EPR NEWSLETTER

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National Biomedical ESR Center, Prof. James S. Hyde, Director. Medical College of Wisconsin, MACC Fund Research Center Building, 8701 Watertown Plank Road, Milwaukee, Wisconsin 53226, USA. ☎: 414/266-4000. E-Mail: felixc@medcolwi.BITNET. FAX: 414/266-4007.

Biotechnology Resource in Pulsed EPR Spectroscopy, Prof. Jack Peisach, Director. Albert Einstein College of Medicine, Department of Molecular Pharmacology, 1300 Morris Park Avenue, Bronx, New York 10461, USA. ☎: 212/430-2175. FAX: 212/829-8705. E-mail: Use INTERNET address "peisach@aecom.yu.edu"

Illinois EPR Research Center (IERC), Profs. Harold M. Swartz and R. Linn Belford, Directors; Prof. Robert B. Clarkson, Associate Director; Prof. Peter G. Debrunner, co-Principal Investigator; other senior staff: Prof. Mark J. Nilges and Dr. Tadeusz Walczak; University of Illinois at Urbana-Champaign, 190 Medical Sciences Building, 506 South Mathews Ave., Urbana, Illinois, 61801, USA. ☎: 217/244-1186. E-mail: belford@uiucscs.BITNET or ierc@uiucvmd.BITNET. FAX: 217/244-8068.

These Centers, which were described in our first issue (Volume 1, #1), cooperate to facilitate research requiring EPR-related techniques. Prospective collaborative or service users may contact the staff at any of the Centers.

IN THIS ISSUE

HOW TO REACH US

To communicate concerning the EPR Newsletter, contact R. Linn Belford, Editor or Becky Gallivan, Editorial Assistant, at IERC (address above). Alternatively, contact any other IERC senior staff member or any officer of the International EPR Society. We welcome announcements, news items, notices of events, appropriate articles, requests, and technical tips pertinent to EPR for possible publication.

NOTICE: EPR Newsletters are published and distributed to Members of the International EPR Society quarterly — in January, April, July, and October. One of these issues each year will be a public issue, which nonmembers on our mailing list also will receive. The material to be published (articles, letters to the editor, advertisements, notices, etc.; see the Editorial in the previous issue, Vol. 2, No. 3, October, 1990) should arrive in the editor's office by the fifth day of the month preceding publication of the issue in which it is intended to appear. Publishable material arriving by March 5 is assured of publication in the April issue. Copy which arrives later may be published in the forthcoming issue but is more likely to be considered for the following issue. Submissions should indicate whether the material is proposed to run in more than one issue.

NOTICES OF MEETINGS

TWENTY-FOURTH INTERNATIONAL MEETING OF THE ELECTRON SPIN RESONANCE GROUP OF THE ROYAL SOCIETY OF CHEMISTRY, Royal Agricultural College, Cirencester, Glous., England. April 15-19, 1991. The theme will be "Inorganic Radicals and Metal Ions in Organic and Biological Systems". However, there also will be a session on the application of computers in EPR, and participants may give posters or talks relating to this topic. Among the plenary lecturers will be Prof. R. Cammack (London); Prof. E. de Boer (Nijmegen); Dr. B. Mile (Cardiff); Prof. P. M. H. Kroneck (Konstanz); Dr. M. Schroder (Edinburgh); Prof. D. Rehorek (Leipzig); and Dr. E. Samuel (Paris). The conference will open with a reception on Monday evening and close after lunch on Friday. Attendance will be limited; accommodations will be in individual rooms. The deadline for registration and submission of short papers and posters is February 1, 1991. For details, contact Dr. C. C. Rowlands, Secretary, Committee of the ESR Group, School of Chemistry, Univ. of Wales, PO Box 912, Cardiff CF1 3TB, U.K.

EIGHTH ANNUAL CONGRESS OF THE EUROPEAN SOCIETY FOR MAGNETIC RESONANCE IN MEDICINE AND BIOLOGY, ESMRMB 1991, Zürich, Switzerland, April 18-21, 1991. An educational program (April 18, Zürich University Hospital) covers three areas; 1. Basic course - imaging, 2. Basic course - spectroscopy, 3. Advanced course.

Scientific program, Congress Center Zürich:

Thursday, April 18: 17.00-18.30, Registration. 18.30, Opening Ceremony. *Friday, April 19*: Plenary session: State-of-the-art in MRI (Chairman: W.A. Fuchs). Other scientific sessions. Poster session. *Saturday, April 20*: Plenary session: Contrast Media-Current Status. Other scientific sessions. Poster session. *Sunday, April 21*: Plenary session on MR-

Pulse-Sequences.

Abstracts for talks were due in January, 1991, but work-in-progress abstracts may be submitted until March 1, 1991. For more information contact Scientific Secretariat, Department of Medical Radiology, 100 Ramistrasse, 8091 Zürich, SWITZERLAND. Phone (01) 255.25.80; FAX (01) 255.44.28

MEETING OF ESR SPECTROSCOPISTS. May, 1991. Each year, a meeting of scientists interested in EPR is held in the last week of May. For details, contact Dr. Andres Stasko, Department of Physical Chemistry, Slowak Technical University, 81237 Bratislava, Czechoslovakia.

II INTERNATIONAL WORKSHOP ON ELECTRON MAGNETIC RESONANCE OF DISORDERED SYSTEMS, May 27-31, 1991, Gjulechitza, Bulgaria. Organized by the Institute of Kinetics and Catalysis, Bulgarian Academy of Sciences and the Department of Chemistry, Sofia University.

The aim of the workshop is to cover all aspects of recent development in the theory, methodology, experiment, instrumentation, etc. of EPR, ENDOR, and ESE spectroscopy of disordered systems through lectures given by the top experts and selected applicants.

At the moment, the following world-known scientists are expected to deliver lectures: W.E. Antholine (Natl. Biomed. ESR Center, Wisconsin), R.L. Belford (Illinois EPR Research Center, Urbana), M. Brustolon (Univ. Padova), M. Che (CNRS, Paris), A. Colligiani (Univ. Messina), L.R. Dalton (Univ. Southern California, Los Angeles), S. Dikanov (Acad. Sci. USSR, Novosibirsk), G. Eaton (Univ. Denver), U. Ewert (Acad. Sci. DDR), W. Froncisz (Jagellonian Univ., Krakow), J. Freed (Cornell Univ., Ithaca), D. Goldfarb (Weizmann Inst. Sci., Rehovot), A.J. Hoff (Univ. Leiden), B.M. Hoffman (Northwestern Univ., Illinois), J. Hüttermann (Univ. Saarlandes), J.S. Hyde (Natl. Biomed. ESR Center, Wisconsin), M. Ikeya (Osaka Univ.), M. Iwaizumi (Tohoku Univ.), L. Kevan (Univ. Houston), H. Kurreck (Freie Univ., Berlin), Ya.S. Lebedev (Acad. Sci. USSR, Moscow), K. Ohno (Inst. Vocational Training, Kanagawa), B.S. Prabhananda (Tata Inst. Fund. Res., Bombay), J.B. Raynor (Univ. Leicester), E.J. Reijersa (Univ. Nijmegen), M. Romanelli (Univ. Florence), D. Schmalbein (Bruker GmbH, Rheinstetten), B.S. Tsukerblat (Mold. Acad. Sci. Kishinev), Yu.D. Tsvetkov (Acad. Sci. USSR, Novosibirsk), H. van Willigen (Univ. Massachusetts at Boston), Y. Xu (Zhejiang Univ.).

In addition, selected short presentations will be made in the form of posters.

Timing: Abstracts requested as soon as possible. Confirmation - February 28, 1991. The workshop will commence with dinner Monday (May 27th), and will finish Friday (May 31st), after breakfast.

Contact: N.D. Yordanov (Convener), Institute of Kinetics & Catalysis, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria (TELEX: 22729 echban; FAX: 359-2-720038; Telephone: 359-2-7131, ext. 2546 or 3917); or G. Gochev (Sci. Secretary), Department of Chemistry, Sofia University, 1, A. Ivanov Avenue, 1126 Sofia, Bulgaria (Telephone: 359-2-62561, ext. 223).

ACTIVITIES OF THE EAST GERMAN ESR GROUP: The Magnetic Resonance Group of the Physical Society in east Germany organizes two biennial conferences.

A. **International Magnetic Resonance Conference (MARECO) (ESR/EPR AND NMR), held in odd-numbered years (invited lecturers). The next one is in 1991** at Castle Reinhardsbrunn, Thüringen Mountains, Germany. For details, please contact: Professor Dr. Wolfgang Windsch, Section Physics, University of Leipzig, Lönne-Str. 5, Germany.

B. **ESR SYMPOSIUM,** with workshops of the EPR/ESR laboratories in east Germany (soon to be joint with west German ESR laboratories), with invited lecturers, held in even-numbered years.

Participants from EPR/ESR laboratories in other countries are cordially welcomed.

FOURTH CHIANTI WORKSHOP ON MAGNETIC RESONANCE, NUCLEAR AND ELECTRON RELAXATION, San Miniato (Pisa), Italy, June 2-8, 1991. As a continuation of the series, the present Workshop aims at bringing together scientists involved with the theory and applications of nuclear and electron spin relaxation to the study of the structure and dynamics of molecules. The topics to be discussed will mainly deal with the structure of biologically active molecules with particular emphasis on the NMR of paramagnetic molecules, and the combination of NMR with molecular dynamics simulations.

Abstracts of proposed communications should be submitted no later than March 31, 1991, be typed single-spaced, and not exceed one A4 sheet of paper.

The cost of accommodation, based on sharing a twin-bedded room, plus all meals (including Chianti wine) will be £550,000 (£ = Italian Lira) per person. There is a registration fee of £200,000 for active participants and £100,000 for accompanying members. For further information please contact:
Prof. Claudio Luchinat (c/o Dept. of Chemistry, Univ. of Florence, Via G. Capponi, 7, 50121 Florence, ITALY) or Prof. Claudio Rossi (Dept. of Chemistry, Univ. of Siena, Pian dei Mantellini 44, 53100 Siena, ITALY).

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FOURTEENTH INTERNATIONAL EPR SYMPOSIUM at the 33d Annual Rocky Mountain Conference, Denver, CO. July 28 to August 2, 1991. At this meeting, Prof. John A. Weil (University of Saskatchewan, Saskatoon) and Dr. Michael K. Bowman (Argonne National Laboratory) are organizing a session on determination of structures by EPR techniques and Prof. Robert B. Clarkson (University of Illinois, Urbana) is organizing a session on standards for EPR. Other events will include plenary lectures, topical sessions, general contributed papers, and poster sessions, and a business meeting of the International EPR Society (time and place to be announced). For further details, contact Prof. Gareth Eaton or Prof. Sandra Eaton, Dept. of Chemistry, University of Denver, Denver, CO, 80208.

INTERNATIONAL SYMPOSIUM ON RECENT ADVANCES IN ESR SPECTROSCOPIES, Padova, Italy. September 8-12, 1991. Joint meeting of The ESR Group of the Royal Society of Chemistry (United Kingdom) and GIRSE (Italy).

General Information: The Symposium will be held at the University of Padova, Dipartimento di Biologia, Via Trieste 75, Padova. The meeting opens on Sunday afternoon with registration and closes on Thursday afternoon. Accommodations will be in hotels in the city and in some rooms in a Student House. Registration fee (including conference tour and banquet: £200.000 plus accommodations). A limited number of grants for students will be available; a request for a grant must be signed by the Supervisor of the student. Registration fees should be paid in Italian Lire (£) by money order to account 472140/P, Cassa di Risparmio di Padova e Rovigo, Agenzia 7, Padova, ITALY.

Scientific Program: The purpose of the Symposium is to gather scientists working in different areas and interested in new developments and applications of ESR spectroscopies. There will be invited plenary lectures (45 min, 10 min for discussion), invited short lectures (25 min, 5 min for discussion), and two poster sessions. Plenary lectures will be delivered by: A. Alberti (CNR, I.CO.C.E.A., Bologna Italy); D. Gatteschi (University, Dept. of Chemistry, Firenze, Italy); M. Hemminga (Agricultural University, Wageningen, Holland); Ya.S. Lebedev (Institute of Chemical Physics, Moscow, USSR); D. Marsh (Max Planck Institute, Göttingen, Germany); K.A. McLauchlan (Chemical Physics Laboratory, Oxford, U.K.); K. Möbius (Freie Universität, Berlin, Germany); A. Schweiger (ETH, Zürich, Switzerland)

Call for Papers and Proceedings: All contributed papers will be presented as posters on panels 1.5m(w)x1m(h). All contributors are invited to submit the contents of their previously unpublished paper for a special issue of "Applied Magnetic Resonance", Editor K.M. Salikhov, Kazan. Such papers must be ready at the start of the conference (preferably also on diskette).

Timing: Submit abstracts and registration fee by 15 May 1991. A hotel reservation card must be received by CIT not later than 20 March 1991 as it may be difficult to find rooms for late applicants.

For details and registration, contact Marina Brustolon, Dipartimento di Chimica Fisica, Via Loredan, 2, 35131 Padova, ITALY. FAX: +39 49 831328.

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THIRD INTERNATIONAL SYMPOSIUM ON SPIN TRAPPING AND AMINOXYL RADICAL CHEMISTRY, Kyoto, Japan, November 22-24, 1991. The three-day program at Kyoto International Congress Hall will include both talks by invited and contributed speakers and poster presentations. You are invited to submit an abstract on original research for consideration for inclusion in the program:

Deadline for submission of abstracts: Although the deadline for receipt of abstracts for talks is May 15, 1991, abstracts received after May 15 will be considered for the poster session.

For details, contact the Chairman: Professor Toshikazu Yoshikawa, Japan Spin Trapping Society, K-Building 2F, Kojinguchi-cho 115, Kawaramachi-Kojinguchi-agaru, Kamigyo-ku, Kyoto 602, JAPAN. Telephone: 075-222-2715. FAX: 075-222-2718.

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ISMAR INTERNATIONAL WORKSHOP ON ELECTRON SPIN ECHO SPECTROSCOPY, Novosibirsk, USSR. September 25-28, 1991. The workshop will deal with problems related to novel trends in experiment, theory, instrumentation, and applications of ESE spectroscopy. The scientific program comprises about 20 plenary lectures and a poster session. Among the plenary lecturers are M.K. Bowman (Argonne), S.A. Dzuba (Novosibirsk), J. Forrer (Zürich), A.J. Hoff (Leiden), T. Ichikawa (Sapporo), L. Kevan (Houston), Ya.S. Lebedev (Moscow), J.R. Norris (Argonne), D. van Ormondt (Delft), J. Peisach (New York), A. M. Raitsimring (Novosibirsk), E. Reijerse (Nijmegen), M. Romanelli (Potenza), K.M. Salikhov (Kazan), J. Schmidt (Leiden), D.J. Singel (Harvard), Yu.D. Tsvetkov (Novosibirsk), G. Voelkel (Leipzig). The conference language is English. For details, contact the Conference secretary, Dr. A. V. Astashkin, Institute of Chemical Kinetics and Combustion, 630090 Novosibirsk, USSR. Phone (8-383-2) 35-48-32. Telex 133148 KING SU.

THIRD INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY, National Institute of Standards and Technology (NIST), Gaithersburg, Maryland, USA. October 14-18, 1991. The Symposium is organized by the Ionizing Radiation Division of NIST, in cooperation with the China University of Science and Technology and the International Atomic Energy Agency. The scope of this timely series of international meetings is broad, but is bound coherently by the theme of electron spin resonance spectrometry applied to absorbed dose measurement and the analysis of a variety of ionizing radiation effects. These include applications of dosimetry for photon, electron, neutron, and heavy-particle radiations, studies of radiation accidents, clinical and biomedicine, dating of archeological and geological specimens, radiation effects in materials, development of transfer and reference standards, preservation of foods, sterilization of medical devices, and the development and enhancement of ESR instrumentation. The primary aim of the Third Symposium is to bring together, from around the world, experts in all these topics, in order to address recent advances and to continue the improvement of applied dosimetry and materials analysis by EPR/ESR methods. It is also intended to provide a forum for the exchange of ideas by the leaders in this important and expanding field of radiation metrology. The official language of the symposium is English.

Location: **The Conference will be held at the National Institute of Standards and Technology, Gaithersburg, Maryland.**

Registration: A registration reception will be held on Sunday, October 13, 1991 at the Gaithersburg Marriott from 18:00 to 20:00 hours. Registration will be held at NIST at 8:00 hours, Monday October 14.

Abstracts and Proceedings: **Abstracts are to be no more than 300 words and should be typewritten. The deadline for submission of abstracts is** March 21, 1991. Abstracts should be sent directly to the program chairman: Dr. A.F. Skinner, Chemistry Department, Williams College, Williamstown, MA 02167, USA. Telephone: 413/597-2323. FAX: 413/597-4116. **The proceedings will be published in the international journal, *Applied Radiation and Isotopes,*** according to its format and rules. The proceedings will not distinguish between oral and poster presentations. The full text of the manuscripts must be submitted by the last day of the Symposium.

Technical Exhibition: For information and applications, please contact Marc Desrosiers, Telephone: 301/975-5639; FAX: 301/869-7682.

Timing: Abstracts due: March 21,1991; Advance registration: August 31, 1991; Hotel reservations: October 1, 1991.

For details and to express interest in attending or submitting an abstract, contact Dr. Marc F. Desrosiers, NIST, Building 245, Room C214, Gaithersburg, MD, 20889, USA; Telephone: 301/975-5639; FAX: 301/869-7682.

TWENTY-FIFTH ANNUAL INTERNATIONAL MEETING OF THE ELECTRON SPIN RESONANCE INTEREST GROUP OF THE ROYAL SOCIETY OF CHEMISTRY (UK), University of York. March 30 to

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April 3, 1992. This will be a joint meeting with the Society of Free Radical Research. The theme will be "Radicals in Organic and Bioorganic Systems." For details, contact Dr. C. C. Rowlands, Secretary, Committee of the ESR Group, School of Chemistry, Univ. of Wales, PO Box 912, Cardiff CF1 3TB, U.K.

VI INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE, Florence, Italy, June 22-26, 1992. The 6th International Symposium on Magnetic Resonance in Colloid and Interface Science will be held at the University of Florence, Florence, Italy, June 22-26, 1992. This is a continuation of the previous triennial conferences held on the same subject in San Francisco, USA (1976), Mentone, France (1979), Torun, Poland (1983), Münster, FRG (1986), and Newark, Delaware, USA (1989). This symposium has become a major event; its aim is to provide a forum for physicists, chemists, and biologists at which they can present and discuss their recent research in the field. The symposium program will include plenary lectures, invited reports, and original research contributions. The official language will be English. The proceedings will be published as full articles in a major scientific journal.

A wide spectrum of the applications of magnetic resonance spectroscopies to colloid and interface systems will be addressed. Among the topics to be covered:

- Adsorption, catalysis, and surface chemistry
- Dispersed systems, colloids, and gels
- Ordered systems
- Zeolite and silicate surfaces
- Intercalation compounds
- Biological systems
- Magnetic systems with specific surface properties
- New magnetic resonance techniques

Other topics can be included depending on the response.

All scientific activities will be held downtown in Florence and all reservations for accommodations will be handled by local travel office directly. Detailed information will be sent in further circulars. Florence is easily reached by train from the international airports of Pisa (1 hour), Rome (3 hours), and Milan (3 hours).

For more information, and to indicate whether you wish to attend, and whether you wish to present a paper, contact: Dr. M. Francesca Ottaviani, Department of Chemistry, University of Florence, Via G. Capponi 9, 50121 Firenze, ITALY.

ESR APPLIED METROLOGY WORKSHOPS, Japan. Prof. Motoji Ikeya (Department of Physics, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan) would like members of the international EPR community to know about these workshops. The first such workshop was organized in 1985, at the time of the First Symposium on ESR Dating, held at Yamaguchi, Japan; cf. the Proceedings of ESR Dating and Dosimetry (Ionics, Tokyo, 1985). Five annual workshops and symposia have been held. Proceedings are available at a cost. Members are mostly physicists, geologists, and some chemists who are interested in EPR applications to geology and archaeology as well as in the development of EPR imaging (or scanning EPR microscopy) and of portable EPR spectrometers. Publications - "Applied ESR Metrology" and Newsletters with English-language titles - are available to members (dues, $20/year). For details and Workshop schedules, contact Prof. Ikeya, whose organization wishes to exchange information with foreign EPR specialists and to encourage more involvement of geologists in the EPR community.

TWENTY-NINTH INTERNATIONAL CONFERENCE ON COÖRDINATION CHEMISTRY, Lausanne, Switzerland, July 19-24, 1992. This conference will treat all aspects of coördination chemistry including magnetic resonance. There will be five plenary lectures to cover themes of general interest, to which ten microsymposia will be linked conceptually. Fifteen subjects will be themes for section lectures, and there will be poster sessions. The official conference language is English. Deadline for abstracts is January 10, 1992. For information, contact 29th ICCC Secretariat, AKM Congress Service, Clarastrasse 57, P.O. Box, CH-4005 Basel, Switzerland. Telephone: ++41-61-691 51 11; Telefax: ++41-61-691 81 89.

BOOKS; CONFERENCE PROCEEDINGS

The Eatons (Gareth and Sandra) wrote a chapter on EPR in the recently-published "Analytical Instrumentation Handbook," which was edited by Galen Ewing and published by Dekker. This chapter provides an entry-level tutorial on the instrumental aspects of EPR.

Larry Dalton, Arthur Bain, and Christy Young wrote a chapter on Recent Advances in EPR for the newest *Review of Physical Chemistry* (Vol. **41**, 1990).

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EDITORIAL

Now that the EPR Newsletter is established as the news and information medium and discussion forum for the International EPR Society, remember that you are needed to contribute material. The previous issue (Volume 2, No. 3, October, 1990) describes the categories of material to be published; you are welcome to suggest other kinds of items and help us get the copy for them.

EPR, ESR, EMR, or what? The discussion on this and other aspects of nomenclature continues in several items in this issue. If our Society establishes a nomenclature committee, its activities are sure to be interesting and its discussions lively.

To the five corporate donor-members of the International EPR Society: Welcome! I am pleased with the broadly international flavor of this group. In the future, informational and advertising material will appear in their Newsletter display boxes.

Linn Belford

INTERNATIONAL EPR SOCIETY REPORTS

STUDENT TRAVEL GRANTS FOR CONFERENCES: The officers anticipate that the International EPR Society will be able to provide a few travel grants to students who need to travel a considerable distance in order to present work at a conference relevant to EPR. In anticipation that the Council will authorize some of these grants this year, students are encouraged to apply for awards up to $250(US) or equivalent to attend the Royal Society ESR meeting at Cirencester, England (April, 1991), the International EPR symposium at Denver, USA (July/August, 1991), the International Symposium on Recent Advances in ESR at Padova, Italy (September, 1991), or other appropriate EPR meeting (see "Notices of Meetings" above). Applications should be brief - just a page or two with a little information about the student and a statement of reasons for the student's wishing to attend and present work at a particular meeting - and should include the endorsement of the student's research advisor. The Awards Committee will make the decisions and announce results to all applicants. Applications addressed to Ms. Rebecca Gallivan (Illinois EPR Research Center, University of Illinois, 190 Medical Sciences Building, 506 S. Mathews, Urbana, IL 61801, USA) will be forwarded to the Awards Committee as soon as this program is authorized by the Council and an Awards Committee appointed.

SOCIETY ELECTIONS: Dr. Christopher Felix, who was responsible for receiving and counting ballots, informs us that the slate of officers and Council listed on the ballot has been elected. The precise tally will be announced in the April Newsletter. Unfortunately, Dr. Hans Fischer, who is elected as Vice President, will not be able to serve on account of the press of other duties. The Nominations Committee will, of course, take into consideration suggestions received earlier and on this ballot in nominating a replacement candidate, who must not be located in the USA.

REPORT ON EPR SOFTWARE COMMITTEE; Information provided by Prof. Richard Cammack (Biochemistry Section, King's College, Campden Hill Road, London W8 7AH, UK), Chair of the committee: Prof. Cammack has invited additional (international) members to help with the committee work; he hopes that the commitee composition will be announced in the next issue of the EPR Newsletter. Meanwhile, he has been working on compilation of an **EPR software database**, containing a collection of software written by users, manufacturers, and professional programmers. This is a continuation of the initiative which he started within the ESR interest group of the Royal Society in Britain. Two databases are being combined and extended — one of 39 entries from the software swapshops of the British ESR interest group; the other, of 70 entries, compiled by Arthur Heiss (Bruker), Mark Crowder (IBM), and Richard Keys (California State University, Los Angeles). A flyer and survey form, designed to gather specific information on other such software and to find out what people really want, is being sent to a short selective list of probable users/providers of EPR software, and a wider mailing will be made based on the responses received. The first survey form requests the respondents to indicate (1) whether they are interested in details on EPR software in each of these areas: Data acquisition and manipulation, Spectral simulations, Advanced EPR techniques, Data transfer formats, Others; (2) whether they currently use software for these purposes, and if so, what details they can provide; (3) what kinds of programs (if any) they can contribute to the Software Committee's EPR/ESR database, and (4) where they see a need for further software developments. Prof. Cammack can best be reached by electronic mail at R.CAMMACK@UK.AC.KCL.CC.HAZEL.

INDIVIDUAL MEMBERSHIPS: Registrations continue to come in. Please solicit your colleagues, including students and postdoctorals, in your institution and elsewhere to join with you in the

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The International EPR Society

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as a

SUPPORTER

Society. If you need additional membership applications, please make copies of the forms provided with previous Newsletters or contact Ms. Gallivan at the IERC (address on p. 1). Remember, we welcome members across the whole span of disciplines that use EPR including biochemists, chemists, biologists, physicists, geologists, and physicians.

CORPORATE MEMBERSHIPS: Five generous corporate members have joined the Society — Bruker, Medical Advances, Oxford Instruments, JEOL, and Wilmad Glass.

LETTERS TO THE EDITOR

Sir:

As I have learned from your Editorial of the EPR Newsletter, you are opening an "equipment exchange section" in your publication, which is, by the way, invaluable for our institute which has no other means of information about the EPR community but you.
I am the head of the Quantum Chemistry and Molecular Structure Laboratory of the Institute of Physical Chemistry, working for almost 30 years in the EPR field. As you probably know, as a result of the former government policy in science, our scientific instrumentation, as well as publications (journals, books, etc.) are completely down. For example my instrument is a JEOL-3B electron spin resonance spectrometer manufactured in 1963; we have received no journals (even the most important ones) and no books since 1985. Thus, we can make good use of surplus equipment and supplies and hope some of our colleagues in the EPR community can help.

Dr. Horia Caldararu, Romanian Academy
Institute of Physical Chemistry
Splaiul Independentei 202
77208 Bucharest, ROMANIA

(Editor's note: See the Equipment Exchange section in this issue.)

Sir:

Enclosed is the full text of "IUPAC Recommendations for EPR/ESR Nomenclature and Conventions for Presenting Experimental Data in Publications," mentioned in the previous issue (EPR Newsletter, Vol. 2, No. 3, October, 1990). The process of getting such recommendations reviewed, revised, and accepted by IUPAC is careful, deliberate, and requires a great deal of consultation.

Hideo Kon
Building 2, National Institutes of Health
Bethesda, MD 20892 USA

(Editor's note: The IUPAC text is reproduced in this issue.)

Sir:

In the last issue of the EPR Newsletter, Dr. Ralph T. Weber, EPR Division, of Bruker Instruments, addressed some important questions raised by Dr. Albert Bobst regarding the low sensitivity with lossy and low-loss samples on Bruker spectrometers. Dr. Weber went into detail to explain how, for lossy samples, the Q is reduced in Bruker and other commercial EPR spectrometers. Unfortunately, people involved in biological, biochemical, medical and other research often must deal with lossy samples. They are left with a frustrating sensitivity problem which needs to be addressed.

The Ohio State University purchased three new top-of-the-line commercial EPR spectrometers about two years ago, two of which are dedicated to biological research, some of which involves lossy samples. In the Chemistry Department, several of our people have reverted to the older instruments.

We sincerely hope that the major makers of EPR instrumentation are becoming aware of the special needs

of the many biological researchers and those working with lossy samples in general. There is growing competition in the EPR equipment marketplace; we hope it will stimulate the development and marketing of higher-sensitivity instruments, and upgrades to current instruments, which are effective for biological and other lossy samples.

Lawrence J. Berliner
Professor of Chemistry
The Ohio State University
Columbus, Ohio, USA

Sir:

Those readers who read my 'last stand' letter on esr versus epr with sympathy will be sad to learn that, for some publications, I have already given up the fight! This is because Editors now insist on epr and I have never tried to argue with Editors! However, we still use esr for the Royal Society of Chemistry Specialist Periodical Reports - because the title of these reviews has always been "Electron Spin Resonance Spectroscopy" and we are loathe to change this. It would seem odd if we all talked about epr spectroscopy in a book with this title.

Also, if epr is adopted-as we are told it must be by a Committee, what about ese, eseem, cesr and others? I find electron paramagnetic echo somewhat difficult to accept and wonder if it is necessary - in other words, I still think both 'names' should be allowed.

Martyn C.R. Symons
Department of Chemistry
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Sir:

ESR, EPR, or EMR? Nuclear magnetic resonance spectroscopy and electron spin resonance spectroscopy were both discovered at about the same time in the mid-Forties but from that time researchers in the two areas have tended to go their separate ways. Apart from a very minor diversion (to nuclear spin resonance, NSR) in the early days the nuclear branch has always been known as nuclear magnetic resonance (NMR) spectroscopy. Unfortunately, practitioners of the electron branch have been divided geographically and by topic: in North America the name electron paramagnetic resonance (EPR) spectroscopy is given which is also usual for those working with transition metal compounds (because the word "spin" does not convey orbital contributions). Europeans and free radical chemists tend to prefer the term electron spin resonance (ESR) spectroscopy. The division is compounded even further because the title "electronic magnetic resonance" has also been used from time to time. The lack of consensus amongst a set of scientists is unfortunate since it suggests woolly thinking and it confuses the uninitiated; furthermore, the problem is made worse by the instrument manufacturers who are inconsistent in their nomenclature. In particular, confusion is likely to occur in the newly-emerging area of ESR/EPR imaging where scientists from other disciplines are going to be involved. For those of us who would like to see the situation resolved we might turn to the recent IUPAC recommendations on the subject (published in Pure and Applied Chemistry *61*, 2195 (1989), in Magnetic Resonance in Chemistry, and in this issue of the EPR Newsletter). In fact, what we find is that the issue has been dodged and although EPR is preferred, "ESR has been so widely used that it is not practical to exclude it completely". This writer is of the opinion that a good opportunity has been missed: had electronic magnetic resonance (EMR) been suggested, the objections of both camps would have been met and consistency with the closely-related technique of NMR would also have been achieved.

From the slow pace of adoption of SI units it is obvious that people don't readily give up their habits of many years. Hence, even a clear-cut recommendation would not have been followed in the short term, so now it is likely that confusion will persist in the naming of a very important branch of spectroscopy for many years to come.

Despite the above comments, IUPAC have made some useful detailed recommendations for presenting experimental data in publications: ESR/EPR spectroscopists are urged to consider implementing these. Spectrometer manufacturers might wish to adopt some of the proposals.

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NOMENCLATURE

RECOMMENDATIONS FOR EPR/ESR NOMENCLATURE AND CONVENTIONS FOR PRESENTING EXPERIMENTAL DATA IN PUBLICATIONS (RECOMMENDATIONS 1989)

[©1989 IUPAC] **INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY:** PHYSICAL CHEMISTRY DIVISION, COMMISSION ON MOLECULAR STRUCTURE AND SPECTROSCOPY*

Abstract - The recommendations presented here contain definitions of basic terms, conventions and practices for data presentation in the area of electron paramagnetic resonance spectroscopy. This part includes those pertaining to spectra of systems with S = ½. Recommended units for microwave frequency (gigahertz), and the static and oscillating magnetic field (tesla) are based on the current usage in the SI system. Definitions and relations for the g-factor, the nuclear hyperfine coupling, and the nuclear electric quadrupole coupling are given, and designations for their anisotropy in crystalline and powder samples are clarified. Required items of experimental conditions to be included in actual EPR data presentation in the text or in graphic presentation of EPR spectra are listed to facilitate accurate transfer of spectral data. This part does not include the areas pertaining to saturation transfer, double resonance and time domain techniques.

COMMENTS

The very first version of the Recommendations on EPR Nomenclature was drafted in 1977 by James R. Bolton, University of Western Ontario, and was the subject of discussion in a group meeting chaired by Dr. Bolton in the VIth ISMAR in Banff, Canada in 1977.

The second version, which was sent out for reviewing by a number of EPR experts in several countries in 1984, was based on the Bolton draft and was revised by Hideo Kon, National Institutes of Health.

The present proposal had been re-written by Kon, taking into account the suggestions and criticisms by twenty-five reviewers during 1984-1985 in consultation with James Vincent of the University of Maryland.

Rationales for the choice in some of the items are inserted in the text (indented and italicized paragraphs).

In view of the extensive use of electron paramagnetic resonance (EPR) spectroscopy (electron spin resonance (ESR) spectroscopy) in chemistry, physics and biology, it is desirable to encourage the use of consistent nomenclature and the presentation of experimental data in a uniform manner. **The Commission on Molecular Structure and Spectroscopy recommends the following:**

SCOPE

These recommendations contain definitions of basic terms, conventions and practices for data presentation in the area of EPR/ESR spectroscopy. This part A includes those pertaining to spectra of systems with S = ½. A version for systems with S > ½ may follow. This part also does not include the areas pertaining to saturation transfer, double resonance and time domain techniques.

NOMENCLATURE AND BASIC DEFINITIONS

2.1 Electron paramagnetic resonance (EPR) and/or electron spin resonance (ESR) is defined as the form of spectroscopy concerned with microwave-induced transitions between magnetic energy levels of electrons having a net spin and orbital angular momentum. In the present part, the magnetic field scanning method is assumed. Other methods, however, are also conceivable. The term electron paramagnetic resonance and the symbol EPR are preferred and should be used for primary indexing.

2.1 Use of the upper case, with no punctuation, "EPR" as opposed to "e.p.r.", is adopted, since it is consistent with the existing IUPAC NMR nomenclature. Also "paramagnetic" should be used, since it comprises other than 'spin only' systems. On the other hand, "ESR" has been so widely used that it is not practical to exclude it completely.

2.2 The frequency (ν) of the oscillating magnetic field applied to induce transitions between the magnetic energy levels of electrons is measured in gigahertz (GHz) or megahertz (MHz).

2.3 The static magnetic field at which the EPR spectrometer operates is measured by the magnetic flux density *B* and the recommended unit is the tesla (T) (1 T = 10^4 gauss).

2.3 tesla vs. gauss: both tesla and gauss are units of magnetic induction (magnetic flux density) for which the symbol B *has been used. The magnetic field strength* H *has been recorded in ampere turn/meter or oersted, and not by gauss. One may argue that "the abscissa of every EPR spectrum is recorded in units of* H, *namely the field applied to the sample achieved by passing current through coils". However, the calibration of the field strength is inevitably based upon the*

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magnetic induction in matter, whether one uses a standard sample, a proton probe, or the Hall effect. For that reason, it is more appropriate to use B *(the magnetic flux density) and specify the method of calibration. The "tesla" rather than "Tesla" is used in SI convention.*

2.4 The amplitude of the oscillating magnetic field is designated by B_1. The recommended unit is the millitesla (mT).

2.5 EPR absorption and dispersion. A single transition and a set of degenerate or unresolved transitions are referred to as a line. The line shape is often described to be Lorentzian, Gaussian, or a mixture of the two. Absorption or dispersion lines are commonly presented in the first or the second derivative mode.

Symbols for the modes are U_1 and U_2 for dispersion first and second derivatives, respectively, and V_1 and V_2 for absorption. Spectra recorded out-of-phase with respect to the Zeeman field modulation are indicated by adding primes to the previous symbols (e.g. V_2' for second derivative out-of-phase absorption).

2.5 Although this version of the recommendation does not include the saturation transfer technique (ST-EPR), it seems appropriate to standardize the mode designations here for future extension.

2.6 In the absence of nuclear hyperfine interactions (vide infra), B and $\underline{\nu}$ are related by

$$h\underline{\nu} = g\underline{\mu}_B B$$

where h is the Planck constant, $\underline{\mu}_B$ is the Bohr magneton $eh/(4\pi m_e)$, and the dimensionless scalar g is called g-factor. Use of the term g-value is discouraged.

2.6 "In the absence of nuclear hyperfine interaction" the nuclei involved have no nuclear spin, and therefore, there will be no nuclear Zeeman term or nuclear electric quadrupole term. Thus the relation is rigorously correct for $S = \frac{1}{2}$ systems. IUPAC Manual of symbols & Terminology for Physicochemical Quantities and Units adopts $\underline{\mu}_B$ (Pure & Appl. Chem. vol. 51, pp. 1-41, 1979) *as the Bohr magneton.*

2.7 When the paramagnetic species exhibits an anisotropy, the spatial dependency of the g-factor is represented by a 3x3 matrix g. The matrix representation is referred to as g-matrix. In a general coordinate system, such as (x,y,z), the components may be designated as g_{xx}, g_{xy}, ..., etc. In cases where a principal axis system can be assigned, in which the off-diagonal terms are zero, the three principal values of the g-matrix will be expressed by g with a single subscript identical to the principal axis designation adopted for the g-matrix. A recommended example is: g_X, g_Y, g_Z, for the principal axes (X,Y,Z).

2.7 That g *is not in general a tensor (neither is the hyperfine coupling constant* $\underline{A}$ *(ref. 2.8)) was shown by Abragam and Bleaney ("Electron Paramagnetic Resonance of Transition Ions", Clarendon Press, Oxford 1970, pp. 166, 170, 651), while the nuclear electric quadrupole coupling* $\underline{P}$ *(ref. 2.11) is a tensor in the strict sense. Some authors clearly distinguish them by calling* g *and* $\underline{A}$ *a "matrix" and* $\underline{P}$ *a "tensor" when all three are involved.*

Use of the double subscripts for a general coordinate system and a single subscript for the principal axes has a definite merit of clearly distinguishing the principal components.

*The matrices (*g *and* $\underline{A}$*) and tensor (*$\underline{P}$*) quoted here are defined through the Hamiltonian expression*

$$\hat{H} = + \underline{B} \bullet \underline{g} \bullet \underline{S}\, \underline{\mu}_B - \Sigma_a \underline{S} \bullet \underline{A}_a \bullet \underline{I}_a - \Sigma_a \underline{I}_a \bullet \underline{P}_a \bullet \underline{I}_a$$

where $\hat{H}$ *is the Hamiltonian operator,* $\underline{B}$ *is the magnetic flux density,* $\underline{S}$ *and* $\underline{I}$ *are vector spin operators, the summation index* $\underline{a}$ *covers all nuclear species (except that* $\underline{I} = 0$ *nuclei can be omitted and* $\underline{I} = \frac{1}{2}$ *nuclei have no quadrupole term) and the direct interaction of nuclear spin with the magnetic flux density is omitted.*

Use of the double subscripts for a general coordinate system and a single subscript for the principal axes has a definite merit of clearly distinguishing the principal components.

In general, the square roots of the principal values of a symmetric tensor $\underline{G}$ *represent the principal values of* g.

$$\underline{G}_{ik} = \Sigma_i \underline{g}_{ii} \underline{g}_{ik}$$

A similar condition applies to $\underline{A}$*; in this case the correct signs of the square roots may be uncertain.*

It is too restrictive to choose a specific set of nomenclature for the principal components of g*, another set for* $\underline{A}$*, and another for* $\underline{P}$*, in addition to the molecular coordinate axis system which normally is dictated by orbital designations such as* $d_{x^2-y^2}$, $2p_z$, *etc. The recommendation must allow for the most general case, assuming that all these axis systems occur and do not coincide, and yet, has to make certain that there is no conflict under any circumstances. While this could be done, it would make the convention too complicated and cumbersome for authors to remember. In most writing situations, however, not all of the above mentioned principal axis systems occur and some of them may coincide. Thus authors can choose the principal axis designations for only the necessary matrices.*

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Considering all these complications, it seems much more practical to leave designation of principal axis systems, to a certain extent, to individual authors. One conceivable drawback in so doing, would be that two authors, describing the same compound, may adopt two different principal axis designations so that one author's $\underline{g}_X$, for example, may correspond to $\underline{g}_c$ of the other. However, this kind of inconsistency can not be completely avoided anyway, even if the two authors adopt the same principal axis designation, unless the convention dictates also the order of g-factors such as, e.g., $\underline{g}_X > \underline{g}_Y > \underline{g}_Z$. In fact, one might suggest a convention for setting the ordering of the principal values by "taking the average and designating the farthest one from the average as $\underline{g}_z$ and the next as $\underline{g}_y$, etc." However, ordering cannot be determined a priori, because it depends on the individual compound. For example, in Cu^{2+}-porphyrin, the g-factor measured with the magnetic field parallel to the four-fold axis is the largest, whereas in low-spin Co^{2+}-porphyrin, the g-factor measured similarly is in the middle, but one would not call the four-fold axis $\underline{Z}$ in one compound and $\underline{Y}$ in another.

Thus, forcing too many details of the principal component designations tends to run into conflict with the orbital designations.

For a powder spectrum, if a specific assignment is not made, the following conventions are recommended:

(a) In a spectrum having the characteristics of lower than axial symmetry with three distinct lines, g_1, g_2, and g_3 are used for the low, middle and high field line in that order.

2.7a There are, even in powder spectra, cases in which one can make a specific assignment of principal axes. The recommended convention 2.7(a) is strictly for the cases where no such assignment can be made. Designation of unassigned g-factors in terms of ($\underline{x}$, $\underline{y}$, $\underline{z}$) subscripts should be discouraged, because it may turn out to be in conflict with molecular axis system designation as explained above. Non-committal (1,2,3) is much preferred for unassigned cases.

(b) In a spectrum having the characteristics of apparently uniaxial symmetry, exhibiting a parallel and a perpendicular feature, the lines are designated as $g_\parallel$ and $g_\perp$, respectively.

(c) In a spectrum representing more than one paramagnetic species, designations of g-factors must include some species identification in parenthesis, e.g., g_1(radical 1) or $g_1(1)$.

2.8 Hyperfine interactions. The interaction energy between the electron spin and a magnetic nucleus is characterized by the hyperfine coupling constant A with units in joules. A/h and $A/(hc)$ may be reported in MHz and cm^{-1}, respectively. Expressing A in units of tesla, millitesla, or gauss is rejected. When the paramagnetic species has magnetic anisotropy the hyperfine coupling is expressed by a 3x3 matrix called a hyperfine coupling matrix $\underline{\mathbf{A}}$. $\underline{\mathbf{A}}$ is often divided into an anisotropic and an isotropic term as follows:

$$\underline{\mathbf{A}} = \underline{\mathbf{T}} + [\mathrm{Tr}(\underline{\mathbf{A}})/3]\underline{\mathbf{1}}$$

$\underline{\mathbf{T}}$ is a traceless 3x3 matrix (sum of the diagonal elements being equal to zero), $\underline{\mathbf{1}}$ is a unit matrix of the same dimension. The principal components of $\underline{\mathbf{A}}$, when resolved, are denoted by A with the principal axis designation added as the subscript(e.g., A_a, A_b, A_c, if (a,b,c) is chosen as the principal axes for $\underline{\mathbf{A}}$). If the absolute sign of a principal component is deduced theoretically, it should be given in parentheses as e.g. A_a/h = (+)70 MHz. The principal axis systems for matrix $\underline{\mathbf{A}}$ and $\underline{\mathbf{g}}$ may or may not coincide with each other. In cases where the principal components of $\underline{\mathbf{A}}$ are not resolved, the hyperfine interaction in a line is described in terms of A' with the same subscript adopted for the g-factor of the line in which the hyperfine interaction is observed.

2.9 Hyperfine interaction usually results in splitting of lines in an EPR spectrum. The splitting (a) is measured in units of millitesla (mT). The relation between the hyperfine splitting and hyperfine coupling constant must be derived for each system, e.g. by computer simulation, depending upon the accuracy desired. For cases where higher-order terms can be neglected and the effects of the nuclear Zeeman term need not be taken into account, the splitting a is related to the absolute value of the hyperfine coupling constant A by

$$A = g\underline{\mu}_B a$$

2.10 The nuclear species giving rise to the hyperfine interaction should be explicitly stated, e.g. "the hyperfine splitting due to ^{65}Cu". When additional hyperfine splittings due to other nuclear species are resolved, the nomenclature should include the designation of the nucleus, and the isotopic number, e.g. $a(^{14}\mathrm{N})$. If the splittings are assigned to more than one nucleus of the same nuclear species, they may be distinguished by adding subscripts such as $a(^{15}\mathrm{N}_1)$ and $a(^{15}\mathrm{N}_2)$. The same conventions apply to the nuclear hyperfine coupling constant A.

2.11.a When the nucleus has an electric quadrupole moment (i.e., $I > ½$), its interaction with the surrounding molecular electric field-gradient is expressed by a second rank tensor $\underline{\mathbf{P}}$ called the nuclear electric quadru-

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pole coupling tensor. The principal components of $\underline{P}$, if resolved by analysis of a hyperfine spectrum, are denoted by P with the principal axis designation as the subscript (e.g. P_1, P_2, P_3 for the principal axes (1,2,3)).

In the presence of axial symmetry, the axial component of $\underline{P}$ tensor, e.g. P_3 is defined by

$$P_3 = eQq/[2I(2I - 1)]$$

where eQ is the nuclear quadrupole moment, q is the axial electric field gradient at the nucleus and I is the nuclear spin. Deviation from axial symmetry is expressed by the asymmetry factor

$$\underline{\eta} = (P_1 - P_2)/P_3.$$

The nuclear species involved must be specified following the conventions for hyperfine interactions, e.g. $P_1(^{75}As)$.

2.11.b Values of P are expressed in joules; P/h and $P/(hc)$ may be reported in MHz and cm^{-1}, respectively.

2.11 Nomenclature for nuclear quadrupole interaction is limited to the minimum necessary for reporting EPR data. Use of notations such as $\underline{QD}$ (= $3\underline{P}_{zz}/2$), *which appear in some EPR articles, are not included. However, use of these and other parameters derived from* $\underline{P}$ *should be considered optional, as long as they are clearly defined in terms of the present notation. Numerous different designations are also in use for nuclear quadrupole coupling tensors in other fields of spectroscopy. The relationship of* $\underline{P}$ *to them should be derived from the definitions given in this recommendation.*

PRESENTATION OF EPR DATA AND EXPERIMENTAL CONDITIONS

Reference back to previous publications for experimental method is permitted only if the required specific information is present there.

3.1 At least the following items should be specified in presentation of EPR data to facilitate transfer of spectral information:

(a) If in solution, name of the solvent (or matrix) and concentration of the solution; for solid materials, methods of sample preparation and mounting
(b) Temperature of the sample and how it is controlled
(c) Type of sample cell (e.g. aqueous flat cell)
(d) Type of resonator used, microwave frequency (GHz or MHz), power level (mW) incident on the resonator and loading information (e.g. dewar insert used); whether the frequency and power level are calibrated or taken from the spectrometer settings; power saturation distorting the spectrum, if any, must be so stated.

3.1(d) The commonly used term "cavity resonator" is replaced by a generic term "resonator", since various types of non-cavity resonators are now in use.

(e) If Zeeman field modulation is used, frequency (MHz or Hz) and amplitude (mT) of modulation, and whether they are calibrated or from the spectrometer settings

3.1(e) "If Zeeman field modulation is used ..."; in some EPR measurements, Zeeman field modulation and/or analog field scan are not used.

(f) Type of standard sample, if used for field calibration and/or quantitation of the magnetic species

(g) Method of g-factor measurement and experimental uncertanties

3.2 When EPR spectra are graphically presented, the following information for abscissa and ordinate should be supplied in addition to the above items:

(a) If the spectra are obtained by analog field scan, the field scan rate, otherwise, the field step size
(b) Total field extent and/or field calibration marker and method of field calibration
(c) Markers indicating the point in a line where the g-factor is measured; use of g-factors in place of field scale is discouraged.
(d) Ordinate information, if the ordinate is not the direct spectrometer output (e.g. computer processed normalization)
(e) Presentation mode, e.g. "the first derivative of absorption"
(f) Filtering information (e.g. analog time constant, digital smoothing specifications, etc.)

3.3 Other conventions in graphical presentation of the spectra:

(a) The Zeeman field increases to the right.
(b) The phase should be adjusted so that the start of the first low field line in V_1 mode has a positive excursion.

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* Membership of the Commission for varying periods during which the report was prepared (1983-1987) was as follows: *Chairman*: J. R. Durig (USA); Secretary: H. A. Willis (UK); *Titular Members*: JA. M. Bradshaw (FRG); C. G. Derendjaev (USSR); S. Forsen (Sweden); J. G. Graselli(USA); E. Hirota (Japan); J. F. J. Todd (UK); *Associate Members*: R. D. Brown (Australia); R. K. Harris (UK); H. Kon (USA); G. Martin (France); Yu. N. Molin (USSR); W. B. Person (USA); H. Ratajczak (Poland); C.

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J. H. Schutte (R.S. Africa); M. Tasumi (Japan): *National Representatives*: R. Colin (Belgium); J. E. Colin (Belgium); Y. Kawano (Brazil); G. Herzberg (Canada); J. Lu (Chinese Chemical Society); Z. Luz (Israel); S. Ng (Malaysia); B. Jezowska-Trzebiatowska (Poland); G. Varsanyi (Hungary).

NEWS FROM EPR CENTERS

OXYGEN-SENSITIVE FUSINITE SAMPLES AVAILABLE FROM IERC - In the course of a major activity of the Illinois EPR Research Center, *in vivo* EPR, certain materials have shown great potential for EPR oximetry. One of the most promising is fusinite; in the Tips and Techniques section of this Newsletter, Profs. Swartz and Clarkson briefly describe its use. Because several colleagues have asked if our fusinite could be made available, we have decided to provide at cost standard samples of this material. The Illinois EPR Center will prepare and distribute 1-gram samples of fusinite, milled and screened to a uniform maximum particle size, and provided with some documentation. There will be a $100 charge for each sample to cover the cost of procurement, preparation, and shipping of the material. Contact Becky Gallivan at IERC (address on first panel of this Newsletter) to order a sample.

EPR CENTRE-LJUBLJANA, A NEW EPR CENTER IN YUGOSLAVIA — M. Schara, Director; M. Šentjurc, Secretary General; Scientific Board: P. Cevc, D. Keber, S. Pečar, B. Plesnicar, G. Serša, A. Šebenik, A. Štalc, J. Žel.

The EPR Centre-Ljubljana is an association of several research groups in Ljubljana which employ EPR methods. It was established in April 1990 as a result of quite a long tradition and efforts on the field of EPR. The first "home-made" EPR spectrometer was built back in 1957 by Professor Savo Poberaj at J.Stefan Institute in Ljubljana, Yugoslavia. The continuous growth of knowledge and experience since that time is today expressed in interdisciplinary scientific work with participation of research groups from many different fields, including medicine, pharmacology, physics and biophysics, biology, chemistry and other natural sciences.

The aim of the EPR Centre-Ljubljana is to provide a better transfer of knowledge and information among scientists at home and abroad working on common problems in which EPR spectroscopy is a useful and powerful method.

The EPR Centre plans to publish EPR reports from Ljubljana — two issues per year, containing information about the activities of the Centre including current scientific news and bibliography of the coworkers of the Centre. We also intend to include information about the scientific meetings in this field to be organized in Yugoslavia.

Information is available from Dr. Marjeta Šentjurc, Secretary General, EPR Centre-Ljubljana, at the J.Stefan Institute, Jamova 39, 61111 Ljubljana, Yugoslavia; Tel: (061) 214-399; Telex: 31-296 Y JOSTIN; Telefax: 219-385.

TIPS AND TECHNIQUES

Magnet Tip — Those who need to refurbish their old EPR spectrometers or custom-build new ones for low-to-moderate resolution may find it useful to know that there is at least one company (Lakeshore Cryotronics, 64 East Walnut St., Westerville, OH 43081, USA, phone 614/891-2243, FAX 614/891-1392) which sells an updated version of Varian's four-inch variable-pole-gap electromagnet.

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Techniques — A New Generation Of Very Sensitive EPR Probes For The Measurement Of The Concentration Of Oxygen: Fusinite And Lithium Phthalocyanine:

The use of EPR for oximetry has been an important and increasingly popular development because of the sensitivity and versatility of this methodology [1]. It has usually been based on the use of nitroxides as the paramagnetic probes and with these probes it has been possible to measure the concentration more accurately and/or conveniently in many types of samples than had been possible by other methodologies. The method, however, still had some significant limitations in applications to functioning biological systems such as living cells and tissues because of the low concentrations of oxygen that occur in these systems (often less than 20 micromolar) and bioreduction of the nitroxides. In spite of these limitations there has been widespread and increasing use of this methodology in biological systems.

Within the last year two "new" paramagnetic probes have been introduced, fusinite (a type of coal) and lithium phthalocyanine, that have properties that appear to extend EPR oximetry to most biological systems. The "new" aspect of these probes was the recognition of the usefulness of their properties for such measurements, because their sensitivity to the concentration of oxygen had been noted previously [2,3]. The key properties of both of these paramagnetic species include a sensitivity

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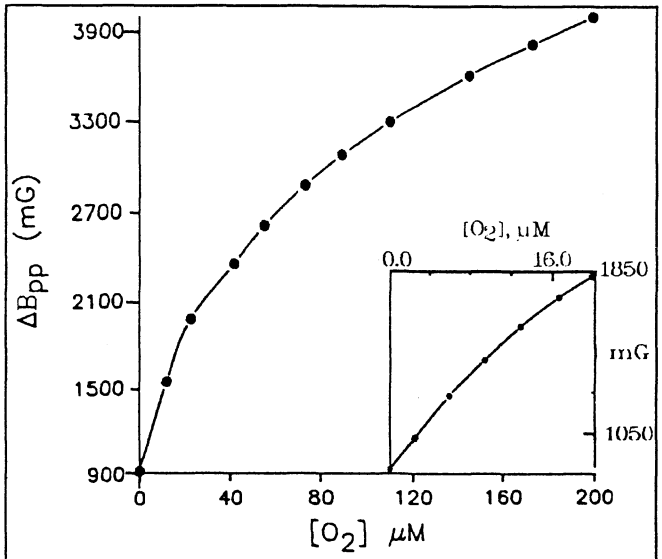

Figure 1. Fusinite EPR linewidth *vs* O_2 concentration.

to oxygen concentrations as low as 0.1 micromolar (as shown in Figure 1), essentially complete stability in biological systems (Figure 2), and high and very stable EPR signal intensities. These properties appear to provide a basis for the widespread and successful use of EPR oximetry in biology and probably also in other disciplines such as material sciences.

Currently there are no commercial sources of these materials. Until such sources become available, the Illinois EPR Research Center will try to make fusinite available to potential users by providing samples at cost, as detailed in the "EPR Centers" news above. We understand that there are efforts underway in France by Dr. Mehdi Moussavi to make lithium phthalocyanine available commercially. When those efforts are successful, they will be announced in the Newsletter.

[1] J. S. Hyde and W. K. Subczynski, Biol. Magn. Reson., 8, 399 (1989); H. M. Swartz and J. F. Glockner, in *Advanced EPR in Biology and Biochemistry*, Elsevier, 1989, pp.753-782.

[2] R. B. Clarkson, W. Wang, D. R. Brown, H. C. Crookham, and R. L. Belford, Fuel, 69, 1405 (1990).

[3] H. M. Swartz, J. F. Glockner, H. C. Chan, and P. Gast, Proc. Soc. Magn. Reson. Medicine (1990); M. K. Bowman, T. J. Michalski, M. Peric, and H. J. Halpern, Pure & Appl. Chem., 62, 271 (1990).

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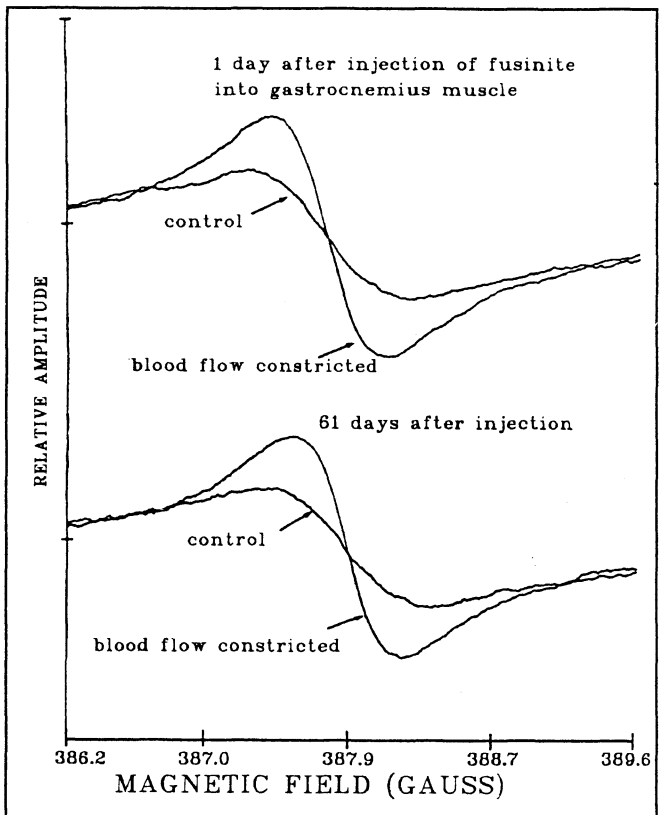

Figure 2. Use of fusinite to measure $[O_2]$ in skeletal muscle over a long time.

POSITIONS OPEN

POSTDOCTORAL POSITION ON BIOLOGICAL EPR AND ENDOR SPECTROSCOPY. A postdoctoral research associate position is available for characterization of enzyme reaction intermediates by EPR and ENDOR spectroscopy. The focus of the research is directed specifically to the application of cryoenzymologic, magnetic resonance, and molecular graphics techniques to assign the structural basis of catalytic action of enzymes. The objectives are to stabilize catalytically competent reaction intermediates at subzero temperatures for structural characterization by EPR and ENDOR methods, and, on this basis, to identify catalytically significant stereochemical interactions of substrates with active site residues. In recent years we have made extensive use of nitroxyl spin-labeled substrates for such structural studies, and representative publications can be found in J. Am. Chem. Soc., J. Magn. Reson., and Biopolymers. We have a well-

equipped laboratory for protein chemistry and enzyme kinetics, a dedicated Bruker ER200D spectrometer with ENDOR accessory, and a computer controlled, state-of-the-art molecular graphics facility with a VAX3500 and an Evans & Sutherland PS390 system.

Salary for this position is generally at the NIH scale but is commensurate with experience. Interested candidates should submit directly copies of a Curriculum vitae, list of publications, summary of research and training experience, and have at least two, preferably three, letters of reference forwarded to:

Dr. Marvin W. Makinen
Dept. of Biochemistry and Molecular Biology
The University of Chicago
920 E. 58th Street
Chicago, IL 60637, USA.
Telephone (312) 702-1080; Fax (312) 702-0439;
E-mail Makinen%biovax@uchicago.Bitnet

EQUIPMENT EXCHANGE

FOR SALE: VARIAN FIELD FREQUENCY LOCK.

A brand new, never-been-used Varian model E272B field frequency lock unit (8.9-9.6 GHz) is offered for sale. The asking price is $3,900. Please contact:

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Department of Chemistry
Dartmouth College
Hanover, NH 03755, USA.
Telephone: 603-646-2874. E-Mail:
Dean.Wilcox@Dartmouth.EDU.

WANTED: A MAGNET FOR A VARIAN E4 EPR UNIT.

We are in need of a magnet for our Varian E4 spectrometer. Any laboratory or researcher proposing to dispose of a magnet kindly contact:

Professor P.T. Manoharan
Regional Sophisticated Instrumentation Centre
Indian Institute of Technology
Madras 600036, INDIA.
Telex 041 21062 IITM IN; Telefax 044 412509. We are ready to bear the expenses involved in transportation/packing/forwarding and shipping.

WANTED: USED VARIAN EPR X-BAND CAVITY.

We are in need of a Varian cavity, either TE_{102} or TM_{011} preferred, to fit an E-line or Century series EPR spectrometer. Many Varians have been sent to the ironmonger, but people usually keep their cavity for sentimental reasons. We want to buy an old cavity. We will have it reconditioned, if necessary - as these are no longer sold by Varian. If you can help, please contact:

Professor Lawrence J. Berliner
Dept. of Chemistry
The Ohio State University
120 West 18th Ave.
Columbus, OH 43210-1173, USA.
Telephone: 614-292-0134; E-Mail:
BERLINER@LIVERS.MPS.OHIO-STATE.EDU.

WANTED: SURPLUS EQUIPMENT, PARTS, BOOKS, JOURNALS.

My Letter to the Editor above explains how our institute has become sadly depleted in equipment and supplies in recent years. So, if anyone is willing to help us by giving away surplus equipment (or any auxiliary parts) in either EPR or NMR field, we are grateful. Also, we would like to receive any surplus books or journals in the field (EPR and NMR) or in closely related areas (physical chemistry). Concerning transportation, any help would be priceless; otherwise, we shall find a way to pay.

Dr. Horia Caldararu
Romanian Academy
Institute of Physical Chemistry
Splaiul Independentei 202
77208 Bucharest, ROMANIA.

WANTED: EPR Spectrometer.

We are looking for a Varian E-Line Century series spectrometer to purchase. An E-109 is preferable, but any working Century series model would be acceptable. Please contact:

Richard Lokken or Mark Wolski
Medical Advances, Inc.
10431 W. Watertown Plank Rd.
P.O. Box 26425
Milwaukee, WI 53226-0425, USA.
Telephone: (414) 258-3808. FAX: (414) 258 4931

EPR NEWSLETTER

Published at the Illinois EPR Research Center (IERC), Urbana, IL 61801

Volume 3, #2 Page 1 April, 1991

MEMBERS: PLEASE RETURN YOUR DUES STATEMENT, WHICH YOU WILL FIND ON PAGE 15

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 the national Centers for EPR/ESR spectroscopy in the USA. These Centers are sponsored by the Division of Research Resources of the U.S. National Institutes of Health:

National Biomedical ESR Center, Prof. James S. Hyde, Director. Medical College of Wisconsin, MACC Fund Research Center Building, 8701 Watertown Plank Road, Milwaukee, Wisconsin 53226, USA. ☎: 414/266-4000. FAX: 414/266-4007. E-Mail: Use INTERNET address "felixc@uvax01.biostat.mcw.edu".

Biotechnology Resource in Pulsed EPR Spectroscopy, Prof. Jack Peisach, Director. Albert Einstein College of Medicine, Department of Molecular Pharmacology, 1300 Morris Park Avenue, Bronx, New York 10461, USA. ☎: 212/430-2175. FAX: 212/829-8705. E-mail: Use INTERNET address "peisach@aecom.yu.edu"

Illinois EPR Research Center (IERC), Profs. Harold M. Swartz and R. Linn Belford, Directors; Prof. Robert B. Clarkson, Associate Director; Prof. Peter G. Debrunner, co-Principal Investigator; other senior staff: Prof. Mark J. Nilges and Dr. Tadeusz Walczak; University of Illinois at Urbana-Champaign, 190 Medical Sciences Building, 506 South Mathews Ave., Urbana, Illinois, 61801, USA. ☎: 217/244-1186. E-mail: belford@uiucscs.BITNET or ierc@uiucvmd.bitnet. FAX: 217/244-8068.

These Centers, which were described in our first issue (Volume 1, #1), cooperate to facilitate research requiring EPR-related techniques. Prospective collaborative or service users may contact the staff at any of the Centers.

IN THIS ISSUE

HOW TO REACH US

To communicate concerning the EPR Newsletter, contact R. Linn Belford, Editor or Becky Gallivan, Editorial Assistant, at IERC (address above). Alternatively, contact any other IERC senior staff member or any officer of the International EPR Society.

PUBLICATION AND DISTRIBUTION: This is a members' issue. EPR Newsletters are published quarterly for members of the International EPR (ESR) Society. One issue each year is public, which nonmembers on our mailing list also receive. The material to be published (articles, letters to the editor, advertisements, notices, etc.; see the Editorial in Vol. 2, No. 3, October, 1990) is requested at the editor's office by the twenty-fifth day of the month preceding publication of the issue in which it is intended to appear. Copy which arrives late may be published immediately but is more likely to be held for the subsequent issue. Submissions should indicate whether the material ought to run in more than one issue.

NOTICES OF MEETINGS

FOURTEENTH INTERNATIONAL EPR SYMPOSIUM at the 33d Annual Rocky Mountain Conference, Denver, CO. July 28 to August 2, 1991. At this meeting, Prof. John A. Weil (University of Saskatchewan, Saskatoon) and Dr. Michael K. Bowman (Argonne National Laboratory) are organizing a session entitled "How good is EPR at determining atom positions?" with lectures by C. A. Hutchison Jr. (U. Chicago), M. Moreno (U. Catabria, Spain), M. W. Makinen *et al.* (U. Chicago), J.-M. Spaeth (U. Paderborn, Germany), W. L. Hubbell (UCLA), J. L. McCracken (Mich. State U.), B. M. Hoffman (Northwestern U.), D. J. Singel (Harvard U.), S. A. Dikanov (Novosibirsk, USSR), and others. There will also be an open discussion on this topic. Prof. Robert B. Clarkson (University of Illinois, Urbana) is organizing a session on standards for EPR including lectures by G. R. and S. S. Eaton (U. Denver), M. F. Desrosiers (NIST), R. A. Isaacson (U. California, San Diego), I. Goldberg (Rockwell International), and J. A. Weil (U. Saskatchewan). There will also be an open discussion on this topic. Other events will include plenary lectures, an ENDOR session chaired by Karl Hausser, several sessions of general contributed papers, poster sessions, and a business meeting of the International EPR Society (16:45 Monday, July 29), an instrument and vendors' exhibition, and a Bruker users' meeting. For further details, contact Prof. Gareth Eaton or Prof. Sandra Eaton, Dept. of Chemistry, University of Denver, Denver, CO, 80208.

TENTH ANNUAL SCIENTIFIC MEETING AND EXHIBITION OF THE SOCIETY OF MAGNETIC RESONANCE IN MEDICINE, San Francisco, California, USA, August 10-16, 1991. To be held at the San Francisco Hilton and Towers. The expected attendance is 3500 plus 50 exhibitors.

Deadline for submission of abstracts: Although the deadline for submission of regular papers and posters has passed, there is a "Works-in-Progress" category for which abstracts will be received through June 3, 1991. Send to: Works-in-Progress, SMRM, 1918 University Ave., Berkeley, CA 94704, USA.

For details, contact the SMRM Business Office, 1918 University Avenue, Suite 3C, Berkeley, CA, 94704, USA; Telephone 415-841-1899; FAX 415-841-2340.

INTERNATIONAL SYMPOSIUM ON RECENT ADVANCES IN ESR SPECTROSCOPIES, Padova, Italy. September 8-12, 1991. Joint meeting of The ESR Group of the Royal Society of Chemistry (United Kingdom) and GIRSE (Italy).

General Information: The Symposium will be held at the University of Padova, Dipartimento di Biologia, Via Trieste 75, Padova. The meeting opens on Sunday afternoon with registration and closes on Thursday afternoon. Accommodations will be in hotels in the city and in some rooms in a Student House. Registration fee (including conference tour and banquet: £200,000 plus accommodations). A limited number of grants for students will be available; a request for a grant must be signed by the Supervisor of the student. Registration fees should be paid in Italian Lire (£) by money order to account 472140/P, Cassa di Risparmio di Padova e Rovigo, Agenzia 7, Padova, ITALY.

Scientific Program: The purpose of the Symposium is to gather scientists working in different areas and interested in new developments and applications of ESR spectroscopies. There will be invited plenary lectures (45 min, 10 min for discussion), invited short lectures (25 min, 5 min for discussion), and two poster sessions. Plenary lectures will be delivered by: A. Alberti (CNR, I.CO.C.E.A., Bologna Italy); D. Gatteschi (University, Dept. of Chemistry, Firenze, Italy); M. Hemminga (Agricultural University, Wageningen, Holland); Ya.S. Lebedev (Institute of Chemical Physics, Moscow, USSR); D. Marsh (Max Planck Institute, Göttingen, Germany); K.A. McLauchlan (Chemical Physics Laboratory, Oxford, U.K.); K. Möbius (Freie Universität, Berlin, Germany); A. Schweiger (ETH, Zürich, Switzerland).

Papers and Proceedings: All contributed papers will be presented as posters on panels 1.5m(w)x1m(h). All contributors are invited to submit the contents of their previously unpublished paper for a special issue of "Applied Magnetic Resonance", Editor K.M. Salikhov, Kazan. Such papers must be ready at the start of the conference (preferably also on diskette).

For details and registration, contact Marina Brustolon, Dipartimento di Chimica Fisica, Via Loredan, 2, 35131 Padova, ITALY. FAX: +49 831328. It may be difficult to find rooms for late applicants.

ISMAR INTERNATIONAL WORKSHOP ON ELECTRON SPIN ECHO SPECTROSCOPY, Novosibirsk, USSR. September 25-28, 1991. The workshop will deal with problems related to novel trends in experiment, theory, instrumentation, and applications of ESE spectroscopy. The scientific program comprises about 20 plenary lectures and a poster session. Among the plenary lecturers are M.K. Bowman (Argonne), S.A. Dzuba (Novosibirsk), J. Forrer (Zürich), A.J. Hoff (Leiden), T. Ichikawa (Sapporo), L. Kevan (Houston), Ya.S. Lebedev (Moscow), J.R. Norris (Argonne), D. van Ormondt (Delft), J. Peisach (New York), A. M. Raitsimring (Novosibirsk), E. Reijerse (Nijmegen), M. Romanelli (Potenza), K.M. Salikhov (Kazan), J. Schmidt (Leiden), D.J. Singel (Harvard), Yu.D. Tsvetkov (Novosibirsk), G. Voelkel (Leipzig). The conference language is English. For details, contact the Conference secretary, Dr. A. V. Astashkin, Institute of Chemical Kinetics and Combustion, 630090 Novosibirsk, USSR. Phone (8-383-2) 35-48-32. Telex 133148 KING SU.

THIRD INTERNATIONAL SYMPOSIUM ON SPIN TRAPPING AND AMINOXYL RADICAL CHEMISTRY, Kyoto, Japan, November 22-24, 1991. The three-day program at Kyoto International Congress Hall will include both talks by invited and contributed speakers and poster presentations. You are invited to submit an abstract on original research for consideration for inclusion in the program.

Deadline for submission of abstracts: Although the deadline for receipt of abstracts for talks is May 15, 1991, abstracts received after May 15 will be considered for the poster session.

For details, contact the Chairman: Professor Toshikazu Yoshikawa, Japan Spin Trapping Society, K-Building 2F, Kojinguchi-cho 115, Kawaramachi-Kojinguchi-agaru, Kamigyo-ku, Kyoto 602, JAPAN. Telephone: 075-222-2715. FAX: 075-222-2718.

THIRD INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY, National Institute of Standards and Technology (NIST), Gaithersburg, Maryland, USA. October 14-18, 1991. ***[IMPORTANT NOTICE: ALTHOUGH AN EARLIER DEADLINE FOR RECEIPT OF ABSTRACTS PREVIOUSLY WAS ADVERTISED, A PROBLEM WITH THE MAIL HAS CAUSED AN EXTENSION TO JUNE 15, 1991.]*** The Symposium is organized by the Ionizing Radiation Division of NIST, in cooperation with the China University of Science and Technology and the International Atomic Energy Agency. The scope of this timely series of international meetings is broad, but is bound coherently by the theme of electron spin resonance spectrometry applied to absorbed dose measurement and the analysis of a variety of ionizing radiation effects. These include applications of dosimetry for photon, electron, neutron, and heavy-particle radiations, studies of radiation accidents, clinical and bio-medicine, dating of archeological and geological specimens, radiation effects in materials, development of transfer and reference standards, preservation of foods, sterilization of medical devices, and the development and enhancement of ESR instrumentation. The primary aim of the Third Symposium is to bring together, from around the world, experts in all these topics, in order to address recent advances and to continue the improvement of applied dosimetry and materials analysis by EPR/ESR methods. It is also intended to provide a forum for the exchange of ideas by the leaders in this important and expanding field of radiation metrology. The official language of the symposium is English.

Location: **The Conference will be held at the National Institute of Standards and Technology, Gaithersburg, Maryland.**

Registration: A registration reception will be held on Sunday, October 13, 1991 at the Gaithersburg Marriott from 18:00 to 20:00 hours. Registration will be held at NIST at 8:00 hours, Monday October 14.

Abstracts and Proceedings: Abstracts are limited to no more than 300 words, typewritten. Abstracts should be sent directly to the program chairman: Dr. A.F. Skinner, Chemistry Department, Williams College, Williamstown, MA 02167, USA. Telephone: 413/597-2323. FAX: 413/597-4116. **The proceedings will be published in the international journal, *Applied Radiation and Isotopes,*** according to its format and rules. The proceedings will not distinguish between oral and poster presentations. The full text of the manuscripts must be submitted by the last day of the Symposium.

Technical Exhibition: For information and applications, please contact Marc Desrosiers, Telephone: 301/975-5639; FAX: 301/869-7682.

Timing: **Abstracts due: June 15, 1991. Advance registration due: August 31, 1991; Hotel reservations due: October 1, 1991.**

For details and to express interest in attending or submitting an abstract, contact Dr. Marc F. Desrosiers, NIST, Building 245, Room C214, Gaithersburg, MD, 20889, USA; Telephone: 301/975-5639; FAX: 301/869-7682.

TWENTY-FIFTH ANNUAL INTERNATIONAL MEETING OF THE ELECTRON SPIN RESONANCE INTEREST GROUP OF THE ROYAL SOCIETY OF CHEMISTRY (UK), University of York. March 30 to April 3, 1992. This will be a joint meeting with the Society of Free Radical Research. The theme will be "Radicals in Organic and Bioorganic Systems." For details, contact Dr. C. C. Rowlands, Secretary, Committee of the ESR Group, School of Chemistry, Univ. of Wales, PO Box 912, Cardiff CF1 3TB, U.K.

VI INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE, Florence, Italy, June 22-26, 1992. The 6th International Symposium on Magnetic Resonance in Colloid and

Interface Science will be held at the University of Florence, Florence, Italy, June 22-26, 1992. This is a continuation of the previous triennial conferences held on the same subject in San Francisco, USA (1976), Mentone, France (1979), Torun, Poland (1983), Münster, FRG (1986), and Newark, Delaware, USA (1989). This symposium has become a major event; its aim is to provide a forum for physicists, chemists, and biologists at which they can present and discuss their recent research in the field. The symposium program will include plenary lectures, invited reports, and original research contributions. The official language will be English. The proceedings will be published as full articles in a major scientific journal.

A wide spectrum of the applications of magnetic resonance spectroscopies to colloid and interface systems will be addressed. Among the topics to be covered:

- Adsorption, catalysis, and surface chemistry
- Dispersed systems, colloids, and gels
- Ordered systems
- Zeolite and silicate surfaces
- Intercalation compounds
- Biological systems
- Magnetic systems with specific surface properties
- New magnetic resonance techniques

Other topics can be included depending on the response.

All scientific activities will be held downtown in Florence and all reservations for accommodations will be handled by local travel office directly. Detailed information will be sent in further circulars. Florence is easily reached by train from the international airports of Pisa (1 hour), Rome (3 hours), and Milan (3 hours).

For more information, and to indicate whether you wish to attend, and whether you wish to present a paper, contact: Dr. M. Francesca Ottaviani, Department of Chemistry, University of Florence, Via G. Capponi 9, 5021 Firenze, ITALY.

ESR APPLIED METROLOGY WORKSHOPS, Japan. Prof. Motoji Ikeya (Department of Physics, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan) would like members of the international EPR community to know about these workshops. The first such workshop was organized in 1985, at the time of the First Symposium on ESR Dating, held at Yamaguchi, Japan; cf. the Proceedings of ESR Dating and Dosimetry (Ionics, Tokyo, 1985). Five annual workshops and symposia have been held. Proceedings are available at a cost. Members are mostly physicists, geologists, and some chemists who are interested in EPR applications to geology and archaeology as well as in the development of EPR imaging (or scanning EPR microscopy) and of portable EPR spectrometers. Publications - "Applied ESR Metrology" and Newsletters with English-language titles - are available to members (dues, $20/year). For details and Workshop schedules, contact Prof. Ikeya, whose organization wishes to exchange information with foreign EPR specialists and to encourage more involvement of geologists in the EPR community.

ELEVENTH ISMAR MEETING, Vancouver, British Columbia, CANADA, July 18-24, 1992. The International Society of Magnetic Resonance is preparing for its XIth international meeting to be held on the campus of the University of British Columbia, Vancouver, BC., Canada. The meeting is being organized by Professor Colin Fyfe, Department of Chemistry, University of British Columbia, 2036 Main Mall, Vancouver, BC, V6T 1Y6, CANADA. (Telephone 604-228-2847; FAX 604-228-2847).

TWENTY-NINTH INTERNATIONAL CONFERENCE ON COÖRDINATION CHEMISTRY, Lausanne, Switzerland, July 19-24, 1992. This conference will treat all aspects of coördination chemistry including magnetic resonance. There will be five plenary lectures to cover themes of general interest, to which ten microsymposia will be linked conceptually. Fifteen subjects will be themes for section lectures, and there will be poster sessions. The official conference language is English. Deadline for abstracts is January 10, 1992. For information, contact 29th ICCC Secretariat, AKM Congress Service, Clarastrasse 57, P.O. Box, CH-4005 Basel, Switzerland. (Telephone: ++41-61-691 51 11; Telefax: ++41-61-691 81 89).

EPR NEWSLETTER

Published at the Illinois EPR Research Center (IERC), Urbana, IL 61801

Volume 3, #2 Page 5 April, 1991

BOOKS; CONFERENCE PROCEEDINGS

New Book: Modern Pulsed and Continuous-Wave Electron Spin Resonance, Edited by Larry Kevan and Michael K. Bowman. Wiley, New York, 1990. 440 pp. This book contains nine chapters, each authored by different scientists distinguished for their contributions to modern EPR techniques. About 65% of the book concerns pulsed techniques and applications. The other 35% (three chapters — Cw transient ESR, High-frequency cw ESR, and ESR imaging) concern cw methods which Kevan and Bowman state to be "... ripe for more widespread exploitation ..."

Reminder: Each year the Journal of the Chemical Society *Faraday Transactions* publishes a special issue based on papers presented at the annual spring conference of the ESR Group of the Royal Society of Chemistry (United Kingdom). The issue containing papers from last year's conference (the 23rd International ESR Conference at Egham in March, 1990) has been published (*J. Chem. Soc. Faraday Trans.*, No. 19, 7th October 1990, pp. 3173-3379). Copies may be obtained *via* either Prof. M.C.R. Symons, CRC ESR Research Group, Dept. of Chemistry, Univ. of Leicester, University Rd, Leicester LE1 7RH, UK or Dr. Bob Parker at The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Rd., Cambridge CB4 4WF, UK.

New edition of book: *Principles of Magnetic Resonance*, Charles P. Slichter, Springer-Verlag, Berlin and New York, 3d edition enlarged and updated, 1990. 655 pp.

New book: *Radiospectroscopy of Natural Substances (by EPR and NMR)*, by B. F. Alekseev, Yu. V. Bogachev, V. Z. Drapkin, A. S. Serdjuk, N. B. Strakhov, and S. G. Fedin (1991) is published in English translation by Norell Press, 22 Marlin Lane, Mays Landing, New Jersey 08330, USA. This book is intended as a comprehensive manual on the theory and practical uses of magnetic resonance techniques in studying natural substances. There is an emphasis on the latest techniques and current progress in magnetic resonance spectroscopy.

EDITORIAL

Again I remind you, the readers, that the EPR Newsletter is now the news and information medium and discussion forum for your International EPR(ESR) Society, and that you are needed to contribute material. Volume 2, No. 3, October, 1990, describes the categories of material to be published; you are welcome to suggest other kinds of items and help us get the copy for them.

Newsletter distribution: For some reasons that we know and others which we do not know, some recipients have been experiencing long delays in receiving their copies of the EPR Newsletter. Our apologies to those who have experienced the long delays; we are attempting to correct the problems. Please let us know if our address for you should be corrected.

To Micronow and Norell, the two new corporate donor-members of the International EPR Society: Welcome!

Linn Belford

INTERNATIONAL EPR SOCIETY REPORTS

REPORT OF ACTIONS BY THE COUNCIL OF THE EPR SOCIETY:

Based on input that had been received from the members and officers of the Society, the Council of the Society was polled to establish a number of policies. As a consequence of this input, the following actions have been taken.

I. The business year of the Society will be the same as the calendar year.

II. The dues for 1991 are established as follows (MEMBERS: PLEASE NOTE ENCLOSED DUES STATEMENT (p. 15, to be detached and returned) AND PAY APPROPRIATE DUES PROMPTLY TO CONSERVE THE ASSETS OF YOUR SOCIETY):

A. Full members: $25
B. Associate members: $25
C. Emeritus: $10
D. Postdoctoral: $10
E. Predoctoral: $5

III. Regional treasurers will be established in order to minimize costs and inconvenience associated with converting currencies.

David Greenslade will be regional treasurer for Europe. European members can pay their dues in eurodollars directly to him:

University of Essex
Dept. of Chemistry
Colchester C04 35Q, UNITED KINGDOM

John R. Pilbrow will be the regional treasurer for Australia:

Department of Physics
Monash University
Clayton, Victoria 3168, AUSTRALIA
Phone: 61-3-565-3630
FAX: 61-3-565-3637

Yakob S. Lebedev will be regional treasurer for the USSR:

ESR Research Center
Inst. of Chemical Physics, USSR Academy of Sciences
Kosygin Str. 4
117977 Moscow B-334, USSR
Phone: 95-93-97-408
FAX: 95-93-82-156

Other regional treasurers probably will be established. Of course, any member may pay dues in U.S. dollars to the Treasurer, Sandra Eaton.

IV. It was recommended that the following committees, with the indicated chair and co-chair(s), be established. (The vote on establishing a committee on nomenclature indicated a variety of viewpoints; therefore, the possibility of establishing that committee awaits further discussions.) These committees are in the process of being implemented. IF YOU WOULD LIKE TO SERVE ON A COMMITTEE AND HAVE NOT YET BEEN ASSIGNED TO IT, PLEASE CONTACT ONE OF THE CHAIRS OF THE COMMITTEE or the President. **An Appendix (p. 12) in this Newsletter lists addresses, telephone and FAX numbers, and electronic mail names for the chairs.**

A. Bylaws (Chairs: L. Kevan & B. Gilbert)
B. Awards (Chairs: L. J. Berliner, E. deboer, K. Hausser)
C. Software (Chair: R. Cammack)
D. Meetings & Workshops (Chairs: J. Peisach & Ya. S. Lebedev)
E. Standards (Chairs: R. B. Clarkson & J. André)
F. Publications (Chair: R. L. Belford)
G. Commercial Relations (Chair: J. S. Hyde)
H. Nominations (A. Schweiger & P. Fajer)

Although not listed in the suggestions for the Council, an additional committee—Membership—has been established chaired by Dr. Peter Gast, University of Leiden.

V. The following budget was established for this year. It is based on a conservative estimate of income, with an aim to build some reserves to protect future activities of the Society. As you will note from the Newsletter, we have received substantial backing from several companies, which should further enhance the stability and growth of the Society.

A. Postage (in addition to that provided in the form of assistance from Companies)	$1,000
B. Clerical	5,200
C. Newsletter (direct publishing costs)	3,200
D. Stipends for ca. 12 students to attend meetings (@ ca. $200)	2,500
TOTAL	$11,900

In general, the Society has continued to make excellent progress. Its existence and role are becoming known increasingly, and virtually all of the commentary we have received has been very positive. On the other hand, there clearly is a great deal of work to be done if we are to achieve the maximum benefits from establishing the Society. The success of the Society, ultimately, rests with the members and the amount of interest and energy they direct towards the Society and its activities. The greatest needs at this time are:

1. Participation in the activities of the Society, especially via the committees,
2. Extending and increasing the support of commercial companies for the Society,
3. Enhancing the Newsletter by contributing articles and other material to it, and
4. Increasing the membership, including stimulating younger members in YOUR institution to join the Society, as well as your more senior colleagues. It is especially important to increase membership from those countries which currently are underrepresented in consideration of the number of scientists who actively use EPR.

As always, the officers and Council of the Society greatly appreciate and need your input.

Hal Swartz, President

STUDENT TRAVEL GRANTS FOR CONFERENCES: The International EPR Society hopes to provide a few travel grants to students who need to travel a considerable distance in order to present work at a conference relevant to EPR. Students may apply for awards of no more than $250(US) or equivalent to attend the International EPR symposium at Denver, USA (July/August, 1991), the International Symposium on Recent Advances in ESR at Padova, Italy (September, 1991), or other appropriate EPR meeting (see "Notices of Meetings" above). Applications should be brief - just a page or two with a little information about the student and a statement of reasons for the student's wishing to attend and present work at a particular meeting - and should include the endorsement of the student's research advisor. The Awards Committee will make the decisions and announce results to all applicants. Applications may be addressed to any Awards Committee co-Chair or to Ms. Rebecca Gallivan (Illinois EPR Research Center, Univ. of Illinois, 190 Med. Sci. Building, 506 S. Mathews, Urbana, IL 61801, USA) to be forwarded to the Awards Committee.

SOCIETY ELECTIONS: Dr. Christopher Felix, who was responsible for receiving and counting ballots, reports that the slate of officers and Council listed on the ballot has been elected. Of the 232 ballots received, 198 specified that the complete list of Officers and Council provided by the Nominating Committee should be elected, while 34 ballots were marked for that list with various minor modifications. New suggestions from these ballots will be transmitted to the Nominating Committee for future consideration.

INDIVIDUAL MEMBERSHIPS: Your society's membership continues to grow. For your convenience in recruiting new members, a registration form is enclosed (pp. 13-14 of this issue). Remember, we welcome members across the whole span of disciplines that use EPR (ESR, EMR, ENDOR, ESE, FMR, CESR, etc.) including biochemists, chemists, biologists, physicists, geologists, engineers, and physicians.

CORPORATE MEMBERSHIPS: Micronow Instruments and Norell, Inc. join the first five corporate members of the Society.

LETTERS TO THE EDITOR

Sir:

I raise the following technical topics which I hope are of common interest to the International EPR Society members:

(1) It's hard and getting harder to obtain spare parts from Varian, especially for the microwave bridge, and at what prices! I have difficulty in finding second sources here in Italy, but hope the situation is better in the USA. I would like to get in contact with other Varian users to cooperate. Of course, my twenty years of experience is fully available to help solve problems with Varian machines.

(2) Is there any source (except Bruker) for calibrated EPR standards? As far as I know, neither Bruker nor Wilmad can provide them any more.

Vanni Piccinotti
Assistenze Tecnica Risonanze Magnetiche
Via del Berignolo 5, 50141 Firenze, ITALY
Tel or FAX (39) 055 434841

(Editor's note: As mentioned in previous issues, the standards problem is being addressed by some organizations including the NIST and IERC and by the newly-formed Committee on Standards of the International EPR(ESR) Society. A symposium on standards will be held as part of the 1991 International EPR Symposium in Denver.)

Sir:

Thank you for sending me the information on the International EPR Society. I feel that such a society is highly needed, as the scope of all other "magnetic resonance" groups (e.g., Groupement Ampére) seems to be too broad. The main purpose of this letter is to point out one branch of EPR/ESR, namely the electron spin resonance in highly magnetically ordered materials (ferromagnets, antiferromagnets, ferrimagnets ...) - usually called (anti) ferromagnetic resonance (FMR, AFMR), sometimes spin-wave resonance (SWR), which may better fit the term ESR than EPR. Sometimes it is difficult to use a right description for resonance studies in the above-mentioned materials as, e.g., by a slight temperature change one formally changes the field from EPR to FMR. Personally, I think that nature cannot be

divided into strongly separated fields and I (as one who uses both EPR and FMR methods) certainly don't mind describing generally FMR effects by the term EPR. Will the scope of the EPR Society encompass FMR?

Zdenek Frait, Head
Department of Magnetism
Institute of Physics
Czechoslovak Academy of Sciences
Na Slovance 2
180 40 Prague 8
CZECHOSLOVAKIA

(Editor's note: Yes, the Society encompasses all areas of electronic magnetic resonance. The next Letter also addresses the question of the FMR people in our Society.)

Sir:

Your comments concerning ferromagnetic resonances in a recent EPR Newsletter editorial was very relevant. During the past few years my work in magnetic resonance has shifted primarily to ferromagnetic resonance. Much of the work in this field is published in Journal of Applied Physics, IEEE Transactions on Magnetics, and Journal of Magnetism and Magnetic Materials. Older work is also found in Physical Review. Occasionally, some work is published in chemistry-oriented journals. Furthermore, two annual meetings each year contain sessions on ferromagnetic resonances: the *Annual Conference on Magnetism and Magnetic Materials* and *Intermag*.

One reason for the strong ties of ferromagnetic resonance researchers to the Magnetics Society is that the properties that are measured are strongly associated with the magnetostatic properties of materials. In a way, these magnetics researchers form a group that does not need to extend too far into other areas. This differs from EPR researchers who address different areas of chemistry, biology, and physics, where the range of interaction must be very broad. All this is to point out that the chances of getting extensive involvement of ferromagnetic resonance researchers in the EPR Society is relatively small. Even the EPR manufacturers do not address this market. However, it would be worthwhile to try to get greater representation of ferromagnetics people. There is a good possibility of cross-fertilization of techniques, and different viewpoints regarding the significance of certain magnetic units. If I can be of some assistance in initiating some interactions, I would be happy to try.

Ira B. Goldberg
Science Center
Rockwell International
1049 Camino Dos Rios
P.O. Box 1085
Thousand Oaks, CA 91358, USA

NEWS FROM EPR CENTERS

SPIN TRAPPING CENTER IN OKLAHOMA - The National Biomedical Center for Spin Trapping and Free Radicals has been established at the Oklahoma Medical Research Foundation in Oklahoma City. It is funded by the US National Institutes of Health. This is the first NIH Research Resource devoted to spin trapping. Its goal is to improve the techniques for detecting and characterizing free radicals in biological systems particularly utilizing the approach of spin trapping. Both EPR and mass spectrometry will be used in the development of improved methodology for this rapidly expanding area of research. Personnel currently in the Molecular Toxicology Research Program associated with this center are: Edward G. Janzen, Director; Yashige Kotake, Associate Director; Coit M. DuBose, Manager; Robert A. Floyd, Paul B. McCay, J. Lee Poyer, and Lester A. Reinke, co-investigators and collaborators.

Correspondence should be directed to Edward A. Janzen, Ph.D., Member of the Molecular Toxicology Research Program and Director, National Biomedical Center for Spin Trapping and Free Radicals, Oklahoma Medical Research Foundation, 825 N.E. 13th Street, Oklahoma City, OK 73104, USA. Telephone 405-271-6673.

TIPS AND TECHNIQUES

Traveling Wave Tube Artifacts: Grid Driver —

High-power traveling wave tube amplifiers (TWTAs) ordinarily generate microwave pulses from an input continuous wave signal by modulating the electron beam through a traveling wave tube (TWT). This is achieved by applying a high voltage across a grid, which deflects the beam. This scheme works well for the generation of pulses lasting hundreds of nanoseconds; however, for many pulsed EPR experiments, pulses of about ten nanoseconds are required. Because the fall time of pulses generated by most TWTAs is slow, alternative procedures are used to generate short pulses of high power.

In practice, what one does to generate short microwave pulses is place a fast PIN diode switch between the cw source and TWTA input. The TWTA grid is switched on for an interval (100-200 ns), during which the PIN diode is opened for a short period thereby generating a short pulse

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that is amplified by the TWTA. The timing diagram is illustrated in Figure 1.

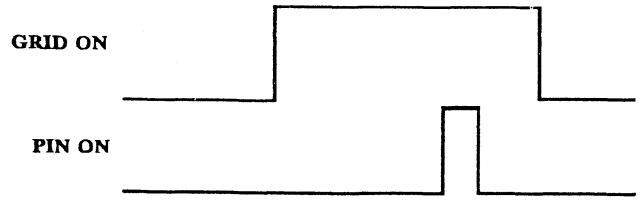

Figure 1. Timing diagram for short, high-power pulses

Our spectrometer is set up to apply one grid pulse per microwave pulse. Therefore, at short τ and/or t, grid pulses overlap. As the experiment proceeds, the grid pulses eventually separate and pulses are produced independently. What I have noticed is that there occurs a glitch in the echo envelope modulation (most prominent in experiments featuring shallow high frequency modulations) that is attributable to the separation of the overlapping grid pulses (Figure 2). The cause/effect relation was established by varying the grid pulse length and timing of the PIN diode with respect to the grid pulse.

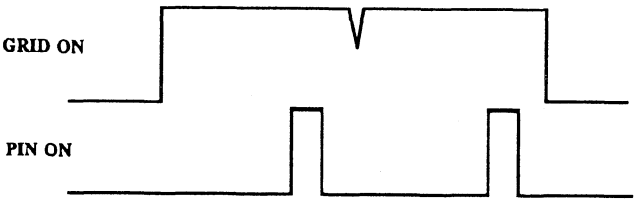

Figure 2. Origin of a glitch. Timing diagram as grid pulses separate.

Two other symptoms can be observed during the grid pulse separation. One is a slight jump in the beam current of the TWT. The second is what appears to be a sudden phase shift in the shape of the echo. Apparently this point is problematic due to the very close proximity of the falling and rising edge thresholds of the grid pulses and a resultant rapid off/on cycle.

The ETH group has proposed a pulse sequence and phase cycling method that eliminates this glitch, among other unwanted signals. However, I have found that adjustments to the TWT can also reduce the magnitude of the artifact. I noticed that the glitch became more pronounced as I lowered the repetition rate of my experiment (normally I set up the TWT and tune the spectrometer at repetition rates of 200 Hz). As the repetition rate is lowered, the beam current drops commensurately due to the lowered duty cycle. If I raise the beam current by adjusting the trimming potentiometers in our system, I can reduce the size of the glitch. Our experiments are run far below the rated 1% duty cycle of the TWT, and lowering the repetition rate apparently exacerbates a problem symptomatic of an already underdriven tube. Readjusting the beam current for a given repetition rate to the maximum allowable (limit imposed by the onset of tube oscillation) greatly helps; in other words, if I optimize a TWT at 200 Hz and find that the magnitude of the beam current is 0.15 mA, I ensure that the beam current is at this level at lower repetition rates.

A second adjustment can be made in the reference arm. Normally the echo is maximized by adjusting the phase of the reference arm. However, with some strong signals (e.g. Mn(II) aquo, Figure 3) there is a small range in phase over which the echo intensity at maximum does not change. Careful adjustment of the phase (using the phase shifter's vernier as a reference) also seems to reduce the amplitude of the glitch.

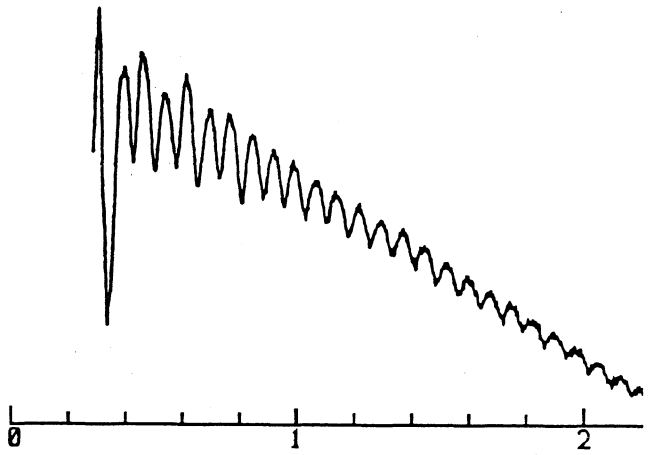

Figure 3. Anatomy of a glitch. Two-pulse echo envelope modulation of 0.1 mM $MnCl_2$ in water.

The best solution, clearly, is to eliminate the problem of grid pulse overlap. Using a cw input on a test bench the minimum effective grid pulse on our TWTA is about 60 ns (newer TWTAs can do better); what I hope to be able to do as our spectrometer is renovated is center our short PIN pulse within a 60 ns grid pulse without introducing AM problems. If successful (with regard to AM), this arrangement will avoid grid driver pulse overlap unless τ and/or t are less than 40 ns, which is shorter than our cavity dead-time. I hope to be able to get our system onto the test bench for analysis at some time in the future and try to report these findings more quantitatively.

Another related note: For those using time domain EPR methods, there are two recent articles in the journal *Computers in Physics* that may be of interest. One is entitled 'Some Comments on Maximum Entropy Spectral Analysis', by F. Laeri (Vol. 4, No. 6, p. 627), which compares the maximum entropy and fast fourier transform methods of obtaining spectral estimates. The other paper is 'An Algorithm and Computer Program for Calculation of

Envelope Curves', by M. MacClain *et al.* (Vol. 5, No. 1, p. 45). The latter article is perhaps of more interest to those writing programs for the simulation of echo modulation.

Christopher Bender
Biotechnology Resource in Pulsed EPR Spectroscopy
Albert Einstein College of Medicine
1300 Morris Park Avenue
Bronx, NY 10461, USA

Metallic Collar to Improve the Positioning of the RF Coil Inside a TM_{110} ENDOR Cavity -

In an early adaptation of the cw ENDOR cavity described by Biehl *et al.* [R. Biehl, M. Plato, and K. Möbius, J. Chem. Phys. **63**, 3515 (1975)], we have found that metallic collars which extend the sample access holes inside the cavity, on both the top and bottom (see the Figure), make the introduction of the rf coil into the resonator less troublesome.

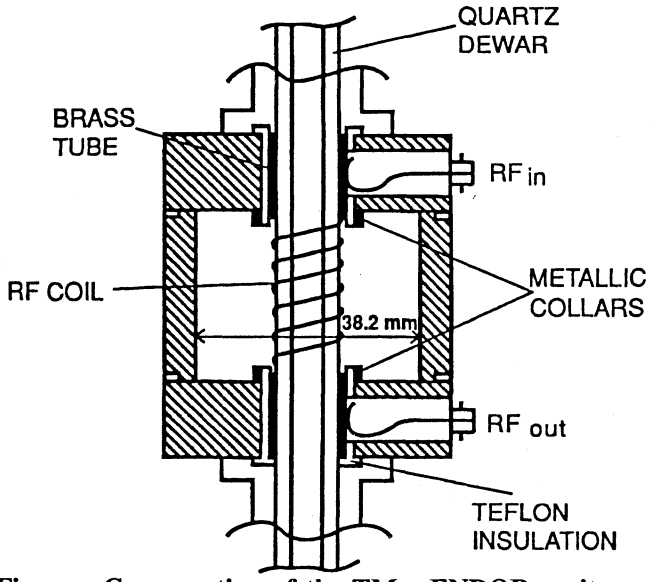

Figure. Cross-section of the TM_{110} ENDOR cavity.

The 20-turn rf coil with a length of 28 mm is made of brass wire, 0.4 mm in diameter, covered with 20 μm of silver and a flash of hard gold. The rf coil is hard-soldered on both sides to a brass tube and then directly glued under tension onto the helium gas flow dewar (Air Products, Inc., now APD Cryogenics). The cavity also has been used successfully in our first pulsed ENDOR experiments at liquid helium temperature.

Jörg Forrer
Laboratory for Physical Chemistry
ETH-Z (Eidgenössische Technische Hochschule)
CH-8092 Zürich, SWITZERLAND

POSITIONS OPEN

EPR APPLICATIONS SPECIALIST. Medical Advances, Inc., a Milwaukee-based company with worldwide markets for magnetic resonance coils, accessories, and EPR components and subsystems has an opening for an EPR Applications Specialist.

Qualified applicants must have at least a bachelor's degree in Biochemistry or Physical Chemistry and at least two years of experience with EPR and NMR systems. An advanced degree is desirable.

This position is expected to provide expertise in applications of EPR and NMR spectroscopy. A major part of the job is associated with EPR applications support at university research centers, using our own designs and getting feedback from the field.

Applicants should send résumé in confidence to:

Human Resources
Medical Advances, Inc.
10431 W. Watertown Plank
P.O.Box 26425
Milwaukee, WI 53226, USA.

Equal opportunity employer.

EQUIPMENT EXCHANGE

FOR SALE: VARIAN FIELD FREQUENCY LOCK.

A brand new, never-been-used Varian model E272B field frequency lock unit (8.9-9.6 Ghz) is offered for sale. The asking price is $3,900. Please contact:

Dean Wilcox
Department of Chemistry
Dartmouth College
Hanover, NH 03755, USA.
Telephone: 603-646-2874. E-Mail: Dean.Wilcox@Dartmouth.EDU.

EPR NEWSLETTER

Published at the Illinois EPR Research Center (IERC), Urbana, IL 61801

Volume 3, #2 Page 11 April, 1991

WANTED: EPR SPECTROMETER.

We are in need of a Varian E series spectrometer, preferably an E-4, in good condition. A klystron for an E-3 is also useful. To discuss either item, please contact:

Mark McNamee
Department of Biochemistry and Biophysics
University of California at Davis
Davis, CA, 95616, USA
Telephone: 916-752-6418.
FAX: 916-752-3085.

WANTED: MAGNETIC FIELD CONTROLLER.

We are seeking a replacement for the magnetic field controller, Model E-203, for our Varian E-9 EPR spectrometer. This instrument is no longer supported by the manufacturer. If anyone has such a module and is willing to part with it, please contact me at the following address:

J. Krzystek
Department of Chemistry BG-10
University of Washington
Seattle, WA, 98195, USA
Telephone: 206-543-2258.
FAX: 206-685-8665.
E-Mail: krzystek@uwachem.BITNET or krzystek@uwchem.chem.washington.EDU

WANTED: PAR BOXCAR-AVERAGER.

We are seeking a dual-channel boxcar-averager, PAR Model 162. Please contact:

Dr. Günter Grampp
Institute of Physical Chemistry
University of Erlangen
Egerlandstraße 3
D-852 ERLANGEN, GERMANY

WANTED: A VARIAN E4 EPR UNIT.

Any laboratory or researcher proposing to dispose of a magnet kindly contact:

Professor P.T. Manoharan
Regional Sophisticated Instrumentation Centre
Indian Institute of Technology
Madras 600036, INDIA.
Telex 041 21062 IITM IN; Telefax 044 412509. We are ready to bear the expenses involved in transportation/packing/forwarding and shipping.

WANTED: USED VARIAN EPR X-BAND CAVITY.

We are in need of a Varian cavity, either TE_{102} or TM_{011} preferred, to fit an E-line or Century series EPR spectrometer. Many Varians have been sent to the ironmonger, but people usually keep their cavity for sentimental reasons. We want to buy an old cavity. We will have it reconditioned, if necessary - as these are no longer sold by Varian. If you can help, please contact:

Professor Lawrence J. Berliner
Dept. of Chemistry
The Ohio State University
120 West 18th Ave.
Columbus, OH 43210-1173, USA.
Telephone: 614-292-0134; E-Mail: BERLINER@LIVERS.MPS.OHIO-STATE.EDU.

WANTED: SURPLUS EQUIPMENT, PARTS, BOOKS, JOURNALS.

My Letter to the Editor in the previous issue explains how our institute has become sadly depleted in equipment and supplies in recent years. So, if anyone is willing to help us by giving away surplus equipment (or any auxiliary parts) in either EPR or NMR field, we are grateful. Also, we would like to receive any surplus books or journals in the field (EPR and NMR) or in closely related areas (physical chemistry). Concerning transportation, any help would be priceless; otherwise, we shall find a way to pay.

Dr. Horia Caldararu
Romanian Academy
Institute of Physical Chemistry
Splaiul Independentei 202
77208 Bucharest, ROMANIA.

WANTED: EPR Spectrometer.

We are looking for a Varian E-Line Century series spectrometer to purchase. An E-109 is preferable, but any working Century series model would be acceptable. Please contact:

Richard Lokken or Mark Wolski
Medical Advances, Inc.
10431 W. Watertown Plank Rd.
P.O. Box 26425
Milwaukee, WI 53226-0425, USA.
Telephone: (414) 258-3808
FAX: (414) 258 4931

EPR NEWSLETTER

Volume 3, Number 3 Page 1 Fall, 1991

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 Centers for EPR/ESR spectroscopy in the USA. These Centers are sponsored by the Division of Research Resources of the U.S. National Institutes of Health:

National Biomedical ESR Center, Prof. James S. Hyde, Director. Medical College of Wisconsin, MACC Fund Research Center Building, 8701 Watertown Plank Road, Milwaukee, Wisconsin 53226, USA. ☎: 414/266-4000. FAX: 414/266-4007. E-Mail: Use INTERNET address "felixc@uvax01.biostat.mcw.edu".

Biotechnology Resource in Pulsed EPR Spectroscopy, Prof. Jack Peisach, Director. Albert Einstein College of Medicine, Department of Molecular Pharmacology, 1300 Morris Park Avenue, Bronx, New York 10461, USA. ☎: 212/430-2175. FAX: 212/829-8705. E-mail: Use INTERNET address "peisach@aecom.yu.edu"

Illinois EPR Research Center (IERC), Profs. Harold M. Swartz and R. Linn Belford, Directors; Prof. Robert B. Clarkson, Associate Director; Prof. Peter G. Debrunner, co-Principal Investigator; other senior staff: Prof. Mark J. Nilges and Dr. Tadeusz Walczak; University of Illinois at Urbana-Champaign, 190 Medical Sciences Building, 506 South Mathews Ave., Urbana, Illinois, 61801, USA. ☎: 217/244-1186. E-mail: belford@uiucscs.BITNET or ierc@uiucvmd.bitnet. FAX: 217/244-8068.

These Centers, which were described in our first issue (Volume 1, #1), cooperate to facilitate research requiring EPR-related techniques. Prospective collaborative or service users may contact the staff at any of the Centers.

IN THIS ISSUE

HOW TO REACH US

To communicate about the EPR Newsletter or submit material, contact R. Linn Belford, Editor or Becky Gallivan, Editorial Assistant, at IERC (address above).

PUBLICATION AND DISTRIBUTION: This is a members' issue. EPR Newsletters are published quarterly for the members (ca. 1000) of the International EPR (ESR) Society. One issue (the winter issue in 1991) each year is public, which the (ca. 2000) nonmembers on our mailing list also receive. To be assured of consideration for the Spring issue, material to be published (articles, letters to the editor, advertisements, notices, etc.; see the Editorial) should arrive at the editor's office by the first day of February, and similarly for the other issues at 3 month intervals. Copy which arrives late may be published immediately but is more likely to be held for the subsequent issue. Submissions should indicate whether the material ought to run in more than one issue. In the absence of such indication, an ad automatically will be repeated in one or more subsequent issues if space permits. It is helpful if paper copy is accompanied by text and graphics submitted on computer diskette or transmitted by E-mail.

CONGRATULATIONS, GEORGE FEHER!

One goal of the Society is to draw attention to outstanding scientists and outstanding science in EPR. George Feher has won the first senior award of the International EPR Society. He provides tangible and incontrovertible evidence of the high quality of scholars in this field. The award will be presented formally to Prof. Feher in August 1992 at the 15th International EPR Symposium in Denver, Colorado.

AWARD STATEMENT FOR GEORGE FEHER

George Feher was born in Czechoslovakia in 1924. He received his B.S. in Engineering Physics from the University of California - Berkeley in 1950, followed by an M.S. in Electrical Engineering in 1951 and a Ph.D. in Physics in 1954. While doing graduate studies at Berkeley, he worked with A.F. Kip on the EPR of conduction electrons in metals, culminating in the 1955 publication in *Physical Review* of the now famous paper on CESR (Freeman Dyson wrote a companion paper in the same issue of *Physical Review* developing his theory of the effects of electronic diffusion and skin depth on the EPR of conducting materials based on Kip and Feher's data).

Upon completion of his graduate work, Feher exchanged the West Coast for the East Coast, taking a position as research physicist in the Bell Telephone Laboratory, Murray Hill, New Jersey. There, during the period from 1956 to 1960, he published an extraordinary series of papers describing the invention, theory, and application of Electron-Nuclear Double Resonance (ENDOR) spectroscopy, for which he was awarded the 1960 American Physical Society Prize. His early applications of ENDOR included studies of phosphorus-doped silicon (both ^{31}P and ^{32}P), where he observed the importance of cross relaxation (T_{1x}) processes in

steady-state ENDOR, and F-centers in KCl. Other discoveries in this early period include the packet-shifting mechanism, line-shift mechanism, and absorption and dispersion ENDOR methods.

During this period from 1956 to 1960, George Feher was a Visiting Associate Professor at Columbia University in addition to his position as research physicist at Bell Labs. In July of 1960, he again changed coasts, moving to the University of California at San Diego, where he took up the position of Professor of Physics that he still holds today. During his thirty years at La Jolla, George has continued to extend EPR and ENDOR methods into biophysical and biochemical problems, particularly photosynthesis. Throughout this period, his most consistent collaborator has been Roger Isaacson, whose technical inventiveness in EPR and ENDOR has done much to facilitate biophysical applications of these techniques. Together, they have done research on a wide variety of problems in physics, biophysics, chemistry, and biochemistry, making use of X-ray diffraction, Mössbauer spectroscopy, EXAFS, picosecond spectroscopy, Stark effect, and site-directed mutagenesis, to name some techniques employed in this work.

For his many important contributions in several fields, George Feher has been deservedly honored. He received, in addition to the 1960 American Physical Society Prize, a National Science Foundation Senior Postdoctoral Fellowship (1967-68), the Oliver E. Buckley Solid State Physics Prize (1976), and the American Physical Society Biophysics Prize (1982). Next year (1992), he will be awarded the Bruker Lectureship, the annual prize awarded by the Electron Spin Resonance Group of the Chemical Society (London). He has been elected to the National Academy of Sciences (1975), the American Academy of Arts and Sciences (1977), and to Fellowship in the American Association for the Advancement of Science (1986). He has been a Visiting Professor in Biology at MIT (1967-68), the 1983 National Lecturer of the Biophysical Society, the William Draper Harkins Lecturer at the University of Chicago (1986), and the Raymond and Beverly Sackler Distinguished Lecturer at the University of Tel-Aviv (1986). He also serves on the Board of Governors of both The Technion-Israel Institute of Technology and The Weizmann Institute of Science.

Statement prepared by Robert B. Clarkson

INTERNATIONAL EPR SOCIETY REPORTS

FROM THE PRESIDENT

The Society continues to grow and develop at a satisfactory rate. We have over 900 members from 38 countries and 9 corporate members. We initiated our first travel awards for students (one at the 14th International EPR Symposium in Denver, Colorado, July 1991; another at the GIRSE-Royal Society meeting, Padova, Italy, September 1991) and have named the first senior awardee of the Society: George Feher (see above).

Please give your attention to the following items:

1. A ballot to fill the balance of the term of the Vice-President. Prof. Fischer, University of Zürich, had to resign because of unexpected new responsibilities which prevented him from devoting sufficient time to Society business. Prof. Karl Hausser, Max Planck Institute, Heidelberg, has agreed to serve as interim vice-president until the election is completed.
2. A ballot for the revised constitution of the Society. This version, revised according to suggestions put forth by the members, is printed at the end of this Newsletter.
3. The dues statement--**please send your dues immediately to assure the smooth operation of your Society**. Members are encouraged to prepay their 1992 dues as well to minimize the effort of members and the work of the business office of the Society. Note that European members may pay in Eurodollars to the European treasurer, Dr. Greenslade. USSR members may pay in Rubles to Prof. Lebedev. Australian members may pay in Australian dollars to Dr. J. Pilbrow at Monash University. All members may pay in U.S. dollars to the treasurer, Prof. S. Eaton.
4. An application form for new members. Please encourage students and colleagues to join you in the Society. We already have received quite favorable comments from other scientists, companies, and government agencies; they are impressed with the numbers and energy of EPR scientists. These positive effects, which can facilitate your research, will be enhanced by a continued strong growth in membership.

Report submitted by Harold M. Swartz, President

EPR SOCIETY TREASURER'S REPORT FOR THE PERIOD 7/89 to 12/31/90*

I. Income	
A. Dues	
Full/Associate Members:	370 @ $25 = $9250.00
Postdoctoral Members:	35 @ $10 = 350.00
Student Members:	49 @ $5 = 245.00
	total dues paid = $9845.00
B. Corporate Support	$1750.00
C. Interest on Bank Account	339.41
D. Miscellaneous	5.00
	total income = $11,939.41
II. Expenses	
A. Postage	$184.25
B. Photocopying	98.11
C. Filing for Tax Exempt Status	351.00
D. Miscellaneous	32.37
	total expenses = $665.73
	Balance in account 12/31/90 = $11,273.68

***This report includes information provided in the mid-year report dated 7/30/90.**

Report submitted by Sandra S. Eaton, Treasurer

EPR SOCIETY TREASURER'S MID-YEAR REPORT FOR THE PERIOD 1/1/91 to 7/27/91

I. Income	
A. Dues	
Full/Associate Members:	99 @ $25 = $2475.00
Postdoctoral Members:	8 @ $10 = 80.00
Student Members:	16 @ $5 = 80.00
	total dues paid = $2635.00
B. Corporate Support	$2900.00
C. Interest on Bank Account	332.63
D. Miscellaneous	100.00
	total income = $5967.63
II. Expenses	
A. Postage for treasurer's office	$58.69
B. Expenses at University of Illinois	
supplies	$117.58
hourly help	2570.19
postage/shipping	321.38
printing/copying	1318.24
	total expenses at U of I = $4327.39
C. Incorporation and Tax Exempt Status	$820.47
D. Student travel award	250.00
E. Miscellaneous	11.95
	total expenses = $5468.50
	Account balance 1/01/91 $11,273.68
	7/27/91 $11,772.81

Report submitted by Sandra S. Eaton, Treasurer

MINUTES OF THE 1991 ANNUAL BUSINESS MEETING

The annual business meeting of the International EPR Society was held Monday, July 29, 1991, in Denver, Colorado, USA, in conjunction with the 14th annual International EPR Symposium. About 80 people were present. Scientists from eleven countries were in attendance at the Symposium, but individual attendance at the Business Meeting was not recorded. Dr. Harold Swartz, President of the Society, presided at the meeting.

Treasurer Sandra S. Eaton reported that as of 7/27/91 the balance in the Society's US bank account was $11,772.81. Details are presented separately in this Newsletter. No information was available to the Treasurer of the disposition of funds deposited with the Regional Treasurers in soft-currency countries. An effort will be made to obtain an accounting of these funds prior to the 1992 Business Meeting. Dues for the second year are beginning to be paid. Apparently, many members overlooked the dues request/payment form in the April issue of the Newsletter.

Newsletter editor Linn Belford reported that the Newsletter is now published four times per year. One of these issues is mailed to about 3000 scientists. The other three are mailed only to members of the Society. Dr. Belford urged members to shape the Newsletter to their needs by contributing to the Newsletter the types of articles and other information that they would like to see published in the Newsletter. So far, interest has been expressed, via contributions, in notices of books, meetings, positions available, equipment available for sale, donation, or exchange, tips and techniques, etc.

Some of the Committees of the Society made reports at the meeting. A message from Dr. Cammack, Chairman of the Software Committee, was displayed in the poster area during the Symposium. Members interested in software issues were urged to contact Dr. Cammack. (email address: UDBC033@hazel.cc.kcl.ac.uk).

Prof. Karl Hausser, Chairman of the Awards Committee, reported to general applause that the EPR Society Award will be presented to Prof. George Feher for the invention of ENDOR. Dr. Feher will receive the award at the 15th (1992) International EPR Symposium in Denver, at which time he will present his award address. The other type of award made by the Society is a travel award to students and young faculty. Initially it is intended to make about 10 awards per year, increasing the number as funds permit. The first two awards have been made. One was to a student to attend the EPR Symposium in Denver, and the other was to a student to attend the joint meeting of the ESR Group of the Royal Society of Chemistry (U.K.) and GIRSE (Italy) in Padova, Italy, September 8-12, 1991. Applications for student travel awards for 1992 should be made to the Awards Committee.

Only grammatical/clarifying comments were received on the draft Constitution published in the Newsletter, Volume 2, #3, October, 1990. The drafting of the Constitution is

considered complete. The "final" version will be published in the next issue of the Newsletter, at which time a formal ratification vote of the membership of the Society will be conducted. No changes were suggested at this Business Meeting.

Prof. Hans Fischer regretfully resigned his election as Vice President of the Society, due to the press of new duties. The other officers and members of the Council asked Prof. Karl Hausser to serve as "acting" Vice President, pending an election by mail ballot, which will be held as soon as is practicable.

The membership of the Society numbered 919 at the last count, and included people from 38 countries. The largest contingents are from the USSR and the USA. The President is still working on cooperative arrangements with regional EPR societies, and on financial arrangements with "soft-currency" countries.

There are nine corporate members (listed elsewhere in the Newsletter). Some corporate representatives were present at the meeting and received the thanks of the membership.

No new business was brought to the floor. The next Business Meeting will be held at the 15th International EPR Symposium in Denver in 1992.

Minutes submitted by Gareth R. Eaton, Secretary

NOTES FROM THE MEETING OF THE OFFICERS OF THE SOCIETY, JULY 30, 1991.

Following the Business Meeting of the Society, the officers met on July 30, 1991, to consider implementation of some of the functions of the Society. In response to many questions, the officers reaffirmed their strong desire not to start a new journal, but rather to seek a relation with existing journals that would obtain subscription discounts for members. The Newsletter will be the only periodical publication of the Society. It was agreed that timely issuance of the Newsletter on a regular schedule was crucial.

Efforts continue to work out mutually beneficial relations with other magnetic resonance societies, including regional EPR societies. For example, Hal Swartz will attend the joint English/Italian meeting in September, and seek to provide to the attendees the same information that was reported at the Denver Business Meeting. Karl Hausser will explore cooperation with AMPERE and ISMAR, including the possibility of *ex officio* positions on the Council of the EPR Society for the presidents of these other societies.

Concern was expressed that not enough information has been received concerning the use of the Society dues paid in the "soft currency" countries.

As part of the outreach and education goals of the Society, members are asked to identify scientists in developing countries who could benefit from membership and receiving the Newsletter. Complimentary membership would be offered to those who do not have adequate resources.

With regard to the question of sponsorship of meetings, it was agreed that the Society would not establish an additional scientific meeting. Instead, the Society will provide sponsorship of existing meetings including sponsoring travel awards for students. Upon application to the Society by the organizers of a meeting that has a strong emphasis on EPR (as evidenced by the overall program of the meeting), the Society could provide endorsement of that meeting in concrete form by providing travel support for up to a specified number of students, who would apply to the Society in the usual way for the support.

A modest honorarium, consistent with the budget of the Society, was approved for the Society Award.

The officers affirmed a commitment to keep the cost of administering the Society to a minimum. For example, the current Vice President, Treasurer and Secretary so have performed their functions without paid assistance, charging only postage costs to the Society. All officers, members of committees, and the Editor of the Newsletter serve without compensation, and the offices of the President and Editor have used uncompensated local help and resources in addition to costs charged to the Society. The major administrative costs so far have been with regard to developing and maintaining the mailing list, correspondence from the president's office soliciting society membership, and support of the publication of the Newsletter.

Prepared from draft submitted by Gareth R. Eaton, Secretary

STUDENT TRAVEL GRANTS FOR CONFERENCES - CALL FOR APPLICATIONS:

The International EPR Society provides a few travel grants to students needing to travel a considerable distance to present work at a conference relevant to EPR. A student may apply for an award of no more than $250(US) or equivalent to attend an appropriate EPR/ESR meeting (see "Notices of Meetings"). Applications should be brief - just a page or two with a little information about the student and a statement of reasons for the student's wishing to attend and present work at the particular meeting specified - and should include the endorsement of the student's research advisor. The Awards Committee will make the decisions and announce results to all applicants. Send applications to Prof. L. J. Berliner, Chair, IES Awards Committee, Dept. of Chemistry, The Ohio State University, 120 West 18th Ave., Columbus, OH 43210-1173, USA. Tel: 614-292-0134; E-Mail: berliner@livers.mps.ohio-state.edu

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INDIVIDUAL MEMBERSHIPS: Your society's membership continues to grow. For your convenience in recruiting new members, a registration form is enclosed with this issue). Remember, we welcome members from all disciplines that use EPR (ESR, EMR, ENDOR, ESE, FMR, CESR, etc.) including biochemists, chemists, biologists, physicists, geologists, engineers, and physicians.

CORPORATE MEMBERSHIPS: Now, with the recent addition of Scientific Software Systems and CRC Press, there are nine corporate members of the Society.

EDITORIAL

Again I remind you, the members of the International EPR(ESR) Society, that the EPR Newsletter is now the news and information medium and discussion forum for your Society, and that you are needed to contribute material which may be of interest to others in the EPR community. The **"Tips and Techniques"** section started last year (Volume 2, #2) is an example. Here, we print technical information or discussions which would not be appropriate to submit to a regular scientific journal but which could be of use and interest to other EPR practitioners. Acceptable material can include reminders of technical tips which were once published in some context but which have not been widely enough noticed. **Articles** and **Notices** containing news, information, and discussions of interest to the EPR community are welcome. Articles of the sort usually published in regular journals are not within the scope of the EPR Newsletter. **Letters to the Editor** may express opinions, raise issues, or simply inform. **Requests for information** are printed. We also publish notices of **job openings** and of **positions sought** in the field of EPR and have started an **equipment exchange** section, where those who wish to sell, give away, trade, or acquire surplus equipment of interest to EPR spectroscopists may place announcements. We urge readers to provide information on **meetings to be held**, on published **proceedings** of meetings, and on recently or soon-to-be published **books** or **conference proceedings** pertaining to EPR; we shall publish such information in the "Notices of Meetings," "Books," and "Proceedings" sections. Some **advertising** material will be accepted from companies which affiliate with the International EPR Society. What else shall be published in the EPR Newsletter? You decide; you are welcome to suggest other kinds of items and help us get the copy for them.

A hearty welcome to CRC Press and Scientific Software Systems, the two new corporate Contributor members of the International EPR Society!

Linn Belford

CONTEST

Who has the oldest working commercial EPR Spectrometer? Hint - there are still many Varian V4500-series spectrometers operating, so an E-3 will not win the contest! A current weak-pitch S/N test spectrum, and a list of the spectrometer modules used to obtain the spectrum, must be submitted to us as proof that the spectrometer is still functioning. To establish instrument age please indicate the date of purchase and give the serial number for the console. We suggest that the Society award a travel grant to attend an EPR meeting (in accordance with the Society's rules) to a student in the laboratory of the winner. Please send your entry to

Sandra and Gareth Eaton, Department of Chemistry
University of Denver, Denver, CO, 80208, USA

LETTERS TO THE EDITOR

Sir:

I wish to inform your readers that the educational journal, *Concepts in Magnetic Resonance*, seeks the submission of educational articles on EPR subjects. This journal, now in its third volume, seeks to address a perceived shortage of educational articles in the existing literature. In general, we seek any well-presented article that teaches magnetic resonance. The journal's interests include articles which cover specialized knowledge that is not completely, clearly, or cohesively covered in the existing literature; offer clear explanations of phenomena that are difficult to

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understand; research results that require a more extensive explanatory background treatment than is consistent with the more limited space available in a research journal. Examples of topics are: pulsed EPR, including its similarities and differences from pulsed NMR; an introduction to EPR imaging; the effects of field modulation and phase sensitive detection on the appearances of spectra; new fields of applications of EPR.

Articles are expected to maintain the highest standards of scientific and educational rigor and substance. In achieving that objective, the journal benefits from the insights of its distinguished Editorial Advisory Board. All manuscripts will be reviewed by eminent scientists before acceptance.

Members of the International EPR Society and other readers are encouraged to contact the editor of the journal:

Daniel D. Traficante, Senior Editor
Concepts in Magnetic Resonance
P.O. Box 1577
Kingston, RI 02881

Sir:

In the Equipment Exchange of a recent EPR Newsletter, Professor Berliner says that "... many Varians have been sent to the ironmonger." Please, colleagues, don't do that! As independent service agents and consultants for Varian and Bruker EPR equipment, it hurts us to hear that useful spectrometer parts are wasted! It is a near certainty that a better fate than the scrap heap awaits that old EPR spectrometer you're about to abandon. Almost all such instruments can be recycled as refurbished spectrometers or mined for parts. For example, see our ad in the Equipment Exchange.

Vanni Piccinotti

Assistenze Tecnica Risonanze Magnetiche
Via del Berignolo, 5
I 50141 Firenze, ITALY
Tel or FAX (39) 055 434841

Sir:

We wish to inform Newsletter readers that we are interested in testing the structure and dynamic properties of paramagnetic centers in new organic and bioorganic systems with wide-wave-range (30-2 mm) EPR. Our EPR spectroscopy group of the Institute of Chemical Physics (Chernogolovka) has the capability to study the nature, dynamics, etc. of paramagnetic centers in organic and biological systems over this frequency range.

Note that the 2 mm wave band allows the possibility of remarkably increasing sensitivity and resolution. More complete investigations of the origin and the character of the mobility of the paramagnetic center in such systems has become possible by application of the 2 mm EPR wave band. The device in which a 2,000 quality cavity (H_{011} mode) and samples of $1 \cdot 10^{-4}$ mm^3 size are used will be described in *J. Biochem. & Biophys. Methods*, 1991 (in press). Measurements can be done in absorption as well as dispersion at 90-330 K, with spectral identification.

Dr. V. I. Krinichnyi
Institute of Chemical Physics
USSR Academy of Science
Chernogolovka, 142 432 USSR
Telex: 346611 Atom; Fax: (7-905) 938-21-56
E Mail: ngm@kiae.su

TIPS & TECHNIQUES

TIP: CLEANING EPR TUBES - Nearly everyone who uses EPR spectroscopy faces the problem of either cleaning or discarding expensive quartz sample tubes. Sometimes, cheap disposable plastic or glass substitutes for quartz tubes can be used (as, for example, flat cells suggested by Eaton and Eaton in the EPR Newsletter, vol. 2, #2). However, standard quartz tubes can be cleaned very simply with the apparatus shown. It consists of a Bunsen flask, covered by a rubber stopper with two holes.

The long end of a J-shaped glass tube is inserted in one hole of the stopper while the short end, covered by a septum cap, lies inside a filter flask. A plastic cap tapered to an inner diameter small enough to firmly hold an EPR sample tube is inserted in the other hole. A 1.5 mm plastic centrifuge tube with the very bottom cut off, or a syringe cap with the sealed end cut off, for example, work

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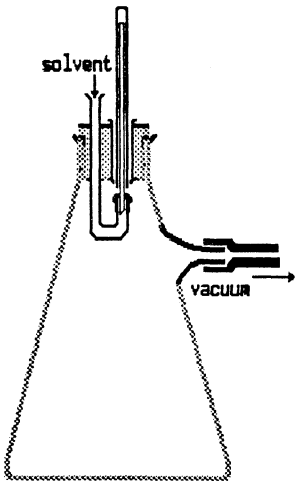
very well for standard size EPR tubes. A stainless steel needle or thin tube is inserted through the open end of the stopper, and rubber septum. The protruding length of the stainless steel tubing is adjusted to match the length of the EPR tube which is placed over the steel tubing and into the cap. The open end of the EPR tube should not touch the septum cap. Solvent introduced at the external open end of the J tube, typically from a squirt bottle, is drawn through the steel tube to the tip of the EPR tube, cleaning it effectively. Most dirty tubes can be cleaned quite rapidly (15-20 seconds) with organic and/or aqueous solvents.



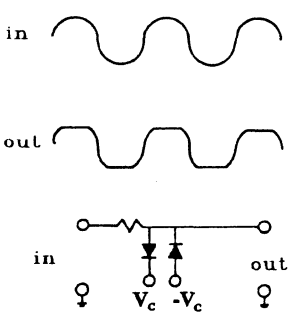
Another method, less elaborate and a little messy but quick and convenient, for cleaning EPR tubes is to connect a section of thin teflon tubing to an aspirator. With the aspirator always on, the tubing is inserted directly into the EPR tube. Solvents are introduced at the mouth of the tube, drawn to the tip, and out through the teflon tube.

Frank Auteri, Igor Kuriashkin, and Mark Nilges
Illinois EPR Research Center
University of Illinois at Urbana
505 S. Mathews, Urbana, IL 61801, USA

TECHNICAL NOTE: SATURATING ENDOR TRANSITIONS OF RANDOMLY ORDERED SAMPLES — Double ENDOR (or Triple) is a useful method for obtaining more ENDOR information by exploiting the interaction between nuclear spin systems. The technique entails the simultaneous irradiation of the sample with two rf fields, one of which is resonant for a given nuclear transition. The second rf field is the probe and is swept. The pumped transition is saturated, and this enhances the intensity of the other ENDOR lines in a manner that is indicative of the relative signs of the hyperfine constants (Möbius, 1979). Another variant of the technique is the spin decoupling experiment (Schweiger et al., 1980).

I have found that the technique yields less than satisfactory results with randomly oriented samples whose ENDOR lines generally exceed 200 Khz in width. In these cases I am only able to burn a hole in the pumped ENDOR transition since the bandwidth of my PTS synthesizer is about 4 times more narrow that the ENDOR line I wish to saturate. I have no trouble with the much more narrow lines characteristic of solution samples.

A solution to this problem that has so far shown promise is to increase the bandwidth of the PTS by introducing additional frequency components into the output waveform. A fairly easy way to do this involves the subtle alteration of the sine wave output of the PTS by passing it through a 'clipper' circuit (see accompanying figure). The amount of clipping, and hence the bandwidth, can be controlled by changing the supply voltage, V.



References: Möbius, in "Multiple Electron Resonance Spectroscopy," (Dorio/Freed, eds.) Plenum, 1979.; Schweiger et al., Mol. Phys. **41**, 63 (1980).

Chris Bender, Biotechnology Resource in Pulsed EPR Spectroscopy, Albert Einstein College of Medicine, Bronx, New York, 10461, USA

TECHNICAL INFORMATION: OXYGEN-SENSITIVE LITHIUM PHTHALOCYANINE SAMPLES - Lithium phthalocyanine is a stable free radical (up to 350°C). The EPR linewidth of this material increases linearly with the oxygen concentration from 50 mG to 1 Gauss for polycrystalline samples and 20 to 900 mG for single crystals. This oxygen effect is instantaneous and reversible. It can be used for many applications in EPR such as in vivo oxygen measurements, field frequency look asp for narrow line radicals, magnet inhomogeneity analysis, etc.

We have now decided to provide samples of this material which is currently produced in small amounts by our laboratory.

10 mg samples of lithium phthalocyanine single crystals will be prepared and distributed in a vacuum sealed tube by LETI.

There will be a $850 charge for each sample to cover the cost of synthesis, characterization (EPR spectrum), preparation and shipping of material. Special rates for bulk quantities might be arranged.

The technical contact is M. MOUSSAVI, LETI/DSYS/SESA; telephone: (33) 76 88 56 59; Fax: (33) 76 88 51 64. The administrative contact is M. ELMALEH, Director, LETI; telephone: (33) 76 88 44 21; Fax: (33) 76 88 51 83; Telex: F 320323.

Mehdi Moussavi, CEA-DTA-LETI, P.O. Box 85 X, 38041 Grenoble CEDEX, FRANCE

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TECHNICAL NOTE: CONSIDERATIONS ON EXPERIMENTAL CONDITIONS ASSOCIATED WITH THE STUDY OF VERY NARROW LINES AS ILLUSTRATED BY LOW LEVEL OXIMETRY BY EPR IN VIVO - The use of Lithium Phthalocyanine (LiPc) crystals to measure oxygen concentration in vivo by EPR appears to be a powerful new tool. It raises some experimental considerations that are not familiar to most investigators. In this communication we summarize some of the practical and conceptual aspects that have occurred in our use of LiPc in vivo and in model systems; they may apply to a number of other experimental uses of EPR as well.

Magnetic field stability and homogeneity

Most commercial EPR spectrometers have magnetic field resolution of 30 to 50 mG (Varian E-line Century series, etc.). The usual field control system, based on a Hall probe, provides a stabilized magnetic field with a maximum rms noise of about 2.5 mG, line ripple (peak-to-peak) of about 3 mG at the narrowest field set, and a drift of about 35mG/hour. In our experience, the X-band EPR spectrum from a LiPc crystal can be as narrow as 13 mG (using a 0.2 G scan over 30 sec. on a Varian E-112); however, a longer scan and/or averaging of spectra gives a much broader EPR line due to field instability. This situation is the same at lower frequencies (L-band, 1.0-1.2 GHz), limiting the ability to average and accumulate LiPc EPR spectra from experimental animals. One possible solution is to use a permanent magnet system with Helmholz coils for precision scanning of the field.

In principle, the homogeneity of the magnetic field in the sample volume should be one tenth of the observed line width; therefore, for a sample with dimensions less than 1mm and linewidth of 10-20mG, the homogeneity of the magnetic flux should be at least 10-20mG/cm. Our 12" Varian magnet system has a homogeneity in the center of the magnet gap of about 9 mG/cm which is sufficient for the study of the narrowest EPR line of a single LiPc crystal. However, its homogeneity is not sufficient to get an undistorted narrow signal (10-20mG) from a bulk sample with dimensions about 1cm. This is important for many biological applications such as measurements of extracellular and intracellular oxygen in suspensions of cells which use LiPc as an oxygen probe.

Effect of sidebands from modulation

It is known that when the frequency of the magnetic field modulation does not satisfy the inequality:

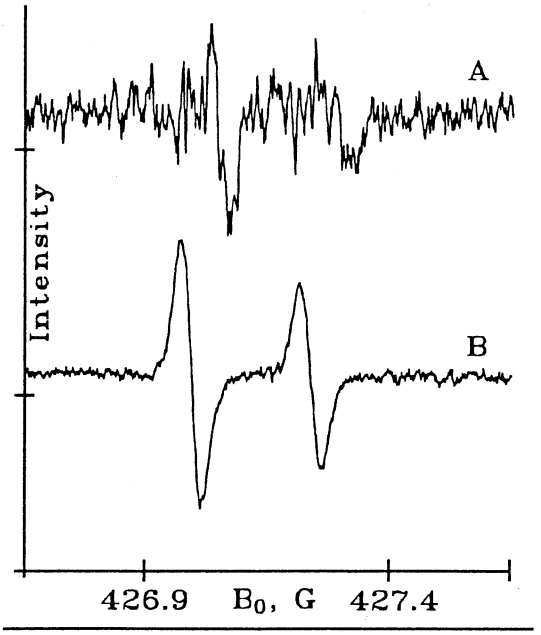
$$\omega_m/\gamma << \Delta H$$

Table 1. Linewidths in mG for various oxygen concentrations and modulation frequencies.

Oxygen, %	Modulation Frequency		
	1 kHz	25 kHz	100 kHz
0.0	17 ± 1	20 ± 1	56 ± 1
0.35	34 ± 1	36 ± 1	60 ± 1
1.4	88 ± 2	88 ± 2	93 ± 2
2.7	151 ± 3	151 ± 3	152 ± 3

(where ω_m is modulation frequency, γ is magnetogyric ratio, and ΔH is linewidth) sideband resonances separated by the field intervals ω_m/γ occur. We fixed an LiPc crystal in a TE_{102} cavity and measured the EPR linewidth at different oxygen concentrations by using modulation frequencies of 1, 25 and 100 kHz; the data are summarized in Table 1. The distortion at 25 kHz due to sidebands becomes negligible at 0.4% oxygen, but at 100kHz it is apparent up to 1.5%.

Figure 1. EPR signals from 2 LiPc crystals in living specimen with field gradient: (A) with AFC or (B) fixed microwave frequency.



Microwave frequency instability

A typical EPR spectrometer has an automatic-frequency-control (AFC) system which keeps the frequency of the microwave source "locked" to the frequency of the cavity giving the highest sensitivity for most EPR studies. For in vivo EPR experiments (usually at L-band) physiological movements of the animal, however, can change the resonant frequency of the surface

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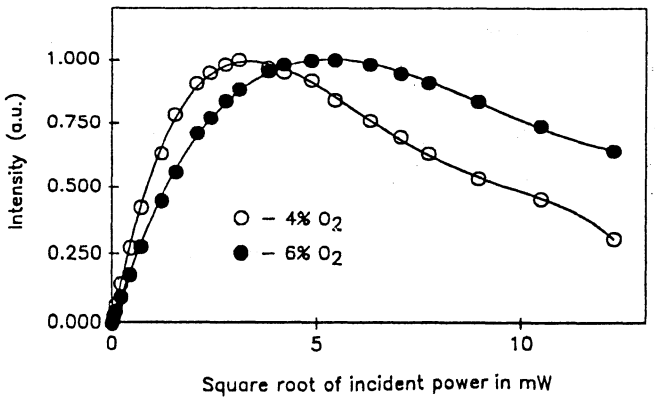
coil up to ± 1 MHz. The AFC system follows this change, and as a result, the resonance line moves as much as 700 mG or even more, causing very considerable distortion of the EPR signal (Figure 1A).

As a solution, one can switch off the AFC system and fix the frequency of microwave source. In such a setting the cavity resonant frequency may change slightly during the measurement and cause some changes in the signal intensity due to mixing of absorption and dispersion signals, but the field position of the signal remains the same. In such a way, it was possible to accumulate and average EPR signals in vivo from two LiPc crystals injected into rat heart (Figure 1B), when a moderate magnetic field gradient (0.3 G/cm) was applied to separate signals spatially without significant broadening of the spectra.

Figure 2. Saturation curves for EPR first derivative spectra from LiPc crystal in CHO cells perfused by gas mixtures of different oxygen content show possibility to use saturation phenomena to measure $[O_2]$.

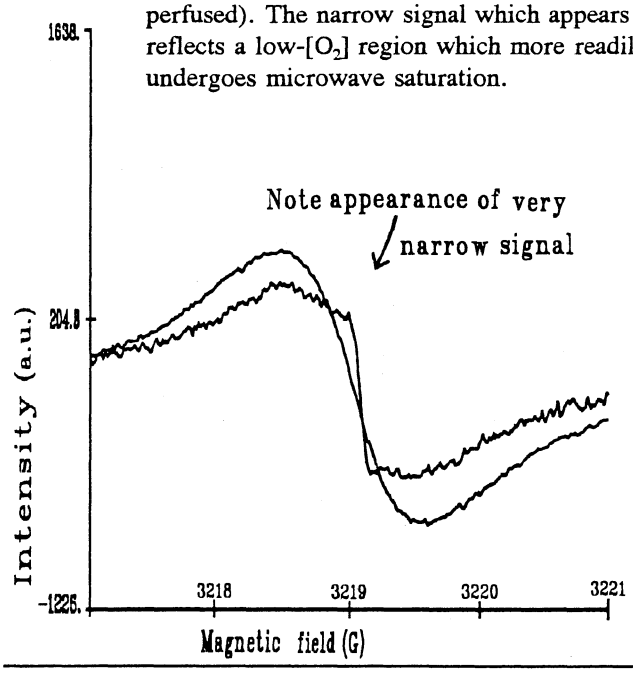


In order to improve stability, we have designed a new AFC system in which the cavity is electronically retuned to the fixed-frequency oscillator.

Sensitivity in studies in vivo

The key to achieving optimum sensitivity is to obtain a favorable relationship between the detector and the region of interest. When LiPc crystals are used as EPR oxygen sensors the region of interest is much smaller than in EPR imaging study (usually the whole animal). One very useful approach which helps in the attainment of a good filling factor, with suitable geometry in regard to the animal and the spectrometer, is the use of coupled circuits with a loop that can be placed around or near the region to be studied. This approach is especially useful for studies at low microwave frequencies, as demonstrated in Figure 1.

Figure 3. Experimental X-band EPR spectra from LiPc crystal stored in triolein for 1 week (air-perfused). The narrow signal which appears reflects a low-$[O_2]$ region which more readily undergoes microwave saturation.



CW saturation of LiPC

The EPR signal of LiPc readily undergoes microwave power saturation. Since this occurs in proportion to the oxygen concentration, it can be exploited to measure $[O_2]$ (Figure 2). However, this also can be a source of significant experimental error if it is not recognized. This is especially a possibility if the sample contains areas with the different oxygen concentrations; in this circumstance, the signal corresponding to low $[O_2]$ may be missed because it will be saturated more readily (Figure 3).

Conclusions

Available EPR spectrometers do not have sufficient magnetic field resolution for some potential in vivo EPR experiments using paramagnetic species with narrow line spectra, such as LiPc as an oxygen sensor. It is necessary to use a modulation frequency of about 10kHz or less for EPR oximetry by LiPc. An EPR detection scheme with fixed frequency is preferable for in vivo EPR oximetry by LiPc.

The use of LiPc as an EPR oxygen sensor in biological samples, including living animals, is a very attractive technique, but the full exploitation of LiPc requires the modification of existing EPR instruments and, ideally, the development of new machines designed specifically for the use of LiPc and similar substances (e.g. fusinite and artificial chars) for measurements in vivo.

A.I. Smirnov, T. Walczak, K.J. Liu, S.W. Norby, and H.M. Swartz, Illinois EPR Research Center

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BOOKS

New Books: The following two books recently arrived in the editor's office. The next issue of the Newsletter will provide more details about each of them.

EPR Imaging and In Vivo EPR, Gareth R. Eaton, Sandra S. Eaton, and Keiichi Ohno, editors. 330 pp. 1991. Published by CRC Press, Inc., 2000 Corporate Blvd., Boca Raton, FL, 33431, USA. This book contains twenty-six chapters, each authored by one or more scientists distinguished for their contributions to the title techniques.

Transition Ion Electron Paramagnetic Resonance, by John R. Pilbrow, Oxford University Press (Clarendon Press), Oxford, 1990. 737 pp.

PROCEEDINGS

Electron Magnetic Resonance of Disordered Systems (EMARDIS-89). Proceedings of the International Workshop on Electron Magnetic Resonance (EPR, ENDOR, ESE) of Disordered Systems held at Pravetz, Bulgaria on July 7-10, 1989. 400pp. Edited by N. D. Yordanov (Bulgarian Academy of Sciences). Published by World Scientific Publishing Co., Inc. (New York, Tel. 800-227-7582; London, Tel. (081) 4462461; Singapore, Tel. 3825663). US$99; £58.

Reminder: Each year the Journal of the Chemical Society *Faraday Transactions* publishes a special issue based on papers presented at the annual spring conference of the ESR Group of the Royal Society of Chemistry (United Kingdom). The issue containing papers from last year's conference (the 23rd International ESR Conference at Egham in March, 1990) has been published (*J. Chem. Soc. Faraday Trans.*, No. 19, 7th October 1990, pp. 3173-3379). Copies may be obtained *via* either Prof. M.C.R. Symons, CRC ESR Research Group, Dept. of Chemistry, Univ. of Leicester, University Rd, Leicester LE1 7RH, UK or Dr. Bob Parker at The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Rd., Cambridge CB4 4WF, UK. The next such publication will be based on this year's conference, which was held at Cirencester, Glous. during April, 1991.

NOTICES OF MEETINGS

TWENTY-THIRD SOUTHEASTERN MAGNETIC RESONANCE CONFERENCE at Georgia State University, Atlanta, Georgia, USA, October 3-5, 1991. Contributed papers are solicited from those interested in techniques and applications of both NMR and EPR. For information, call: William H. Nelson, (404) 651-3221.

THIRD INTERNATIONAL SYMPOSIUM ON ESR DOSIMETRY, National Institute of Standards and Technology (NIST), Gaithersburg, Maryland, USA. October 14-18, 1991. The Symposium is organized by the Ionizing Radiation Division of NIST, in cooperation with the China University of Science and Technology and the International Atomic Energy Agency. The scope of this timely series of international meetings is broad, but is bound coherently by the theme of electron spin resonance spectrometry applied to absorbed dose measurement and the analysis of a variety of ionizing radiation effects. These include applications of dosimetry for photon, electron, neutron, and heavy-particle radiations, studies of radiation accidents, clinical and bio-medicine, dating of archeological and geological specimens, radiation effects in materials, development of transfer and reference standards, preservation of foods, sterilization of medical devices, and the development and enhancement of ESR instrumentation. The primary aim of the Third Symposium is to bring together, from around the world, experts in all these topics, in order to address recent advances and to continue the improvement of applied dosimetry and materials analysis by EPR/ESR methods. It is also intended to provide a forum for the exchange of ideas by the leaders in this important and expanding field of radiation metrology. The official language of the symposium is English.

Location: **The Conference will be held at the National Institute of Standards and Technology, Gaithersburg, Maryland.**

Registration: A registration reception will be held on Sunday, October 13, 1991 at the Gaithersburg Marriott from 18:00 to 20:00 hours. Registration will be held at NIST at 8:00 hours, Monday October 14.

Program and Proceedings: The program chairman is Dr. A.F. Skinner, Chemistry Department, Williams College, Williamstown, MA 02167, USA. Telephone: 413/597-2323. FAX: 413/597-4116. **The proceedings will be published in the international journal, *Applied Radiation and Isotopes,*** according to its format and rules. The proceedings will not distinguish between oral and poster presentations. The full text of the manuscripts must be submitted by the last day of the Symposium.

Technical Exhibition: For information and applications, please contact Marc Desrosiers, Telephone: 301/975-5639; FAX: 301/869-7682.

Timing: Advance registration due: August 31, 1991; Hotel reservations due: October 1, 1991.

For details and to express interest in attending or submitting an abstract, contact Dr. Marc F. Desrosiers, NIST, Building 245, Room C214, Gaithersburg, MD, 20889, USA; Telephone: 301/975-5639; FAX: 301/869-7682.

THIRD INTERNATIONAL SYMPOSIUM ON SPIN TRAPPING AND AMINOXYL RADICAL CHEMISTRY, Kyoto, Japan, November 22-24, 1991. The three-day program at Kyoto International Congress Hall will include both talks by invited and contributed speakers and poster presentations. You are invited to submit an abstract on original research for consideration for inclusion in the program.

Deadline for submission of abstracts: ***On account of uncertainties caused by the recent Persian Gulf war, the deadline for receipt of abstracts has been extended.***

For details, contact the Secretary/Treasurer: Professor Toshikazu Yoshikawa, c/o 1st Department of Internal Medicine, Kyoto Prefectural University of Medicine, Kamigyo-ku, Kyoto 602, JAPAN. Telephone: 075-251-5505. FAX: 075-222-2718, or Keisuke Makino, President, Department of Polymer Science and Engineering, Kyoto Institute of Technology, Dakyo-ku, Kyoto 606, JAPAN. Telephone: 075-781-9447. FAX: 075-702-4404.

TWENTY-FIFTH ANNUAL INTERNATIONAL MEETING OF THE ELECTRON SPIN RESONANCE INTEREST GROUP OF THE ROYAL SOCIETY OF CHEMISTRY (UK), University of York. March 29 to April 2, 1992. This will be a joint meeting with the Society of Free Radical Research. The theme will be "Radicals in Organic and Bioorganic Systems." The scientific programme will address all aspects of ESR(EPR) of radicals in organic and bioorganic systems. The 1992 Bruker Lectureship is awarded to Professor George Feher, who will address the conference. Other plenary lectures will be given, including those by Dr. G.R. Buettner (Iowa), Dr. M.J. Davies (York), Prof. A.J. Hoff (Leiden), Dr. B.P. Roberts (London), Dr. A. Watts (Oxford), Dr. M.R. Wasielewski (Argonne), and Dr. C.J. Rhodes (London).

The deadline for registration and for submission of short papers and posters is January 2d, 1992. Attendance is limited to about 150.

The cost is expected to be about £200 for registration, accommodations, and social events. Accommodations in modern individual rooms in Derwent College are about 2 minutes' walk from the conference site. JOEL (UK) has provided 3 predoctoral bursaries to cover registration and accommodations costs. Limited funds also are available to help meet costs for a few attendees who have funding difficulties. For more details or registration forms, contact Dr. C. C. Rowlands, Secretary, Committee of the ESR Group, School of Chemistry and Applied Chemistry, Univ. of Wales, PO Box 912, Cardiff CF1 3TB, U.K.

VI INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE, Florence, Italy, June 22-26, 1992. The 6th International Symposium on Magnetic Resonance in Colloid and Interface Science will be held at the University of Florence, Florence, Italy, June 22-26, 1992. This is a continuation of the previous triennial conferences held on the same subject in San Francisco, USA (1976), Mentone, France (1979), Torun, Poland (1983), Münster, FRG (1986), and Newark, Delaware, USA (1989). This symposium has become a major event; its aim is to provide a forum for physicists, chemists, and biologists at which they can present and discuss their recent research in the field. The symposium program will include plenary lectures, invited reports, and original research contributions. The official language will be English. The proceedings will be published as full articles in a major scientific journal.

A wide spectrum of the applications of magnetic resonance spectroscopies to colloid and interface systems will be addressed. Among the topics to be covered:

- Adsorption, catalysis, and surface chemistry
- Dispersed systems, colloids, and gels
- Ordered systems

- Zeolite and silicate surfaces
- Intercalation compounds
- Biological systems
- Magnetic systems with specific surface properties
- New magnetic resonance techniques

Other topics can be included depending on the response.

All scientific activities will be held downtown in Florence and all reservations for accommodations will be handled by local travel office directly. Detailed information will be sent in further circulars. Florence is easily reached by train from the international airports of Pisa (1 hour), Rome (3 hours), and Milan (3 hours).

For more information, and to indicate whether you wish to attend, and whether you wish to present a paper, contact: Dr. M. Francesca Ottaviani, Department of Chemistry, University of Florence, Via G. Capponi 9, 5021 Firenze, ITALY.

ESR APPLIED METROLOGY WORKSHOPS, Japan. Prof. Motoji Ikeya (Department of Physics, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan) would like members of the international EPR community to know about these workshops. The first such workshop was organized in 1985, at the time of the First Symposium on ESR Dating, held at Yamaguchi, Japan; cf. the Proceedings of ESR Dating and Dosimetry (Ionics, Tokyo, 1985). Five annual workshops and symposia have been held. Proceedings are available at a cost. Members are mostly physicists, geologists, and some chemists who are interested in EPR applications to geology and archaeology as well as in the development of EPR imaging (or scanning EPR microscopy) and of portable EPR spectrometers. Publications - "Applied ESR Metrology" and Newsletters with English-language titles - are available to members (dues, $20/year). For details and Workshop schedules, contact Prof. Ikeya, whose organization wishes to exchange information with foreign EPR specialists and to encourage more involvement of geologists in the EPR community.

ELEVENTH ISMAR MEETING, Vancouver, British Columbia, CANADA, July 18-24, 1992. The International Society of Magnetic Resonance is preparing for its XIth international meeting to be held on the campus of the University of British Columbia, Vancouver, BC., Canada. The meeting is being organized by Professor Colin Fyfe, Department of Chemistry, University of British Columbia, 2036 Main Mall, Vancouver, BC, V6T 1Y6, CANADA. (Telephone 604-228-2847; FAX 604-228-2847).

TWENTY-NINTH INTERNATIONAL CONFERENCE ON COÖRDINATION CHEMISTRY, Lausanne, Switzerland, July 19-24, 1992. This conference will treat all aspects of coördination chemistry including magnetic resonance. There will be five plenary lectures to cover themes of general interest, to which ten microsymposia will be linked conceptually. Fifteen subjects will be themes for section lectures, and there will be poster sessions. The official conference language is English. Deadline for abstracts is January 10, 1992. For information, contact 29th ICCC Secretariat, AKM Congress Service, Clarastrasse 57, P.O. Box, CH-4005 Basel, Switzerland. (Telephone: ++41-61-691 51 11; Telefax: ++41-61-691 81 89).

FIFTEENTH INTERNATIONAL EPR SYMPOSIUM at the 34th Annual Rocky Mountain Conference, Denver, CO. August 2 to August 6, 1992. Reports of new developments in all areas of fundamental and applied EPR spectroscopy are invited. Topics selected for special focus at the 1992 Symposium include (a) the interface/overlap between NMR and EPR, to be organized by Hans Thomann; (b) ferromagnetic resonance, to be organized by Ira Goldberg; and (c) EPR in biological systems without added labels, probes, or spin traps. Related to the Workshop on the Future of EPR, for which the papers and posters of the Symposium serves as background, contributors are invited to emphasize (a) aspects of research that are limited by the state-of-the-art of commercial instruments and (b) new instrumental capabilities that provide new horizons for biomedical research.

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SECOND WORKSHOP ON THE FUTURE OF EPR. On Friday, August 7, 1992 at Denver, CO, USA, immediately following the 15th International EPR Symposium, the second Workshop on the Future of EPR will be held. The first Workshop was held in 1987 - see reports in Spectroscopy 3, 34 (1988), the Bulletin of Magnetic Resonance 10, 2 (1988), and the Newsletter vol. 1, no. 2, August 1988). The major aim of the Workshop will be to focus attention of researchers and instrument and software vendors on new EPR methodologies, instrumentation, and software that will enhance the power of EPR as a research resource. The formal presentations and panel discussions will clarify for researchers what is technically possible and what is likely to be successful in the marketplace. The predictions of the first Workshop will be tested against progress. Areas requiring critical breakthroughs will be identified to stimulate new research on resource development.

ICDIM 92 - INTERNATIONAL CONFERENCE ON DEFECTS IN INSULATING MATERIALS, Nordkirchen, GERMANY, August 16-22 1992. Organized by Prof. Dr. O. Kanert, Fachbereich Physik, Universität Dortmund, and Prof. Dr. J.-M. Spaeth, Fachbereich Physik, Universität Paderborn. For details, contact Prof. Dr. Spaeth at Universität-GH Paderborn, Fachbereich 6 Physik, Warburger Strasse 100, D4790 Paderborn, GERMANY, Telefax: +5251 60 3216, Phone: +5251 60 2745 or 2743, Telex: 936776 unipb d.

FIFTEENTH INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Jerusalem, ISRAEL, August 16 - 21, 1992. The meeting will consist of plenary sessions, symposia and poster sessions. The conference will cover major topics of current interest in Magnetic Resonance in Biological Systems: * Peptides and Proteins - Structure and Dynamics * Protein-Nucleic Acid Interactions * Stable Isotopes - Aided NMR Studies * NMR and Drug Design * Membranes and Lipid-Protein Interactions * Biologically Active Polysaccharides * Biological Solid State NMR * EPR: New Biological Applications and Imaging * Metalloproteins * Magnetic Resonance of Photosynthesis * NMR in Living Systems * Cellular Metabolism - Mammalian, Bacterial and Plant Cells * Quadrupolar Nuclei in Biological Systems * Advances in Magnetic Resonance Imaging and Microscopy * New Experimental Methods. For further details, contact the Organising Committee, G. Navon, Chairman, Tel-Aviv University, Tel-Aviv, A. Lapidot, The Weizmann Institute of Science, Rehovot, H. Levanon, The Hebrew University, Jerusalem, or the Secretariat, P.O. Box 3190, Tel-Aviv 61031, ISRAEL, Tel: 972-3-5271111 Telex: 33614, Cable TORUNI, Fax: 972-3-5239099.

POSITIONS OPEN

POSTDOCTORAL RESEARCH OFFICER POST IN PULSED E.S.R. A U.K. collaborative project on coal characterisation is being carried out, and the Essex contribution involves pulsed electron spin resonance, including echo techniques. We have constructed, in-house, a coherent electron spin echo spectrometer which is used for such studies. A research officer is required to carry out the ESR studies. The candidates for this position should preferably have experience in this technique, but a good understanding of coherent pulse spectroscopy is the essential requirement, and this might have been obtained in other fields such as solid state NMR. The appointment will probably be for one year, renewable for a further year, on the R.A.1A. scale.

Letters of application, with C.V. and two reference names, should be sent to:

Dr. David Greenslade
Department of Chemistry and Biological Chemistry
University of Essex
Wivenhoe Park
Colchester, CO4 3SQ
UNITED KINGDOM

EPR SPECIALIST. To supervise departmental EPR facility. The successful candidate should have experience in EPR spectroscopy and will be responsible for: coordination of research projects among faculty, postdocs and graduate students; routine system maintenance; training of users; acquisition and implementation of new software; development of new EPR techniques; interfacing with other campus units and local industry.
Applications and three letters of reference should be sent to:

Dr. Wayne Adickes, Operations Manager
Department of Chemistry
University of Arizona
Tucson, Arizona 85721

Equal Opportunity Affirmative Action Employer

POSTDOCTORAL POSITIONS AT THE UNIVERSITY OF DENVER.

Position A: The Postdoctoral Research Associate will design, perform, and interpret experiments involving spin-spin interactions in metallobiochemistry. A Ph.D., experience in handling metalloproteins, including purification, sample preparation, and characterization, and sufficient background with spectroscopy to learn the EPR techniques used in our lab, is required. Experience with spin-labeling and hemoglobin is desired.

Position B: The Postdoctoral Research Associate will design, perform, and interpret experiments involving spin-spin interactions in metallobiochemistry. A Ph.D. and experience in EPR is required. A knowledge of transition metal chemistry with experience in handling metalloproteins is desired.

Contact:

Gareth or Sandra Eaton
Department of Chemistry
University of Denver
Denver, CO 80208 USA
Phone: 303-871-2980 or 303-871-3102
Bitnet: geaton@ducair or seaton@ducair

NOTICES & REQUESTS

Request for Opinions: The Bruker EPR-Standard for Spectrum Storage and Transfer — At the Bruker Users Group Meeting in Denver (August, 1991), Bruker proposed a standard for EPR spectrum storage and transfer. The proposed standard is intended to permit worldwide exchange of EPR spectra in a hardware-independent computer-readable format. The concept includes both storage of spectrum data, experimental parameters, and context descriptors. In a layered concept, it would be possible to have device-specific information which would, however, not be needed for the minimal implementation of the standard. A 30-page printed booklet defining the proposed standard and giving examples of implementation was provided to attendees. Interested people are invited to obtain copies from Bruker and submit comments to Bruker and to the International EPR Society Committee on Software, Dr. Richard Cammack, Chairman. If this standard, as amended, meets with general approval, Bruker will incorporate it in the next software release for Bruker EPR spectrometers.

EQUIPMENT EXCHANGE

FOR SALE: VARIAN FIELD FREQUENCY LOCK.

A brand new, never-been-used Varian model E272B field frequency lock unit (8.9-9.6 Ghz) is offered for sale. The asking price is $3,900. Please contact:

Dean Wilcox
Department of Chemistry
Dartmouth College
Hanover, NH 03755, USA.
Telephone: 603-646-2874.
E-Mail: Dean.Wilcox@Dartmouth.EDU.

WANTED: EPR SPECTROMETER.

We are in need of a Varian E series spectrometer, preferably an E-4, in good condition. A klystron for an E-3 is also useful. To discuss either item, please contact:

Mark McNamee
Department of Biochemistry and Biophysics
University of California at Davis
Davis, CA, 95616, USA
Telephone: 916-752-6418.
FAX: 916-752-3085.

WANTED: MAGNETIC FIELD CONTROLLER.

We are seeking a replacement for the magnetic field controller, Model E-203, for our Varian E-9 EPR spectrometer. This instrument is no longer supported by the manufacturer. If anyone has such a module and is willing to part with it, please contact me at the following address:

J. Krzystek
Department of Chemistry BG-10
University of Washington
Seattle, WA, 98195, USA

Telephone: 206-543-2258. FAX: 206-685-8665.
E-Mail: krzystek@uwachem.BITNET or krzystek@uwchem.chem.washington.EDU

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AVAILABLE: VARIAN 620L BOARDS

A full set of boards for the Varian 620L computer is available from the Eatons at the University of Denver (BITNET SEATON@DUCAIR).

WANTED: PAR BOXCAR-AVERAGER.

We are seeking a dual-channel boxcar-averager, PAR Model 162. Please contact:

Dr. Günter Grampp
Institute of Physical Chemistry
University of Erlangen
Egerlandstraße 3
D-852 ERLANGEN, GERMANY

FOR SALE: A 15" VARIAN EPR MAGNET.

The University of Wisconsin-Madison Department of Chemistry has a 15-inch Varian magnet for sale or disposal. Heat exchanger and power supply are not included. The magnet, purchased in 1968, has been used solely for X-and Q-band EPR experiments and is in very good condition. The magnet runs at 20 kW power (10 kW per coil), sits on a 360° rotating base, and weighs 7700 lbs. The air gap is 76.2 mm (3 inches). The center of the air gap is 83 cm (32⅜ inches) above the floor. For further details, please contact:

Professor Tom Farrar [Tel. 608-262-6158] or
Dr. Richard Fronko [Tel. 608-262-3182]
Department of Chemistry
University of Wisconsin at Madison
Madison, WI 53706-1396, USA.

Fax: 608 262 0381. E-mail: fronko@chem.wisc.EDU

AVAILABLE: BOXCAR AVERAGER

An inexpensive boxcar averager designed for use in electron spin echo (ESE) spectrometers is available from the University of Denver. At slow repetition rates it gives about two orders of magnitude better S/N than the well-known PAR 162/164 boxcar.

Contact Richard Quine (303-871-2419).

AVAILABLE: VARIAN V 4500 MODULES

Modules for the Varian V4502 EPR spectrometer are available from the Eatons at the University of Denver (BITNET GEATON@DUCAIR).

FOR SALE: VARIAN EPR SPECTROMETER.

We have decided to sell our old Varian EPR spectrometer. This instrument will be available to the highest bidder on the basis of sealed bids as determined by Colorado law sometime early this fall. The instrument is described as follows:

E-109E EPR Spectrometer purchased new from Varian in 1979 with the following components: E-102 Microwave Bridge, V-7200 9 inch magnet, V-7600 Magnet Power Supply, Field/Frequency Lock Unit (21480) E-272B, Consul Century (917190-08), Field Control Unit E-203B, High Frequency Unit E-207, Oscilloscope Unit E-200B, E-231 Multi-Purpose Cavity, E-80A Recorder.

The Instrument is still in working condition. The signal-to-noise ratio is reasonable; however, the sensitivity is below specification based upon weak pitch. Sensitivity may benefit from a new crystal detector. More details are available to interested parties.The instrument is available for inspection in the Chemistry Building. The instrument will be available for pick up toward the end of October or in early November depending upon the installation of our new instrument.

Contact:

Tad H. Koch, Professor
Department of Chemistry & Biochemistry
University of Colorado at Boulder
Campus Box 215
Boulder, Colorado 80309-0215, USA
Tel: (303) 492-6193
E-Mail: "KOCH_T%CECHEM@VAXF.Colorado.EDU"

WANTED: USED VARIAN EPR X-BAND CAVITY.

We are in need of a Varian cavity, either TE_{102} or TM_{011} preferred, to fit an E-line or Century series EPR spectrometer. Many Varians have been sent to the ironmonger, but people usually keep their cavity for sentimental reasons. We

want to buy an old cavity. We will have it reconditioned, if necessary - as these are no longer sold by Varian. If you can help, please contact:

Professor Lawrence J. Berliner
Dept. of Chemistry
The Ohio State University
120 West 18th Ave.
Columbus, OH 43210-1173, USA.
Telephone: 614-292-0134; E-Mail: BERLINER@LIVERS.MPS.OHIO-STATE.EDU.

AVAILABLE: VARIAN FIELD SCAN CONTROLLER CARDS

Any Varian magnetic field controller can be modified to permit control of the magnetic field by a computer. A fully documented printed circuit card and controller modifications is available from the University of Denver.

Contact Richard Quine (303-871-2419).

WANTED: SURPLUS EQUIPMENT, PARTS, BOOKS, JOURNALS.

My Letter to the Editor in a previous issue (vol. 3, #1, January, 1991) explains how our institute has become sadly depleted in equipment and supplies in recent years. We are grateful to anyone who can help us by giving away surplus equipment (or parts) for either EPR or NMR. Also, we could use surplus books or journals in the field (EPR and NMR) or in closely related areas (physical chemistry). Concerning transportation, we would appreciate help but shall find a way to pay if necessary.

Dr. Horia Caldararu
Romanian Academy
Institute of Physical Chemistry
Splaiul Independentei 202
77208 Bucharest, ROMANIA.

WANTED: EPR SPECTROMETER.

We are looking for a Varian E-Line Century series spectrometer to purchase. An E-109 is preferable, but any working Century series model would be acceptable. Contact:

Richard Lokken or Mark Wolski
Medical Advances, Inc.
10431 W. Watertown Plank Rd.
P.O. Box 26425
Milwaukee, WI 53226-0425, USA.

Telephone: (414) 258-3808
FAX: (414) 258 4931

APPENDIX

REVISED CONSTITUTION

Members may vote on this Constitution (see enclosed ballot).

Constitution of the International EPR(ESR) Society

Article I. Name

The name of this Society shall be the International EPR(ESR) Society, hereinafter called "the SOCIETY".

Article II. Objectives

The objectives of the SOCIETY shall be:

(a) To advance and stimulate knowledge of the principles, recent developments, and applications of Electron Paramagnetic Resonance (EPR) spectroscopy and related techniques;
(b) To communicate information and news about EPR and its applications among its members and to serve as a clearing house on EPR among scientists in academia, government, and industry;
(c) To encourage appropriate and useful application of EPR in a wide variety of fields including physics, chemistry, biology, medicine, geology, and other disciplines;
(d) To provide a central voice for the EPR community by promoting support for research and development utilizing EPR through interaction with other societies, government funding agencies, and international scientific organizations;
(e) To stimulate educational programs on EPR and related spectroscopies through organization of schools, workshops, courses, and seminars;
(f) To foster scientific interaction among EPR spectroscopists throughout the world and to engage in any lawful activities which further this end.

The SOCIETY is to be international in scope and is to cover the entire range of disciplines that use EPR.

Article III. Membership

1. The SOCIETY shall consist of Regular Members, Student Members, Associate Members, and Institution Members.
(a) Regular Members. Any person who has made a personal contribution to the advancement of EPR or its applications shall be eligible to become a Regular Member.

(b) Student Members. Any student actively engaged in EPR research or its applications shall be eligible to become a Student Member.

(c) Postdoctoral Members. Any person engaged in EPR research or its applications and holding a postdoctoral position shall be eligible for this status of membership for up to three years.

(d) Associate Members. Any person supporting the objectives of the SOCIETY, and who is not eligible as a Regular Member, shall be eligible to become an Associate Member.

(e) Emeritus Members. Any person whose professional activities qualify him/her for status as a Regular Member and who holds emeritus status or the equivalent.

(f) Institutional Members. Any institution supporting the objectives of the SOCIETY shall be eligible to become an Institutional Member.

2. Admissions. Persons satisfying the required conditions may become Members of the SOCIETY, in the appropriate category, on making written application to the Secretary of the SOCIETY and on paying the membership fee established for that category.

3. Rights and Privileges. All Members of the SOCIETY shall have the right to attend any meeting of the SOCIETY and to participate in the discussion, to hold office, and to vote on candidates for office and on matters of policy.

4. Termination of Membership. Membership of the SOCIETY may be terminated by resignation in writing, or, as provided in Article VIII, by nonpayment of membership fees.

Article IV. Council and Officers

1. Council. The management of the SOCIETY shall be vested in a Council consisting of the President, the Vice President, the immediate Past President, the Secretary, the Treasurer, as Officers, and elected Council members. The Council shall consist of not less than 20 members nor more than 40 members, plus the Officers. The composition of the Council shall provide for a balanced international and geographical distribution, as well as a proper balance of researchers in different branches of EPR.

The term of office of elected members of the Council shall be three years, subject to re-election for no more than one further period of three years.

The Council shall meet at least once per year, normally during a suitable scientific conference. Business may be transacted by mail between meetings. The Council will determine its own rules of conduct of business.

2. President. The President shall be the chief executive officer of the SOCIETY and shall chair meetings of the Council. The President shall direct the general affairs of the SOCIETY and execute such other duties as may be determined by the Council. The term of office of the President shall be three years, and any person may serve only one term as President, except that if the Vice President succeeds to the office as a result of the death, disability, or resignation of the President, such service shall not be counted as a regular term.

3. Vice President. The Vice President will carry out any duties assigned by the President or Council, will carry out the duties of the President in the absence of that person, and shall assume the office of President in the event of the death, disability, or resignation of the President. The term of office shall be three years.

4. Treasurer. The Treasurer shall have custody of all funds of the SOCIETY, collect all dues and disburse funds in accordance with the direction of the Council. The Treasurer shall maintain proper books of accounts for the SOCIETY. The term of office of the Treasurer shall be three years, subject to re-election for no more than two further periods of three years.

6. Executive Committee. The SOCIETY's day-to-day affairs shall be conducted by the Executive Committee in accordance with the general directions of the Council. The Executive Committee shall consist of the President, the immediate Past President, the Vice President, the Secretary, and the Treasurer.

Article V. General Meetings

1. General Meetings of the SOCIETY shall be held during suitable scientific meetings at least once every three years. All participants at that scientific meeting may attend and speak at such meetings; only members of the SOCIETY may vote. The President of the SOCIETY, or the President's designate, shall chair any General Meeting.

2. Quorum. The Quorum for a General Meeting shall be at least 20 Members in attendance. By decision of the Council any matter deemed to be of major impact on the SOCIETY shall be submitted to the Membership for a mail ballot.

Article VI. Standing Committees

1. In addition to the Executive Committee, there shall be the following Standing Committees:

Nominating Committee
Elections Committee
Awards Committee

The Council may appoint other Committees as required. Recommendations concerning Conferences, Symposia, Courses, and Schools shall be the business of the Executive Committee. A majority of a Committee shall constitute a quorum for business. All

recommendations of the Committees are subject to approval by the Council.

2. Nominating Committee. The Nominating Committee shall consist of at least five persons appointed by the Council to serve for three years. The immediate Past President shall be an automatic member of the Nominating Committee and shall chair its meetings. The members of the Nominating Committee shall have an international distribution and reflect a range of scientific aspects of EPR. Members of the Nominating Committee may not be candidates in the elections as officers and of members of the Council. They shall have particular regard to a geographical and international distribution of nominees and to balance of scientific aspects of EPR. In particular, successive Presidents should come from different countries. Nominations may also be received by petition signed by at least five Regular Members and accompanied by a written statement from the nominee of willingness to serve.

3. Elections Committee. The Elections Committee shall consist of three members from different institutions appointed by the Council to serve for three years. Members of the Elections Committee may not be candidates in the elections as Officers of the SOCIETY. The Elections Committee shall conduct all elections and mail ballots of the SOCIETY.

4. Awards Committee. The Awards Committee shall consist of five members appointed by the Council to serve for three-year terms. Any member of this Committee may be appointed by only one additional three-year term. The Awards Committee shall administer all awards of the SOCIETY, shall solicit nominations for awards, and decide on winners of awards. No member of the Committee may, while on this committee, be a nominee for any award of the SOCIETY.

Article VII. Elections

1. The Members shall vote on ballot papers distributed to them by the Secretary. The ballot papers shall be returned to the Office of the SOCIETY in signed, sealed envelopes by mail. Mail ballots must be received prior to a date specified by the Secretary after consultation with the Elections Committee.

2. On receipt of all the ballots for an election, the Secretary shall turn over the ballots to the Elections Committee, which shall open the ballots, tally the votes, and prepare a report of the election, which shall be circulated to members of the SOCIETY.

3. Elections will be held every three years. In the event that an Officer of the SOCIETY of the Officers and Council becomes vacant due to any cause, the Nomination Committee will nominate a candidate or candidates and a special election will be carried out as soon as feasible.

Article VIII. Fees

1. Fees. The fees (annual subscription) for the various membership categories of the SOCIETY shall be determined by the Council.

2. Waiver of Fees. The Treasurer may waive the membership fee of a Member for good reason. If because of currency restrictions in a Member's country, Members shall have the option to pay their dues in the currency of their country to a Committee in that country that has been established by the SOCIETY.

3. Nonpayment of Fees. A Member who has not paid the appropriate membership fee by three months after the expiration of the membership period shall be sent a notice of pending termination of membership. If the fee has not been paid by six months after the expiration of the membership period, that person shall cease to be a Member of the SOCIETY.

Article IX. Miscellaneous Provisions

1. Incorporation. The Council may arrange for the SOCIETY to be incorporated in a particular country or state, if it is deemed advantageous to do so. If, for the purposes of incorporation, the SOCIETY requires a Board of Directors or Trustees, then the members of the Council shall be the Directors or Trustees.

2. Office of the SOCIETY. The Office of the SOCIETY shall be established at an address determined by the Council.

3. The Financial Year of the SOCIETY shall be the same as the calendar year.

4. Audit. The accounts of the SOCIETY shall be reviewed annually by appropriate independent professionals. A report shall be presented to the Council and reported to the Membership.

5. Divisions. The Council may approve the formation of Divisions to encompass specialized areas of scientific interest within the EPR field, and shall determine the conditions of operation of such Divisions.

6. Affiliations. The SOCIETY may maintain affiliations with other appropriate organizations as determined by the Council.

7. Amendments. Any provision in the constitution may be amended, or repealed by two-thirds majority of the Members casting ballots in a mail ballot, except that for the first two years of the existence of the SOCIETY a simple majority of those voting will be sufficient.

8. Dissolution. The SOCIETY may be dissolved by a two-thirds majority of those Members casting ballots in a mail ballot. The assets of the SOCIETY will be distributed in a manner determined by the Council and in accordance with the provisions of the Articles of Incorporation, in a manner that is consistent with the non-profit status of the SOCIETY.

EPR NEWSLETTER

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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 Centers for EPR/ESR spectroscopy in the USA. These Centers are sponsored by the Division of Research Resources, U.S. National Institutes of Health:

National Biomedical ESR Center, Prof. James S. Hyde, Director. Medical College of Wisconsin, MACC Fund Research Center Building, 8701 Watertown Plank Road, Milwaukee, Wisconsin 53226, USA. ☎: 414-266-4000. FAX: 414-266-4007. E-Mail (INTERNET): "felixc@uvax01.biostat.mcw.edu".

Biotechnology Resource in Pulsed EPR Spectroscopy, Prof. Jack Peisach, Director. Albert Einstein College of Medicine, Department of Molecular Pharmacology, 1300 Morris Park Avenue, Bronx, New York 10461, USA. ☎: 212-430-2175. FAX: 212-829-8705. E-mail (INTERNET): "peisach@aecom.yu.edu".

Illinois EPR Research Center (IERC), Prof. R. Linn Belford, Director; Prof. Harold M. Swartz, Co-Director; Prof. Robert B. Clarkson, Associate Director; Prof. Peter G. Debrunner, co-Principal Investigator; other senior staff: Prof. Mark J. Nilges, Dr. Alex Smirnov, Laboratory Manager, and Dr. Tadeusz Walczak; University of Illinois at Urbana-Champaign, 190 Medical Sciences Building, 506 South Mathews Ave., Urbana, Illinois, 61801, USA. (IERC operates a satellite site for EPR *in vivo* at Dartmouth University in Hanover, New Hampshire; see announcement in this issue.) ☎: 217-244-1186. FAX: 217-333-8868. E-mail: belford@uiucscs.BITNET or ierc@uiucvmd.bitnet.

These Centers, which were described in our first issue (Volume 1, #1), cooperate to facilitate research requiring EPR-related techniques. Prospective collaborative or service users may contact the staff at any of the Centers.

IN THIS ISSUE

HOW TO REACH US — To communicate about the EPR Newsletter or submit material, contact R. Linn Belford, Editor or Becky Gallivan, Editorial Assistant, at IERC (address above).

PUBLICATION AND DISTRIBUTION: *This is a public issue. EPR Newsletters are published quarterly for the members (ca. 1000) of the International EPR (ESR) Society. One issue (the winter issue in 1991) each year is public, which the (ca. 2000) nonmembers on our mailing list also receive. To be assured of consideration for the Spring issue, material to be published (articles, letters to the editor, ads, notices, etc.; see the Editorial) should arrive by the end of February, and similarly for the other issues at 3 month intervals. Copy arriving later may be published immediately but is more likely to be held for the subsequent issue. Submissions should indicate whether the material ought to run in more than one issue. In the absence of such indication, ads and some notices automatically will be repeated in one or more subsequent issues if space permits. It is helpful if paper copy is accompanied by text and graphics (for example, .PCX files) submitted on IBM-compatible computer diskette or transmitted by E-mail. Submitted copy may be edited. Normally, proofs are not sent to the author.*

INTERNATIONAL EPR SOCIETY REPORTS

MESSAGE FROM THE PRESIDENT

The Society continues to develop. We have over 900 members from 38 countries and 10 corporate members. We initiated travel awards for students (see below), and our awards committee selected George Feher (University of California at San Diego) for the first senior award of the Society (see the Fall, 1991 issue, Volume 3, No. 3). Prof. Feher will accept this honor at the next Denver EPR Symposium in August, 1992; see "Notices of Meetings" section below.

We cordially invite all our nonmember readers to join the Society. Members from all disciplines that use EPR (ESR, EMR, ENDOR, ESE, FMR, CESR, etc.) including biochemists, chemists, biologists, physicists, geologists, engineers, and physicians are welcome. A membership application form is included at the end of this issue. Please also encourage students and colleagues to join you in the Society. The greater our membership, the more effect we are likely to have in the service of EPR(ESR) and its practitioners.

Harold M. Swartz, President

CONFERENCE TRAVEL GRANTS FOR STUDENTS - CALL FOR APPLICATIONS AND CONTEST ENTRIES:

The International EPR Society provides travel grants to students needing to journey a considerable distance to present EPR-related work at an appropriate conference

(see "Notices of Meetings" in each Newsletter). A student may apply for an award of up to $250(US). The application should be brief - just a page or two with a little information about the student and a statement of reasons for the student's wishing to attend and present work at the particular meeting specified - and should include the endorsement of the student's research advisor. The Awards Committee will make the decisions and announce results to all applicants. *Send applications to Prof. L. J. Berliner, Chair, IES Awards Committee, Dept. of Chemistry, The Ohio State University, 120 West 18th Ave., Columbus, OH 43210-1173, USA. Telephone: 614-292-0134; E-Mail: berliner@livers.mps.ohio-state.edu*

The Awards Committee also has decided to offer a travel grant to a student designated by the winner of the contest entitled **"Who has the oldest working commercial EPR spectrometer?"** *Profs. Gareth and Sandra Eaton announced this contest in the previous edition of the EPR Newsletter (v. 3, #3, Fall, 1991). Contest entries should be sent to them at the University of Denver, Denver, CO, 80208, USA.* A current weak-pitch S/N test spectrum and a list of the spectrometer modules (or complete description of the spectrometer system) used to obtain the spectrum, must be submitted as proof that the spectrometer is still functioning. To establish instrument age please indicate the date of purchase and give the serial number for the console. (Hint - since there are still many EPR spectrometers of the Varian V4500-series vintage still operating, an E-3 will not win the contest!)

CORPORATE MEMBERSHIPS: Corporate members are welcome to the Society. There are four classes of corporate membership carrying different fees and privileges. Currently, there are ten corporate members; see their display boxes in each issue of the EPR Newsletter.

EDITORIAL

What a delight it was to hear that Prof. Richard R. Ernst (ETH, Zürich), our esteemed fellow resonator and a Councilor of our EPR Society, had been named to receive the Nobel Prize! Congratulations, Richard!

As to whether there should be a preferred name for our discipline(s), and if so what it should be (EPR, ESR, EMR?), we continue to hear from colleagues. For example, David Westmoreland, in a Letter to the Editor in this issue, raises a practical question. He writes that he has had some trouble in computerized literature searching because "EPR" is an much-used abbreviation for a common polymer. Other abbreviations may also be confusing, depending upon the literature database(s) utilized, as there are dozens of databases available. For example, in medicine, ESR commonly stands for "Erythrocyte Sedimentation Rate." In our experience, a computerized literature search should be fairly sophisticated in order to net most of the pertinent citations but exclude voluminous lists of irrelevant papers. It needs to be organized with well-thought-out complex queries. There should be ways to structure such searches to yield the appropriate retrievals regardless of the accidental (but perhaps extensive) irrelevant use of our favorite acronym. Perhaps one of our readers who is skilled in the art could provide us with a useful exposition on getting what one wants (and not much more) from a literature search in EPR.

To our readers: You are needed to contribute material of interest to others in the EPR community. The **"Tips and Techniques"** section started last year (Volume 2, #2) is an example. Here, we print technical information or discussions. Most such discussions would be inappropriate, by form or content, to submit to a regular scientific journal but could be of considerable value to other EPR practitioners. Acceptable

material can include reminders of technical tips which were once published in some context but which have not been widely enough noticed. **Articles** and **Notices** containing news, information, and discussions of interest to the EPR community are welcome. Articles of the sort usually published in regular journals are not within the scope of the EPR Newsletter. **Letters to the Editor** may express opinions, raise issues, or simply inform. **Requests for information** are printed. We also publish notices of **job openings** and of **positions sought** in the field of EPR and have a very active **equipment/supplies exchange** section, where those who wish to sell, give away, trade, or acquire surplus equipment of interest to EPR spectroscopists may place announcements. We urge readers to provide timely information on **meetings to be held**, on published **proceedings** of meetings, and on recently or soon-to-be published **books** or **conference proceedings** pertaining to EPR; we shall publish such information in the "Notices of Meetings," "Books," and "Proceedings" sections. Brief reports of recent meetings are also welcome. Some **advertising** material will be accepted from companies which affiliate with the International EPR Society, and such corporate members are invited to submit **company profiles** for publication. What else shall be published in the EPR Newsletter? You decide; you are welcome to suggest other kinds of items and help us get the copy for them.

R. Linn Belford, Editor

WHAT IS THE SIGNAL/NOISE OF AN EPR SPECTROMETER?

by
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How should we define the S/N performance of a modern spectrometer system with the variety of new resonators, the increasing use of frequencies away from the "standard" X-band,and the increasing use of digital computers for data acquisition? This brief essay suggests an approach to using a weak pitch sample as a signal-to-noise standard in the multifrequency future.

A crucial issue in discussions of S/N criteria is a clear statement of what one wishes to measure. Very different "S/N" measurement methodologies would be used, for example, to report a measure of the source noise (amplitude or phase noise) or a measure of the S/N one could expect in a single scan with a sample as weak as weak pitch.

Present situation

Since most interesting experiments push instrumentation to its limits, especially with respect to signal-to-noise ratio, this ratio has been one of the most important benchmarks for magnetic resonance instrumentation. Long, long ago Varian Associates specified the signal-to-noise (S/N) ratio of a standard sample of pitch as a criterion of quality of an EPR spectrometer. Generations of spectroscopists have embraced this "weak pitch" standard (0.0035% pitch in KCl).

Initially, Varian simply stated that one should be able to obtain S/N > 20 for weak pitch, and did not specify the conditions of the measurement, other than to warn that everything had to be tuned very well to achieve this S/N, and to imply use of 1 sec "integration time." Modern X-band EPR spectrometers typically achieve a S/N of 450:1 on a similar weak pitch sample.

The improving S/N performance of each generation of X-band spectrometer was due to both major innovations, such as the reference arm bridge, use of a circulator, and replacement of vacuum tubes by solid state electronics, and general improvement of the electrical and mechanical features of the spectrometer. One consequence of these improvements is that even the specification of a "1 sec time constant" has had a changing meaning. The filter circuits in the new Bruker spectrometers are designed to give a true 1 sec time constant for a 1 sec console setting. The Bruker filter circuits are different from the Varian Century Series, which in turn were different from the E-line, etc. Each generation did a better job of suppressing high frequency noise at the same time-constant setting.

The protocol that is currently used by instrument manufacturers to measure the S/N for weak pitch is as follows:

1. Record signal at 12 Db (12.5 mW) microwave power, 6.3 G modulation amplitude, 1 sec. time constant, 200 sec. scan time,and 50 G scan width.
2. Record noise at same settings as for the signal except that the microwave power is increased to 0 Db (200 mW), the center field is increased by 100 G, and the scan width is set to 0. G.
3. Measure the peak-to-peak signal height for the signal and multiply by 4 (the square root of 200/12.5) to extrapolate the signal intensity to that which would be observed at 200 mW if the signal did not saturate. This is the value of S.
4. Measure the peak to peak excursion of the noise and divide by 2.5 to estimate the root-mean-square (rms) noise. This is the value of N.
5. Divide S by N to define the signal-to-noise ratio.
6. Apply a correction factor that accounts for differences in preparations of weak pitch samples.

Several features of this measurement should be noted.

1. The linewidth of the weak pitch signal is 1.5 to 2.0 G, depending on the sample. The current protocol uses a modulation amplitude that distorts the lineshape. This is desirable to make the S/N measurement insensitive to small variations in linewidth from one sample to another.
2. The microwave power at which the S/N check is done is in a region in which signal amplitude is not proportional to square root of power, i.e. there is some saturation of the signal.
3. The weak pitch signal would be severely saturated at 200 mW so the extrapolation to 200 mW is a hypothetical signal-to-noise.
4. The selection of a noise trace at 200 mW presumes that the source noise is limiting.

Suggestion for the future

We suggest continued use of weak pitch, both for historical reasons and because it remains a S/N challenge for new experimental methods. If the standard sealed weak pitch sample is geometrically incompatible with a particular resonator, one could prepare a secondary standard, such as powdered coal in KCl, with due care concerning all of the well-known problems in quantitative EPR and the time-dependence of carbonaceous samples exposed to the atmosphere.

It is incumbent upon the experimenter to demonstrate the validity of each of the assumptions built into the "standard" weak pitch S/N methods described in the manuals for commercial instruments. Specifically, one must check the power saturation behavior for a new spectrometer and resonator combination. The pitch signal should be obtained at a power level of only limited saturation. On a newly designed system the source noise or detector noise may or may not be the

limiting noise. In a well-designed system the first detector amplifier should define the noise floor, and the measured noise should be independent of source attenuation. One certainly should not extrapolate the signal to 200 mW unless that power is actually available at the resonator, and was used for the noise measurement. It may be most meaningful to measure noise at the same power as that used for the pitch signal. The modulation amplitude should be that appropriate to the sample. No factor should be applied to "correct" it to a higher modulation amplitude than was actually used. The signal-to-noise specification would then be an accurate reflection of the performance that a user could expect for a sample with power saturation behavior similar to that of the pitch standard. If a 6.3 G modulation is still used for the weak pitch standard, a user would need to recognize that the specified signal-to-noise ratio could only be achieved if distortion by over-modulation is acceptable.

An exception to the above statements about a "well-designed system" would be the case in which a design criterion was maximum power at the sample, regardless of noise. Some spectrometers include a power amplifier on the output of the microwave source,to ensure sufficient power for types of experiments in which saturation of the EPR signal is needed. In such cases, the source plus amplifier noise may be the limiting noise in the system.

We need to have a separate criterion for the noise characteristics of a spectrometer. This test could be the ratio of the noise at full power to the noise at the power level selected for the weak pitch test.

Since a computer is an inherent part of a modern EPR spectrometer, the measurement of S/N should be made on computer-collected data. This can have the advantage of some degree of additional filtering in the A/D conversion, but it also tests noise problems with grounding, glitches, etc., in the interface. The computer should be used to calculate a true rms noise. This rms noise should be used instead of a peak-peak noise divided by the traditional factor of 2.5, in order to remove the subjectivity from the measurement. (E.g., how much of the noise trace do you measure, how many peaks do you ignore in selecting the "peak-to-peak" noise excursion?)

WEAK PITCH S/N CRITERION - A PROPOSAL

1. Measure signal and noise at the same microwave power, at a known degree of saturation of the pitch sample.
2. Measure signal and noise at the same time constant, modulation amplitude, and sweep time.
3. Offset magnetic field from resonance and set sweep width to zero to record the noise trace.
4. Measure the peak-to-peak signal amplitude with no extrapolation.
5. Measure noise over the entire time trace and use the computer to calculate rms noise.

$$S/N = \frac{\text{peak-to-peak signal amplitude}}{\text{rms noise}}$$

6. Measure noise at full spectrometer power with all other settings the same as in part 3 and calculate a second ratio that we call full-power-to-test-power noise ratio (FPTPNR):

$$FPTPNR = \frac{\text{Noise at full power}}{\text{noise at power used for weak pitch test}}$$

We would be glad to receive comments rebutting or refining these suggestions. Please write to us or send E-mail (Bitnet): **geaton@ducair** or **seaton@ducair.**

LETTERS TO THE EDITOR

Sir:

I just wanted to comment on one aspect of the EPR versus ESR nomenclature question which I haven't seen raised, namely the practical aspect of literature searching. I have not noticed any problem with ESR when literature searching, but there is a major problem with EPR which also stands for ethylene-propylene rubber and has a voluminous literature. Even the CA Selects on ESR allows some false hits to get through in this regard. Is there is a solution to this? If so, I would like to know what it is; otherwise, it seems to me that this very

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practical matter could weigh in favor of the use of ESR rather than EPR.

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Sir:

I would like to offer some questions for readers of the EPR Newsletter to think about and would like to hear opinions on these matters from any readers who would care to respond.

1. We are considering organizing an international EPR-related conference to be held in Hong Kong during the summer of 1993 or later. There are two possibilities for this conference. One is a worldwide INTERNATIONAL CONFERENCE ON THE CONCEPT OF THE SPIN HAMILTONIAN IN PHYSICS AND CHEMISTRY OF MATERIALS. This conference would aim to bring together active researchers from different parts of the world and having a variety of expertise. Probable topics would include the following: (a) spin Hamiltonian in physics of semiconductors, laser host materials, and high-T_c superconductors, (b) microscopic theories of the spin Hamiltonian, (c) single-ion magnetic anisotropy in magnetic materials, (d) spin Hamiltonian and magnetic susceptibility, (e) large zfs in metalloproteins, (f) low-symmetry effects in EPR and related areas, (f) superposition model in EPR and related analysis, (g) industrial applications of EPR, and (h) new trends (e.g., spectroscopic studies at laser frequencies, high-field EPR, EPR of disordered materials, random field and random anisotropy models in magnetism, Monte Carlo simulations and spin Hamiltonian analysis).

The alternative is a regional EPR WORKSHOP FOR RESEARCHERS FROM THE ASIA-PACIFIC REGION, aiming to foster regional collaboration and facilitate exchange of ideas, samples, and resources within the Asia-Pacific EPR community. Formation of a regional EPR Society or Committee to be affiliated with the International EPR Society (IEPRS) could be considered during the workshop.

If you wish to comment on either conference possibility, please contact me for the "International Conferences" draft proposal and questionnaire.

2. In a recent paper (C. Rudowicz, Bull. Mag. Resonance **12**, 170-182, 1991), I made some proposals for the future of computers in EPR studies relating to (a) computer programs, (b) possible EPR database, and (c) EPR communication network. In this connection, I have prepared for the IEPRS a SUBMISSION ON ESTABLISHMENT OF A COMPUTERIZED EPR-RELATED DATABASE and an accompanying questionnaire. On request, I will be glad to send interested colleagues copies of these items.

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Sir:

As medical professionals, we would like to point out that EPR(ESR) has a number of uses in the investigation of biological materials taken from the human body, to encourage others to develop such uses, and to illustrate this with an example - our study of synovial fluid (SF) in patients with rheumatoid arthritis (RA) and osteoarthrosis deformans (OD). These are serious diseases, but many aspects of their development are as yet unknown.

X-band ESR of SF frozen to liquid N_2 temperature detected Fe^{+3} ($g=4.3$), Cu^{+2} ($g\approx2.05$), and free radicals ($g\approx2.0029$-30) and $\Delta\approx.6$-.8mT; see Table:

Species in SF in Patients with RA and OD ($M\pm m$)

indices	RA; n=18	OD; n=10	P
Fe^{+3} (mkmol/ℓ)	5.02±.65	12.72±.61	<0.001
Cu^{+2} ($\times10^{-5}$M)	2.21±.14	1.26±.19	<0.001
Radicals ($\times10^{-6}$M)	0.51±.05	0.34±.05	<0.05

The results indicate different relative paramagnetic species in these two diseases. It is known that SF is practically identical to the serum [V.N. Pavlova, Moscow:Medicine, 1980], in which the Fe^{+3} signal is caused by transferrin and the Cu^{+2} signal is due to ceruloplasmin [T. Pocklington & M.A. Foster, Brit. J. Cancer, *36*, 369-74, 1977]. Presumably, the SF signals correspond to the same species. Adding ferrous solution to the SF of RA patients increases the $g=4.3$ signal about twentyfold and reduces the Cu^{+2} concentration to about 25%. This points to ferroxidative activity of SF and may indicate that the SF from RA patients contains many proteins similar to transferrin.

We know of only one article in the open literature [G.R. Buettner & W. Chamulitrat, Free Rad. Biol. & Med. *8*, 55-6, 1990] devoted to ESR investigation of SF. This useful work shows an interrelation between ascorbate and iron in SF. However, this being a room temperature study, Fe^{+3} and Cu^{+2} were not examined.

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Our results help throw light on some details of iron metabolism in SF in RA cases, as the iron content in SF in the same patients is known to increase [P. Biemond, A.J.G. Swaak, H. G. van Eijk, & J.F. Koster, Free Rad. Biol. & Med. *4*, 185, 1988]. We believe that ESR of paramagnetic centers in SF of patients afflicted with RA and OD could be used in differential diagnosis.

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TIPS & TECHNIQUES

TECHNICAL NOTE: HANDMADE PRODUCTION OF THE BRIDGED LOOP-GAP X-BAND RESONATOR — The bridged loop-gap X-band resonator introduced for pulsed and CW spectroscopy has proven to be straightforward in construction [S. Pfenninger, J. Forrer, A. Schweiger, and Th. Weiland, Rev. Sci. Instrum. **59**, 752 (1988); J. Forrer, S. Pfenninger, J. Eisenegger, and A. Schweiger, Rev. Sci. Instrum. **61**, 3360 (1990)].

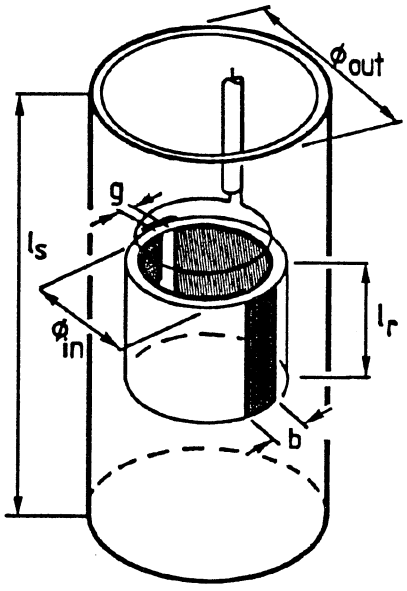

Figure 1. Arrangement of BLGR setup with microwave shield and coupling loop. Length of BLGR: l_r = 4-10 mm; length of shield: l_s = 32 mm.

The following description is intended to help others in producing their own resonators. The resonant structure shown in figure 1 is formed by metallic layers with a thickness of 0.5-4 μm on the inner and outer surface of a quartz tube (dimensions see table) and by a surrounding metal tube or outside-metallized quartz tube (ϕ_{out} = 10 mm, ϕ_{in} = 9 mm, length = 32 mm). The metallic layer inside the smaller quartz tube is split by two gaps in two symmetric half-loops and symmetrically bridged over the gaps by two metallic outer layers.

This resonant structure is first masked by adhesive plastic stripes (width: 1 mm, for the gaps) on the cleaned and de-greased surface of the quartz tube. The layers are painted with an organic metallic solution (Gold solution: Liquid bright lustre FW 6095; Silver solution: Silver Paste T-1012, Thinning Essence VL 730; Company: Engelhard Corporation Hanovia Product, Menlo Park, CN 28 Edison, 08818 NJ, USA, Phone: 800-524-2861) and in a first step burned in inside and then painted and burned in outside the quartz tube.

Table. Dimensions of different BLGRs for resonant frequency of about 9.2 GHz.

microwave shield (quartz tube) dia.	ϕ/mm	9 x 10			
length of BLGR	l_r/mm	4 - 10			
dia. of BLGR	ϕ/mm	5x6	5x6	4x5	3x4
gap width	g/mm	0.5	1	1	0.5
bridge width	b/mm	1	2	2.5	3.5

All the painting and masking work is done under close inspection with an illuminated magnifying glass. The organic gold solution is partially diluted with toluene and the silver solution with thinning essence VL 730. It is painted on the quartz tube **by hand** with a small soft brush. The painted layers should be homogeneous and free of bubbles. They are first dried with an infra-red lamp for one hour at room temperature. The plastic stripes are removed and the residual metallic solution on the top and the bottom of the tube is cleaned with a tissue moistened with toluene. If the gap spacing is not completely free from metallic paint, the tube is best cleaned and painted again. If it looks good the metallic paint is then burned in at 1200 K for 30 minutes. To avoid temperature shocks the painted tube should be warmed and cooled gradually.

The achievable thickness of the layers obtained with one coating is about 1 μm for silver and 0.5 μm for gold. The thickness and the metallic quality may be increased by repeating the procedure or by adding a layer of pure silver by electroplating. If the first attempt

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is not successful, don't give up; try again and you will learn to succeed.

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TECHNICAL NOTE: ABSORBED DOSE MEASUREMENT IN HUMAN TOOTH ENAMEL BY VHF EPR - This Note is intended to stimulate interest in applications of very high frequency EPR (VHF EPR) to radiation dosimetry. For a concrete practical example, we discuss the case of tooth enamel. The procedure is based on the experimentally established fact that a very stable EPR signal accumulates in tooth enamel under ionizing radiation of natural or artificial origin. Because the radiation yield of paramagnetic centers may vary among individual samples, the suggested procedure for detecting the cumulative dose includes artificial irradiation of the sample and extrapolation of signal *vs* dose (D) to zero signal level. This kind of EPR dosimetry was described elsewhere[1]; it is considered an effective approach for checking the total radiation dose sustained by people in radiation accidents and has gained special attention in connection with the consequences of the infamous Chernobyl accident.

Unfortunately, this kind of EPR dosimetry has some serious problems. In the dose range of interest, the signal is rather weak and superimposed upon the noise of the spectrometer and some extra EPR signals. To obtain the dose dependence of the signal, one needs to irradiate the same sample several times, which makes the procedure time-consuming. These and other reasons, especially the low accuracy of estimated dose, make practical application of EPR dosimetry too complicated.

To the best of our knowledge, only traditional X-band CW EPR spectroscopy has been applied to this problem. Our aim was to apply VHF EPR (in particular, D-band, ~140 GHz) which has already-known advantages in providing higher absolute sensitivity and resolution of overlapping signals[2].

We used occasional samples collected during tooth extraction from people living in the area of the Chernobyl accident. The tooth enamel was removed by a special drill and then ground into fine powder (the procedure recommended in [3]). Then the optimal quantity of powder was studied in X-band (spectrometer Bruker ESP 300), in Q-band (spectrometer RE1308 of the USSR production) and in D-band (spectrometer experimentally produced by the Design-Engineering Office, Donetsk, Ukraine). We do not discuss here technical details such as how much the grinding may influence the dose measurement and so on; these topics will be included in our literature publications on the subject. Rather, we address here only the frequency dependence of sensitivity of EPR to these particular signals.

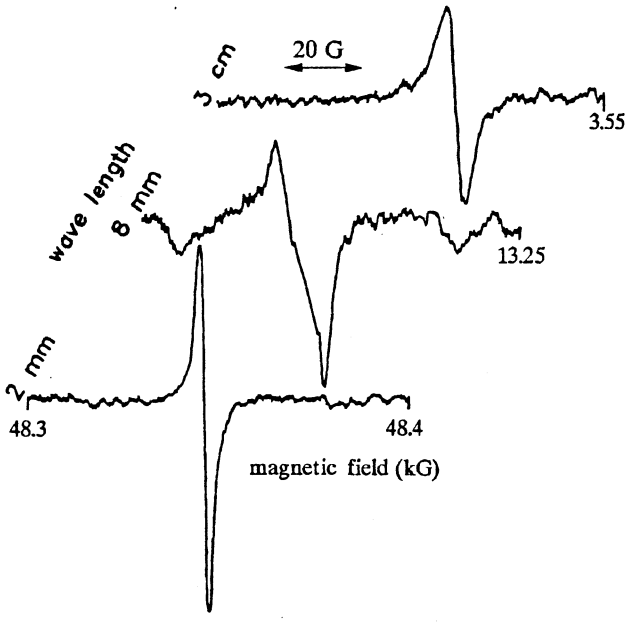

Figure 1. EPR spectra of the human tooth (D ≈ 20 rad) at different microwave wavelengths. Mass of sample: 14.3 mg at 3 cm; 4.4 mg at 8 mm; 0.2 mg at 2 mm.

The spectra from typical γ-irradiated samples (dose 20 RAD) are shown in Figure 1. At higher frequencies, the optimal sample size drops from 15 to 0.2 mg but the signal-to-noise ratio is about the same in Q-band and increases in D-band. Since the EPR spectra in D-band were recorded at 8 kHz modulation frequency and low microwave power level, sensitivity at VHF band could be improved even more. All other parameters for EPR detection were comparable for all bands.

The main conclusion is that at VHF bands one may use small fractions of human tooth enamel, down to 0.1-0.2 mg. That means that the average human tooth may give about 100 EPR-sensitive samples, while at X-band this quantity is about 1-3. The possibility to have about 100 identical samples may accelerate manyfold the procedure of dose determination, as well as increase the accuracy of measurements. Moreover, it will allow exchange of samples between different research units thus increasing the reliability of results. We believe that any advance in solving the small accumulated dose testing problem is valuable and that EPR laboratories which can

employ advanced techniques should be aware that it a most exciting challenge to EPR community.

[1] M. Ikea, T. Miki, eds, *ESR Dating and Dosimetry*, IONICS, Tokyo, 1985a, 538 pp.
[2] Ya. S. Lebedev, in *Modern Pulsed and Continuous Wave Electron Spin Resonance* (L. Kevan and M. Bowman, eds), Wiley, New York, 1990, p. 365.
[3] R. Grun, *Quaternary International*, I, 65 (1989).

E. V. Galtseva, O. Ya. Grinberg, V. N. Krimov, Ya. S. Lebedev, V. Ye. Galtsev, Yu. G. Petrov; EPR Research Center, Moscow Institute of Chemical Physics, RUSSIA.

TECHNICAL TIP: SOLVING A LIMITED-FIELD-SWEEP PROBLEM IN OLD VARIAN EPR SPECTROMETERS - The upkeep and repair of Varian EPR spectrometers can be quite a challenge . Not too long ago we experienced a problem with our Varian V7700 magnet power supply (part of an E-109 spectrometer). Since other spectrometers may eventually suffer from this fault, we thought it might be helpful if we described the symptoms, the suspected cause, and the solution we found to the problem.

The problem came to our attention when we noticed that our magnet could not attain a field higher than about 950 mT, well short of the magnet's 1.12 T maximum field specification. We also noticed a momentary flash of blue light from inside the power supply whenever we turned on the magnet. Upon opening up the power supply, we discovered that some of the insulation had burnt off of the individual power wires near the point of the power cord connection to the main contactor. (The main contactor is the large relay which switches the line power to the power supply's transformer.) In removing the power wires from the contactor we found that the bakelite insulation of the contactor was crumbling. The ends of the wires were gray or black.

Although the cause of the failure is not proven, one may speculate. We suspect that the contacts of the contactor had become dirty making them more resistive. The more resistive contacts probably got hot. Through some combination of heat and age, the bakelite began to decompose. Because of the way in which the contactor is mounted, the crumbling bakelite can fall into the contacts adding to the problem. The conductivity of the power wires was also degraded through either oxidation or accumulation of decomposing insulation between the strands of copper. Eventually the resistance near the contactor became so large that it limited the current to a level which was insufficient for the magnet to reach its maximum field specification.

We fixed the problem by replacing the contactor and removing the damaged ends of the power wires. A company which currently manufactures a suitable replacement for the contactor is Telemechanique, 2002 Bethel Rd., Westminster MD 21157, USA; tel. 301-876-2214.

Harry Crookham, Evan Glaser, and Thomas Kennedy
Code 6877
Naval Research Laboratory
4555 Overlook Av. SW
Washington, DC 20375, USA

NEWS FROM EPR CENTERS

FROM IERC: Linn Belford is now the Director of the Illinois EPR Research Center (IERC), and H. M. Swartz has become co-director. Hal Swartz has moved to Dartmouth Medical School in Hanover, New Hampshire, where he plans to continue to carry out development and applications of EPR *in vivo* technology at 1.1 GHz. We expect the program at Dartmouth to remain a component (satellite site) of the IERC under a subcontract from the University of Illinois. All the missions of an NIH biotechnology resource center (development, collaborative research, service, education, and dissemination) will be continued at Illinois and will be supported at the Dartmouth site. The activities at Dartmouth will focus specifically on EPR in viable biological systems. Call Hai at 603-646-6672 for information and/or to schedule use of the IERC facilities at the Dartmouth site. His mailing address is:
Prof. Harold Swartz, Dartmouth Medical School, Strasenburgh Hall, Hanover, NH 03755.

At the main Center site (Urbana-Champaign), we will continue to focus on multifrequency EPR spectroscopy (L-, S-, X-, Q-, and W-band) with a particular emphasis on W-band (~95 GHz) experiments (cf. EPR Newsletter, vol.2, #2, April, 1990, pp.7-9) and are equipped to perform ENDOR and low-frequency (S-band, 2-4 GHz) pulsed EPR. Typical systems studied include metal ions (including metalloproteins), radicals, and disordered solid materials such as gas-sensitive chars and biopolymers. Although the Champaign-Urbana site will retain the capability for users to do some EPR *in vivo* work, most such experiments, which can benefit from the developments being made at the Dartmouth site, will use the IERC facilities there.

The W-band spectrometer is working very well and is quite busy. Many experiments on both radical and metal

ion systems have been performed, and are in progress, taking advantage of the extraordinary resolution of species and g-anisotropy which accompanies the high magnetic field. The bridge and console have been upgraded with a new solid-state microwave source to improve S/N and custom-designed electronics for better stability and ease of use. A new superconducting magnet has been installed for it, providing a extended sweep range (superconducting magnet set, persistent, or sweeping 0 to 7 Tesla; auxiliary coil providing ±500G around any superconducting magnet set point), a 2.5-400K cryostat insert, and an expanded sample access space (50 mm dia. inside cryostat; 70 mm dia without cryostat). The magnet is undergoing performance tests; full testing and fitting it to the existing bridge and electronics will require a shakedown period. Prospective users requiring the new magnet are advised that we expect to bring up this system in two stages: (1) operation with the wide sweep range without cryostat, and then (2) full cryostatted operation. We invite prospective users/visitors to contact us *(Drs. Belford, Clarkson, Debrunner, Nilges, or Smirnov; call 217-244-1186 or see p. 1 of this issue)* to propose collaborative or exploratory projects, particularly for stage (1).

FROM NATIONAL BIOMEDICAL ESR CENTER:

TRAINING AWARDS — Five to ten awards of $500 are available to pre- and post-doctoral young investigators as partial defrayment of expenses to visit the National Biomedical ESR Center in Milwaukee for a two-week period during 1992. The purposes of the program are not only to provide training in modern EPR methods, but also to permit the investigators to use the unique facilities of the Center in their on-going research. It is always hoped that a publication or presentation will result.

The faculty and staff of the Center have expertise in the three main areas of EPR research: free radicals, spin labels and transition metals. A representative recent publication or abstract in each of the three areas is listed below, with the name of the trainee underlined:

Radicals:

PBN Traps Hydroxyl Radical but Fails to Protect Heart During Ischemia and Reperfusion, Eugene A. Konorev, John E. Baker, Susanna Y. H. Tse, Joy Joseph, Balaraman Kalyanaraman. Annual Meeting, International Society for Heart Research. Submitted abstract, 1992.

Spin Labels:

Resolution of Phospholipid Conformational Heterogeneity in Model Membranes by Spin-Label EPR and Frequency-Domain Fluorescence Spectroscopy, Thomas C. Squier, James E. Mahaney, J. J. Yin, Ching San Lai, and Joseph R. Lakowicz. Biophys. J. 58, 654 (1991).

Transition Metals:

Peter M. H. Kroneck, William E. Antholine, Dieter H. W. Kastrau, Gerhard Buse, Guy C. M. Steffens, and Walter G. Zumft. FEBS Lett. 268, 274 (1990).

Tse is from George Washington University Medical School, Squier from the University of Maryland School of Medicine and Kastrau from the Fakultät für Biologie, Universität Konstanz, Germany.

Funding is expected to be available as of March 1, 1992. To apply, send a letter and one-page research plan; student applications should be accompanied by a letter from the graduate faculty advisor. Address applications to Dr. Ching-San Lai, National Biomedical ESR Center, Medical College of Wisconsin, 8701 Watertown Plank Road, Milwaukee, WI 53226, USA; telephone: 414-266-4051.

SUMSPEC92 to be Released in January - The National Biomedical ESR Center announces the release of the computer program SUMSPEC92, replacing SUMSPEC90. This post-acquisition spectral processing program will be distributed free of charge, one copy per laboratory, to interested persons. The program was written on and for IBM or IBM clone PC's. The graphics requires an EGA or better display system. Available disk formats are 5-1/4" (360 kb or 1.2 Mb), 3.5" (720 kb or 1.44 Mb). Recent papers illustrating the use of this program are:

J. S. Hyde, M. Pasenkiewicz-Gierula, A. Jesmanowicz and W. E. Antholine, "Pseudo Field Modulation in EPR Spectroscopy," *Appl. Magn. Reson.* **1**, 483-496 (1990).

J. S. Hyde, A. Jesmanowicz, J. J. Ratke, and W. E. Antholine, "Pseudomodulation: A Computer Based Strategy for Resolution Enhancement," *J. Magn. Reson.* (in press).

Pseudomodulation is a unique aspect of the program, but many other spectral manipulation options are incorporated including FFT, Hilbert transform, addition, subtraction, multiplication, and several smoothing procedures.

SUMSPEC was developed primarily for convenience in post-processing of spectra. We recently used it as the primary teaching tool for first-year graduate students. Fourteen computer experiments were designed, entirely based on SUMSPEC. An effort was made to provide balance between ESR, NMR and MRI.

The syllabus is as follows:

I. Filtering of Noise
II. Filtering of Noise in Time Domain
III. Signal Transformation by Pseudomodulation
IV. Hilbert Transform
V. Signal Transformation by the Fourier Transform
VI. Transformation by Integration
VII. Resolution Enhancement
VIII. Signal Combining
IX. Optimum Filters
X. Optimum Transformations
XI. Fitting Models to Data
XII. Sensitivity Analysis
XIII. Cross Correlation
XIV. High Pass and Band Pass Filters

This course served a number of purposes: it brought the students to a common level of computer expertise, provided training in mathematics, was used to develop the ideas of computer modeling of experiments as applied to magnetic resonance, and provided an introduction to magnetic resonance principles. A write-up of the 14 experiments will be sent to interested persons without charge.

Address requests to: James S. Hyde, National Biomedical ESR Center, Medical College of Wisconsin, 8701 Watertown Plank Road, Milwaukee, Wisconsin 53226. Please include self-addressed mailing label with your request.

Q-Band Bridge with Enhanced Sensitivity Available at the National Biomedical Center ESR (Milwaukee) for Collaborative Projects. -

The overall receiver noise figure at Q-band has been improved relative to the Varian Q-band bridge by 24.6 dB (a factor of 17) by introduction of a GaAsFET microwave amplifier and balanced mixer. At low incident microwave powers, this modification alone would result in the expected improvement in performance in any bridge. At higher incident powers, phase noise from the klystron readily dominates and overall system performance is degraded. This problem has now been overcome in a practical Q-band bridge using an oscillator designed as described in Ref. 1. The details of the bridge are described in Ref. 2.

The Center announces that the necessary "reliability engineering" has now been completed and the instrument is available for collaborative projects. Increase of more than an order of magnitude in sensitivity is thought to make this instrument the most sensitive in the world at Q-band and, on a number-of-spins basis using a Q-band loop-gap resonator, the most sensitive at any frequency. A signal-to-noise ratio of about 100:1 from a 30 nl sample of 1.6×10^{-6} M spin label was achieved.

Persons interested in using this instrument should outline their proposed research in a one-page letter addressed to: Dr. Christopher Felix, National Biomedical ESR Center, Medical College of Wisconsin, 8701 Watertown Plank Road, Milwaukee, Wisconsin 53226, USA.

REFERENCES:

1. R. A. Strangeway, T. K. Ishii, and J. S. Hyde, "Low Phase Noise Gunn Diode Oscillator Design," *IEEE Trans. Microwave Theory Techn.* 36, 792-794 (1988).
2. J. S. Hyde, M. E. Newton, R. A. Strangeway, T. G. Camenisch, and W. Froncisz, "EPR Q-Band Bridge with GaAsFET Signal Amplifier and Low Noise Gunn Diode Oscillator," *Rev. Sci. Instrum.* (in press, 1991).

FROM NATIONAL BIOMEDICAL CENTER FOR SPIN TRAPPING AND FREE RADICALS — The first months of the new center for spin trapping have been occupied with recruiting personnel and setting up laboratories. Drs. Koshida, Wilcox, Zhang and Arimura have been hired who with Dr. Kotake, DuBose, Poyer and Hinton comprise the working team for the center. Research objectives include synthesis of new spin traps and development of new applicable spectroscopies in order to improve the spin trapping methodology. A series of 3- and 4- substituted PBN's have been synthesized; limited quantities are available upon request for specific research projects. Please direct inquiries to Mrs. Audrey Winkles by FAX: 405-271-3980.

Edward G. Janzen.

COMPANY PROFILES

From time to time we will print company profiles provided by Corporate Member/Donors of the International EPR Society. The first such profiles to arrive follow:

WILMAD GLASS Co.

Get Quality Quartzware and Consumables from Wilmad. For many researchers, Wilmad means the finest NMR Sample Tubes in the world. But we've also committed our resources to providing quality Quartzware and consumables for EPR, as well.

Wilmad was founded in the 1950's to manufacture quality precision glass. We first entered EPR by selling quartzware manufactured by James F. Scanlon Co. This was the same quartzware made for Varian during the years it made EPR Spectrometers. When Mr.

Scanlon retired in the early 1980's, Wilmad bought Scanlon's business.

The quartzware we sell is now manufactured in our New Jersey facility. Frequently, the quartzware you get with a new EPR Spectrometer is made by Wilmad. We've expanded our product offering since purchasing Scanlon, too. It includes quartzware for Bruker EPR Spectrometers as well as other important research developments.

The largest portion of our manufacturing capacity is actually applied to the non-spectroscopic application of precision glass tubing. Some examples include custom electronic glass and specialty flowmeter tubes. Because of this custom glass capability, we provide extensive services for making customer EPR Quartz apparatus. We also maintain an enviable inventory of supplies and accessories for sample handling and recording or plotting of spectra.

Wilmad Slates New EPR Catalog in 1992. Wilmad will release a new EPR Catalog in 1992. It will feature a number of important new products. Contact Wilmad or your local distributor to have your name placed on a mailing list that will assure you get a copy when it is available.

Wilmad Glass Co.
Route 40 and Oak Road
Buena, NJ 08310 USA
Telephone: 609-697-3000
FAX: 609-697-0536

SCIENTIFIC SOFTWARE SYSTEMS

Since 1987, Scientific Software Services has provided the EPR community with data acquisition software and hardware for the personal computer. In 1985, Dr. Philip D. ("Reef") Morse took on the task of writing EPR data-acquisition and manipulation programs to run on IBM PC-compatible computers when he was a member of the staff of the Illinois EPR Research Center (IERC) at Urbana. Later, Dr. Morse moved to Bloomington, Illinois to join the faculty at Illinois State University in Normal and established a separate company (Scientific Software Services) to further develop, improve, document, and market this software and related products. Scientific Software Services now has over 80 installations around the world and offers an excellent price/performance ratio for its products. Support is available for almost all spectrometers marketed in the United States (Bruker, JEOL, MicroNow, and Varian) and most other countries. All software includes source code to allow users to modify the software on site. Scientific Software Services specializes in individual installations. Their portfolio of software includes CW EPR and ENDOR data acquisition, manipulation, and simulation packages. Future developments include a data manipulation package for Windows 3.0 and imaging package.

For further information call:

Philip D. (Reef) Morse at 309-829-9257
(Internet address: reef@xenon.che.ilstu.edu)

or write to:

Scientific Software Services
305 E. Locust, Bloomington, IL 61701 USA.

NORELL, Inc.

For the past 25 years, Norell, Inc. has been catering to the NMR spectroscopist world-wide, and is basic manufacturer of NMR Sample Tubes, Deuterated Compounds for NMR, and miscellaneous accessories.

Norell Press, a Division of Norell, Inc., is also active in publishing and marketing of scientific books. *More recently, Norell, Inc. is engaged in promoting EPR Spectrometers manufactured in Russia, assembled and tested in USA.*

We would be pleased to provide information on supplies, spectrometers, or books. Please contact:

Mark W. Norell, President
Norell, Inc.
22 Marlin Lane
Mays Landing, NJ 08330 USA
Tel: 609-625-2223, Fax: 609-625-0526
Telex: 5106006283

MEDICAL ADVANCES, Inc.

Medical Advances, Inc. was created in 1985 as a conduit for transferring Medical College of Wisconsin based research into the commercial markets. The focus of this transfer has been RF technology in the form of coils and probes for clinical diagnostic magnetic resonance imaging and spectroscopy. In addition, the company manufactures and markets instrumentation for EPR research. Specific products for the latter include loop gap resonators for S-band

and X-band and a microwave bridge for S-band. Other ESR products are either under development or being explored.

The company's current employment is 54 people with 20 members of the staff engaged in engineering and product development. Though the company still explores the transfer of university-based research as the source of new products, a majority of product development is the creation of internal engineering activities.

For more information, contact:

Richard J. Stevens, president
Medical Advances, Inc.
P.O. Box 26425
10431 W. Watertown Plank Road
Milwaukee, WI 53226-0425.
Tel: 414-258-3808. FAX: 414-258-4931.

BRUKER Company/Product Profile

The worldwide group of Bruker companies, founded in 1960, has always been one of the major driving forces of innovation in analytical instrumentation. Production facilities are located at Rheinstetten, Karlsruhe and Bremen in GERMANY, at Wissembourg in FRANCE, at Fällanden (near Zürich) in SWITZERLAND, at Billerica (near Boston, MA) in the USA and in Coventry, UK. Additional application and service facilities are located at Milton, Ontario, CANADA, and Ibaraki-ken, JAPAN.

Bruker started producing magnets for laboratory and magnetic resonance applications in Karlsruhe. In 1963 Bruker offered the first commercial pulsed NMR Spectrometer and in 1965 joined Spectrospin AG in Switzerland to open up the field of high resolution NMR. EPR joined the world's first truly multinuclear NMR in 1967 as a commercial product and has remained one of Bruker's premier offerings in a continually evolving array of flexible research and analytical instrumentation.

Our EPR Spectrometer series is without equal worldwide. For many years our EPR instrument development team has led the field and set important benchmarks unmatched by any other manufacturer. Important milestones include the first commercial ENDOR/Triple Resonance Spectrometer in 1974, the introduction of the first commercial FT-EPR in 1989 and many other enhancements to EPR instrumentation in between.

Bruker's impressive range of EPR equipment now includes five complete spectrometer lines: the EMS 104, ER 200D, ECS 106, ESP 300E and ESP 380E series which cover nearly every conceivable application used today. Bruker's modularity and flexibility offers unlimited upgradeability for whatever the future may bring.

Model →	EMS 104	ER 200D	ECS 106	ESP 300E	ESP 380E
Microwave Source	Gunn	Gunn	Gunn	Klystron or Gunn	Klystron or Gunn
Sensitivity	2×10^{10}	2×10^{10}	1×10^{10}	0.8×10^{10}	0.8×10^{10}
Magnets	Permanent	9" to 10"	6"	9" to 18"	9" to 18"
Resolution	100 mG	18 mG	20 mG	8 mG	8 mG
Data System	ESP 1620	Optional	ESP 3220	ESP 3220	ESP 3220
Control	Touch Panel	Manual	Computer	Computer & Manual	Computer & Manual

The well established ER 200D series became the world standard for manually controlled instruments by offering unmatched sensitivity, accuracy and linearity. These uncompromising requirements were further extended by their combination with a real-time, multi-tasking, multi-user data system in the compact ECS 106 and fully featured ESP 300E instruments. Fully computer controlled, the ECS 106 with its compact 6" magnet system, frees the spectroscopist from the complications associated with microwave and cavity tuning procedures giving the novice, student or departmental user access to high quality spectra with a minimum of effort. The instrument is ideally suited for measuring large numbers of samples in a relatively short time as required by the growing applications of radiation dosimetry and testing the durability and aging of paints and coatings.

The ESP 300E, an enhanced version of the popular ESP 300 series, is the ideal tool for routine or automated applications as well as highly sophisticated research demands when combined with magnet systems ranging from 9" to 18" pole diameters and power supplies up to 40 kW. The ESP 3220 32-bit data system is integrated into the spectrometer and supports the spectroscopist in the setup, acquisition and processing modes. Probehead adjustment and microwave bridge tuning may be carried out manually or automatically. The graphic controller and its parallel 32-bit CPU produce a flicker-free display which allows main parameters to be controlled in real-time. Other features include an integrating analog/digital converter with 9-22 bit dynamic range, a 2 Mhz flash converter for kinetics, standard rapid scan acquisition with up to a 200 G sweep width at repetition rates up to 1 Khz and a wide range of triggering options.

Accessories for the ESP 300E include an autolocking/autotracking NMR Gaussmeter, a computer controlled Field Frequency Lock Unit, ENDOR/Triple

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Resonance, Vector EPR, Digital Phase Sensitive Detection (DPSD) for ST-EPR and additional microwave bridges for L-, S-, K-, and Q-Band operation.

With developments beginning more than six years ago, Bruker has now produced and delivered in substantial quantities the first commercial Fourier Transform EPR Spectrometer, the ESP 380E. This has proven to be a unique pulse spectrometer with outstanding performance capable of generating a wide range of applications including many used in NMR. The nanosecond time scale in which these experiments are performed requires a sophisticated ECL pulse programmer with up to 16 channels and a special broadband microwave bridge with up to 11 microwave pulse and CW channels. A comprehensive software package incorporating the PulseSpel programming language helps to handle complex pulse sequences and provide protection to delicate receiver electronics.

Typical applications include FT-EPR spectroscopy, T_1, T_2, $T_{1\rho}$, measurements of spin dynamics, 1D and 2D ESEEM experiments, 2D correlation spectroscopy (COSY, SECSY), selective excitation, field-swept spin-echo, and pulsed ENDOR and imaging experiments.

At the other end of the product line is the newly announced EMS 104 EPR Analyzer. This EPR minispec is in reality a complete, fully computer controlled EPR instrument based on a permanent magnet with a 200 G sweep width that has been optimized for measurements of alanine dosimeters and radiation damage to materials and foodstuffs, yet can be used for many other EPR applications as well.

The development of outstanding EPR products cannot occur without a broad, diverse and dedicated group of scientists and engineers and worldwide involvement in the EPR community. Bruker has established extensive development and production facilities in both Germany and France and is beginning final test of EPR instruments in the USA as well. These groups, with their associated application laboratories, are available to EPR researchers worldwide for the pursuit of new techniques, the evaluation of instrumentation and help in preparing and justifying instrumentation proposals. The wide range of demonstration equipment available in these laboratories allows potential customers to select the correct instrumentation for his/her particular application.

Worldwide service and customer/service training centers in Europe and the USA combine with large parts inventories to provide excellent after-sale support for Bruker's EPR customers. Classes are regularly held on advanced techniques and instrument service on a wide range of instruments and accessories (For example, the facility in Billerica has four EPR Spectrometers for demonstration and training: ESP 380E, ESP 300E, ECS 106, ER 200D).

Bruker has become the industry leader and fully intends to stay at the forefront of EPR development and technology. For more information on Bruker's products or to arrange a visit to our laboratories, please contact the office nearest you (or in Europe call Dr. Ing. Dieter Schmalbein: 0721-5161-141; in the USA call Dr. Arthur Heiss: 508-663-7406).

CONFERENCE REPORT - ELECTRON MAGNETIC RESONANCE OF DISORDERED SYSTEMS

The Second International workshop on Electron Magnetic Resonance of Disordered Systems (EMARDIS-91) was held May 27-31, 1991 in the Scientific Station of Sofia University "Gjulechitza" situated 75 km from Sofia, in Rila Mountain (1530 m.o.s.l.). It was organized by the Institute of Kinetics and Catalysis, Bulgarian Academy of Sciences and the Department of Chemistry, Sofia University under sponsorship of the National Foundation for Fundamental Research and BRUKER Analytische Messtechnik, GmbH. The aim of the workshop was to cover all aspects of recent development in the theory, methodology, experiment, instrumentation, etc., of EMR (EPR, ENDOR, ESE) spectroscopy of disordered systems through lectures delivered by top experts and selected applicants. In order to facilitate easy scientific contacts and discussions on the individual level, participants were limited to 35 persons from 11 countries (Canada, Germany, Israel, Italy, Japan, Poland, Romania, The Netherlands, USA, USSR, Bulgaria) and, indeed, the level of interaction was very high. Excellent lectures included those by M. Branca (Sassari, Italy), A. Colligiani (Pisa, Italy), S. Dikanov (Novosibirsk, USSR), W. Froncisz (Cracow, Poland), E. Giamello (Torino, Italy), D. Goldfarb (Rehovot, Israel), P. Hoefer (Bruker, Germany), A. Hoefer (Leiden, The Netherlands), M. Iwaizumi (Sendai, Japan), L. Kevan (Houston, USA), H. Kurreck (Berlin, Germany), Ya. Lebedev (Moscow, USSR), V. Linev (Minsk, USSR), K. Ohno (Tokyo, Japan), E. Reijerse (Nijmegen, The Netherlands), M. Romanelli (Florence, Italy), Yu. Tsvetkov (Novosibirsk, USSR), Yu. Yablokov (Kazan, USSR). Several posters were presented and discussed. Also, the attention of all participants was focused on

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the problem of "Standards in Quantitative EPR" on which a round-table discussion was held. After extended discussions the participants decided to attend an international experiment on quantitative measurements of samples pre-prepared by the organizers. The results of this experiment will be published within the end of this year. During the meeting "Advanced Analytical Instruments Co., (Minsk, USSR) exhibited a fully PC controlled "Personal EPR Spectrometer."

The memorable weather also stimulated extended discussions. In Bulgaria, particularly in the mountains, the weather at the end of May is usually hot, but this year was unusual; upon arrival in Gjulechitza, the participants were surprised to find about 40 cm of snow on the ground.

Finally, I would like to thank all the participants and sponsoring organizations helping to make the meeting such a success. The next EMARDIS workshop is planned to be held in 1993 and anyone interested in receiving information about it should contact Professor Nicola D. Yordanov, Institute of Kinetics and Catalysis, Bulgarian Academy of Sciences, 1113 Sofia, Fax: 359-2 (Bulgaria, Sofia)-756116 or 720038; telephone 359-2-7131, ext. 2546 (office), 3917 or 2519 (labs); telex 22729 ECHBAN.

Report submitted by Nicola D. Yordanov

CONFERENCE REPORT - RECENT ADVANCES IN ESR (PADOVA)

The "International Symposium on Recent Advances in ESR Spectroscopies. Applications to Chemistry, Physics and Biology," organized jointly by the Italian ESR group GIRSE (Gruppo Italiano di Risonanza di Spin Elettronico) and the ESR group of the British Royal Society of Chemistry, has been held in Padova, Italy, September 8th to 12th, 1991. Two other European groups affiliated to the promotion of the Symposium, the French GARPE (Groupe pour l'Application de la Resonance Paramagnetique Electronique), and the Dutch NEDG (Nederlandese EPR Discussie Groep). Nearly 150 scientists attended the Symposium from 20 countries, mostly European.

The Symposium was organized with invited lectures and contributed papers presented as posters to a total number of 110 scientific contributions. The invited lecturers were A. Alberti (Ozzano, Italy), L.C. Brunel (Grenoble, France), A. Butterfield (Kentucky, USA), C. Corvaja (Padova, Italy), A.G. Davies (London, GB), A. Desideri (Messina, Italy), M.C.W. Evans (London, GB), A. Gamba (Milano, Italy), D. Gatteschi (Firenze, Italy), M.A. Hemminga (Wageningen, The Netherlands), A. J. Hoff (Leiden, The Netherlands), P.J. Krusic (Wilmington, USA), Y.S. Lebedev (Moscow, USSR), D. Marsh (Göttingen, Germany), G. Luckhurst (Southampton, GB), M. Martinelli (Pisa, Italy), K.A. McLauchlan (Oxford, GB), K. Möbius (Berlin, Germany), A. Schweiger (Zürich, Switzerland), H.M. Swartz (Urbana, USA), M.R.C. Symons (Leicester, GB).

During the Symposium a meeting was held to discuss the problem of coordination of European ESR groups.

In Europe, there are presently four already formalized groups, i.e. the British ESR group of the Royal Society of Chemistry (constituted in 1968), the Italian GIRSE (1987), the French GARPE (1990) and the newly born Dutch NEDG (1991).

The arguments discussed during the meeting can be summarized in the following way:

1. **Constitution of other European ESR groups:** Other national groups are likely to be constituted in the near future. However, for small countries it would be more sensible to participate directly in the activities of a federation of European groups.

2. **Coordination of ESR groups and societies:** A federation of European ESR groups was desired by many representatives of the existing groups. This European federation is not intended to become a competitor of the International EPR Society (IES), but should be regarded as a complementary institution with the goal of addressing the specific problems presently pressing the scientific communities in Eastern and Western Europe. A close working relationship with the IES is anticipated and a subsequent merger with the IES was advocated for the farther future.

H.M. Swartz, as president of the International EPR Society, expressed the willingness of the IES to collaborate with other ESR groups in common activities, such as organization of conferences, and also to provide a communication channel through its widespread "EPR Newsletter."

3. **European federation of ESR groups. Steering Committee:** Through a formal vote the participants in the meeting approved the formation of a steering committee for the promotion of a European federation of ESR groups (British ESR Group: K.A. McLauchlan; Italian GIRSE: A. Alberti; French

GARPE: B. Catoire; Dutch NEDG: A.J. Hoff). The composition of this committee could be changed by the national groups. The steering committee will be chaired by K. Möbius.

4. **Future activities:** The constitution of a European federation should lead to the organization of an international symposium similar to the one in Padova every three years. A possible candidate for the next symposium is Leiden, The Netherlands.

Report submitted by Marina Brustolon, Padova, Italy, and Klaus Möbius, Berlin, Germany.

BOOKS

***EPR Imaging and In Vivo EPR*, Gareth R. Eaton, Sandra S. Eaton, and Keiichi Ohno, editors.** 330 pp. 1991. Published by CRC Press, Inc., 2000 Corporate Blvd., Boca Raton, FL, 33431, USA. The book has twenty-six chapters, each authored by one or more scientists distinguished for their contributions to the title techniques. It contains information on both the most widespread techniques (*e.g.*, X-band CW EPR imaging) and several special methods (*e.g.*, imaging by ENDOR or pulsed EPR). In the Preface, the editors describe their aims:

"The purpose of this book is to describe the physical basis for EPR imaging and *in vivo* EPR spectroscopy, the experimental arrangements, and the analysis of data in sufficient detail to provide a tutorial to a newcomer in the field. It is assumed that the reader is familiar with the basic principles of EPR..."

"A variety of approaches ... have been used — these are introduced and compared in Part I. Most experiments have used magnetic field gradients to encode spatial information although localized detection has also been used in some cases as described in Part II. A wide variety of detection methods are also discussed in Part II. Methods of data manipulation including image reconstruction and deconvolution algorithms are described in Part III. Examples of application including inhomogeneous materials, diffusion kinetics, reaction kinetics, liquid crystals, microwave distribution, radiation damage, defects in solids, and oximetry are provided in Part IV."

"*In vivo* EPR spectroscopy is described in Part IV. Because of its importance for *in vivo* studies low frequency instrumentation is discussed in Part II."

The sections and contributing authors are as follows:
Part I "Introduction" - 11 pp. Authors:
Ch 1 - K. Ohno, G.R. & S.S. Eaton; Ch 2 - L. J. Berliner
Part II. "Instrumentation" - 76 pp. Authors:
Ch 3 - R.W. Quine, G.R. Eaton, K. Ohno, & S.S. Eaton; Ch 4 - Ya.S. Lebedev & O.Ye. Yakimchenko; Ch 5 - T. Herrling; Ch 6 - H.J. Halpern & M.K. Bowman; Ch 7 - L.J. Berliner & J. Koscielniak; Ch 8 - G.R. & S.S. Eaton; Ch 9 - E.G. Janzen, Y. Kotake, & U.M. Oehler
Part III "Software" - 84 pp. Authors:
Ch 10 - R.K. Woods, W.B. Hyslop, R.B. Marr, & P.C. Lauterbur; Ch 11 - U. Ewert & K.-U. Thiessenhusen; Chs 12 & 16 - U. Ewert; Chs 13 & 14 - M.M. Maltempo, S.S. Eaton, & G.R. Eaton; Ch 15 - M.J.R. Hoch and U. Ewert
Part IV "Applications" - 134 pp. Authors:
Chs 17, 18, & 21 - K. Ohno; Ch. 19 - J.K. Moscicki, Y.K. Shin, & J.H. Freed; Ch 20 - M.J.R. Hoch; Ch 22 - K. Ulbricht, U. Ewert, T. Herrling, K.U. Thiessenhusen, G. Abeli, J. Volter, & W. Schneider; Ch 23 - Ya.S. Lebedev & O.Ye. Yakimchenko; Ch 24 - H.M. Swartz & J.F. Glockner; Ch 25 - L.J. Berliner
Part V. - "Conclusion" - 4 pp.
Ch 26 (Future of EPR Imaging) - S.S. & G.R. Eaton.
Index - 11 pp.

***Transition Ion Electron Paramagnetic Resonance*, by John R. Pilbrow**, Oxford University Press (Clarendon Press), Oxford, 1990. 737 pp. The author's Preface contains the following statements:

"This book, which is restricted to ions of the first three transition series, is intended as an introductory text on transition ion EPR at a level appropriate to beginning graduate students in physics or chemistry, or graduate students in other disciplines with a reasonable background in quantum mechanics and spectroscopy."

Chapter 1 (61 pages) "is an overview of transition-metal-ion EPR with a number of representative spectra and examples. The 'new' perspective on field-swept EPR, which was first properly recognized by R. E. Coffman in 1975, is developed here."

Chapter 2 (53 pp) "is an introduction to crystal and ligand field theories as a basis for understanding the spin Hamiltonian."

Chapter 3 (56 pp) "reviews the major results for spin Hamiltonian parameters for *d*-configurations."

Chapter 4 (37 pp) "is a short introduction to experiment, with discussion of the setting up of the reference arm bridge, limits of sensitivity, and methods for single crystal measurements."

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Chapter 5 (49 pp) "is mainly to do with models of lineshapes as a basis for computer simulations."

Chapter 6 (72 pp) "is a survey of the EPR of transition metal ions grouped according to systems of phenomena."

Chapter 7 (36 pp) "reviews the basis for coupled systems in such a way as to reflect the place this has in EPR theory and practice."

Chapter 8 (27 pp) "is an attempt to introduce spin lattice relaxation in such a way that the flavor of the theory is conveyed without demanding the formidable presentation of full derivations."

Chapter 9 (45 pp) "covers ENDOR and ENDOR-derived techniques such as ENDOR-induced EPR."

Chapter 10 (41 pp) "is mainly concerned with ESEEM and completes a case study of copper diethyldithiocarbamate begun earlier in Chapters 6 and 9."

Chapter 11 (74 pp) "is a largely descriptive overview of transition-metal ions in biological systems."

Chapter 12 (16 pp) "provides a short introduction to zero-field EPR which has had a small but significant part to play in EPR."

There are also 21 Appendices (81 pp) containing reference data, derivations, formulae, and other auxiliary information. Over 1300 literature references are cited.

PROCEEDINGS

EMARDIS-91 Proceedings. All invited lectures presented at the Second International Workshop on *Electron Magnetic Resonance of Disordered Systems (EMARDIS-91)* held in Gjulechitza, Bulgaria, May 12-31, 1991 are being published in full by World Scientific Publishing Co., Singapore. Edited by N. D. Yordanov; expected publication date December, 1991; *Ca.* 400pp.; US$99, UK£39. Orders may be placed with the publisher (in Europe FAX 44-81-4463356; in USA and Canada call toll-free 1-800-227-7562; in other countries FAX 65-3825919).

An indication of the scientists and topics is given by Dr. Yordanov's post-conference report on EMARDIS-91, printed above in this issue.

Proceedings of annual ESR Group Conferences. Each year, the Journal of the Chemical Society *Faraday Transactions* publishes a special issue based on papers presented at the annual spring conference of the ESR Group of the Royal Society of Chemistry (United Kingdom). Papers from the last two years' conferences (the 23rd International ESR Conference at Egham, March, 1990 and the 24th International ESR Conference at Cirencester, Glous. in April, 1991) have been published in *J. Chem. Soc. Faraday Trans.* (the 23rd Conference in Vol. 86, No. 19, 7th October 1990, pp. 3173-3379 and the 24th Conference in Vol. 87, No. 19, 7th October, 1991, pp. 3105-3206). Copies may be obtained *via* either Prof. M.C.R. Symons, CRC ESR Research Group, Dept. of Chemistry, Univ. of Leicester, University Rd, Leicester LE1 7RH, UK or Dr. Bob Parker at The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Rd., Cambridge CB4 4WF, UK.

NOTICES OF MEETINGS

TWENTY-FIFTH ANNUAL INTERNATIONAL MEETING OF THE ELECTRON SPIN RESONANCE INTEREST GROUP OF THE ROYAL SOCIETY OF CHEMISTRY (UK), University of York. March 29 to April 2, 1992. This will be a joint meeting with the Society of Free Radical Research. The theme will be "Radicals in Organic and Bioorganic Systems." The scientific programme will address all aspects of ESR(EPR) of radicals in organic and bioorganic systems. The 1992 Bruker Lectureship is awarded to Professor George Feher, who will address the conference. Other plenary lectures will be given, including those by Dr. G.R. Buettner (Iowa), Dr.

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M.J. Davies (York), Prof. A.J. Hoff (Leiden), Dr. B.P. Roberts (London), Dr. A. Watts (Oxford), Dr. M.R. Wasielewski (Argonne), and Dr. C.J. Rhodes (London).

Deadline for registration and for submission of short papers and posters is January 2d, 1992. Attendance is limited to about 150.

Cost is expected to be about £200 for registration, accommodations, and social events. Accommodations in modern individual rooms in Derwent College are about 2 minutes' walk from the conference site. JOEL (UK) has provided 3 predoctoral bursaries to cover registration and accommodations costs. Limited funds also are available to help meet costs for a few attendees who have funding difficulties.

For more details or registration forms, contact Dr. C. C. Rowlands, Secretary, Committee of the ESR Group, School of Chemistry and Applied Chemistry, Univ. of Wales, PO Box 912, Cardiff CF1 3TB, U.K.

NINTH CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Zvenigorod, Moscow region, RUSSIA, May 18-25, 1992. This conference is organized by the Institute of Chemical Physics (Russian Academy of Sciences). It is the third time that the meeting of this series has been organized on an international basis.

Both NMR and EPR/ESR methods lie within the scope of the series. Traditionally, there has been particular emphasis on EPR/ESR methods. The topics to be discussed will deal mainly with:

- the nature and mechanism of action of isolated and membrane-bound enzymes in model systems, cells, and biological tissues;
- paramagnetic enzymes and free radicals in native and pathological animal and plant tissues as well as the paramagnetic centers associated with physical or chemical factors;
- spin labels and spin probes used in investigations of biological systems
- new techniques and methods in EPR/ESR spectroscopy.

Abstracts of the lectures (1 page) will be published in English or Russian.

For more details, please contact:

RUSSIAN ACADEMY OF SCIENCES, INSTITUTE OF CHEMICAL PHYSICS, 4 Kosygin st., Moscow B-334, 117977 RUSSIA. Contact *either*

Lev A. Blumenfeld, Professor, Chairman of the Organizing Committee; Tel. (007-095)-939-7556 or 7558 (direct line); FAX (007-095)-938-2156 *or*

Yakov S. Lebedev, Professor, member of the Organizing Committee; Tel. (007-095)-939-7408; FAX (007-095)-938-2156.

6TH BIENNIAL MEETING SFRR INTERNATIONAL FREE RADICALS: FROM BASIC SCIENCE TO MEDICINE, June 16-20, 1992. For more information, contact: Scientific Secretariat, c/o Dipartimento di Medicina e Oncologia Sperimentale, Sezione di Patologia Generale, Corso Rafaello 30, 10125 Torino, Italy.

VI INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE IN COLLOID AND INTERFACE SCIENCE, Florence, Italy, June 22-26, 1992. The 6th International Symposium on Magnetic Resonance in Colloid and Interface Science will be held at the University of Florence, Florence, Italy, June 22-26, 1992. This is a continuation of the previous triennial conferences held on the same subject in San Francisco, USA (1976), Mentone, France (1979), Torun, Poland (1983), Münster, FRG (1986), and Newark, Delaware, USA (1989). This symposium has become a major event; its aim is to provide a forum for physicists, chemists, and biologists at which they can present and discuss their recent research in the field. The symposium program will include plenary lectures, invited reports, and original research contributions. The official language will be English. The proceedings will be published as full articles in a major scientific journal.

A wide spectrum of the applications of magnetic resonance spectroscopies to colloid and interface systems will be addressed. Among the topics to be covered:

- Adsorption, catalysis, and surface chemistry
- Dispersed systems, colloids, and gels
- Ordered systems
- Zeolite and silicate surfaces
- Intercalation compounds
- Biological systems
- Magnetic systems with specific surface properties
- New magnetic resonance techniques

Other topics can be included depending on the response.

All scientific activities will be held downtown in Florence and all reservations for accommodations will be handled by local travel office directly. Detailed information will be sent in further circulars. Florence is easily reached by train from the international airports of Pisa (1 hour), Rome (3 hours), and Milan (3 hours).

For more information, and to indicate whether you wish to attend, and whether you wish to present a paper, contact: Dr. M. Francesca Ottaviani, Department of Chemistry, University of Florence, Via G. Capponi 9, 5021 Firenze, ITALY.

GORDON RESEARCH CONFERENCE ON RADICAL IONS, Brewster Academy, New Hampshire, USA, June 22-28, 1992. The 1992 conference will take place on the shores of Lake Winnepesaukee. Phil Rieger (Brown University) is the conference Chair; Alex Trifunac

(Argonne), the Vice-Chair. In addition to the talks listed below, there will be time for some short talks and plenty of room for posters.

The following sessions are planned:

- Matrix Isolation Studies (Lon Knight, Session Chair): J. A. Howard, "Reactions of Naked Metal Clusters"; William Welther, Jr., "Matrix Isolation Studies"; Paul Kasai, "Dissociative Electron Capture Processes in the Matrix Environment."
- Radical Ions on Surfaces: Ronald Birke, "Investigation of Radical Ions with Surface-enhanced Raman Spectroscopy"; Elio Giamello, "Small Radical Ions Stabilized on Solid Surfaces."
- Radical Ions in Biological Systems (Gary Brudvig, Session Chair): Gerald Babcock, "Electron Transfer in Photosystem II"; James Whittaker, "The Free-Radical-Coupled Copper Active Site of Galactose Oxidase"; Mark Nelson, "Radical Intermediates in Oxygenation of Fatty Acids by Lipoxygenase."
- Radical Ions in Micelles and Surfaces (David Gosser, Session Chair): James Russling, "Electrochemical Studies of Radicals in Micellular Systems"; Akio Yasuda, "Electrochemistry-based Novel Molecular Electrochromics".
- Radical Ion Reactivity (Joe Dinnocenzo, Session Chair): Sason S. Shaik, "Cation Radicals and Nucleophiles. Reactivity Patterns"; Vernon Parker, " Radical Cation-Nucleophile Reaction Barriers in Solution from Bas-Phase Quantities?"; Helmut Schwarz, "Gas-Phase Studies on Open-Shell Ions."
- Radical Ions from C_{60} and Related Species (Paul Krusic, Session Chair): Keith Preston, "Paramagnetic Fullerenes"; Additional speaker to be named.
- Organotransition Metal Radical Ions (Dwight Sweigart, Session Chair): Edmund Samuel, "Formation and Reactivity of Group-4 Organometallic Radicals"; Martin Schröder, "Stabilisation of Metal Radicals in Co-ordination Complexes"; Brian Robertson, "Electron Transfer Involving a Reduced Carbonyl Cluster."
- Radical Ions in Polymers: Nigel Hacker, "Role of Cations, Radicals, and Radical Cation Intermediates in Onium Salt Photoinitiation Reactions); Abbas Razavi, "New Aspects of Olefin Polymerization Reactions"; Shirley A. Fairhurst, "ESR Studies of Sodium-Doped Polyacetylene."

Attendance at this conference is strictly limited. To express interest or obtain information, contact Dr. Alexander D. Trifunac, Vice-Chair of Gordon Conference on Radical Ions, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, IL 60439, USA. FAX: 708-972-4993. E-mail: BITNET Trifunac@ANLCHM.

GORDON RESEARCH CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGY AND MEDICINE, Tilton, New Hampshire, USA, July 13-17, 1992. The organizer of the 1992 conference is Dr. Betty Gaffney, Department of Chemistry, Remsen Hall, 3400 N. Charles St., Johns Hopkins University, Baltimore, MD 21218, USA.

The deadline for applying to attend is May 29, 1992. For applications, contact Dr. Alexander Cruikshank, Director, Gordon Research Conferences, Gordon Research Center, University of Rhode Island, Kingston, RI 02881-0801, USA; telephone 401-783-4011; FAX 401-783-7644.

ESR APPLIED METROLOGY WORKSHOPS, Japan. Prof. Motoji Ikeya (Department of Physics, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan) would like members of the international EPR community to know about these workshops. The first such workshop was organized in 1985, at the time of the First Symposium on ESR Dating, held at Yamaguchi, Japan; see the Proceedings of ESR Dating and Dosimetry (Ionics, Tokyo, 1985). Five annual workshops and symposia have been held. Proceedings are available at a cost. Members are mostly physicists, geologists, and some chemists who are interested in EPR applications to geology and archaeology as well as in the development of EPR imaging (or scanning EPR microscopy) and of portable EPR spectrometers. Publications - "Applied ESR Metrology" and Newsletters with English-language titles - are available to members (dues, $20/year). For details and Workshop schedules, contact Prof. Ikeya, whose organization wishes to exchange information with foreign EPR specialists and to encourage more involvement of geologists in the EPR community.

ELEVENTH ISMAR MEETING, Vancouver, British Columbia, CANADA, July 18-24, 1992. The International Society of Magnetic Resonance is preparing for its XIth international meeting to be held on the campus of the University of British Columbia, Vancouver, BC., Canada. The meeting is being organized by Professor Colin Fyfe, Department of Chemistry, University of British Columbia, 2036 Main Mall, Vancouver, BC, V6T 1Y6, CANADA. (Tel: 604-228-2847; FAX: 604-228-2847).

ROLES OF VITAMIN C & VITAMIN E IN FREE RADICAL REACTIONS, July 19-24, 1992, FASEB Summer Research Conference, Federation of American Societies for Experimental Biology. Saxtons River, Vermont. For more information, contact Dr. Richard C. Rose, Vitamin C-Vitamin E Conference, Department of Physiology and Biophysics, Chicago Medical School, 3333 Green Bay Road, North Chicago, IL 66064, USA. Tel: 708-578-3000 or 708-578-3280.

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TWENTY-NINTH INTERNATIONAL CONFERENCE ON COORDINATION CHEMISTRY, Lausanne, Switzerland, July 19-24, 1992. This conference will treat all aspects of coordination chemistry including magnetic resonance. There will be five plenary lectures to cover themes of general interest, to which ten microsymposia will be linked conceptually. Fifteen subjects will be themes for section lectures, and there will be poster sessions. The official conference language is English. For information, contact 29th ICCC Secretariat, AKM Congress Service, Clarastrasse 57, P.O. Box, CH-4005 Basel, Switzerland. (Tel: 41-61-691 51 11; FAX: 41-61-691 81 89).

FIFTEENTH INTERNATIONAL EPR SYMPOSIUM at the 34th Annual Rocky Mountain Conference, Denver, CO. August 2 to August 6, 1992. Reports of new developments in all areas of fundamental and applied EPR spectroscopy are invited. Topics selected for special focus at the 1992 Symposium include (a) the interface/overlap between NMR and EPR, to be organized by Hans Thomann; (b) ferromagnetic resonance, to be organized by Ira Goldberg; and (c) EPR in biological systems without added labels, probes, or spin traps. Related to the *WORKSHOP ON THE FUTURE OF EPR* (see below), for which the papers and posters of the Symposium serves as background, contributors are invited to emphasize (a) aspects of research that are limited by the state-of-the-art of commercial instruments and (b) new instrumental capabilities that provide new horizons for biomedical research.

Special events will include (1) George Feher's acceptance of the first senior award of the International EPR(ESR) Society and (2) the annual business meeting of the Society. For more information, contact Profs. Gareth R. Eaton or Sandra S. Eaton, Dept. of Chemistry, University of Denver, Denver, CO, 80208, USA.

SECOND WORKSHOP ON THE FUTURE OF EPR. On Friday, August 7, 1992 at Denver, CO, USA, immediately following the 15th International EPR Symposium. The first Workshop was held in 1987 - see reports in Spectroscopy 3, 34 (1988), the Bulletin of Magnetic Resonance 10, 2 (1988), and the Newsletter vol. 1, no. 2, August 1988). The major aim of the Workshop will be to focus attention of researchers and instrument and software vendors on new EPR methodologies, instrumentation, and software that will enhance the power of EPR as a research resource. The formal presentations and panel discussions will clarify for researchers what is technically possible and what is likely to be successful in the marketplace. The predictions of the first Workshop will be tested against progress. Areas requiring critical breakthroughs will be identified to stimulate new research on resource development. Contact Profs. Gareth or Sandra Eaton, Dept. of Chemistry, University of Denver, Denver, CO, 80208, USA.

SIXTH INTERNATIONAL SYMPOSIUM ON ORGANIC FREE RADICALS, August 16-21, 1992, Noordwijkerhout, The Netherlands. For more information, contact: Dr. Peter Mulder, OFR, CCE, Gorlaeus Labs, Leiden University, PO Box 9502, 2300 RA Leiden, The Netherlands.

ICDIM 92 - INTERNATIONAL CONFERENCE ON DEFECTS IN INSULATING MATERIALS, Nordkirchen, GERMANY, August 16-22 1992. Organized by Prof. Dr. O. Kanert, Fachbereich Physik, Universität Dortmund, and Prof. Dr. J.-M. Spaeth, Fachbereich Physik, Universität Paderborn. For details, contact Prof. Dr. Spaeth at Universität-GH Paderborn, Fachbereich 6 Physik, Warburger Strasse 100, D4790 Paderborn, GERMANY, Telefax: +5251 60 3216, Phone: +5251 60 2745 or 2743, Telex: 936776 unipb d.

FIFTEENTH INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Jerusalem, ISRAEL, August 16 - 21, 1992. The meeting will consist of plenary sessions, symposia and poster sessions. The conference will cover major topics of current interest in Magnetic Resonance in Biological Systems: * Peptides and Proteins - Structure and Dynamics * Protein-Nucleic Acid Interactions * Stable Isotopes - Aided NMR Studies * NMR and Drug Design * Membranes and

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Lipid-Protein Interactions * Biologically Active Polysaccharides * Biological Solid State NMR * EPR: New Biological Applications and Imaging * Metalloproteins * Magnetic Resonance of Photosynthesis * NMR in Living Systems * Cellular Metabolism - Mammalian, Bacterial and Plant Cells * Quadrupolar Nuclei in Biological Systems * Advances in Magnetic Resonance Imaging and Microscopy * New Experimental Methods. For further details, contact the Organising Committee, G. Navon, Chairman, Tel-Aviv University, Tel-Aviv, A. Lapidot, The Weizmann Institute of Science, Rehovot, H. Levanon, The Hebrew University, Jerusalem, or the Secretariat, P.O. Box 3190, Tel-Aviv 61031, ISRAEL, Tel: 972-3-5271111 Telex: 33614, Cable TORUNI, FAX: 972-3-5239099.

FREE RADICALS AND ANTI-ISCHAEMIC AGENTS, December 16-18, 1992, SFRR Europe/Biochemical Society Joint Meeting, London, United Kingdom. For more information, contact Dr. Rice-Evans, UMDS, Lambeth Palace Road, London SE17EH, United Kingdom. Tel: 071-928-9292.

4TH ANNUAL INTERNATIONAL SYMPOSIUM ON SPIN TRAPPING AND AMINOXYL CHEMISTRY to be held during **1993** at the **University of Oklahoma Medical School.** Professor Ed Janzen chairs organizing committee. Details on date forthcoming.

WORKSHOP ON *IN VIVO* EPR AND EPR STUDIES OF VIABLE BIOLOGICAL SYSTEMS to be held during **1993 at Dartmouth Medical School, Hanover, New Hampshire, USA.** Harold Swartz, chair of organizing committee. Sponsored by the Illinois EPR Research Center (IERC) and held at the IERC Dartmouth site. Details on date forthcoming; to be coordinated with the 4th Annual International Symposium on Spin Trapping.

POSITIONS OPEN

POSTDOCTORAL RESEARCH OFFICER POST IN PULSED E.S.R. A U.K. collaborative project on coal characterisation is being carried out, and the Essex contribution involves pulsed electron spin resonance, including echo techniques. We have constructed, in-house, a coherent electron spin echo spectrometer which is used for such studies. A research officer is required to carry out the ESR studies. The candidates for this position should preferably have experience in this technique, but a good understanding of coherent pulse spectroscopy is the essential requirement, and this might have been obtained in other fields such as solid state NMR. The appointment will probably be for one year, renewable for a further year, on the R.A.1A. scale.

Letters of application, with C.V. and two reference names, should be sent to:

Dr. David Greenslade
Department of Chemistry and Biological Chemistry
University of Essex
Wivenhoe Park
Colchester, CO4 3SQ
UNITED KINGDOM

POSTDOCTORAL/RESEARCH ASSOCIATE. A position is available for studying the structure and function of cell adhesive glycoproteins (1,2). The project requires knowledge of ESR spectroscopy and protein purification techniques. Salary will be commensurate with experience. Send curriculum vitae and three letters of reference to:

Dr. Ching San Lai, National Biomedical ESR Center, Medical College of Wisconsin, 8701 Watertown Plank Road, Milwaukee, WI 53226.

1. C. Narasimhan and C-S. Lai (1991) Biopolymers, **31**:1159-1170.
2. C. E. Wolff and C-S. Lai (1990) Biochemistry, **29**:3354-3361.

POSTDOCTORAL/RESEARCH ASSOCIATE. 1-2 positions available in projects using EPR spectroscopy in viable biological systems *in vitro* and *in vivo*. The positions require background in EPR spectroscopy and/or working with viable cells and animals.

Send C.V. and three letters of reference to:

Dr. Harold Swartz
Dartmouth Medical School
Strasenburgh Hall
Hanover, NH 03756, USA
Telephone: (603) 646-8684

POSTDOCTORAL POSITIONS. Positions are available in laboratories associated with the Arizona State University Center for the Study of Early Events in Photosynthesis. Research emphases include mutational analysis of photosynthetic reaction centers from algae, cyanobacteria,

and green and purple bacteria, design and synthesis of biomimetic systems, and photosystem analysis by optical and EPR spectroscopy. Depending on the research project and mentor selected, the work may involve biochemistry, biophysics, molecular biology, organic chemistry, and/or physiology. Interdisciplinary interests are encouraged.

To apply, submit a curriculum vitae and an application letter detailing research interests to:

Larry Orr, Program Coordinator
Center for the Study of Early Events in Photosynthesis
Arizona State University
Tempe AZ 85287-1604, USA
Telephone (602) 965-1963; fax (602) 965-2747; bitnet: photosyn@ASUCPS.

POSTDOCTORAL POSITIONS AT THE UNIVERSITY OF DENVER.

Position A: The Postdoctoral Research Associate will design, perform, and interpret experiments involving spin-spin interactions in metallobiochemistry. A Ph.D., experience in handling metalloproteins, including purification, sample preparation, and characterization, and sufficient background with spectroscopy to learn the EPR techniques used in our lab, is required. Experience with spin-labeling and hemoglobin is desired.

Position B: The Postdoctoral Research Associate will design, perform, and interpret experiments involving spin-spin interactions in metallobiochemistry. A Ph.D. and experience in EPR is required. A knowledge of transition metal chemistry with experience in handling metalloproteins is desired.

Contact:

Gareth or Sandra Eaton
Department of Chemistry
University of Denver
Denver, CO 80208 USA
Phone: 303-871-2980 or 303-871-3102
Bitnet: geaton@ducair or seaton@ducair

SITUATIONS WANTED

ACADEMIC or INDUSTRIAL POSITION WANTED. Solid state physicist. Ph.D.'88. Held academic fellowships and scholarships. Now National Research Council Research Associate at the Naval Research Laboratory. Teaching experience. Research experience in semiconductors utilizing EPR, cryogenic, SiO_2 film fabrication, and various electrical measurement techniques. Seek either a faculty position with the opportunity to teach basic physical principles and laboratory techniques and to conduct research in the physical structure of materials, or an industrial position offering some basic research opportunities. Please contact:

Dr. M. E. Zvanut
Naval Research Laboratory
Code 6816
Washington, DC 20375, USA
[Telephone 202-767-3357]

FREE RADICAL CHEMIST, 42, Cand. Chem. Sci. (Moscow State University, Russia) seeks new challenging research position. Fifteen years university research/teaching experience in radiation chemistry and photochemistry, physical-organic chemistry, application of EPR and EPR-Spin Trapping in various fields of chemistry and biology. Hands-on experience with EPR and Pulse Radiolysis. Interested in applying EPR, spin trapping, and time-resolved techniques to investigate both the structure and kinetics of short-lived free-radical intermediates. Would like to participate in training of masters and doctoral students a,d to develop an independent and interdisciplinary research program in free radical chemistry. Available now. Presently working in Germany. Please contact Dr. V. Zubarev; FAX (international): 49-2461-612535

Valentin E. Zubarev
ICH-1 (Institut für Chemie)
Forsuchungszentrum Jülich, GmbH
Postfach 1913, D-5170, FRG

WANTED: POSITION IN THE FIELD OF EPR APPLICATIONS TO BIOCHEMISTRY. Established scientist (age - mid-30's) with experience in the West, now a group leader at a major Institute in Russia, is interested in exploring the possibility of a position in the Western world. Contact the IERC in Champaign-Urbana, IL for a C.V. and more information.

NOTICES & REQUESTS

Notice: Sources of Conference Travel Funds: In an effort to assist our readers, we list below some information, taken from a research resource database, on programs which might provide travel funds for conferences.

1) Alfred P. Sloan Foundation
General Program
Science and Technology
630 Fifth Avenue, Suite 2550
New York, NY 10111 *(continued on page 23)*

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Support: Research or Dissertation, Seminar or Conference or Travel, Operating or General Support. **Academic background required:** Doctorate/Equiv. Professional. **Agency type:** Non-Federal.

This program provides direct support of research in areas that are or have the potential to become significant but have not received sufficient attention. They may be newly emerging topics or subjects that do not fit into a disciplinary or program orientation of one or another of the government science agencies. Other areas of support include support of the research infrastructure (such as support of conferences, workshops, or fellows programs and understanding of the working of the university research process). There are no deadlines or standard forms. The advisable first step for the applicant is a brief letter of inquiry rather than a fully developed proposal.

2) U.S.-Spanish Joint Committee for Cultural and Educational Cooperation
Study of History Society and Culture
Promotion of University and Institutional Linkages
Paseo del Prado, 28-5.a Planta
28014 Madrid, SPAIN

Support: Research or Dissertation; Seminar or Conference or Travel; Consultant or Visiting Personnel; Collaborative Activity. **Temporary Relocation:** Required. **Academic Background Required:** Doctorate/Equiv. Professional. **Agency type:** Non-Federal.

The Joint Committee seeks to promote understanding of the cultural and intellectual heritage of the United States and Spain. These grants will promote relations between universities and academic institutions of the two countries in the following fields: basic sciences, communication sciences, economics, history, literature, political science, and sociology. The grants will be awarded to: 1) encourage relations through meetings, congresses, conferences, seminars, and institutional visits; and 2) support administration policy, managerial skills, organizational development, and administration of projects dealing with scientific research, technological development, and curriculum development. American and Spanish public and private institutions that wish to collaborate with a university or academic institution in the other country are eligible. The grant covers round trip costs, per diem, and publication of results.

3) National Science Foundation
Directorate for Scientific Technical and International Affairs, International Cooperative Science and Engineering Activities, Cooperative Science Program
Washington, DC 20550, USA. 202-357-7494

Support: Seminar or Conference or Travel; Collaborative Activity. **Temporary Relocation:** Not Required. **Academic Background Required:** Doctorate/Equiv. Professional.

Bilateral Cooperative Science activities generally require each country to pay for the costs of the participation of its own scientists and engineers. NSF will usually provide only the supplemental support required to introduce an international element to or broaden the international character of a research effort. The Cooperative Science Program supports cooperative research, joint seminars/workshops, and individual scientific visits between the USA and other countries. Only proposals in selected areas and topics are eligible. Seminars/workshops and individual visits are considered solely for the purpose of developing concrete proposals for long-term cooperative research. Because proposals for joint research projects will be evaluated through the merit review process of the individual NSF discipline-oriented programs, investigators should consult the appropriate discipline-oriented program concerning applicable deadlines or target dates.

Notice and Request for Opinions: NEW DATA STANDARD FOR EPR-SPECTRUM STORAGE AND TRANSFER

Abstract - A data storage standard for EPR spectra and related data is presented. The experimental data set itself as well as acquisition parameters are

contained in a layered structure which demarcates general physical parameters from spectrometer-dependent quantities. This permits a computer-system independent interpretation of the data. The complete data storage format specifications are accessible to everybody, supporting the writing of compatible software at independent sites.

INTRODUCTION

Meeting a frequent demand of the EPR community, the BRUKER company has designed a data format standard for the storage and transfer of EPR spectra and related data. A preliminary version of this standard has been presented at the 1991 Rocky Mountain Conference in Denver. Herein, BRUKER would like to present a summary of this standard to scientists who did not attend that conference. Additionally, a detailed description in a scientific journal is in preparation.

BES^{3}T^{TM}

This term, which abbreviates BRUKER EPR Standard for Spectrum Storage and Transfer, denominates a public data format description which has been designed with the following objectives in mind:

- Worldwide exchange of EPR spectra in hardware-independent computer-readable format.
- Standardized storage format for all EPR-related data, from Intensity-vs.-Field spectra to multi-dimensional datasets.
- Addition of a rich context for interpretation and presentation to the raw spectrum data.
- Preservation of the flexibility of individual solutions permitting BES^{3}T^{TM} use for local spectrum storage.

BES^{3}T^{TM} General Structure

A BES^{3}T^{TM} dataset is divided into three parts: A Spectrum File, a Parameter File, and additional context files. The Spectrum File exclusively contains experimental data points, no other information. This numeric data may be given in many different formats, most of which are binary, i.e. in the format a computer would store the data in its memory. In its simplest form, a Spectrum File may consist of a sequence of 1D-Spectrum points in a binary 32-bit integer format, which makes it just the same as a current BRUKER '.SPC' file. However, more sophisticated data structures may be stored in the file, which are recognized by looking at the parameter file.

The Parameter File, in contrast to the Spectrum File, uses ASCII characters to store its information. All entries adhere to a clearly arranged "<keyword> <value>" format. A Parameter File consists of two main parts. The Descriptor part provides the information required to read in and present the numeric data in the Spectrum File. In other words, after reading the Descriptor and the Spectrum File, a suitable program has everything it needs to produce a publication-ready plot of the data, including axes, labels, units, and a title. In addition, the descriptor indicates whether the Spectrum File contains experimental or manipulated data.

If the Spectrum File contains experimental data, the second part of the Parameter File contains experiment parameters. Because not all spectrometers are the same, this information is split into a Standard Parameter Layer, applicable to all spectrometers, and a Device Specific Layer, which accounts for the particularities of specific equipment.

If the Spectrum File contains manipulated data, the second part of the Parameter File contains a description of how the data was obtained and from which experimental spectra it stems. This part is called the Manipulation Parameter Layer.

By the first version of the standard, Additional Context Files are defined to represent nonlinear sweeps or irregular 'sweeps'. Other types of Context Files may be added in future versions, if required.

ADDITIONAL INFORMATION. If you would like to receive a copy of the BES^{3}T^{TM} specifications booklet, or make any suggestions, please write to:

BRUKER INSTRUMENTS, INC., Manning Park, Billerica, Mass. 01821, USA or
BRUKER ANALYTISCHE MESSTECHNIK GMBH, Silberstreifen, D-7512 Rheinstetten 4, BRD.

Notice and Request for Opinions: A Proposal for Standardization of Symbols in EPR — Dr. Czeslaw Rudowicz, of the City Polytechnic of Hong Kong, is interested in the establishment of standard notations and symbols to be used in EPR, especially for high-spin systems. With the encouragement of some colleagues in the international EPR community, he has written a short review and proposal which has been published in the *Bulletin of Magnetic Resonance*, Vol. 12, No. 4, 174-182 (1991). As a supplement to that proposal, a questionnaire has been prepared soliciting opinions of scientists active in EPR. You are invited

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to fill out and return this questionnaire, which may be obtained from

Dr. C. Rudowicz
Department of Applied Science
City Polytechnic of Hong Kong
83 Tat Chee Avenue
Kowloon, HONG KONG
Telephone 852-788-7787; FAX: 852-788-7830

EQUIPMENT & SUPPLIES EXCHANGE

WANTED: EPR SPECTROMETER.

We are in need of a Varian E series spectrometer, preferably an E-4, in good condition. A klystron for an E-3 is also useful. To discuss either item, please contact:

Mark McNamee
Department of Biochemistry and Biophysics
University of California at Davis
Davis, CA, 95616, USA
Telephone: 916-752-6418; FAX: 916-752-3085.

WANTED: OLD OR JUNKED VARIAN E-3.

We need an old or junked Varian E-3 EPR spectrometer to be used for parts for one that is still running. Contact:

H. D. Gesser
Dept. of Chemistry, U. of Manitoba
Winnipeg, CANADA R3T 2N2
Telephone: 204-474-9893
FAX: 204-275-0905

NICOLET EPR COMPUTER SYSTEM FOR SALE.

Asking price is US$2750 for the total system which includes: NIC-1280 mainframe processor with 64K RAM, 8K ROM, 20 bit memory, cpu; power supply I/O board and X-Y interface. NIC-123/2 dual input 12 bit 333 kHz ADC; NIC-300A I/O; NIC-1280 dual disk interface; NIC-Zeta plotter; CDC "Hawk" dual disk drive with 4 extra cartridges; Teletype model 43 terminal; large cabinet on wheels for all components; various cables for connecting to Varian E-9 and all manuals. Please contact:

Alfred F. Esser
University of Missouri
Division of Cell Biology and Biophysics
Kansas City, MO 64110, USA.
Telephone: 816-235-5316
FAX: 816-235-5158
E-Mail: aesser@umkcvax1.bitnet

AVAILABLE: VARIAN 620L BOARDS

A full set of boards for the Varian 620L computer is available from the Eatons at the University of Denver (BITNET SEATON@DUCAIR).

WANTED: PAR BOXCAR-AVERAGER.

We are seeking a dual-channel boxcar-averager, PAR Model 162. Please contact:

Dr. Günter Grampp
Institute of Physical Chemistry
University of Erlangen
Egerlandstraße 3
D-852 ERLANGEN, GERMANY

FOR SALE: A 15" VARIAN EPR MAGNET.

The University of Wisconsin-Madison Department of Chemistry has a 15-inch Varian magnet for sale or disposal. Heat exchanger and power supply are not included. The magnet, purchased in 1968, has been used solely for X-and Q-band EPR experiments and is in very good condition. The magnet runs at 20 kW power (10 kW per coil), sits on a 360° rotating base, and weighs 7700 lbs. The air gap is 76.2 mm (3 inches). The center of the air gap is 83 cm (32⅝ inches) above the floor. For further details, please contact:

Professor Tom Farrar [Tel. 608-262-6158] or
Dr. Richard Fronko [Tel. 608-262-3182]
Department of Chemistry
University of Wisconsin at Madison
Madison, WI 53706-1396, USA.

Fax: 608 262 0381. E-mail: fronko@chem.wisc.EDU

AVAILABLE: BOXCAR AVERAGER

An inexpensive boxcar averager designed for use in electron spin echo (ESE) spectrometers is available from the University of Denver. At slow repetition rates it gives about two orders of magnitude better S/N than the well-known PAR 162/164 boxcar.

Contact Richard Quine (303-871-2419).

AVAILABLE: VARIAN V 4500 MODULES

Modules for the Varian V4502 EPR spectrometer are available from the Eatons at the University of Denver (BITNET GEATON@DUCAIR).

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FOR SALE: VARIAN EPR SPECTROMETER.

We have decided to sell our old Varian EPR spectrometer. This instrument will be available to the highest bidder on the basis of sealed bids as determined by Colorado law sometime early in 1992. The instrument is described as follows:

E-109E EPR Spectrometer purchased new from Varian in 1979 with the following components: E-102 Microwave Bridge, V-7200 9 inch magnet, V-7600 Magnet Power Supply, Field/Frequency Lock Unit (21480) E-272B, Consul Century (917190-08), Field Control Unit E-203B, High Frequency Unit E-207, Oscilloscope Unit E-200B, E-231 Multi-Purpose Cavity, E-80A Recorder.

The Instrument is still in working condition. The signal-to-noise ratio is reasonable; however, the sensitivity is below specification based upon weak pitch. Sensitivity may benefit from a new crystal detector. More details are available to interested parties. The instrument is available for inspection in the Chemistry Building. The instrument is expected to be available for pick up by late winter to early spring, depending upon the installation of our new instrument.

Contact:

Tad H. Koch, Professor
Department of Chemistry & Biochemistry
University of Colorado at Boulder
Campus Box 215
Boulder, Colorado 80309-0215, USA

Tel: 303-492-6193
E-Mail: "KOCH_T@CECHEM.Colorado.EDU"

WANTED: USED VARIAN EPR X-BAND CAVITY.

We are in need of a Varian cavity, either TE_{102} or TM_{011} preferred, to fit an E-line or Century series EPR spectrometer. Many Varians have been sent to the iron-monger, but people usually keep their cavity for sentimental reasons. We want to buy an old cavity. We will have it reconditioned, if necessary - as these are no longer sold by Varian.

If you can help, please contact:

Professor Lawrence J. Berliner
Dept. of Chemistry
The Ohio State University
120 West 18th Ave.
Columbus, OH 43210-1173, USA.

Telephone: 614-292-0134; E-Mail: BERLINER@LIVERS.MPS.OHIO-STATE.EDU.

AVAILABLE: VARIAN FIELD SCAN CONTROLLER CARDS

Any Varian magnetic field controller can be modified to permit control of the magnetic field by a computer. A fully documented printed circuit card and controller modifications is available from the University of Denver.

Contact Richard Quine (303-871-2419).

WANTED: SURPLUS EQUIPMENT, PARTS, BOOKS, JOURNALS.

My Letter to the Editor in a previous issue (vol. 3, #1, January, 1991) explains how our institute has become sadly depleted in equipment and supplies in recent years. We are grateful to anyone who can help with a gift of surplus equipment (or parts). Also, we could use surplus books or journals in the field (EPR and NMR) or in closely related areas (physical chemistry). We would appreciate help with transportation, but shall find a way to pay if necessary.

Dr. Horia Caldararu
Romanian Academy
Institute of Physical Chemistry
Splaiul Independentei 202
77208 Bucharest, ROMANIA.

NITROXIDES FREE!

We have a large amount of nitroxide radicals to give away: 5g samples of 4-Hydroxy-TEMPO and 25mg samples of 4-Phosphonooxy-TEMPO hydrate, both from Aldrich. Contact by Bitnet (SCHWEIGER@CZHETH5A) or mail:

Arthur Schweiger
Laboratory for Physical Chemistry
ETH-Zentrum
CH-8092 Zürich
SWITZERLAND

WANTED: EPR SPECTROMETER.

We are looking for a Varian E-Line Century series spectrometer to purchase. An E-109 is preferable, but any working Century series model would be acceptable. Contact:

Richard Lokken or Mark Wolski
Medical Advances, Inc.
10431 W. Watertown Plank Rd.
P.O. Box 26425
Milwaukee, WI 53226-0425, USA.

Telephone: 414-258-3808
FAX: 414 258 4931

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APPENDICES

APPENDIX I. Errata

Constitution of International EPR Society: In the previous issue (Volume 3, Number 4), the Constitution of Society was printed. Members should make the following additions and corrections:

Article IV. Council and Officers, paragraphs 4 & 5:

4. Secretary. The Secretary shall maintain all the records of SOCIETY meetings, and be responsible for the distribution of all essential information to members. The term of office of the Secretary shall be three years, subject to re-election for no more than two further periods of three years.

5. Treasurer. The Treasurer shall have custody of all funds of the SOCIETY, collect all dues and disburse funds in accordance with the direction of the Council. The Treasurer shall maintain proper books of accounts for the SOCIETY. The term of office of the Treasurer shall be three years, subject to re-election for no more than two further periods of three years.

Article VI. Standing Committees, paragraph 2:

2. Nominating Committee. The Nominating Committee shall consist of at least five persons appointed by the Council to serve for three years. The immediate Past President shall be an automatic member of the Nominating Committee and shall chair its meetings. The members of the Nominating Committee shall have an international distribution and reflect a range of scientific aspects of EPR. Members of the Nominating Committee may not be candidates in the elections for which they have prepared nominations. They shall have particular regard to a geographical and international distribution of nominees and to balance of scientific aspects of EPR. In particular, successive Presidents should come from different countries. Nominations may also be received by petition signed by at least five Regular Members and accompanied by a written statement from the nominee of willingness to serve.

Article VII. Elections, paragraph 3:

3. Elections will be held every three years. In the event that an Office of the SOCIETY or a position on the Council becomes vacant due to any cause, the Nomination Committee will nominate a candidate or candidates and a special election will be carried out as soon as feasible.

APPENDIX II. COUNCIL AND OFFICERS OF THE INTERNATIONAL EPR SOCIETY

J.-J. André {Institut Charles Sadron, Strasbourg, FRANCE};
R.Basosi {Universita di Siena, ITALY};
A.J.J. Beckwith {AUSTRALIA National University};
R.L. Belford {University of Illinois, Urbana IL, USA};
L.J. Berliner {Ohio State University, Columbus OH, USA};
A. Beth {Vanderbilt University, Nashville TN, USA}
J.R. Bolton {University of Western Ontario, London, Ont., CANADA}
D.C. Borg {Brookhaven National Lab., Upton, NY, USA}
M. Brustolon {University of Padova, ITALY};
H.A. Buckmaster {University of Calgary, Alta, CANADA};
A.G. Davies {University College London, UNITED KINGDOM};
E. de Boer {University of Nijmegen, NETHERLANDS};
K.P. Dinse {Universität Dortmund, GERMANY};
G.R. Eaton, Secretary {University of Denver, CO, USA};
S.S. Eaton, Treasurer {University of Denver, CO, USA};
A. Ehrenberg {University of Stockholm, SWEDEN};
R.R. Ernst {ETH, Zürich, SWITZERLAND};
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J.S. Hyde {Medical College of Wisconsin, Milwaukee WI, USA};
M.P. Klein {Lawrence Berkeley Laboratory (University of California), CA, USA
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R.P. Mason {NIH/NIEHS, Research Triangle Park NC, USA};
K.A. McLauchlan {Oxford University, UK};
K. Möbius {Free University of Berlin, GERMANY};
E. Niki {University of Tokyo, JAPAN};
J. Peisach {Albert Einstein College of Medicine, Bronx NY, USA};
J.R. Pilbrow {Monash University, Clayton, Victoria, AUSTRALIA};
B.H. Robinson {University of Washington, Seattle WA, USA};
K.M. Salikhov {Zavoisky Institute, Academy of Science, Kazan, RUSSIA};
T. Sarna {Jagiellonian University, Krakow, POLAND};
A. Schweiger {ETH, Zürich, SWITZERLAND};
T. Shida {Kyoto University, JAPAN}};
H. M. Swartz, President {Dartmouth University, Hanover, NH, USA};
M.C.R. Symons {University of Leicester, UK};
D.D. Thomas {University of Minnesota, Minneapolis MN, USA};
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APPENDIX III. COMMITTEE CHAIRS FOR THE INTERNATIONAL EPR(ESR) SOCIETY

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