

## AUSTRALIA SETS STRICT RF/MW EXPOSURE STANDARD.

The new Australian safety standard for public and worker exposures to radiofrequency and microwave (RF/MW) radiation is one of the strictest outside of the Soviet Union and Eastern Europe. Issued in 1985, the national standard is based on the "as low as reasonably achievable" - or the ALARA -principle.

The developers of the standard adopted a cautious attitude towards radiation risks - especially with respect to protecting the general public:

"Because the effects of ... exposures to electromagnetic fields are only imperfectly understood, it is recommended that the levels of all electromagnetic fields to which people are non-occupationally exposed should be kept as low as reasonably achievable." (emphasis in the original)

### A "Flat" Standard

The standard differs from those used in other "Western" countries in two crucial aspects. First, it is frequency-independent - or "flat" - between 30 MHz and 300 GHz, limiting exposures to 1 mW/cm<sup>2</sup> for workers and to 200 uW/cm<sup>2</sup> for the general public; second, it specifies special precautions to safeguard against RF shocks and burns. (See Table below.)

While the Australian exposure limits are the same as those of both the American National Standards Institute (ANSI) and the International Radiation Protection Association (IRPA) in the 30-300 MHz band, they are five times stricter than those of ANSI and IRPA above 1,500 MHz.

The Australian standard is similar to the safety guidelines adopted by the Johns Hopkins University Applied Physics Laboratory (JHU-APL) in 1984. The JHU-APL limits are also based on the ALARA principle and are frequency-independent from 30 MHz to 100 GHz; they are stricter, however, limiting exposures to 100 uW/cm<sup>2</sup> in that frequency range.

In a "Rationale" accompanying the Australian standard, Committee TE/7 on Hazards of Non-Ionizing Radiation explained that:

"With the present state of knowledge and taking into account the differences in opinion as to where an increase in the maximum exposure level would be appropriate, it would be wise not to increase the maximum exposure level for this higher frequency range above 1 mW/cm<sup>2</sup> at the present time."

Like IRPA's standard but unlike ANSI's, the Australian standard specifies limits for the general public which are five times more stringent than those for workers - ANSI recommends the same levels for workers and the general public. (The rationale details why its recommendations differ from those of the ANSI standard.)

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### HERBERT A. POHL 1916 - 1986

Professor Herbert A. Pohl passed away Saturday, 21 June, of a heart attack. Born 1916, Pohl earned his Ph.D. in chemical physics at Duke University in 1939. He was a faculty member at the Departments of Anatomy and Chemical Engineering, Johns Hopkins Medical School. He served in the Navy during World War II at the Naval Research Laboratory, and later worked for the DuPont Company on nylon, dacron, and in the atomic energy division. From 1957-1962 he taught at Princeton University. Later he joined the Brooklyn Polytechnic Institute, then was a Visiting Professor at the University of Uppsala, Sweden as a Wallenberg Fellow from 1963-1964. He served as Professor of Physics at Oklahoma State University from 1964-1981. As a NATO Senior Fellow, he did research at Cambridge University in 1971, and at Woods Hole, MA in 1976. His active research was on electroactive organic polymers, and on biological dielectrophoresis, a phenomena he discovered and named.

Dr. Pohl was the Editor of the Journal of Biological Physics, and Co-Editor of the IEEE Digest of Dielectrics. He was also the Director of the Pohl Cancer Research Laboratory, Stillwater, OK; and at his death was a Visiting Scientist at the Francis Bitter National Magnet Laboratory, Massachusetts Institute of Technology.

## Shock and Burn Hazards Minimized

The committee that wrote the standard devised an original solution to the vexing problem of RF shocks and burns, setting different exposure limits for environments with and without such threats. For instance, when the risk of shocks and burns is present, RF exposures below 9.5 MHz are limited to 10 mW/cm<sup>2</sup>, but when the necessary precautions are taken, the standard rises to 100 mW/cm<sup>2</sup> below 3 MHz.

Other key features of the Australian standard are:

- Between 300 kHz and 300 GHz, exposures can never exceed 1000 mW/cm<sup>2</sup>, no matter how short the time.
- For all exposure conditions, regardless of the field strength, an averaging time of 1 minute is used.
- For exposures between 6 and 30 minutes, the limits can be relaxed by a factor of up to 5.
- Devices operating at frequencies below 1 GHz with an output power of less than 7 watts are excluded.
- Eye examinations are recommended for non-ionizing radiation workers before and after employment and at least every five years, if not more frequently.

## RF Heater Workers are Overexposed

In a paper presented at last August's *Conference of the Australian Radiation Protection Society* in Melbourne, Dr. K.H. Joyner of the Australian Radiation Laboratory noted that, "Implementation of the new standard will undoubtedly require surveys of existing facilities to be carried out. Subsequent to these surveys, and where necessary, changes to work practices and/or alteration to

these facilities, such as the installation of shielding, will have to be made."

Indeed, Joyner and his colleague, Dr. M.J. Bangay, have found, in a survey of the electric and magnetic fields near 101 RF heaters, that 39 percent of the units exposed the operators to levels greater than the 1985 limits - up to ten times the standard - and that 23 percent of the heaters exposed the operators to levels that were at least ten times greater than the standard. The survey results were published in the March 1986 issue of *Health Physics*.

The Australian standard had been under development since 1978. In 1982, occupational limits identical to ANSI's were proposed, with public exposure limits ten times stricter. That proposal was opposed by the Australian Council of Trade Unions.

A copy of Australian Standard AS 2772-1985, Maximum Exposure Levels - Radiofrequency Radiation - 300 kHz to 300 GHz, is available in the U.S. for \$15.00, plus \$4.00 shipping and handling, from the ANSI Sales Office, 1430 Broadway, New York, NY 10018, (212) 642-4900. Orders must be prepaid. In Canada, the standard is sold by the Standards Council of Canada and in the U.K. by the British Standards Institution. It is also available directly from the Standards Association of Australia, PO Box 458, North Sydney 2060, Australia. See also two papers that discuss the standard: "Overview and International Approaches to Radiofrequency Radiation Exposure Standards" by T.N. Swindon and "The Australian Radiofrequency Exposure Standard: Implications and Implementation" by K.H. Joyner (cited above), both published in *Radiation Protection in Australia*, 3, pp. 119-121 (No. 3) and pp. 135-140 (No. 4), respectively.

(Reprinted with permission from the March/April 1986 issue of *Microwave News*, a New York City-based Newsletter.)

### MAXIMUM OCCUPATIONAL EXPOSURE LEVELS

#### CONDITION A

Frequency	Mean power flux density (S)†	
	W/m <sup>2</sup>	mW/cm <sup>2</sup>
300 kHz ≤ 9.5 MHz	100	10
> 9.5 MHz ≤ 30 MHz	9000/f <sup>2*</sup>	900/f <sup>2*</sup>
> 30 MHz ≤ 300 GHz	10	1

#### CONDITION B

Frequency	Mean power flux density (S)†	
	W/m <sup>2</sup>	mW/cm <sup>2</sup>
300 kHz ≤ 3 MHz	1000	100
> 3 MHz ≤ 30 MHz	9000/f <sup>2*</sup>	900/f <sup>2*</sup>
> 30 MHz ≤ 300 GHz	10	1

NOTE: Values of S are averaged over any 60-second period.

\*f = frequency in megahertz.

†S = equivalent plane wave power flux density.

Condition A applies in areas in which the risks of shocks and burns exist. Condition B applies when these risks have been eliminated.

## NATIONAL VIBRATING PROBE FACILITY

Sensitive probes that measure the miniscule electric field produced by living cells are available for use at the National Vibrating Probe Facility in Woods Hole, Massachusetts. Under the direction of Dr. Lionel Jaffe, the facility, funded by the biomedical Research Technology Program of the NIH Division of Research Resources, operates three electrode systems which can detect current densities smaller than 50 nanoamps/cm<sup>2</sup> (10<sup>-9</sup> amps/cm<sup>2</sup>) from cells or tissues 50 microns or more in diameter.

According to Dr. Carl Scheffey, managing director of the probe facility, the vibrating electrodes are particularly useful for detecting low frequency currents associated with such biological phenomena as the expulsion of chloride ions from the gills of sea fish, ionic transport by human epithelial cells, and the development of cockroach eggs. The fluctuating electrical signals produced during these activities, which aid researchers in monitoring the development of cells and their function, typically vary over a period of minutes or even hours.

But electrical noise known as contact noise, which occurs at low frequencies, makes these weak biological signals difficult to detect by pairs of electrodes held at rest. Instead, the facility relies on a system of single platinum electrodes, which are vibrated at a rate (typically 400 cycles per second) thousands of times higher than the electrical frequency detected. The effect of the vibrating electrodes is to convert the low frequency electric fields into higher frequency signals. The large electrical noise associated with

lower frequencies is avoided and more accurate measurements are possible.

In practice, a probe is set vibrating only a few millimeters from the sample. This motion enables the probe to measure two components of the electric field simultaneously.

The sample is also observed under a Zeiss IM-35 inverted microscope and the image is displayed on a video monitor. A computer converts the probe's electrical measurements into field vectors that are mapped onto the video image, yielding information about the flow of current in the living system. Altering the fluid in which the probe and sample are immersed and noting the resulting change in current can help identify the type of ions that make up a particular electronic signal.

Researchers have used the probes to study cell motility, wound healing and regeneration of nerves, as well as normal growth and development of cells. Investigators have studied currents through toad skin, snake muscle spindles, budding moss filaments, *Limulus* photoreceptors, and gliding *Cyanobacteria*. One scientist recently compared the currents produced by corn roots placed perpendicular and parallel to the ground. The differences in current may indicate why roots grow into rather than out of soil.

Phase, DIC, and fluorescence optics are available. Two of the electrode systems are cushioned by Newport air tables and are supplemented with equipment that can apply a fixed voltage across the sample and allow measurements with intracellular microelectrodes in addition to the vibrating probes. A set of stationary glass electrodes is also available for measuring voltages. Although the resource specializes in low frequency measurements, electrical signals that have a duration of hundredths of seconds or shorter can also be detected.

Researchers may use the facility free of charge. Proposals for projects that require 4 weeks or more of laboratory study should be submitted several months in advance to the facility. Shorter-term request can be telephoned a few weeks before the resource is needed; demand for the probes is heaviest in the summer. For more information on the resource contact:

Dr. Carl Scheffey  
National Vibrating Probe Facility  
Marine Biological Laboratory  
Woods Hole, Massachusetts 02453  
Telephone (617) 548-3705

(Extracted from Research Resources Reporter, a publication of the Division of Research Resources, NIH, Vol. IX, No. 12, December 1985)

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*The BIOELECTROMAGNETICS Society Newsletter is published and distributed to all members of the Society. Information regarding the Society may be obtained by writing to BEMS, P.O. Box 3729, Gaithersburg, MD 20878. Institutions and libraries may subscribe to the Newsletter at an annual cost of \$35 (\$45 for overseas subscribers). The Newsletter serves the membership and subscribers in part as a forum for the presentation of ideas and issues related to bioelectromagnetics research. All submissions to the Newsletter must be signed and reflect the individual views of the authors and not official points of view of the Society or of the institutions with which the authors are affiliated. The Society solicits contributions to the Newsletter from its members and others in the scientific and engineering communities. News items as well as short research notes and book reviews are welcome. Submit items for consideration to: Editor, BEMS Newsletter, 4105 Fairfax Drive, Suite 105, Arlington, VA 22203.*

TC Rozzell, Editor  
CA Jordan, Asst. Editor

**BEMS 86: ANNUAL BUSINESS MEETING**

The Annual Business Meeting of the Society was held on Wednesday, 4 June 1986, in the Great Hall of Memorial Union, University of Wisconsin, Madison, Wisconsin, with President Elliot Postow presiding.

There were 238 registrants at this year's Annual Meeting.

The President announced several actions taken by the Board during its recent meetings. At the midwinter meeting in January, the Board decided not to award the D'Arsonval Medal in 1986. The certificate of award for the best student paper at the Annual Meeting would include the name of the student's advisor and duplicate certificates would be awarded to the student and the advisor. At the meeting of June 1, the fees and benefits of Sustaining Membership were reviewed. The fee was raised to \$500 per year and the benefits include one registration at the Annual Meeting, one subscription to the Journal, name to be listed in the fourth issue of a volume of the BEMS Journal, a 25% discount on the exhibitor's fee, access to the BEMS mailing list once at no cost, and a certificate. The Board also decided that the recipient of the D'Arsonval Medal will receive an illuminated testimonial at the time of the award. The testimonial will be awarded retroactively to Herman Schwan.

The Secretary-Treasurer, Eleanor Adair, reported that the Society had 444 members in good standing as of the beginning of the meeting. This membership total was broken down as 67 charter, 261 full, 6 emeritus, 91 associate, and 11 student, with 8 pending. In addition, 33 new applicants took advantage of the special offer of \$5 above the meeting registration fee to apply at the time of the meeting; this is a much larger number than last year. During the 12 months prior to the meeting, 49 applications were processed by the Membership Committee: 24 full, 21 associate and 4 student. This is about the same as the corresponding previous 12 months. The geographic distribution of new members is 90% USA with the rest from Europe, Canada and Australia. By discipline, the membership is 37% biological sciences, 45% engineering/physical sciences and 18% other, which reflects the distribution of the membership as a whole.

The mail ballot to change the Bylaws so the Society's fiscal year begins April 1 instead of January 1 resulted in 161 ballots received with 158 in favor. The change will aid the Board in managing the fiscal affairs of the Society.

The Secretary-Treasurer discussed the financial status of the Society. At the midwinter Board meeting, the management of the Society was

changed effective April 1, 1986, on the recommendation of the Management Committee. The Board ordered a full audit of the Society's books at the time of the changeover. The audit, encompassing the 15 months prior to April 1, has not been completed because of certain inadequacies of documentation and record keeping by the previous management of the Society. The auditors are currently constructing audited financial statements and a balance sheet that will be submitted to the Board upon their completion. The statements will be available to the membership at that time and may be obtained by writing to the BEMS office.

Although audited figures were not available, a balance sheet prepared by the former Executive Director as of March 31, 1986 indicated the following: an estimated loss for the previous 15 months of \$3514; total assets of \$30,029 and total liabilities of \$5615; total liabilities and members' equity of \$30,524. The current Executive Director had reported a cash position of \$26,000 before the meeting and an additional \$12,000 was received in registration fees, for total cash in excess of \$38,000.

The Editor-in-Chief of Bioelectromagnetics, R. Phillips, reported that there has been a small decrease in subscriptions to the Journal so far this year, 464 compared to 474 at this time last year. Members subscriptions decreased from 274 to 253 while non-members subscriptions increased from 200 to 211.

Thirty-five full papers and two brief communications were published in 1985 (Volume 6). Eighteen full papers and five brief communications have been published in the first two issues of Volume 7. The last two issues of Volume 7 are now filled, and papers accepted at this time will be published in 1987.

The number of manuscripts submitted in 1985 was 65 compared to 76 in 1984. Submissions this year are running about even with last year. The rejection percentage has decreased from about 50% to 37% in 1985. The Editor-in-Chief attributed the decrease to better quality of the submissions. About one-third of the submissions are from European and Asian countries.

The **Newsletter** Editor, Tom Rozzell, reported that the **Newsletter** would be published on schedule, 10 issues per year. It will take on a new format this year and it will be printed on a laser printer. The Editor asked for feedback on how members liked the new format. He also encouraged members to suggest ideas for publication.

A report of the Ad Hoc Committee on Research Funding was presented by Jim Bond, chairman of

the committee. He reported on the trends in funding research in the field of bioelectromagnetics over the last several years. A full copy of the committee's report appears elsewhere in the **Newsletter**. The information was provided by the program managers at various agencies.

The proposed amendment to the Constitution was provided to each attendee, and had been mailed to each member in February. The Secretary-Treasurer read the article of the Constitution pertaining to amendments which stated that an opportunity for discussion of the proposed amendment must be provided at the Annual Business Meeting. President Postow stated that the amendment expressed the intent of the Board to make the immediate Past President an officer of the Society and automatically a member of the Board's executive committee. Currently, the Past President is a member of the Board. The Board believes that the Past President has a great deal of experience that should be available to the executive committee. There was no discussion of the proposed amendment from the floor. A ballot for passage of the amendment will be sent to all voting members within eight weeks of the annual meeting.

Future meetings were discussed by President Postow. He announced that the 1987 meeting of the Society would be in Portland Oregon at the Lloyd Center Red Lion Hotel, June 21-25, 1987. The third week in June was selected because last year's poll indicated that week was favored by the attendees. Members were again requested to fill out the questionnaire so that the Board could try to plan meetings in accordance with the desires of the membership.

For BEMS 88, the Boston metropolitan area is being investigated, with the third week in June again being the favored time. The Board and representatives of the Gordon Conference are discussing the timing of these two meetings.

There will be some BEMS participation in the URSI meeting in Israel during the last week of August, 1987 and the Bioelectrochemical Society (BES) meeting in Hungary during the first week of September, 1987. Information concerning these meetings will be published in the **Newsletter** as it becomes available.

In his closing remarks, President Postow thanked the retiring officers and members of the Board: Charles Cain, Barbara Chang, Joe Elder, Ken Foster (Chairman of the Awards Committee), Past President Don Justesen, and Secretary-Treasurer Eleanor Adair. President Postow thanked especially Secretary-Treasurer Adair who had taken the leadership over the last 18 months

in improving the management of the Society. The retiring Secretary-Treasurer was presented with a plaque in appreciation of her contributions.

President Postow congratulated incoming President Maria Stuchly and her Program Committee for an excellent scientific program and wished her luck during her term. Stuchly, in turn, presented a plaque to Postow thanking him for his guidance through difficult times.

### TENFORDE ELECTED VP/PRES.-ELECT

At the Annual Business Meeting, Carl Durney, Chairman of the Election Committee, announced the results of the election. Tom Tenforde, University of California at Berkeley, beat out Mary Ellen O'Connor, University of Tulsa, as Vice-President (President-Elect). One hundred and eighty one ballots were received; four were unsigned therefore not counted. The newly elected Board Members were:

Tom S. Tenforde	Vice-President (President-Elect)
Asher R. Sheppard	Engineering/Physical Sciences
Larry E. Anderson	Biological/Medical Sciences
Robert P. Liburdy	Biological/Medical Sciences
James C. Lin	At Large

The full board for 1986-1987 appears below:

#### 1986-1987 BOARD MEMBERS

Maria Stuchly	President
Tom S. Tenforde	Vice-President (President-Elect)
John W. Allis	Secretary/Treasurer
Richard D Phillips	Editor-in-Chief
Elliot Postow	Past President

#### Directors

Howard Wachtel	Engineering/Physical Sciences
Michael Marron	Engineering/Physical Sciences
Asher R. Sheppard	Engineering/Physical Sciences
W. Gregory Lotz	Biological/Medical Sciences
Shirley Motzkin	Biological/Medical Sciences
Carl H. Sutton	Biological/Medical Sciences
Richard Lovely	Biological/Medical Sciences
Larry E. Anderson	Biological/Medical Sciences
Robert P. Liburdy	Biological/Medical Sciences
William Pickard	At Large
James D. Bond	At Large
James C. Lin	At Large

#### Executive Director

William G. Wisecup

#### Newsletter Editor

Thomas C. Rozzell

## BIOELECTROMAGNETICS FUNDING SURVEY

At the annual meeting, Jim Bond presented some "rough" data reflecting past, current, and projected levels of funding by those U.S. Government Agencies who sponsor research in the area known as bioelectromagnetics. The data was organized so as to distinguish between intramural and extramural support. It is reproduced here for **Newsletter** readers; all dollar values are expressed in units of thousands of dollars.

### ENVIRONMENTAL PROTECTION AGENCY

<u>Year</u>	<u>Intramural (K)</u>	<u>Extramural (K)</u>
1980	1191.3	2402.8
1981	1168.1	1549.4
1982	1289.1	2161.7
1983	797.3	1130.2
1984	512.2	1299.3
1985	784.1	717.7
1986	450.0*	250.0*

\*Pending

### DEPARTMENT OF ENERGY (EES)

<u>Year</u>	<u>Extramural (K)</u>
1980	3300
1981	3300
1982	2400
1983	2300
1984	3000
1985	4700
1986	3000
1987	2100**

\*\*Projected

### DEPARTMENT OF ENERGY (OTHER)

<u>Year</u>	<u>Extramural (K)</u>
1980	1000
1981	900
1982	1500
1983	170
1984	150
1985	0
1986	0
1987	0

### NAVAL MEDICAL R&D COMMAND (BIOHAZARDS)

<u>Year</u>	<u>Intramural (K)</u>
1980	1895
1981	1274
1982	1292
1983	1293
1984	1061
1985	733
1986	513
1987	530

### NAVAL MEDICAL R&D COMMAND (INSTRUMENTATION)

<u>Year</u>	<u>Intramural (K)</u>	<u>Extramural (K)</u>
1980	--	--
1981	--	--
1982	291	291
1983	355	355
1984	396.5	396.5
1985	385.5	385.5
1986	267	267
1987	125	125

### U.S. AIR FORCE SCHOOL OF AEROSPACE MEDICINE (RADIATION PHYSICS)

<u>Year</u>	<u>Intramural (K)</u>	<u>Extramural (K)</u>
1980	1200	1900
1981	1300	2700
1982	1400	3400
1983	1500	2500
1984	1300	2500
1985	1200	2000
1986	1200	3200
1987	1400	3700

### OFFICE OF NAVAL RESEARCH

<u>Year</u>	<u>Extramural (K)</u>
1980	500
1981	1000
1982	1500
1983	2300
1984	1800
1985	1800
1986	1500
1987	700

## GENERAL NEWS

### WALTER REED ARMY INSTITUTE OF RESEARCH (DEPARTMENT OF MICROWAVE RESEARCH)

<u>Year</u>	<u>Intramural (K)</u>	<u>Extramural (K)</u>
1980	550	550
1981	550	550
1982	550	550
1983	550	550
1984	550	550
1985	1100	1100
1986	2050	2050
1987	2050	2050

### NIEHS

<u>Year</u>	<u>Intramural (K)</u>	<u>Extramural (K)</u>
1985	340	1166
1986	275	510
1987	275	380

### ELECTRIC POWER RESEARCH INSTITUTE

<u>Year</u>	<u>Extramural (K)</u>
1980	1780
1981	2115
1982	1960
1983	2075
1984	2160
1985	1680
1986	1700

### NIOSH

<u>Year</u>	<u>Intramural (K)</u>	<u>Extramural (K)</u>
1982	115	--
1983	280	--
1984	285	--
1985	165	100
1986	330	100

### E-MAIL NET FORMED

An electronic mail network has been formed to provide better communication between members of the bioelectromagnetics community. Organized by Mike Marron and Tom Rozzell of the Office of Naval Research, the net is operated by ITT Dialcom. In addition to BEM researchers, the net includes people working in the Free Electron Laser Program of ONR. One of the features of the net will be a bulletin board for use by all participants, allowing conferencing on issues, research results, etc. There will also be a segment dedicated to electronic publishing, a sort of electronic newsletter or E-News. E-News will contain late-breaking abstracts from the research literature supplied by Information Ventures of Philadelphia. It will also contain information about upcoming meetings, symposia and conferences, and other information of general interest to the BEM scientific community.

At present, the net has about 100 members of which approximately two thirds are from the bioelectromagnetics community. Membership in the net is open to those persons engaged in BEM research or administration who possess a computer or terminal and a 300 or 1200 baud modem. There is no charge for use of the net and requests for inclusion and assignment of a directory and password should be forwarded to:

BEM Program Manager  
Code 1141CB  
Office of Naval Research  
Arlington, VA 22217-5000

Please include a stamped, self-addressed envelope with your request. You will be added to the net and assigned an ID number. In addition, you will receive instructions for connecting to the net via a local (in most cases) telephone number. Since the net is world-wide, most countries are able to communicate with it.

### BEMS Phone Number Change

The BEMS office in Gaithersburg  
has a new telephone number:

(301) 921-0172

Imagination is more important than knowledge,  
for knowledge is limited, whereas imagination  
embraces the entire world.

Albert Einstein

## CALENDAR

**July 26-August 9: NATO Advanced Study Institute: Physics and Technology of Hyperthermia**, Urbino, Italy. Contact: S.B. Field, MRC Cyclotron Unit, Hammersmith Hospital, Ducane Rd., London W12, UK, (1) 743-4594, or C. Franconi, Medical Physics Institute; University of Rome, Via O. Raimondo, 00173 Rome, Italy, (6) 613-1200.

**July 28-30: 21st Annual Microwave Power Symposium**, Crowne Plaza Hotel, Memphis, TN. Contact: International Microwave Power Institute (IMPI), 13542 Union Village Circle, Clifton, VA 22024, (703) 830-5588.

**August 11-15: Non-Ionizing Radiations: Biophysical and Biological Basis, Applications, and Hazards in Medicine and Industry**, Massachusetts Institute of Technology, Cambridge, MA. For further information on this Special Summer Program, contact Director of Summer Sessions, MIT, Room E19-356, Cambridge, MA 02139.

**August 20-22: 11th Annual Conference on the Australian Radiation Protection Society**, Sydney, Australia. Contact: D.A. Woods, Office of the Supervising Scientist, P.O. Box 387, Bondi Junction, NSW 2022, Australia, (02) 387-0666.

**August 25-29: 1986 URSI International Symposium on Electromagnetic Theory**, Budapest, Hungary. Sponsored by the International Union of Radio Sciences and the Hungarian Academy of Sciences. Contact: Prof. T. Bercelli, Research Institute for Telecommunications, 1525 Budapest 114, POB 15, Hungary. Telex: 22-4338.

**August 25-29: 8th MICROCOLL Colloquium on Microwave Communication**, Budapest, Hungary. Sponsored by the International Union of Radio Sciences and the Hungarian Academy of Sciences. To be held concomitant with the 1986 URSI International Symposium on Electromagnetic Theory. Contact: Secretariat of the 8th MICROCOLL, H-1525 Budapest 114, POB15, Hungary. Telex: 22-4338.

**September 8-11: 16th European Microwave Conference**, National Concert Hall, Dublin, Ireland. Contact: Microwave Exhibitions and Publishers Ltd., Convex House, 32 Dudley Rd., Tunbridge Wells, Kent, TN11 5LE, United Kingdom.

**September 11-13: Scientific Conference on Electropathology**, Research Institute of Electropathology, Freiburg im Breisgau, FRG. Contact: Conference Secretariat, Forschungsstelle für Elektropathologie, Reutebachgasse, D-7800 Freiburg, FRG. Tel. 076/56201.

**September 16-19: International Utility Symposium on the Health Effects of Electrical and Magnetic Fields: Research, Communication and Regulation**, Constellation Hotel, Toronto, Ontario, Canada. Contact: John O'Grady, Ontario Hydro, Suite H8 D4, 700 University Ave., Toronto, Ontario, M5G 1X6, Canada, (416) 592-3395.

**September 28-October 2: Fifth International Conference on Electromagnetic Compatibility**, University of York, England. Organized by the Institution of Electronic and Radio Engineers. Contact: Conference Secretariat IERE, 99 Gower St., London WC1E 6AZ, England. Tel. 01-388-3071.

**October 6-12: 1st International School: Electromagnetic Fields and Biomembranes**, Pleven, Bulgaria. Contact: Prof. Marko Markov, Dept. of Biophysics and Radiobiology, Sofia University, 8 Dragan Tzankov Blvd., Sofia 1000, Bulgaria.

**October 19-22: 6th Annual Meeting of the Bioelectrical Repair and Growth Society (BRAGS)**, Utrecht, Holland. Contact: BRAGS, P.O. Box 64, Dresher, PA 19025, (215) 659-5180.

**October 20-21: Fifth Southern Biomedical Engineering Conference**, Louisiana State University Medical Center, Shreveport, Louisiana. Contact: Dr. S. Saha, Dept. of Orthopaedic Surgery, Louisiana State University Medical Center, P.O. Box 33932, Shreveport, Louisiana 71130, (318) 674-6187.

**October 20-24: 11th IEEE International Conference on Infrared and Millimeter Waves**, Hotel Continental, Pisa, TIRRENIA, Italy. Contact Conference Co-Chairmen: M. Inguscio and F. Strumia, Dipartimento di Fisica dell' Università di Pisa, Piazza Torricelli 2, I-56100 Pisa, Italy. Tel. 050/45222, Telex PSFIS 500319.

**November 7-10: IEEE/Engineering in Medicine and Biology Society's Eighth Annual Conference**, The Worthington Hotel, Fort Worth, Texas. A suggested topic area includes Bioelectricity in Orthopedic and Wound Management. Contact: C.J. Robinson, D.Sc., Rehabilitation R&D Center, Hines VA Hospital, Box 20, Hines, IL 60141, (312) 343-7200, x2240.

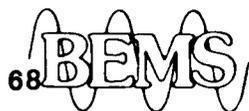
**June 21-25, 1987: Ninth Annual Meeting of the Bioelectromagnetics Society**, Center Red Lion Hotel, Portland, Oregon. Contact: Dr. William G. Wisecup, BEMS, P. O. Box 3729, Gaithersburg, MD 20878

**August 24-September 4, 1987: XXII General Assembly of the International Union of Radio Science**, Tel Aviv, Israel. Contact: Organizing Committee, Secretariat, P.O. Box 50006, Tel Aviv 61500, Israel. Tel. 03-654571; Telex 341171 KENS IL.

**August 27-30, 1987: 6th International Conference on Biomagnetism**, Kyoto, Japan. Corresponding office for the meeting is Prof. M. Kotani, Secretary-General, Tokyo Denki University, 2-2 Kanda Nishikicho, Chiyoda-ku, Tokyo 101 Japan. The North America section chairman is Prof. S.J. Williamson, New York University.

**September 1-5, 1987: 9th International Symposium on Bioelectrochemistry and Bioenergetics**, Szeged, Hungary. Contact: Dr. Lajos Keszthelyi, Institute of Biophysics, Biological Research Center of the Hungarian Academy of Sciences, H-6701, Szeged, P.O. Box 521, Hungary.

BIOELECTROMAGNETICS SOCIETY  
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