510-841-2340. SMR can now be reached by e-mail at info@smrm.org.

**VII INTERNATIONAL CONFERENCE on BIO-INORGANIC CHEMISTRY (ICBIC 7), Lübeck, Germany, September 3-8, 1995.**

The Scientific Program will be organized around eight plenary lectures, which will introduce topics to be expanded by

invited speakers in two parallel sessions and additional micro-symposia, and by two poster sessions. Tentative topics include:

- Redox reactions
- Hydrolic and group transfer
- Energy transfer, bioenergetics
- Transport, storage, and assembly of metals
- Metals and nucleic acids
- Gene regulation
- Metals in medicine
- Environmental chemistry
- Spectroscopy and specific applications
- — and more

The plenary lectures are: Stephen Lippard (Cambridge), *Synthetic models for and mechanistic studies of methane mono-oxygenase*; Ken Raymond (Berkeley), *The coordination chemistry of biological iron transport: Iron and disease*; Dieter Sellmann (Erlangen), *Modelling the reactivity of metal-sulfur oxidoreductases*; Britt-Marie Sjöberg (Stockholm), *Ribonucleotide reductase - an ancient enzyme with radical mechanism*; Rolf Thauer (Marburg), *Metalloenzymes involved in methanogenesis*; Andy Thomson (Norwich), *Magneto-optics and metalloproteins*; Anthony Wedd (Melbourne), *Oxo-molybdenum enzymes*; Raymond Weiss (Strasbourg), *Advances in modelling the high-valent iron intermediates of heme proteins*.

Call for posters: Formats required to prepare posters and to publish abstracts will be sent with the second announcement. Abstracts will be accepted for publication in the *Journal of Inorganic Biochemistry* only after receipt of conference fee.

Social events will include a get-together party on Sunday evening, September 3; an organ concert at Marienkirche, Tuesday evening, September 5; optional excursions to the old City of Lübeck, to Mecklenburg, to Schleswig-Holstein, to Hamburg, etc. on Wednesday afternoon, September 6. The official conference dinner will be held on Friday evening, September 8. There will also be a panorama of daytime events for accompanying persons who are not engaged in the scientific program.

For further information, contact either one of the Conference Chairs: Alfred X. Trautwein, Institut für Physik, Medizinische Universität, Ratzeburger Allee 160, D-23538 Lübeck, GERMANY. ☎: 49-451-500-4200; FAX: 49-451-500-4214; e-mail: icbic7@miraculix.physik.mu-luebeck.de OR Karl Wieghardt, ☎: 49-234-700-4153; FAX: 49-234-700-4109.

**II INTERNATIONAL WORKSHOP ON IN-VIVO ESR AND ESR IMAGING, L'Aquila, Italy, September 10-13, 1995.** It will cover the following topics: EPR instrumental development, new technologies, EPR imaging, low frequency EPR, *In-Vivo* EPR, Spin Trapping, Oximetry and Advances in Biophysical Applications. For further information and to be included in the mailing list please contact: Prof. Antonello Sotgiu, Dept. STBB, University of L'Aquila, Via Vetoio, Coppito, 67100-L'Aquila, Italy. Fax: 39-862-433-433, E-Mail: sotgiu@vxscq.aquila.infn.it.

**VII INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE (ISMRCIS VII), Madrid, Spain, September 11-15, 1995**

(Preliminary Information). This Symposium, to be held at the central premises of the Consejo Superior de

Investigaciones Cientificas (CSIC) in Madrid, Spain, September 11-15, 1995, is a continuation of the previous triennial conferences on the same subject started in San Francisco, USA (1976) and followed on in Menton, France (1979), Torun, Poland (1983), Muenster, Germany (1986), Newark, Delaware, USA (1989) and Firenze, Italy (1992). These symposia have become a major event whose aim is to provide a forum for physicists, chemists, and biologists at which to present and discuss their recent research in the field. The program will include plenary and invited lectures as well as oral and poster presentations. The official language is English. The proceedings will be published as full articles in an archival scientific journal.

*Topics:* Among the topics to be covered are:

- Adsorption, Catalysis and Surface Chemistry
- Interfacial Coordination Chemistry
- Molecular Sieves, Zeolites and Silicate Surfaces
- Intercalation Compounds
- Advanced Materials, Ceramics and Composites
- Surfaces, Interfaces and Nanostructures of Magnetic and Electronic Materials
- Dispersed Systems (including colloids, polymers and gels)
- Ordered Systems (including liquid crystals, self-assembling materials and micelles)
- Biological Systems, Membranes and Interfaces
- New Magnetic Resonance Techniques
- Other topics to be included depend upon the response.

*Organizing and Program Committee Officers:* Javier Soria, Chairman, CSIC; José L. De Segovia, Co-Chairman, CSIC; José C. Conesa, Secretary, CSIC.

*Accommodations:* The scientific activities will be held on the Campus of the CSIC located close to downtown Madrid. Information on housing and social programs will be published later.

To indicate interest in attending this symposium and receiving next circulars, please supply the following preliminary-registration information to Dr. José Conesa, Inst. de Catal. y Petroleo-química, CSIC, Campus Univ. de Cantoblanco, 28149 Madrid, Spain; Fax 34-1-5854760; e-mail: mrcis@icp.csic.es: *Name, Title, Affiliation, Address, Telephone, Fax, e-mail, Telex, Field(s) of interest, Suggestions for specific Conference topics, Tentative title of paper if you plan to submit one.*

## POSITIONS WANTED

**An EPR-spectroscopist with biophysical/biochemical background seeks a position in an EPR-lab after February 1, 1995.** Experience: working on Bruker ER 220D and ER 200D-SRC spectrometers, plus Aspect 2000 or Aspect 3000. Measurements at 77-300 K. Background in some basic biochemical techniques and in working with animals. General interests: Paramagnetic centres in biological and biochemical systems including whole human and animal blood and its components, whole animal tissues; biochemical reactions involving free radicals and non-free-radical paramagnetic species. Paramagnetic centres induced by ionising radiation at 77 K in whole biological tissues and cell cultures. Computer assistant decomposition of the gross EPR spectrum of an irradiated at 77K sample into separate EPR signals of different paramagnetic centres (using the subsequent annealing technique). ESR dosimetry in tooth enamel. A new approach in measuring reproducible spectrum of

a whole solid sample with a great anisotropy of the resonance absorbance. Present research: the mechanism of reaction of MetHb with H<sub>2</sub>O<sub>2</sub>; nature of the free radical intermediate.

### Education:

- 9/75-5/81 Dept. Molec. Biophysics, Moscow Inst. Physics and Technology, Moscow, Russia. Diploma (graduate certificate) in Physics and Engineering.
- 9/81-5/84 Post-graduate courses, Dept. Chim. Bio., Inst. Chem. Physics, Moscow, Russia.
- 1986 Ph.D. (Physics & Mathematics), Dept. Chim. Bio., Inst. Chem. Physics, Moscow, Russia.

### Work Experience:

- 8/84-2/94 Jr. Researcher, Researcher, Sr. Researcher, Dept. Chim. Bio, Inst. Chem. Physics, Moscow, Russia.
- 12/89-5/90 Visiting Scholar, N. Bethune Univ. Med. Sci., Changchun, China.
- 2/94-present Visiting Research Scientist, Royal Society Fellowship, Chemistry Dept., Univ. Essex, UK.

Full resume and references available on request. Dr. Dimitri A. Svistunenko, Department of Chemistry and Biological Chemistry, University of Essex, Wivenhoe Park, Colchester, Essex CO4 3SQ, United Kingdom; ☎: 44-206-872183 ; FAX: 44-206-873598; Telex: 98440 (UNILIB G); E-mail: svist@essex.ac.uk.

**EPR and NMR Spectroscopist Seeks an Academic or Industrial Position.** Biophysicist-solid state physicist, Ph.D. '87, research/teaching experience. Now research worker/teacher at Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University. Research experience: A) liquid- and solid-state EPR spectroscopy of biological, organic and inorganic materials (Bruker 200D SRC NMR Spectrometer with Aspect 2000 Computer). Special research experience: membrane biophysics, drugs-membrane interaction, spin-label EPR spectroscopy (International Training Course, Hungarian Academy of Sciences, Szeged, Hungary). Also sol-gel or glass solid-state EPR spectroscopy; transition-metal spin labels. B) liquid- and solid-state NMR spectroscopy of biological, organic, and inorganic materials (Varian 300 MHz VXR spectrometer). Special research experience: 1D, 2D, and pseudo-3D multinuclear NMR spectroscopy of biopolymers, using Varian Unity 500 MHz spectrometer (postdoctoral fellowship at McGill University, Pulp and Paper Research Center, Montreal, Canada). Also sol-gel or glass multinuclear NMR spectroscopy. Wanted: faculty or research post, or opportunity to teach basic principles of resonance spectroscopy or biophysics. Please contact:

Dr. Milan Mazur, Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University, Radlinskeho 9, CS-812 37 Bratislava, SLOVAKIA; FAX: 42-7-493-198.

**EPR Spectroscopist seeks a Postdoctoral Fellowship Position.** Semiconductor physicist, 32 years old, Ph.D. '88, research worker of the Institute of Semiconductor Physics (Novosibirsk, Russia). Research experience: EPR of defects in irradiated semiconductors, spin-dependent transport in semiconductors, EPR of paramagnetic centers in quantum size semiconductor structures. Please contact: Dr. A.A. Karanovich, Inst. Semiconductor Phys. Russian Acad. Sci., Siberian Branch, pr.Lavrenteva 13, 630090 Novosibirsk, RUSSIA; ☎: 38-32-354255; FAX: 38-32-354265; Telex: 133243 FONON SU; e-mail: lab24@isph.nsk.su.

## POSITIONS AVAILABLE

Professor John Pilbrow, Physics Department, Monash University, has a position which could be either at the post-doctoral level or suitable for an appropriately qualified sabbatical visitor which could run from about nine months to one year, depending on seniority and negotiated salary level to carry out ESEEM and relaxation time measurements using a Bruker ESP380E FT/CW spectrometer. Person to have had experience in pulsed EPR (ESEEM etc.) in one or more of the following areas: transition metal ions in crystalline and non-crystalline solids, metal proteins, transition metal complexes.

In 1995 the group will consist of three Faculty members, two other post-doctoral fellows and three PhD students. Position could start almost immediately.

For further information contact Prof. John R. Pilbrow, Department of Physics, Monash University, Clayton, Victoria 3168, Australia; ☎: 61-3-905-3630; FAX: 61-3-905-3637; E-mail: j.pilbrow@sci.monash.edu.au.

**Postdoctoral Research Position** is available on an EU-funded project, to study the nickel-iron-sulphur enzyme hydrogenase, of which the structure has recently been determined. Experience with EPR or NMR or other spectroscopy an advantage. Training will be provided as necessary in spectroscopy, protein chemistry, and redox methods. There are opportunities for exchange visits to other research laboratories in the EU. The position is available immediately, for two years. Salary according to age and experience. Apply as soon as possible to: Prof. R. Cammack, Centre for the Study of Metals in Biology and Medicine, Division of Life Sciences, Campden Hill Rd., London W8 7AH, UK. ☎: 44-171-333-4264;; E-mail: r.cammack@hazel.cc.kcl.ac.uk; FAX: 44-71-333-4500.

**Help wanted:** A group in the Cancer Institute at NIH is working on a novel biological application of magnetic resonance spectroscopy. Some funding has been secured, and we are looking for an individual who might be interested to help. We need a person with a good understanding of a modern spectrometer, particularly the analog and RF circuitry. Experience in RF design, hi speed signal switching, gradient coil design and the associated prototype execution and testing is highly desirable. No formal position has been established. The person could be on a postdoctoral or visiting scientist appointment, on an engineering or technician employment level or even part time as a consultant or outside contractor. Anyone who feels qualified and is interested

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in talking to us can contact me to exchange more information. All responses will be held in strict confidence. Contact Rolf Tschudin, Bldg.5, Rm. B2-29, National Institutes of Health, Bethesda, MD 20892-0505, USA; ☎: 1-301-496-2692; Fax: 1-301-496-0825; E-mail: tschudin@nih.gov; CompuServe: 71543,751.

**Postdoctoral Research Fellow**, Department of Bio-Medical Physics and Bio-Engineering, University of Aberdeen, U.K. Applications are invited for this MRC-funded post, to work on the development of an instrument to detect and image free radicals in biological systems. This procedure uses longitudinal detection techniques in electron spin resonance and has great potential for biomedical research and medical diagnosis as free radicals are thought to be implicated in many disease processes.

Applicants should have a good honours degree in physics or a related subject and, ideally, should have completed a Ph.D. in NMR or ESR. The appointment will be made within the range (UKP) 13,941-15,566 on the Grade 1A scale for research staff for candidates with a Ph.D. and is for a fixed period of 3 years.

For further information contact: Dr. Ian Nicholson; e-mail: mpu016@biomed.abdn.ac.uk; ☎: 44-1224-681818 ext. 53192; Application forms are available from: Personnel Office, University Office, Regent Walk, Aberdeen, AB9 1FX, UK. Closing date for applications is 20th January 1995.

**Postdoctoral Research Position.** The research will involve measurements of magnetic properties of various metallo-proteins and synthetic model complexes to gain insight into structural and mechanistic questions. Part of the research effort will be the development of an EPR microwave probe and cryostat configuration suitable for metalloprotein research at high microwave frequency. Minimum requirement: Ph.D.

Send resume to: Professor Michael Hendrich, Department of Chemistry, Mellon Institute, Carnegie Mellon University, 4400 5th Ave., Pittsburgh, PA 15213, USA.

## EQUIPMENT & SUPPLIES EXCHANGE

### FOR OWNERS OF VARIAN & BRUKER EPR SPECTROMETERS

Micro-Now Instrument Company now has available replacement klystrons (new) for Varian 4500, E3, E4, Century Series and some Bruker spectrometers available at attractive prices.

Contact Clarence Arnow, ☎: 1-708-677-4700, FAX: 1-708-677-0394; 8260 N. Elmwood St., P.O. Box 1488, Skokie, IL 60076, USA.

### FOR OWNERS OF VARIAN EPR SPECTROMETERS:

- (1) Field Scan Potentiometer;
- (2) Klystrons for Replacement;
- (3) Parts for Varian E-256 Electrolytic Cell;
- (4) Diodes for Varian E-101 & E-102 Dispersion Style Microwave Bridge Users;
- (5) Varian E-3, 9 12 & E-104, 9, 12 Crt's :

(1) Varian E-3, E-4 and E-9 and early E-109 users: I have arranged for a custom group order of replacement field scan potentiometer using Varian's specifications and the original vendor part number. These Model #3406 are 30 ohm, 0.06%

linearity 3,0 turn pots with a center tap and have infinite resolution. This replacement can solve field stability problems arising from a noisy wiper. If you would like to participate and make this opportunity possible, please contact me regarding your interest. The price would be \$723.00 each with a \$35.00 handling fee per order plus shipping charges (we need to get 25 to get this price). They have a long shelf life. A purchase order would be required. The expected delivery time is about 160 days. There can be no returns on this order, but a vendor's 1-year warranty would apply.

I could also rebuild these parts, but the turn-around time would be long due to batch requirements. So I recommend an order of at least one new pot, which will allow the old one to be recycled at some later date at a price of around \$525.00 depending on the batch size at that time (I would expect most pots are suitable for rebuilding). Please indicate your interest.

(2) Varian V-4500, E-3, E-4, E-9, and E-104,9,12 users: I am arranging one large order for Varian X-Band Klystrons with Varian. If we have a sufficient quantity, Varian will supply with volume pricing. So I need to know your needs, that you would be willing to commit a purchase order to (at a later date). The pricing would probably be in the \$6000 range. I would extract a \$100.00 handling fee per order plus shipping for my time. Warranty period from Varian would be a 2-year shelf life plus a 3-year 12,000-hour prorated warranty (typical life 50,000 hours). Delivery times would be long term (6 months). If you need Q-Band or E-3 klystrons, let me know; these should be available as well. Prompt response will help in determining the Varian's pricing on this one-time order. Varian's quoted introductory pricing is \$7,000 for unit quantities and is subject to change. The volume price will only be available for a short period of time.

(3) I have the following parts to the Varian E-256 electrolytic cell, unused in factory wrappings: Varian PN 908721-02 Reference Bridge, with protective container; Varian PN 908721-01 Potential Bridge, with protective container; Varian PN 908723 Flat cell; Varian PN 908732 Reservoir upper half; Varian PN 908717 Reservoir lower half.

(4) I have arranged for a custom order of replacement microwave diodes using Varian's specifications and vendor part number (pill style case). If you would like to participate, please contact me regarding your interest. Each dispersion bridge uses two microwave diodes. Fortunately, the diodes don't fail often because of the diode protection circuitry; however, failures have occurred, with replacements difficult to obtain. The price would be \$150.00 each. Since this is a custom order, there would be no returns possible. The suitability of the diode for this purpose is based on Varian's prior usage of this vendor part number for this part. A purchase order would be required.

(5) I have a possible source for rebuilding E-3 crt's for the oscilloscope module. Let me know your needs in this area both now and for the future (I would like to know how many E-3's are still in operation). I will have one crt rebuilt shortly. Don't discard or break the old crt.

E-4;9; 12, E-104;9;12 crt's for the oscilloscope modules and the Varian NMR Gaussmeter are currently available new at \$255.00 ea. Buy one now for stock before they are discontinued.

Stringing kits for the Varian recorder are available.

For information, contact James R. Anderson at Research Specialties, 5629 N. Maplewood, Chicago, IL, USA 60659.

☎/FAX: 1-312-728-6570.

#### WANTED: VARIAN MAGNET COIL

We are looking for a magnet coil for a Varian V-3400 9-inch magnet. We need the coil on the right-hand side (from the front). Please contact Shen or David at E-mail address "gashe@ttacs.edu" or call 1-806-742-3764. Jimmiao Shen, Physics Dept., Texas Tech Univ., Lubbock, TX, 79409, USA.

#### WANTED: HALL PROBE

We urgently need a Varian E-4 magnet Hall Probe - P/N - 908742-05 and an E-112 magnet Hall Probe - P/N - 929279-02B. If available, please contact or send to Prof. P.T. Manoharan, RSIC, IIT, Madras - 600 036, India.

#### WANTED: USED EPR/NMR ELECTROMAGNET

We are looking for a used 12" (or bigger) NMR/EPR electromagnet in a good operating condition. A used MRI imaging resistive magnet is also desirable. Please contact: Michael Chzhan, EPR Labs, Johns Hopkins University, Baltimore, MD, USA; ☎: 1-410-550-2438, FAX: 1-410-550-2448, e-mail: kppu@welchlink.welch.jhu.edu.

#### OFFERED: HELP IN THE DESIGN AND CONSTRUCTION OF EPR ELECTRONICS

The University of Denver is able to provide design and construction services for EPR-related electronics such as low noise signal pre-amplifiers, timing systems for pulsed EPR, or complete microwave bridges. Contact: Richard Quine at the University of Denver, Denver, CO 80208 USA. E-mail: rquine@diana.cair.du.edu ☎: 1-303-871-2419.

#### FIELD SCAN CARDS AVAILABLE FOR COMPUTER CONTROL OF VARIAN FIELD CONTROLLERS

Any Varian magnetic field controller can be modified to permit control of the magnetic field by a computer. An improved scan card design with better documentation at lower cost is available from the University of Denver. Contact Richard Quine, University of Denver, Denver, CO 80208 USA;

E-mail: rquine@diana.cair.du.edu; ☎: 1-303-871-2419.

## ANNOUNCEMENT

**Members:** Have you paid your dues for 1994? If you are not sure, it will save the Society the expense of mailing late notices if you will take a moment to ascertain the status of your membership according to our records. To do this, please check the lower right hand corner of your mailing label. You will find there four dashes ("-- --"). If only the four dashes "-- --" or "--0--" appear, no dues have been recorded for you for the 1994 year. If dues have been paid, either a numeric value or a letter "R" or "C" (for soft currency countries) will appear, e.g. "--25--". If you don't have your label, please contact the IERC (address on page 1) and we will check to see if dues have been recorded. Your prompt payment of dues will be appreciated! For information on the amount of dues and method to pay, please see Vol 6 #2 (Directory Issue).



# EPR NEWSLETTER

Volume 6, Number 4

Page 1

Winter, 1994-95

Editor: R. Linn Belford, Urbana, IL (address below).  
Assistant Editor, Becky Gallivan, Urbana, IL (address below).  
Typography: Martha Moore.

*This, the official newsletter of the International EPR(ESR) Society, is supported by the Society, by corporate and other donors, and by three EPR/ESR centers:*

#### National Biomedical ESR Center,

Prof. James S. Hyde, Director, Medical College of Wisconsin,  
MACC Fund Research Center Building, 8701 Watertown Plank  
Road, Milwaukee, WI 53226, USA. ☎: 414-456-4007.  
FAX: 414-266-8515. E-Mail: cfelix@mis.mcw.edu

#### Biotechnology Resource in Pulsed EPR Spectroscopy,

Prof. Jack Peisach, Director, Albert Einstein College of Medicine,  
Dept. of Molecular Pharmacology, 1300 Morris Park Avenue,  
Bronx, New York 10461, USA.  
☎: 718-430-2175. FAX: 718-829-8705.  
E-mail: peisach@aecom.yu.edu

#### Illinois EPR Research Center (IERC),

Prof. R. Linn Belford,\* Director; Prof. Harold M. Swartz,<sup>†</sup> Co-  
Director; Prof. Robert B. Clarkson,\* Assoc. Director; Prof. Peter  
C. Debrunner,\* Co-Principal Investigator; other senior staff: Prof.  
Mark J. Nilges,\* Dr. Alex Smirnov,\* Laboratory Manager at  
Urbana. Dr. Tadeusz Walczak,<sup>†</sup> and Dr. Jim Liu,<sup>†</sup> Laboratory  
Manager at Dartmouth.

\*University of Illinois at Urbana, 190 MSB, 506 South  
Mathews, Urbana, IL, 61801, USA.  
☎: 217-244-1186. FAX: 217-333-8868.

E-mail: ierc@uiucvmd.bitnet or rlbelford@uiuc.edu

<sup>†</sup>[IERC also operates a satellite site for EPR in viable  
biological systems at Dartmouth College, Hanover, NH; USA.  
☎: 603-650-1955; FAX: 603-650-6525;  
E-mail: harold.swartz@dartmouth.edu]

*All these Centers, Research Resources sponsored by the National  
Institutes of Health, cooperate to facilitate research involving EPR.  
Prospective users may contact the staff at any of the Centers.*

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Please direct communications about the EPR Newsletter or prospective material for publication to the Editorial Office at the IERC address above.

## ACS NAMES RONALD P. MASON THE 1994 SOUTHERN CHEMIST GOLD MEDALIST—

We are pleased to report that another charter member of the International EPR(ESR) Society has won a prestigious award. Dr. Ronald P. Mason, research chemist in the Laboratory of Molecular Biophysics at the National Institute for Environmental Health Sciences, won the 1994 Southern Chemist Award by the American Chemical Society (ACS) for his research on the role of free radical metabolites in the toxicity of chemicals. The prize, including a gold medal, recognizes distinguished service to the profession of chemistry in the southern United States.

Dr. Mason, who has published 190 original articles, received his Ph.D. in physical chemistry from the University of Wisconsin-Madison in 1972 and then did postdoctoral research at Cornell University with Prof. Jack Freed. He has held his current position at NIEHS since 1978 and concurrently serves on the professorial Toxicology faculties of the University of North Carolina at Chapel Hill and Duke University.

Almost 20 years ago, at a time when few researchers were active in the area, Dr. Mason began using EPR to detect and identify free radical metabolites of toxic chemicals and drugs. He has been a pioneer in the application of the EPR spin trapping technique to biochemical, pharmacological and toxicological problems with particular emphasis on the use of spin traps *in vivo*. The *in vivo* experiments are critical because, unless free radical metabolites can be demonstrated with a whole animal model, there will always be some question as to their actual existence in biology.

Dr. Mason continues his research on free radicals, concentrating on the nature of free radical damage to proteins and other biochemical macromolecules and the *in vivo* detection of free radicals.

## FROM THE EDITOR

As we are approaching the end of our winter in the northern hemisphere we look forward to the springtime and new growth. New things are popping up in the EPR Newsletter, too. I am delighted to introduce a new regular column edited by Prof. Arthur Schweiger (ETH, Zürich). It is entitled "EPR SPECIALIST VIGNETTES" His column is devoted to brief reviews or overviews of research or technical specialty areas in electron magnetic resonance. He inaugurates the column in this issue with an invited piece by Motoji Ikeya on the topic of EPR Microscopy.

I urge you readers to keep on furnishing interesting material for the EPR Newsletter - articles, notices, letters, advertisements, conference reports, etc. The editors of our regular columns (the *Computer Corner* and *Building the Perfect Beast*) will appreciate your comments and will welcome possible contributions. **Please:** When you notice announcements of pertinent meetings, books, conference proceedings, or the like, inform us; otherwise, we may not see them soon enough for timely listing in the Newsletter. As I have frequently mentioned, we reserve the right to edit material submitted for publication. That includes shortening to abbreviate items. In that connection, we have been having a dialogue with Keith McLauchlan about the length and level of detail of certain parts of the Newsletter and have decided that to conserve space and expense, improve efficiency for the reader, and speed publication, we should try publishing somewhat shorter Meeting Notices. Therefore, starting with Volume 7, we shall begin limiting the extent and level of detail in some of these entries; this applies especially to meeting notices that have been published previously in some detail. If you are involved in the publicity for a conference and send us a suggested notice to print, you'll probably be happier with the editing if you do it yourself rather than leaving it all to us. Also, as a general rule, a conference report will be published only if it is delivered to us within six months of the end of the conference.

You'll notice large ads from two of our corporate sponsors - Bruker (four-page flyer in the center) and Varian (full page ad on page 5). The higher levels of corporate membership in the International EPR(ESR) Society (IES) carry privileges

that include advertising in this way in the Newsletter. It's good for all of us, as it provides essential financial resources for IES to provide services for the members and the EPR community, and it's good for the companies, who get relatively inexpensive advertising easily delivered to the desired specialty audience - us.

A warm welcome to Cryo Industries, our newest corporate IES member. At the end of this issue you will find a list of our current corporate contributors. IES members, please consider patronizing, and thanking, them. Also, please point out the advantages of such sponsorship to other businesses.

At the end of this Newsletter are IES membership forms for your use. If you have not yet joined, I most warmly invite you to do so; you're missing things, including the annual directory of EPR-active colleagues that we distribute to IES members. Compared with most other scientific societies, it's very inexpensive. And if you're a lapsed member (i.e., haven't paid your dues recently), please reactivate your membership.

Linn Belford

## —ANNOUNCEMENT— CELEBRATION OF THE 80TH YEAR OF PROFESSOR BREBIS BLEANEY

A meeting will be held in the garden quad auditorium at St. John's College, Oxford from 1:45 to 6 p.m. on Thursday, 29 June, 1995 to mark Professor Bleaney's 80th year. Lectures given by Profs. R.A. Stradling, R. Orbach, W.P. Wolf, Sir Martin Wood and Drs. J.M. Baker, N.J. Stone and J.F. Gregg will review the scientific fields to which Professor Bleaney has contributed. The meeting is open to visitors, but as space is limited please inform Dr. J.M. Baker of your intention to attend to avoid disappointment. J.M. Baker, Clarendon Laboratory, Parks Road, Oxford OX1 3PU, UK; FAX: 44-1865-272400; E-mail: m.baker@physics.oxford.ac.uk.

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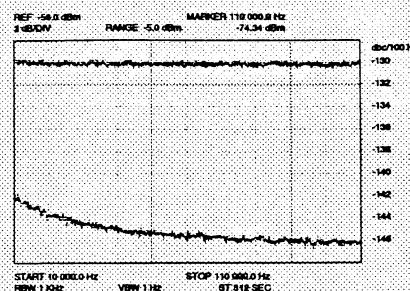
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◆ **IES AFFAIRS** ◆  
**ANNOUNCEMENTS AND  
 REPORTS FROM THE INTER-  
 NATIONAL EPR SOCIETY**

### *From the President —*

During the summer and fall of 1994 I attended several international meetings, where I was given the opportunity to speak to the scientists attending about the International EPR Society. The following conveys the sense of my remarks:

I should like to remind you that the IES is in no sense a competitor to any other EPR Society. We do not organize conferences, but we do give our support to them, and we provide services to the EPR community which no other group does. This is mainly through our Newsletter which is issued four times a year, and through a very extensive database which lists about 3,800 EPR scientists world-wide. The Newsletter provides information on conferences, advice on where to get and how to use (often free) EPR software, opportunities to advertise for post-doctoral and other positions, sources of essential pieces of equipment (e.g. klystrons) which may be out of normal production but which can be obtained relatively inexpensively, technical hints, discussions of new devices/instruments/techniques, and general information. It encourages input from its readers, and many have obtained direct help through its columns, and from the database which allows one to find out who else in the world shares similar interests and problems. The IES also makes a Gold Award each year, three Silver ones (roughly in the areas of chemistry, biology/medicine and physics/instrumentation), and a Young Investigator's award.

The Society is truly international. Although it originated mainly on the initiative of U.S. scientists, it is emphatically not a local U.S. society - all the major officers at present are Europeans - although its administration is run from the Illinois EPR Research Center. Due to the large U.S. contingent in its membership, we expect that one of the meetings the IES will be associated with each year will be the traditional Denver one; however, there will always be others. In the coming year these will be the ISMAR meeting in Australia, and an ESR dosimetry meeting in Munich.

The present subscription is US\$25 a year ( increasing to US\$30 next financial year). You can join by filling in the form on the last page of this newsletter and sending it to Mrs. Rebecca Gallivan at the IERC. To avoid excess loss in currency exchange if you do not live in North America and cannot easily pay in US\$, the subscription is best paid to the Treasurer (David J. Greenslade) by Eurocheque. We should be happy, of course, for you to send both your forms and the

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dues to either one, you need not send them separately. In some areas of the world we have local Treasurers who can be paid most conveniently (please see the form provided).

I very much hope that I have persuaded you to join. We believe that we provide a unique and genuine service to the ESR community world-wide, and that becoming a member will have direct benefits for you. Our membership has increased steadily from the start and the feedback we get makes us feel that the work we do is worthwhile. We need, however, to increase our membership to sustain this service, which is supported entirely by individual and corporate subscriptions.

Keith A. McLauchlan, President of, IES  
 Oxford, UK

### ***New Regional Treasurers for Society Members in the Russian Federation --***

During the short meeting of IES members from the Russian Federation (RF) held in Kazan (August 1994) and the subsequent discussions with IES officers (Profs K. A. McLauchlan and A. Schweiger) it was agreed that:

1. All Society members from RF may be considered as the Russian National EPR Group, and
2. In the next two years they should start to pay IEPRS membership dues but on the reduced level of the student membership category.

The collected funds will be earmarked for use inside RF, in particular for posting information and resuming regular EPR meetings.

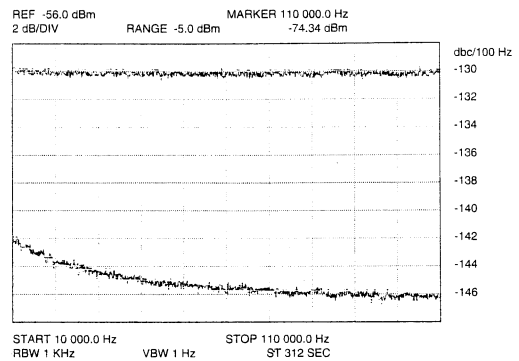
To pay 1995 dues in Russian Rubles, you may contact one of the two persons: Dr. Alexander Nikolajevich Goloshapov, Inst. of Chem. Phys., Moscow 117977, Kosygina 4, ☎: 7-095-939-7181, FAX: 7-095-938-2156, E-mail: chembio@glas.apc.org; or Dr. Michail Leonidovich Falin, Kazan Phys.-Techn. Institute, Kazan 420029, Sibirsky Tract 10/7; ☎: 7-8432-76-0503; FAX: 7-8432-76-5075; E-mail: falin@ksc.ias.net.com.

Iakov Lebedev

# For EPR Performance, Varian Sets the Standard

The spectrum illustrated at right was taken with a Varian weak pitch sample in a TE102 cavity under the conditions specified in the Varian E Line Series unmodified (E102/E109 bridge) instruction manual. Signal to noise ratio represented is 245:1.

A 2.5 conversion factor was used to convert rms noise to p-p noise. The weak pitch sample had a .663 multiplication factor. Without the multiplication factor, the signal to noise would be 369:1.



Example parameters are:  
Scan range = 40G  
Field set = 3461G  
Modulation amplitude = 10G  
Modulation frequency = 100 kHz  
Receiver gain noise =  $20 \times 10^{-4}$   
Receiver gain signal =  $4 \times 10^{-4}$   
Time constant = 1 second  
Power for noise = 200 MW  
Power for signal = 12.5 MW  
Scan time = 4 minutes

The AM Noise Graph indicates how quiet the Varian VA297 is with AM noise of -142 dbc or better. The upper trace represents a calibration of the AM detector at -130 dbc. The lower trace represents the extremely low noise of the VA297 klystron which is -142 dbc at 10 kHz and -146 dbc at 100kHz. Also note the lack of visible sidebands.

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## Awards

Although nominations for awards for the current year were due March 1, we repeat here the Society's award policies for non-members who receive only this one "public" issue each year. (Awards are not restricted to IES members, but the awards committees may take membership into account when deciding on the award winners.) We are pleased to announce that agreement has been reached between the British and Russian Groups and ourselves to cooperate in the award of the Bruker and Zavoisky Prizes and our Gold Award each year, with each group invited to make input into the selection of each, but with the final choice left to each group. The area of research interest is to rotate between the groups each year, with the loosely-interpreted categories, chemistry, physics and instrumentation, and biology and medicine; these are expected to be interpreted liberally and not to be restrictive.

In the coming year, the IES award will be in Chemistry, the Bruker in Biological Chemistry and the Zavoisky in Physics/ Instrumentation. Prof. Larry Berliner, continuing Chairman of the Gold Award committee, will welcome nominations for this.

**Gold Medal:** 1995 Gold Medal, recognizing benchmark contributions to EPR spectroscopy in chemistry. Nominations to Prof. Larry Berliner.

**Silver Medals:** One each in the general areas of Chemistry, Physics/Instrumentation, and Biology/Medicine. To propose names, please send your suggestion(s), or preferably full nomination(s), to the appropriate Silver Awards Sub-committee(s): *For Physics and Instrumentation* - Jim Hyde, Chair; John Pilbrow, George Feher, & Jan Stankowski. *For Chemistry* - Bruce Gilbert, Chair; J. Sohma, Jim Bolton & Kev Salikhov. *For Biol./Medicine* - Harold M. Swartz, Chair; Marjeta Sentjurc, Hideo Utsumi & Tadeusz Sarna.

**Young Investigator Awards:** One Young Investigator award each year; "young" is defined as less than 7 years since the Ph.D. degree. Nominations to Prof. Keith McLauchlan.

## Fellows of the Society

For some time the Committee has been exercised by the thought that many very distinguished EPR/ESR scientists who are either retired or about to retire have not received the recognition to which they are due from their colleagues simply because most international awards in the subject have only recently been made. Whilst not wishing to exclude them from consideration now, our inclination is to ensure that they are properly recognised independently of the award system.

A proposal was therefore made, and accepted, at the Denver meeting that we should create Fellowships of the Society to recognise truly outstanding achievements in electron paramagnetic/spin resonance amongst these scientists (hopefully members). The highest international standards are to be applied to the recognition of those worthy of this distinction, and their formal connection with the Society will enhance its own image.

Nominations were to be made in confidence to Keith McLauchlan before March 1, 1995, and will be considered by the Committee, afforded as appropriate.

## PROFESSOR BREBIS BLEANEY. AN APPRECIATION

Professor Brebis Bleaney is one of the founders of Electron Magnetic Resonance. He was born on June 6th 1914, so this is his 80th year, which we propose to celebrate with a short scientific meeting in Oxford on 29 June. Bleaney still comes on most weekdays into the Clarendon Laboratory at Oxford, where he spent most of his working life. He is still a prolific publisher of papers.

Bleaney has made several distinct contributions to science in the various phases of his career. His doctorate was done under the supervision of F.E. (later Sir Francis) Simon on the thermodynamic temperature scale in the temperature range of liquid helium. This was followed by a war-time period of work on microwave applications, particularly sources of microwaves. After the war, it was therefore natural for him to

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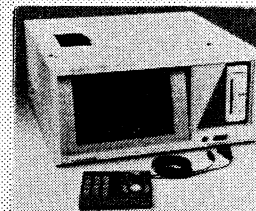
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exploit the newly invented microwave sources to perform spectroscopy, initially of the ammonia molecule with R.P. Penrose and J.N.H. Loubser. Later his research drew on the other thread of early experience and combined cryogenics with microwave spectroscopy to perform some of the earliest electron magnetic resonance experiments in England. This was his greatest and most successful innovation. The invention of the technique was independent of the more or less simultaneous use of it in the U.S.A., and the somewhat earlier use of it in the U.S.S.R. Zavoiski, in Kazan, was the first to perform electron magnetic resonance in 1944, but news of his invention did not reach the West for several years.

Electron paramagnetic resonance (EPR) at room temperature is limited to paramagnetic species with a relatively long spin-lattice relaxation time, which effectively means species with zero or quenched orbital angular momentum, and  $g$ -values close to 2. By exploiting the low temperature facilities available at the Clarendon Laboratory, Bleaney was able to extend the range of experiments to include those ions of the 3d transition group where orbital angular momentum is not quenched and ions of the 4f transition and the actinide groups, for which spin-lattice relaxation at room temperature is too fast, but may be slowed down by cooling.

The principal feature that allowed Bleaney's work to progress much faster than that of his competitors in the early period was the use of mixed crystals of isomorphous paramagnetic and diamagnetic salts. The dilution of the paramagnetic species reduced the line broadening due to electron spin-spin interaction, and so allowed the spectral resolution of structure which was obscured by the line width in undiluted paramagnetic salts. Fine structure and hyperfine structure were revealed by this method. Such dilution was first done by Penrose while visiting Leiden, on a period of leave from Oxford, at the perceptive suggestion of Gorter (an unfortunate inventor of many of the principal ideas of nuclear and electron magnetic resonance, who was never quite able to pull them off). After Penrose's untimely death, the dilution technique which he had demonstrated was explored to the full by Bleaney's group. Bleaney, together with a succession of graduate students, worked through the ions of the 3d and 4f transition groups, producing a detailed understanding of their

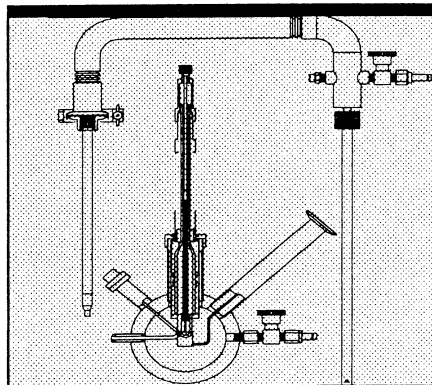
ground states, and contributing to the understanding of crystal fields and spin-lattice relaxation. Bleaney's group was the first to find an example of the Jahn-Teller effect for  $\text{Cu}^{2+}$  ions in a crystal environment, predicted by van Vleck.

Out of the close collaboration between Bleaney and the theoretical physicists, Maurice Pryce and Anatole Abragam, came the concept of the "Spin Hamiltonian" as a means of describing the properties of the ground state. Although Bleaney is primarily an experimentalist, he is also an excellent theoretician who has been able to bridge the gap between professional theorists and experimentalists. This fruitful collaboration helped to launch the careers of several productive theorists such as Ken Stevens, Roger Elliott, Mary O'Brien and Brian Judd.

Bleaney's interest in, and deep appreciation, of hyperfine and fine structure led him to propose the magnetic structure alignment of nuclear spins, a method which was used by Daniels, Grace and Robinson in the first ever experimental demonstration of the anisotropy of the gamma rays emitted by oriented radioactive nuclei. It also led him to close involvement with the experiments in Oxford on atomic beams performed by Kem Woodgate.

The very large hyperfine interaction for some lanthanide ions also led to thoughts about magnetic resonance in a region where the Zeeman interaction is not very much larger than the hyperfine interaction. Hence  $M_j$  and  $M_l$  are not very good quantum numbers, and forbidden transitions are allowed between states with different  $M_l$ . It was probably this which led Bleaney, independent of George Feher, to suggest that one should look for  $\Delta M = \pm 1$  transitions, as these are much narrower than  $\Delta M_l = \pm 1$  transitions observed in EPR. Unfortunately, his two graduate students at that time, Peter Llewellyn and I, did not appreciate quickly enough what a brilliant idea this was, so it was George Feher who initiated Electron Nuclear Double Resonance (ENDOR). However, Bleaney's group was quickly able to use ENDOR to extend the measurements on hyperfine structure, either exploiting the increased precision of measurement of large hyperfine interactions, or the increased resolution to measure small hyperfine interaction with ligand or more distant nuclei.

From 1947 to 1957 Bleaney was a Fellow and Physics Tutor at St John's College, Oxford. His experience of



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teaching undergraduates led him to publish, together with his wife Betty, who was one of his first research students, his first large book: "Electricity and Magnetism".

In 1957 Bleaney became the Dr. Lee's Professor of Natural Philosophy at Oxford - the person in charge of the Clarendon Laboratory, which was in those days the whole of Oxford Physics. This involved a great administrative load, but it enabled him to spread his influence and support to a much wider range of colleagues, graduate students and post-docs; but it inevitably gave him much less time for research. It did not prevent him from the publication of his magnum opus, co-authored with Anatole Abragam: Electron Paramagnetic Resonance of Transition Ions.

In 1977, Bleaney resigned the Dr. Lee's Chair and started another prolific research career first as Warren Research Fellow of the Royal Society and later as Leverhulme Emeritus Fellow. This new career was based upon another exploitation of the hyperfine interaction: enhanced nuclear magnetism and enhanced nuclear magnetic resonance. This proved to be another rich seam enabling him to get back into resonance physics.

As someone who has been associated with Brebis Bleaney through most of his 50 years of development of microwave spectroscopy and magnetic resonance, I have found him a stimulating tutor, a tolerant and encouraging supervisor, a perceptive and penetrating examiner of experimental data and the hypotheses drawn from them, and a warm and supportive colleague. It has been a great privilege to be able to have him nearby for advice and knowledge drawn from a long experience of resonance physics and interaction with its major exponents. In its heyday the Clarendon Laboratory was the major centre of magnetic resonance in the West. Gradually the young people who were Bleaney's satellites have moved off, and his former pupils are spread all over the globe.

Bleaney has held numerous prestigious positions for short periods abroad, and has been the winner of many prestigious prizes: the list, published in Who's Who, will not be repeated here, but they testify to the international recognition of Bleaney's enormously significant contribution to science.

J.M. Baker

## OBITUARY -- JUNKICHI SOHMA

Junkichi Sohma, professor of physics at Kanagawa University and emeritus professor of materials science at Hokkaido University, died on October 4, 1994 at a hospice in Hiratsuka, Japan. He was 71.

Prof. Sohma received his Ph.D. in physics from Hokkaido University in 1957. He was an associate professor of physics at Hokkaido University of Education from 1952 to 1961. He moved to an associate professor of materials science at Hokkaido University (HU). He remained there, becoming a full professor in 1962, until his retirement in 1987. At HU he served at various times as the director of instrumental research centers, the chairman of department of the chemical synthetic and process engineering and the chairman of innovation in general education. He wrote two textbooks and numerous journal articles on the electron paramagnetic resonance on the polymer, irradiated organic materials and biologically relevant molecules.

He was well beloved by his students, and his advice was reliable and helpful to all. We shall miss him. Prof. Sohma was a charter member of the International EPR Society and served on the committee for Silver Awards in Chemistry since the Society's inception.

Keiichi Ohno

Dept. of Information Engineering  
The Polytechnic Univ., Sagamihara, Japan;

Masaru Shiotani

Dept. of Applied Chemistry, Faculty of Engineering  
Hiroshima Univ., Higashi-Hiroshima, Japan;

Yuhei Shimoyama

Dept. of Physics  
Hokkaido Univ. of Education, Hakodate, Japan

## LETTER TO THE EDITOR

Dear Sir:

I am writing to alert magnetic resonance researchers to the recent availability of a portable relaxometer developed at the Kazan Radio-Technological Institute, a research institute in Russia. It is the first device of such kind produced in Russia and offered to others, and it should find many applications in research, education, medicine, and industry. One of these units is now in use at the University of Illinois and may be seen there. An ad in the "Equipment Exchange" section of this Newsletter gives some details about this instrument and how to inquire about it.

Boris Odintsov  
Kazan, Russia

**THE COMPUTER CORNER**

*Edited by Philip D. Morse II, Keith P. Madden,  
and Richard Cammack*

The Computer Corner is a feature of the EPR Newsletter. Currently it is edited by Reef Morse, Keith Madden, and Richard Cammack with assistance from Graeme Hanson. Submissions can be sent to any of the editors, whose E-mail addresses are, respectively,

(reef@xenon.che.ilstu.edu),

(keith.p.madden.1@nd.edu),

(udbc033@hazel.cc.kcl.ac.uk),

(graeme@cmr.uq.oz.au).

Submissions may be edited for publication here; on special request, substantial edits will be cleared with the sender for approval prior to publication.

**EPR on the Internet -- by Reef Morse**

This is both an update and a reminder about the availability of EPR-related data bases, list servers, and other projects on the Internet. Access to these electronic facilities is free and available to all. All are welcome to make use of these facilities. Their purpose is to help you communicate and obtain information about EPR-related subjects.

1) **THE ILLINOIS EPR SERVERS**

The International EPR Society, the Illinois EPR Research Center (IERC) at the University of Illinois, and Illinois State University (ISU) cooperate to maintain three public servers devoted to the exchange of information on EPR topics:

a) **The Illinois EPR List server —**

Anyone can join an EPR-related discussion list as follows: Send the single word SUBSCRIBE to epr-list-request@xenon.che.ilstu.edu and you will be automatically placed on the list. You will receive verification of your subscription, usually within one or two minutes.

Send messages to epr-list@xenon.che.ilstu.edu. These will be posted to the other subscribers on the list immediately. You will also receive a copy of your posting which confirms that your posting has been sent out.

b) **The two Illinois Anonymous FTP servers —**

These two *anonymous ftp* servers are managed cooperatively, with the IERC server at Urbana specializing in public-domain (free) downloadable EPR software and the server at ISU containing demonstration versions of commercial EPR software. Both servers contain Richard Cammack's EPR software database.

If you sign on to the IERC anonymous ftp server — **rlb6000.scs.uiuc.edu** — you should sign on under the name *anonymous*, give your full E-mail address as your password, and retrieve the file *README.IST*, which explains the organization of the server. This server is located on an IBM RS6000 AIX (UNIX) workstation. John Chen (jwcj@rlb6000.scs.uiuc.edu) is the current system manager. On this server, you will find Rich Cammack's database listing a great deal of EPR software with short descriptions, information about authors, applicability, availability, etc. You will also find copies of some **free (public-domain) EPR-related software** that you can download for your own use. Finally, you are invited to upload your own software for others to try.

If you sign on to the anonymous ftp server at ISU — **xenon.che.ilstu.edu** — you will find archive information from the EPR list server in [*epr-list-archives*], a copy of Cammack's software database in [*data-base*], and **demonstration software from commercial vendors** in [*demons*]. This is a VAXStation, so directories are called with brackets and dots, not slashes. For example, to get to the software database, type *cd [.data-base]*. This server is maintained by Reef Morse.

2) **EPR ON WORLD WIDE WEB**a) **Partridge's WWW EPR Database —**

Dr. Richard Partridge has established an EPR data base project on the World Wide Web. His WWW EPR page can be accessed using any WWW browser. The URL is [http://www.biomed.abdn.ac.uk/ftphome/pub/esr/epr\\_db.html](http://www.biomed.abdn.ac.uk/ftphome/pub/esr/epr_db.html). The files can also be accessed by anonymous ftp to <ftp://biomed.abdn.ac.uk> in the directory *pub/esr*. Richard welcomes any further submissions.

b) **The Laboratory of Molecular Biophysics at NIEHS WWW EPR Database service —**

This is a relational database with the journal references and published results of Spin Trap experiments from the early 1970s through the 1990s and has now expanded to include other forms of EPR data. It can be accessed by the World Wide Web at <http://lmb.niehs.nih.gov/home.html>.

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Contact Dave Duling at [duling@alfred.niehs.nih.gov](mailto:duling@alfred.niehs.nih.gov) for further information.

c) *EPR/ENDOR WWW Server at Northwestern University* —

This new WWW facility, under the direction of Brian Hoffman, is provided as an interface tool to exchange EPR/ENDOR related information. Notable features in this Web server include access to (or downloading of) Hoffman's EPR/ENDOR simulation programs, and links to other EPR Web servers (NIEHS and Bristol) and to other interesting WWW sites in the world. This server is running on a 486-33 PC (HTTPD-Win v.1.4) located in the Hoffman laboratory. The home page URL is <http://endor1.chem.nwu.edu/endor.html>. Please note that the server name is ENDOR1 (numeral one, not letter L). The /endor.html is optional. The best time to access this server is before 10:00 a.m. or after 6:00 p.m. CST on weekdays and weekends.

### 3) *RADIATION CHEMISTRY DATA CENTER (RCDC)*

The mission of the center is to compile and distribute critically evaluated data on processes initiated by light or ionizing radiation. Available databases include the RATES database, giving rate constants for free radical reactions in aqueous solution, the triplet-triplet absorption database, containing the spectral parameters for excited species in condensed phase media, and the bibliographic database, the source for the Biweekly List of Papers on Radiation Chemistry and Photochemistry, which is available by subscription. For more information on these services write to Dr. Alberta Ross, Radiation Chemistry Data Center, Radiation Laboratory, University of Notre Dame, Notre Dame, IN 46556 U.S.A. ☎: 1-219-631-6527; E-mail: [alberta.b.ross.2@nd.edu](mailto:alberta.b.ross.2@nd.edu).

### *Computer-controlled magnet field controllers for EPR spectrometers -- by Keith P. Madden*

In an earlier Computer Corner column we started a discussion of the hardware in EPR instrument computer systems. In particular, we discussed devices to use for improved resolution in the recording of the EPR spectrum, that is, the y-axis in the conventional representation. The inclusion of a personal computer in an EPR system also allows for the enhancement of spectral resolution in the x-axis as well, since field control can be managed directly by the computer, bypassing or even replacing the traditional Hall-probe field-controller. The resolution of the magnetic field sweep has historically been set by the nature of the scan control signal sent to the Hall controller; in Varian Fieldial I systems, the scan was derived from a multi-turn potentiometer driven by a clock motor, while the Varian

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Fieldial II systems in the E-line spectrometer series used a similar potentiometer mechanically driven by the digital x-y recorder. In both cases the resolution was set by the quality of the scan pot. Later field controllers, such as the Bruker ER03X series, used a 12-bit analog to digital converter to produce the ramp voltage, providing a resolution of 4096 steps on a given scan range.

For experiments requiring a narrow sweep range, the magnetic field step size of such a system serves well. But in the case of a narrow-lined spectrum with large spectral extent, the distortion of a digitally recorded spectrum due to the limited step size can produce appreciable distortion in recorded lineshapes. Digitally controlling the center field setting, and using a smaller sweep range isn't necessarily a panacea, as the center-field offset may drift as the center-field value is shifted. The desired situation is to be able to record the entire sweep range at high resolution, without having to make any adjustments to the magnetic field measurement system. The PC data acquisition system, tied to an NMR gaussmeter, makes such measurements practical. It has long been appreciated in our laboratory<sup>1</sup> that field measurement using a field-tracking proton NMR unit and a frequency counter equipped with a high-stability time-base allows the measurement of magnetic field to high precision. The availability of low-cost ISA bus analog I/O boards containing both counters and D/A converters makes implementation of such a system relatively straightforward.

Details of a more elaborate earlier version of such a magnetic field control system have been given recently<sup>2</sup>, but a simple description of the system is given here. The timing standard for the measurement is provided by a high-stability, high-frequency time-base divided down to a five Hz TTL square wave. The 100msec logic high interval of the square wave is used as a gating signal for measuring the frequency of the field-tracking proton NMR RF signal. At the end of each counting period the observed NMR frequency is subtracted from the target NMR frequency

calculated from the desired field value, yielding a digital error value. This error is scaled, and loaded into a digital to analog converter, which is in turn fed into an integrator. The integrator controls the current output of the magnet power supply, closing the overall feedback loop. The entire magnetic field control system can be interrupt driven, providing wide-range, high accuracy, high resolution magnetic field control as a background process in the EPR data acquisition program. The accuracy and stability of this type of system is controlled by the signal to noise ratio of the field-tracking NMR unit -- our lab-built design shows a short-term noise of 2 milligauss at 3300 gauss, and is comparable to the magnetic field step size imposed by the 0.1 second counter gating interval. This resolution is maintained over a 500 gauss range, making line position and lineshape studies easy for radicals having large spectral extent.

<sup>1</sup> Fessenden, R.W., Schuler, R.H.; *J. Chem. Phys.* 39(9), 2147 (1963).

<sup>2</sup> Madden, K.P.; McManus, H.J.D.; Fessenden, R.W.; *Rev.Sci.Instrum.* 65(1),49 (1994).

## BUILDING THE PERFECT BEAST

Chris Bender

NIH Biotechnology Resource for Pulsed EPR

### KLYSTRON TUBES AND ALTERNATIVES II: CHECKING FOR GASSY KLYSTRON TUBES

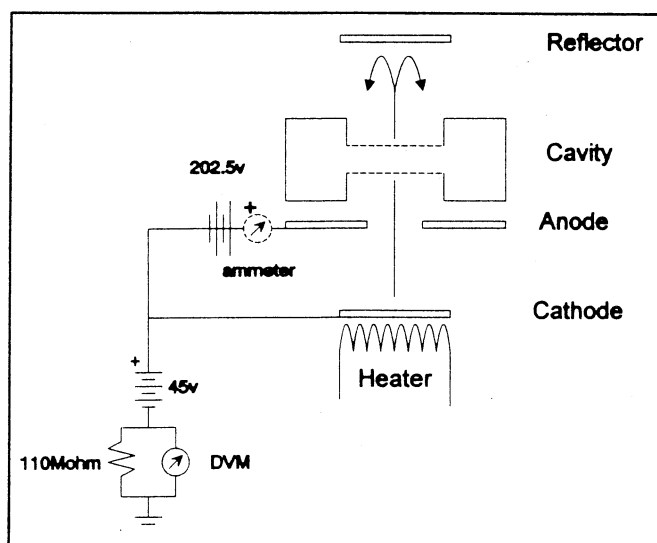


FIGURE 1: Circuit diagram for detection of gas in a reflex klystron (adapted from refs 1-5).

The incompatibility of delivery dates for parts and publishing deadlines have put a wrench in the planned order of this klystron series, so I'm resorting to an alternative topic than I had promised in Part I. I was recently browsing in the Brooklyn Polytechnic library and ran across several articles on the 'care and feeding' of klystron tubes.<sup>1-5</sup> They are, for the most part, devoted to high power klystron tubes that are used for transmitters, but I found that they are applicable to reflex klystrons in a limited sense. Some may be applicable to traveling wave tubes.

One method, which I found rather clever, was to test for a gassy tube by using the klystron's system of electrodes as a vacuum ionization gauge. One biases the cathode and anode while the heater filament is on, then measures the current as an indicator of gas. The method is very simple and can be performed with readily available test equipment (DVM and ammeter) and a few batteries that are readily available from electronics supply houses like Newark Electronics.

The hook-up is illustrated in Figure 1. A 45 V battery is applied across the heater/cathode terminal in series with a parallel arrangement of a 110 M $\Omega$  resistor and the DVM. Three 67.5 V batteries are connected in series (202.5 V total) to bridge the heater/cathode and the anode (beam). The other end is grounded and connected to the klystron body. The heater is connected, but no power is applied to start.

At this stage, the DVM should read near zero and be stable. Check connections if otherwise, then apply heater voltage for a warm-up period. The DVM should respond and eventually stabilize. The gas current corresponds to about 0.01 mA per 0.1 V measured on the DVM, and the vacuum 'pass' criterion is voltage less than 5 V (the 5V upper limit is a figure given for the transmitter klystrons, which are bigger and operate at very high voltages, so the 5V figure may be high as a 'pass' condition). Unfortunately, all my klystrons passed this test, and I had to inflict a pinhole in the mica window of an old and noisy klystron in order to make sure the test worked; it does!

A second test may be required to verify that an extremely low (i.e., apparently none) voltage is the result of an excellent vacuum. The three 67.5 V batteries that are connected in series between the heater/cathode terminal and the anode (modulating) terminal with an ammeter in series. The heater is still on, and the vacuum is verified by a current of 1 - 4 mA.

The batteries I used are made by Eveready and can be found in the Newark catalog (Type 455 - 45V; Type 416 - 67.5V). Mercifully, these things are fairly small and cheap (\$19 and \$14 each, respectively), and I assembled the unit as a 'Klystron Test Station'. The device is a box that is outfitted with a klystron tube socket and banana jacks that make the connection to my digital voltmeter. Inside the box I have the batteries pre-wired to the tube socket and the hookup points for the DVM. A small single-pole-double-throw switch permits me to disengage the

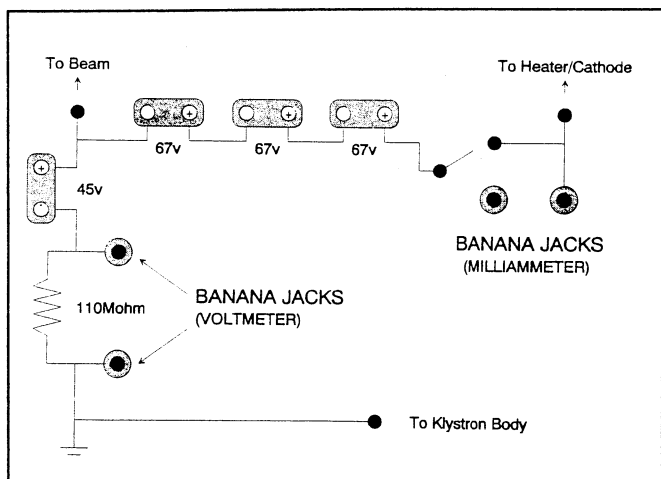


FIGURE 2: Implementation of a test rig for klystron gas. Rounded rectangles are standard 9V battery terminals.

multimeter for use in either of the two tests. Figure 2 depicts the scheme for the DC portion of the test box. Excluding the batteries, it cost about \$10 in parts. For such a test, one can tie in the heater cables from the klystron power supply and just operate the latter in the 'filament' mode. And finally, I have an external source to provide the heater current when needed. If one wants to get fancy or really doesn't like the idea of the klystron power supply used in this way, one could put a separate high power 6.5V DC for the heater. I recommend the modular power sources, converters, and line conditioners produced by Vicor.

Lastly, there was a recipe in these articles for getting an old gassy tube back into condition for service. With the heater off, connect the negative lead of a current-limiting high voltage source to the cathode and the positive lead to the anode of the klystron. Set the current trip to 3-4 mA, then gradually increase the voltage in steps, ensuring that the current remains below 2mA. With time, the current should drop to 0.5 mA, at which point you step the voltage again. The process is repeated until you reach the operating voltage. I haven't tried this test since my only 'gassy' klystron was intentionally made leaky.

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 6. Bear in mind that the heater pulls a fairly high current (order of 100 mA) and 10-30 mA through the body is the point at which nasty stuff begins to happen (15 mA is cited as the 'LD<sub>50</sub>' of muscle freezing and the inability to let go).

FINAL NOTE: More comments on books. I've gotten a couple of notes in the mail from people with suggestions on good microwave reference books. One text is the ARRL UHF/Microwave Experimenter's Manual, a book I had heard of but never actually read. The note from the Micro-Now crowd was very enthusiastic, however. Someone also asked me if I knew of any good books on stochastic dynamics relevant to signal processing; for the benefit of all interested per se, I suggest the signal processing books that I listed in the original bibliography plus the following:

- Tolimieri, R. *Mathematics of Multidimensional Fourier Transforms*, Springer-Verlag.
- Hackbusch, W. *Iterative Solutions of Large Sparse Systems of Equations*, Springer-Verlag.
- Stenger, F. *Numerical Methods Based on Sinc and Analytical Functions*, Springer-Verlag (*sinc is not a typo*).
- Kloeden & Platen *Numerical Solutions of Stochastic Differential Equations*, Springer-Verlag.
- Parlett, B. *The Symmetric Eigenvalue Problem*, Prentice-Hall.

And a few pedestrian-style reviews . . .

- Davidson, E.R. *Monster Matrices: Their Eigenvalues and Eigenvectors*. *Computers in Physics*, 7, 519 (1993).
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## EPR SPECIALIST VIGNETTES

Edited by  
Arthur Schweiger

In this issue we start with a new regular column called EPR SPECIALIST VIGNETTES, where experts review for the community fields of EPR research that are not common knowledge to all of us. The contributions will survey the use of EPR in fields beyond the traditional ones, and will give overviews about methods and techniques used in special EPR investigations. The first contribution written by Motoji Ikeya covers the rapidly growing field of EPR microscopy. Suggestions for subjects to be presented in this column are welcome.

Arthur Schweiger

### ESR Microscopy

#### --Scanning ESR Imaging of Spin Density--

Motoji Ikeya

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#### 1. Introduction

The microscopic spatial distribution of radicals and paramagnetic ions has been studied with ESR imaging at X-band (9.5 Ghz) by using (a) a magnetic field gradient (*f.g.*) method with *f.g.* coils and wires inside a cavity, (b) scanning the localized static or modulation field, and (c) scanning the localized microwave field using a cavity with an aperture. Some examples are given in this letter for further applications in various fields.

ESR imaging has been developed following the *f.g.* method used in NMR imaging.<sup>1,2</sup> The large linewidth of an ESR signal, the low sensitivity, and the demanding pulse microwave techniques hinder the rapid development of practical ESR imaging.<sup>4,5</sup> Attempts of ESR imaging are made mostly in biomedical sciences at L-band (1.5 Ghz) using a loop gap resonator<sup>5</sup> since the microwave loss is small and the penetration depth is sufficient at this frequency.

I have been involved in the applications of ESR to radiation dosimetry and to interdisciplinary fields like geosciences, especially with ESR dating based on natural radiation effects on minerals and fossils.<sup>3</sup> In order to image the spatial distribution of radicals microscopically, we developed simple ESR microscopes at X-band frequency. They may also be useful for those who are involved in ESR applications.

#### 2. Computer Tomography ESR Microscope

##### (a) Field Gradient Coils

A high resolution necessary for microscopic imaging is obtained if an intense field gradient (*f.g.*) is realized. Joule heating of the *f.g.* coils at high currents was reduced by cooling with insulator oil or a cooled gaseous N<sub>2</sub> flow and by employing pulse currents.<sup>4</sup> A small helix cavity was fabricated at the tip of a semirigid coaxial cable to make a small *f.g.* coil pair for an intense *f.g.* of 30 T/m.<sup>6</sup>

Small field gradient coils inserted into a microwave cavity allowed a resolution of a few  $\mu\text{m}$  with *f.g.* of 20 T/m using a low-cost current and voltage source,<sup>7</sup> though the

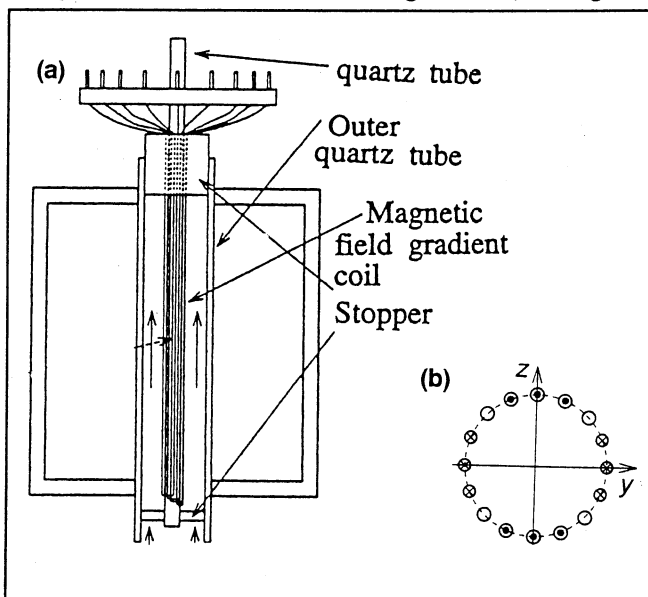


Figure 1: (a) illustration of the experimental assembly of the gradient wires inserted into a TE<sub>011</sub> mode cavity. (b) Cross-sectional view of the gradient coil in the *y-z* plane.<sup>8</sup>

microwave loss caused by the coils is a problem. The most intense *f.g.* of 60 T/m was established by using superconducting coils of Nb (Ti) inside the cavity at a current of 5A. An exponential decay of the spin concentration from the surface in X-rayed NaCl was observed by deconvolution.

##### (b) Field Gradient Wires in a Cavity

Straight wires, saddle-type and cage coils and magnetic field screening coils were developed for *f.g.* and *r.f.* coils in

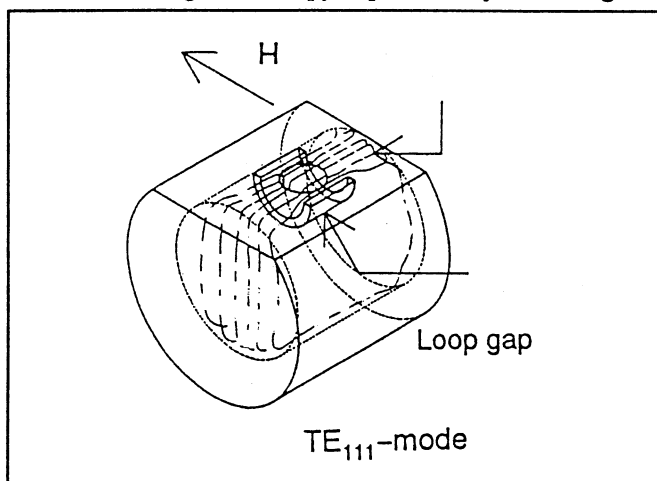


NMR microscopy.<sup>2</sup> The homogeneity of the *f.g.* and *r.f.* field is excellent in a small volume. Straight wires parallel to the cylinder axis cause little microwave loss in a TE<sub>011</sub> cylindrical cavity. Sixteen copper wires whose current,  $I(0) = a \sin 2\theta + b \cos 2\theta$  is independently controlled, were attached to the inner quartz tube using epoxy resin and the cooling gas was flowed between the inner and outer quartz tubes (Figure 1).<sup>8</sup>

### 3. Scanning the Localized Field

#### (a) Scanning the Magnetic or Modulation Field

There are two physical quantities in magnetic resonance: the magnetic field and the electromagnetic waves. Scanning microscopy is possible by localizing one



**Figure 2:** Microwave scanning microscope using a microwave cavity with an aperture.

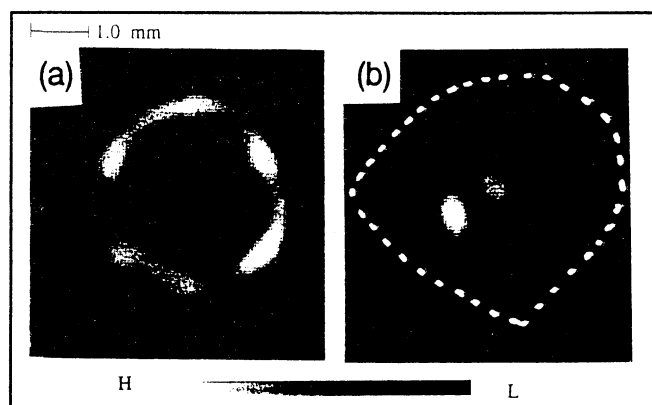
of them or by modulating the field spatially and scanning it.<sup>10</sup> A refined method of electronically scanning the local static or modulation field is achieved by using a quartz sample holder with printed wire arrays.

#### (b) Scanning the Localized Microwave Field

The system with a TE<sub>111</sub> cylindrical cavity with an aperture contains a small "loop-gap" resonator to concentrate the microwave field (Figure 2). The sample is scanned mechanically using a PC-controlled X-Y stage. The distribution of the microwave power around the aperture, measured by scanning a DPPH dot sample, is used as a *point spread function* (PSF),  $r(z,x)$ . The obtained image,  $g(z,x)$  is the convolution integral of the distribution function of the spin concentration,  $f(z,x)$  and  $r(z,x)$ . The deconvolution gives the image  $f(z,x)$  with a resolution order of magnitude smaller than the diameter of the aperture. The resolution is determined by the scanning step length and the *S/N* ratio,<sup>11</sup> and neither by the size of the probe nor by the wavelength.

### 4. Applications

#### (a) CT-ESR Image:



**Figure 3:** (a) An image of a dried dragon fly and (b) Mn<sup>2+</sup> signal in a stomach of an earthworm after keeping in soil mixed with stromatolite (CaCO<sub>3</sub>) with Mn<sup>2+</sup>.<sup>11</sup>

Only a few biological applications are described in the literature, since involved moisture causes microwave loss. Images obtained of a dragon fly and a frozen earthworm are shown in Figure 3.

#### (b) Scanning Microwave Images

##### Paramagnetic ions

- Mn<sup>2+</sup>: fossils (ammonites, crinoid, belemnite).
- Mn<sup>2+</sup>, Gd<sup>3+</sup>: minerals.
- Reactive catalysts: Nb<sup>4+</sup> valency change.
- Zoning: ruby (Cr<sup>3+</sup>), diamond (N, Ni).

##### Dangling bonds in semiconductors

Annealing image under a thermal gradient in polysilicon CVD films<sup>11</sup> gives decay times  $\tau_i$  at the temperature  $T_i$  (Figure 3), which leads to an Arrhenius plot with the activation energy  $E$  and the pre-exponential factor  $\nu_0$ .

##### Dosimetric Image

- Minerals: natural electron and hole centers
- Radiation dose image in teeth: CO<sub>2</sub><sup>-</sup>
- Imaging Plate: alanine film, CO<sub>2</sub><sup>-</sup> in apatite

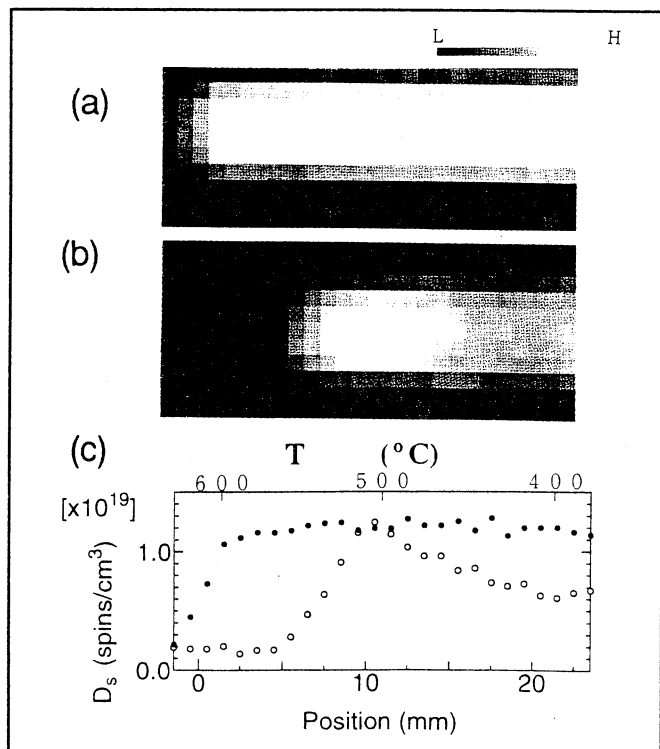
##### Biological Applications

- Broiled fish: peroxy and carbon radicals
- Broiled nuts; melanoma; earthworm; insects

At present, ESR microscopy is far retarded from NMR microscopy with respect to resolution and sensitivity. Nevertheless, simple scanning and CT-ESR microscopes may be useful in many fields.

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**Figure 4:** Scanning image of the distribution of dangling bonds in a poly-silicon CVD film on a Si wafer before and after annealing under a thermal gradient ((a) and (b)). (c) The decay time,  $\tau_i$  and the temperature  $T_i$  at each pixel b before and after annealing.<sup>12</sup>

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## TIPS & TECHNIQUES

### Miscellaneous Tips for EPR Users

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Research Specialties  
5629 N. Maplewood, Chicago, IL 60659  
☎/FAX: 1-312-728-6570

Surge protection for computers and other instruments interfaced to Varian EPR spectrometers (Brukers and

JEOLs are also at risk) is valuable not only for the computer, but can protect the scan logic board that is used to generate the standard synchronization signals derived from the Varian. I have one recent example of board damage during an electrical storm that occurred after the storm in spite of the fact that the spectrometer was off. The computer was on and allowed a transient to reach the scan logic board affecting only the computer synchronization signals. There was no surge protection on this set up.

Of course, surge protection for the whole spectrometer is equally important and does not have to be terribly expensive (a few hundred dollars can get a minimal protection kit for the whole spectrometer). Ultimate protection is available at somewhat higher costs.

One of my tips from an earlier EPR newsletter reads: "Surge protectors (MOV's) for three phase and single phase power are available for installation on your electrical service that will help guard the entire EPR system from electrical transients due to electrical storms and in-house electrical disturbances. Additional transient protection can be obtained with the use of Faraday shielded isolation transformers, in addition to the surge protectors. The transformers also help reduce ground loops, which are a source of instability to the EPR system. As more auxiliary instruments are added to the EPR system, ground loop problems can surface."

### HOW TO GET EXPERIMENTAL TIPS AND TECHNICAL ASSISTANCE from WILMAD:

Even though Wilmad has not yet acquired an Internet hub, I want to let all you EPR Researchers know that I have acquired a personal Online address primarily to provide you with technical support. So please feel free to contact me at PaulC149@aol.com. I'll respond to your technical or other EPR- and NMR-related inquiries as promptly as possible. I also monitor the EPR Newsgroup and will try to offer advice when Wilmad's capabilities may help solve your problems. Sorry, I'm not mobile in computer

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capabilities, yet, so when I'm away on business, I may not be able to respond for a few days.

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## INFORMATION FROM EPR CENTERS

### *FROM THE IERC: MEASUREMENT of pO<sub>2</sub> IN VIVO by EPR: ANNOUNCEMENT of FUNDING by NIH of a PROGRAM PROJECT and INVITATION to PARTICIPATE*

This program project involving both parts of the IERC (Illinois and Dartmouth) is aimed at bringing an emerging technology which is based on the capability of EPR to measure pO<sub>2</sub> in viable biological systems to bear on several areas of research which will benefit significantly from the availability of such measurements, and to develop the technology to facilitate its adoption by other scientists for experimental and potential clinical uses. *In vivo* EPR appears to have a unique capability to make repeated, accurately localized measurements of pO<sub>2</sub> *in vivo* and in isolated organs with the accuracy and sensitivity needed for the study of many oxygen-dependent physiological and pathophysiological phenomena. The rationale for carrying out these studies in a program project is based both on the efficiency and effectiveness that this approach adds for the measurements in the components which apply this technology, and the positive effect that this association will have on the further development of the technology. The successful attainment of the goals of this project should result in the widespread availability of the tools and the concepts to use EPR for measurements of pO<sub>2</sub> *in vivo*.

The component of the project directed by Hal Swartz at Dartmouth will provide the technical expertise and equipment needed to make the measurements of pO<sub>2</sub>, and will carry out the studies in biological systems needed to characterize and calibrate the paramagnetic materials used for the measurements of pO<sub>2</sub> and to evaluate their interactions with the biological systems. It also will undertake the further development and optimization of paramagnetic agents and techniques for the measurement of pO<sub>2</sub> in viable biological systems, including developments and background information which will facilitate the adoption of these techniques for use with patients. The component at the University of Illinois, directed by Bob Clarkson, provides unique strengths in the

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development and physical-chemical characterization of paramagnetic probes to be used in the applications. These components will provide support for component medical research projects at Dartmouth (currently only the 2nd is funded, but we are working on the others!) in order to understand:

1. the relationship between tissue pO<sub>2</sub>, MRI (including perfusion/diffusion weighted images) and high resolution 31P NMR spectra of metabolic intermediates in tumors and in the CNS under baseline conditions and during and after acute ischemia;
2. the role of pO<sub>2</sub> in radiation induced damage to the spinal cord and the effect of therapeutic interventions;
3. the relationship of pO<sub>2</sub> in organs (kidney, heart, and hypothalamic and cortical areas of brain) to the markedly different responses to chronic hypoxia of two strains of rats.

Investigators at other labs are cordially invited to take advantage of the presence of the program project to obtain information and assistance in using this exciting new technology and to add their insights, paramagnetic materials, technical developments, etc. to the effort. We feel that projects such as this, which involve the cooperation of several different members of the EPR community are one of the best ways for all of us to realize the full potential of our field. The collaborative use of the Center and the program project may be especially compatible with taking a sabbatical or extended research leave at Dartmouth. If you think the program project can help you or you can help it, please contact Hal Swartz at Dartmouth (E-mail: [harold.swartz@dartmouth.edu](mailto:harold.swartz@dartmouth.edu); ☎: 603-650-1955; FAX: 603-650-6525; mail address: Dartmouth Medical School, HB 7252, Hanover, NH, 03755, USA). If you want especially to discuss the synthesis and characterization of paramagnetic probes for sensing of oxygen or nitric oxide, please contact Bob

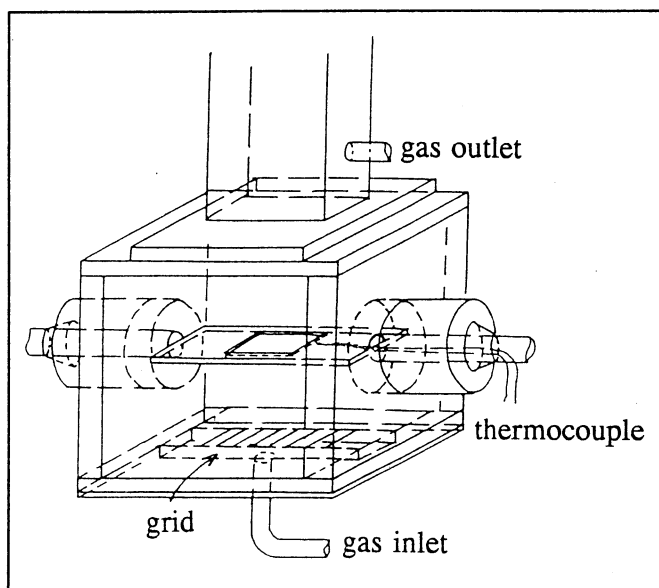
Clarkson at the IERC in Urbana (Univ. Illinois College of Veterinary Medicine, MRI Lab, 1008 Hazelwood Drive, Urbana, IL 61801, USA; ☎: 1-217-244-1375; FAX: 1-217-244-1475; E-mail: clarkson@uiuc.edu).

**FROM the NATIONAL BIOMEDICAL CENTER for SPIN TRAPPING and FREE RADICALS, Oklahoma City, Oklahoma, USA:**

We have developed and tested a horizontal EPR cavity in which one can manipulate the conditions around small biological (dead or alive) specimens without disturbing the EPR measurement. Characteristics of this cavity allow one to monitor continuously an EPR spectrum from biological samples exposed to varying gaseous environments. A sketch of the modified cavity is shown in the figure. Minor modifications of a standard cavity (TE102) were made: 1). The cavity was rotated by 90° by use of a straight waveguide; 2). The cavity was modified into an airtight structure; 3). A gas inlet was installed to feed gases into the cavity; 4). An "open-air" sample cell (such as Tissue cell, Wilmad WG-806) was used; 5). Temperature of the cavity was controlled with the water jacket installed outside

the cavity. For example, this cavity has been used to determine the lifetime of superoxide adduct of DMPO produced from stimulated leukocytes (*Free Rad. Biol. Med.* 17, 215-223, 1994). The stimulated leukocytes were placed in the groove of the open-air EPR-cell with DMPO. A steady EPR signal of the superoxide adduct of DMPO was observed for many hours because of the continuous supply of oxygen. When the gaseous atmosphere was rapidly switched from wet-air to wet-nitrogen, the superoxide adduct was observed to decay. Because the diffusion of gas into a thin layer of solution should be fast, we consider this decay to be the spontaneous decay of the superoxide adduct. Infusion or injection of a small volume of solution (<2μl) into the center of the groove by means of a syringe with very thin tubing is feasible while EPR measurement is going on.

If you are interested, or for information, contact Dr. Yashige Kotake, National Biomedical Center for Spin Trapping and Free Radicals, Oklahoma Medical Research Foundation, 825 NE13th, Oklahoma City, OK, 73104 USA; E-mail: yashige-kotake@omrf.uokhsc.edu; FAX: 1-405-271-3980.



## CONFERENCE REPORTS

**EUROPEAN ESR MEETING ON RECENT  
ADVANCES & APPLICATIONS TO ORGANIC  
& BIO-ORGANIC MATERIALS  
(Paris, September 5-9, 1994)**

This symposium was initiated by the European Federation of ESR Groups, presently consisting of:

- ESR Group of the Royal Society of Chemistry
- Gruppo Italiano di Risonanza di Spin Elettronico
- Nederlandse EPR Discussie Groep
- Polish ESR Group
- Bulgarian ESR Group
- German ESR Discussion Group
- Groupe d'Application de la Résonance Paramagnétique Electronique

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It was held in the center of Paris at the "Ministère de l'Enseignement Supérieur et de la Recherche." The meeting is the outcome of long-standing contacts between the ESR communities of various European countries.

The Steering Committee of the Federation, inaugurated in 1991 during the international ESR meeting in Padova, choose the main topics of the Symposium: organic and bio-organic systems, applied ESR and ESR methodology.

The Steering and Scientific Program Committee consisted of two representatives of each national ESR Group (chairman K. Möbius - Berlin). The French Organizing Committee consisted of representatives of university and scientific institutions (Chairman B. Catoire - Paris).

Nearly 200 academic and industrial scientists coming from 15 countries, mostly European with small but very significant contributions from the U.S., attended the meeting. There were 18 invited plenary lectures, 20 oral presentations and about 120 posters.

The plenary lecturers were: H.B. Ambroz (Warszawa), A. Angerhofer (Stuttgart), R. Basosi (Siena), L.C. Brunel (Grenoble), R. Cammack (London), P. Gast (Leiden), G. Giacometti (Padova), B.C. Gilbert (York), E.J.J. Groenen (Leiden), H. Kurreck (Berlin), B. Mile (Cardiff), F. Ottaviana (Firenze), T. Prisner (Berlin), A. Van der Pol (Nijmegen), A. Rassat (Paris), H. Thomann (New Jersey, USA), P. Tordo (Marseille), N.D. Yordanov (Sofia).

It is our opinion, confirmed by many participants, that most of the oral presentations and posters were of very high standard. In a pleasant environment and gratifying informal atmosphere, discussions between scientists from various research areas were very stimulative.

During the Symposium a business meeting was held to discuss the future of the European Federation. The representatives of the Federation were very pleased to have with them the president and vice president of the International EPR(ESR) Society: Keith A. McLauchlan and Karl H. Hausser. Their participation in the scientific, administrative and social activities of the meeting reflects the excellent relationship between the IES and the European Federation.

During the well-attended business meeting the following decisions were made, all approved by a great majority of the participants:

- The European Federation of ESR Groups will continue to exist as a formal forum for addressing specific problems of the European ESR communities.
- The Federation will be headed by a Council of two representatives of each national ESR Group elected by their members.

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- The elected president of this Council is Marina Brustolon, Padova, Italy.
- The organizational structure of the Federation will be as unbureaucratic as possible (no treasurer, no secretary, no publication of its own, etc.).
- The main purpose of the Council is to organize every three years a European ESR Symposium in a different European country. A strong participation of scientists of non-European countries is highly appreciated. The general themes of the European ESR Symposium will be decided by the Council. The national ESR Group in charge of the local organization of a European ESR Symposium is also responsible for handling the financial affairs.
- The next European ESR Symposium will be in Leipzig, Germany, in 1997.

During the business meeting, the following information was given:

- The Dutch EPR Group decided to join with Belgium and Luxembourg and changed its name to the Benelux EPR Discussion Group.
- A Russian ESR Group will be founded in the near future and intends to join the European Federation.
- In Romania, initiatives are in progress to form a national ESR Group.
- The president of the International EPR(ESR) Society, Keith McLauchlan, offered to use its publication, the *EPR Newsletter*, as a platform to exchange information on all EPR related questions. This offer was highly appreciated by the audience and considered as a precious tool of communication among the EPR community which should be used as much as possible. In this context, it was recommended to take advantage of the "EPR list servers" computer program by Richard Cammack, London (see Computer Corner, this issue, or *EPR Newsletter*, Vol. 5 #3, 1993-94).
- Finally, the organizers of the meeting thanked all participants for their contributions to the success of this

Symposium and acknowledged the financial and organizational support by the sponsors.

We thank the members of the Steering and Program Committee and of the Organizing Committee for their cooperation. We wish Marina Brustolon good luck in her new function.

Bernard Catoire, Paris  
Klaus Möbius, Berlin

## BOOKS AND PROCEEDINGS

*ELECTRON SPIN RESONANCE, Vol. 14.* Senior Editors: N.M. Atherton (Univ. Sheffield), M.J. Davies and B.C. Gilbert (Univ. York). Volume 14 covers the literature to late 1993, and extends coverage into physical and biological areas of the subject and re-combines the previously separate organic and inorganic volumes. This new, more comprehensive Electron Spin Resonance will be an even more important reference than before. Contents:

- **Organic Radical Ions**, A.G. Davies and G. Gescheidt
- **Time Resolved ESR Studies of Free Radicals**, K.A. McLauchlan and M.T. Young
- **High-Field ESR**, Ya S. Lebedev
- **Transition Metals in Inorganic Systems**, F.E. Mabbs and D. Collison
- **Radiation Damage in DNA**, M.D. Sevilla and D. Becker
- **Spin Labelling in Biological Systems**, D. Marsh
- **EPR Studies of Photosynthesis**, K. Möbius
- **Biological Spin Trapping**, J.A. DeGray and R.P. Mason

The ISBN number is 0 85186 921 1, the cost is £140.00, and publication date was November, 1994.

Also of Interest: *Special Issue on Electron Paramagnetic Resonance Spectroscopy*, Vol. 22 Issue 5, from October 1993. The Electron Spin Resonance Group of The Royal Society of Chemistry celebrated its 25th Anniversary with a meeting at Sheffield in March 1993. Plenary lectures were invited to review the subject and its current developments, a selection of which are included in this special issue. They illustrate the importance of the technique in all the main branches of chemistry, present the state-of-the-art in electron spin resonance and anticipate the developments and application of the technique that the next 25 years may bring. Single Issue Price for this Special Issue: £18.00/\$40.00. To order, contact The Royal Society of Chemistry, Turpin Distribution Services Limited, Blackhorse Road, Letchworth, Herts SG6 1HN, UK; ☎: 44-1462-672555; FAX: 44-1462-480947.

## NOTICES OF MEETINGS

### 2nd WORKSHOP ON LOOP-GAP

**RESONATORS**, National Biomedical ESR Center, Biophysics Research Institute, Medical College of Wisconsin, Milwaukee, WI, May 12-13, 1995.

This workshop is supported by the National Center for Research Resources of the National Institutes of Health, and marks the 20th year of funding for the National Biomedical ESR Center by NCRR. The first day will consist of lectures, while the second day will be devoted to "hands-on" demonstrations, discussions, and tours of the National Biomedical ESR Center. The budget for the workshop is limited, but it is expected that a portion of the living expenses while attending the Conference will be covered. Also, a limited number of travel awards for students may be available. If you are interested in attending, please contact Christopher C. Felix, Ph.D., Scientific Administrator, Natl. Biomedical ESR Ctr., Biophysics Research Inst., Medical Coll. Wisconsin, 8701 Watertown Plank Road, P.O. Box 26509, Milwaukee, WI 53226-0509. ☎: 1-414-456-4000; FAX: 1-414-266-8515; E-mail: cfelix@mis.mcw.edu (INTERNET).

### IV INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY AND APPLICATIONS, Munich, Germany, May 15-19, 1995.

The meeting will be held under the sponsorship of GSF. Topics to be covered will be similar to past symposia and will include dose measurements of various types of ionizing radiation, radiation accidents and other biomedical applications including radiation therapy, development of standards and instrumentation (modern EPR, pulsed EPR, double resonance), imaging and dating of archaeological and geological materials. Other topics may be added depending on the interests of participants. The proceedings will be published in a special issue of the *International Journal of Applied Radiation and Isotopes*. A detailed announcement will be forthcoming. In the meantime, the organizers invite interested parties to contact any of the following: Dr. Dieter Regulla, GSF-Institut für Strahlenschutz, Neuherberg, D-85758, Germany; ☎: 49-89-387-2517; FAX: 49-89-3187-2517; Dr. Anne Skinner, Williams College, Department of Chemistry, Williamstown, MA 01267, USA; FAX: 1-413-597-4116; E-mail: anne.r.skinner@williams.edu; or Prof. Harold Swartz, Dartmouth Medical School, Department of Radiology, Hanover, NH 03755-3863, USA; FAX: 1-603-650-1935; E-mail: harold.swartz@dartmouth.edu.



## 6th CHIANTI WORKSHOP ON MAGNETIC RESONANCE: NUCLEAR & ELECTRON RELAXATION, San Miniato (Pisa), Italy, May 27-June 2, 1995.

This well-established series of magnetic resonance meetings in San Miniato will have its 6th edition in 1995. Continuing the spirit of this series, the present Workshop aims to bring together scientists involved in theoretical and experimental aspects of nuclear and electron spin relaxation to study the structure and dynamics of molecules.

The main topics to be discussed by NMR and EPR scientists will deal with:

- structure determination of biomolecules
- spin polarization phenomena and processes
- relaxation in paramagnetic systems
- quasi-ordered phases
- spin imaging
- new methodologies

The program will consist of invited lectures and poster presentations. A first circular containing more details will be distributed. Participants are asked to present posters on work related to the topics of the Workshop. Please submit an abstract (max. 1 page A4 format typed single-spaced) of the proposed communication not later than April 15, 1995. Since the total number of participants is limited, acceptance will be on a "first come, first served" basis.

The registration fee is 250,000 Italian Lira for active participants and 120,000 Italian Lira for accompanying persons. The cost of the accommodation, based on sharing a twin-bedded room, plus all meals (including Chianti wine!) will be 700,000 Italian Lira per person.

For further information, please contact one of the following: *Prof. Riccardo Basosi* (Organizer), Dept. of Chemistry, Univ. Siena, Pian dei Mantellini, 44, 53100 Siena, Italy, ☎: 39-577-295040, FAX: 39-577-280405; *Prof. Claudio Luchinat*, c/o Dept. Chemistry, Univ. Florence, Via G. Capponi, 7, 50121 Florence, Italy, ☎: 39-55-2757563, FAX: 39-55-2757555; *Prof. Carlo A. Veracini* (Organizer), Dept. Chemistry, Univ. Pisa, Via Risorgimento, 35, 56100 Pisa, Italy, ☎: 39-50-918266, FAX: 39-50-918260, or the Program Chairman: *Prof. Klaus Möbius*, Dept. Physics, Free Univ. Berlin, Arnimallee 14, D-14195 Berlin, Germany, ☎: 49-30-8382770, FAX: 49-30-8386046.

## FIRST NSR WORKSHOP ON ADVANCED EPR SPECTROSCOPY, Nijmegen, The Netherlands, June 1-2, 1995.

This 2-day workshop is organized on the occasion of the retirement of Prof. Dr. E. de Boer as a professor at the University of Nijmegen. With this meeting we would like to

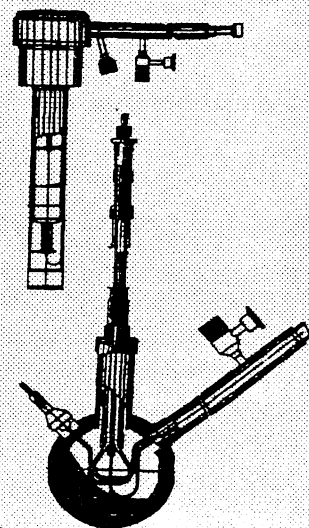
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honour his extensive contributions to the field of EPR. Several aspects of modern EPR spectroscopy will be covered. In particular: Pulsed EPR, high frequency EPR and applications to bio-inorganic systems. Lectures on these subjects will be presented by invited speakers. Participants are invited to present their research in two poster sessions. The number of participants will be limited to approximately 75 persons.

A first circular was distributed in July/August of 1994. For information contact: E.J. Reijerse or D.D. van der Wey, Dept. of Molecular Spectroscopy, University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands; ☎: 31-80-653105 or 31-80-652004; FAX: 31-80-553450; Telex: 48228 wina. E-mail: rey@sci.kun.nl or desiree@sci.kun.nl.

## IV INTERNATIONAL WORKSHOP ON ELECTRON MAGNETIC RESONANCE OF DISORDERED SYSTEMS followed by I INTERNATIONAL SEMINAR ON APPLIED EPR, Sofia, Bulgaria, June 12-19, 1995.

These conferences are organized by the Bulgarian EPR Society in collaboration with Institute of Catalysis, Bulgarian Academy of Sciences and Department of Chemistry, Sofia University. English is the language of these conferences.

a. The aim of the EMARDIS Workshop is to cover all qualitative (structural-reactivity, kinetics, etc.) aspects of

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recent development in theory, experiment, methodology, instrumentation, etc. of EMR (EPR, ENDOR and ESE) spectroscopy of disordered systems through lectures given by the top specialists, selected applicants and round-table discussions. Lecturers scheduled so far include: R. L. Belford, A. Bencini, M. K. Bowman, L. C. Brunel, R. Cammack, A. Colligiani, J.-M. Dance, J. Freed, C. Friebel, J. Forrer, E. Giamello, D. Goldfarb, A. Hoff, M. Iwaizumi, L. Kevan, H. Kurreck, Ya. S. Lebedev, W. Lubitz, G. Martini, S. K. Misra, O. Ohba, M. F. Ottaviani, J. Pilbrow, E. J. Reijerse, B. S. Prabhananda, A. Rockenbauer, J. Stankowski, B. S. Tsukerblat, H. van Willigen, Yuanzhi Xu.

b. Topics in the **APPLIED EPR Seminar** will include: Fundamental aspects of Quantitative EPR (standards, calibration, metrology and methodology of quantitative measurements, instrumentation - new methods, advanced techniques, automatization, etc.); EPR Dosimetry (monitoring of high energy radiation effects, high energy radiation processing control in food preservation and sterilization, dating of archeological and geological samples, etc.); EPR in medicine (clinical and biomedical studies); EPR in environmental control; EPR in the petrol industry; EPR and fossil fuels; EPR in polymer chemistry, etc. Expected specialist-lecturers include: B. Catoire, M. Che, S. Duber, K. Dyrek, M. Ikeya, V. Nagy, B. Nickel-Pepin-Donet, K. Ohno, D. Regulla, J. Raffi, R. Sayfutdinov, D. Schmalbein, M. H. Stevenson, H. Swartz, Yu. Tsvetkov, A. M. Wasserman, J. Weil.

Lectures from the organizers will also be scheduled in the programmes of both events. Original communications will be presented orally or as posters. An abstract book will be available at the meeting.

**Publications**--In the tradition of the EMARDIS meetings there will be two kinds of publications - short abstracts and full length of the invited lectures. A one-page abstract of each presentation should be typed either with good (carbon) ribbon, or printed with a letter-quality matrix or laser printer. Please use white paper and type

single-spaced in the area limited with 25 mm margins on both sides, top and bottom of the standard A4 sheet. The abstracts should be sent to the Convener by February 15. Alternatively, if no formulas, symbols, figures, etc. are present in it they may be sent by E-mail up to the above date. In this case the organizers will print the abstract but at the author's responsibility. The book with abstracts will be available at the meeting. As done for previous meetings, the full text of the lectures will be published in special proceedings at the end of the year. In view of this, manuscripts prepared in camera-ready form will be collected during the workshop. Instructions for preparing of the manuscripts will be given in the second circular.

**Schedule/Attendance** -- The meeting will commence with dinner on Monday (June 12) and will finish Monday (June 19) after breakfast. From Monday the 12th to Friday the 16th, EMARDIS problems will be discussed. The last two days (Saturday/Sunday, June 17-18) will be devoted to the "Applied EPR" Seminar. Friday (June 16) will be leaving/arrival day for those who wish to attend only one of the events or free (excursion) day for those who will attend both the events. The meetings will be limited to about 50 participants to facilitate scientific interactions. Those interested in attending should contact us for applications and send prospective abstracts to arrive before February 15, 1995. Acceptance into the meetings (on a first-come, first-served basis) will be sent by February 28, 1995.

**Social Program** -- Welcome party, half-day sightseeing tour in Sofia and traditional farewell dinner are planned. In addition, an excursion to some places of regional historical and cultural interest will also be offered (Friday, June 16).

**Location, Accommodations, and Costs** -- The meetings will be held June 12-19, 1995 near Sofia. The accommodation of all participants will be arranged in two-bed rooms. The cost of accommodation, including all meals, is US \$250 for EMARDIS and US \$200 for APPLIED EPR. In addition, there is the registration fee (US \$150 for the EMARDIS meeting, US \$120 for the APPLIED EPR Seminar, or US \$250 for both).

The deadline for receiving abstracts is February 15, 1995, and the deadline for confirmation of attendance is February 28, 1995. A Second Circular of the EMARDIS meeting with more details will be distributed at the end of February, 1995, only to those who respond to the present announcement.

**For further information, contact:** N. D. Yordanov (Convener) or M. Zdravkova (Sci. Secretary), Institute of Catalysis, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria. E-mail: banchem@bgearn.bitnet. ☎: 359-2-

713-2546 or 713-3917 or 724-917; FAX: 359-2-756-116 or 720-038; telex: 22729 echban.

**BIOMED 95 3rd ANNUAL CONFERENCE, SIMULATIONS IN BIOMEDICINE, Palazzo delle Stelline, Milan, ITALY, June 21-23, 1995.**

The objective of this Third International Conference on Computers in Biomedicine is to bring together different scientists who work on the application of computers to simulate biomedical phenomena, as well as to develop numerical algorithms to analyse, manage and visualise biomedical data. This conference is specifically aimed at scientists throughout the world working on the application of computers to simulate and analyse biomedical phenomena but who may not be fully aware of each other's developments.

The Conference Chairmen are: Prof. C. A. Brebbia (Wessex Inst. Technology, UK), Prof. R. T. Hart (Tulane Univ, New Orleans, USA) and Dr. H. Power (Wessex Inst. Technology, UK). The International Scientific Advisory Committee are: Prof. M. W. Collins (City Univ., UK), Dr. P. R. Johnston (Univ. Tasmania, Australia), Dr. M. Karlsson (Linköping Univ., Sweden), Dr. L. J. Leon (Univ. Montreal, Canada), Prof. C. J. Lumsden (Univ. Toronto, Canada), Prof. M. D. Nowak (Univ. Connecticut, USA), Dr. M. Tanaka (Osaka Univ., Japan), Mr. A. Urbaszek (Univ. Erlangen-Nurnberg, Germany) and Dr. Y. Xu (City Univ., UK).

*Conference Topics:*

- Simulation of Physiological Processes
- Computational Fluid Dynamics in Biomedicine
- Orthopedics/Bone Mechanics
- Electrical and Magnetical Simulation
- Imaging Processing
- Data Acquisition and Analysis

For information, contact:

Jane Evans, Conference Secretariat *Biomed 95*, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA UK; ☎: 44-703-293-223; FAX: 44-703-292-853; E-mail: cmi@uk.ac.rl.ib; Intl. E-mail: cmi@ib.rl.ac.uk.

**EPR-95 IES WORKSHOP, Sydney, Australia, July 13-15, 1995.**

On behalf of the organising committee and the Australian EPR community we would like to invite you to a workshop, supported by the International EPR Society, on innovative methods and applications of both continuous wave and pulsed EPR. The workshop will be held at the University of Sydney and is designed to bring together specialists in EPR spectroscopy and users of this technique to allow communication and provide solutions to users'

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problems. The meeting will be comprised of a series of invited lectures, a poster session Friday night and a Bruker Users meeting on Sunday. *Conveners:* John R. Pilbrow and Graeme R. Hanson. For a copy of the registration brochure please send your name, address, fax, E-mail and area of interest to Dr. Graeme Hanson, EPR-95, Center for Magnetic Resonance, University, Queensland, St. Lucia, Queensland, 4072 Australia; FAX: 61-7-365-3833 or E-mail: epr-95@cmr.uq.oz.au. or to Prof. John R. Pilbrow, Monash University, Department of Physics, Clayton, Victoria 3168, Australia, FAX: 61-3565-3637, E-mail: j.pilbrow@monash.edu.au. All names and addresses will automatically be added to the ISMAR mailing list.

**ISMAR-95, TWELFTH CONFERENCE OF THE INTERNATIONAL SOCIETY OF MAGNETIC RESONANCE, Sydney, Australia, July 16-21, 1995.**

This international conference will have sessions covering all major areas of magnetic resonance, including:

- Advances in imaging and microscopy
- Inorganic and multinuclear NMR
- Chemical applications of NMR
- EPR and applications (joint with IES)
- Proteins and nucleic acids: structure and dynamics
- Developments in multidimensional spectroscopy
- *In vivo* spectroscopy and clinical applications
- Solid state NMR
- Membranes and liquid crystals
- New technology and experimental methods
- Advances in theory and computational methods

Presentations will be via plenary lectures, invited lectures, colloquia and poster sessions, with special invited lectures from some of the pioneers of NMR to commemorate the 50th anniversary of its discovery. A comprehensive trade exhibition will be held in conjunction with the conference. Companies wishing to display magnetic resonance hardware, software or accessories should contact the conference chairman. The social

program will give delegates and their companions opportunities to meet informally and to get to know this magnificent harbourside city. We will be suggesting pre- and post-conference tours for those who wish to travel more extensively around Sydney or to other parts of Australia.

For more information, contact Dr. L.D. Field, Chairman ISMAR-95, Department of Organic Chemistry, University of Sydney, Sydney NSW 2006 AUSTRALIA, ☎: 61-2-692-2060; FAX: 61-2-692-3329; E-mail: ISMAR-95@biochem.su.02.au

**EIGHTEENTH INTERNATIONAL EPR SYMPOSIUM at the 37th Annual Rocky Mountain Conference, Denver, CO, USA, July 23-28, 1995.**

*Symposia:*

- Atomic Spectroscopy (Gary Rayson, Las Cruces, NM)
- Chromatography (Denise Kent, Conifer, CO)
- Composting (Cal Kuska, Greenwood Village, CO and Robert Wershaw, Arvada, CO)
- Electrochemistry (C. Michael Elliott, Ft. Collins, CO)
- Environmental Chemistry (Maria Tikkanen, Sacramento, CA)
- EPR (Gareth Eaton and Sandra Eaton, Denver, CO)
- FTIR/NIT/RAMAN Spectroscopy (Abdul Chughtai, Denver, CO)
- General Posters (Mary Cast, Arvada, CO)
- ICP/MS (Howard Taylor, Boulder, CO)
- Laboratory Safety (Victoria Swancutt, Broomfield, CO)
- Luminiscence (DeLyle Eastwood, Las Vegas, NV and Robert Hurtubise, Laramie, WY)
- Mass Spectrometry (Joseph Zirrolli, Denver, CO)
- NMR (Lex Vega)
- Pharmaceutical Analysis (Mike Cutrera, St. Petersburg, FL, Robert Lantz, Ft. Collins, CO and Patricia Sulik, Ft. Collins, CO)
- Quality Assurance (William Shampine, Denver, CO)
- Radiochemistry (Ann Mullin, Arvada, CO)
- Robotics (Jerry Hoffman, Arvada, CO)

*Exhibits Chair:* Sue Zeller, Huffman Laboratories, Inc., 4630 Indiana Street, Golden, CO 80403, USA; ☎: 1-303-278-4455; FAX: 1-303-278-7012. *Conference Chair:* Jefferey Cornell, Quanterra Environmental Services, 4955 Yarrow Street, Arvada, CO 80002, USA; ☎: 1-303-421-1025 ext. 206; FAX: 1-303-431-7171. *Publicity Chair:* Patricia Sulik, Rocky Mountain Instrumental Labs, 456 S. Link Lane, Ft. Collins, CO 80524, USA; ☎/FAX: 1-303-530-1169.

The abstract deadline is March 27, 1995. For more information contact: Rocky Mountain Conference,

Barbara Coles, Registration Chair, P.O. Box 506, Wheat Ridge, CO 80034, USA.

**3rd MEETING OF THE SOCIETY OF MAGNETIC RESONANCE, Nice, France, August 19-25, 1995.**

For information, *Contact:* Society of Magnetic Resonance, 1918 University Avenue Suite 3C, Berkeley, CA, USA. ☎: 1-510-841-1899; FAX: 1-510-841-2340. SMR can now be reached by E-mail at [info@smrm.org](mailto:info@smrm.org).

**VII INTERNATIONAL CONFERENCE on BIO-INORGANIC CHEMISTRY (ICBIC 7), Lübeck, Germany, September 3-8, 1995.**

The Scientific Program will be organized around eight plenary lectures, which will introduce topics to be expanded by invited speakers in two parallel sessions and additional microsymbosia, and by two poster sessions. Tentative topics include:

- Redox reactions
- Hydrolic and group transfer
- Energy transfer, bioenergetics
- Transport, storage, and assembly of metals
- Metals and nucleic acids
- Gene regulation
- Metals in medicine
- Environmental chemistry
- Spectroscopy and specific applications
- --- and more

The plenary lectures are: Stephen Lippard (Cambridge), *Synthetic models for and mechanistic studies of methane monooxygenase*; Ken Raymond (Berkeley), *The coordination chemistry of biological iron transport: Iron and disease*; Dieter Sellmann (Erlangen), *Modelling the reactivity of metal-sulfur oxidoreductases*; Britt-Marie Sjöberg (Stockholm), *Ribonucleotide reductase - an ancient enzyme with radical mechanism*; Rolf Thauer (Marburg), *Metalloenzymes involved in methanogenesis*; Andy Thomson (Norwich), *Magneto-optics and metalloproteins*; Anthony Wedd (Melbourne), *Oxomolybdenum enzymes*; Raymond Weiss (Strasbourg), *Advances in modelling the high-valent iron intermediates of heme proteins*.

Call for posters: Formats required to prepare posters and to publish abstracts will be sent with the second announcement. Abstracts will be accepted for publication in the *Journal of Inorganic Biochemistry* only after receipt of conference fee.

Social events will include a get-together party on Sunday evening, September 3; an organ concert at Marienkirche, Tuesday evening, September 5; optional excursions to the old City of Lübeck, to Mecklenburg, to

Schleswig-Holstein, to Hamburg, etc. on Wednesday afternoon, September 6. The official conference dinner will be held on Friday evening, September 8. There will also be a panorama of daytime events for accompanying persons who are not engaged in the scientific program.

For further information, contact either one of the Conference Chairs: Alfred X. Trautwein, Institut für Physik, Medizinische Universität, Ratzeburger Allee 160, D-23538 Lübeck, GERMANY. ☎: 49-451-500-4200; FAX: 49-451-500-4214; E-mail: icbic7@miraculix.physik.mu-luebeck.de OR Karl Wiegardt, ☎: 49-234-700-4153; FAX: 49-234-700-4109.

### SECOND INTERNATIONAL WORKSHOP ON *IN-VIVO* ESR AND ESR IMAGING, L'Aquila, Italy, September 10-13, 1995.

The first such event was the First International Workshop on "*In Vivo* ESR and ESR Imaging" was held in L'Aquila in 1989. In 1993 the Workshop on "*In Vivo* EPR of Viable Biological Systems" was organized by the IERC at the Dartmouth site and hosted by Hal Swartz in Hanover, NH, USA, and in 1994 an international conference on "Bioradicals Detected by EPR Spectroscopy" was held in Yamagata, Japan. This year, the Second of the L'Aquila Workshops will be held. This workshop will cover the following topics: EPR instrumental development, new technologies, EPR imaging, low frequency EPR, *In-Vivo* EPR, Spin Trapping, Oximetry and Advances in Biophysical Applications. Scientific activities will include lectures, discussions, and poster sessions organized under "Instrumental Development", "Image Reconstruction by EPRI and PEDRI", "Spin Trapping and Spin Probes", "ESR Oxymetry", "*In Vivo* Applications", and "Biophysical Applications". There is still room for more participants. For further information and to be included in the mailing list please contact: Prof. Antonello Sotgiu, Dept. STBB, University of L'Aquila, Via Vetoio, Coppito, 67100-L'Aquila, Italy. FAX: 39-862-433-433, E-Mail: sotgiu@vxscsq.aquila.infn.it.

### VII INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE (ISMRCIS VII), Madrid, Spain, September 11-15, 1995.

This Symposium, to be held at the central premises of the Consejo Superior de Investigaciones Científicas (CSIC) in Madrid, Spain, September 11-15, 1995, is a continuation of the previous triennial conferences on the same subject started in San Francisco, USA (1976) and followed on in Menton, France (1979), Torun, Poland

(1983), Muenster, Germany (1986), Newark, Delaware, USA (1989) and Firenze, Italy (1992). These conferences have become a major event whose aim is to provide a forum for physicists, chemists, and biologists at which to present and discuss their recent research in the field. The program of the conference will include plenary lectures as well as oral and poster presentations. The official language will be English. The proceedings will be published in a special issue of the journal *Colloids and Surfaces*.

*Scientific Programme (Tentative):* The Conference will cover all applications of magnetic resonance spectroscopies to colloid and interface systems. The programme of the Conference will be divided into the following topical sessions. Invited Speakers to these sessions and subjects of their lectures are also included:

- *Adsorption, Catalysis and Surface Chemistry* (pending)
- *Interfacial Coordination Chemistry*, E. Giamello (Torino), "ESR of Coordination Compounds at Surfaces and Interfaces"
- *Molecular Sieves, Zeolites and Silicate Surfaces*, G. Engelhardt (Stuttgart), "NMR of Zeolites and Molecular Sieves"
- *Intercalation Compounds and Confined Fluids*, R.J.S. Brown (Claremont), "NMR in Pore-Confined Liquids"
- *Advanced Materials, Ceramics and Composites* (pending)
- *Surfaces, Interfaces and Nanostructures of Magnetic and Electronic Materials*, H.J. von Baerdeleben (Paris), "ESR of Paramagnetic Centers in Luminescent Silicon"
- *Dispersed Systems (Including Colloids, Polymers and Gels)*, F. Lauprêtre (Paris), "NMR Studies of Local Dynamics in Polymers"
- *Ordered Systems (Including Liquid Crystals, Self-Assembling Materials and Micelles)*, G.R. Luckhurst (Southampton), "Magnetic Resonance Studies of Liquid Crystals"
- *Biological Systems, Membranes and Interfaces*, G. Otting (Stockholm), "NMR for Studies of Water-Protein Interactions"
- *New Magnetic Resonance Techniques*, N. Yannoni (San José), "Detection of MR at Microscopic Scale with STM/AFM Setups"

*Organizing and Program Committee Officers:* Javier Soria, Chairman, CSIC; José L. De Segovia, Co-Chairman, CSIC; José C. Conesa, Secretary, CSIC.

*Accommodations:* The scientific activities will be held on the Campus of the CSIC located close to downtown Madrid.

*Social Programme (tentative):* The following social events included in the registration fees are foreseen: For

Attendees and Accompanying persons, a welcome party on Sunday September 10 at the Conference Center; an outing to Toledo and Conference dinner on Wednesday September 13. For accompanying persons, half-day guided visits to the Royal Palace on Monday September 11, the Escorial and Valley of the Fallen on Tuesday September 12, and the Prado Museum on Thursday September 14.

*Important Dates:* 3/15/95--Deadline for reception of abstracts at the Conference Office. 5/15/95--Acceptance letter including presentation, date and session. 7/1/95--Deadline for registration (registration form including full payment should be received by this date). 7/31/95--Preliminary Program sent to participants.

To receive the final announcement and call for papers, contact the Conference Office, ISMRCIS-VII Secretariat, Assistant Secretary: Mrs. I. Hernández, CETEFI "L. Torres Quevedo," Serrano 144, E-28006 Madrid, Spain; ☎: 34-1-561-88-06; FAX: 34-1-411-76-51.

#### GORDON CONFERENCE, FALL, 1995.

September 24-29, Schwaebisches Bildungszentrum, Irsee, Germany, "Solid State Chemistry," Kenneth Poepelmeir, Gerd Meyer.

*Program Information:* The complete program for the Winter and Spring 1995 Gordon Research Conferences is published in *Science*, October 14, 1994. General information on all of the Gordon Research Conferences is available on E-mail: via **gopher**, [hackberry.chem.niu.edu](mailto:hackberry.chem.niu.edu) port 70; via **world-wide web**, <http://hackberry.chem.niu.edu:70/0/webpage.html>; via **anonymous ftp** to [hackberry.chem.niu.edu](ftp://hackberry.chem.niu.edu) (in the `pub/Conferences/GordonConferences` directory).

*Mailing Address:* Conference Application, Gordon Research Conferences, University of Rhode Island, P.O. Box 984, West Kingston, RI 02892-0984, USA.

**MICROSIM 95, FIRST INTERNATIONAL CONFERENCE ON SIMULATION & DESIGN OF MICROSYSTEMS & MICROSTRUCTURES**, Wessex Institute of Technology, Southampton, UK, September 26-28, 1995.

Purpose: To promote international cooperation among scientists and engineers involved in the design and simulation of microsystems and microstructures.

Topics include:

- Design
- Simulation and Analysis
- Optimization
- Material Modeling
- Fabrication and Manufacturing Processes
- Correlation with Experimentation
- Integration

- CAD
- Processes (i.e. Etching)
- Measurement Problems

Application areas:

- Microelectronics
- Mechatronics
- Micro Electrical Mechanical Systems
- Engineering, Automotive and Aerospace
- Medicine and Biology
- Transducers
- Environmental
- Computers and Information Processes

For information, contact Mrs. Sue Owens, MICROSIM95 Conference Secretariat, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA, UK; ☎: 44-703-293-223; FAX: 44-703-292-853; E-mail: [cmi@ib.rl.ac.uk](mailto:cmi@ib.rl.ac.uk).

**22nd ANNUAL CONFERENCE of the FEDERATION of ANALYTICAL CHEMISTRY AND SPECTROSCOPY SOCIETIES, Cincinnati, Ohio, October 15-20, 1995.**

The FACSS meeting is one of the world's leading conferences in analytical chemistry, with over 1,500 participants and a program comprised of almost 1,000 presentations. This year, in addition to sessions on the core topics of atomic and molecular spectrometry, chromatography, and electroanalysis, the meeting will also feature sessions devoted to nanoscale analyses, biosensors for the 21st century, materials characterization, chemical analysis and neuroscience, challenges to environmental analysis, and issues facing the next generation of analytical scientists. Contributed original research papers are solicited in all areas of analytical chemistry. Titles should be submitted on a form obtainable from the FACSS National Office, 201-B Broadway St., Frederick, MD 21701-6501, USA; ☎: 1-301-846-4797; FAX: 1-301-694-6860. Acceptance of submissions after March 31, 1995 is not guaranteed. Submitted papers will either be 20-minute talks or be presented in poster sessions. Upon acceptance of your submission, final abstract materials and instructions will be sent to you in May. Listing of your presentation in the Final Program is contingent upon receipt of your 250 word final abstract via disk submission (5.25" or 3.5" - preferably in WordPerfect format) by June 30, 1995.

**INTERNATIONAL CONFERENCE on ELECTRON SPIN RESONANCE in ELECTRON TRANSFER and ORGANIC SOLIDS, Dresden, Germany, November 22-25, 1995.**



The conference will be organized by the Institut für Festkörperforschung of the IFW Dresden. The topics include ESR in electron transfer reactions, ESR at fullerenes, ESR at conducting polymers and ESR as an *in situ* method. Presentations will be via invited lectures, short oral presentations and posters.

For further information, contact Dr. Lothar Dunsch, Institut für Festkörperforschung im IFW Dresden, e. V. Hemholtzstraße 20, D-01069 Dresden, Germany; ☎: 49-351-46-59-548; FAX: 49-351-46-59-313; E-mail: dunsch@ifw-dresden.d400.de.

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## POSITIONS WANTED

**EPR Spectroscopist seeks a Postdoctoral Fellowship.** Solid state physicist/chemist, 26 years old, Ph.D. 1994 (physics and mathematics), researcher at the Institute of Chemical Physics (Moscow, Russia). Research experience: Investigation of the microwave response in HTSC, conducting polymers (polyaniline), synthesis of byradicals with the help of mechanoactivation. Please contact: Dr. D.S. Tipikin, Institute of Chemical Physics, Russian Academy of Science, Kosygin Str. 4, 117977 Moscow, Russia; ☎: 7-095-939-71-85; FAX: 7-095-938-21-56; E-mail: kinet@glas.apc.org.

**EPR and NMR Spectroscopist Seeks an Academic or Industrial Position.** Biophysicist-solid state physicist, Ph.D. '87, research/teaching experience. Now research worker/teacher at Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University. Research experience: A) liquid- and solid-state EPR spectroscopy of biological, organic and inorganic materials (Bruker 200D SRC NMR Spectrometer with Aspect 2000 Computer). Special research experience: membrane biophysics, drugs-membrane interaction, spin-label EPR spectroscopy (International Training Course, Hungarian Academy of Sciences, Szeged, Hungary). Also sol-gel or glass solid-state EPR spectroscopy; transition-metal spin labels. B) liquid- and solid-state NMR spectroscopy of biological, organic, and inorganic materials (Varian 300 MHz VXR spectrometer). Special research experience: 1D, 2D, and pseudo-3D multinuclear NMR spectroscopy of biopolymers, using Varian Unity 500 MHz spectrometer (postdoctoral fellowship at McGill University, Pulp and Paper Research Center, Montreal, Canada). Also sol-gel or glass multinuclear NMR spectroscopy. Wanted: faculty or research post, or opportunity to teach basic principles of resonance spectroscopy or biophysics. Please contact:

Dr. Milan Mazur, Department of Physical Chemistry, Faculty of Chemical Technology, Slovak Technical University, Radlinskeho 9, CS-812 37 Bratislava, SLOVAKIA; FAX: 42-7-493-198.

**EPR Spectroscopist seeks Postdoctoral Fellowship Position.** Semiconductor physicist, 32 years old, Ph.D. '88, research scientist of the Institute of Semiconductor Physics, Novosibirsk, Russia. Research experience: EPR of defects in irradiated semiconductors, spin-dependent transport in semiconductors, EPR of paramagnetic centers in quantum size semiconductor structures. Please contact: Dr. A.A. Karanovich, Inst. Semiconductor Phys. Russian Acad. Sci., Siberian Branch, pr.Lavrenteva 13, 630090 Novosibirsk, RUSSIA; E-mail: lab24@isph.nsk.su; ☎: 38-32-354255; FAX: 38-32-354265; Telex: 133243 FONON SU.

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## POSITIONS AVAILABLE

**Professor John Pilbrow, Physics Department, Monash University,** has a position which could be either at the post-doctoral level or suitable for an appropriately qualified sabbatical visitor which could run from about nine months to one year, depending on seniority and negotiated salary level to carry out ESEEM and relaxation time measurements using a Bruker ESP380E FT/CW spectrometer. Person to have had experience in pulsed EPR (ESEEM etc.) in one or more of the following areas: transition metal ions in crystalline and non-crystalline solids, metal proteins, transition metal complexes.

In 1995 the group will consist of three Faculty members, two other post-doctoral fellows and three PhD students. Position could start almost immediately.

For further information contact Prof. John R. Pilbrow, Department of Physics, Monash University, Clayton, Victoria 3168, Australia; ☎: 61-3-905-3630; FAX: 61-3-905-3637; E-mail: j.pilbrow@sci.monash.edu.au.

**EPR Engineer/Postdoctorate position** is available immediately. Must have experience in microwave electronics and EPR. Project is design, repair, and maintenance of low field *in vivo* EPR apparatus as well as two Varian E-line X-band systems. Send CV, including the names, fax and E-mail of at least three referees to: Lawrence J. Berliner, Dept. of Chemistry, The Ohio State University, 120 W. 18th Ave., Columbus, OH 43210 USA; ☎: 1-614-292-0134; FAX: 1-614-292-1532; E-mail: berliner@livers.mps.ohio-state.edu, lberline@magnus.acs.ohio-state.edu, ts0288@ohstmvs.a .bitnet, or ts0288@ohstmvs.a.acs.ohio-state.edu

**Postdoctoral Research Position** is available on an EU-funded project, to study the nickel-iron-sulphur enzyme hydrogenase, of which the structure has recently been determined. Experience with EPR or NMR or other spectroscopy an advantage. Training will be provided as necessary in spectroscopy, protein chemistry, and redox methods. There are opportunities for exchange visits to other research laboratories in the EU. The position is available immediately, for two years. Salary according to age and experience. Apply as soon as possible to: Prof. R. Cammack, Centre for the Study of Metals in Biology and Medicine, Division of Life Sciences, Campden Hill Rd., London W8 7AH, UK; ☎: 44-171-333-4264; FAX: 44-71-333-4500; E-mail: r.cammack@hazel.cc.kcl.ac.uk.

**Help Wanted:** A group in the Cancer Institute at NIH is working on a novel biological application of magnetic resonance spectroscopy. Some funding has been secured, and we are looking for an individual who might be interested to help. We need a person with a good understanding of a modern spectrometer, particularly the analog and RF circuitry. Experience in RF design, hi speed signal switching, gradient coil design and the associated prototype execution and testing is highly desirable. No formal position has been established. The person could be on a postdoctoral or visiting scientist appointment, on an engineering or technician employment level or even part time as a consultant or outside contractor. Anyone who feels qualified and is interested in talking to us can contact me to exchange more information. All responses will be held in strict confidence.

Contact Rolf Tschudin, Bldg.5, Rm. B2-29, National Institutes of Health, Bethesda, MD 20892-0505, USA; ☎: 1-301-496-2692; FAX: 1-301-496-0825; E-mail: tschudin@nih.gov; CompuServe: 71543,751.

## **EQUIPMENT & SUPPLIES EXCHANGE**

### **FOR OWNERS OF VARIAN & BRUKER EPR SPECTROMETERS**

Micro-Now Instrument Company now has available replacement klystrons (new) for Varian 4500, E3, E4, Century Series and some Bruker spectrometers available at attractive prices. Contact Clarence Arnow, ☎: 1-708-677-4700, FAX: 1-708-677-0394; 8260 N. Elmwood St., P.O. Box 1488, Skokie, IL 60076, USA.

### **FOR OWNERS OF VARIAN EPR SPECTROMETERS:**

(1) Field Scan Potentiometer; (2) Klystrons for Replacement; (3) Parts for Varian E-256 Electrolytic Cell; (4) Diodes for Varian E-101 & E-102 Dispersion Style Microwave Bridge Users; (5) Varian E-3, 9 12 & E-104, 9, 12 Crt's :

(1) Varian E-3, E-4 and E-9 and early E-109 users: I have arranged for a custom group order of replacement field scan potentiometer using Varian's specifications and the original vendor part number. These Model #3406 are 30 ohm, 0.06% linearity 3,0 turn pots with a center tap and have infinite resolution. This replacement can solve field stability problems arising from a noisy wiper. If you would like to participate and make this opportunity possible, please contact me regarding your interest. The price would be \$723.00 each with a \$35.00 handling fee per order plus shipping charges (we need to get 25 to get this price). They have a long shelf life. A purchase order would be required. The expected delivery time is about 160 days. There can be no returns on this order, but a vendor's 1-year warranty would apply.

I could also rebuild these parts, but the turn-around time would be long due to batch requirements. So I recommend an order of at least one new pot, which will allow the old one to be recycled at some later date at a price of around \$525.00 depending on the batch size at that time (I would expect most pots are suitable for rebuilding). Please indicate your interest.

(2) Varian V-4500, E-3, E-4, E-9, and E-104,9,12 users: I am arranging one large order for Varian X-Band Klystrons with Varian. If we have a sufficient quantity, Varian will supply with volume pricing. So I need to know your needs, that you would be willing to commit a purchase order to (at a later date). The pricing would probably be in the \$6000 range. I would extract a \$100.00 handling fee per order plus shipping for my time. Warranty period from Varian would be a 2-year shelf life plus a 3-year 12,000-hour prorated warranty (typical life 50,000 hours). Delivery times would be long term (6 months). If you need Q-Band or E-3 klystrons, let me know; these should be available as well. Prompt response will help in determining the Varian's pricing on this one-time order. Varian's quoted introductory pricing is \$7,000 for unit quantities and is subject to change. The volume price will only be available for a short period of time.

(3) I have the following parts to the Varian E-256 electrolytic cell, unused in factory wrappings: Varian PN 908721-02 Reference Bridge, with protective container;

container; Varian PN 908723 Flat cell; Varian PN 908732 Reservoir upper half; Varian PN 908717 Reservoir lower half.

(4) I have arranged for a custom order of replacement microwave diodes using Varian's specifications and vendor part number (pill style case). If you would like to participate, please contact me regarding your interest. Each dispersion bridge uses two microwave diodes. Fortunately, the diodes don't fail often because of the diode protection circuitry; however, failures have occurred, with replacements difficult to obtain. The price would be \$150.00 each. Since this is a custom order, there would be no returns possible. The suitability of the diode for this purpose is based on Varian's prior usage of this vendor part number for this part. A purchase order would be required.

(5) I have a possible source for rebuilding E-3 crt's for the oscilloscope module. Let me know your needs in this area both now and for the future (I would like to know how many E-3's are still in operation). I will have one crt rebuilt shortly. Don't discard or break the old crt.

E-4:9; 12, E-104;9;12 crt's for the oscilloscope modules and the Varian NMR Gaussmeter are currently available new at \$255.00 ea. Buy one now for stock before they are discontinued. Stringing kits for the Varian recorder are available.

For information, contact James R. Anderson at Research Specialties, 5629 N. Maplewood, Chicago, IL, USA 60659. ☎/FAX: 1-312-728-6570.

#### WANTED: VARIAN MAGNET COIL

We are looking for a magnet coil for a Varian V-3400 9-inch magnet. We need the coil on the right-hand side (from the front). Please contact Shen or David at E-mail address "gashe@ttacs.edu" or call 1-806-742-3764. Jinmiao Shen, Physics Dept., Texas Tech Univ., Lubbock, TX, 79409, USA.

#### WANTED: HALL PROBE

We urgently need a Varian E-4 magnet Hall Probe - P/N - 908742-05 and an E-112 magnet Hall Probe - P/N - 929279-02B. If available, please contact or send to Prof. P.T. Manoharan, RSIC, IIT, Madras - 600 036, India.

#### WANTED: USED EPR/NMR ELECTROMAGNET

We are looking for a used 12" (or bigger) NMR/EPR electromagnet in a good operating condition. A used MRI imaging resistive magnet is also desirable. Please contact: Michael Chzhan, EPR Labs, Johns Hopkins University,

Baltimore, MD, USA; ☎: 1-410-550-2438, FAX: 1-410-550-2448, E-mail: kppu@welchlink.welch.jhu.edu.

#### OFFERED: HELP IN THE DESIGN AND CONSTRUCTION OF EPR ELECTRONICS

The University of Denver is able to provide design and construction services for EPR-related electronics such as low noise signal pre-amplifiers, timing systems for pulsed EPR, or complete microwave bridges. Contact: Richard Quine at the University of Denver, Denver, CO 80208 USA. E-mail: rquine@diana.cair.du.edu ☎: 1-303-871-2419.

#### FIELD SCAN CARDS AVAILABLE FOR COMPUTER CONTROL OF VARIAN FIELD CONTROLLERS

Any Varian magnetic field controller can be modified to permit control of the magnetic field by a computer. An improved scan card design with better documentation at lower cost is available from the University of Denver. Contact Richard Quine, University of Denver, Denver, CO 80208 USA; E-mail: rquine@diana.cair.du.edu; ☎: 1-303-871-2419.

#### AVAILABLE: TABLETOP NMR RELAXOMETERS

A portable (tabletop) NMR relaxometer, the "REKAR", has been developed by the Kazan Radio-Technical Institute. Because the Innovation Fund of the Tatarstan Republic has provided funding to produce this instrument for sale, this model is now available to users worldwide. REKAR is based on principles of pulsed NMR. Its main applications are express-analysis and testing of a wide variety of proton-containing substances. REKAR's computer and oscillograph outputs make it useful for demonstration of the principles of pulsed NMR. The device is reliable, compact, fast, and universal. REKAR's flexibility and modular construction are key advantages.

*Applications:* The relaxometer can be used in different fields of science, education, as well as in medicine, oil, chemical and food industry:

Medicine: Blood analysis (viscosity, hematocrit, protein content in serum, degree of aggregation of erythrocytes, relative oxygen content, fibrinogen in plasm, colloid-oncotic pressure, osmolarity); *Urine analysis* (viscosity, protein content, content of intracellular and extracellular water).

Oil industry: *Analysis* of oil products (humidity and content of high molecular products in oil and bitumen).

Oil industry: *Analysis* of oil products (humidity and content of high molecular products in oil and bitumen).

Chemical industry: *Analysis* of polymer materials (degree of hardening, crystallization and polymerization).

Food industry: *Test of food quality* (milk - fat content, protein content, acidity; meat - fat content, water content; agricultural - cereal, flour, sugar, etc.; humidity).

Electrodeposition: *Concentration* of main components of copper plating electrolytes, nickel plating, iron plating, metal paramagnetic ions in running and rising waters.

#### Basic REKAR Specifications:

Operating frequency, MHz	5.8; 10 (Optional)
Range of measurable relaxation times	2-3000 msec
Accuracy for T <sub>1</sub> ; T <sub>2</sub>	± 3%; ± 5%
Automatic sample temperature range/accuracy	35-50 °C/± 0.1 °C
Field homogeneity, better than	10 <sup>-4</sup>
Wright, 20 Kg, max	20
Dimensions:	310*210*265 mm (electronic unit); 265*210*235 (sensor)
Warranty on parts and labor	18 months

Special orders are welcome.

A REKAR unit has been placed in the United States and can be examined or demonstrated at the University of Illinois. For information, contact Dr. Yong-Min Chang, College of Veterinary Medicine, MRI Lab, 1008 W. Hazelton, Urbana, IL 61801, USA (E-mail: ychang@rlb6000.scs.uiuc.edu; ☎: 1-217-244-5670; FAX: 1-217-244-1475;) or the IERC (address on front page).

For more information, contact Prof. Boris M. Odintsov, Innovation Fund of Tatarstan Republic, Zurnalistov Str., 2a, Kazan, 420029, Russia; ☎: 7-8432-387331; FAX: 7-8432-761128; E-mail: root@kncran.kazan.su.

## ANNOUNCEMENT:

### MAILING LISTS FOR SCIENTIFIC MEETINGS

If you are planning a scientific conference, you may contact an officer of the International EPR Society or the IERC to obtain a list of the 1,000+ Society members for use in issuing invitations. If you would like to have preprinted mailing labels, Martha Moore, who provides secretarial support for the Society, can do this at cost -- approximately \$50.00 (includes cost of labels, postage and, if you wish, a disk copy of the list in ASCII format). Labels for the entire database (3,500+ members and non-members) would cost approximately \$175.00. See the listing of IES officers and their addresses on the next page.

## SPECIAL ANNOUNCEMENT:

*PARTICIPANTS INVITED TO SEPTEMBER  
WORKSHOP IN L'AQUILA, ITALY.*

We are advised that, as this Newsletter goes to press, there is still some room for more participants for the II International Workshop on "In-Vivo" ESR and ESR Imaging to be held in L'Aquila, Italy September 10 to 14 of this year. (See the announcement on p. 23.) This workshop will be held jointly with the IV National Meeting of the Italian ESR Group (GIRSE).

If you are interested in participating in this workshop, please get in touch with Prof. Antonello Sotgiu:

FAX: 39-862-433-433

E-mail: sotgiu@vxscsq.aquila.infn.it

## ANNOUNCEMENT

**Members:** Have you paid your dues? If you are not sure, it will save the Society the expense of mailing late notices if you will take a moment to ascertain the status of your membership according to our records. To do this, please check the lower right hand corner of your mailing label. You will find there four dashes ("-- --"). If only the four dashes "-- --" or "--0--" appear, no dues have been recorded for you for the 1994 year. If dues have been paid, either a numeric value or a letter "R" or "C" (for soft currency countries) will appear, e.g. "--25--." If you don't have your label, please contact the IERC (address on page 1) and we will check to see if dues have been recorded. Your prompt payment of dues will be appreciated! For information on the amount of dues and method to pay, please see Appendix.