(continued from p. 3)

nology for microwave-relayed private phone service.... *In response* to a request from M/A-COM Inc., the FCC has extended the comment period for its rulemaking on digital termination systems to January 14, 1982 (46 *FR* 55124, November 6). (See *MWN*, October 1981.) ...The FCC has ruled against reducing AM channel spacing to 9 kHz from 10 kHz (46 *FR* 56214, November 16). The commission found the benefit of more stations at 9 kHz spacing would not outweigh the problem of possible interference and the excessive costs to alter broadcast facilities....The FCC regulatory agenda was published in the November 17 *Federal Register*.... Pacific-Sierra Research Corp. will analyze ultra-low-frequency propagation data for the Office of Naval Research (*Commerce Business Daily*, November 30, 1981).

Government.... Battles over budgets are continuing in Washington. The Office of Management and Budget has proposed cutting the Environmental Protection Agency's (EPA) Office of Research and Development (ORD) budget by 51% for FY83, according to the *New York Times*....Testifying before a subcommittee of the House Committee on Science and Technology on October 22, EPA Administrator Anne Gorsuch said that she considered the ORD program "critically important to the goal of more informed decision making." But she felt the headquarters office was too "top heavy" with an "astonishing" 31 percent of the 230 staffers employed as managers.... *And* the Center for Disease Control (CDC), which has been trying to bring most of the National Institute for Occupational Safety and Health *(NIOSH) down to Atlanta, now has troubles of its own.* The *Washington Post* reports that CDC may have to lay off between 350 and 780 of its 3,700 employees if planned budget cuts go through.... EPA's Office of Radiation Programs (ORP) issued a revised publications list on October 23. For a copy write to: EPA, ORP (ANR-461), 401 M Street, SW, Washington, DC, 20460.... According to the draft agenda for the Bureau of Radiological Health's (BRH) Technical Electronic Product Radiation Safety Standards Committee (TEPRSSC) December 9–10 meeting, William Herman will present a status report on the bureau's microwave oven amendment and Dr. Mays Swicord will present a short briefing on RF sealers....When the government closed down on November 23, researchers at EPA's ORD Research Triangle Lab were allowed to continue their experiments; they were deemed "essential."

Litigation.... Hellen Formakis lost her $1 million suit alleging a malfunctioning Tappan microwave oven caused burns on her hand. A jury in the Bronx County Supreme Court, NY, found for the defendant, the Tappan Company, on November 30. Formakis had claimed she was injured when her 1976 counter-top model continued to operate after she opened its door. Tappan's counsel, Remo Acito of Acito and Klein in New York City, maintained that the oven worked properly and that, in fact, no injury was sustained. The attorney for Formakis, Cecile Weich of Bronx, NY, said lack of funds will prevent an appeal....The family of seaman Charles Day is attempting to file suit against the US government for his "wrongful" and unexplained death at age 19 while serving in the Navy. Their son, who died of cardiac arrythmia after a prolonged illness, had been assigned to a NATO base in Naples, Italy. The Navy has refused to divulge the nature of Day's work, though Christopher Scanlan reports in the October 11 *Providence Sunday Journal* that Day helped install microwave equipment. (The article is reprinted in the October 29 *Congressional Record*, p. S12613.) Senator Claiborne Pell (D-RI) introduced private bill S493 on February 18, 1981 (*CR*, p. S1351) to permit the Days to try and force the Navy to provide them with more information....A decision on New York Telephone's appeal of Nettie Yannon's successful worker's compensation claim (see *MWN*, April 1981) is expected next spring.... A defense motion to dismiss Yannon's suit against RCA is scheduled to be argued on January 8 in the New York Supreme Court, Richmond County, according to Jerome Ellis of Staten Island, NY, co-counsel for Yannon in this case....The Microwave Radiation Information & Action Center (MRIAC) is open for business. (See *MWN*, September 1981.) A brochure and membership information are now available and the center's first bimonthly newsletter is scheduled for early next year. The sliding scale of fees for members range from $180 for attorneys with active cases to $20 for the newsletter. Contact: J. Stuart Lemle, MRIAC, 1320 19th Street, NW, Washington, DC 20036.

Medical Applications.... Some 200 scientists, clinicians and engineers attended the first annual meeting of the Bioelectrical Repair and Growth Society (BRAGS) in Philadelphia, PA, November 9–11. BRAGS President Dr. Carl Brighton of the University of Pennsylvania medical school was impressed by the "tremendous enthusiasm" of the participants, as was Columbia University medical school's Dr. Andrew Bassett, though the latter was disturbed by the "general lack of understanding of the pitfalls of the research." The abstracts of the meeting's 87 papers and posters are available for $10.00 from: N. Thiede, 425 Medical Education Building, 36th and Hamilton Walk, Philadelphia, PA, 19104. Next year's meeting is scheduled for Oxford, England, in September (see Calendar p. 8).... There will be a special symposium on "Electrochemistry for the Study and Control of Cell and Tissue Growth and Repair" at the Electrochemical Society meeting in Montreal, May 9–14. Contact: A.A. Pilla, Bioelectrochemistry Lab, Columbia University, 630 West 168 St., New York, NY 10032....*The surge of research using* nuclear magnetic resonance (NMR) continues, with England leading the way. A team from Oxford applied P-31 NMR to diagnose muscle disorders. (D. Gadian *et al.*, "Examination of a Myopathy by Phosphurus Nuclear Magnetic Resonance," *Lancet*, October 10.) EMI and London's Hammersmith Hospital researchers scanned the brains of patients with MS and demonstrated abnormalities "on a scale not previously seen except in necropsy." (I.R. Young *et al.*, "Nuclear Magnetic Resonance Imaging of the Brain in Multiple Sclerosis," *Lancet*, November 14). A group from Aberdeen have used the technique on alcoholics and found, contrary to popular thinking, that "water intoxication might be an important part of the delirium tremens syndrome." (J.A.O. Besson *et al.*, "Nuclear Magnetic Resonance Observations in Alcoholic Cerebral Disorder and the Role of Vasopressin," *Lancet*, October 24.) And a joint US-UK study by Yale and Oxford Research Systems scientists shows that naturally occurring C-13 NMR can be used to study disorders of fat metabolism and carbon labeled substrates for investigations of carbohydrate metabolism. (J.R. Alger *et al.*, "In vivo Carbon-13 Nuclear Magnetic Resonance Studies of Mammals," *Science*, November 6.)...But Glasgow's Thurstan Brewin issued a note of caution about ordering too many scans in the November 14 *Lancet*: "Perhaps, before [NMR] and other advances place still further temptations in our path, we should spend a little more time discussing the principles involved."... Andrew Scott presents a general introduction to NMR and its applications in the November 12 *New Scientist*....The first issue of the new journal, *IEEE Transactions on Medical Imaging, will appear next* spring. Dr. Michael Ter-Pogossian of Washington University School of Medicine, St. Louis, MO, is the editor-in-chief. The subscription price for IEEE members will be $8.00; others will have to pay $50.00 a year. For a sample copy contact: Martin Plotkin, Brookhaven National Lab, Bldg. 902A, Upton, NY 11973....The program for the March 15–18 *International Workshop on Physics and Engineering in Medical Imaging* is now available. (See conference calendar p. 8 for address.)...NMR diagnostics is only one of the many topics to be addressed at the National Council on Radiation Protection and Measurements (NCRP) annual meeting next April 6–7 in Washington, DC. Bureau of Radiological Health (BRH) Director John Villforth will be one of the speakers at the session on "Radiation Protection and New Medical Diagnostic Approaches." For more information contact: NCRP, (301) 657-1652....The Public Health Service's Office of Health Research, Statistics and Technology (OHRST) is assessing "what is known of the safety and clinical effectiveness of diathermy." OHRST seeks all relevant information on shortwave, microwave and ultrasound diathermy in order to assist the Health Care Financing Administration in establishing Medicare coverage policy (46 *Federal Register* 58599, December 2). Comments are due March 2. For more information contact: Dennis Cotter, (301) 443-4990....BRH's Donald Witters and Gideon Kantor have just published "An Evaluation of Microwave Diathermy Applicators Using Free Space Electric Field Mapping," in *Physics in Medicine and Biology*, an English journal (*26*, 1099, 1981). They show that a prototype applicator, specially

designed by BRH, is superior to those now on the market in terms of uniformity and effectiveness of energy deposition and minimal radiation leakage.... Researchers at the University of Utah are continuing their work on the measurement of lung water content. The most recent paper is in the December issue of the *IEEE Transactions on Biomedical Engineering*.... Dr. Robert Gordon of Lutheran General Hospital outside Chicago has received a third patent on the injection of magnetic particles to collect applied fields, according to the November 28 *New York Times*.... In its annual report, Clini-Therm Corp. of Dallas, TX, announced its intent to produce and ship about 40 hyperthermia systems in 1982.

Military Systems.... The House and Senate Appropriations Committees are divided about the new proposal for Project ELF. On November 18, the House committee rejected an appropriation for $34.9 million for the project. The Senate, however, recommended that amount be spent. The difference must now be hammered out in a Senate-House conference scheduled for December 9.... There have been allegations that the ELF signal will be modulated at 16 Hz. A Navy spokesman denied this, explaining: "The ELF signal is transmitted by sending a sequence of zeros and ones; a total of 16 zeros and ones are transmitted each second. Zeros are sent by energizing the antenna with 72 Hz current, and ones with 80 Hz current. This is minimum shift keying modulation, which generates a continuous frequency spectrum in the 71-81 Hz frequency band. Accordingly, no measurable signals are transmitted by the antenna at 16 Hz. Essentially, the minimum shift keying has nothing to do with human resonance."... Meanwhile, the Navy is continuing to develop the blue-green laser. The Naval regional contracting office in Long Beach, CA, awarded Mathematical Sciences Northwest, Inc., of Bellevue, WA, $9,482,174 on September 30 to develop a mercury bromide laser.... Professor Michael Callaham of Carnegie-Mellon University has published a review article on "Submarine Communications" in the November issue of *IEEE Communications Magazine*.... The Air Force issued a request for a contractor to write an environmental impact statement (EIS) for its PAVE PAWS radars at Robins and Goodfellow AFBs. One EIS will cover both installations (*Commerce Business Daily*, November 4).... The AF's armament division at Eglin AFB, FL, is developing a safety program, which will include electromagnetic radiation hazard analysis (*CBD*, November 24).... The Rome Air Development Center at Griffis AFB, NY, is looking for a contractor to work on millimeter wave communications—in the 30-50 GHz range (*CBD*, October 27).

Occupational Health.... The National Institute for Occupational Safety and Health (NIOSH) in Cincinnati, OH, is looking for a contractor to write a report listing companies in the US currently using more than 30 dielectric heaters operating in the 3-100 MHz range (RFQ 82-14).... The Environmental Health Directorate of the Canadian Department of Health and Welfare has issued a report, *Dielectric (RF) Heaters: Guidelines for Limiting Radio-Frequency Exposure* (No. 80-EHD-58). Copies are available from: Information Directorate, Department of National Health and Welfare, 5th Floor, Brooke Claxton Building, Ottawa K1A OK9, Canada.... Two GE walkie talkies were withdrawn from use at the Toronto *Globe and Mail* last year after measurements indicated that they caused radiation levels above the current exposure standard. One of them had a recorded level of 22.5 mW/cm^2, according to a check by Dr. Anthony Muc of the Ontario Ministry of Labour.

Ovens.... The November issue of *Consumer Reports* rates four combination microwave/convection ovens manufactured by Sharp, Panasonic, Quasar and Amana.... The Association of Home Appliance Manufacturers (AHAM) reports that 430,500 microwave ovens were shipped from the factory in October, down 5.1 percent from last year. Nevertheless, shipments are up 23.9 percent for the year for a total of 2,840,700. (See also Litigation Update.)

Radar & Technology.... The National Highway Traffic Safety Administration (NHTSA) has decided to scrap its proposal to set performance standards for speed measuring devices (see *MWN*, February 1981). The National Bureau of Standards (NBS) still intends to publish a list of devices that meet its radar specifications. (46 *Federal Register* 56823, November 19). According to NHTSA's Kathy DeMeter, states will now be free to use federal funds for the purchase of any radars they wish, whether or not they meet the NBS criteria.... A two-part overview of "Space-Based Radar" is featured in the September and October issues of *Military Electronics/Countermeasures*.... Raytheon's Albert Jelalian reviews laser radar in the November *IEEE Spectrum*.... The Federal Aviation Administration (FAA) is requesting comments on a draft Technical Standard Order (TSO-C104), which prescribes a minimum performance standard for microwave landing systems (see *MWN*, February 1981). For more information contact: FAA's Bobbie Smith, (202) 426-8395 (46 *FR* 54958, November 5).... The November-December issue of *Radio Science* presents a special collection of papers presented at the *Munich Symposium on Electromagnetic Waves*.... The program for the *National Radio Science Meeting* to be held in Boulder in mid-January is now available (see conference calendar p.8).... The Department of Energy has issued the final report of work done by GE, *Analysis and Measurement of Electric Fields from DC Transmission Lines* (No. DOE/CE/29006-1), May 1981. It is available from the National Technical Information Service, $11.00 printed copy, $4.00 microfiche.... A laser-induced device for generating millimeter waves is described in the November *IEEE Transactions on Microwave Theory and Techniques*.... The Georgia Institute of Technology is holding a short course on *Millimeter Wave Systems and Technology*, January 26-28 in Atlanta. Fee: $420. Contact: (404) 894-2400.

Satellite Communications.... Local zoning board approval for a Communications Satellite Corp. (COMSAT) satcom station in Cleveland Township, PA, was not challenged before the period for appeal expired in late October. Following FCC approval, COMSAT plans to solicit contracting bids for the facility and begin construction next year.... NASA will hold its third industrial briefing on the 30/20 GHz communications satellite program on April 20-21 in Cleveland, OH. Contact: Joseph Sivo, Space Communications Division, NASA, Lewis Research Center, Cleveland, OH 44135.... Alascom, the Alaskan phone company, proposes to build a satcom station on Vashon Island to serve nearby Seattle, WA. Two 47-foot-diameter antennas are planned for the site. Vashon is south of Bainbridge Island where RCA plans to build a similar station.... The benefits of creating more orbital slots by reducing satellite spacing to 2° from 4° must be weighed against the costs of upgrading existing ground facilities, including antennas, according to an analysis in the November issue of *Satellite Communications*. The official FCC proposal for 2° spacing was published in the November 20 *Federal Register*.... The FCC accepted eight out of 14 applications to develop direct broadcast satellite service. In the October 22 action (46 *FR* 54796, November 4), the commission accepted applications from CBS, Direct Broadcast Satellite Corp., Focus Broadcast Satellite, Graphic Scanning Corp., RCA American Communications, US Satellite Broadcasting Co., Video Satellite Systems and Western Union Telegraph Co. Five applications were rejected for being incomplete. An application from Satellite Television Corp. had already been accepted.... A Frost & Sullivan study predicts a booming market for satellite services by the end of the decade. In fact, it forecasts demand will outpace supply. Contact: Frost & Sullivan, 106 Fulton Street, New York, NY 10039; Report No. 954, $1,150.... Satellite Television Corp., a subsidiary of COMSAT, plans to introduce a two-channel pay television service for the northeastern US in late 1983. The November 20 *Washington Post* reports that the television programming service would be distributed to subscribers in multiple resident buildings through a master antenna system. COMSAT must win FCC approval for the plan.... The Air Force wants to develop an airborne UHF satcom terminal. The 100-watt unit should weigh 40 pounds (*Commerce Business Daily*, November 9, 1981).... The Air Force Communications Command recently demonstrated a portable UHF satcom terminal for use in the field. According to the November issue of *Military Electronics/Countermeasures*, production models of the seven-pound mobile unit are expected next year.... Scientific-Atlanta's 7th Satellite Com-

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munications Symposium drew over 600 participants to Atlanta on November 2–4. A company spokesman said the enthusiastic participation of the business community was the most significant trend signaled by this year's gathering.... A low-cost, one-meter-diameter antenna has been designed for 12 GHz direct broadcast television in Europe. The receiver system, designed by a French firm, is described in the November 17 *Electronics*.... RCA's auction of seven leases for transponders on its Satcom IV satellite, scheduled for a January launch, brought $90.1 million in winning bids at Sotheby Park Bernet in New York City on November 9. FCC approval of the auction is still pending.... RCA successfully launched its Satcom III-R on November 19. Satcom III disappeared soon after its December 1979 blast-off.

Standards.... Only one comment was submitted to the Institute of Electrical and Electronics Engineers (IEEE) and the American National Standards Institute (ANSI) on the proposed, revision of ANSI's safety standard (C95.1). RCA's Howard Johnson registered his objections. (See *MWN*, May 1981.) The comment period expired December 1.... ANSI has now published the new C95.5-1981 standard "Recommended Practice for the Measurement of Hazardous Electromagnetic Fields—RF and Microwave." A copy is available for $6.00 from ANSI's Sales Department, 1430 Broadway, New York, NY 10018.

VDTs.... The Ontario Ministry of Labour's Advisory Council on Occupational Health and Occupational Safety has set up a task force on video display terminals (VDTs). The seven member group will investigate possible health hazards, including cataracts, discomfort, degradation of visual acuity and excessive fatigue. The task force, chaired by Dr. Gordon Stopps of the University of Toronto's Occupational and Environmental Health Unit, met for the first time on November 2. The other group members are: Drs. Steven Garnette, J. Purdham and Robin Roberts of McMaster University; Dr. E. Kaegi of C-I-L Inc.; Dr. John Parker of the University of Toronto; and Professor Stan Stuchly of the University of Ottawa.... A bill addressing VDT radiation as well as ergonomic issues was introduced in the Ontario provincial legislature on November 17 by Richard Johnson. The "VDT Operators' Safety Act, 1981," would prohibit the sale or lease of any terminal emitting radiation other than visible light, insure operators the right of alternative work during pregnancy and provide standards for VDT work. For more information contact: (416) 965-7771.... The National Academy of Sciences' Committee on Vision is preparing a summary and overview of key issues discussed at its symposium on VDTs and vision this August. (See *MWN*, September 1981). The paper will be published in the journal, *Behavior and Information Technology*, early next year. A VDT literature review by Dr. Marvin Dainoff, a visiting scientist at NIOSH's Division of Biomedical and Behavioral Sciences, is scheduled to appear in the same issue.... Fumes, caused by the over-heating of a transistor in a VDT, have been linked to an operator's headaches, according to the November 27 Newspaper *Guild Reporter*.

Etc..... Janet Raloff of *Science News* and William Broad of *Science* won National Association of Science Writers awards for their articles on electromagnetic pulse (EMP) radiation (see *MWN*, June 1981).... A new band, "Los Microwaves" is on tour. A New York *Soho News* critic described them this way: "LA 'technicano': smart, sharp, sassy, hook-laden, Latin-infected electro-pop with plenty of bounce to the ounce. Check 'em out."

MICROWAVE NEWS is published monthly, except in January and July • ISSN 0275-6595 • PO Box 1799, Grand Central Station • New York, NY 10163 • (212) 794-9633 • Editor: Louis Slesin, Ph.D., Associate Editor: Martha Zybko • Subscription: $165 per year (overseas $200) • Copyright © 1981 by Louis Slesin • Reproduction in any form is forbidden without written permission.

CONFERENCE CALENDAR

• December 7–12: 6th International *Conference on Infrared and Millimeter Waves*, Carillon Hotel, Miami Beach, FL. Contact: K.J. Button, MIT National Magnet Laboratory, Cambridge, MA 02139.

• December 29–30: *International Symposium on Microwaves and Communications*, Kharagpur, India. Contact: Professor B. Chatterjee, Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur-721302, India.

1982

• January 13–15: *National Radio Science Meeting*, University of Colorado, Boulder, CO. Contact: S.W. Maley, Dept. of Electrical Engineering, University of Colorado, Boulder, CO 80309.

• March 15–18: *International Workshop on Physics and Engineering in Medical Imaging*, Asilomar Conference Grounds, Pacific Grove, CA. Contact: University Extension, University of California, PO Box AZ, Irvine, CA 92716.

• March 29–April 2: 3rd *International Congress of Thermology*, Bath, England. Contact: Congress Secretariat, Martlet Conference Services, 24 Preston Street, Brighton, Sussex BN1 2HN, England.

• April 21–23: *Biomedical Engineering Society Annual Meeting*, New Orleans, LA. Contact: Dr. Yoram Ruby, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH 44106.

• May 24–28: *International IEEE/APS Symposium, National Radio Science Meeting and Nuclear Electromagnetic Pulse Meeting*, University of New Mexico, Albuquerque, NM. Contact: Dr. Kendall F. Casey, Dikewood Corp., 1613 University Blvd., NE, Albuquerque, NM 87102.

• June 7–8: 1st *Southern Biomedical Engineering Conference*, Louisiana State University Medical Center, Shreveport, LA. Contact: Dr. S. Saha, Department of Orthopaedic Surgery, Louisiana State University Medical Center, PO Box 33932, Shreveport, LA 71130.

• June 15–17: IEEE MTT-S *International Microwave Symposium*, Hyatt Regency Hotel, Dallas, TX. Contact: J.R. Griffin, Texas Instruments, Mail Stop 3432, PO Box 405, Lewisville, TX 75067.

• June 28–July 2: 4th Annual *Bioelectromagnetics Society Meeting*, Beverly Wilshire Hotel, Beverly Hills, CA. Contact: BEMS, 1 Bank Street, Suite 307, Gaithersburg, MD 20878.

• July 25–30: 17th Annual Symposium of the *International Microwave Power Institute*, Town and Country Hotel, San Diego, CA. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.

• August 11–13: 4th *Satellite Communications Users Conference*, Regency Inn, Denver, CO. Contact: Satellite Communications Magazine, 3900 S. Wadsworth Blvd., Denver, CO 80235.

• September 6–10: 7th *Colloquium on Microwave Communication*, Budapest, Hungary. Contact: Secretariat of the 7th Microcoll, H-1525, Budapest 114, POB 15, Hungary.

• September 20–21: 4th Annual *Conference of the IEEE Engineering in Medicine and Biology Society*, Marriott Hotel, Philadelphia, PA. Contact: Dr. Alfred R. Potvin, Department of Biomedical Engineering, PO Box 19138, University of Texas, Arlington, TX 76019.

• September 20–22: 2nd Annual *Meeting of the Bioelectric Repair and Growth Society*, Oxford, England. Contact: Dr. B.F. Sisken, Wenner Gren Research Laboratory, University of Kentucky, Lexington, KY 40506.

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Microwave News *invites letters from its readers. We ask writers to be brief, and we reserve the right to edit contributions for length.*

1982 RF/MW Litigation Survey

Litigation over siting new radiofrequency and microwave (RF/MW) installations is on the rise, according to our 1982 case survey. Companies and local residents have turned to the courts to resolve disputes in four states. With many other siting applications now meeting local opposition, these cases may well mark the beginning of an important new trend.

The survey also reveals that most product liability claims are still being settled out of court, following the pattern reported in last year's survey (see *MWN*, April 1981). Several plaintiffs have dropped suits in exchange for settlements which stipulate that the terms remain confidential. The Delsesto and Spinella microwave oven case, for example, was dismissed with the consent of both parties after one day of trial last March: neither side would discuss the details. And news of the Karras $200,000 settlement for various severe injuries he claims resulted from working on radar leaked out months after the suit was quietly dropped last year.

The announced pre-trial settlements of the Kerch case for $30,000 this spring and the Foley case for $25,000 last year were exceptions to the rule. Both men alleged radiation-induced cataracts from exposure to radar. New cataract claims were filed late this year by former radar technicians Coatney and Becker.

Because no radar case has yet been decided by a jury, lawyers are closely watching the Engell suit against ITT, which is scheduled to go to trial this month. Lawyers for Robert Engell, a former radar technician who now has cancer, settled out of court with four other defendants this November, agreeing not to discuss the awards.

The major occupational exposure case to come before a workers' compensation board is now closed. This year a New York state appeals court upheld Antoinette Yannon's award for the death of her husband. Mrs. Yannon successfully maintained her husband's death was caused by chronic radiation exposure while tuning television relay equipment for New York Telephone. In a separate action, Mrs. Yannon is appealing the dismissal of her product liability suit against RCA, a manufacturer of relay equipment.

In litigation against the US government, George Watson has appealed the dismissal of his claim that he suffered genetic damage from exposure to microwaves at the US embassy in Moscow, which caused birth defects in his son. Other embassy cases are still pending.

Plaintiffs in several cases reported this year have turned to the Microwave Radiation Information and Action Center (MRIAC) for assistance. (See *MWN*, September 1981.) J. Stuart Lemle reports that the center is no longer a membership organization, but is now offering consulting services. Lemle is handling one of the Moscow embassy cases.

Summaries of over 30 cases, which are either in progress or have been recently settled, appear on pp. 2–4 and are followed by a list of participating attorneys. (The names of attorneys who are on the list appear in italics in the case summaries.) Included whenever possible are counsel for both plaintiffs and defendants and case numbers. Because a number of attorneys refuse to discuss litigation, however, the list is not complete.

1982 RF/MW LITIGATION SURVEY: CASE SUMMARIES

Siting Cases

In Progress:

• RCA Americom filed suit against Kitsap County, WA, and its Board of Commissioners on November 17, 1982. Claim: no basis to indicate that Americom's proposed satellite communications station poses health hazards. Specific information submitted by Americom not considered in board deliberations. Company wants court to set aside board ruling denying company's application and to direct county to issue permit. Status: county deputy prosecutor ordered application returned to board on December 3. Board must now reconsider all material and issue another ruling. Attorney for plaintiff: *William Rives.* Attorney for defendant: Patricia Shafer, Kitsap County, WA, deputy prosecutor. See *MWN,* May, July/August and November 1982. [*RCA American Communications v. Kitsap County,* State Superior Court for Kitsap County, Port Orchard, WA, No. 82-2-01177-2.]

• Vashon for Quality Environment (local citizens group) filed a petition against the King County Council, WA, the County Zoning and Subdivision Examiner and Alascom Inc. in October 1982 to block further construction of a satellite communications station. Claim: improper procedures followed by zoning examiner in refusing group's appeal of building permit issued to Alascom in September 1982. Also challenging legality of zoning examiner's permit and variance. Seeking review of proceedings and voiding of county action. Status: pending. Attorney for petitioner: *Michael Gillett. [Vashon for Quality Environment v. King County et al.,* State Superior Court for King County, Seattle, WA.]

• Carole Halloran and other local residents filed suit against the Coventry, CT, Zoning Board of Appeals and US Transmission Systems, an ITT subsidiary, in May 1982. Claim: board acted improperly in processing ITT application to build microwave relay tower. Citizens seek reversal of board's April 20 approval of tower, which they believe poses a health hazard. Status: trial date expected for early next year. Attorney for plaintiffs: *Lawrence Bates.* Attorney for defendant, ITT: *William Hall.* See *MWN,* June 1982. [*Halloran et al. v. Coventry Zoning Board of Appeals and US Transmission Systems,* State Superior Court for Tolland County, Rockville, CT, No. CV-82-27799.]

• Leo and Muriel Shuerman filed suit against Pacific Telephone and Telegraph in 1980 and amended complaints in September 1980 and August 1981. Claim: point-to-point relay transmitter sited near their property and sending a beam across it renders property valueless and may pose health hazards. Seeking inverse condemnation (PT&T, as a quasi-public agency with power of eminent domain, would be required to buy the property) and $10 million in punitive damages. Status: trial date set for April 4, 1983. Attorney for plaintiffs: *Joe Aklufi.* See *MWN,* April 1982. [*Shuerman v. Pacific Telephone and Telegraph,* State Superior Court for Riverside County, Riverside, CA, No. 136703.]

• Filmways Communications of Syracuse, NY, filed suit against the town of Onondaga, NY, in November 1981. Claim: town's 1980 moratorium on construction of new broadcast sources infringes on company's first amendment rights. Company, which wants to build a TV station, seeks lifting of ban (see *MWN,* October 1982) and more than $5 million in damages. Status: pre-trial discovery. Attorney for plaintiff: *Robert Bernius.* Attorney for defendants: *Raymond D'Agostino. [Filmways Communications v. Town of Onondaga et al.,* US District Court for Northern District of New York, No. 81-CV-1293.]

• Attorney *Michael Prigoff* is investigating a possible suit against the operator of a "microwave tower" sited in a residential community. Concern in community that long-term radiation exposure is responsible for cluster of various tumors, some cancerous, among residents.

Concluded:

• Cylix Communications Network of Memphis, TN, and Anthony Capodanno lost their appeal of a Township of Haverford, PA, zoning board ruling blocking construction of a low-power satellite communications station in May 1982. Claim: board abused its discretion in denying zoning variance. Status: zoning board ruling upheld. Attorney for plaintiff, Cylix: *John Trevaskis, Jr.* See *MWN,* October 1981. [*Capodanno and Cylix Communications Network v. Zoning Hearing Board of Haverford,* Court of Common Pleas of Delaware County, PA, No. 81-15321.]

• WIXT Television and Albert and Beatrice Peck lost their appeal of an Onondaga, NY, Zoning Board of Appeals decision blocking construction of a TV transmission tower in May 1979. Claim: board's determination was unsupported and arbitrary. Maintained hardship was grounds for land use variance and that tower would pose no health hazards in case filed February 1979. Status: after the judicial review opinion of May 21, 1979, town went on to impose moratorium on new broadcast sources in 1980. Attorney for intervenors in opposition to applicants: *Robert Liegel.* [*Peck and WIXT Television v. Petrie et al.* (Town of Onondaga Zoning Board of Appeals), State Supreme Court for Onondaga County, NY.]

• William Pomeroy's application for a transmitting tower in LaFayette, NY, was denied in 1979. Town ruling cited potential health hazards. Decision followed May 1978 ruling against WIXT proposal by Onondaga, NY (see above). Status: decision not appealed to court. Attorney for intervenors opposed to application: *Robert Liegel.*

• MCI Telecommunications' application for a transmitting tower in Skaneateles, NY, was denied in 1980. Town ruling cited potential health hazards. Decision followed ruling against WIXT proposal by Onondaga, NY (see above). Status: decision not appealed to court. Attorney for intervenors opposed to application: *Robert Liegel.*

Radar Cases

In Progress:

• Robert Engell filed suit against General Dynamics, ITT, Raytheon, Rockwell International and Varian Associates in March 1977. Claim: radiation exposure while working on TACAN and other radars from 1964 to 1975 caused pancreatic cancer. Status: out of court settlements reached with all but ITT in November 1982. ITT trial expected to begin in December, jury selection completed in November. Attorneys for plaintiff: *Marc Moller* and *Matthew Shafner.* Attorney for defendant, ITT: *John FitzGerald.* See *MWN,* November 1982. [*Engell v. ITT,* US District Court for Connecticut, Hartford, CT, No. H77-130.]

• Robert Barbee filed suit against Bendix, General Electric, Raytheon, RCA, Reeves Instrument, Western Electric and Zenith Radio in Mississippi in October 1982. Claim: radiation exposure while serving as a radar technician in the armed forces from 1942 to 1951 caused cataracts. Status: waiting for pleadings from defendants. Case previously filed in 1979 in Nevada and dismissed in the Ninth Circuit Court of Appeals because of statute of limitations in Nevada. Attorney for plaintiff: *James Cothren.* Previous attorney for plaintiff: *Brent Leavitt.* [*Barbee v. Bendix et al.,* Circuit Court for the First Judicial District of Hinds County, Jackson, MS. Initially filed in US District Court for Nevada, Las Vegas, NV, No. CV-LV-79238.]

• Joseph Coatney filed a claim with the Veterans Administration (VA) in 1981 and filed suit against General Dynamics, Hughes Aircraft and Westinghouse in 1982. Claim: radiation exposure from onboard radar while serving in navy for six years caused cataracts. Status: Claim for VA benefits still pending. Suit against radar manufacturers pending. Attorney for plaintiff: *John Sweeney.* [Administrative agency: VA. Court: State Superior Court, Los Angeles, CA.]

• Frederick Becker filed a claim with the VA several years ago and is in the process of filing suit against radar manufacturers. Claim: radiation exposure from radar on aircraft he serviced while in armed forces caused cataracts and other injuries. Attorney for plaintiff: *John Sweeney.*

• William Farnham filed suit against Hughes Aircraft, Northrop Aviation and Rockwell International in October 1978. Claim: radiation exposure in air force aircraft from 1951 to 1973 caused cataracts. Status: pre-trial. Defendants' offer to settle not accepted, though out of court settlement still possible. Attorney for plaintiff: *Seymour Ellison.* [*Farnham v. Northrop Aviation et al.*, State Superior Court, San Francisco, CA, No. 744782.]

• Glenn Lough filed suit against ITT, Raytheon, Sperry Rand and Western Electric in 1978. Claim: radiation exposure in 1955 and 1956 while in the armed forces caused cataracts. Status: pre-trial. Attorney for plaintiff: *Seymour Ellison.* [*Lough v. Raytheon et al.*, State Superior Court, San Francisco, CA, No. 744781.]

• Don Turner filed suit against Hughes Aircraft, Lockheed, McDonnell Douglas Aircraft and Northrop Aviation in May 1978. Claim: radiation exposure aboard US aircraft from 1954 to 1967 caused cataracts. Status: pre-trial. Defendants' offer to settle not accepted, though out of court settlement still possible. Attorney for plaintiff: *Seymour Ellison.* [*Turner v. Lockheed et al.*, State Superior Court, Los Angeles, CA (moved from State Superior Court, San Francisco, 738065).]

• Stanley Burgis filed suit against Western Electric in 1980. Claim: radiation exposure from M-33 radar he worked on for nine months between 1952 and 1954 while in the army caused cataracts and retina damage. Status: pre-trial. Attorney for plaintiff: *Jeffrey Slopford.* [*Burgis v. Western Electric,* US District Court for Eastern Pennsylvania, Philadelphia, PA (moved from Pennsylvania state court soon after initial filing).]

• Attorney *Richard Leonard* is preparing a case for a former B-47 aircraft crew member. His client alleges one hour of close-range exposure to an electronic countermeasures device mounted under a plane caused severe injuries. Exposure occurred in the 1960s. Leonard seeking medical experts to support the claim, which is not yet filed.

Concluded:

• Joseph Kerch settled his suit against Air America in spring 1982. Claim: radiation exposure from on-board radar and navigational equipment while working as a pilot caused cataracts. Prior to Air America, Kerch served in the air force for 20 years. This workers' compensation case filed in December 1980 under the Defense Bases Act. Status: settled out of court for $30,000. Attorney for plaintiff: *Matthew Shafner.* [*Kerch v. Air America,* Department of Labor, Office of Administrative Law Judges, No. 15-19092 80-LHCA-1388 and No. 15-16930 80-LHCA.]

• Leo Foley settled his suit against General Electric, Hazeltine, Hughes Aircraft, Lockheed Aircraft, Philco-Ford, Raytheon and Telerad-Lionel in 1981. Claim: radiation exposure while serving on EC-121 constellation aircraft between 1957 and 1975 caused cataracts. Case filed April 1979. Status: settled out of court for $25,000. Attorney for plaintiff: *Seymour Ellison.* See *MWN,* November 1981. [*Foley v. Lockheed Aircraft et al.*, State Superior Court, Sacramento, CA, No. 280696.]

• Ronald Karras settled his suit against General Electric and Western Electric early in 1981. Claim: exposure to radiation while working on Nike Hercules radars for 14 years resulted in multiple injuries, including bleeding eyes, deafness and systemic hemorrhaging. Status: settled out of court for $200,000. Attorney for plaintiff: John Phillips of Chicago, IL. See *MWN,* July/August 1981. [*Karras v. General Electric and Western Electric,* Cook County Circuit Court, IL, No. CV-79-L-20237.]

Oven Cases

In Progress:

• Mildred Beadles, Delores Terhaar and Patricia Seelye filed suit against Litton Industries, Litton Microwave Division, and City Electronics in December 1980. Claim: a malfunctioning Model 800 microwave oven in the restaurant where they worked burned two of the women and traumatized all three. Approximately $5 million sought. Status: pre-trial. Attorneys for plaintiffs: *Riner Deglow, Leonard Schroeter* and *Robert Scanlon.* Attorney for defendant: *James Connelly.* [*Beadles et al. v. Litton,* Superior Court, Spokane, WA, No. 80-2-04512-6.]

• Joyce McCarty filed suit against Magic Chef in 1978. Claim: her son's lymphatic cancer and eventual death were caused by radiation leaking from a microwave oven where he worked. Status: pre-trial, on hold while McCarty seeks medical experts to support claim. Attorney for plaintiff: *Wallace Stephens.* [*McCarty v. Magic Chef,* Second Judicial District Court, Washoe County, NV.]

Concluded:

• Delores Delsesto and Lynn Spinella ended their suit against Amana Refrigeration out of court in March 1982. Claim: radiation from a leaking microwave oven in their company lunch room induced cataracts in both women. Approximately $3 million sought in suit filed February 1979. Status: case dismissed with consent of both parties after one day of trial in March 1982. Both parties refused to give details. Attorney for plaintiffs: *Mark Decof.* See *MWN,* April 1982. [*Delsesto and Spinella v. Amana Refrigeration,* US District Court, Providence, RI, No. 79-0082.]

• Helen Formakis lost her suit against Tappan in November 1981. Claim: counter-top microwave oven malfunctioned and burned her hand. $1 million sought. Status: jury found for defendant. Attorney for plaintiff: *Cecile Weich.* Attorney for defendant: *Remo Acito.* See *MWN,* December 1981. [*Formakis v. Tappan,* State Supreme Court, Bronx County, New York, NY.]

US Embassy in Moscow

In Progress:

• George Watson filed suit against the US government in January 1981. Claim: genetic changes and injury from radiation exposure while serving as a marine guard at the US embassy in Moscow caused birth defects in his son. Status: charge that microwave radiation played role in causing defects—negligent failure to warn of hazard under Federal Tort Claims Act—dismissed in spring 1982 under the *Feres* doctrine and is now being appealed. Trial on second charge of medical malpractice by navy doctors set for March 1, 1983. Attorneys for plaintiff: *Peter Danelo* and *Charles Peery.* See *MWN,* January/February 1982. [*Watson v. US,* US District Court, Central District of California, Los Angeles, CA, No. CV 80-5737-CHH. Appeal on first charge filed in Ninth Circuit Court of Appeals, San Francisco, CA.]

• Attorney *John Parker Hills* has filed four cases for people exposed to radiation at the US embassy in Moscow. Two claims filed several years ago with the Department of Labor Employment Standards Administration, Office of Workers' Compensation Programs, were denied by a special claims examiner on July 19, 1982. One of these, filed by the spouse of an embassy employee who died of brain cancer, is being appealed to the Employees' Compensation Appeal Board. Hills also filed an individual and a class action suit for a woman who worked at the embassy and now has cancer. This case, filed with the State Department, is pending. See *MWN,* January 1981.

• Barton Reppert filed suit against the Central Intelligence Agency in July 1981. Claim: seeking documents under the Freedom of Information Act relating to the bioeffects of microwave radiation and to the Soviet microwave irradiation of the US embassy in Moscow. Status: pre-trial. Attorney for plaintiff: *J. Stuart Lemle.* See *MWN,* September 1981. [*Reppert v. CIA,* US District Court, Washington, DC.]

Other Work-Related Claims

In Progress:

• Attorney *Robert Young* added a ninth flight controller claim to the eight reported in last year's survey. Claim: radiation from communications, navigation and radar equipment near control towers and possibly cathode ray tube (CRT) displays in the work place caused cataracts. Status: all nine cases pending. [Administrative agency: Department of Labor Office of Workers' Compensation Programs, Branch of Special Claims.]

• Antoinette Yannon is appealing the July 1982 dismissal of her product liability suit against RCA. Claim: husband's illness and eventual death caused by long-term exposure to microwave radiation while

working on TV relay equipment for New York Telephone. Seeking $3.5 million from equipment manufacturer for breach of warranty and negligence in suit filed in May 1976. Status: case dismissed on pre-trial motion in July 1982. Appeal filed this fall. Attorneys for plaintiff: *Jerome Ellis* and *David Paully.* See *MWN,* April 1981, July/ August and November 1982. [*Yannon v. RCA,* State Supreme Court for Richmond County, Staten Island, NY, No. 1009-1976. Appeal filed in State Supreme Court Appellate Division, Second Department, Brooklyn, NY.]

• Frederick Nepa filed a workers' compensation claim against the Port Authority of NY and NJ in February 1979. Claim: radiation from a walkie-talkie he used as a PA policeman caused cataracts. Status: pending. Attorney for plaintiff: *Angelo Gucciardo.* [*Nepa v. Port Authority,* Administrative agency: New York State Workers' Compensation Board, New York, NY.]

• Attorney *Angelo Gucciardo* is handling a workers' compensation claim filed this year for a Long Island, NY, police officer. Claim: radiation from a walkie-talkie caused a cataract. Status: waiting for hearing date. [Administrative agency: New York State Workers' Compensation Board, New York, NY.]

Concluded:

• Antoinette Yannon's workers' compensation award for the death of her husband has been upheld in appeals made by New York Telephone. Claim: husband's illness and eventual death caused by long-term exposure to microwave radiation while working on TV relay equipment for New York Telephone. Status: awarded benefits by New York Workers' Compensation Law Judge in 1980. Decision upheld by Workers' Compensation Board on February 26, 1981 and in appeal to a state court on May 6, 1982. Award of $45 per week and $29,000 in retroactive benefits. Attorney for plaintiff: *Angelo Gucciardo.* Attorney for defendant: *Saul Schier.* See *MWN,* April 1981, June and November 1982. [*Yannon v. New York Telephone,* Administrative agency: New York State Workers' Compensation Board, New York, NY, No. 0714-2308 and No. 0752-3602. Appeal filed May 1982 in New York State Supreme Court Appellate Division, Third Department, NY, No. 41045.]

• Sybil Barker and Industrial Indemnity, the workers' compensation carrier for her employer in San Francisco, reached a private settlement for her 1982 partial-disability claim. Claim: visual demands of VDT work caused debilitating eye problem (diagnosed as accommodative spasm). Status: $7,500 settlement reached in October-November 1982 without compensation board ruling. Attorney for plaintiff: *Kathryn Ringgold.* [Administrative agency: State Workers' Compensation Board, San Francisco, CA.] ●

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MICROWAVE NEWS is published monthly, except in January and July • ISSN 0275-6595 • PO Box 1799, Grand Central Station • New York, NY 10163 • (212) 794-9633 • Editor: Louis Slesin, Ph.D., Associate Editor: Martha Zybko • Subscription: $200 per year (overseas $235) • Copyright © 1982 by Louis Slesin • Reproduction in any form is forbidden without written permission.

HIGHLIGHTS

Broadcasters Balk at Proposed Massachusetts Standard

At a public hearing convened by the Massachusetts' Department of Public Health in Boston on November 29, representatives from the broadcasting industry complained that the state's draft regulations on non-ionizing radiation are too strict. Neil Smith, a consulting engineer testifying on behalf of RKO General, accused the department of trying to satisfy "irrational" public fears by setting an "unnecessarily stringent standard."

Massachusetts became the first state to propose general population health standards for radiofrequency and microwave (RF/MW) radiation last February. (See *MWN*, March 1982.) The Massachusetts proposal is in fact identical to the recently approved American National Standards Institute (ANSI) standard except that it is five times stricter over the entire frequency range between 300 kHz and 100 GHz. The standard is most strict in the 30–300 MHz band, where it specifies a maximum exposure of 200 uW/cm^2. Although the February draft required the registration of all major stationary RF/MW sources and prescribed limits for occupational exposures, the revised draft, the subject of the hearing, limits registration to *new* sources and drops the occupational standard altogether. (A number of different types of sources are exempt from the rules.)

Jules Cohen, a consulting engineer based in Washington, DC, speaking on behalf of the National Association of Broadcasters, said that if Massachusetts could not wait for a standard to be set by the federal Environmental Protection Agency, "the new ANSI criteria should form the basis for the [standard] — not ANSI divided by five." Douglas Rowe, an attorney in Marlborough, MA, representing the Massachusetts Broadcasters Association, agreed saying the ANSI standard is "more than sufficient."

Others have endorsed the new standard however. In a November 22 letter to the Department of Public Health, Professor A.W. Guy wrote that the proposal is "an excellent compromise that should satisfy the concerns of the public about long-term exposure to non-ionizing radiation without unnecessarily being too restrictive to the users of the radio spectrum." Guy was the chairman of the subcommittee that drafted the ANSI standard. Raytheon's John Osepchuk told *Microwave News* at the hearing that the state did an "eminently reasonable" job, which only needs a little refinement. Osepchuk is a member of the *ad hoc* committee that advised the state on developing the standard over the last two years.

The hearing was relatively brief as most of the 35 attendees preferred to listen rather than testify. Participation was livelier at an informal question-and-answer period that followed the hearing. After repeated complaints about the stringency of the standard, Robert Watkins, a radiation scientist at the department, gave three reasons for the decision to add a safety factor to the ANSI standard, which he called an occupational standard despite ANSI's claims to the contrary: (1) the classic distinction between the general public and workers with respect to age, health and length of exposure; (2) the recommendation of international organizations, especially the World Health Organization, for dual standards; and (3) the language in the ANSI standard that, "Because of the limitations of the biological effects data base, these guides are offered as upper limits of exposure, particularly for the population at large ..." As for the origin of the factor of five, Watkins said "our committee picked it."

Another contentious topic was the problem of assigning responsibility for a given level of radiation when there are multiple sources. The only way to deal with it, according to Robert Hallisey, was on a case-by-case basis. Hallisey is the director of the department's radiation control program; he chaired the meeting.

Hallisey said the rules could be promulgated within 90 days of the close of the comment period on December 13. He said that unless "substantial" changes are made after public comments are reviewed, there will be no further hearings. He also noted that the Massachusetts Department of Labor and Industry was developing an occupational standard.

Also testifying were Dr. Don Justesen of the VA Medical Center in Kansas City, MO, on behalf of RKO General and Dr. Russell Carpenter, who retired from the Bureau of Radiological Health in September. Carpenter said that the major problem with RF/MW radiation was the "illusion of risk." He called the level of public ignorance "appalling."

A second hearing on the proposed rules was held in Holyoke, MA, on December 2. According to Watkins, some 25–30 people attended the meeting. He said that they raised similar complaints as those who spoke at the Boston meeting. Ron Peterson of Bell Labs and a representative from Northeast Utilities were among those testifying.

Leukemia and Electromagnetic Fields: New Evidence and a Dissenting Opinion

Researchers at the University of Southern California (USC) School of Medicine have uncovered new support for the hypothesis that there is a link between leukemia and exposures to electrical and magnetic fields. Three members of the school's Department of Family and Preventive Medicine have found that white males in Los Angeles County whose jobs required contact with electromagnetic fields had a greater risk of developing leukemia, especially acute myelogenous leukemia (AML).

In a letter published in the November 20 *Lancet*, Drs. William Wright, John Peters and Thomas Mack write that their data are consistent with those of Dr. Samuel Milham who reported a similar link among workers in Washington state last July (see *MWN*, July/August 1982). The USC team identified power linemen as one class of workers who are at increased risk of developing both acute leukemia and AML; telephone linemen had a significantly higher chance of getting AML.

Speaking from his office at the Division of Occupational Health, Dr. Wright told *Microwave News* that he had read Milham's letter when it was published and thought that it would be interesting to apply the same methods to data collected by Mack's Cancer Surveillance Program for Los Angeles. He said he would like to continue this line of research and is looking for a suitable cohort population.

Although the USC researchers warn that the sample size is small and that the workers could have been exposed to other carcinogenic agents, they conclude that the connection between leukemia and non-ionizing radiation deserves further study.

Meanwhile, Dr. Robert Liburdy of the New York University Medical Center takes issue with Milham's paper in a letter to the *New England Journal of Medicine* (November 25). Citing work from the National Institute for Occupational Safety and Health (NIOSH) and the World Health Organization (WHO) and the epidemiological study of employees at the US embassy

in Moscow, Liburdy judges that the "mechanism of interaction of electrical and magnetic fields with biologic materials, although not well understood, differs importantly from the etiology of cancer, which is also not well understood. Negative results do not conclusively rule out a health risk; the data, however, argue against an association."

Busy Times for ANSI C63

Members of the American National Standards Institute (ANSI) Committee on Radio-Electrical Coordination (C63) have been very active revising existing standards and initiating new ones. At meetings held November 3–4 in Washington, DC, they made substantial progress on a number of fronts related to electromagnetic compatibility (EMC), especially with respect to instrumentation and the measurement and control of radiation emissions.

The C63 Committee is in the process of revising two of its standards and has completed work on its one draft standard: ANSI C63.2-1980, *Specifications for Electromagnetic Noise and Field Strength Instrumentation, 10 kHz to 1 GHz;* ANSI C63.4-1981, *Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 10 kHz to 1 GHz;* and ANSI C63.12 (draft), *Recommended Practice on Procedures for Control of System Electromagnetic Compatibility.*

Outlined below are reports of various subcommittee 1 (Techniques and Development) activities, most of which were presented at its November 3 meeting:

• A draft addition to ANSI C63.4 on "Open Area Test Sites," has been forwarded to the full committee for a vote. According to subcommittee chairman Edwin Bronaugh of Electro-Metrics in Amsterdam, NY, most members approved the draft. Representatives of the Federal Communications Commission (FCC) were concerned over the use of broadband antennas to be specified in the new standard. The commission staff prefers making measurements with tuned dipole antennas and is seeking more data before a vote is taken by the full committee next February. The FCC members abstained in the subcommittee balloting.

• The proposed revisions to C63.2 and C63.4 to extend their frequency range down to 20 Hz and up to 18 GHz are nearing completion. A task force chaired by Marge Stone of AEL Industries in Farmingdale, NJ, has finished working on the lower frequencies for both standards. William Lambdin of Electro-Metrics has nearly completed the revisions to C63.2 for higher frequencies. Only the revision extending C63.4 to 18 GHz, coordinated by James Klouda of Elite Electronics Engineering in Downers Grove, IL, will not be ready for balloting until next summer.

• Don Heirman of Bell Labs in Holmdel, NJ, has developed a first draft for an addition to C63.4 on "Immunity Measurements of Electronic Products." Heirman expects to have a second draft by February and a version ready for a subcommittee vote by June.

• Preparation of a national EMC standard is underway under the direction of Herb Mertel of EMACO in San Diego, CA. The document will compile all EMC standards in the US, either by inclusion or by reference.

• A draft standard for measurement of radiated emissions from and susceptibility of medical devices is being circulated for comment among subcommittee members. The work of the task force, chaired by Al Smith of IBM in Poughkeepsie, NY, has been partially stalled by the loss of several members. A decision on how to proceed will be made at the next subcommittee meeting.

At the full C63 committee meeting on November 4, following the subcommittee session, a decision was made to accept the draft C63.12 EMC standard as final without modification. At the next meeting a new task force chairman will be appointed by members of subcommittee 1 to begin working on refinements to this standard.

The C63 meeting also featured reviews of on-going revisions of the International Electrotechnical Vocabulary and efforts towards international standardization. And Professor Ralph Showers, chairman of the C63 committee, reported on the International Special Committee on Radio Interference (CISPR) meeting held in Stockholm in September. (Showers, who is with the Department of Electrical Engineering at the University of Pennsylvania in Philadelphia, is also the president of CISPR.) *Microwave News* will run an update of CISPR activities in a future issue.

Bronaugh has tentatively scheduled a meeting of subcommittee 1 for next February. A date for the next C63 committee meeting has not been set.

UPDATES

Biological Effects ... *Radio Science,* the journal of the American Geophysical Union, has published the proceedings of URSI's *Symposium on Biological Effects of Electromagnetic Radiation,* held in Helsinki in 1978, as a supplement to its September-October 1982 issue (Volume 17, Number 5S). Among the papers is the study of the effects of prenatal and postnatal exposure to 2450 MHz radiation on squirrel monkeys, which caused quite a stir when it first appeared at a poster session four years ago. At that time, Dr. Joel Kaplan and co-workers reported that, while most of the monkeys suffered no ill effects, there was a high mortality rate among those animals exposed to an average SAR of 3.4 W/Kg before *and* after birth. EPA, the sponsor of the original study, agreed to supply more money for a replication study to see whether this new effect was more than a statistical anomaly—a possibility given the small sample size and the fewer than expected deaths among the controls. The results of that second experiment, reported in a *note added in proof* to the original paper, "did not support those obtained in the initial experiment. No differences were found between irradiated and control monkeys in the number of abortions, stillbirths or livebirths that occurred or in the number of offspring that died." In a telephone interview from his office at SRI International, Kaplan said that he believed the matter was now settled. At EPA, Dr. Joe Elder, the acting director of the division that supported the SRI work said, "The suggestions that were raised by the first study have now been satisfactorily answered." This view was echoed by Dr. Michael Gage, who is a co-author of the paper and one of Elder's colleagues at EPA. Though Gage agreed that the question of lethality is now settled, he still favors more work on behavioral teratology, a research area he describes as "not very well explored." Among the 24 other papers in the collection are: "Measurements of Electric and Magnetic Stray Fields Produced by Various Electrodes of 27 MHz Diathermy Equipment" by a team from Finland; "Coherent Oscillations in Biological Systems: Interaction with Extremely Low Frequency Fields" by F. Kaiser of the Institute of Theoretical Physics at the University of Stuttgart; "ELF Magnetic Fields in Electrosteel and Welding Industries" by a group from Linkoping University in Sweden; and "Population Exposure to VHF and UHF Broadcast Radiation in the [US]" by R. Tell and E. Mantiply of EPA ....In another teratology study, a group from Thomas Jefferson University in Philadelphia, PA, reports on the effects of prenatal exposure of rats to 10 mW/cm² of 915 MHz for six hours a day throughout gestation in the October issue of *Radiation Research.* They found "no significant teratogenic activity" at this exposure level—a level which did not induce a "significant" increase in the rat's body temperature (average SAR = 3.57 W/Kg)....And a team from EPA has

found that the exposure of pregnant rats to 425 MHz continuous wave radiation (SAR = 3.1–6.7 W/Kg) "may lead to increased mitogen-stimulated responses by lymphocytes." Writing in the September issue of the *Journal of Microwave Power*, the authors state that they do not know what mechanism is responsible for the observed changes, though it does not appear to be frequency dependent: "Whether these changes in lymphocyte response reflect an alteration in the functional integrity of the exposed animal's immune system remains to be investigated."... Dr. Gregory Lotz of the Naval Aerospace Medical Research Laboratory in Pensacola, FL, has issued a technical report, *Hyperthermia in Rhesus Monkeys Exposed to a Frequency (225 MHz) near Whole-Body Resonance*, describing the work that prompted great interest when he first presented it at the 1981 BEMS conference (see *MWN*, September 1981). At power levels in excess of 5 mW/cm² (SAR = 2.3 W/Kg), Lotz observed "severe hyperthermia" and concludes that "the effects on rhesus monkeys of exposure to a resonant frequency (225 MHz) were substantially greater than what could be predicted based upon straightforward comparisons of dosimetric information (SAR) and the effects of exposures to a much higher frequency (1290 MHz)."...Do non-thermal effects of RF/MW radiation exist? Professors Herman Schwan and Sol Michaelson, neither one a stranger to this continuing debate, offer opposite views in recently published papers. In a presentation at last year's 10th *L.H. Gray Conference* (see Medical Applications Update), Schwan describes "observed non-thermal effects of alternating fields" and states that he believes that "ponderomotoric" forces are responsible—these are caused by electrical fields acting on non-polar particles. Among the non-thermal effects listed by Schwan are: pearl chain formation, movement in inhomogeneous fields and changes in the shape of cells as well as their destruction and fusion. Michaelson takes an opposite view in an unfavorable review of the World Health Organization's (WHO) criteria document on RF/MW radiation (see *MWN*, March 1982). In the October issue of *Radiation Research*, Michaelson writes: WHO's "unqualified acceptance of postulated non-thermal bioeffects with resonant frequency dependence and 'windows' is not justified by the evidence. There are many scientists who hold a working hypothesis that all RF/MW bioeffects are explainable as the result of internal heating (albeit nonuniform throughout the organism). Much of the literature on 'non-thermal' effects is marred by artifacts, conceptual problems or misinterpretation of data. It is regrettable the author(s) of the present document neglected to fully explore and take such factors into cognizance." Overall, he finds the document "distressing" because it "does not come up to the high scientific caliber and accuracy of the usual WHO publications."...Another paper presented at the Gray Conference argues for the presence of non-thermal effects of microwaves. A group of German researchers report on experiments in which they monitored the growth rate of yeast exposed to radiation in the frequency range 41.640–41.835 GHz. Previous work had indicated the occurrence of "very remarkable effects": the growth rate increased and decreased at certain specific frequencies and there were a number of resonances, each with a line-width of about 10 MHz. The new work provided confirmation. They conclude, "There are changes in yeast growth rate, caused by low intensity microwave irradiation. These effects depend on frequency, showing a strong resonant-like behavior, and are not correlated to the microwave power used. These effects are not explainable in terms of simple thermal response."...Commenting on the paper connecting fluorescent light with skin cancer (see *MWN*, September 1982), Allan Jensen of the Danish National Institute of Occupational Health proposes that polychlorinated biphenyls (PCBs) may be the more likely toxic agent. PCBs can be emitted by fluorescent light fixtures, especially after the burnout of a ballast. His letter appears in the October 23 issue of *Lancet*....The *IEEE Transactions on Microwave Theory and Techniques* will publish a special issue on "Electromagnetic Wave Interactions with Biological Systems" in July 1984. Georgia Institute of Technology's James Toler is the guest editor of the collection. Papers are due by October 12, 1983.

Communications...The New Jersey Department of Health will investigate a possible link between microwaves and birth defects and cancer in Vernon, NJ. Responding to local fears stirred up in a siting battle over a proposed RCA Americom relay tower, the Sussex County Health Department contacted the state's Epidemiology and Disease Control Division late last month. (There are already a number of RF/MW sources in Vernon. See *MWN*, November 1982.) A health department spokeswoman said the Sussex request is routine except for the possible link with microwaves: the department gets "a number of cancer clusters reports" every month. Charles Lawson, an epidemiologist with the department's Parental and Child Health Services, said the analysis would probably include a review of local hospital records for 1979–1981 and whatever other information the county board could provide. According to Lawson, this type of analysis usually takes over six months to complete. Meanwhile, Americom is scheduled to host a public meeting to discuss its proposed tower on December 11....NTIA plans for developing long-range international telecommunications policies appear in the November 2 *Federal Register* (47 *FR* 49694).

Compatibility & Interference... Competition between land mobile services and UHF-TV stations for spectrum space continues and promises to get worse: often, the result is unacceptable interference. A classic example is WVEU, Channel 69 in Atlanta, GA. The station, operating at 800–806 MHz from the roof of the Peachtree Plaza Hotel, has been forced to broadcast at an ERP of 2.63 kW, 30 dB or a thousand times below its authorized level, because of out-of-band interference with land mobile (806–807 MHz) repeaters located on the same roof. As the "newcomer" WVEU has the responsibility for correcting the RFI problem. Last April, the station asked the FCC for permission to operate at 50 percent power but the petition was denied on September 29. The station has now filed a petition for reconsideration. Also in November, the commission proposed rules to allow the operation of public land mobile units on UHF Channel 14 in Pittsburgh, PA (see 47 *Federal Register* 53752, November 29). According to Ralph Justus of the FCC's Broadcast Bureau, "Unless the spectrum is managed to afford protection between these services, the interference problem is going to recur many times over the next 20 years." He cites UHF stations in Tyler, TX, Boulder, CO, San Diego, CA, and Washington, DC as other potential trouble spots. The commission's Private Radio Bureau has released an interim report, *Future Private Land Mobile Telecommunications Requirements*.... With respect to satellite communications, the FCC has issued an alert on the need to consider the potential for RFI in designing and manufacturing direct broadcast satellite home receivers. Specifically, the commission noted that, based on theoretical considerations, out-of-band emissions from terrestrial systems could fall into the 12 GHz band, as could harmonics from ISM equipment — especially microwave ovens—and very high-power radars....On September 10, the American Satellite Co. of Rockville, MD, filed a petition asking the FCC to adopt standards that would protect against RFI from the improper operation of transmitting earth stations. One commission staffer told *Microwave News* that the FCC has not received a large number of complaints with respect to RFI from satcom stations and that "there are differences in opinion on how serious this problem is."...The October 11 issue of *Broadcasting* features a summary of comments submitted on the FCC's proposed rule for resolving FM blanketing interference (see *MWN*, May 1982)....And the FCC has found that, while cordless telephones do not comply with its rules on radiated signals, they do not constitute a serious problem: it has received few RFI complaints from amateur radio operators in the 1.8–2.0 MHz band. The FCC plans to propose new rules for cordless telephones in 1983 .... State policemen have begun noticing that signals from their walkie talkies can interfere with their Breathalyzer units, used to test the sobriety of drivers. A spokesman for Smith & Wesson, the manufacturer of the units in Springfield, MA, admits such RFI, though rare, can occur....George Washington University's Continuing Engineering Education program is sponsoring a course on *Electromagnetic Interference and Control* in Washington, DC, January 10–14. For more information, call (800) 424-9773.

Government... For a brief moment in early October there were rumors that EPA management had officially approved long stated plans to set safety levels for public exposure to RF/MW radiation. Work on the guidance has been going on for some time: EPA's Office of Research and Development in Research Triangle Park, NC, is in

the final stages of preparing a criteria document on the effects of non-ionizing radiation—due for release early next year—which will serve as the basis for the guidance. And a group at the Environmental Sciences Division of DOE's Lawrence Livermore Laboratory in Livermore, CA, is studying the economic impact of the guidance (see *MWN*, December 1981). EPA Assistant Administrator Kathleen Bennett did approve the advanced notice of proposed rule making (ANPRM), but Administrator Anne Gorsuch has yet to sign it. As we go to press at the end of November, there is still no sign as to when the ANPRM will appear in the *Federal Register*....The National Center for Devices and Radiological Health (which absorbed BRH) is reviewing its reporting and record-keeping requirements for radiation emitting products as required under the Radiation Control for Health and Safety Act of 1968. According to present rules, manufacturers must submit data on the operation, labeling and design of electronic devices as well as incidents of accidental radiation exposure. In addition they must maintain records on quality control procedures, test results and methods for controlling radiation emissions. Among those devices using non-ionizing radiation that fall under these regulations are: microwave heating equipment, RF heaters and sealers and diathermy machines. A task force at the center is assessing whether or not the regulations are still needed and is soliciting public comment. As the center's John Bailey put it: "We are looking to see if there is a better or alternative way of satisfying the act." For more information see the notice in the November 16 *Federal Register* (47 *FR* 51706) or call Bailey, (301) 443-3434. Comments are due by February 14, 1983; Bailey hopes to have recommendations ready by next September....The Consumer Product Safety Commission (CPSC) has proposed rules to decide when to release complaints on specific products. The proposal, published in the November 5 *Federal Register* (47 *FR* 50283), would make it easier for CPSC to disclose information to the public .... NIOSH's Division of Biomedical and Behavioral Science in Cincinnati, OH, is looking for a chief for its Physical Agents Effects Branch to replace Dr. Wordie Parr who is retiring at the end of the year. A candidate must be an engineer or a physicist and be able to direct a research program on the health and safety impact of occupational exposures to radiation, noise, vibration as well as high and low temperatures and pressures. The salary range is $41,000–$48,500. For more information contact: Jon Ruse, Personnel Office, NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226.

Measurement...A team from Italy's National Research Council in Florence has developed an RF hazard monitor to protect workers against overexposure to RF heater and sealer radiation. The patented instrument has a flat frequency response in the 2–100 MHz range, with an overall accuracy of ±2.5 dB with a typical value of ±0.7 dB. The monitor incorporates applicable safety standards: red and yellow indicator lights turn on in the presence of "excessive" power levels. In the description of the monitor, presented in the September issue of the *Journal of Microwave Power*, the team advises that it could also be used in a number of other applications, including exposures to AM and FM broadcast radiation, short-wave diathermy and military communications....The publication of NBS' draft handbook for its Electromagnetic Calibration Services Voluntary Laboratory Accreditation Program, due out this month, has been held up as the bureau resolves a number of tricky technical questions. According to NBS' John Locke, the draft handbook should be available early next year. ...In a paper to appear in a forthcoming issue of *IEEE Transactions on Instrumentation and Measurement*, David Wait of NBS' Boulder laboratories reviews NBS' noise measurement program for antenna systems with gains between 51 and 65 dB in the 1–10 GHz frequency range. For large antennas, 11–28 meters in diameter, radio stars are used as the known noise source. For smaller antenna systems, 4–5.5 meters in diameter, the moon is the preferred source....Among the papers to be presented at the *National Radio Science Meeting* in Boulder during the first week in January are "Preliminary Results from Measurements of 800 MHz Radio Transmission into Residential Buildings" by a team from Bell Labs in Holmdel, NJ, and "Measurements of the Microwave Dielectric and Attenuation Properties of Plants" by two researchers from the Remote Sensing Lab at the University of Kansas in Lawrence. For details see Conference Calendar on p. 10.

Medical Applications...The National Center for Devices and Radiological Health's Radiological Devices Panel is set to meet on December 8 and 9 in Rockville, MD. On the agenda are a review of the current status of NMR imaging devices and a premarket approval application for a RF/MW hyperthermia machine. The identity of the manufacturer seeking approval is confidential until the meeting. Dr. R.D. Saunders of the NRPB in the UK was scheduled to review the British experience with NMR, but will not be able to attend. At the request of the National Electrical Manufacturers Association (NEMA), there will be a discussion of the reorganization of the BRH and the Bureau of Medical Devices. What concerns NEMA, according to one of its staff, is that BHR's past authority should not get diluted by the change. For more information contact: Dr. Robert Phillips, (301) 443-3426....The North American Hyperthermia Group (NAHG) will hold its third annual meeting during the Radiation Research Society's conference February 27–March 7 in San Antonio, TX. For more information contact: Dr. Dennis Leeper, 925 Chestnut Street, Philadelphia, PA 19107. The abstracts of the papers from this year's NAHG meeting, held in Salt Lake City, UT, April 17–19 are published in the August issue of *Radiation Research*....The Proceedings of the 10th *L.H. Gray Conference: Ultrasound, Microwave and Radiofrequency Radiations: the Basis for Their Potential in Cancer Therapy*, held in Oxford in July 1981, are published in a supplement to the March 1982 issue of the *British Journal of Cancer*. Among the large number of papers is one from Poland that compares the effects of whole-body and local microwave hyperthermia on the immune system. Drs. M. Janiak and S. Szmigielski of the Center for Radiobiology and Radioprotection in Warsaw report that local heating is preferable to whole-body hyperthermia because the former does not inhibit the immune response....Fonar announced a breakthrough at the Radiological Society of North America meeting in Chicago at the end of November: a new 3,000-gauss permanent magnet for use in whole-body NMR imagers. A spokesman for Fonar said the magnet has a very small fringe field and is therefore much easier for hospitals to house. He added that Fonar hopes to get FDA approval for its NMR units in the first half of 1983. The news sent the price of Fonar stock to new highs....The program for the first annual *Meeting of the Society for Magnetic Resonance Imaging* to be held in Colorado Springs in February is now available. See Conference Calendar on p. 10 for details.

Military Systems...Wisconsin Governor-Elect Anthony Earl has confirmed his campaign commitment to oppose Project ELF, the navy's land-to-submarine communication system. In a post-election statement, he called it "primarily an offensive system which would not help to move us along the road to arms control and arms reduction," and announced plans to contact Michigan's Governor-Elect James Blanchard to work together against the project. On another front, the Wisconsin Natural Resources Board passed a resolution affirming its opposition to Project ELF on November 17....The Department of Transportation has approved the construction of the H-3 highway project, part of which will be under the coast guard's Omega antenna (see *MWN*, July/August 1982). Construction could begin in January. ...The navy is building an AEGIS Combat System Center on Wallops Island, VA. In a November 1 notice in the *Federal Register* (47 *FR* 49437), the navy announced that it would not prepare an environmental impact statement for the project but that an environmental assessment had been completed. The navy notes that, "The radars utilized do constitute a hazard zone extending some 2,000 feet seaward; however, the beam is elevated to keep radiation levels at the shoreline within the standard of 10 mW/cm² for continuous exposure. Continuous monitoring and built-in system checks will automatically turn off the equipment if radiation levels are excessive so that there is no perceived hazard to operating personnel, shoreside or surface inhabitants."

Mobile Communications...Allocating cellular mobile phone markets is proving to be a tough job. The second FCC cellular construction permit went to AT&T's Boston subsidiary last month. But at about the same time, the Justice Department asked the FCC to delay issuing permits to phone companies until the commission clears up

questions over its licensing procedures, which some applicants argue are anti-competitive. And the commission must now wade through almost 400 applications received for the 30 second-largest cellular markets.

Ovens...It looks as if a large number of people are planning to put a microwave oven under their Christmas trees, or at least that is what retailers are betting on. Factory shipments of ovens exceeded 470,000 in October, the largest number for any month in history. A spokeswoman for the Association of Home Appliance Manufacturers, which compiles these statistics, noted that microwave ovens are popular gift items in the current economic climate because they meet the needs of working women. Even with a record-breaking October, microwave oven shipments for the year are still down 11.2 percent over the first ten months of 1981....A one-month-old baby girl was hospitalized with third degree burns on the left hand, right foot and abdomen in Caledonia, MI, on October 31. State police Detective Sgt. Robert Golm suggested that the burns were caused by the microwave oven in the home of the baby's parents; the police have impounded it. Golm told *Microwave News* that there were no defects in the oven and that it would not operate with the door open. "We do not feel it was an accident," he said. The case is now being handled by Barry County Prosecutor Judy Hughes. Repeated attempts to reach Hughes were unsuccessful....A November 29 pre-trial conference on the FTC's complaint against Amana Refrigeration Inc. for deceptive advertising (see *MWN*, November 1982) was rescheduled for December 9. On November 30, the FTC moved for a "summary decision," according to FTC attorney Andy Sachs. If accepted, there would be no trial; a decision would be issued by the administrative law judge hearing the case....Thermador/Waste King Co. has reissued a booklet, *Microwave Nutrition Report*, first released in 1977, which compares the reduction of Vitamin C (ascorbic acid) in fruits and vegetables cooked in microwave ovens and by other conventional methods: "In 18 out of 24 instances studied, the ascorbic acid content of the microwave cooked product was significantly higher than that observed after the conventional and convenient methods were used." The studies were carried out by Professor Gertrude Armbruster at Cornell University's Division of Nutritional Sciences. Copies are available from the company at 5119 District Blvd., Los Angeles, CA 90040....General Electric has introduced a new line of microwave ovens. Its Dual Wave system cooks food from the top with a rotating antenna and from the bottom with a static wave guide. GE is marketing eight models in the line, with prices ranging from $300 to $550. Among their features are "Auto Roast" with automatic temperature control and "Auto Defrost."...The International Electrotechnical Commission has published its standard IEC 705-1981, *Methods for Measuring the Performance of Microwave Cooking Appliances for Household and Similar Purposes.* A copy is available for $14.00 from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

Power Lines...DOE held a meeting to review its sponsored research on 60-Hz electric field effects, November 15-18 in Denver, CO. Representatives from seven research groups presented progress reports on 28 different projects. A limited number of copies of the abstracts of the papers are available from Kenneth Klein, Electric Energy Systems Divison, CE-143, DOE, Forrestal Building, Mail Stop 5EO52, Washington, DC 20585. No other proceedings of the meeting will be prepared. DOE is still operating on last year's budget under a continuing budget resolution. As a consequence, Klein said in an interview, it is doubtful that any new contracts will be signed this fiscal year: all available money will be devoted to work already in progress....The Minnesota Environmental Quality Board (MEQB) is scheduled to meet on December 16 to review a number of studies on the effects of the Cooperative Power Association-United Power Association DC power line (running from a coal field in North Dakota to Minneapolis-St. Paul) and to consider whether its construction and operation permit requirements adequately protect health and safety. According to a presentation by Professor Frank Martin of the University of Minnesota, Minneapolis, at a November 13 MEQB public meeting, preliminary evidence from a study of dairy cattle indicates no ill effects due to the 400 kV line. The board's ion monitoring program did uncover one surprising result: a relatively high concentration of small ions (5,000/cc) a quarter of a mile downwind from the line. Final reports are scheduled for release in January. For more information contact: MEQB's George Durfee, 15 Capitol Square Building, 550 Cedar Street, St. Paul, MN 55101, (612) 296-2878....Last month we reported on a Swedish study linking power lines with cancer. We have now learned that one of the authors, Professor Bengt Enander of the Royal Institute of Technology in Stockholm died in June 1981; he was only involved in the early stages of the project helping Dr. Lennart Tomenius make magnetic field measurements. Dr. Tomenius was the principal author of the report.

Satellite Communications...The Stamford, CT, Citizen Action Group is pressing for satcom station siting rules. A proposed city ordinance that would require current and future station operators to perform environmental impact studies is now before the Health and Protection Committee of the Stamford Board of Representatives—the town council. According to a group spokesman, local concern focuses on Group W Satellite Communications' new Stamford facilities. If the draft ordinance passes a committee vote, which the group expects will happen soon, a public hearing on the rules will be held early next year....Progress toward developing direct broadcast satellite (DBS) services continued last month as seven applicants joined Comsat's Satellite Television Corp. in winning FCC construction permits for DBS systems....As the future grew brighter for domestic DBS last month, the international picture dimmed. According to a November 29 report in *Broadcasting*, a UN special political committee voted to bar direct satellite transmissions across national borders without the receiving country's consent.

VDTs...According to Dr. Michael Rosenberg, chief of reproductive health at NIOSH in Cincinnati, negotiations are still underway for a planned reproductive study of VDT operators. As we reported last month, NIOSH is in the process of setting up an epidemiological study, which will include over 5,000 pregnancies, to investigate charges that the sets are associated with miscarriages and birth defects. Rosenberg said that the negotiations should be concluded by the beginning of the new year....NIOSH is also planning a reproductive study of women exposed to PCBs. This work is unrelated to VDTs, but may be of interest to those who believe they are exposed to these chemicals in the office either from fluorescent light fixtures or from VDT capacitors and transformers. (See also Biological Effects Update.) NIOSH will investigate 200 women who worked at a New York factory that manufactured transformers between 1940 and 1976. Rosenberg is the project officer for the PCB study....Two ergonomics studies are also getting started. NIOSH has contracted with Dr. Marvin Dainoff of Miami University in Oxford, OH, to evaluate three of its in-house studies on the effects of adjustable furniture and lighting, separately and together, on worker health and productivity. In another project scheduled to begin this January, NIOSH will monitor the vision and blood pressure of 24 professional typists for nine months in an experimental study of VDT workplace design. The institute's Dr. Michael Smith is the project officer for both projects....An Ontario task force investigating VDTs has recommended shielding all flyback transformers and testing all units for X-rays before they leave the manufacturer. The group's draft report, *Possible Health Hazards of Video Display Units*, also calls for a major epidemiological study of potential reproductive hazards, including radiation and PCBs. It advises that when alternative work is not available, pregnant operators should be eligible for workers' compensation, with the employer making up any loss in income. The task force, chaired by Dr. Gordon Stopps of the University of Toronto, presented its draft report to the Ontario Ministry of Labor's Advisory Council on Occupational Health and Safety on November 30....Maria Stuchly and colleagues at the Radiation Protection Bureau of Health and Welfare Canada in Ottawa have a different view of potential VDT hazards. They made measurements of ELF (5-500 Hz) magnetic fields and RF (10-200 kHz) electric fields from VDTs. For the three units tested for ELF, most emissions were at 60 Hz and its harmonics, with higher levels for even harmonics than odd ones. At 30 cm from the front of the screen, magnetic fields were between 0.097 and 0.217 A/m. Only one reading was taken close to the transformer at the back of a unit, the Perkin Elmer Model 550: there

the magnetic field was 4.019 A/m. According to bureau scientists, these radiation levels were in line with other electrical devices; for instance, a hand mixer has been found to have localized fields of 9.295 A/m. They say that ELF magnetic fields around VDTs "are of such low intensities that they are very unlikely to have any biological effects, let alone represent a health hazard." The bureau staff tested 57 models (86 sets) for RF radiation and found emissions in this frequency range were also well below safety limits. At the operator's position, 30 cm from the screen, electric field intensities for 20 models were in the range between 1 and 5 V/m and for 37 models below 1 V/m. Maximum readings were generally found near the flyback transformer, but for three models the maximum reading was found at the screen, with emissions dropping from above 200 V/m to less than 70 V/m at a distance of 10 cm. For 10 other models, maximum readings above 200 V/m, but not specified, were identified on the top, side and back of the units....Plans are still in the works for introducing a VDT safety bill into the Connecticut Legislature. State Senator Michael Skelley is likely to submit a bill to the legislature's Labor and Public Employees Committee early next year (see *MWN*, November 1982).... A VDT safety bill introduced in the British Columbia Legislature failed to receive consideration this year. Private members bill No. M210 was introduced by legislator Karen Sanford in October.... The Australian Council of Trade Unions published its "Guidelines for Working with Screen-Based Equipment" in its *Health and Safety Bulletin* this May. The 44-page report lists cataracts and pregnancy problems among potential VDT hazards. It states that "no satisfactory long-term follow-up study of operators of [VDTs] has been performed,and so statements to the effect that the equipment does not or cannot damage, e.g. eyes or eyesight, are without foundation. In the light of disastrous experiences associated with introduction of new technologies in the past, [union] affiliates should regard screen-based equipment as a likely cause of severe health effects until it is shown to be safe." The guidelines were edited by John Mathews and Nick Calabrese, ACTU/VTHC Occupational Health and Safety Unit, Trades Hall, Box 93, Carlton South, 3053 Victoria, Australia....The Newspaper Guild has warned its locals not to accept VDT radiation tests performed by the Research Institute of the American Newspaper Publishers' Association. Guild President Charles Perlik argues that an impartial third party should perform the tests.

Etc...The papers presented at the Ann Arbor meeting on risk analysis and microwaves (see *MWN*, December 1981) have been edited by University of Michigan Professor Nicholas Steneck and have just been published by the San Francisco Press. In one of the conference's more controversial and widely circulated papers, Allan Frey criticizes Professor Bill Guy's experiment on the long-term, low-level effects of 2450 MHz radiation. (The study, funded by the air force, is now nearing completion at the University of Washington, Seattle.) When the paper was first distributed, Guy and his co-workers asked Steneck for the opportunity to respond, and Frey in turn was allowed a brief reply. All of this was to be published in the book, but as Steneck notes, on seeing Frey's second statement, Guy's group withdrew its critique. Steneck published Frey's reply anyway; in it Frey asks, "Why did Guy take on a project which involved the expenditure of approximately $1.5 million of public funds with the known critical sensitive tests ruled out by the sponsor for a nonsensical reason? Is this science?" *Risk/Benefit Analysis: The Microwave Case* is available for $15 from the San Francisco Press, Box 6800, San Francisco, CA 94101....In an article published in the summer 1982 issue of *Science, Technology & Human Values*, Steneck argues for involving historians in policy deliberations. He uses the microwave debate as a case study, which "shows how history has been misused, abused and neglected ..." Steneck is with the Department of History at the University of Michigan....There is a new computer game called *Microwave* on the market. The objective is to direct Teddy the Salvage Man through a maze so that he can repair equipment and computers (thereby collecting points) while avoiding attacks by alien beings. Teddy can outrun the aliens or fight them off with dishes that spew out lethal microwaves. This writer who has little talent for such games nevertheless found *Microwave* quite addictive. The game is designed for an Apple II computer; it is available for $34.95 from Cavalier Computer Corp, PO Box 2032, Del Mar, CA 92014. ●

CONFERENCE CALENDAR

- January 5–7: *National Radio Science Meeting*, University of Colorado, Boulder, CO. Contact: T.E. VanZandt, NOAA/ERL/R445, 325 Broadway, Boulder, CO 80303.

- February 14–18: 1st Annual *Meeting of the Society for Magnetic Resonance Imaging*, Broadmore Hotel, Colorado Springs, CO. Contact: SMRI, Suite 506, 4720 Montgomery Lane, Bethesda, MD 20814.

- February 14–19: 7th *International Conference on Infrared and Millimeter Waves*, University of St. Jerome, Marseille, France. Contact: Kenneth Button, National Magnet Lab, MIT, Cambridge, MA 02139.

- February 27–March 3: 31st Annual *Meeting of the Radiation Research Society*, Hyatt Regency, San Antonio, TX. Contact: RRS, 925 Chestnut Street, Philadelphia, PA 19107. The 3rd Annual *Meeting of the North American Hyperthermia Group* will be held simultaneously, February 27–March 1.

- March 8–10: *Microwave Systems Applications Technology*, Sheraton Washington, Washington, DC. Contact: Richard Hartman, EW Communications, 1170 East Meadow Drive, Palo Alto, CA 94303.

- March 8–10: 5th *Electromagnetic Compatibility Symposium and Technical Exhibition*, Zurich, Switzerland. Contact: Dr. T. Dvorak, EMC-83, ETH Zentrum-IKT, 8092 Zurich, Switzerland.

- April 5–8: *International Magnetics Conference*, Franklin Plaza Hotel, Philadelphia, PA. Contact: F.J. Friedlander, School of Electrical Engineering, Purdue University, W. Lafayette, IN 47907.

- April 6–7: Annual *Meeting of the National Council on Radiation Protection and Measurements*, Washington, DC. Contact: NCRP, 7910 Woodmont Avenue, Bethesda, MD 20814.

- April 10–13: 61st Annual *Convention of the National Association of Broadcasters*, Las Vegas Convention Center, NV. Contact: NAB, 1771 N Street, NW, Washington, DC 20036.

- April 12–15: 3rd Annual *International Conference on Antennas and Propagation*, University of East Anglia, Norwich, UK. Contact: IEE, Savoy Place, London WC2R OBL, United Kingdom.

- May 2–5: 2nd Annual *Test & Measurement World Expo*, Convention Center, San Jose, CA. Contact: Meg Bowen, Conference Director, 215 Brighton Avenue, Boston, MA 02134.

- May 15–19: 15th Annual *Meeting of the Conference of Radiation Control Program Directors*, Eldorado Hotel, Reno, NV. Contact: Charles Hardin, CRCPD, 65 Fountain Place, Frankfort, KY 40601.

- May 22–25: 18th Annual *Meeting of the Association for the Advancement of Medical Instrumentation*, Loews Anatole, Dallas, TX. Contact: AAMI, Suite 602, 1901 N. Fort Myer Drive, Arlington, VA 22209.

- May 23–26: *International IEEE/APS Symposium and National Radio Science Meeting*, University of Houston, TX. Contact: Professor Liang Shen, Department of Electrical Engineering, University of Houston, TX 77004.

- June 1–3: *IEEE/MTT-S International Microwave Symposium*, Sheraton Boston Hotel, Boston, MA. Contact: Frank Leith, Alpha Industries, 20 Sylvan Road, Woburn, MA 01801.

- June 12–16: 5th Annual *Bioelectromagnetics Society Meeting*, University of Colorado, Boulder, CO. Contact: BEMS, 1 Bank Street, Gaithersburg, MD 20878.

- June 21–23: *International Aerospace and Ground Conference on Lightning and Static Electricity*, Fort Worth, TX. Contact: Nick Rasch, FAA Technical Center, ACT-340, Atlantic City Airport, NJ 08405.

- July 18–21: 20th Annual *IEEE Conference on Nuclear and Space Radiation Effects*, Sheraton Gatlinburg Hotel, Gatlinburg, TN. Contact: E.F. Hartman, Div. 9336, Sandia National Laboratories, Albuquerque, NM 87185.

- July 18–22: 7th *International Symposium on Bioelectrochemistry and Bioenergetics*, Stuttgart, West Germany. Contact: Professor M. Blank, Department of Physiology, Columbia University Medical School, 630 West 168th Street, New York, NY 10032.

- August 23–25: *IEEE International Symposium on Electromagnetic Compatibility*, Hyatt Regency-Crystal City, Arlington, VA. Contact: Aaron Sullivan, Jr., 7121 Wolf Tree Lane, Rockville, MD 20852.

- August 23–26: *URSI International Symposium in Electromagnetic Theory*, Santiago de Compostela, Spain. Contact: Dr. J.L. Sebastian, Dept of Electricidad y Electronica, Facultad de Ciencias Fisicas, Ciudad Universitaria, Madrid (3), Spain.

- October 3–5: 3rd Annual *Meeting of the Bioelectrical Repair and Growth Society*, San Francisco, CA. Contact: Dr. Lorraine Day, San Francisco General Hospital, 1001 Potrero, San Francisco, CA 94110.

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VDTs: VLF Measurements

Researchers at the Canadian Center for Occupational Health and Safety (CCOHS) have measured "relatively strong" emissions of very low frequency (VLF) radiation near the flyback transformers of some video display terminals (VDTs). They also have demonstrated a "practical method" for shielding against these emissions.

The center's Dr. Karel Marha and David Charron found that a simply constructed copper foil hood "greatly reduced VLF levels" around the terminals.

These results are described in a draft version of *The Very Low Frequency (VLF) Emissions Testing of CCOHS Video Display Terminals*. The document is currently under review and is scheduled for publication by CCOHS in early 1984.

The VLF electric field exceeded 300 V/m at 20 cm from the casings of several terminals near their flyback transformers, although significantly lower levels were found in front of the screen. Marha and Charron used an IFI EFS-1 meter which goes off scale at 300 V/m and so the maximum readings are unknown.

Emissions from flyback transformers are pulsed, with peak values from five to ten times greater than average readings, according to CCOHS spokesman Jim Purdham. The intensity of the individual pulses was not measured.

Pulsed v. Continuous Waves

Purdham said in a telephone interview that the authors hope their findings will lead to research on the biological effects of pulsed waves as compared to those of continuous waves. He said the draft report "helps define the research that's needed."

(continued on p.7)

NCRP To Study ELF Bioeffects

The Environmental Protection Agency (EPA) has asked the National Council on Radiation Protection and Measurements (NCRP) for a critical review of the biological effects of extremely low frequency (ELF) radiation.

Under a three-year, $150,000 contract, the NCRP will assemble a committee of experts to evaluate studies from around the world on the effects of ELF electric and magnetic fields, including those from high voltage overhead power lines.

W. Roger Ney, executive director of NCRP, said that the council is now in the process of assembling Scientific Committee No. 79 to write the report for EPA. Nominees for chairman and members of the committee are being weighed and will be presented to NCRP's Board of Directors at its December 13 meeting. (There are usually six to ten experts on NCRP committees.)

Speaking from his office in Bethesda, MD, Ney said that the committee will assess what standards might be needed in addition to surveying the available literature.

(continued on p.7)

EBI v. Inco Case Settled

Electro-Biology Inc. (EBI) has retained its patent for the Bi-Osteogen bone regenerating system after a two-year court battle against three subsidiaries of Inco Ltd. In an out of court settlement, the Fairfield, NJ, company also acquired Inco's patent for treating bone breaks with pulsed electromagnetic fields (PEMFs). The November 11 agreement removes the threat of competing devices entering the market under licensing agreements from Inco.

Although the terms of the settlement are confidential, sources close to the proceedings report that Inco received no money or future royalties because, they speculated, EBI probably would have won its suit.

EBI sought a judgment from the Federal District Court for Southern New York, New York City, in 1981 (81 Civ. 7592) to uphold the validity of its patent, which defines specific electromagnetic signals that enhance bone growth. Inco held an extremely broad patent for PEMF bone treatment. (Inco Ltd. is a Canadian corporation.)

The suit focused on whether EBI obtained the rights to the Bi-Osteogen signal illegally. In a countersuit filed in 1982, Inco accused Dr. Arthur Pilla, one of the founders of EBI, of developing the idea for the Bi-Osteogen generator while still working for the Electric Storage Battery Corp. (ESB), which later became an Inco subsidiary called Exide. During Pilla's four-year tenure at ESB he was obligated to assign all discoveries to ESB. Pilla left ESB in February of 1975; EBI filed a trademark application for its device that June, which claimed the machine had been in existence since April, and Pilla and a colleague filed a patent application for certain PEMFs that fall.

Pilla maintains that the Bi-Osteogen signal was not discovered and patented until mid-1976. In an interview he explained that the 1975 filing was so general that it was rejected by the patent office.

After Pilla left ESB he went to work at Columbia University where John Ryaby and Dr. Andrew Bassett were already on staff. The three researchers started EBI in 1975. Pilla currently works at Columbia part time, and is a professor of orthopedics at Mt. Sinai Medical Center in New York City.

Though not a central issue in EBI v. Inco, the scope of the two patents raises interesting questions about PEMF treatment in general and EBI's formidable market position in particular. Are some signals more effective than others, and which signals fall under EBI's patents? As yet there are no clear answers.

Inco's former patent, filed by ESB employee Michael Manning in 1972 (US Patent No. 3,893,462; 1975), covers the therapeutic use of a wide range of PEMF signals with differing pulse rise and fall times. EBI's patent, on the other hand, specifies very complex signal characteristics defined by Pilla and Ryaby (US Patent No. 4,105,017; 1978). EBI claims the Bi-Osteogen waveform is what makes treatment work, though it does not rule out the possibility that other signals are effective.

Many researchers suspect that the type of signal used to stimulate bone growth is unimportant. For example, a number of scientists told *Microwave News* that it appears almost any signal will work, from PEMFs to ultrasound, but various systems and signals may be best suited for different applications.

Nevertheless, with Telectronics and a number of other companies now developing bone generators with signals similar to EBI's, new patent infringement claims may be filed. Asked about the Telectronics device, which is already in clinical trials, EBI Vice President Richard Reisner told *Microwave News* that his company "will take appropriate legal action" if the Telectronics signal is covered by the Manning or Ryaby-Pilla patents.

Some observers believe EBI's market position is so strong that it will ignore Bi-Osteogen look-alikes as long as competitor sales remain small. The EBI generator is by far the most widely used bone regenerating device and the only PEMF unit cleared by the Food and Drug Administration which does not require surgically implanted electrodes. According to Reisner, the generator had a 77 percent success rate for the 13,000 bone fractures treated to date. Another 7,000 patients are currently using the device.

Surprisingly, the settlement has done little to boost Wall Street's opinion of EBI. Stock prices for the fast-growing company plunged 60 percent, to about $12 per share, in late October because of a drop in third quarter earnings. Paul Combs, a stock analyst for Morgan Stanley & Co., explained that at present, a slowdown in the demand for its product outweighs the importance of patent protection for EBI. As we go to press, EBI is trading in the low teens. Its past year high was 34.

Uncertain Link Between RF/MW and Cancer

Dr. William Morton of the University of Oregon has completed a revised report of his study linking nanowatt-levels (billionths of W/cm^2) of radiofrequency and microwave (RF/MW) radiation to leukemia. His analysis of radiation exposure and cancer rates among Portland residents has failed to pass peer review at the Environmental Protection Agency (EPA), however.

The EPA-sponsored study, begun in 1978 and initially completed in late 1981, is the first to link environmental RF/MW exposures to cancer (see *MWN*, January/February 1982). Morton, a professor at the university's Health Sciences Center in Portland, believes his findings for frequencies in the very low frequency (VLF) and FM bands could be significant and recommends further studies among the general population.

[At extremely low frequencies (ELF), Dr. Nancy Wertheimer and Ed Leeper have found an association between power line radiation and leukemia. A similar link has been found in a number of studies of occupationally exposed groups (see *MWN*, March 1983).]

Because of unfavorable peer reviews, EPA will not publish the Portland study. Dr. Joe Elder of the agency's Experimental Biology Division in Research Triangle Park,

NC, told *Microwave News* that Morton's project is being closed out and that the agency has no plans to fund similar investigations. Elder said the difficulty of documenting exposure histories for the public is a key problem.

The agency is currently doing a retrospective study of workers exposed to RF/MW radiation at MIT's radiation research lab. Elder noted that these exposures are certain to be greater than those experienced by the general population.

In an interview Morton said although there were unavoidable problems with his study, he is convinced that only more research will yield adequate exposure guidelines and calm public fears. Morton plans to publish his findings independently of EPA.

Though his 1981 preliminary report indicated a link between radiation levels and adenocarcinoma of the uterus, breast cancer and leukemia, further analysis revealed an association only with leukemia.

Radiation levels for the low VHF (54-88 MHz), FM (88-108 MHz) and high VHF (176-216 MHz) bands were extrapolated from EPA measurements made in 1977. According to these measurements, the average RF/MW level in Portland is 0.02 uW/cm^2. Morton assumed that the levels were constant over the 1963-1977 period for which cancer incidence and mortality were checked. No information is available on how RF/MW radiation patterns in Portland changed over this period.

Soviets Again Beam Microwaves at US Embassy in Moscow

The Soviet Union resumed beaming microwaves at the US embassy in Moscow last summer, according to US Ambassador Arthur Hartman. The irradiation was intermittent with average power levels outside the embassy of 2 uW/cm^2. The microwaves were detected on average for two hours a day (never longer than four hours a day) between July 14 and October 19.

At a press briefing in Moscow on November 10, Hartman said that the microwaves were not a health hazard but that he had filed a formal protest with the Soviet Foreign Ministry "as a matter of principle." Two days later Reuters reported that the Foreign Ministry denied that microwaves were being aimed at the US embassy.

This is the first acknowledged resumption of the Moscow signal since the summer of 1979. The irradiation of the embassy was first discovered in 1953 and continued periodically at various frequencies and intensities for the next 26 years. In 1976 protective screening was installed on the windows at the embassy.

An informed source told *Microwave News* that the new signal comes from a single source, south of the embassy. The microwaves were primarily 7 GHz, with some components as low as 2 GHz, he said. The two-microwatt intensity was measured on the embassy roof.

The reason for the Soviets' use of microwaves remains unknown, though theories abound. Among the most popular hypotheses are that they are trying to interfere with embassy communications or are eavesdropping on conversations inside the embassy building. (Hartman said that the new signals did not cause any interference.)

In a new book, Martin Ebon takes the speculation one step further: the Soviets may be trying to alter the minds of embassy personnel or even read their minds by "tuning microwaves to the level of brain waves, possibly amplifying their intensity, then effecting a 'feedback' that could range from remote monitoring of brain wave activity to recording emotions, images or thoughts."

Ebon thinks that the Soviets' continued use of microwaves over so many years testifies to their utility and that "the potential of microwave technology in intelligence-gathering and brain manipulation is, literally, unimaginable." He even suggests that President Carter was subjected to some esoteric form of brain manipulation during the Vienna SALT II conference to explain what he calls Carter's "erratic, virtually manic-depressive" behavior when he returned home from Vienna.

One expert commented that he would be surprised if the Soviets could pull off something like this. "It's pretty far out," he said.

Ebon's *Psychic Warfare: Threat or Illusion* was published by McGraw-Hill ($15.95).

ELF Fields Inside Homes Near Power Lines

Household wiring makes a significant contribution to the ambient electric fields inside homes located near power lines, according to two new studies.

GE and PSE&G

In a collaborative effort between General Electric (GE) and New Jersey Public Service Electric and Gas (PSE&G), measurements were taken in a house located 95 meters from a 500 kV transmission line and 49 meters from a 13 kV distribution line. The electric field was measured while the transmission line and house power were each "on" and "off." The results indicate that E-fields "created by the house wiring were a significant part of the total field inside the homes."

For those combinations of transmission line and house power in which at least one was "on," the measured E-fields were in the 1-10 V/m range, with maxima of 14-24 V/m. When both the transmission line and house power were turned "off," the E-fields were below 1 V/m. A limited number of measurements of magnetic (H) fields and space potentials were also made.

E-fields measured in a house located a mile from the 500 kV power line were essentially the same as those within 100 meters of the line. The maximum reading was 16 V/m.

Interestingly, the E-field was often greater in the house near the power line when the transmission line was turned *off*. In a telephone interview, GE's Dr. Don Deno explained that when household and power line fields combine, they can do so "in unpredictable ways." The important point, he said, is that the contributions from the wiring and the transmission line to the E-fields are of the same order of magnitude.

Deno said that measuring space potentials is preferable to E-fields. He added that the unique element in this study is that the transmission line had been turned off. "That's an expensive proposition," Deno said.

Among the other results, Deno and co-workers found that houses can shield external electric fields by a factor of eight. That is, if the E-field outside a house is 80 V/m, the field inside is 10 V/m. In addition, they measured the fields generated by appliances. For example, the E-field is 250 V/m at 30 cm from an electric blanket and 90 V/m at the same distance from a stereo. Deno's paper appears in the October issue of *IEEE Transactions on Power Apparatus and Systems*.

Deno said that he is preparing two detailed reports on E-field measurements and is also collaborating with Michael Silva of ENERTECH in Pittsburgh, PA, on a measurement study for the Electric Power Research Institute (EPRI).

SRI International

Ray Vincent of SRI International, Menlo Park, CA, presented similar data to those of GE and PSE&G on November 7 at the Department of Energy-EPRI contractors meeting in Kansas City, MO. In measurements taken for EPRI, Vincent and collaborator Jane Clemmensen found that the E- and H-fields in a house 7-10 meters from a 69 kV transmission line and a 13 kV distribution line were primarily due to the house wiring and consumer appliances. Similar results were obtained for homes near only a 13 kV distribution line.

The SRI researchers also conclude that it is important to measure both the E- and H-fields for 60 Hz radiation because one is always in the source's inductive zone. Also, they argue that whenever possible harmonics and subharmonics should be measured.

Clemmensen said that, in general, the SRI results are "consistent" with Deno's. But she does not agree with Deno's preference for measuring the space potential. "It is not a quantity defined by the IEEE," she said, "so you are better off sticking with the E- and H-fields."

The SRI measurement study will be published as an EPRI report.

Is There Any CW Radiation?

"There is essentially no CW radiation in domestic, industrial or military environments." With these words, Dr. Ross Adey has challenged the relevance of a paper in *Science* that supports the new ANSI standard and the Environmental Protection Agency's (EPA) recent draft report on the bioeffects of radiofrequency and microwave (RF/MW) radiation.

At a meeting of Department of Energy (DOE) and Electric Power Research Institute (EPRI) contractors in Kansas City, MO, on November 8, Adey argued that the conclusions of a study by a research group at the University of Rochester were misleading. Drs. Norbert Roberts, Jr., Shin-Tsu Lu and Sol Michaelson examined the viability and function of white blood cells after a two-hour exposure to 2450 MHz continuous wave (CW) radiation (see *MWN*, May 1983). The results, which were published in the April 15 issue of *Science*, were supportive of the new American National Standards Institute (ANSI) RF/MW safety standard.

Adey said that "2450 MHz CW radiation does not occur outside the lab; it has no relevance to the real world." For example, he added, not even microwave ovens emit CW radiation. Adey said he decided to speak out because the Rochester paper had been widely cited in the press.

Michaelson, who was in the audience, replied that Adey's comments were "totally irrelevant to the proceedings of the meeting." He refused to respond beyond saying that he found them "personally insulting." The DOE-EPRI meeting was a forum on the bioeffects of high voltage power lines.

Turning to EPA, Adey said that the agency's emphasis on the thermal effects of RF/MW radiation in its criteria document is "totally inappropriate" (see *MWN*, October 1983). In addition, he charged that the membership of the special panel of the Scientific Advisory Board (SAB) assembled to review the EPA report was too heavily weighted with experts on thermal effects, with insufficient representation by those knowledgeable about non-thermal effects (see Adey's letter to EPA p.8).

EPA's David Janes replied that "it would be premature to say how the agency will set standards for public exposures to RF/MW radiation, but we want all the help we can get." The SAB panel is not the only source of EPA advice, Janes added.

NAS Briefing on Non-Ionizing Radiation

The Board on Research on the Effects of Radiation at the National Academy of Sciences (NAS) has scheduled a briefing on non-ionizing radiation for December 5 in Washington, DC. Dr. Stephen Cleary of Virginia Commonwealth University in Richmond, Dr. Przemyslaw Czerski of FDA's National Center for Devices and Radiological Health and Dr. Michael Marron of the Office of Naval Research have been invited to address the board.

June Ewing, the board's staff officer, said that the background briefing was in line with the board's oversight function: to monitor radiation issues and to advise the academy on developments as they occur. The five-member board chaired by Institute Professor Salvador Luria of MIT has no ongoing program or funding for non-ionizing radiation.

According to Ewing, the briefing was prompted by recent press reports on non-ionizing radiation in general and the New York State Power Lines Project in particular.

The review of current research on the biological effects of non-ionizing radiation and federal regulatory activities is only one part of the agenda. The briefing will be closed to the public, although representatives of federal agencies will attend as observers. Ewing left open the possibility of a public meeting sometime in the future.

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CONFERENCES

January 11-14: National Radio Science Meeting, University of Colorado, Boulder. Contact: S.W. Maley, Dept. of Electrical Engineering, University of Colorado, Boulder, CO 80309, (303) 492-7004.

January 16-20: Microwave Signatures in Remote Sensing, URSI Commission F Specialist Meeting, Toulouse, France. Contact: Dr. Richard Moore, Remote Sensing Laboratory, University of Kansas Center for Research, 2291 Irving Hill Drive, Lawrence, KS 66045, (913) 864-4836.

January 17-19: Instrumentation & Measurement Society Technology Conference (IMTC) 1984, Aboard the Queen Mary, Long Beach, CA. Contact: Robert Myers, 1700 Westwood Blvd., Suite 101, Los Angeles, CA 90024, (213) 475-4571.

January 27-29: Symposium on NMR Imaging, Fontainebleau Hotel, Miami Beach, FL. Contact: American College of Radiology, 6900 Wisconsin Ave., Chevy Chase, MD 20815, (301) 654-6900.

January 30-February 3: IEEE Power Engineering Society: 1984 Winter Meeting, Hilton Hotel, Dallas, TX. Contact: Gerson Berman, Texas Power & Light Co., 1511 Bryan, PO Box 6331, Dallas, TX 75222, (214) 748-5411, ext. 5666.

February 6-8: NIH Consensus Development Conference on Use of Diagnostic Ultrasound Imaging in Pregnancy, National Institutes of Health, Bethesda, MD. Contact: Michaela Richardson, NIHCD, Bldg. 31, Room 2A32, 9000 Rockville Pike, Bethesda, MD 20205, (301) 496-5133.

February 23-25: Biological Effects and Therapeutic Applications of ELF Electromagnetic Fields, Venice, Italy. Contact: Dr. Luigi Zecca, Association for Biomedical Applications of Electromagnetism, Via Gentilino 9/a, 20136 Milan, Italy, (02) 8321655.

March 13-14: 1984 National Radar Conference: Radar Technology for the 80's, Atlanta, GA. Contact: Dr. Edward Reedy, Georgia Institute of Technology, Engineering Experiment Station, Radar & Instrumentation Lab, Atlanta, GA 30332, (404) 424-9621.

April 2-5: 3rd Annual Test & Measurement World Expo, Brooks Hall, San Francisco, CA. Contact: Meg Bowen, 215 Brighton Ave., Boston, MA 02134, (617) 254-1445.

April 4-5: 20th Annual Meeting of the National Council on Radiation Protection and Measurements, Washington, DC. Contact: NCRP, Suite 1016, 7910 Woodmont Ave., Bethesda, MD 20814, (301) 657-2652.

April 14-19: 19th Annual Association for the Advancement of Medical Instrumentation Meeting and Exhibit, Washington Hilton, Washington, DC. Contact: AAMI, 1901 North Fort Myer Drive, Suite 602, Arlington, VA 22209, (703) 525-4890.

April 24-26: IEEE 1984 National Symposium on Electromagnetic Compatibility, Hyatt Regency Hotel, San Antonio, TX. Contact: William McGinnis, Southwest Research Institute, PO Drawer 28510, San Antonio, TX 78284, (512) 684-5111, ext. 2721.

April 29-May 4: 9th Conference & Exposition on Overhead and Underground Transmission and Distribution, Bartle Exposition Hall, Kansas City, MO. Contact: Walter Ros, GE, Bldg. 2, Rm 507, 1 River Rd., Schenectady, NY 12345.

April 30-May 3: 5th Annual Meeting of the Canadian Radiation Protection Association, Banff, Alberta. Contact: Stuart Hunt, C-7 Civil Electrical Engineering Bldg., University of Alberta, Edmonton, Alberta T6G 2G7, Canada.

May 7-9: 1984 Microwave Power Tube Conference, Naval Postgraduate School, Monterey, CA. Contact: John Skowron, Raytheon Co., Foundry Ave., Waltham, MA 02254, (617) 899-8400, ext. 4311.

May 7-11: Nuclear Magnetic Resonance 1984: National Symposium, Hyatt Regency Grand Cypress Resort, Orlando, FL. Contact: Ms. Norine Karwel, Educational Symposia, PO Box 17241, Tampa, FL 33682, (813) 879-8765.

May 7-12: 6th International Radiation Protection Association (IRPA) Congress, International Congress Center, Berlin, West Germany. Contact: R. Neider, Bundesanstalt fur Materialpurfung (BAM), Unter den Eichen 87, D-1000 Berlin 45, West Germany.

May 30-June 1: IEEE MTT-S International Microwave Symposium, San Francisco, CA. Contact: Dr. Ferdo Ivanek, Harris Corp., Farinon Division, 1691 Bayport Avenue, San Carlos, CA 94070, (415) 594-3529. The ***1984 IEEE Microwave and Millimeter Wave Monolithic Circuits Symposium*** will be held in San Francisco May 29-30 in conjunction with the MTT-S meeting.

June 3-8: 29th Annual Meeting of the Health Physics Society, Hyatt Regency, New Orleans, LA. Contact: Richard Burk, Jr., HPS, 4720 Montgomery Lane, Suite 506, Bethesda, MD 20814, (301) 654-3080.

EXCERPTS

The Federal Communications Commission (FCC) received nine sets of comments on how to regulate radiofrequency (RF) lighting to minimize interference problems. The comments came in response to a commission notice of inquiry (NOI) published in the August 17 *Federal Register* (48 *FR* 37235) (see *MWN*, September 1983). Energy efficient RF bulbs are expected to come into widespread use in the near future.

Not everyone agrees with the commission's view that industry rather than government should police RF lighting emissions. Anova Electronics, AT&T, the National Association of Broadcasters and the National Radio Broadcasters Association told the commission RF lighting could create significant interference and supported federal standards.

Industry self-regulation was favored by General Electric, the National Electrical Manufacturers Association and the Lighting Systems Research Program at Lawrence Berkeley Laboratory and the American Radio Relay League.

Comments on FCC Inquiry on RF Lighting RFI

American Radio Relay League: It is apparent that the interference potential of this type [North American Phillips SL-18 bulb] of RF lighting device is most acute at medium frequencies such as the AM broadcast band. It might be assumed that some potential for interference exists with respect to household carrier current electronic systems, such as intercoms or some security systems....From the point of view of interference potential to amateur radio stations, the league believes it both necessary and sufficient for the commission to require labeling of each RF light bulb to provide user information to educate consumers and users about interference potential to radio receivers.

Anova Electronics: Anova Electronics has developed a fully integrated intelligent system for communications, control and protection within the home and small businesses. RF lighting has the potential for interfering with the operation of the Anova system and others which utilize power line carrier technology....Anova urges the commission to adopt a regulatory scheme for RF lighting devices which would protect communications users of the radio spectrum both radiated and via power line carrier, from interference caused by RF lighting devices.

AT&T: In summary, our position is that the commission, not the lighting industry, should regulate the RF emission of such devices, and FCC regulation should be accomplished under Part 15, rather than Part 18 of the [FCC] rules....We believe the central issue of RF interference requires the commission to apply appropriate regulatory requirements to control potential interference and harm to radio licensees and telephone equipment operators. The lighting industry simply will not adopt emission limits and related interference control mechanisms that would provide the same degree of protection that is afforded by the commission's rules. With incentives obviously different from those of the commission, the lighting industry would likely establish more liberal limits for RF emission, thus creating a higher potential for interference to other equipment operators.

General Electric: The FCC favors the use of industry-supported voluntary standards on RF design limits, and GE strongly agrees. GE recognizes the importance of a sound approach to interference control for what will become widely used lighting sources. The industry appears to be on a path of promoting good practices for interference control which, coupled with the voluntary industry standard, should minimize potential problems....Pending the adoption of a voluntary industry standard or FCC regulations appropriate to lighting sources, we recommend that the Part 18 certification requirement be eliminated. In its place, GE recommends that manufacturers be allowed to verify that their products comply with the proposed emanation limits and then to market their products, subject only to a labeling requirement....General Electric Company, which manufactures and uses equipment in the different frequency spectrums, has a particularly high interest in promoting good RF lighting practices.

Lawrence Berkeley Laboratory: We believe the FCC should give the lighting industry a chance to develop voluntary industry standards through an organization such as NEMA....Limits should reflect different environments because the applicances in each would differ, i.e., commercial buildings have computers and communications systems; residential environments have radios, TV sets, etc. In commercial buildings wiring is in conduits; in homes power lines are not shielded.

Motorola: LORAN-C is a low frequency navigation system which operates on a center frequency of 100 kHz. The associated receivers are susceptible to interference in the band from about 75 kHz to 125 kHz. Harmonic energy from the RF lighting devices described in the instant proceeding represents a potential source of interference in this band for terrestrial LORAN-C users. It seems unlikely that direct radiation at this low frequency from these devices will be of significance. There is, however, some possibility that energy may feed onto and throughout the power distribution system and then radiate at points quite removed from the devices themselves.

National Association of Broadcasters: It is clearly probable that AM radio reception will suffer interference when used by persons who live and/or work in multi-unit complexes where RF bulbs may constitute the main source of lighting. Moreover, because the radiated energy emitted by RF lighting pollutes the electrical wiring of a building, AM radio stations that use power lines to transmit broadcast signals ("carrier current radio") may be ineffective in buildings where even just one RF light bulb is plugged into an outlet....RF lighting poses a significant problem of interference to AM radio and to possibly other broadcast and communications services operating in the 10 kHz to 80 MHz range. NAB believes that the commission should not defer to the lighting industry the authority to regulate the interference potential of these devices. ...The RF lighting industry has little incentive, if any, to adopt voluntary standards to reduce harmful interference to licensed broadcast communication services.

National Electrical Manufacturers Association: NEMA feels strongly that such a voluntary standard should be given an opportunity to prove effective and completely supports the commission's

position that regulatory requirements should be enacted only as a last alternative....It is the position of NEMA such RF lighting devices do not represent a serious potential for interference to authorized communication services....NEMA's position is that evidence to date supports a conclusion that [broadband emissions from RF light bulbs] do not represent a serious interference potential, nor do they represent a threat to safety and air navigation services....The technical standards designed to limit emissions from ISM equipment in general as presently exists in Part 18 is most definitely inadequate. Limits roughly approximate to the recently enacted computer rules are felt to provide very adequate protection for authorized communication services from harmful interference from RF lighting devices....

National Radio Broadcasters Association: It is imperative for the FCC, rather than the industry, to regulate the development and use of these new devices....The results of preliminary lab tests are alarming. They demonstrate that AM radios can receive objectionable radiation interference as far away as several meters from RF light bulbs.

VDTs: VLF Measurements

(continued from p.1)

Earlier this year, a CCOHS report suggested that "pulse-modulated fields could be biologically more harmful than [unmodulated] fields." The center recommended an interim limit of 60 V/m at 30 cm for all non-ionizing radiation from VDTs (see *MWN*, January/February 1983).

CCOHS scientists, including Marha, have suggested that pulsed VLF may be one of the agents suspected of causing miscarriages and fetal abnormalities among VDT operators. Clusters of pregnancy-related problems have been documented at eight sites (see *MWN*, July/August 1982).

Non-Uniform Fields

CCOHS's Purdham also discussed the effect the new measurements could have on where VDTs are placed in automated offices. An operator seated near the flyback transformer of a neighboring terminal might be exposed to VLF emissions if the terminal is not shielded. Purdham said that "if problems are being caused by VLF radiation —and we don't know that they are— configuration of VDTs becomes an important factor." VLF levels are significantly lower away from the flyback transformer.

CCOHS researchers measured 38 VDTs used at the center. Of these, 13 Hewlett-Packard units gave the high-level VLF readings. Much lower levels were produced by 25 Wang terminals, which require "no further attention," the report states. The Wang units contain a thin metallic lining inside their plastic casing to block non-ionizing radiation.

The investigators took readings at graduated distances from the terminals and at various heights above, below and level with them. The EFS-1 is a broadband (10 kHz to 200 MHz) electric field meter with sensitivity from 1 V/m to 300 V/m. It is made by Instruments for Industry of Farmingdale, NY.

Robert Bouzon, a spokesman for Hewlett-Packard (HP), told *Microwave News* the HP terminals tested by CCOHS are approximately seven years old and that HP's more recent units are shielded with metallic linings. He said that the company began using containment shielding in 1980 to prevent radiofrequency interference (RFI) and that new HP units meet RFI standards set recently by the Federal Communications Commission.

Bouzon said the CCOHS study was "curious" because the investigators did not test newer HP terminals although he acknowledged that "many thousands" of the older models are still in use. He refused to disclose a precise figure.

CCOHS's Purdham said the tests were run to gather information about terminals used at the center, not to evaluate a range of VDTs. The center owns HP terminal models 2621A and 2621P. The "P" model has a printer built into the top of its casing, which Marha and Charron say blocks emissions. The "A" model produced slightly higher readings on the side near the flyback transformer.

A Wang spokeswoman said that the company would not comment until it had seen the report.

Dr. Hari Sharma of the University of Waterloo, Ontario, said in a telephone interview that the CCOHS measurements generally are in line with readings he has taken. Sharma's tests at Surrey Memorial Hospital in Vancouver, British Columbia, found comparable VLF levels (see *MWN*, April 1983). A final report on his measurements is expected soon. ●

NCRP *(continued from p.1)*

The EPA contract follows soon after a congressional subcommittee asked the agency to look into the bioeffects of radiation from power lines (see *MWN*, June 1983). EPA is in the process of developing a standard for public exposures to non-ionizing radiation, but excluding ELF. In the preamble to the NCRP contract, EPA notes that its Office of Radiation Programs is contemplating a complimentary standard for ELF.

Another NCRP committee (No. 53) has completed a draft of a report on the bioeffects of radiofrequency and microwave (RF/MW) radiation (see *MWN*, October 1981). Ney said that the draft is now being reviewed by the full council membership. He predicted that the study, which has been under way since 1977, will be released in the fall of 1984. ●

MICROWAVE NEWS is published monthly, except in January and July • ISSN 0275-6595 • PO Box 1799, Grand Central Station • New York, NY 10163 • (212) 725-5252 • Editor: Louis Slesin, Ph.D., Associate Editors: Martha Zybko, Mark Pinsky • Subscription: $200 per year (overseas $235) • Copyright © 1983 by Louis Slesin • Reproduction in any form is forbidden without written permission.

FROM THE FIELD

Letter to EPA from Dr. W. Ross Adey

On November 1, Dr. W. Ross Adey wrote to William Ruckelshaus, Administrator of the Environmental Protection Agency (EPA), concerning the agency's recently released Biological Effects of Radiofrequency Radiation *(see* MWN, *July/August and October 1983). Reprinted below is the full text of Adey's letter (see also story p.4).*

Dear Mr. Ruckelshaus:

The Environmental Protection Agency has recently issued a draft report on biological effects of radiofrequency/microwave (RF/MW) radiation as a step towards establishing a general exposure standard. I write as a research scientist with more than 20 years experience in this field, and as the leader of interdisciplinary and interinstitutional teams that have made many pioneering contributions to our knowledge of biological effects of low level nonionizing electromagnetic fields including microwaves.

When finally established, this standard would be expected to fill important needs in defining acceptable limits for human exposure. To be effective and credible, it would therefore seem of the utmost importance that, on the one hand, this standard be based on the most comprehensive scientific information available, and on the other, that it should utilize the most relevant and realistic scientific models.

I respectfully submit that this draft report has serious deficiencies in both criteria; deficiencies that may be expected to hamper initial acceptance of the proposed standard and to grievously impede its further development as new and important scientific information becomes available.

The cutoff date for scientific material evaluated in the report is stated to be December 1980. In this rapidly growing scientific field, much new work has appeared in the past three years on biological effects of low level RF/MW fields. Many of these findings bear directly on the establishment of safety standards.

Evaluation of the scientific literature in the draft and the models developed by EPA's Office of Research and Development as a basis for the proposed standard are primarily concerned with heating as the principal cause of harmful effects in man and other living organisms. It is proposed to extrapolate down to "nonthermal" levels of exposure from thermalizing levels as the basis for a safety standard.

I respectfully submit that there is no scientific validity in this approach. Moreover, there is now unequivocal evidence that many significant neurologic, endocrine and immunologic responses occur in living tissues exposed to RF/MW fields at levels below those producing frank heating. These data have been evaluated in a recently completed study by the National Council on Radiation Protection (Panel 53), extending over the past seven years. This panel report emphasizes the unique character of the mechanisms underlying these interactions which are considered to rest on quantum mechanical mechanisms as distinct from the equilibrium thermodynamics that describes heating responses.

Amongst the findings in research since 1980 pertinent to a safety standard for RF/MW field exposure is the disclosure of effects at cell membranes mediated by pulsed and sinusoidally modulated microwave fields at non-thermalizing levels, and the coupling of these effects at cell surfaces to the cell interior. They involve the susceptibility of cell membranes to neurotransmitters, hormones and antibodies. There is impressive evidence of modification of immune functions of blood and tissue white cells by microwave fields below frank heating levels. Millimetric microwave fields have been shown to increase and decrease cell growth by exposure at closely adjacent wavelengths, and similar fields alter the genetic structure of mammalian sex cells. Although the full significance of these findings in such problems as aging and cancer must await future research, the sequence of administrative steps to the establishment of safety standards should proceed with current knowledge of low level interactions as essential cornerstones, rather than by extrapolation from irrelevant premises derived from the unrelated field of thermoregulatory pathophysiology.

It is clear that the proportion of the US population exposed to even a single heating dose of microwaves over an entire lifetime is negligible. I submit that this alone makes an approach to standard setting through heating models quite inappropriate. At the same time, there is strong evidence that many of these interactions between tissues and low level microwave fields have a specific character that relates to pulsed and other forms of amplitude modulation of the imposed field. Therefore, an appropriate biophysical model for standard setting should take account of known modulation-dependent bioeffects. These modulation patterns are produced by virtually all military, industrial and domestic microwave devices.

Membership of the Scientific Advisory Board Panel of the Office of Research and Development, chaired by Professor Charles Susskind, is restricted to those with backgrounds in thermoregulatory physiology and in the engineering aspects of tissue heating. In no way does this panel reflect the clear importance of specific consideration of so called "athermal" microwave bioeffects. It is to these weak fields that the US population will be exposed over a lifetime. Prudence would suggest that serious consideration should be given to evidence suggesting the potentially hazardous character of certain of these fields.

Standards established on this basis might be slightly lower than those derived from thermal models. However, they would not be expected to interfere with operation of any existing military, industrial or domestic systems. Of profound importance for future developments in standard setting, there would be a rational scientific basis for continuing review of new knowledge of biological effects attributable to low level exposures.

Thank you for your consideration.

Sincerely,

W. Ross Adey, MD
Associate Chief of Staff for Research and Development
Jerry L. Pettis Memorial Veterans' Hospital
11201 Benton Street, Loma Linda, CA 92357

AF's Summary of Circumstances for Radar Accident at Clear AF Station

Last month, we reported on a radiation accident at Clear Air Force Station near Fairbanks, Alaska, in which a tracking radar —part of the Ballistic Missile Early Warning System— was accidentally turned on. On November 22, we received the following statement from Vincent Murone of the Directorate of Aerospace Safety in the Air Force's Inspection and Safety Center at Norton Air Force Base in California.

At approximately 3:35 pm on September 14, 1983, nine personnel at the Clear Air Force Station site were possibly exposed for about seven minutes to high frequency radio radiation. Of the nine, seven were employees of FELEC Services, Incorporated, the company that has the Air Force contract for maintenance and operation of the radar facility at the site, and two were US government employees from the Sacramento California, Air Logistics Center.

One individual was positively not exposed because he was outside the area. Therefore, the other eight are undergoing medical evaluation.

During a normal shutdown of the tracker radar assembly, crews were sent in to perform preventive maintenance work. The tracker had been locked off to prevent RF energy from entering the feedhorn of the tracker and the area where they were to work. Then, the site crew, joined by civil engineering welders and civil service employees who were inspecting the tracker screen, entered the tracker. Work continued throughout most of the day. At about 3:35 pm, two technicians discovered that the transmitter was working and that there was RF energy being fed through the feedhorn toward their work area. They then signaled everyone to evacuate the tracker pedestal where they were working. Preliminary indication is that a key lockoff position on the transmitter was opened by a technician without standard and proper safeguards being employed.

Initially, the eight workers were examined at the FELEC Services, Incorporated, clinic at Clear Air Force Station and then on Thursday, September 15, they were transported to Fairbanks by government vehicle where additional medical examinations were done at the Fairbanks Memorial Hospital. Initial examinations indicated that their medical conditions were not life threatening, long term debilitating or chronic. Blood, chest X-rays and eye checks were made by physicians and an ophthalmologist at Fairbanks Memorial Hospital. Preliminary results indicate no apparent ophthalmological problems. The physicians suggested funduscopy (eye examinations) for the next six months and a neurological examination. Complete physical examinations at the hospital did not reveal any obvious abnormal findings.

On Thursday, September 15, one individual who did not feel well was admitted for observation. The other seven individuals were released and instructed to return for additional examination if any problems developed. These people returned to work. A second individual returned to the hospital on Monday, September 19, for further observation.

A thorough investigation is currently underway, looking into how the breakdown in safety procedures occurred and how safety procedures can be improved. Although there are certain data existing surrounding the event, it is impossible to determine exact exposure time or level; best estimate is that no one was exposed for more than 8 minutes.

UPDATES

BIOLOGICAL EFFECTS

Potential Epidemiology Populations...A recent EPA report identifies eight population groups exposed to radiation as potential subjects for epidemiological studies. *Potential Human Study Populations for Non-Ionizing (Radiofrequency) Radiation Health Effects* (Report No. EPA-600/S1-82-017) recommends: RF heat sealer operators, high frequency (HF) tube welders, medical diathermy operators in VA hospitals and in rehabilitation facilities, children attending schools near broadcast towers, state policemen, security guards and radar technicians. The report, which was prepared for EPA by JRB Associates of McLean, VA, cautions that no single study group is ideal. An agency staffer said that EPA is "fairly cautious" about moving forward and added that it is not a given that a "Problem Definition Study," the next step toward an epidemiological study, will be taken. The EPA report (Order No. PB 83-147447) is available for $14.50 from the National Technical Information Service, Springfield, VA 22161.

COMPATIBILITY & INTERFERENCE

Resources... Richard Schulz, editor of the *IEEE Transactions on EMC*, has left IITRI in Annapolis, MD, to join Xerox's Office Products Division. Schulz will work with Xerox's Regulatory Agency Requirements group in Dallas. His new address is: Mail Stop 114, Xerox Corp., 1341 West Mockingbird Lane, Dallas, TX 75247....Although the *1982 Wroclaw EMC Symposium* was never held, the papers that would have been presented have now been published. The two-volume record includes 74 papers (41 in English and 33 in Russian) and runs 750 pages. A copy is available for $30.00 in the US and Canada and $36.00 elsewhere. Order from James Hill, EMXX Corp., 6706 Deland Dr., Springfield, VA 22152. Checks should be made out to "IEEE-EMC Society."...The Electric Power Research Institute (EPRI) has been sponsoring research on ways to avoid interference caused by induced voltages on pipelines and railroad signal wires from power lines (see *MWN*, June and September 1983). The research is now complete and the EPRI reports prepared. For pipelines, the report (RP742-2), *Power Line—Induced AC Potential on Natural Gas Pipelines for Complex Right-of-Way Configurations*, has three volumes: Volume 1 ($29.50) describes the development of analytic methods for solving EMI problems; Volume 2 ($34.00) is a handbook for graphic analysis for those without access to a computer; and Volume 3 ($10.00) is a user's guide to a newly developed computer program, PIPELINE, to calculate induced voltages with sample examples. The printing of the final report (RP 1902-1) on railroads, *Mutual Design of Overhead Transmission Lines and Railroad Communications and Signal Systems*, has been delayed for a few months. It also comes in three volumes: Volume 1 is an engineering analysis for designing a mutually acceptable siting design, with technical appendices in Volume 2. Volume 3 is a user's manual for a computer program, TRAIN. The price of the latter set of reports has yet to be set. Order from: Research Reports Center, PO Box 50490, Palo Alto, CA 94303, (415) 965-4081....The FCC's Office of Science and Technology has issued *Analysis of Technical Possibilities for Further Sharing of the UHF Television Band by the Land Mobile Services in the Top Ten Land Mobile Markets*, (No. FCC/OST R83-3). A copy is available from the International Transcription Services, FCC, Room 248, 1919 M St., NW, Washington, DC 20554. For more information, contact FCC's Victor Tawil at (202) 653-8113.

UPDATES

GOVERNMENT

Advisory Committees...DOE has set up a new advisory committee, the Health and Environmental Research Advisory Committee, to help address the impacts of energy projects and to recommend levels of funding within the health and environment research program. The committee's charter was approved on November 22; its chairman and membership have yet to be named. A committee staffer said that he did not think the committee would review research on transmission lines. But, he added, plans are still in their formative stages. For more information, contact DOE's Gloria Decker, (202) 252-8990....The Radio Technical Commission for Aeronautics' (RTCA) Special Committee 156 on Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard will meet in Washington, DC, December 1-2, to discuss the extent of the RFI problem caused by the use of portable computers and games on planes (see *MWN*, October 1983) and to develop a work schedule for the committee. For more information, contact RTCA, (202) 682-0266....NTIA's Frequency Management Advisory Council (FMAC) will meet in Washington, DC, on December 6. The agenda is the same as it was for its last meeting on September 21: the constitution and convention of the International Telecommunications Union (ITU), High Definition Television and government and industry coordination to minimize interference from radiation devices. For more information, contact Charles Hutchison, (202) 377-0805.

MILITARY SYSTEMS

Developments at Clear... The Air Force has disclosed that human error caused the accident in which workers were overexposed to radiation at Clear Air Force Station near Fairbanks, Alaska (see *MWN*, November 1983). A technician turned on the tracking radar (see From the Field p.8). One of the exposed workers, Richard Eldridge, has been fired by FELEC Services Inc., a subsidiary of ITT. Eldridge told *Microwave News* that he was informed that he lost his job because he had violated his employment contract by being absent from work without permission. In fact, he said, he and his doctor had notified FELEC that he would take medical leave to seek expert medical advice. A spokesman for FELEC said that Eldridge was fired for reasons that had nothing to do with the radiation incident. He refused to reveal the specific reasons because, he said, ITT policy prevents him from discussing personnel matters. ...Alaskan Senator Ted Stevens (R) has become interested in the accident and is making inquiries about how it happened and how future incidents can be prevented....FELEC is preparing a High Accident Potential (HAP) mishap report; it was due to be released by the end of November, but has been delayed for about a month.

SE and SW PAVE PAWS Radars... Raytheon Co.'s Equipment Division of Wayland, MA, has won a $77 million contract to build, install and test the Air Force's third PAVE PAWS radar at Robins AFB in Georgia. The phased array radar is designed to detect sea-launched ballistic missiles at a range of up to 3,000 miles off the US's southeastern coast and can also track satellites in earth orbit. Work is scheduled to begin in the spring of 1984 and the radar should be operational in late 1986. Raytheon built the first two PAVE PAWS radars, now in operation at Otis Air Guard Base on Cape Cod, MA, and at Beale AFB, CA. It also has an option for the fourth PAVE PAWS system planned for Goodfellow AFB, TX....SRI International prepared the environmental assessment for the AF's southwest radar system at Goodfellow (Report No. USAFSAM-TR-83-13). It concluded that chronic exposure of humans to the RF radiation outside the exclusion fence "is not likely to be harmful." With respect to RFI, it found that there may be some interference with TV reception and other home electronic systems and with UHF land mobile and amateur radios, depending on which site is selected. In addition, SRI predicted that there would be no hazards associated with fuel handling or cardiac pacemakers at ground level beyond the exclusion fence and that electroexplosive devices could be safely used beyond about 1.2 miles for the basic system and 2.4 miles for the optional, higher power system.

Under the Ice... Tests run last year indicate that the navy's ELF communications system can send messages to submarines under the North Pole ice cap, according to Vice Admiral Gordon Nagler, director of command and control in the office of the Chief of Naval Operations. This is the suggestion of Nagler's testimony to a closed hearing of the House Appropriations Committee's subcommittee on defense last March. What Nagler actually said is uncertain because the recently released transcript of the hearing has been heavily censored....James B. Schultz reviews the progress being made on an alternative submarine communications system, blue-green lasers, in the November *Defense Electronics*.

EMP in Michigan... There was a pulse of sixties-style activism at the University of Michigan's Ann Arbor campus when demonstrators took over an engineering lab to protest research on EMP being carried out by Professor Thomas Senior. The students want to stop all military research at the university.

OCCUPATIONAL HEALTH

RF Sealer Studies... Two new RF sealer studies are under way. The Swedish National Board of Occupational Safety and Health will begin testing 100 RF sealer operators in January for potential ill effects of radiation exposure. Among the tests to be administered is one designed to check finger motion —the fingers are closest to the radiation source. Data collection will take about a year. In an interview Dr. Kjell Mild, the principal investigator for the study, said that he had not yet decided whether the worker population would be male or female. Most of the RF sealers in Sweden operate at 27 MHz, though some use 13 or 40 MHz. Mild is based in Umea on Sweden's eastern coast, about

300 miles north of Stockholm....The FDA has issued a contract to the Maryland Department of Health and Mental Hygiene's Office of Environment Health to locate most of the RF sealers used in the state. During the first year of a planned two-year study, the researchers will measure the RF exposure levels in the work places and assess other potential hazards. Next year, if FDA funds are available, a study population of exposed operators will be identified and the feasibility of completing an epidemiological study will be determined.

Cancer in the Electronics Industry...A Swedish study on the incidence of cancer in the electronics industry has identified a "slight excess risk of cancer" in the industry as a whole. But "blue collar workers in the industry had twice the risk of getting pharyngeal cancer compared with the working population in general." There may also be a "slight excess risk of lung cancer." Dr. D. Vagero of Huddinge University Hospital and Dr. R. Olin of Stockholm's Royal Institute of Technology report that when they looked at specific categories within the Swedish electronics industry, "certain clusters appeared." For instance, there was a raised relative risk of nasopharyngeal cancer among men in the radio and TV industry, and cancer of the nasal cavities for other electronic workers. The researchers are quick to point out that methodological problems should be considered when their results are interpreted. The study appears in the *British Journal of Industrial Medicine, 40,* 188, 1983.

POWER LINES

Resources... The Aerospace Corp. has prepared a report summarizing the status of research projects being funded by DOE, the Electric Power Research Institute and the New York State Power Lines Project on (1) 60 Hz electric and magnetic fields, (2) DC electric fields and ions and (3) spark discharges and conducted currents. The report includes recommendations for future research. A limited number of copies of *Biological Effects from High-Voltage Transmission Lines: Research Guidance,* No. DOE/CE/76007-1, September 1983, are available from Kenneth Klein, Electric Energy Systems Division, CE-143, Forrestal Bldg., Mail Stop 5E052, DOE, Washington, DC, 20585....Researchers at the Tennessee Valley Authority (TVA) have been measuring electric and magnetic fields in the vicinity of its high voltage transmission lines and have developed a model for calculating fields for various types of terrain and ground cover. They found their predictions agreed with actual measurements. *TVA's 500 kV Electric and Magnetic Fields: Measurements and Analyses,* No. DOE/ET/29016-1, September 1983, is available from the National Technical Information Service, Springfield, VA 22161....One of the criticisms leveled against Dr. Nancy Wertheimer and Ed Leeper's epidemiological studies relating cancer to power lines is that they have no precise data on exposures to the 60 Hz fields. The two researchers respond to this argument in a letter published in the November 18 issue of *Science.*

STANDARDS

IEC & EIA... The International Electrotechnical Commission (IEC) has published two new standards: *CISPR 18-1-1982, Radio Interference Characteristics of Overhead Power Lines and High Voltage Equipment—Part 1: Description and Phenomena* ($72.00); and *CISPR 19-1983, Guidance on the Use of the Substitution Method for Measurements of Radiation from Microwave Ovens for Frequencies above 1 GHz* ($11.00). IEC has also released the following three six-month draft rules: *77A(Central Office)3, Amendment to Publication 552-2: Disturbances in Supply Systems Caused by Household Appliances and Similar Electrical Equipment—Part 2: Harmonics* ($5.00); *12F(Central Office)81, Publications 489-2 and 489-4, Appendix D and Publications 489-3 and 489-5, Appendix H: Guide for Construction of a 3-Meter Radiation Test Site for Measurements above 100 MHz of Equipment Emitting RF Electromagnetic Energy* ($5.00); and *12F(Central Office)83, Publication 489-3, Appendix G and Publication 489-5, Appendix G: Guide for Construction of a 30-Meter Radiation Test Site for Equipment Receiving RF Electromagnetic Energy* ($5.00). Copies are available pre-paid from the International Sales Dept., ANSI, 1430 Broadway, New York, NY 10018....The Electronic Industries Association (EIA) has approved a new standard, *Recommended Practice for the Measurement of X-Radiation from Direct-View TV Picture Tubes,* (No. RS-503). A copy is available for $5.00 from Standard Sales Dept., EIA, 2001 Eye St., NW, Washington, DC 20006.

VDTs

IEEE Survey... An informal readers' poll by *The Institute,* a monthly publication of The Institute of Electrical and Electronics Engineers, found that 17 percent of the respondents experienced eyestrain, headaches or back and neck aches that they associated with VDT use. Eighty-two percent identified no health problems due to work at VDTs. In September, *The Institute* asked readers to report their VDT experiences in an item accompanying a report on the National Academy of Sciences VDT report released earlier this year (see *MWN,* July/August 1983). Three-fourths of those who responded were regular VDT users, and six out of ten of this group described their terminals as well designed.

Conference Report...A new call for an interim occupational standard governing VDT non-ionizing radiation emissions came out of the PACE conference on VDTs held in Toronto, October 27-28. It was one of several consensus recommendations adopted at a conference-closing session, moderated by Chris Dodge, a science policy specialist with the US Library of Congress. Conference participants also urged that ELF research comparing VDT users and non-operators be accorded "highest priority" by government agencies. Finally, more rapid development of non-CRT display technologies that would produce less non-ionizing radiation was endorsed. At an earlier session, Dodge told

participants that weak ELF fields have been shown to enduce a host of ailments....A new hypothesis that might help explain VDT-related ailments was presented at the conference, as well. Eric McLuhan, a communications consultant in Ontario, said that VDT-induced stress disorders result from a clash between the right and left hemispheres of the brain. While a visual image, such as a screen display, stimulates the right half of the brain, language or information on the screen reaches the left side. What results, according to McLuhan, is a "war in the brain," causing severe stress. For more information about the conference contact PACE's president, Andrew Michrowski, 100 Bronson Ave., Rm. 1001, Ottawa, Ontario K1R 6G8, Canada, (613) 236-6265.

Resources... The American Council on Science and Health (ACSH) has published *Health and Safety Aspects of Video Display Terminals*, a 22-page pamphlet intended to "present the current scientific evidence" on VDTs. ACSH concludes that alleged radiation hazards do not exist, reported cataracts and pregnancy problems apparently are due to chance and vision and musculo-skeletal difficulties can be "caused or aggravated" by ergonomic factors. It costs $2.00 from ACSH, 1995 Broadway, New York, NY 10023, (212) 362-7044....The risks of X-ray and microwave radiation from VDTs are discounted, and ELF emissions are only slightly more suspect in an analysis offered by a radiation protection officer from MIT. James L. Jones writes that "research suggests that any effects [of ELF], if found, will be subtle and low-level." *Video Radiation: Fears Out of Focus* is published in the MIT *Technology Review*, October 1983....The National Academy of Sciences is sending an errata sheet to recipients of its report *Video Displays, Work, and Vision*. The results of a report done by the Newspaper Guild are incorrectly presented. Contact NAS's Pepper Leeper, 2101 Constitution Ave., NW, Washington, DC 20418, (202) 334-2000 for a copy of the corrections.

ETC...

IMPI Publications... International Microwave Power Institute (IMPI) has issued the proceedings of its symposium held in Philadelhia, PA, last July (see *MWN*, July/August 1983). The collection consists primarily of abstracts of the original papers, though some of the contributions are more detailed. A copy is available for $20 from Barbara Jean Frye, IMPI, Tower Suite 520, 301 Maple Ave., Vienna, VA 22180, (703) 281-1515....IMPI has also published its first *International Directory of Electromagnetic Heating and Instrumentation 1983/4* for $15.00 (members) or $18 (nonmembers)....The March 1983 issue of *The Journal of Microwave Power* (an IMPI publication) features a collection of papers on "Electromagnetic Techniques in Energy Applications." Topics include RF/MW radiation applications for heavy oils, oil shale and coal....The September 1983 issue is devoted to "Electromagnetic Techniques in Medical Diagnosis and Imaging." Topics include NMR, thermography, millimeter waves and measuring lung water content.

SHORT COURSES

January 16-20: ***Fundamentals of Radar Cross Section,*** St. Cloud, FL. Fee: $695. Contact: Southeastern Center for Electrical Engineering Education (SCEEE), Central Florida Facility, 1101 Massachusetts Ave., St. Cloud, FL 32769, (305) 892-6146. Repeated ***April 30-May 4:*** Los Angeles, CA ($745).

January 17: ***EMC: The FCC Means Business,*** San Francisco, CA. Fee: $595. Contact: Carol Clark, McGraw-Hill Seminar Center, 331 Madison Avenue, Suite 603, New York, NY 10017, (212) 687-0243. Repeated ***April 3:*** Boston, MA.

January 23-27: ***Microwave High-Power Tubes and Transmitters,*** Los Angeles, CA. Fee: $875. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773.

January 31-February 2: ***Millimeter Wave Systems & Technology,*** Atlanta, GA. Fee: $535. Optional fourth day on millimeter wave radar for $180. Contact: Dept. of Continuing Education, Georgia Institute of Technology (GIT), Atlanta, GA 30332, (404) 894-2547.

February 8-9: ***Microwave Devices & Sources,*** Atlanta, GA. Fee: $475. Contact: GIT, see January 31 above.

February 13-17: ***Advanced Radar Technology,*** Orlando, FL. Fee: $795. Contact: Linda Billard, Technology Service Corp. (TSC), 8555 16th St., Suite 300, Silver Spring, MD 20910, (800) 638-2628.

February 14-17: ***Modern Microwave Techniques,*** San Diego, CA. Fee: $675. Contact: TSC, see February 13 above.

February 16-17: ***Grounding, Bonding & Shielding,*** San Diego, CA. Fee: $625. Contact: GWU, see January 23 above. Repeated ***April 9-10:*** Washington, DC; ***May 17-18:*** Ottawa, Canada; ***May 21-25:*** Hamburg, West Germany.

February 21-24: ***Microwave Solid State Devices and Circuits,*** Los Angeles, CA. Fee: $895. Contact: UCLA Extension Short Course Program, PO Box 24901, 6266 Boelter Hall, Los Angeles, CA 90024, (213) 825-1047.

February 27-March 2: ***Spread Spectrum Systems and Interference Rejection Techniques,*** Los Angeles, CA. Fee: $895. Contact: UCLA, see February 21 above.

March 5-7: ***Planning & Implementing an NMR Imaging Facility,*** Washington, DC. Fee: $695. Contact: GWU, see January 23 above.

March 12-16: ***Radiowave Propagation for Communications Systems Design,*** Orlando, FL. Fee: $875. Contact: GWU, see January 23 above.

March 15-16: ***Lightning Protection,*** Orlando, FL. Fee: $625. Contact: GWU, see January 23 above. Repeated ***June 4-5:*** Washington, DC.

March 19-23: ***Flat-Panel and CRT Technologies,*** Los Angeles, CA. Fee: $895. Contact: UCLA, see February 21 above.

March 22-24: ***NMR: A Primer for Radiologists,*** Hilton Head Island, SC. Fee: $375. Contact: K.V. Pyles, Foundation for Education in Magnetic Resonance, 111 Glade Park East, Kittanning, PA 16201, (415) 545-7085.

April 30-May 4: ***High Frequency Spectrum: New Concepts and Technologies,*** Washington, DC. Fee: $875. Contact: GWU, see January 23 above.

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Full Text of Johns Hopkins University Applied Physics Laboratory Standard for Exposures to RF/MW Radiation

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Microwave News invites contributions to *From the Field*, our occasional column featuring news and opinions from the non-ionizing radiation community. Letters from readers are also welcome.

WHO-IRPA ELF Health Report

The World Health Organization's (WHO) and International Radiation Protection Association's (IRPA) criteria document on extremely low frequency (ELF) radiation recommends limiting long-term exposures to "levels as low as can be reasonably achieved," especially for the general population, until more is known about ELF biological effects.

The newly released report concludes that, "It is not possible from present knowledge to make a definitive statement about the safety or hazard associated with long-term exposure to sinusoidal electric fields in the range of 1-10 kV/m," although there is no need to limit access to areas which will result in "intermittent exposure" to electric fields below 10 kV/m.

The 131-page document, prepared by a joint WHO-IRPA committee, provides an overview of bioeffects research for 0-300 Hz radiation and offers tentative conclusions about the significance of reported findings. For example, the authors state that cellular, physiological and behavioral effects observed in *in vitro* and animal studies cannot be extrapolated to humans, although these studies "serve as a warning that unnecessary exposure" to these fields should be avoided.

The committee stresses that current knowledge of the mechanism of ELF biological interaction is very limited and that as yet there is no theory

(continued on p.5)

Hopkins Lab Sets 100 uW/cm² RF/MW Safety Standard

The Johns Hopkins University Applied Physics Laboratory (APL) has adopted a "flat" 100 uW/cm² safety standard for exposures to 30 MHz-100 GHz radiation. The standard applies to all lab employees, whether or not they work with radiation emitting devices.

The new APL standard differs from other radiofrequency and microwave (RF/MW) radiation limits in two key ways. First, it is much stricter than other occupational standards. Indeed, it is in line with the limit the Environmental Protection Agency was about to propose for the general public last summer. (EPA has now indefinitely delayed its radiation guidance, see *MWN*, October 1984.) The APL limits are ten times lower than the 1982 American National Standards Institute (ANSI) guidelines for the 30-300 MHz band, and *fifty* times more stringent than ANSI for frequencies above 1500 MHz. It is a hundred times stricter than the current, though older, Occupational Safety and Health Administration (OSHA) and Department of Defense RF/MW standards.

The APL standard also differs by being frequency-independent or "flat" above 30 MHz, as opposed to the increasingly common "well-shaped" limits which are most restrictive at whole-body resonant frequencies (approximately 30-300 MHz).

Below 30 MHz, the standard increases to 10 mW/cm² at 3 MHz and remains at that level down to 300 kHz.

(continued on p.5)

Delgado Group Corrects Pulse Rise Times

Due to an engineering error, Dr. Jose Delgado's research group misreported the rise times of pulsed magnetic fields in a key paper published last year. While the disclosure does not affect the group's finding that pulsed magnetic fields can have profound effects on the development of chick embryos, it will force a reassessment of which pulse shapes induce teratogenic effects (see *MWN*, March and November 1983).

Dr. Jocelyne Leal disclosed the error at a seminar at the Center for Devices and Radiological Health (CDRH) in Rockville, MD, on November 14. She explained that an inappropriate filter had been used to measure the rise times. Leal is a senior researcher in Delgado's lab and has led the group's chick embryo studies.

In a telephone interview with *Microwave News* from Madrid, Spain, Leal dictated the corrected rise times — each is the mean value of ten measurements. She said that the measurements were made with a Tektronix 7854 oscilloscope, equipped with a 7A15A vertical amplifier.

The table compares the revised rise times with those which were originally published in A. Ubeda *et al.*, "Pulse Shape of Magnetic Fields Influences Chick Embryogenesis," (*Journal of Anatomy, 137*, 513, 1983).

According to the original paper, pulse A had a teratogenic effect at certain intensities, pulse B and D upset the development of the embryos, while pulse C had no effect. (The pulse repetition rate was 100 Hz with a pulse duration of 500 microseconds (usec)).

Pulse Type	Reported Rise Time (usec)	Actual Rise Time (usec)	Field Intensity (uT)[1]
A	100	85-100	0.4-104
B	2	~2	0.4
C	42	6.9	1.0
D	42	1.7*	1.0

* maximum value: 3.5 usec
[1] microtesla

The authors have sent a correction to the *Journal of Anatomy*.

Interestingly, although it now turns out that Delgado and Leal did not use a 42 usec rise time, Dr. Kjell Hansson Mild of the National Board of Occupational Safety and Health in Umea, Sweden, has shown that magnetic field pulses with a 40 usec rise time cause harmful effects in developing chick embryos (see *MWN*, June 1984).

On November 15, several researchers who are working on replicating the chick embryo studies met with Leal in an effort to ensure that all the experimental parameters used by the various groups are as similar as possible. Among those present at the Rockville, MD, meeting were Richard Tell and Dr. Ezra Berman of the Environmental Protection Agency (see *MWN*, January/February 1984), Dr. Mays Swicord of CDRH, Dr. Michael Marron of the Office of Naval Research, and Mild and his associate Dr. Monica Sandstrom.

ISM Rules Simplified

The Federal Communications Commission (FCC) is moving ahead with plans to simplify its rules for industrial, scientific and medical (ISM) equipment. The changes proposed on November 21 include publishing emission measurement methods in a separate bulletin and eliminating the three-year recertification requirement for RF lighting devices and other ISM equipment.

The commission opened Docket 20718 six years ago in order to overhaul the decades-old Part 18 Rules which have become complicated and in some cases confusing. While authorization and measurement requirements will be clarified to accommodate the wide range of current ISM equipment, including microwave ovens, the FCC's emission limits will remain unchanged pending further study. An FCC spokeswoman said that it will be at least a year or two before any action is taken on the limits.

Under the proposed rules, emission measurement methods will be consolidated and published in Bulletin MP-5, *Methods of Measurements for Industrial, Scientific, and Medical Equipment*, which will incorporate the procedures for microwave ovens now published in OCE Bulletin 20.

A new authorization program will simplify the old rules, which provided inconsistent definitions and in some cases multiple programs for the same equipment. Now, only notification procedures will be necessary for most devices, with the exception of the following: consumer ISM equipment will require certification, except for microwave ovens which must meet the more stringent "type approval" requirements; and ultrasonic equipment generating less than 500 watts and operating below 90 kHz and one-of-a-kind equipment will require verification. The commission will start a sampling program to assure compliance.

RF lighting devices marketed under the new rules must continue to meet the technical standards established for computing devices in Part 15 Subpart J pending further action, (see *MWN*, September 1983 and October 1984).

Comments on the commission's third notice of proposed rule making (49*FR*47628, December 6, 1984) (which includes an appendix with the revised measurement methods) are due by January 7 and reply comments by January 22. The first two notices appeared in the *Federal Register* on October 6, 1978 (43*FR*46326) and February 15, 1979 (44*FR*9771). For further information, contact Liliane Volcy, Office of Science and Technology, FCC, Washington, DC 20554, (202) 653-8247.

Clear Radar Accident: One Year Later

The Occupational Safety and Health Administration's (OSHA) reenactment of the radar accident at Clear Air Force Station in Alaska indicates that worker exposures could have been significantly different from those previously estimated by the U.S. Air Force.

In an October 25 report released by Alaska Congressman Don Young, Robert Curtis of OSHA's Health Response Team states that the highest exposure may have reached approximately 390 mW/cm^2. The Air Force survey, conducted shortly after the September 14, 1983 incident, concluded that the maximum exposure was 105 mW/cm^2. Some of OSHA's figures for the field intensities are lower than those released by the Air Force and some are higher, indicating the presence of complex fields.

Six welders and technicians were exposed to 420 MHz radiation when a high-power tracking radar (AN/FPS-92) was accidently turned on while undergoing routine maintenance (see *MWN*, November 1983 and January/February 1984). The Clear radar is part of the Ballistic Missile Early Warning System (BMEWS).

A basic problem in attempting to estimate the exposure levels remains unresolved. No one agrees on what the output power was when the radar was turned on. The workers believe the power setting was 1.5-1.7 megawatts (MW), whereas the Air Force maintains that it was 0.9-1.5 MW. The OSHA simulation was run at 1.5 MW.

Curtis and co-worker Dr. Allan Heins positioned a number of probes at various heights in the spots where the workers believe they were at the time of the accident. Based on a series of measurements, they estimate that the greatest exposure for worker Karl Kepler could have been twice as high as the Air Force's figure of 105 mW/cm^2. Their measurements also indicate that Edgar Forsling's exposure may have reached approximately 390 mW/cm^2, as compared to the Air Force estimate of 45-55 mW/cm^2.

The 1982 American National Standards Institute (ANSI) occupational limit for exposure to 420 MHz radiation is 1.4 mW/cm^2. The current Alaska state occupational standard is 10 mW/cm^2. The Air Force also has a 10 mW/cm^2 safety standard.

Other developments related to the Clear accident include:

- The U.S. General Accounting Office (GAO) will soon complete a draft of its report on the radar accident. The report, requested by Congressman Young, will review the general performance of ITT Felec Services Inc., which operates the Clear station for the Air Force. GAO is placing special emphasis on the safety practices at the base and the medical treatment of the six workers after the accident. The final report is scheduled for release next spring.
- On October 26, Felec paid a $420 fine and agreed to institute new procedures that should prevent another accident. In its agreement with the Alaska Department of Labor, Felec did not admit any fault or liability.
- In a June letter to EPA Administrator William Ruckelshaus, Young asked the agency to participate in the investigation of the Clear accident. At the end of July, Ruckelshaus responded that EPA staffers would calculate RF radiation levels around the station, using existing models.
- At this summer's Bioelectromagnetics Society meeting in Atlanta, GA, John Mitchell of Brooks Air Force Base in San Antonio, TX, presented some preliminary data on 58 confirmed cases of overexposure (over 10 mW/cm^2) to radar radiation documented in Air Force files. According to Mitchell, most of the accidents involved partial body exposures to radiation in the 1-10 GHz frequency range. Most incidents lasted less than six minutes. He concluded that few clinical patterns emerge from looking at all the cases together. Mitchell is preparing a report on Air Force radar accidents.
- There are very few case reports on radar accidents in the medical literature. Two which are available are: Robert A. Williams and Thomas S. Webb, "Exposure to Radiofrequency Radiation from an Aircraft Radar Unit," *Aviation, Space and Environmental Medicine, 51,* 1243-1244, 1980; and Samuel Forman *et al.*, "Psychological Symptoms and Intermittent Hypertension Following Acute Microwave Exposure," *Journal of Occupational Medicine, 24,* 932-934, 1982.

Swedish Research

Given the paucity of information on the long-term effects of exposure to radar radiation, there is now much interest in the research of Dr. Hans-Arne Hansson of the University of Goteborg in Sweden. Hansson has been examining radar workers for the Swedish military and he presented some provocative preliminary findings at the workshop on *Electromagnetic Waves and Neurobehavioral Function,* held in Corsendonk, Belgium, last August.

In a summary of the workshop, London-based Dr. Tom Rozzell of the Office of Naval Research reports on some of Hansson's findings:

> "Some [of the examined radar workers] appeared to have a type of frontal brain syndrome. These he referred to a neurology unit at the local hospital. At the hospital, their cerebrospinal fluid was examined for its protein pattern. It was found that there was an increase in a certain acidic (pH=4.9) protein that is not present in more than 10,000 patients that have been examined at this clinic and which served as controls. Thus there appears that there can be some long-term effects of microwaves and that, in the case of the radar workers, there appears to be severe brain damage. It is significant that the radar workers were examined independently by two psychiatrists and were found to be free of any other diseases or things like alcoholism that could account for their decreased brain function. The work is continuing and is not ready for open discussion at this time because of the low number (11) of cases studied to date."

Rozzell's report from the Corsendonk meeting appears in the October 1984 issue of the *Bioelectromagnetics Society Newsletter.*

FCC Revises Cable TV Rules To Avert RF Interference

The Federal Communications Commission (FCC) has revised its Part 76 rules to protect against interference from cable TV to aeronautical and marine radio services. The commission concluded that action is necessary because new frequency assignments for aeronautical radio may increase the risk of interference in coming years, and because it has found cable operators are lax in complying with existing rules.

The cable industry's overall past record of relatively little interference has not assuaged FCC concern. A key reason is the Federal Aviation Administration's decision in the past few years to assign communications frequencies at only 50 kHz, and now even 25 kHz, intervals. Commission staff also suspect that incidents go unreported because affected parties may have considered cable to be a closed system and therefore overlooked it as a possible source of interference.

The rule changes adopted October 26, based on a 1980 proposal, include extending new mandatory frequency "offsets" to all cable systems. In this case, cable TV operators are required to maintain a minimum interval between their carrier frequencies and aeronautical service frequencies. Currently, offset requirements only apply to systems within 60 nautical miles of an aeronautical station.

In addition, operators face more stringent rules for demonstrating compliance with signal leakage requirements and for monitoring systems in the 108-136 and 224-400 MHz aeronautical radio bands. Monitoring entails routine checking of a system for excessive leaks. Operators are now specifically required to monitor their entire systems at least once every three months.

Cable systems in operation before the order goes into effect will be allowed to continue under existing rules for five years.

The commission notes that it has considerably stepped up its enforcement activities, issuing 22 fines totalling $161,000 to cable TV systems in the last three years for failure to comply with pre-notification and frequency offset requirements (see *MWN*, March 1984). And the FCC plans "to continue to increase its compliance and enforcement efforts."

In its new rules (49*FR*45431, November 16, 1984), the commission cites five cases of interference with aeronautical services as reasons for action. One case in particular — involving aeronautical interference near Flint, MI, caused by a major break in a cable system — has made the FCC "considerably less confident" than when it issued a notice in March 1980 that "cable operators will diligently control signal leakage on their systems or operate safely without frequency offset requirements." (The commission's first report and order appeared in 1977.)

According to the FCC's Bernard Gorden, no case of interference has been documented since the Flint incident in late 1980. He explained that, "we are looking to the future now rather than waiting for something to happen," as the number of both aeronautical and cable TV channels grows sharply in coming years.

In each of the cited cases, listed below, signal leakage exceeded the permissible limit of 20 uV/m at 3 meters:

- April 1976: Sammons Communications of Pennsylvania caused noise in aircraft receivers near Harrisburg, PA.
- September 1978: Antietam Cable TV created a potential interference problem near Hagerstown, MD, with signal leakage into aeronautical radio frequencies.
- October 1978: Oxnard Cablevision in Oxnard, CA, caused intermittent interference in communications between aircraft and an air traffic control center.
- April 1979: Coastal Cable Company caused interference to aircraft communications as planes approached the Wilmington, NC, Airport.
- August and September 1980: Comcast Cablevision Corp. caused the most serious interference problem reported to date. Aircraft flying in the vicinity of Flint, MI, repeatedly experienced interference when attempting to communicate with the air traffic control center in Oberlin, OH. The problem was tracked to annular cracks in the outer sheathing of a cable line.

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SHORT COURSES

January 21-24: **Millimeter Wave Systems and Technology,** Atlanta, GA. Fee: $550 (3 days), $725 (4 days). Contact: Dept. of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-2400.

January 22-25: **Grounding & Shielding,** Phoenix, AZ. Fee: $815 (Optional fourth day: $235). Contact: DWCI, Star Route 625, PO Box D. Gainesville, VA 22065, (703) 347-0030. **Repeated** February 5-8: Orlando, FL; February 19-22: Boulder, CO. March 12-15: San Diego, CA.

January 28: **Electrostatic Discharge (ESD) Control,** Los Angeles, CA. Fee: $295. Contact: R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1960. **Repeated** March 4: San Francisco, CA; March 18: Dallas, TX.

January 28-29: **Grounding, Bonding & Shielding,** Washington, DC. Fee: $650. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC. **Repeated** May 2-3.

January 30-31: **Electromagnetic Pulse (EMP) Design and Test,** Los Angeles, CA. Fee: $595. Contact: R&B, see January 28 above. **Repeated** March 6-7: San Francisco, CA; March 20-21: Dallas, TX.

February 5-8: **Modern Microwave Techniques,** Orlando, FL. Fee: $715. Contact: Contact: Linda Billard, Technology Service Corp. (TSC), 962 Wayne Ave., Suite 600, Silver Spring, MD 20910, (800) 638-2628, or (301) 565-2970 in Maryland.

February 7: **Power System Harmonics,** New York, NY. Fee: $70. Held at IEEE PES Winter Meeting, see Conference Calendar on p.12.

February 13-14: **Microwave Devices: Present and Future,** Atlanta, GA. Fee: $475. Contact: Georgia Tech, see January 21 above.

February 13-15: **Microwave Technology and Applications for Industry,** East Brunswick, NJ. Fee: $750. Contact: Robert LaGasse, IMPI, Tower Suite 500, 301 Maple Ave. West, Vienna, VA 22180, (703) 281-1515.

February 14-19: **Fundamentals of Radar Cross Section,** Orlando, FL. Fee: $745. Contact: Ann Beekman, Southeastern Center for Electrical Engineering Education, 1101 Massachusetts Ave., St. Cloud, FL 32769, (305) 892-6146. **Repeated** May 13-17: San Diego, CA ($795).

February 19-22: **Modern Microwave Measurements and Applications,** Los Angeles, CA. Fee: $845. Contact: UCLA Extension Short Courses, PO Box 24901, Los Angeles, CA 90024, (213) 825-1295.

APL RF/MW Standard *(continued from p.1)*

According to Dr. Sam Koslov, an assistant director of the lab and a longtime member of the now-defunct Electromagnetic Radiation Management Advisory Council (ERMAC), the APL standard is based on the ALARA ("as low as reasonably achievable") principle, that has won widespread acceptance in the setting of ionizing radiation safety guidelines. He explained that current trends in biological effects research suggest that an ALARA approach is warranted.

When asked why all members of the staff were covered by the same standard, Koslov said that a single standard will not affect work at the lab and it is easier to enforce.

Robert Mallalieu, who serves on the APL safety committee, agreed: "As far as I am concerned we are all ignorant about what is going on at low levels, so we should all get the same level of protection."

APL's previous safety standard, set in 1970, was 1 mW/cm^2.

The Johns Hopkins lab, located in Laurel, MD, has 2800 employees. It does $200 million of contract research a year, primarily R&D for the Department of Defense.

The full text of the APL RF/MW standard is reprinted on pp.7-8.

CONFERENCES *(continued from p.12)*

September 23-26: **4th International Conference on AC & DC Power Transmission,** London, UK. Contact: IEE, see April 16 above.

September 27-30: **7th Annual Conference of the IEEE Engineering in Medicine and Biology Society,** Americana Congress Hotel, Chicago, IL. Contact: Dr. Barry Feinberg, Kendall Co., 411 Lake Zurich Rd., Barrington, IL 60010, (312) 381-0370.

October 13-17: **5th International Meeting of the Bioelectrical Repair and Growth Society,** Park Plaza Hotel, Boston, MA. Contact: Dr. S.R. Pollack, University of Pennsylvania, 119 Towne Bldg., 220 South 33rd St., Philadelphia, PA 19104, (215) 898-8241.

December 4-5: **International Conference on Electric and Magnetic Fields in Medicine and Biology,** London, UK. Contact: IEE, see April 16 above.

December 9-13: **10th International Conference on Infrared and Millimeter Waves,** Americana Dutch Resort Hotel, Orlando, FL. Contact: Dr. Kenneth Button, MIT, Box 72, MIT Branch, Cambridge, MA 02139, (617) 253-5561.

WHO-IRPA ELF Report *(continued from p.1)*

to predict the effects of exposure. Therefore, it recommends more basic research and more epidemiological studies. In fact, the committee goes so far as to call the need for "well done" epidemiological studies "imperative."

Epidemiological studies by Wertheimer and Leeper, Tomenius et al., Milham, Wright et al., Coleman et al., McDowell, and Vagero and Olin — all of which found an increased incidence of cancer among exposed populations (see *MWN*, March, June and December 1983) — are flawed, according to the report. Although the data from these researchers "cannot be dismissed," the committee believes that "there must be considerable study before they can serve as useful inputs for risk assessment." They note that adverse effects from exposure to ELF levels normally found in the environment or the work place "have not been established."

The report states that direct interference with cardiac pacemakers has not been reported in fields below 2.5 kV/m.

Selected excerpts from the document appear on pp.6-7.

Environmental Health Criteria 35: Extremely Low Frequency (ELF) Fields, evolved from drafts prepared over a four-year period by a number of experts, including Dr. W.R. Adey, Dr. P. Czerski and J.C. Villforth of the U.S.; Drs. M.G. Shandala and V. Akimenko of the U.S.S.R.; and members of the WHO-IRPA joint ELF committee under the chairmanship of Dr. M. Repacholi of Australia. The other committee members and their home countries are: Dr. J. Bonnell, England; Dr. B. Bosnjakovic, The Netherlands; Dr. J. Cabanes, France; Dr. M. Grandolfo, Italy; Dr. B. Knave, Sweden; Dr. J. Kupfer, German Democratic Republic; Dr. R. Phillips, U.S.; Dr. A. Portela, Argentina; Dr. A. Sheppard, U.S.. A. Duchene, France; G. Ozolins, Switzerland; and Dr. M. Shore, U.S., served as the committee's secretariat.

The document will soon be available in the U.S. from the WHO Publications Center, 49 Sheridan Avenue, Albany, NY 12210, or in Canada from the Canadian Public Health Association, 1335 Carling Avenue, Suite 210, Ottawa, Ontario K1Z 8N8. Or contact the WHO Distribution and Sales Service, 1211 Geneva 27, Switzerland. The price had yet to be set at press time.

WHO-IRPA ELF HEALTH CRITERIA

Reprinted below are excerpts from the "Health Risk Evaluations" and the "Summary and Recommendations" chapters of the World Health Organization's (WHO) and International Radiation Protection Association's (IRPA) recently released Environmental Health Criteria 35: Extremely Low Frequency (ELF) Fields. *(Citations in the text have been deleted.)* *See also story on p.1.*

Health Risk Evaluation

Interactions that lead to measurable biological effects, which remain within the normal range of physiological compensation of the body and do not detract from the physical and mental well-being of human beings, should not be considered hazardous. Interactions that lead to biological effects outside the normal range of compensation of the body may be an actual or potential health hazard....

Unfortunately, the state of knowledge of the interacting mechanisms operating when biological systems are exposed to ELF fields is very limited. At present, it is impossible to furnish any theory to predict the effects of exposure to these fields. Because of this lack of information, care must be taken in attempting to predict or extrapolate effects in man from effects found in animals. Physical differences (size, shape, fur-bearing, etc.) result in marked differences in the internal field distribution and in different behavioral and homeostatic responses....

It would be ideal to make health risk evaluations on the basis of well-conceived, well-conducted, and well-analyzed epidemiological studies. Unfortunately, all such studies on human beings exposed to ELF fields have suffered from one or more deficiencies...

With such a limited scientific data base, the determination of the existence of a true threshold exposure level below which no adverse health effect occurs, cannot be made with confidence. Thus, any health risk analysis for the development of standards must inevitably adopt a phenomenological approach. In this case, a review of the literature is made to determine the lowest exposure levels at which adverse biological effects have been established. A biological effect that occurs in living organisms or animals may be detected as some general or specific alteration. If the change appears irreversible or pathological, it might be presumed that it could be hazardous to man under comparable exposure conditions. This assumption is made only because insufficient information is available on the effect or the underlying interaction mechanism to make an extrapolation to exposure conditions producing similar effects in human beings and to make a well-substantiated health risk evaluation.

The epidemiological studies suggesting a relationship between childhood or adult cancer and residence in houses at various distances from high current flow due to external electrical wiring configurations, can only be considered as preliminary because of the many criticisms that have been levelled at the studies.

The studies suggesting an association between electrical occupations (exposure to electric and magnetic fields) and cancer were analyses of occupational mortality data and subject to many sources of errors.

Thus, although these reports suggest potential adverse health effects, they cannot be evaluated in terms of health risk until the potentially confounding factors and sources of errors are eliminated. It is of concern, however, that no studies have yet been published following up these reports.

Laboratory studies on human volunteers exposed for short periods to electric fields (up to 20 kV/m) have, in general, shown no effects. The results of these studies suggest that no apparent acute effects are likely from exposure to strong electric fields. However, they cannot be used as indicators that no health effects will occur from long-term exposure (months or years).

Studies on the health status of linemen and switch-yard workers have not revealed any differences between exposed and control groups....These epidemiological studies, although among the more complete, have still suffered from a lack of numbers of persons exposed to high electric field strengths for extended periods. However, these workers are exposed to potentially the highest electric field strengths albeit for short periods of time. These studies do not provide a good data base on which to evaluate the possible health effects from long-term exposure of the general public to electric fields near transmission lines. More definitive information is needed, which in general, can only be provided through both large-scale epidemiological studies and developments in dosimetry that will make it possible to extrapolate the experimental animal results to human beings.

While attempting to arrive at general conclusions concerning the health hazards of ELF electric fields for protection purposes, the fundamental question that requires an answer is whether or not exposure to these electric fields induces any physiological or pathological effects in man.

From a careful review of laboratory studies *in vivo* and *in vitro*, and from human studies, the following conclusions can be drawn:

a. Adverse human health effects from exposure to ELF electric field levels normally encountered in the environment or the work place have not been established.

b. Some human beings feel spark discharges in electric fields of about 3 kV/m and perceive the fields between 2-10 kV/m. At present, there are no scientific data that suggest that perceiving a field produces an adverse pathological effect.

c. Exposure to ELF electric fields can alter cellular, physiological, and behavioral events. Although it is not possible to extrapolate these findings to human beings, at present, these studies serve as a warning that unnecessary exposure to electric fields should be avoided.

d. The preliminary nature of the epidemiological findings on the increased incidence of cancer among children and adults exposed to ELF fields from electric wiring and the relatively small increment in reported incidence, suggest that, although the epidemiological data cannot be dismissed, there must be considerable study before they can serve as useful inputs for risk assessment.

Conclusions and Recommendations

1. In order to relate biological findings from *in vitro* and *in vivo* studies on experimental animals to human beings, it is recommended that dosimetry studies should be continued to measure and relate external electric field strengths and internal current density distributions in the whole body of both animals and human beings.

2. From studies on man and animals, observed sensitivities are consistent with two proposed models, one on the basis of stimulation of peripheral sensory receptors in strong local electric fields at the body surface, and the other on the basis of current densities induced in the extracellular fluid. It is recommended that models be devised that correlate exposure and biological effects in terms of physical factors, such as surface electric field, tissue current density, spark discharges, and waveform.

3. The continuation of basic research on electric and magnetic field interaction mechanisms is strongly recommended. Investigations should be conducted on the possible synergism or antagonism of

field influences with physical and chemical agents, since such data are not available.

4. In some studies, restriction of ELF effects to certain "windows" in frequency and amplitude has been reported. It is recommended that the window concept be further investigated to determine the applicability of data obtained with various frequencies and waveforms, and to relate the findings to potential health detriment in human beings.

5. Studies have been performed on workers with long-term exposure to electric and magnetic fields, but no adverse health effects have been identified. However, these studies were not designed to evaluate effects on reproductive functions, or long-term carcinogenic risks. In two of the studies, electric field exposure was carefully evaluated, and it was found that average exposures in the occupationally exposed groups were remarkably low.

A suggestion of increased cancer incidence has been reported by a number of investigators who have examined occupational and general population groups exposed to electric and magnetic fields. The studies performed have serious deficiencies in epidemiological design and do not adequately characterize levels and duration of exposure.

The limited knowledge of the potential human health risk associated with exposure to electric and magnetic fields makes it imperative that well-designed epidemiological studies should continue to be undertaken to provide a firmer basis for risk assessment.

6. Occupational exposure to strong electric fields is generally intermittent and of short duration; exposed populations have been identified, and there are some limited data based on practical experience. At field strengths where spark discharges are prevalent, prolonged exposures may impair performance. Such exposures should be avoided, where possible.

7. Linemen working on energized extra- or ultra-high-voltage conductors experience extreme electric field conditions, and the use of appropriate protective clothing or devices is desirable.

8. Whilst it would be prudent in the present state of scientific knowledge not to make unqualified statements about the safety of intermittent exposure to electric fields, there is no need to limit access to regions where the field strength is below about 10 kV/m. Even at this field strength, some individuals may experience uncomfortable secondary physical phenomena such as spark discharge, shocks, or stimulation of the tactile sense.

9. It is not possible from present knowledge to make a definitive statement about the safety or hazard associated with long-term exposure to sinusoidal electric fields in the range of 1-10 kV/m. In the absence of specific evidence of particular risk or disease syndromes associated with such exposure, and in view of experimental findings on the biological effects of exposure, it is recommended that efforts be made to limit exposure, particularly for members of the general population, to levels as low as can be reasonably achieved.

10. In principle, electric and magnetic field interference with implanted cardiac pacemakers can lead to reversion to a fixed rate, but cessation of stimulation is possible. Direct interference has not been reported in fields below 2.5 kV/m. Although body currents produced by contact with a vehicle in a weaker field may cause interference, the risk of pacemaker reversion is believed to be slight.

It is recommended that pacemaker designers and manufacturers of other similar electronic equipment ensure that their devices are resistant to failures caused by electric or magnetic field-induced currents.

JHU-APL RF/MW Safety Standard

Reprinted below is the full text of the Johns Hopkins University (JHU) Applied Physics Laboratory's (APL) new health and safety standard for exposures to radiofrequency and microwave (RF/MW) radiation. The standard, adopted on October 19, 1984, replaces the lab's 1970 standard.

The APL Microwave Radiation Subcommittee recommends that the APL operating standard for permissible exposure to radiofrequency electromagnetic fields be revised to reflect evolving scientific understanding of the biological effects of non-ionizing radiation, the difficulties of properly measuring complex fields, and the desirability of a conservative safety factor. There is no evidence that permissible power levels stated in the old standard were unsafe, and this revision is intended only to increase the factor of safety over the old APL standard of 1 mW/cm^2.

The standard calls for averaging over a 0.1 hour period for all modulations. Typically, the maximum equivalent power density is 0.1 mW/cm^2 for frequencies above 30 MHz. Both mean-squared field strength and equivalent power density are specified according to frequency. These several parameters describe similar levels of exposure. Unusually high peak power levels should be noted. The safety office shall be consulted whenever the peak equivalent power density, during the pulse, is greater than 100 mW/cm^2 in any area of potential personnel exposure.

For personnel directly involved in the operation of RF equipment, exposures to higher intensity fields are permissible for very brief periods. The average power density during the period of exposure to the higher intensity fields shall not exceed ten times the values given in the exposure standard. Such exposures should be no longer than six minutes total in any one hour. Staff members responsible for the operation of various RF equipment must ensure that personnel exposures be as low as reasonably achievable below the maximum levels. The safety office must be notified if field levels are expected to approach the maximum levels so that a survey can be conducted.

Radiofrequency Exposure Limits (Averaged Over 0.1 Hour)

Frequency	Equivalent Power Density (mW/cm^2)	Mean-Squared Electric Field Strength (V/m)^2	Mean-Squared Magnetic Field Strength (A/m)^2
0.3-3 MHz	10	40,000	0.25
3-30 MHz	90/f^2	360,000/f^2	2.25/f^2
30 MHz-100 GHz	0.1	400	0.0025

(f=frequency in MHz)

This standard does not apply to emissions from consumer electronic products such as microwave ovens and hand held transceivers which are controlled by product performance standards administered by the Food and Drug Administration (FDA). It also does not address intentional exposures during the course of medical experimentation such as RF hyperthermia for cancer therapy.

Mark W. Woods, Chairman
Safety Committee

H.L. Hall, Jr.
Safety Officer

Definitions

A few definitions are required to allow a consistent interpretation of the standard. Except for Hermitian magnitude, all quantities that follow have units of mW/cm^2:

Equivalent power density: The power density of a hypothetical plane wave in free space having the same electric or magnetic field strength (Hermitian magnitude) as that measured in a complex reflective field or in an antenna near-field. Equivalent power density varies from point to point within a complex field.

Hermitian magnitude: For a vector **A**, the Hermitian magnitude is $|A|=\sqrt{A \cdot A^*}=\sqrt{AxAx^*+AyAy^*+AzAz^*}$ in which the asterisk denotes the complex conjugate. It implies a time averaging when used with the electric (**E**) or magnetic (**H**) field vector. The Hermitian magnitude provides a means of comparing fields with different polarizations.

Power density: The time average of the Poynting vector.

Poynting vector: The vector product of the electric and magnetic field vectors of an electromagnetic wave (**S=ExH**). When summed over a closed surface, the Poynting vector represents the total instantaneous power entering or leaving that surface. At a single point, the Poynting vector is generally accepted to denote the instantaneous power flow per unit area.

Discussion

Traditionally, radiation hazard standards have specified power density (mW/cm^2). This parameter is a valid indicator of potential hazard only for plane wave exposure. Under more complicated conditions, such as antenna near-fields or regions containing direct and reflected waves, true power density cannot be properly measured, and the parameter itself is not well related to potential hazard.

Mean-squared field strength, the square of the Hermitian magnitude, is an accepted indicator of hazard in a complex field. This is the quantity measured by the isotropic field probes which have become available commercially in recent years. Equivalent power density is derived from the observed level of mean-squared field strength. Although this parameter has little physical meaning, it retains the familiar units of mW/cm^2, and most isotropic field meters are so calibrated. Accordingly, the exposure limits are defined for each of three parameters: mean-squared electric field strength, mean-squared magnetic field strength, and equivalent power density.

The instrumentation used to measure potentially hazardous fields must have an isotropic probe which responds to mean-squared field strength. The only exception is for far-field zones within an RF anechoic chamber or other situations in which a simple unidirectional field exists. In those cases, true power density may be measured or calculated.

When their source is a radar, RF electromagnetic fields will have a very complex time modulation. This is caused by the combination of the transmitter's pulse modulation and the scanning of the radar's antenna. The standard calls for averaging over a 0.1 hour interval to ensure all such modulations are included.

UPDATES

BIOLOGICAL EFFECTS

EPA RF/MW Report Out... Over the last year, we have devoted a great deal of space to EPA's development of a criteria document for its guidance on public exposures to RF/MW radiation (see *MWN*, October 1983 and January/February 1984). Although EPA has now indefinitely delayed the proposed guidance, it has released the criteria document. Copies of *Biological Effects of Radiofrequency Radiation* (EPA-600/8-83-026F, September 1984) edited by Drs. Joe Elder and Daniel Cahill are available at no charge while supplies last from ORD Publications, CERI, U.S. EPA, Cincinnati, OH 45268. Afterwards, they will be available for $22.00 from the National Technical Information Service (NTIS), Springfield, VA 22161. NTIS Order No. PB 85120848.

ELF Resources... Details on the frequency and intensity windows for the efflux of calcium ions from brain tissue (in vitro) for ELF fields between 1-120 Hz, observed by Dr. Carl Blackman and co-workers at EPA, will appear in the first issue of Volume 6 (1985) of *Bioelectromagnetics*. ...DOE has released *Biological Responses to Extremely Low Frequency Electromagnetic Fields: Some Underlying Hypotheses,* (June 1984; Aerospace Report No. ATR-84-(7045)-1) by Professor H.B. Graves of Pennsylvania State University. Copies are available at no charge while supplies last from Dr. William Wisecup, Aerospace Corp., 955 L'Enfant Plaza, SW, Suite 4000, Washington, DC 20024....IITRI's J.E. Zapotosky, M.M. Abromavage and J.O. Enk have prepared a summary progress report on the ten projects that make up the Navy's ecological monitoring program on the ELF communication system for the Naval Electronic Systems Command in Washington, DC. Technical Report E06549-9 is available for $10.00 from the National Technical Information Service (NTIS), Springfield, VA 22161. IITRI has also assembled the annual reports from each of the contractors. The two-volume *Compilation of 1983 Annual Reports of the Navy ELF Communications System Ecological Monitoring Program* Technical Report No. E06549-8 is also available from NTIS, though the price has not yet been specified.

COMMUNICATIONS

Hawaii Report & Other Resources...EPA has not yet issued its report on RF/MW radiation levels in Honolulu, HI (see *MWN*, April and June 1984). An agency staffer told *Microwave News* that final editing is nearly complete and release is scheduled for December. Background information is being added to the original draft to put the measurements in context....The November *Proceedings of the IEEE* is a special issue on "Satelitte Communications Networks." Among the twenty papers is one which lists satellite locations....A subcommittee of the National Association of Broadcasters (NAB), under the chairmanship of William Wisniewski of the Mutual Broadcasting System, has issued *AM Technical Improvement*. Among its recommendations, the report urges work to mitigate existing and potential interference from RF electrical equipment, especially RF lighting devices. Copies are available from NAB's Science and Technology Dept., 1771 N St., NW, Washington, DC 20036, (202) 293-3557....A team from Kyoto University

and Nippon Telephone and Telegraph in Yokosuka, Japan, has devised a way of modelling the mean field strength in urban areas from mobile radio systems. Their analysis appears in the August *IEEE Transactions on Antennas and Propagation*.

COMPATIBILITY & INTERFERENCE

FM-Avionics Rules Due Soon... The Federal Communications Commission (FCC) and the Federal Aviation Administration (FAA) are planning to issue separate Notices of Proposed Rulemaking (NPR) by early 1985 to control FM broadcast interference with radio navigation equipment aboard aircraft. Though FM broadcasts occasionally are picked up by airplane receivers, the FCC's Ralph Haller told *Microwave News* that, "We don't know of any cases where it has actually caused a safety hazard." The FAA NPR is expected to require broadcasters to inform the agency of proposed new construction or facilities changes. According to an FAA staffer, the purpose of the new rules is to force notification at the time changes are made so that the agency can try to avert potential interference before it happens. The National Association of Broadcasters (NAB) is opposing the notification provision. The FCC's proposed rule, which according to Haller would supersede the FAA's in the event of a conflict, will set specific protection standards for receivers. Haller said that this is solely a receiver problem but that FM stations would still be required to protect FAA facilities affected by broadcasts. If the FAA disagrees with the FCC's final regulations, it can either file a petition for judicial reconsideration of the rules or change its own rules.

Struzak on ISM... Professor R.G. Struzak of the Institute of Telecommunications in Wroclaw, Poland, has published "Protection of Radiocommunications Against Interference from ISM Equipment," in the May-June issue of *Annales des Telecommunications*, the journal of the Centre National D'Etudes des Telecommunications, based in Cap D'Ail, France. Struzak, the chairman of the CCIR Interim Working Group on Radiation from ISM Equipment, which is developing new international standards for ISM emissions (see *MWN*, September 1983 and May 1984), presents a simple model of the interference problems with strategies to resolve them. He concludes with an overview of the current status of recommendations made by CCIR and CISPR.

INTERNATIONAL

Therein Lies the Rub...A BBC plan to place six 300 kW high frequency towers near Stratford-on-Avon, England, to broadcast to eastern Europe has met stiff opposition from officials of the Royal Shakespeare Theater (RST). Concerned about interference with the theater's electronic equipment — including the stage lighting console — Artistic Directors Trevor Nunn and Terry Hands have been waging their fight since the BBC proposal was announced late last year. Stratford residents are also concerned about the plan because they fear their TV and radio reception will suffer. Low power tests run by the BBC incapacitated the theater's lighting equipment and erased the electronic memories of two typewriters. In letters to *The Times* of London on June 23 and July 9, Nunn and Hands claimed that the towers, which would be built two-and-a-half miles from Stratford at Bearley Ridge, would force the theater to close. BBC officials maintain that the broadcast towers should cause minimal interference and that simple shielding could eliminate any problems. In a June 29 response to the RST, the BBC's chief engineer for external broadcasting wrote to the *Times:* "It is, of course, inconceivable that the BBC, a leading patron of the arts, would contemplate, much less pursue, any action which could have this devastating effect."

MEDICAL APPLICATIONS

More on PEMF Therapy... In our May issue, we reported on a paper describing the successful treatment of rotator cuff tendinitis (shoulder pain) with pulsed electromagnetic fields (PEMFs). In a follow-up letter published in the June 9 *Lancet*, Drs. M.J. Lunt and A.T. Barker warn that there are two mechanisms which might have confounded the double blind study by a team from Addenbrooke's Hospital and Strangeways Research Labs in Cambridge, England. In addition to magnetic and electrical interactions, Lund and Barker cite a possible heating effect from the treatment coils and the ability of the patients to distinguish between active and dummy coils. They suggest that a "bifilar" coil, with an equal number of clockwise and counterclockwise turns, could eliminate the magnetic field. Since many PEMF systems produce noise, the two researchers further argue that patients should be asked whether they think they have active or dummy coils. Barker was the lead author of another recent PEMF paper, also published in *Lancet*, which concluded that PEMFs may not be effective for the treatment of non-union tibial fractures (see *MWN*, June 1984). That paper was also addressed in the June 9 *Lancet* by Dr. David Le Vay, a practicing orthopedist, who was somewhat incredulous that PEMF therapy does not work given the available animal data and its past success in treating congenital non-unions. In a follow-up letter which appeared in the July 21 *Lancet*, Professor Brian O'Connor of the Robert Jones and Agnes Hunt Orthopedic Hospital in Oswestry, England, raised further objections to Barker's conclusions. First, O'Connor expressed surprise that the results of an interim analysis were published and warned of the dangers of extrapolating from such a small sample. He concluded: "It would be a tragedy if even one surgeon was dissuaded from using PEMFs to treat difficult non-unions as a result of Barker and colleagues' paper." Dr. W.J.W. Sharrard, one of Barker's co-authors, replied in the same issue of *Lancet* that he agreed that the "very small trial did not show that PEMFs do not have any effect," and that it would be premature to extrapolate their study to the entire population until a larger study is completed. He went on to note that the study might have been biased because a greater number of patients among those treated with PEMFs, as compared to controls, had non-unions of *both* the tibia and the fibula, a condition which Sharrard's own research group has shown to be a "detrimental factor in the treatment of tibial non-union."

Sharrard added that he believes PEMFs can have an effect; so can conservative management. His compromise is to advocate both types of treatment. In a personal communication to *Microwave News*, Dr. Andrew Bassett of Columbia University's College of Physicians and Surgeons in New York City pointed out that there are significant differences between the signals used in his studies and those reported in Barker's papers.

Diagnosing TB...A group from the University of Sheffield in England has found a way of using a microwave oven to speed up the Ziehl-Neelsen method for the diagnosis of tubercule bacilli. Slides heated with microwaves gave results that were as accurate and reliable as the classical Ziehl-Neelsen method but took only 30 seconds instead of the usual 15-20 minutes. A short letter on the new method was published in the November 3 *Lancet*.

MEETINGS

Bioeffects of Light... The New York Academy of Sciences' *Conference on Medical and Biological Effects of Light*, held October 31-November 2, was the first meeting of its kind, according to Dr. Richard Wurtman of MIT, the conference organizer. Among the 29 presentations, Dr. Alfred Lewy of the Oregon Health Sciences University in Portland reviewed the effects of bright light on human melatonin production. Dr. Norman Rosenthal of NIH in Bethesda showed how seasonal affective disorder (SAD), a winter depression, can be treated with bright, not standard indoor, light; he pointed out that no research has yet been done on the influence of the spectral content of the light. Dr. Richard Edelson of Columbia University in New York City discussed how UV-A light can activate the effectiveness of 8-methoxypsoralen in treating psoriasis. The proceedings of the conference will be available in about six months, according to an academy spokesman. Meanwhile, medical writer Jane Brody has a two-part overview of the meeting in the November 13-14 editions of the *New York Times*.

Power Systems Harmonics... The proceedings of the *International Conference on Harmonics in Power Systems* held at the Worcester Polytechnic Institute (WPI) in Worcester, MA, October 22-23, is avaiable for $50.00 (postage included). Some 40 papers are included in the volume which can be ordered from the Dept. of Electrical Engineering, WPI, 100 Institute Rd., Worcester, MA 01609....There will be a tutorial course on "Power System Harmonics," coordinated by A.A. Mahmoud of Iowa State University, at the *1985 Winter Meeting of the IEEE PES*, to be held in early February in New York City (see Conferences p.12). The registration fee is $70. The course text will also be available by mail.

Zurich EMC Symposium... The preliminary program is out for the *6th Symposium & Technical Exhibition on EMC* to be held in Zurich in early March. Six two- or three-hour workshops are scheduled for March 4-7: "EMI Control Using Computer-Aided Design," "Measurements Related to the Interaction of EM Fields with Biological Systems," "EMP Protection by Filters Combined with Surge Arrestors," "The New CISPR RFI Specification for Information Technology Equipment," " Methods and Results of Open Area Test Site Calibration," and "Existing and Required EMP Instrumentation." For more information see Conferences p.12, or contact: Herb Mertel, EMACO Inc., 7562 Trade St., San Diego, CA 92121, (619) 578-1480.

OVENS

An Exchange on Burns... Last year, Dr. Henry Fleck of Albert Einstein College of Medicine in the Bronx, NY, published a case report of burns suffered by a 51-year-old woman who accidently stuck her hands into an oven that was still operating (see *MWN*, May 1983). Dr. John Osepchuk of Raytheon has responded, charging that Fleck's "speculations about microwave oven hazards" are "an undesirable source of fear and misinformation to the non-engineer and lay person." Specifically, he writes that Tappan estimates the chance of this type of oven failure is one in 300 million (at the 95 percent confidence level) and that "it is very unlikely that the woman would receive burns in five seconds." Osepchuk reveals that the woman who suffered the burns was Helen Farmakis, who lost a suit against Tappan over this injury (see *MWN*, December 1981 and December 1982). He concludes that the "microwave oven as regulated by the FDA is practically a fool-proof device." Fleck is undaunted. He replies that, whatever the stated odds, the "oven did operate when the door was opened," and that "ovens are practically *not* foolproof, no more than cars, airplanes, trains, bridges." He also states that Farmakis had no money to appeal the jury's decision and that "the court had no other option but to affirm the jury's verdict." The Osepchuk-Fleck exchange appears in the October 1984 *Bulletin of the New York Academy of Medicine;* Fleck's original report was in the bulletin's April 1983 issue.

POWER LINES

Resources... Officials of Southern Railway have raised the issue of EMI from power lines as a reason for not siting a Virginia Electric & Power Co. high-voltage line along the railroad's right-of-way. Although this type of EMI problem has gained increasing attention among engineers, this could be the first time it has come up at a formal hearing (see *MWN*, September and December 1983). On November 26, *The Washington Post* quoted a county official as saying, "It never dawned on me that Southern would object to an overhead power line."...The November 28 *Wall Street Journal* ran a front page story on how dairy farmers are dealing with stray voltages in the midwest. Some dairy and rural electric coops have even set up the Stray Voltage Research Council....Can power lines cause allergies? Dr. Jean Munro in England thinks so; indeed, according to an October 24 article in the British *Guardian*, she believes that an electrical reaction is the basis of nearly all allergic reactions. Munro has been collaborating with Dr. Cyril Smith of the University of Salford....Over the last few months, the *IEEE Transactions on Power Apparatus and Systems* has featured a number of papers on electromagnetic effects related to power lines: June: "Electromagnetic Effects of High Volt-

age High Power Equipment," by M.M.A. Salama and R. Hackam of the University of Windsor in Windsor, Canada; July: "Application of Finite Element Method to Analysis (sic) of Induced Current Densities Inside Human Model Exposed to 60 Hz Electric Field," by a group of Japanese researchers; July: "Method for Evaluating Human Exposure to 60 Hz Electric Fields," by GE's Don Deno and Mike Silva of Enertech; August: "Measurements of Transmission Line Electric Fields in a Residential Environment," by P.D. Jacobs and F.M. Dietrich of Electric Research & Management Inc. in Pittsburgh, PA; and September: two papers on "Lightning Induced Voltages on Power Lines," "Theory" and "Experiment" by Maneck Master and Martin Uman of the University of Florida in Gainesville.

STANDARDS

Occupational Rules in Massachusetts and New Jersey ... The state of Massachusetts' Department of Labor and Industries is drafting regulations to protect workers from harmful exposures to non-ionizing radiation in the frequency range 10 kHz-100 GHz. The proposal, which will be the subject of public hearings during the first half of next year, is identical to the 1982 ANSI standard, except that, like the ACGIH guidelines, it covers frequencies down to 10 kHz. Facilities maintained by the federal government are exempted. All employers who are currently using radiating equipment, such as radio and TV stations, radar units, RF heaters and sealers, industrial microwave ovens, mobile communications equipment with an output power of more than 100 watts, and diathermy and hyperthermia units, must notify the state within 12 months after the rules are adopted. Users of new equipment must give prior notification. For more information contact: Frank Archibald, Division of Occupational Hygiene, Massachusetts Dept. of Labor and Industries, 1001 Watertown St., West Newton, MA 02165, (617) 727-3982....A subcommittee of the New Jersey Commission on Radiation Protection is also working on developing occupational exposure limits. The group will submit its recommendations to the commission before next summer. Earlier this year, the state adopted the 1982 ANSI standard for general population exposures (see *MWN*, April 1984). For information, contact Eugene Fisher, Bureau of Radiation Protection, 380 Scotch Road, Trenton, NJ 08628, (609) 292-8392.

SAE on Susceptibility...SAE has completely revised its recommended practice for *Electromagnetic Susceptibility Procedures for Vehicle Components (Except Aircraft)*. The new standard, designated J1113 and dated June 1984, was prepared by the SAE EMI Standards and Test Methods Subcommittee, under the chairmanship of Myron Crawford of NBS. J1113 will be published in the 1985 edition of the SAE Handbook. It covers the testing and measurement of transients as well as radiated and conducted emissions — making them consistent with ISO standards. Crawford is submitting the new standard to ANS C63 for consideration as a national standard. For more information, contact SAE Customer Service, Dept. 346, 400 Commonwealth Dr., Warrendale, PA 15096, (412) 776-4970.

IEC Electroheat Standard... The International Electrotechnical Commission (IEC) has issued Publication 519-1 *Safety in Electroheat Installations, Part 1: General Requirements, 1984*. The new standard covers a host of different types of equipment, including those using low and high frequency non-ionizing radiation. Copies of the standard will be available soon from the International Sales Dept., ANSI, 1430 Broadway, New York, NY 10018, (212) 354-3300.

VDTs

NIOSH Reproductive Study...NIOSH will discuss plans for its epidemiological study of reproductive risks among 2000 female VDT workers at a public meeting on December 17. In preparation for the meeting, the agency has distributed a limited number of copies of the draft protocol for the study. The document states that no radiation measurements will be made in the course of the study, unless "an excess of abnormal pregnancy outcomes is identified." According to the protocol, the study "should have a 90 to 95 percent chance of detecting an increase in spontaneous abortions of about 1.6 times that in an unexposed population, and a similar chance of detecting an increase in total major birth defects in liveborns of 3.0 to 3.5 times that in unexposed groups. The ability to detect a single common birth defect, such as cleft palate, is limited to relative risks of 14 fold." According to the current schedule, the completion date is April 1988. Dr. Teresa Schnorr is leading the NIOSH effort.

IBM Study Released...IBM has published a summary report of VDT emission measurements by Dr. Arthur Guy of the University of Washington, Seattle, despite an earlier policy that the document was for internal use only (see *MWN*, September 1984). The report focuses on pulsed very low frequency magnetic fields and concludes that there are no health hazards associated with non-ionizing radiation emissions from VDTs. Guy discusses apparent similarities between the VDT fields and very weak magnetic fields found by Dr. Jose Delgado's research group to cause developmental abnormalities in chick embryos. "None of the combinations used [by Delgado's team] for producing the effects had characteristics that simultaneously matched the VDT magnetic field waveform," Guy wrote. This conclusion, which has already been cited by NIOSH researchers in their November draft protocol for the agency's epidemiological study (see above), will no doubt have to be reevaluated in light of a recently released correction from Delgado's group (see p.2). For a copy of the IBM summary, contact Les Szabo, Corporation Information, IBM, Old Orchard Rd., Armonk, NY 10504, (914) 765-6408.

MICROWAVE NEWS is published monthly, except in January and July • ISSN 0275-6595 • PO Box 1799, Grand Central Station • New York, NY 10163 • (212) 725-5252 • Editor: Louis Slesin, Ph.D., Associate Editors: Martha Zybko, Mark Pinsky • Subscription: $200 per year (overseas $235) • Copyright © 1984 by Louis Slesin • Reproduction in any form is forbidden without written permission.

CONFERENCES

1985 Conference Calendar

January 3-5: **2nd International Conference on Clinical and Basic Factors Influencing Bone Growth,** Los Angeles, CA. Contact: Dr. Andrew Dixon, UCLA School of Dentistry, Center for Health Sciences, Los Angeles, CA 90024, (213) 825-9187.

January 14-15: **Symposium on Dielectric Phenomena in Honor of the 70th Birthday of Professor Robert H. Cole,** Providence, RI. Contact: Dr. Edward Greene, Dept. of Chemistry, Brown University, Providence, RI 02912, (401) 863-1193.

January 23: **A Review of the State-of-the-Art in EMC in Commercial and Military Electronics,** LA Airport Hilton, Los Angeles, CA. Contact: Ms. Terry Cantine, Eaton Corp., 5340 Alla Rd., Los Angeles, CA 90066, (213) 822-3061.

January 23-25: **RF Technology Expo,** Disneyland Hotel, Anaheim, CA. Contact: Kathy Kriner, RF Tech Expo, 6530 S. Yosemite St., Englewood, CO 80111.

February 3-8: **1985 Winter Meeting of the IEEE Power Engineering Society,** Penta Hotel, New York, NY. Contact: J.G. Derse, 1030 Country Club Rd., Bedminster, NJ 07921, (201) 725-4388.

March 5-7: **6th Symposium & Technical Exhibition on Electromagnetic Compatibility,** Zurich, Switzerland. Contact: EMC Symposium & Exhibition, ETH Zentrum-IKT, 8092 Zurich, Switzerland, 256-27-90.

March 21-22: **IMTC/85: Instrumentation/Measurement Technology Conference,** Hyatt Regency, Tampa, FL. Contact: Dr. Robert Ashley, Sperry Corp., PO Box 4648, Clearwater, FL 33518, (813) 577-1900, ext. 2228.

April 3-4: **21st Annual Meeting of the National Council on Radiation Protection and Measurements,** Washington, DC. Contact: NCRP, Suite 1016, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814, (301) 657-2652.

April 16-17: **8th International Colloquium on the Prevention of Occupational Risks due to Electricity,** London, UK. Contact: International Fire Security & Safety Exhibitions & Conferences Ltd., Cavendish House, 128/134 Cleveland St., London W1P 5DN, UK, (01) 387-5050.

April 16-19: **4th International Conference on Antennas and Propagation (ICAP 85),** Coventry, UK. Contact: Institution of Electrical Engineers (IEE), Savoy Place, London WC2R 0BL, UK, (01) 240-1871, ext. 222.

April 17-19: **3rd International Conference on Developments in Power System Protection,** London, UK. Contact: IEE, see above.

April 24-27: **3rd European Workshop on NMR in Medicine,** Copenhagen, Denmark. Contact: Dr. S.B. Petersen, Dept. of Neurology 2082, State University Hospital, Rigshopitalet, Blegdamsveg 9, DK 2100 Copenhagen 0, Denmark.

April 29-May 2: **23rd International Magnetics Conference,** St. Paul, MN. Contact: R.O. McCary, GE, Corporate R&D, Schenectady, NY 12345, (518) 385-5436.

May 4-7: **5th Annual Meeting of the North American Hyperthermia Group,** Biltmore Hotel, Los Angeles, CA. Contact: NAHG, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153. Held in conjunction with the Radiation Research Society Meeting.

May 5-9: **33rd Annual Meeting of the Radiation Research Society,** Biltmore Hotel, Los Angeles, CA. Contact: RRS, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153.

May 6-9: **IEEE 1985 International Radar Conference,** Washington, DC. Contact: J.Q. Adams, ITT-Gilfillan, M/S 45, 7821 Orion Ave., PO Box 7713, Van Nuys, CA 91409, (818) 988-2600, ext. 6903.

May 14-16: **Test & Measurement World Expo,** Convention Center, San Jose, CA. Contact: Meg Bowen, T&M Expo, 215 Brighton Ave., Boston, MA 02134, (617) 254-1445.

May 15-18: **1st Annual Meeting of the Electromagnetic Energy Policy Alliance,** Inter-Continental Hotel, San Diego, CA. Contact: Richard Ekfelt, EEPA, 1800 M St., NW, Washington, DC 20036, (202) 452-1070.

May 19-23: **17th Annual Meeting of the Conference of Radiation Control Program Directors,** Milwaukee, WI. Contact: CRCPD, 71 Fountain Place, Frankfort, KY 40601, (502) 227-4543.

May 20-24: **8th International Conference on Electricity Distribution,** Brighton, UK. Contact: IEE, see April 16 above.

May 26-31: **30th Annual Meeting of the Health Physics Society,** Chicago, IL. Contact: HPS, Suite 300, 1340 Old Chain Bridge Rd., McLean, VA 22101, (703) 790-1745.

June 4-6: **1985 IEEE MTT-S International Microwave Symposium,** St. Louis, MO. Contact: John Bogdanor, McDonnell Aircraft, Dept. 313, St. Louis, MO 63166, (314) 232-3936.

June 10-12: **International Aerospace and Ground Conference on Lightning and Static Electricity,** Paris, France. Contact: Lawrence Walko, USAF, AFWAL/FIESL, Wright Patterson AFB, Dayton, OH 45433 in US; or Dr. Joseph Taillet, ONERA, BP 72, 92320 Chatillon, France.

June 11-13: **6th Annual Meeting of the Canadian Radiation Protection Association,** St. John, New Brunswick, Canada. Contact: John Paciga, New Brunswick Electric Power Commission, PO Box 10, Lepreau, New Brunswick, Canada E0G 2H0, (506) 659-2102, ext. 324.

June 16-20: **7th Annual Meeting of the Bioelectromagnetics Society,** Hilton Hotel, San Francisco, CA. Contact: BEMS, 1 Bank St., Suite 307, Gaithersburg, MD 20878, (301) 948-5530.

June 17-21: **1985 North American Radio Science Meeting and International IEEE/AP-S Symposium,** University of British Columbia, Vancouver, Canada. Contact: Mr. K. Charbonneau, Conference Services, National Research Council, Ottawa, Ontario Canada K1A 0R6, (613) 993-9009.

June 24-29: **8th International Symposium on Bioelectrochemistry and Bioenergetics,** Bologna, Italy. Contact: C. Bonfiglioli, Institute of Botany, Via Irnerio 42, 40126 Bologna, Italy, (051) 234376.

July 14-19: **1985 Summer Meeting of the IEEE Power Engineering Society,** Vancouver, Canada. Contact: PES Special Activities, IEEE, 345 East 47th St., New York, NY 10017.

July 22-24: **22nd Annual Conference on Nuclear and Space Radiation Effects,** followed by July 25-26: **1985 Hardened Electronics and Radiation Technology (HEART) Conference** Monterey, CA. Contact: K.F. Galloway, Div. 726, NBS, Gaithersburg, MD 20899, (301) 921-3541.

July 22-25: **1985 International Symposium on Microwave Technology in Industrial Development —Brazil,** Campinas, Brazil. Contact: Attilio Jose Giarola, SBMO Symposium Committee, UNICAMP-CCPG (Reitoria), CP 1170, 13100 Campinas, SP, Brazil.

August 11-16: **14th International Conference on Medical and Biological Engineering and 7th International Conference on Medical Physics,** Espoo, Finland. Contact: Congress Office, PO Box 105, SF-00251 Helsinki, Finland.

August 19-21: **10th Annual Conference of the Australian Radiation Protection Society,** Melbourne, Australia. Contact: Dr. T.H. Gan, Australian Radiation Lab, Lower Plenty Rd., Yallambie, Victoria 3085, Australia.

August 20-22: **1985 IEEE International Symposium on Electromagnetic Compatibility,** Hilton at Colonial, Wakefield, MA. Contact: Dr. Chester Smith, PO Box 536, Bedford, MA 01730, (617) 271-7086.

August 20-22: **International Symposium on Antennas and Propagation,** Kyoto International Conference Hall, Kyoto, Japan. Contact: Professor Kazuaki Takao, Dept. of Electrical Engineering, Kyoto University, Kyoto 606, Japan.

August 26-28: **1985 International Symposium on Antennas and EM Theory,** Beijing, China. Contact: Professor Mao Yukuan, Northwest Telecommunication Engineering Institute, Xi'an Shaanxi Province, China.

August 26-30: **International Conference on Magnetism 1985,** San Francisco, CA. Contact: Diane Suiters, Suite 300, 655 15th St., NW, Washington, DC 20005.

September 10-12: **7th Annual Electrical Overstress/Electrostatic Discharge Symposium,** Radisson South Hotel, Minneapolis, MN. Contact: Michael Martin, 3M/Static Control Div., 2111 W. Braker Lane, Bldg. 501, PO Box 2963, Austin, TX 78769, (512) 834-3117. *(continued on p.5)*

MICRO WAVE NEWS

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Microwave News invites letters from its readers. We ask writers to be brief, and we reserve the right to edit contributions for length.

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A list of recently published reports appears on page 8 of this issue. This feature will alternate with the conference calendar which will run again next month.

MICROWAVE-DRUG SYNERGY

Every time a new microwave effect is reported, subsequent research produces a host of conflicting and contradictory results. The latest example of this phenomenon is synergy between tranquilizing drugs and microwave radiation, a topic which stimulated much interest at the September Bioelectromagnetics Society (BEMS) meeting in San Antonio. Recent experimental data have thrown previous proposals about drug-microwave interactions into disarray.

In spring 1979, John Thomas, Linda Burch and Stephen Yeandle of the Naval Medical Research Institute published a paper in *Science* (*203,* 1357, 30 March 1979) showing that pulsed 2.45 GHz radiation enhanced the action of chlordiazepoxide, better known by its brand name, Librium. Librium, one of the most popular drugs on the market, is a close structural relative of diazepam or Valium,

(continued p. 5)

Wall Street Tunes In

New uses for electromagnetic radiation are hot news, if *The Wall Street Journal*'s regular Friday column on technology is any gauge. In recent months the column has featured five innovative applications.

Two products are already on the market. The October 31 column headlined induction stoves that use a magnetic field to heat any cookwear containing iron. Manufacturers claim induction is a cool, energy-efficient way to cook and they forecast large sales for the appliance. The popularity of microwave ovens might be the basis for their optimism. The ovens are already a commercial success, but a new feature, announced January 16, might entice even more buyers. Some Panasonic models now offer a humidity sensor that allows the oven's microprocessor to adjust cooking time and power level.

(In a story appearing December 10, the *Journal* noted that the Department of Energy's pending minimum efficiency standards for major appliances may speed the development of talking microwave ovens. Manufacturers will add sophisticated electronic controls that increase product convenience, efficiency, and repairability to compensate for energy-saving demands that impair performance. The Sanyo Electric Trading Company has already developed an oven that can announce its power setting.)

These advances in the kitchen have outpaced the microwave plans of the auto industry. An anti-collision radar system and a new method for producing "lean burning" engines are two applications whose time has yet to come. An update on a long-dreamed-of radar system to warn drivers of approaching trouble ran on August 1. Six weeks later a less spectacular, but potentially more valuable, idea made the news: by simulating a flame inside the engine, microwaves can help fuel burn more efficiently without producing extra pollution.

The November 7 Technology column highlighted a truly big idea: the possibility of turning the sea around Cape Cod into a giant antenna for submarine communications—a potential substitute for the Navy's hard-to-site ELF antenna, Project Seafarer. Stanford University scientists are working on this concept.

CWA Cancer Cluster

An investigation by federal officials failed to identify a connection between a cluster of cancer cases among a group of AT&T long lines workers at Ragerville, Ohio and microwave radiation, according to a soon-to-be-released National Institute for Occupational Safety and Health (NIOSH) report.

Word of the cluster emerged early last year when James Cole, president of Communications Workers of America local No. 4354, requested an investigation of five cancer cases, including two deaths, among a group of eight workers. In addition to checking microwave radiation levels, Cole asked for an examination of possible polychlorinated biphenyl (PCB) and asbestos contamination, and tests of drinking water wells at the site.

Of the five cases, four were company employees, and the fifth was a cleaning woman, working for a contract service. Three of the employees developed colon cancer, and the fourth had cancer of the larynx. The cleaning woman and one of the colon cancer cases died.

A team from NIOSH and the Occupational Safety and Health Administration (OSHA) made a site visit last March. Bob Curtis of OSHA surveyed microwave and radiofrequency radiation levels, but found no indication of excessive exposures. Checks for PCB's and asbestos and Ames tests of drinking water samples were also negative.

Dr. Sandy Leffingwell, an epidemiologist with NIOSH's Division of Surveillance, Hazard Evaluation and Field Studies, found that this was an unusual but accidental cluster of cases, not related to the work site, but noted that "we really don't know what we are dealing with here." Leffingwell stated that 18 people had worked at the local over the last ten years, and that the first cancer had been identified in the early 1970's.

Cole believes that there must have been some kind of microwave or carcinogenic hazard at the work site: the source has either been eliminated or is still there. "I suspect there could still be a hazard, but we aren't sophisticated enough to measure it or find it," he said. Only three people are now working at the Ragersville site; the cut back is unrelated to the cancer cluster, according to Cole.

Cole said that the maximum NIOSH reading was 0.1 mW/cm^2, but he stressed that the levels could be higher, depending on working conditions. "New technology and design have decreased the levels in recent years," he added. He said that when he worked at the station years ago, the exposure levels were probably much higher.

That possibility was confirmed by Bob Curtis, who noted that the exposures at the local could have been higher before the equipment had been converted to solid state. Previously, the equipment required more maintenance, which could have resulted in greater exposures. "Today, the exposures would be lower," he said, "unless the worker cuts into a hot waveguide, and even then the exposure would be for a short duration."

The radiation at the long line local would have been in the 2-10 GHz range, according to Curtis. He stressed that retrospective predictions on worker exposures are notoriously difficult.

Leffingwell said that further epidemiological investigations of long line workers would be frustrated by the way AT&T kept its employment records. No additional studies are now planned.

The NIOSH report should be released by the end of February, depending on the backlog at the NIOSH printer.

NIOSH Epidemiology

NIOSH is about to begin its long-planned epidemiology of workers exposed to RF radiation from heat sealers.

Terry Leet and Dr. Sherry Sullivan, two epidemiologists in NIOSH's Cincinnati office, and Clinton Cox, an industrial hygiene engineer, were about to select a suitable study population at the end of January. Results will not be ready for publication before the end of 1982.

The NIOSH team had already made 10 to 15 surveys of workers exposed to RF sealers in various plants.

Leet has taken over from Elizabeth Egan who worked on the study since 1979 and has now left NIOSH to go to medical school.

Medical Surveillance

Researchers at the Rocky Mountain Center for Occupational and Environmental Health at the University of Utah have just completed a study on recommended medical examinations for workers exposed to non-ionizing radiation.

The report, *An Evaluation of Medical Surveillance for Workers Exposed to Microwave/Radiofrequency Radiation*, was submitted to the Occupational Safety and Health Administration's (OSHA) Health Response Team office in Salt Lake City. It will now be reviewed in Utah and in Washington and be available for distribution in a few weeks.

Dr. Mark Nichols, a resident at the Center, and Dr. Bill Rom, its Director, wrote the study for OSHA. Recommendations include a list of tests that should be administered annually to chronically exposed workers or to persons who have experienced high-level, acute exposures.

Mount Sinai Epidemiology

Drs. Arthur Frank and Robert Refowitz, two members of Dr. Irving Selikoff's Environmental Sciences Laboratory at the Mount Sinai Medical Center in New York City, are planning an epidemiology of workers exposed to microwave radiation.

As a first step in identifying a suitable study population, Frank and Refowitz, working with behavioral toxicologist, Jose Valcuikas, are designing a questionnaire to assess workers' problems related to non-ionizing radiation. A separate, though related, questionnaire is planned for workers exposed to microwave radiation, radiofrequency radiation, video display terminals (VDT's), and, in the future, lasers.

A sample questionnaire is now being tested among communication workers. The presidents of the 40 long line locals of the Communication Workers of America were sent the survey in order to learn about the CWA membership and any special complaints they may have. The Mount Sinai researchers are anxiously awaiting the responses.

Frank and Refowitz are interested in possible radiation effects on the eyes and the reproductive system of exposed workers, as

well as neurobehavioral changes. In addition, they would like to test the hypothesis that males exposed to non-ionizing radiation have a much greater tendency to father female children.

The Mount Sinai group is thinking about holding a research conference on microwave radiation late this year or next year.

WISH Seminar

Trade union representatives from around the country participated in the Worker Insitute for Safety and Health (WISH) seminar on non-ionizing radiation and laser hazards last September 7-10 in Park City, Utah. Among the labor groups present were the Communication Workers of America, the International Union of Operating Engineers, the United Brotherhood of Carpenters, and the Newspaper Guild.

Other participants included Sheldon Samuels from the Industrial Union Department of the AFL-CIO, Arthur Frank from Mount Sinai, Walter Gundaker from BRH, Bob Curtis from OSHA, and Paul Brodeur, who wrote the briefing manual for the meeting, *The Health Hazards of Radiofrequency, Microwave, and Laser Radiation*.

All 110 attendees supported the following resolution on microwave/radiofrequency radiation standards:

> WHEREAS numerous U.S. industries have demonstrated callous disregard of the hazards posed to their employees by the rapidly spreading use of equipment producing microwave and radiofrequency radiation, and
>
> WHEREAS the existing OSHA standard of 10 milliwatts per centimeter squared is generally recognized as totally inadequate to protect workers against these hazards, and
>
> WHEREAS NIOSH and ANSI (management's standard setting organization) are in the process of recommending that the standard be lowered to one milliwatt per centimeter squared for the most hazardous part of the microwave/radiofrequency spectrum and
>
> WHEREAS the guideline in Russia and some other countries ranges from 10 to 200 microwatts per centimeter squared, far below even the recommended U.S. standard,
>
> THEREFORE, BE IT RESOLVED THAT this WISH seminar of trade unionists representing workers employed in a number of these industries urges OSHA to promptly lower the standard, not merely to the inadequate level proposed by NIOSH and ANSI, but to a level that will give US workers protection at least equal to that enjoyed by those of any other country, and
>
> BE IT FURTHER RESOLVED THAT OSHA be urged to vigorously enforce its radiation standards.

Future WISH activities include co-sponsoring a training course in Ohio next month and developing questionnaires for persons working with microwave/radiofrequency and VDT radiation, in collaboration with Dr. Frank.

Ohio Training Course

There will be a one-day training course on microwave and radiofrequency radiation and lasers at Ohio State University in Columbus on Saturday March 14th.

The course, sponsored by the Labor Education and Research Service of OSU and the Ohio AFL-CIO in cooperation with the Workers Institute for Safety and Health (WISH), the Industrial Union Department of the AFL-CIO, the CWA, the Carpenters, and the Operating Engineers will be similar to last September's WISH seminar (see story above). But given the limited time available, the schedule will be somewhat shortened. The morning session will focus on the types of health effects associated with non-ionizing radiation, and the afternoon will consist of workshops on the measurement and control of radiation hazards. Paul Brodeur is the tentatively scheduled luncheon speaker.

For more information, contact the course organizer, Jack Pompei, an industrial hygienist with the Labor Education and Research Service, at 614-422-8157.

NBC Precautions

Last spring a National Broadcasting Company report recommended that radiation-warning signs be posted on transmitting antennas of minicam trucks and that working personnel avoid positioning themselves within 6 feet of an antenna in the direction of its beam. The study, completed by the NBC Engineering Department in New York City with assistance from the Occupational Safety and Health Administration, was requested by Local 11 of the National Association of Broadcast Employees and Technicians.

As of January 1981, NABET officials have yet to see the report, although NBC has assured them that all measurements were below OSHA guidelines. Some, but not all, of the mobile units now have warning signs. The action only affects New York City operations and personnel.

CWA Training Session

The Communication Workers of America held the first of a series of training programs on occupational safety and health in New York City last January 12-16. Some 85 local union officials learned about the risks associated with VDT's and microwave and radiofrequency radiation, among other topics. The meeting was held in cooperation with Cornell University's School of Industrial and Labor Relations.

On the subject VDT's, the union representatives heard Michael Smith of NIOSH, David Eisen of the Newspaper Guild, and Tobi Bergman of the New York Committee for Occupational Safety and Health (NYCOSH). Smith presented some results from the NIOSH survey of VDT's in San Francisco. The complete report is due to be published soon. Eisen described the Guild's contract negotiations to guarantee its members better ways to work with VDT's. Bergman highlighted NYCOSH's efforts to bring companies and employees together on VDT problems. (Last year, NYCOSH published a booklet on VDT's: *Health Protection for Operators of VDTs/CRTs*.) After these presentations, the meeting broke up into workshops, which focused primarily on ergonomic issues.

Robert Curtis and Alfred Owyang of OSHA gave lengthy presentations on microwave/RF and laser hazards in the workplace.

CWA is organizing three more training sessions. Two will be held in May—in Columbus, Ohio and in Birmingham, Alabama. The final one will be in San Francisco next August.

Comments on the Proposed BRH/FDA Standard for Diathermy Products

The proposed performance standard for microwave diathermy products (45 *Federal Register* 50359, July 29, 1980) elicited 17 sets of comments last fall. The standard is designed to guarantee the safety and effectiveness of microwave therapeutic heat treatment and includes the following key provisions:

- a diathermy product must be capable of delivering a specific absorption rate of 235 W/kg to standardized phantoms.
- a device may not leak more than 10 mW/cm² at 5 cm from the applicator.
- equipment manufactured before the effective date of the standard is excluded from regulation.
- microwave diathermy products used for cancer therapy (hyperthermia treatment) are included under the standard, though variances could be granted. (The Bureau was particularly interested in receiving comments on such exemptions.)

Comments were due September 29, 1980, though the deadline for written submissions was extended a few weeks.

The following is a brief synopsis of the comments received by the Bureau of Radiological Health. The comments were obtained by *Microwave News* through the Freedom of Information Act.

Cancer Therapy

The appropriateness of regulating cancer treatment devices was addressed in a majority of the comments. The response of the **RCA Corporation**, which urged exemption for experimental devices used in hyperthermia treatment, was typical of the criticisms received. **George Kiessling**, Director of Product Safety Plans and Programs, concluded that "applying the regulations to microwave hyperthermia research devices would have the effect of substantially impeding valuable research into the thermal treatment of tumors." He did recognize that regulation of commercial microwave diathermy products, as proposed, is desirable.

The **BSD Corporation** of Salt Lake City also found the proposed standard reasonable for physical therapy devices but not for cancer treatment units.

Dr. **Francis Mahoney**, Program Director for Radiation at **NIH's Division of Cancer Treatment**, wrote that the standard would be overly restrictive for units intended for cancer therapy research.

Drs. **Haim Bicher, Fred Hetzel**, and **Taljit Sandhu** from the **Henry Ford Hospital's** Department of Therapeutic Radiology discussed specific problems with applying the standard to cancer therapy. Treatment frequencies, power density limits, and various safety controls were found unacceptable or inappropriate for cancer treatment.

Professor **John Fazekas**, of **Thomas Jefferson University Hospital**, expressed his doubts about the desirability of applying the standard to cancer therapy. He felt safety in clinical hyperthermia hinged on experienced and knowledgable investigators.

University of Washington Medical School

Three separate sets of comments were received from the University of Washington School of Medicine. Professors **Arthur Guy** and **Justus Lehmann** both stated that a performance standard for equipment used in cancer therapy is a poor substitute for competency of the professionals overseeing treatment. Dr. Guy would have prefered an exposure standard to a performance standard: "It is very naive to think a performance standard based on very limited models will be a substitute for the required complex interdisciplinary judgments coupled with the application of well-developed exposure guidelines in reducing the dangerous side effects for the patient and the equipment operators."

Dr. Lehmann accepted the standard for standardized applications but said it does not provide adequate safeguards against overexposure of the patient or the operator: "We feel that it is essential that the standard include limitations as to the use of this equipment so that it can be used only either under the direct supervision of a knowledgeable physician, or by a knowledgeable physical therapist."

The third response, from Professor **C.K. Chou**, stated that, while it was desirable to eliminate unnecessary radiation exposures, "the usefulness of diathermy will be reduced by an over-restrictive performance standard."

Operator Risks

The **American College of Radiology** stressed that operators giving hyperthermia treatments must have sufficient knowledge and training but opposed regulating the equipment: "As a new developing treatment, it is important that physicians with special expertise supervise microwave diathermy treatments for cancer." The group thought regulations for operators should be set as soon as possible.

Both Dr. **Carlos Perez**, of the **Washington University** School of Medicine, and Dr. **Ned Hornback** of **Indiana University's** Department of Radiation Oncology expressed similar opinions. Dr. Hornback advised that, "the exposure levels of all personnel operating equipment should be included in the regulations and current accepted levels of exposure should be adhered to."

Standard Physical Therapy

The need for regulation of existing equipment, which is exempt from proposed regulation, was expressed by Dr. **Julian Henley-Cohn** and by Dr. **Louis Slesin** and **Martha Zybko**. Henley-Cohn argued against imposing the standard on cancer treatment devices. Slesin and Zybko questioned the wisdom of the FDA decision to double the proposed leakage limit from 5 mW/cm² in an earlier draft of the rule to 10 mW/cm² in the current draft.

John Osepchuk, consulting scientist for the **Raytheon Company**, and **Robert Kruse**, President of **AAMED, Inc.**, of Forest Park Illinois, opposed the standard as an unnecessary and harmfully restrictive measure. Dr. Osepchuk stated that the FDA has not established the need for a standard and that this regulation would create an adverse economic impact on the industry.

The **American Physical Therapy Association** supported the standard and in addition requested "immediate attention be focused on requirements essential for operators of microwave diathermy products" to insure the patient's safety.

Drs. **G.M. Samaras** and **R.G. Slawson** of the Martha V. Filbert Radiation Center at the **University of Maryland** Hospital supported the standard "for all microwave diathermy products, regardless of their proposed clinical application." The 30 minute maximum timer period, however, was deemed an impractical restriction for cancer treatment diathermy.

MICROWAVE NEWS is published monthly. • P.O. Box 1799, Grand Central Station • New York, NY 10163 • (212) 794-9633 • Editor: Louis Slesin, Associate Editor: Martha Zybko • Subscription: $165 per year (overseas $200) • © Copyright 1981 by Louis Slesin • Reproduction in any form is forbidden without written permission.

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(continued from p. 1)

the country's largest selling tranquilizer with some eight million prescribed users and many more unofficial ones. Thomas's widely circulated report caused considerable agitation; if low levels of radiation from a typical radar could intensify the action of a common drug, a new significant risk might exist. Soon a number of other labs were busy trying to replicate and extend Thomas's experiment. (See Table.)

Librium v Valium

At the September conference, Robert Johnson presented the findings of Professor A.W. Guy's group at the University of Washington Medical School. Funded by the Office of Naval Research, they repeated Thomas's experiment using Valium. With the same pulsing characteristics, frequency and average power levels, they found a 30 to 40 percent reduction in sleeping time and an increase in animal feeding. These results were in line with what was expected. However, a few minutes later, John Schrot, a member of Thomas's research team, reported that they had also tested Valium and found *no* microwave-drug synergy. To make matters more complicated, Thomas had also tried continuous wave instead of pulsed radiation and had again found no synergy. (Some of these results have recently been published: *Neurobehavioral Toxicology, 2,* 131, 1980.)

Many biological effects occur at lower power levels for pulsed as compared to continuous radiation, so the failure to get a positive result after continuous wave exposure was not so startling. But a difference beween Valium and Librium, very similar drugs belonging to the benzodiazepine drug family, defied simple explanation. As Thomas wrote in his abstract: "The lack of interaction between diazepam and the pulsed microwave field suggests that drug class alone does not adequately predict outcome."

Robert Johnson offered the hypothesis that two distinct processes were at work in the synergy. In the first week of irradiation, the microwaves counteract the debilitating action of Valium, followed by appetite stimulation during the second week. Nevertheless, he and his colleagues at the University of Washington will be doing some reassessing in light of the conflicting results presented in San Antonio.

Replications Attempted

Even Thomas's original experiment did not survive the meeting unchallenged. G. Rufus Sessions of the Department of Microwave Research at Walter Reed Army Institute of Research reported that he had failed to replicate the Librium study using higher power densities (10 and 20 mW/cm²). His experimental design was quite different, however. Sessions used a variable interval performance test and 915 MHz radiation. These changes could explain the lack of response.

In an interview at the Naval Medical Research Institute last October, Dr. Thomas noted that he had successfully replicated the Librium synergy experiment. He admitted that he had been surprised by the failure to get a positive result with Valium, and offered as a possible explanation an animal's different response to the two drugs. Librium will increase its response rate as compared to baseline behavior, while Valium has an opposite effect.

(continued p. 6)

Summary Table of Microwave-Drug Experiments

Study	Type of Study	Power Density mW/cm² (average)	Frequency	Type of Field	Drug	CW/PW	Results
Thomas (1979)	F.I. Feeding	1.0	2.45 GHz	Near	CDZ	2usec, 500pps	Enhanced Behavioral Effect
Thomas (BEMS)	F.I. Feeding	1.0	2.8 GHz	Near	CDZ DZ DZ CPZ	CW 2usec, 500pps CW 2usec, 500pps	No Effect No Effect No Effect No Effect
Guy (BEMS)	Feeding & Sleeping	1.0	2.45 GHz	Circularly Polarized	DZ	2usec, 500pps	30-40% Reduction in Sleeping Time Increase in Feeding
Battelle (BEMS)	F.I. Feeding	1.0	2.88 GHz	Far	CDZ	3usec, 300pps	None Yet (see text)
Sessions (BEMS)	V.I. Feeding	10 & 20	0.915 GHz	Circularly Polarized	CDZ	2usec, 500pps	No Effect

F.I. = Fixed Interval; V.I. = Variable Interval
CDZ = Chlordiazepoxide (Librium); DZ = Diazepam (Valium); CPZ = Chlorpromazine (Thorazine)

GOVERNMENT

CONGRESS

The Library of Congress' Congressional Research Service (CRS) has published "High Voltage Electric Power Transmission Lines: Impact on Public and Environmental Health" by Kenneth Bogen (Report No. 80-199, November 7, 1980). The 20-page report includes a detailed chronology and bibliography. Bogen has also updated a six-page "Mini Brief" on this subject —with the same title (Number MB80222, December 9, 1980).

The CRS is planning a similar report on the potential hazards associated with extremely low frequency radiation emitted by the Project Seafarer antenna, the Navy's proposed submarine communication system. The schedule for completing this study will depend on Congressional interest.

AGENCIES

Federal Aviation Administration

Plans are underway for phasing in the Microwave Landing System (MLS) which will replace the Instrument Landing System (ILS) now used at airports to guide planes during poor visibility conditions. The MLS operates at frequencies above the VHF/UHF frequencies used in ILS.

The new system offers four essential advantages over the ILS: 1. a common system for civil and military use; 2. a frequency band that will be free of frequency congestion problems; 3. a system that provides a high quality guidance signal that is relatively free from local terrain and structure effects; and 4. an ability to provide multiple paths for various classes of aircraft.

The total estimated cost in today's dollars of the MLS including aircraft equipment exceeds $2 billion according to Martin Olson, Chairman of the MLS Transition Plan Working Group. A few selected airports could have the MLS by 1985.

FAA held four public, regional hearings this January to elicit comments and suggestions on how to proceed with the major task of phasing in the MLS throughout the US. Written comments were due by February 10 (45 *Federal Register* 75041, November 13, 1980). Olson reported that all hearing participants supported the new system: "Generally, people felt MLS offers a beneficial technology that should be implemented as soon as possible."

FAA has released a number of reports on the MLS:

1. *An Analysis of the Requirements for, and the Benefits and Costs of the National Microwave Landing System (MLS),* by William C. Reddick *et al.*, June 1980, in 2 volumes (Report No. FAA-EM-80-7). A brief "Executive Summary" of the report is also available.
2. *The Microwave Landing System Transition Plan, Draft,* October 20, 1980, 203 pages.
3. *Guide to Microwave Landing System Implementation Strategies,* November 1980, 15 pages.

For additional information write to: Mr. Marvin Olson, APO-320, Chairman, MLS Transition Plan Working Group, FAA, Room 939, 800 Independence Avenue, SW, Washington, D.C. 20591

Federal Communications Commission

On January 19th, the FCC reallocated 130 MHz of radio spectrum to allow the development of a Digital Eletronic Message Service (DEMS). The new service will provide business and government offices with a two-way, data and document communication system within and among major US cities.

The intercity transmissions will be authorized under existing FCC rules for point-to-point and satellite microwave links. The

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(continued from p. 5)

Originally Thomas had intended to test a few representative members of each major drug class, but has had to redesign his work plan. Soon he will do a run with a new tranquilizer, still in pre-clinical testing, with a structure falling roughly between that of Librium and Valium. In 1981, Thomas's lab will begin to experiment with monkeys.

A fourth group, at the Battelle Pacific Northwest Laboratories, is specifically trying to replicate Thomas's Librium experiment. Apart from small changes in frequency and pulsing parameters, a major difference in the Battelle study design is the use of far field instead of near field exposures. This experiment by R.H. Lovely and R.D. Phillips had just begun in September, and no firm results were reported in San Antonio. In a December telephone interview, Dr. Lovely said that he had finished two complete runs at 1 mW/cm² and found no synergistic action. The next step is to increase the power to 4 or 8 mW/cm². If a field of 8 mW/cm² causes too much disruption for the animal, the group will use 4 mW/cm². If no synergy is found at the higher power level, Lovely will go to exposures in the near field.

Other Drugs

Thomas's *Science* paper was not the first report of drug-microwave synergy. Cleary and Wangeman showed reinforcement between pentobarbitol and continuous wave microwaves in 1975, and Servantie and co-workers found that microwaves affected the action of curare-type drugs in 1974. In late 1979, Thomas published a paper showing synergy between pulsed microwaves and dextroamphetamine (*Radio Science, 14,* 253, 1979). In San Antonio, Thomas reported no synergy between pulsed radiation and Thorazine (chlorpromazine).

The Navy program on the interaction between microwaves and common drugs is part of a long-term risk assessment for servicemen simultaneously exposed to multiple physical and chemical agents aboard ship.

Where are we now? As Elliot Postow, whose office at the Navy Medical Research and Development Command is funding both Thomas and Battelle, put it: "no clear picture is emerging, and at this point, all bets are off."

intracity links will be handled by the new Digital Termination Systems (DTS).

The FCC decision is the result of a 1978 petition by the Xerox Corporation for spectrum space for a new common carrier service. Under the proposed Xerox system, a customer's terminal would feed into a transceiver connected to a rooftop antenna. The antenna would be in two-way communication with a city-wide substation. A narrow microwave beam would connect the substation to an earth station for transmission to other cities.

The reallocation affects frequencies between 10.55 and 10.68 GHz. The Commission is also considering allocating space in the 17.7-19.7 GHz band for DTS.

Litton Industries had also wanted to use the 10.6 GHz area for a new microwave oven. Litton claims that this higher frequency (most ovens operate at 2.45 GHz), does a better job of browning meat and heating small amounts of food.

Neighboring spectrum space in the 10 GHz region is allocated to police radar, radioastronomy, and point-to-point radio services.

Other companies that have filed for experimental licenses for DEMS-type systems are Digital Communications Corporation and Federal Express. The Commission is reserving some spectrum space for small companies.

The decision will be published in the *Federal Register* within a few weeks. A final rule for the DTS, first proposed in August 1979, will appear as an appendix to the FCC decision.

Federal Trade Commission

The FTC banned Litton ads that claim its microwave ovens are preferred by independent service technicians. The January decision upholds last year's findings of an Administrative Law Judge that the company's surveys of technicians were biased and misleading. The Commission also provided some guidelines for properly using surveys in advertising.

The ads, which ran from 1976 to 1978 in more than 100 national and local newspapers and magazines, stated that technicians chose Litton ovens over other brands. For example, copy placed in a November 1976 issue of *Newsweek* declared: "Quality is No. 1 at Litton! 76% of the independent microwave oven service techicians surveyed recommend Litton." Only authorized Litton service agents were interviewed, however.

The Commission's Opinion is available from the Public Reference Branch, Room 130, FTC, 6th Street and Pennsylvania Avenue, NW, Washington, DC 20580, (202) 523-3598.

National Highway Traffic Safety Administration

NHTSA has proposed performance standards for speed measuring radar devices used by the police (46 *Federal Register* 2097, January 8, 1981).

The standards, developed for NHTSA by the National Bureau of Standards, specify performance requirements for transmission frequency, frequency stability, input current stability, output power stability, and the width of the antenna beam. Each device would have to be free of erroneous signals in the presence of CB and police radio signals and other interfering sources.

According to the NHTSA notice, the standards are designed to diminish litigation over the devices' reliability and accuracy.

For further information contact: Ronald Engle, Enforcement and Emergency Services Division, NHTSA, 400 Seventh Street, SW, Washington DC 20590, (202) 472-4913.

National Institute for Occupational Safety and Health

NIOSH received 81 responses to its RFQ for two television scripts on the risks associated with VDT's. Rather than evaluate all those submissions, NIOSH withdrew the proposal. According to Ray Sinclair of NIOSH's Division of Training and Manpower Development in Cincinnati, the writing will now be done in-house, with a little help paid for on a purchase order basis. The TV shows are due to be completed by October 1, 1981.

National Telecommunications and Information Administration

The Electromagnetic Radiation Management Advisory Council (ERMAC) has postponed its February meeting. One reason for the delay is that the advisory committee's charter, which ran out last December, must be renewed before a meeting can be announced, according to Janet Healer, ERMAC member and NTIA Program Manager for non-ionizing radiation. It is not clear when the paperwork will be completed and the meeting scheduled.

On another front, the hiring freeze instituted by the Reagan administration has put a hold on the hiring of a replacement for Bob Frazier, ERMAC's ex-Executive Secretary, who resigned last year to go work for the Federal Aviation Administration.

ERMAC is assembling all the documents on the irradiaton of the US embassy in Moscow released at the last ERMAC meeting (see *Microwave News*, January 1981) together with the ERMAC recommendations. They will be published as a NTIA report.

Navy

The Naval Surface Weapons Center in Dahlgren, Virginia is seeking better ways to monitor electromagnetic fields aboard ship. Specifically, the Center is soliciting information on ways to (a) measure the E-component of the incident field from all directions and polizarizations; (b) measure the H-field component at low frequencies; and (c) measure equivalent power densities for 10 uW/cm^2 to 200 mW/cm^2 in the frequency range 300 kHz to 40 GHz. *Commerce Business Daily,* December 24, 1980 and repeated January 21, 1981.

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The Naval Surface Weapons Center in Silver Spring, Maryland may decide to develop a lightweight, expendable S-band, RF transmitter no bigger than 5 inches in diameter and 40 inches in length and weighing no more than 40 pounds. The transmitter would produce at least 25 kW pulsed peak power at about 800 pulses per second and a 3 microsecond pulse width with a 0.0024 duty cycle. The transmitter would be able to survive a 200 G rocket launch.

AROUND THE COUNTRY

NY State Transmission Lines Study

This year the New York State Department of Health (NYSDOH) will begin a 5-year, $5 million contractual study on the human health effects of electromagnetic radiation from overhead transmission lines.

All program decisions will be made by an administrating Board composed of the Commissioner of NYSDOH, and the Chairmen of the Power Authority of the State of New York, (PASNY) and of the Public Service Commission (PSC). An advisory Panel of experts chosen by the Board will determine areas of needed research, review and recommend applications for research contracts, evaluate the progress of funded projects, and write an annual report. At the end of the funding period, currently scheduled for no later than July 1987, the Panel will prepare a summary report for the Board.

The tentative selections for the Panel, as of the end of January, were:

Ernest N. Albert, Ph.D., Professor of Anatomy, The George Washington University Medical Center

Antony C. Fraser-Smith, Ph.D., Senior Research Associate, Stanford Electronics Laboratories

Alan J. Grodzinsky, Sc.D., Associate Professor of Electrical and Bioengineering, Massachusetts Institute of Technology

Michael Marron, Ph.D., Professor of Chemistry, University of Wisconsin Parkside

Alice O. Martin, Ph.D., Assistant Professor of Obstetrics and Gynecology, Prentice Women's Hospital

Michael A. Persinger, Ph.D., Professor of Psychology, Laurentian University

Michael L. Shelanski, M.D., Ph.D., Professor and Chairman, Dept. of Pharmacology, New York University Medical Center

Arthur C. Upton, M.D., Professor and Chairman, Dept. of Environmental Medicine, New York University Medical Center

Edward R. Wolpow, M.D., Assistant Clinical Professor of Neurology, Harvard Medical School

Dr. Maria Reichmanis, a research physicist at the VA Medical Center in Syracuse, NY, has been hired as the study's Scientific Research Coordinator.

Because Panel selection has taken longer than anticipated, the initial schedule for getting the study underway has been pushed back three months. A request for proposals will be issued by April 1 and funded research projects should begin by October 1. These dates may be revised when the Panel sets the final timetable.

The RFP will be available from Administrator, Overhead Transmission Lines Project, NYSDOH, Division of Laboratories and Research, Empire State Plaza, Albany, NY 12201. Update information on the project will be provided by Dr. David Carpenter, the Executive Secretary and non-voting member of the Panel, NYSDOH, Empire State Plaza, Albany, NY 12201.

REPORTS

RECENTLY RECEIVED

BRH

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C.M. Rush, *et al.*, *Impact of SPS Heating on VLF, LF, and MF Telecommunications Systems Ascertained by Experimental Means*, Department of Commerce, April 1980, No. NTIA-R-80-37.

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IARC Finds ELF EMFs Are Possible Human Carcinogens

A working group assembled by the International Agency for Research on Cancer (IARC) has unanimously concluded that power-frequency magnetic fields are possible human carcinogens. This finding, announced on June 27 in Lyon, France, is based on the consistent association between childhood leukemia and residential exposure to extremely-low-frequency electromagnetic fields (ELF EMFs).

The makeup of the IARC panel spanned all sides of the EMF controversy

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— from those who openly believe that EMFs promote cancer to industry consultants who are skeptical of any such connection. "We all agreed," said Dr. Larry Anderson. EMFs have now been formally designated "2B Possible Carcinogens." (For a list of the members of the working group and their affiliations, and examples of each type of IARC carcinogens, see p.2.)

"There was a unanimous feeling about it," said Dr. Jan Stolwijk. Dr. Maria

(continued on p.2)

Germans Withdraw Mobile Phone Effect on Blood Pressure

A German neurologist has withdrawn a report stating that mobile phone radiation can raise the blood pressure of the phone user. "The original result had nothing to do with electromagnetic fields," Dr. Stefan Braune told *Microwave News*.

In a research letter published in the June 20, 1998, issue of the *Lancet*, Braune and coworkers at the University Neurological Clinic in Freiburg and at Deutsche Telekom announced that digital signals from a GSM phone could significantly increase the blood pressure of healthy human volunteers (see *MWN*, J/A98). The effect was reported in newspapers around the world.

"There is no evidence that EMFs can influence the central nervous system, blood vessels or any other structure," Braune said in an interview this July. He said that he has repeated the experiment and found the same change in blood pressure, but he now believes that the effect is due to the subjects' physical change in position during the experiment, not to some external stimulus.

A manuscript with his new experimental findings and a reinterpretation of the old data has been submitted for publication and is currently under review.

(continued on p.12)

Stuchly, who remains unconvinced that magnetic fields are responsible for promoting leukemia in children, nevertheless joined the others in voting for the 2B designation. "The epidemiological data are there and it is hard to dismiss them," she said.

Dr. Vincent DelPizzo believes that the cancer evidence is stronger than do any of the other panelists. He cast the only vote that there is "sufficient" human evidence for childhood leukemia, which implies that EMFs are *known* human carcinogens. "I am sure that the childhood leukemia finding cannot be attributed to chance, bias or confounding," he said. (See table below for definitions of "sufficient," "limited" and "inadequate"; for more on DelPizzo's views, see p.5.)

The IARC decision follows similar reviews by panels in the U.S. and the U.K. In 1998, a working group of the National Institute of Environmental Health Sciences (NIEHS), using the same IARC criteria, also classified EMFs as 2B possible human carcinogens, a view that NIEHS Director Kenneth Olden later endorsed in his report to Congress (see *MWN,* J/A98 and J/A99). Earlier this year, an advisory committee to the U.K. National Radiological Protection Board chaired by Sir Richard Doll, also acknowledged the possible link between EMFs and cancer (see *MWN,* M/A01).

The childhood leukemia studies have had a major impact on all of these prior assessments. The Doll report was heavily influenced by the two recent pooled analyses: one led by Dr. Anders Ahlbom and the other by Dr. Sander Greenland (see *MWN,* S/O 99 and S/O00). The IARC panel was similarly swayed, according to both Stolwijk and Dr. Elizabeth Hatch. "The Ahlbom analysis was found to be most impressive," noted Stolwijk.

Much more surprising was the IARC panel members' view of the animal data. They came close to finding "limited" support for a cancer association based on the animal exposure experiments. Seven members voted that there was "limited" evidence of a cancer risk, with 12 voting that the evidence was "insufficient" to back up that designation.

On one side, Dr. Christopher Portier argued that an increase in C-cell thyroid cancers observed in a series of two-year bioassays of male rats could not be dismissed. On the other side, Dr. David McCormick, who ran the bioassays for the National Toxicology Program (NTP) — a program that Portier now helps administer — finds these data less than convincing.

"When we have one finding in one sex of one species, it is likely to be spurious," McCormick said. He stressed that there was no suggestion of cancer in mice or female rats. "My interpretation is that the animal work is negative."

IARC Panel and Observers

MEMBERS: **Larry Anderson**, Battelle Pacific Northwest National Laboratory, Richland, WA; **William Bailey**, Exponent, New York City; **Carl Blackman**, Environmental Protection Agency (EPA), Research Triangle Park, NC; **Nick Day**, University of Cambridge, U.K.; **Vincent DelPizzo**, California EMF Program, Oakland; **Pascal Guénel**, National Hospital, Saint-Maurice, France; **Elizabeth Hatch**, Boston University School of Public Health; **Jukka Juutilainen**, University of Kuopio, Finland; **Leeka Kheifets**, EPRI, Palo Alto, CA; **Abraham Liboff**, Oakland University, Rochester, MI; **David McCormick**, IIT Research Institute, Chicago; **Meike Mevissen**, University of Bern, Switzerland; **Kjell Hansson Mild**, National Institute for Working Life, Umeå, Sweden; **Junji Miyakoshi**, Kyoto University, Japan; **Jørgen Olsen**, Danish Cancer Society, Copenhagen, Denmark; **Christopher Portier**, National Institute of Environmental Health Sciences, Research Triangle Park; **Richard Saunders**, National Radiological Protection Board, Chilton, U.K.; **Joachim Schüz**, University of Mainz, Germany; **Jan Stolwijk**, Yale University School of Medicine, New Haven, CT; **Maria Stuchly**, University of Victoria, Canada; and **Bernard Veyret**, University of Bordeaux, France. **OBSERVERS** *(nonvoting)*: **Norbert Hankin**, EPA, Washington; **Michael Repacholi**, World Health Organization, Geneva, Switzerland; Dr. **Morando Soffritti**, Ramazzini Foundation, Bologna, Italy; and Dr. **John Swanson**, National Grid Co., Leatherhead, U.K.

IARC Carcinogens: Definitions and Examples

Category	Evidence*	Chemical and physical agents
1: CARCINOGEN	Sufficient† in humans	Asbestos, benzene, dioxin, hepatitis C virus, radon, vinyl chloride. Total number of agents: 87.
2A: PROBABLE CARCINOGEN	Limited‡ in humans and sufficient in animals	Benzo[a]pyrene, formaldehyde, PCBs, ultraviolet (A,B&C) radiation. Total number of agents: 63.
2B: POSSIBLE CARCINOGEN	Limited‡ in humans and less than sufficient in animals	Carbon tetrachloride, chloroform, coffee, DDT, ELF EMFs, lead, PBBs. Total number of agents: 236.
3: UNCLASSIFIABLE	Inadequate§ in humans and limited‡ or inadequate in animals	Coal dust, fluorescent lighting, mercury, parathion, phenol, saccharin, tea, xylene. Total number of agents: 483.
4: PROBABLE NONCARCINOGEN	Suggests lack of carcinogenicity in humans	Caprolactam (only one).

*Primary criteria; for full definitions, see: <http://193.51.164.11/Monoeval/Eval.html>.

†Defined as: A positive relationship has been observed and chance, bias and confounding can be ruled out with reasonable confidence.

‡Defined as: A positive relationship has been observed, but chance, bias and confounding cannot be ruled out.

§Defined as: Available studies are of insufficient quality, consistency or statistical power, or no data on carcinogenicity in humans are available.

Sources: For lists of agents in each category: <http://193.51.164.11/monoeval/crthall.html>. For more on IARC, see: <www.iarc.fr>; also *MWN,* J/A98.

IARC's Main Conclusions on EMFs

A working group of 21 scientific experts from ten countries met in Lyon to evaluate possible carcinogenic hazards to human beings from exposures to static and extremely-low-frequency (ELF) electric and magnetic fields. This volume is the first in a planned series of two IARC Monograph volumes on various kinds of non-ionizing radiation in the frequency range below that of visible light.

ELF magnetic field exposures result from proximity to electric power transmission lines, household wiring and electric appliances and are in addition to the exposure that results from the earth's magnetic field. Magnetic fields are measured in units of microTesla (∝T); the earth's static magnetic field varies from 25 ∝T at the equator to 65 ∝T at the poles.

Since the first report suggesting an association between residential electric and magnetic fields and childhood cancer, notably leukemia, was published in 1979, dozens of studies have examined this association. Overall, for the vast majority of children who are exposed to residential ELF magnetic fields less than 0.4 ∝T, there is little evidence of any increased risk for leukemia. There is no evidence that electric fields are associated with childhood leukemia, and there is no consistent relationship between childhood brain tumors or other childhood solid tumors and residential ELF electric and magnetic fields. However, pooled analyses of data from a number of well-conducted studies show a fairly consistent statistical association between childhood leukemia and power-frequency residential magnetic field strengths above 0.4 ∝T, with an approximately twofold increase in risk. This is unlikely to be due to chance, but may be affected by selection bias. Therefore this association between childhood leukemia and high residential magnetic field strengths was judged limited evidence for excess cancer risk in exposed humans.

There is no consistent evidence that residential or occupational exposures of adults are related to excess risks of cancer at any site, although in one Swedish study combined residential and occupational exposures were associated with a significantly increased risk for all leukemia subtypes except chronic lymphocytic leukemia. Evidence for excess cancer risks of all other kinds, in children and in adults, as a result of exposure to ELF electric and magnetic fields was considered inadequate.

Numerous studies to investigate carcinogenicity of magnetic fields have been conducted in experimental animals. These have included long-term bioassays of exposures to magnetic fields alone, and exposures of rats and mice to magnetic fields in combination with known carcinogens. Bioassays of magnetic fields alone generally were negative, although one study that was conducted in both mice and rats of both sexes showed non-exposure related increases in thyroid C-cell tumors in male rats only. Multistage carcinogenesis studies showed no consistent enhancement of chemically initiated mammary tumors in rats or of skin tumors in mice. Magnetic fields had no effects on the incidence of chemically initiated liver tumors in rats or of leukemia/lymphoma in mice or rats. Overall, evidence for carcinogenicity of ELF magnetic fields in experimental animals was judged inadequate. No data on carcinogenicity to animals of static magnetic fields, or of static or ELF electric fields, were available to the working group.

Although many hypotheses have been put forward to explain possible carcinogenic effects of ELF electric or magnetic fields, no scientific explanation for carcinogenicity of these fields has been established.

Overall, ELF magnetic fields were evaluated as possibly carcinogenic to humans (Group 2B), based on the statistical association of higher-level residential ELF magnetic fields and increased risk for childhood leukemia. Static magnetic fields and static and ELF electric fields could not be classified as to carcinogenicity to humans (Group 3).

"My personal conclusion is that the C-cell cancers are not a random observation," countered Portier. The NTP study found that male rats had significantly higher rates of C-cell thyroid cancer at two different dose levels (20 mG and 2 G), and at a third level (10 G), the increase was just short of significance (p=0.055) (see *MWN,* M/A98).

The IARC vote on the animal data stands in sharp contrast to that of the NIEHS working group three years ago. Both based their evaluations on essentially the same experiments, yet not one of the 30 NIEHS panel members voted for "limited" evidence of carcinogenicity in animals. Indeed, eight voted that they believed there was a *lack* of an effect, with five of them filing a minority statement that any suggestion of an effect on animals was totally insupportable.

When the NTP bioassay results were first announced, they were seen as somewhat suspect because the experiments were the first to use a new animal diet. Some reviewers claimed that the rate of thyroid cancer in the control rats was unnaturally low and that if it had been higher, the excess in the exposed animals would disappear.

"There are now enough historical data to show that the EMF increases were clearly not a random fluke," Portier said. He explained that over the last three years, ten other bioassays have been completed with the new diet, and the thyroid cancer rates among the controls have been consistent with those in the original series of EMF experiments.

Somewhat surprisingly, there was much less discussion of the German breast cancer studies carried out at the School of Veterinary Medicine in Hannover by Drs. Wolfgang Löscher and Meike Mevissen. "We agreed to disagree on the significance of the mammary cancer data," said Mevissen. She explained that there was a consensus that both her studies and those by Anderson at Battelle were well done and that there was no simple explanation for the different results (see *MWN,* M/A98 and S/O99).

Reactions and Responses

There have been few public responses to the IARC decision by U.S. government agencies. "The regulatory agencies have to decide what to do about the risks," said NIEHS' Portier. "It's time for the public policy debate."

If so, it will probably get under way at the Environmental Protection Agency (EPA). The agency's Norbert Hankin, who was an observer in Lyon, said that the IARC decision is getting a lot of attention at the EPA. "It's not something the agency can ignore," he said.

Because the IARC decision received little press attention, public reaction was muted. "I was surprised that we did not get any calls on it," said Rick Loughery, director of environmental affairs at the Edison Electric Institute in Washington. He noted that, "EMFs are no longer the hot national public policy issue they were from the late 1980s through the mid-1990s. The issue has been pushed back onto the local level."

The World Health Organization's (WHO) EMF project is working on revising its fact sheet. "All options are being discussed," said WHO's Dr. Michael Repacholi, who was also in Lyon as an observer. A draft will be sent out for review; he expects to release it by the end of August.

In a statement to its members, EPRI in Palo Alto, CA, noted that the IARC panel's conclusions "will help guide the selection of topics for research priorities." The utility group added that, "EPRI work in relevant areas is being planned or is already under way." This analysis was signed by Dr. Leeka Kheifets, an IARC panel member, in one of her last acts before moving to Geneva to work for Repacholi at the EMF project.

A number of observers in Australia and New Zealand said that they were not surprised by the IARC decision. Keith Orchison, the managing director of the Electricity Supply Association of Australia (ESAA), with headquarters in Sydney, commented that the IARC classification is "not new" and is "consistent with the findings of other major scientific reviews." The ESAA was one of the very few organizations anywhere in the world to issue a public comment on the IARC decision.

In a widely circulated e-mail, Dr. Andrew McEwan, the scientific director of New Zealand's National Radiation Laboratory in Christchurch, advised that the "classification is not unexpected." He went on to note that, "The associations are very weak, and the fact that there is no support from laboratory studies to suggest that ELF fields are in any way involved with cancer weighs aginst the possibility that it is a carcinogen."

The report of the IARC EMF panel will appear as volume 80 of its monograph series on cancer risks next spring, according to IARC's Dr. Robert Baan. For more information, go to <monographs.iarc.fr>.

Liboff: A More Sophisticated View of EMFs Is Needed

On his return from Lyon, Dr. Abraham Liboff of Oakland University, a member of the IARC review panel, offered the following perspective on the panel's deliberations. Liboff is a coeditor of the forthcoming journal Electromagnetic Biology and Medicine *(see p.11)*.

There are a number of reasons to welcome the new IARC designation that recognizes ELF magnetic fields as a possible agent for childhood leukemia. This is certainly not a revelation that comes out of the blue, the question having first been raised some 22 years ago. Nevertheless, IARC is a highly respected organization whose conclusions are important to the media and to regulatory bodies.

As a participant in the process that led to this decision, I was greatly impressed by the leadership of Dr. Jerry Rice and his staff at IARC. It is not easy to keep 20 or so highly opinionated experts on track, to be firm about the deadline yet fair in hearing all sides.

It is ironic that the IARC decision is in part based on data contained in the 1997 report by Linet et al. [see *MWN,* J/A97], arguably the most important single coffin nail in the subsequent cessation of federal funding in this area. To reach its conclusion, IARC relied on a pooled analysis [*see MWN,* S/O00] that included the Linet data. It will be interesting to see whether the mainstream media, which acted in lockstep at the time to (incorrectly) declare that the Linet study "proved" that there was no association between power line magnetic fields and childhood leukemia, will now act to correctly report the facts, namely that the Linet study instead provides evidence for an association for 60 Hz mean residential magnetic fields at levels of 0.4 ∝T [4 mG] and above.

The IARC decision again illuminates one disturbing aspect of the question of electromagnetism and cancer that the scientific community has recognized over the years but has not been able to come to grips with. This is the catch-22 problem related to the disconnect between epidemiologist and laboratory scientist. On the one hand, the ultimate verdict concerning EMFs and cancer must come out of epidemiology. On the other hand, there will continue to be limited progress in untangling this question if the epidemiologist fails to heed the clues that arise in the laboratory. From what I observed at IARC, it is clear that some epidemiologists still regard EMFs as merely one more physical agent, different only in name from hazardous chemicals or ionizing radiation. Accordingly, they continue to stick with the traditional paradigm that "more is worse." But, contrary to this view, experimental evidence continues to build showing that ELF magnetic fields can interact in decidedly nonlinear ways with tissue. (Again, this is hardly new information, having first been reported by Adey's group in the mid-1970s.) Many epidemiologists are unaware (or even worse, dismissive) of those reports indicating ELF "windows" or "resonances," a fact reflecting a general lack of awareness as to the extra interactive possibilities attached to EMFs.

This lack of sophistication concerning EMF interactions was fully evident in the IARC deliberations. Consider the fact that no special mention was made of two reports that are very well known to the bioelectromagnetics community — Harland and Liburdy[1] and the replicate study by Blackman et al.[2] — both of which bear directly on the key question as to whether very weak ELF magnetic fields are implicated in breast cancer. Even though these studies were particularly relevant to the issue of residential magnetic fields, they were indiscriminately grouped with other ELF experiments whose results reflected widely different types of exposure conditions. It is little wonder, therefore, that the laboratory evidence, as a whole, was classified as "inconsistent," leaving the unwarranted impression that no clear conclusion was possible.

A more sophisticated reading of such pertinent experiments might not have changed the overall verdict from "possible" to "probable" human carcinogen, but it would have better served the public in conveying a more complete picture as to the potential hazards connected to ELF magnetic fields.

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1) J. Harland and R. Liburdy, "Environmental Magnetic Fields Inhibit the Antiproliferative Action of Tamoxifen and Melatonin in a Human Breast Cancer Cell Line," *Bioelectromagnetics, 18,* pp.555-562, 1997.

2) C. Blackman, S. Benane and D. House, "The Influence of 1.2 ∝T, 60 Hz Magnetic Fields on Melatonin- and Tamoxifen-Induced Inhibition of MCF-7 Cell Growth, *Bioelectromagnetics, 22,* pp.122-128, 2001.

California Report: EMFs Likely Cause of Cancers, Miscarriages

Power-frequency EMFs are more likely than not to cause childhood leukemia and adult brain cancer, according to three researchers at the California EMF Program. Drs. Raymond Neutra, Vincent DelPizzo and Geraldine Lee also consider it likely that EMFs cause miscarriages, in which case, they estimate, magnetic fields would account for as much as 40% of all spontaneous abortions.

Amyotrophic lateral sclerosis (ALS) is another probable EMF effect, the researchers believe. EMFs may also be responsible for a number of other illnesses — but these outcomes are less likely (see box at right).

In an accompanying analysis of policy options, they conclude that some "inexpensive" measures to reduce exposures could be justified on cost-benefit grounds even if EMFs are responsible for "only a few percent of the annual background California deaths." Such mitigation measures, including restringing power lines and changing wiring in homes and schools, would cost an estimated $480 million if implemented in California.

In an interview with *Microwave News,* Neutra cautioned that the state's Department of Health Services (DHS), which oversees the EMF program, "has decided not to make any policy recommendations at this time." Rather, it is opting "just to present the possible implications of the research."

Neutra is the director of the $7 million EMF research effort, authorized by the state Public Utilities Commission in 1993 (see *MWN,* N/D93). DelPizzo became the research director in 1995, and Lee has run its educational and technical assistance work, and led an epidemiological study on miscarriages (see p.18).

The draft report and policy analysis were made available for public comment on July 13, more than two months after the PUC blocked their planned release on May 7 (see *MWN,* M/J01).

In the next few months, Neutra said, the documents will be revised to incorporate public comments and suggestions from the program's scientific advisory panel, after which they will be submitted to the director of the DHS for approval, "probably sometime early next year." At that point, the DHS could issue the risk evaluation as an official report. But until it does so, he stressed, "This is the best judgment of three people who have been immersed in this issue for more than ten years."

The report's estimates of the chances of various health effects are based on the individual opinions of Neutra, DelPizzo and Lee. They are presented anonymously, but with enough clues to determine who is who. Neutra later confirmed their identities and said that the probabilities will be directly attributed to the individuals in future drafts. "We wanted to depersonalize it," he said.

For some outcomes, such as childhood leukemia, their estimates of causality were quite different, while for others, such as ALS, the range was tight. DelPizzo's estimates are well above Lee's and Neutra's for several outcomes, and include two that are close to 100 (see table at left). "If environmental EMFs have enough energy to promote childhood leukemia, it follows that other effects are more credible," DelPizzo explained in an interview.

The California researchers note that, using IARC criteria, they would classify EMFs somewhere betweeen "2B: possible" and "1: human carcinogen" for childhood and adult leukemia (see p.1). They would classify adult brain cancer, miscarriages and ALS as possible (2B) risks.

One of the team's most striking estimates is that up to 40% of miscarriages may be caused by EMFs. "This is potentially of great public health importance," Lee told *Microwave News*. "But this is a first-cut estimate and we need to learn a lot more before we can use this in making policy," said Lee, who is now with the pharmaceutical firm AstraZeneca (see p.17).

Overall, the three researchers contend that the other health

California EMF Program: Assessment of Health Risks

- It is *more than 50% possible* that EMFs at home or at work could cause a very small increased lifetime risk of childhood leukemia, adult brain cancer and ALS.
- It is *more than 50% possible* that EMFs at home or at work could cause a 5-10% added risk of miscarriage.
- It is *10-50% possible* that residential or occupational EMFs could be responsible for a small increased lifetime risk of male breast cancer, childhood brain cancer, suicide, Alzheimer's disease or sudden cardiac death.
- It is *very unlikely (2-10%) but not impossible* that residential or occupational EMFs could be responsible for even a small fraction of birth defects, low birth weight, neonatal deaths or cancer generally.
- It is at least *10-50% possible* that residential or occupational EMFs could be responsible for a small increased lifetime risk of adult leukemia or female breast cancer, and one [researcher] gave a degree of confidence that was higher.

Estimates of "Degree of Confidence"

The risk estimates reported above are the consensus opinions of three DHS scientists. The table below presents the individual researchers' estimates on which the consensus figures are based.



Reviewer #2: Dr. Raymond Neutra

Outcome	Confidence of causality (%)		
	Dr. Vincent DelPizzo (#1)	Dr. Raymond Neutra (#2)	Dr. Geraldine Lee (#3)
Childhood leukemia	99	55	75
Adult leukemia	85	52	40
Childhood brain cancer	45	11	20
Adult brain cancer	98	52	70
Female breast cancer	51	11	15
Male breast cancer	45	40	20
Miscarriage	80	52	65
ALS (Lou Gehrig's disease)	60	60	55
Alzheimer's disease	40	20	15

risks attributable to EMF exposures are "extremely small," so that "the vast majority of highly exposed individuals (95-99.9%)" would not develop cancer or ALS as a result.

In California, they write, approximately four children would die from leukemia resulting from EMF exposures each year, and 24,000 pregnancies would end in miscarriages. No estimates are given for EMF-related deaths from adult brain cancer or ALS.

Neutra will chair a session on the report at the ISEE conference in Germany on September 4 (see p.13) and present his team's findings at the annual meeting of the Society for Risk Analysis in Seattle, December 2-5.

The full text of *An Evaluation of the Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring, Electrical Occupations and Appliances* is available on the program's Web site, <www.dhs.ca.gov/ehib/emf>, along with *Policy Options in the Face of Possible Risk from Power Frequency EMFs*. Print copies are available from the City Copy Center in Oakland; call (510) 763-0193 for information on the price and delivery cost. The deadline for comments is September 10. The EMF program will hold a public workshop in Sacramento on August 16 and in Los Angeles on August 21 to answer questions. There will also be a "telephone workshop" on August 22 from 1 pm to 4 pm. Call (510) 622-4434 for details on how to participate.

HIGHLIGHTS

« Wireless Notes »

On July 23, Chicago Judge **Stephen Schiller** gave his blessing to a tentative settlement between **George Carlo**'s WTR and the attorneys for the class of cell phone users in the long-running ***Busse vs. Motorola et al.*** "human experimentation" lawsuit (see *MWN,* J/F96, N/D97, M/A99 and J/A00)*.* Over the objections of Motorola and the other defendants, which include the **CTIA** and Epidemiology Resources Inc. (**ERI**), Carlo and his Science and Public Policy Institute will receive $250,000 to set up a registry of adverse health effects among users of cell phones who wish to voluntarily report "maladies," such as brain tumors and leukemia. The volunteer nature of the registry is key because the *Busse* litigation centers on the claim that ERI, in the course of doing an epidemiological study for WTR and CTIA, collected information without the informed consent of the phone users. Carlo will also now get access to a $150,000 fund to cover any future legal expenses. The money will be paid by WTR's insurance company, which wants to settle. It has already spent $600,000 of the $2 million policy defending Carlo, leaving $1.4 million to be split between Carlo and the plaintiffs' lawyers at **Barnow & Goldberg**. A proposal to make Carlo's book on cell phone health risks available at half-price was rejected by the judge. Ben Barnow and Alan Goldberg told *Microwave News* that even if they are awarded the close to $1 million left after Carlo gets his $400,000, they will not have recouped the investment they made over the last six years of litigation. Objections to the proposed settlement must be filed by September 26. Schiller will hold a "settlement fairness hearing" on November 13, when the court will also consider Barnow & Goldberg's petition for legal fees. The text of the draft settlement appeared in *USA Today* on July 26 and is on the Web at <www.bussewtrsettlement.com>. (See also p.19.)

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Telecommunications towers are becoming targets of political protest, leading to violent confrontations. On July 4, an elected representative in **Cyprus** was arrested on a British military base on the island for storming a radio tower that is being built for intelligence gathering. He climbed onto the 190-meter structure and stayed there for several hours. In the rioting sparked by his arrest, dozens of automobiles were destroyed and a police station was ransacked. According to the July 14 *Irish Times,* the Cypriot legislature later unanimously adopted a resolution that work on the tower be halted in view of "serious concern" about health risks of radiation. On July 14, in **Scotland**, a "gang" knocked down a mobile phone base station near Port Glasgow that had been opposed by people living nearby, the BBC reported (July 16). The attack, which took place in the middle of the night, caused £25,000 (approximately US$35,000) in damage, according to the wireless carrier Orange. Starting in late July, mobile phone towers in Scotland will be subject to full planning control.

German Radiation Official: Kids Should Not Use Phones

The head of the Federal Radiation Protection Office in Germany says that children should not use mobile phones and recommends that others minimize their use.

"Parents should keep their children away from this technology as much as possible," Wolfram König told the *Berliner Zeitung* (July 31). While there is no evidence of harmful effects, he said, questions about health "urgently" need to be answered (see p.10).

König, a member of Germany's Green Party, called for restrictions on base station antennas near kindergartens, schools and hospitals. He also suggested labeling phones with SAR information, echoing a recent proposal from the German environment ministry.

At the end of last year, the German Academy of Pediatrics made a similar recommendation, as did the British Medical Association this spring (see *MWN,* J/F01 and M/J01). The U.K.'s Stewart panel was the first to call for limiting children's use of phones, in May 2000 (see *MWN,* M/J00).

Last year, anger over cellular towers near Haifa, **Israel**, prompted local residents to hurl rocks at Motorola maintenance workers (see *MWN,* M/A00).

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Sen. **Joe Lieberman** (D-CT) and Rep. **Ed Markey** (D-MA) have asked the General Accounting Office (**GAO**) to continue to watch over how the federal government deals with the potential health risks posed by mobile phones. After the GAO report was released in May, the two legislators wrote to the FCC, FDA and NIH urging them to implement GAO's "sensible" recommendations "expeditiously" (see *MWN,* M/J01). The agencies replied — in very general terms — that they would continue their efforts. But Lieberman and Markey are not satisfied. In a July 30 letter, they asked the GAO to monitor the agencies' progress. The responses "raise our concern that the recommendations made by the GAO have not yet been fully addressed and will require some follow-up," they wrote. (On July 20, the **FDA** posted a revised *Consumer Update on Wireless Phones* on its Web site, <www.fda.gov/cdrh/ocd/mobilphone.html>; it is little changed from previous editions.)

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The siting of cellular towers in the U.S. is decided at the local level on a case-by-case basis because the **FCC** usually grants automatic approval. Now, two large environmental groups want the FCC to look at the overall impact of the towers. It is "beyond dispute" that telecom towers "create significant environmental impacts at the local, regional and national level," state the **Friends of the Earth** (FOE) and the **Forest Conservation Council** in a series of petitions they have filed since March. The petitions call for a programmatic environmental impact statement (EIS) "addressing the direct, indirect and cumulative impacts" of the FCC's tower-siting policies. In addition to effects on wildlife and water quality, the groups want the FCC to assess "adverse public health and safety concerns resulting from increased human exposure to RF radiation." Brian Dunkiel of FOE in Burlington, VT, told *Microwave News* that the legal arguments may be stronger for a review of effects on wildlife but insisted that his organization places equal emphasis on health. (FOE Scotland has long advocated stricter controls on the placement of cellular towers; see p.6 and *MWN,* M/J99.) To put pressure on the FCC, the forest council and FOE are also challenging more than 30 separate tower applications, which, they contend, provide "entirely inadequate" information on potential environmental effects. The approval of the disputed towers is on hold, an FCC spokesperson said, while the commission decides how to respond to the groups' demands. John Talberth of the forest council explained that blocking specific applications is necessary because others who have asked the FCC to look into the environmental effects of telecom towers in general have been ignored. "This is the only way to get the FCC to pay attention," Talberth said in an interview from his office in Santa Fe, NM. He added that the forest council will continue to object to tower applications until the FCC responds. The commission has not been anxious to address this issue. In November 1999, Jamie Clark of the U.S. **Fish and Wildlife Service** asked the FCC to prepare an EIS, contending that tower construction had "almost no environmental oversight" on possible effects on migratory birds. The FCC turned her down.

Angelos's Experts in Mobile Phone–Brain Cancer Suit

Peter Angelos's law firm in Baltimore will call seven experts to testify on behalf of Dr. Chistopher Newman, who claims that his brain tumor was caused by mobile phone radiation (see *MWN* S/O00 and J/F01). The dates currently scheduled for their depositions are given in parentheses.

Dr. Neil Cherry EMF research (August 1-2)	Lincoln University Canterbury, New Zealand
Dr. John Conomy Neurology (August 16)	Health Systems Design Chagrin Falls, OH
Dr. Gunnar Heuser Neurology (August 20-21)	NeuroMed and NeuroTox Associates, Agoura Hills, CA
Dr. Henry Lai Biology (August 14-15)	University of Washington Seattle, WA
Dr. Andrew Marino Biology (July 20-21)	Louisiana State University Medical Center, Shreveport, LA
Dr. Jerry Phillips Biology (August 23-24)	Biological Sciences Curriculum Study, Colorado Springs, CO
Dr. Elihu Richter Epidemiology (August 8-9)	Hebrew University Jerusalem, Israel
Dr. Barry Singer Oncology (August 3-4)	Norristown, PA

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Opponents of federal tower-siting policies are gearing up for another legislative campaign. At a July 12 briefing in Washington, congressional staffers heard reports on public concerns about the proliferation of wireless antennas from **Janet Newton** of the EMR Network in Cabot, VT, **Deb Carney** of Golden, CO, and **Libby Kelley** of the Council on Wireless Technology Impacts in Novato, CA. Dr. **Theodore Litovitz** of the Catholic University of America presented an overview of RF/MW health effects research. In September, after Congress' summer recess, Rep. **Thomas Tancredo** (R-CO) will join the three members of the Vermont delegation in seeking to repeal the preemption clause of the 1996 Telecommunications Act. They will also move to protect local authority on digital television (DTV) antenna siting and to sponsor safety research. Vermont's Rep. **Bernie Sanders** (Ind) and Sens. **Patrick Leahy** (D) and **James Jeffords** (Ind) have mounted similar efforts in the past — all of which have failed (see *MWN,* N/D97, S/O98 and S/O99).

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In a lawsuit now before a federal judge in California, **Gibb Brower** of San Diego contends that radiation from his mobile phone caused his brain cancer. His attorney **Carl Hilliard** quietly filed the suit on April 19 to beat a statute of limitations deadline. In a revised complaint, filed on August 2, Hilliard points out that **Ericsson**, **Nokia** and **Motorola**, among others, have obtained a num-

ber of patents for phones designed to reduce radiation exposures. These patents have not been much of a secret (see *MWN,* N/D96 and S/O99), but Hilliard believes that they are indicative of the manufacturers' bad faith. "The patents speak for themselves. These folks have the ability to protect consumers from being radiated and they're unwilling to spend a couple of bucks to do so. It's outrageous," he told *RCR Wireless News* (June 4). The **British press**, never shy to play up the latest news pointing to the health dangers of mobile phones, quickly spread the word. MOBILE FIRMS PATENT CANCER SHIELDS ran the headline on the front page of the June 11 *Times*. The same day, the BBC quoted Nokia patent applications, filed in 1995 and 1998, which acknowledged that "uncertainty" about phone safety was affecting the "speed of growth" of the market. The companies sought to limit the PR damage. Motorola's patents "were not motivated by concerns about potential health issues," the company told the BBC. A Nokia spokesperson explained to a British television audience that, "A third of our employees are engaged in research and development and it is a natural course of business that they file for patents." Meanwhile, Hilliard is fighting a Motorola motion to move the Brower case to federal court.

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Radiation from mobile phone **towers** is being blamed for a variety of health problems in a lawsuit filed in Indiana state court on July 27. Attorney **John Hamilton** filed the complaint on behalf of four families whose homes in South Bend are near three towers owned by local telecom companies. The familes claim that the radiation has caused maladies ranging from sleep disturbances and memory loss to "multiple tumors" and a miscarriage. In addition to monetary damages, they want one of the towers to be removed and the radiation from the antennas to be reduced to background levels on each of their properties. The families also allege that the value of their homes has been diminished by "the public's growing concern" about possible health effects, and by the towers' unsightly appearance. Adverse impacts on property values have been alleged — with support from tax assessors — in litigation over phone towers in Illinois and Texas (see *MWN,* M/A99).

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Stealth aircraft can be detected with mobile phone **towers**, claims Roke Manor Research, a U.K. engineering firm in Romsey, west of London. Signals transmitted by towers and reflected by the flat undersides of the planes, which are invisible to conventional radar, can be picked up with an antenna array and a laptop, all from the back of a Land Rover. The location can be pinpointed within 10 meters, according to the June 11 *Daily Telegraph*. The U.S. military begs to differ. On July 2, *Aviation Week,* known for its access to Pentagon sources, reported that "U.S. Air Force specialists" predict the system would have a limited range and be plagued with false alarms. And even if the technology could perform as claimed, an official said, the Air Force could disable such location detection systems with a **directed-energy weapon** that produces a "squirt" of high-power microwaves from an air-launched cruise missile. So don't expect your hand-held phone to work if the country goes to war.

Proteomics: Finns Find RF Has Major Impact on Gene Expression

The gene research revolution may soon settle some very old arguments about the health effects of electromagnetic radiation.

In the first application of the powerful new techniques of proteomics to RF biological effects, Dr. Dariusz Leszczynski has found that relatively weak mobile phone radiation altered the production of numerous proteins in cultured human cells. About 15% of the proteins were affected, he said.

Leszczynski and his research group* are with the Finnish Radiation and Nuclear Safety Authority, known as STUK, in Helsinki.

"This is a pretty dramatic change," Leszczynski told *Microwave News* during a break at the Bioelectromagnetics Society's annual meeting in St. Paul, MN, in mid-June. "It suggests that a large number of systems are responding to a nonthermal radiation exposure."

The expression of nine genes was changed by 6- to 13-fold and that of some 20-30 other genes changed by a factor of two, Leszczynski said.

Leszczynski cautioned that "the physiological relevance of these changes is unknown" and that "we have repeated the experiment three times but we need to do it again three more times." But, he added, "I believe that the effects we see on the expression of proteins and also the fact that there was a threefold increase in protein phosphorylation are real responses to mobile phone radiation."

The Finnish research team exposed human endothelial cells, EA.hy926, for one hour to a 900 MHz GSM signal at an average SAR of 1.8-2.5 W/Kg and then compared the expression of 2,400 genes in exposed and sham cells.

The exposure system was built by Dr. Kari Jokela of STUK and later checked by Dr. Niels Kuster of IT'IS in Zurich. Leszczynski noted that with an average SAR of 2 W/Kg and a cooling system for the cell culture dishes, there is no temperature increase — at least on a macro-scale. While allowing that some heating cannot be excluded, Leszczynski believes that it would be very small and localized — as well as undetectable with present technology.

"I am convinced that the changes that we are observing are nonthermal effects of RF/MW radiation," he said.

The Finnish work is part of the REFLEX project, a set of *in vitro* experiments sponsored by the European Commission research program on mobile phones and health (see *MWN,* M/A00).

The ability to monitor changes in so many different genes simultaneously is a radical departure from past methods in which specific genes must be selected at the outset of the experiment. This genomic technique is a powerful new addition to the developing science of proteomics† — the systematic cataloguing and study of the proteins produced by the genes within a cell.

* Sakari Joenväärä, Jukka Reivinen, Pia Kontturi and Hanna Tammio.

"A lot of the past controversies will be put to rest using these new genetic techniques," commented Dr. Jerry Phillips, a staff biologist at the Biological Sciences Curriculum Study in Colorado Springs, CO. Phillips's own studies on gene expression, carried out in Dr. Ross Adey's lab in Loma Linda, CA, were part of the ongoing debate on the effects of power-frequency EMFs.

The most contentious of these EMF disputes concerned the work of Drs. Reba Goodman of Columbia University and Ann Henderson of Hunter College, both in New York City, which was challenged by Dr. Jeffrey Saffer of the Battelle labs in Richland, WA, and Adam Lacy-Hulbert of the U.K.'s University of Cambridge (see *MWN,* J/A94, J/F95 and M/J95). Both sides maintained their positions and the issue remains unresolved.

Now the U.K.'s EMF Biological Research Trust may break the deadlock. Last spring the trust, which is funded by the National Grid, requested proposals to use proteomics to shed light on possible mechanisms of interaction (see *Nature,* March 1).

In late July, Dr. John Male, the administrator of the trust in South Croydon, south of London, said that no funding decisions had yet been made.

†To learn more, see *The Promise of Proteomics: Leading the Way to 21st Century Medicine,* published earlier this year by the New York Academy of Sciences. A copy can be downloaded from <www.nyas.org>.

Latest Swedish Brain Tumor Study Points to Long-Term Risk

The longer one uses a mobile phone, the greater the risk of developing a brain tumor, according to the latest epidemiological analysis by Drs. Lennart Hardell and Kjell Hansson Mild of Örebro University in Sweden.

Hardell and Mild found a 26% increase in benign brain tumors among those who had used an analog phone for more than a year before diagnosis. The risk rose to 35% after five years and to 77% after ten years. All these estimates are statistically significant.

"The increasing risk with tumor induction period — or latency — and the number of hours of use are in agreement with carcinogenesis," Hardell told *Microwave News*. "These findings do certainly strengthen the result."

Mild agrees. "There is a consistency to our results," he said in an interview. Mild is also with the National Institute for Working Life in Umeå.

No increased risk was observed for hand-held digital phones. But Hardell and Mild point out that these phones have not been in use long enough for such risks to be ruled out. There was no excess risk associated with cordless phones that have a power output of 10 mW.

Of the 2,561 cases of brain tumors identified in four regions of Sweden, 540 had died and 35 were too sick to contact. Of the 1,617 patients included in the study, 88% of the cases and 91% of the controls completed the 21-page questionnaire.

There was also an increased risk of malignant tumors, Hardell said, but it was not significant. He pointed to a 40-60% split between malignant and benign brain tumors among the cases.

"We did not include the deceased because we did not think the relatives could give us good answers on the use of phones," Mild said, adding that they might analyze the data on those who had died in a separate, follow-up study.

This is the third mobile phone paper by Hardell and Mild and the first to point to a general increased incidence of brain tumors. Previously, they had shown that there is a greater chance of developing a tumor on the side of the head the phone was used (see *MWN,* M/J99 and M/J00).

The new study once again supports the hypothesis that there is a greater chance of developing a tumor on the side of the head where the phone is used. The risk is two-and-a-half times that of controls, a statistically significant increase. This is approximately the same level of risk as reported by the Örebro team last year.

The new study covers brain tumors that were diagnosed between 1997 and June 30, 2000. The earlier papers investigated tumors reported between 1994 and 1996.

Mild said that the new results, which he and Hardell first presented at a mobile phone conference in London on June 6, have been submitted to the *Lancet*.

Acoustic Neuromas and Cell Phones: Differing Results

The new Swedish study by Hardell and Mild found more than three times the expected number of acoustic neuromas, benign tumors of the eighth cranial nerve — it connects the brain to the inner ear.

But, soon afterwards, Dr. Joshua Muscat of the American Health Foundation in Valhalla, NY, announced that his study did not show a greater risk of this.

In a paper presented at the annual meeting of the Society for Epidemiologic Research in Toronto, June 13-16, Muscat said that among users of cell phones for three years or more the odds ratio for acoustic neuromas was 1.6, but with a confidence interval (CI) that was far short of significance (0.5-4.3). For those who had used mobile phones for less than three years, the risk was lower than expected.

"There is no real association with short-term exposures," Muscat told *Microwave News*. He said that he will soon submit these results for publication. Muscat's findings for brain tumors, which are part of the same cell phone study, were published in the *Journal of the American Medical Association* last December (see *MWN,* J/F01).

Hardell and Mild's odds ratio for acoustic neuromas is 3.27 (CI=1.67-6.43) — it increases to 3.50 (CI=0.73-16.9) for those who used a phone for ten years or more prior to diagnosis.

Mild noted that the first sign of an acoustic neuroma is hearing loss or tinnitus and that, "We found an excess of hearing loss in our study of subjective symptoms among mobile phone users" (see *MWN,* M/J98 and J/A00).

And Muscat pointed out that in his study the acoustic neuromas occurred more often on the side opposite the one used for the phone. But, he explained, this may be because hearing loss prompted moving the phone to the other ear.

Germany Eyes Precautionary RF/MW Limits for Cell Towers

Germany may soon follow Italy and Switzerland in adopting strict exposure limits for radiation from mobile phone base stations. The Green Party wing of the federal government wants tighter standards but is facing resistance from the wireless industry and radiation control officials.

"We want a change in philosophy — namely, to establish the precautionary principle in the area of EMFs," said Simone Probst, a deputy environment minister and Green Party member, at a June 21 conference on mobile phones and health. This change, Probst continued, entails keeping emissions from towers "as low as possible" in places where people spend time, supporting more research on health effects (see box at right) and making information on phone SARs more available to the public.

On July 1, the Federal Environment Ministry issued a press release confirming that it is "currently considering whether to adopt precautionary limits to supplement the existing guidelines," possibly based on the current Swiss standard. But the ministry stressed that, "Deliberations have not yet ended, decisions have not been made."

The wireless industry is already on record as opposing more stringent standards. Precautionary limits below those now in force are "not supported by science," contended T-Mobil, a Darmstadt-based wireless carrier that was formerly part of Deutsche Telekom, in a statement released in May (see *MWN,* M/J01).

The ministry noted that the Radiation Protection Commission (known by its German acronym, SSK), an expert panel that advises the government, will offer its own recommendations. The SSK's principal expert on non-ionizing radiation is Dr. Jürgen Bernhardt, who is also the current vice chair and a past chair of ICNIRP. Bernhardt declined a request for comment from *Microwave News,* but he is likely to oppose any change that would undermine the existing limits, which are based on ICNIRP's guidelines (see *MWN,* S/O97).

Although the environment ministry has stated that its decision will be based "in part" on the SSK's recommendations, their relations have been strained. The commission's chair, Dr. Maria Blettner, an epidemiologist at the University of Bielefeld, resigned in May because the ministry had ignored the SSK's advice, according to the newspaper *Tageszeitung* (June 11).

Some of Blettner's work has concerned the question of mobile phone safety (see *MWN,* N/D99), but according to the *Tageszeitung* (May 17) her break with the environment ministry was primarily over its insistence that depleted-uranium munitions used by NATO forces in the former Yugoslavia could pose a major health hazard. Blettner declined to comment.

Other members of the SSK may be open to lower limits. One panelist, Christian Küppers of the environmental advocacy group Öko-Institut in Darmstadt, told *Microwave News* that stricter limits based on the Swiss model "would be appropriate for Germany." But he noted that his group favors "protected areas" around hospitals, kindergartens and schools (see also p.14).

Others want still tougher limits. In a report prepared for T-Mobil, the Ecolog Institute in Hannover called for a 1 ∝W/cm^2 (2 V/m) maximum exposure level, citing evidence of potentially harmful effects at levels as low as 20 ∝W/cm^2 (8.7 V/m).

Switzerland's precautionary limit for 900 MHz radiation from mobile phone towers is 4 ∝W/cm^2 (4 V/m), more than 100 times lower than ICNIRP (see *MWN,* J/F00). Similar rules for RF/MW radiation have been adopted in Italy and in other parts of Europe (see *MWN,* J/F00, J/A00 and S/O00).

The Social Democrats (in German, SPD), the dominant member of the governing coalition, have long advocated minimizing exposures to non-ionizing radiation and basing standards on the precautionary principle (see *MWN,* S/O97).

If Germany should adopt stricter limits, it would mark a sea change in policy. In 1999, Germany voted for a resolution of the European Union Council of Ministers that endorsed the much looser ICNIRP guidelines as the basis for harmonizing member states' limits (see *MWN,* J/A99).

The environment ministry has been working for some time on revising the 1997 exposure ordinance, but it initially focused on closing gaps and resolving ambiguities. To explain the new openness to more sweeping changes, Probst cited "strong public concerns" and "scientific uncertainties" created by research findings of physiological and psychological effects from low-level exposures.

The Greens' support for precautionary measures is not limited to exposure limits. The environment ministry is also looking for ways to make more information on phone users' radiation exposures available to the public.

Phone makers announced in May that, starting later this year, they will include SAR information in the user instructions inside the box (see p.11). The environment ministry suggested that a "low radiation" label for phones whose SARs do not exceed 25% of the 2.0 W/Kg ICNIRP limit would be more "consumer-friendly." A Nokia spokesperson said that labels would be "unfair," according to the May 14 *Stuttgarter Nachrichten*.

Germany Set To Launch Mobile Phone Research Effort

Germany will soon begin a three-to-four-year research effort on mobile phone safety with a total cost of approximately 8.5 million euros (US$7.4 million).

"The federal government wants to intensify its research activities because in the years ahead we will face great challenges in this area," said Simone Probst, a senior environmental official, at a conference hosted by the Federal Radiation Protection Office in Salzgitter on June 21.

On June 13, the German cabinet increased the environment ministry's budget for research on non-ionizing radiation to 2.2 million euros (US$1.7 million) for 2002. A similar level of support is anticipated for each of the following three years. The budget proposal now goes to the Bundestag, Germany's parliament, where approval is considered likely.

The radiation protection office will administer the program with oversight by the environment ministry. The emphasis will be placed on mechanisms of interaction, epidemiology and dosimetry, according to the ministry.

CENELEC Okays SAR Protocols; IEEE, FCC Move Forward

Test protocols for measuring specific absorption rates (SARs) from mobile phones have finally been completed in Europe and will soon be finished in the U.S.

On July 3, the technical board of CENELEC gave final approval for its SAR standards*—both the test method and the 2 W/Kg limit originally specified when the European Council of Ministers adopted the ICNIRP standard in 1999 (see *MWN,* J/A99). The 19 member countries must now publicize the standards by September 1 and formally adopt them by March 1, 2002.

With this test standard in place, Ericsson, Motorola and Nokia have announced that they will make SAR information more readily available. For instance, Ericsson stated that all new phones will have "easy-to-read and up-to-date SAR information in the packaging" after October 1.

In the U.S., the IEEE SCC-34 subcommittee 2 on SAR measurement techniques is on the verge of finishing its protocol. "The previous draft was approved, but there were over 1,000 comments," Howard Bassen of the FDA's Center for Devices and Radiological Health in Rockville, MD, told *Microwave News*. "We've addressed the vast majority of the objections and I think we should finalize it at our next meeting, in Ottawa." A final ballot will be completed before the subcommittee meets September 17-19, he said.

On June 29, the Federal Communications Commission (FCC) issued its own interim measurement guidelines† for mobile phones. The commission, which has been under intense pressure to adopt an SAR test method to facilitate monitoring compliance with its 1.6 W/Kg SAR limit, decided not to wait until the SCC-34 standard was completed.

"We do plan to use the SCC-34 standard when it is finalized," said Dr. Robert Cleveland of the FCC's Office of Engineering and Technology (OET) in Washington. But, he added, "It will still take at least six months for the IEEE to approve the standard, and there is always the chance that will someone object."

Until the FCC adopts the final SCC-34 standard, manufacturers are being advised to use the interim test method. "For standard equipment, we recommend applicants follow the new procedures to expedite the approval process," Kwok Chan of the FCC OET told *Microwave News*. Otherwise, he said, they will be evaluated on a case-by-case basis, which will take more time.

The CENELEC and IEEE SCC-34 test protocols are essentially the same, with only a few differences. Dr. C.K. Chou of Motorola in Plantation, FL, explained that a working group, with members from both committees, harmonized the two standards.

* CENELEC is the European Committee for Electrotechnical Standardization. It is composed of the 15 member states of the European Union, as well as the Czech Republic, Iceland, Norway and Switzerland. There are two standards: EN50360 and EN50361. EN50360 specifies the ICNIRP SAR limit of 2 W/Kg averaged over 10 g; and EN50361 defines the measurement method. CENELEC standards can be ordered from the secretariat in Brussels at (32+2) 519-6871, Fax: (32+2) 519-6919 or from <www.cenelec.org>.

† The test method is in Supplement C of the FCC's OET Bulletin 65, which is on the Web as a pdf file at <www.fcc.gov/oet>.

Coming in 2002: "Electromagnetic Biology and Medicine"

Electro- and Magnetobiology is being revamped with a new name, new editors and a new mission.

Beginning next year, the journal will be called *Electromagnetic Biology and Medicine* and will be edited by Drs. Abe Liboff and Boris Pasche. The current editor, Dr. Stephen Smith of the University of Kentucky, is retiring but will remain on the editorial board.

"There will be a new emphasis on electromedicine," said Liboff, an emeritus professor of physics at Oakland University in Rochester, MI. "We will publish more clinical studies and add clinicians to the editorial board."

"We will strive to cover medical and clinical developments with scientific rigor," Pasche said. "But we also want to make the journal a center of lively discussion."

Pasche, who has both an MD and a PhD, recently set up a lab at the Northwestern University Medical School in Chicago to do cancer research. For nearly 20 years, Pasche has worked on the use of low levels of amplitude-modulated 27.12 MHz radiation to treat insomnia and anxiety disorders (see *MWN,* M/J96).

This is the third title for the journal, which was founded by Dr. Andrew Marino of Louisiana State University Medical Center in 1982 as the *Journal of Bioelectricity*.

Marcel Dekker will continue to publish the journal. There will be three issues in 2002 and four in 2003.

New Book: Using Mobile Phones Like Russian Roulette

> You pick up the phone, once, twice, ten times a day—or only a few times a month. But each and every time you're gambling that "this time" won't be the occasion when the radiation causes irreparable damage to your brain. It only takes a seemingly small trauma at a very small location to result in tissue damage, DNA damage or chromosome mutations....
>
> It is cellular telephone Russian roulette. Go ahead and make the call. Do you feel lucky today?

These are the closing paragraphs of Robert Kane's new book, *Cellular Telephone Russian Roulette: A Historical and Scientific Perspective*. Apart from this rather dramatic ending, most of the 235-page book is a sober analysis of dosimetric and biological issues related to mobile phones. There is also a detailed discussion of radiation exposure standards. In all, Kane includes 195 footnotes.

Kane is not a disinterested party. He is a former Motorola research engineer who in December 1993 sued the company, alleging that he had developed a brain tumor from testing a prototype cellular phone (see *MWN,* J/F94). The case continues today. Last year, the case was dismissed by a Chicago court (see *MWN,* J/A 00), but Kane's lawyers at Barnow & Goldberg in Chicago will soon file papers in their appeal.

Kane's book is available for $12.95 from Vantage Press. To order call: (800) 882-3273.

Braune is now practicing medicine in Prien, not far from Munich.

Dr. Torsten Gailus of Deutsche Telekom in Darmstadt, a co-author of the original *Lancet* report, told *Microwave News* that he "fully agrees" with Braune's new interpretation and conclusions. Gailus added that he is now a project manager for network technologies and no longer works on radiation health issues.

Even before the retraction, researchers at the Federal Institute for Occupational Safety and Health (FIOSH) in Berlin had raised concerns that blood pressure monitors might be susceptible to electromagnetic interference (EMI).

At a workshop held in Berlin last November, Dr. Peter Ullsperger and FIOSH coworkers reported that mobile phone radiation can "definitively alter" the measurement of blood pressure by a Finapres monitor — the same instrument that was used by Braune. Ullsperger noted that Braune's experimental design did not allow a 2-meter separation between the mobile phone and the Finapres blood pressure monitor. (At a distance of 2 meters, the radiation signal from the phone would be sufficiently attenuated to make EMI very unlikely.)

Dr. Alan Preece of the U.K.'s University of Bristol, who attended the Berlin workshop and who works on mobile phone cognitive effects (see *MWN,* M/A99), said that he has found that many types of medical equipment are susceptible to EMI. "Our ultrasound monitor was badly upset by GSM radiation," he said, pointing out that analog signals pose much less of a problem.

Preece is not surprised by the withdrawal of the Braune results. "I was skeptical when I first read the study because of the small sample size and the fact that the tests were not run blind," he said in an interview.

Meanwhile, a team working under Dr. Maila Hietanen at the Finnish Institute of Occupational Health in Helsinki is investigating whether 900 and 1800 MHz mobile phone radiation can affect the blood pressure and cardiac function of human volunteers. Tests on the first 20 of 60 planned subjects have been completed, according to the institute's Anna-Maija Hämäläinen, but the results are not yet available.

The proceedings of the Berlin workshop, *Is Central Nervous Information Processing Influenced by Electromagnetic Fields of Mobile Phones?,* will be published as a FIOSH report later this year. For details, check FIOSH's Web site, <www.baua.de>.

FROM THE FIELD

Hot New Papers

V. Keetley et al., "Neuropsychological Sequelae of 50 Hz Magnetic Fields," ***International Journal of Radiation Biology, 77,*** **pp.735-742, June 2001.**

"The effects of occupational levels of [28 ∝T (280 mG) circularly polarized] 50 Hz magnetic fields on cognitive function were studied on 30 human volunteers....Subjects sat at a desk within the coils where they undertook a series of verbal and written tests of cognitive function. After these tests were concluded (~30 min) subjects were either exposed or sham-exposed to fields (double-blinded) for 50 min. A second set of tests...was administered 20 min from the start of this period. Each subject returned after seven days to repeat the sequence, but with the opposite field/sham status....In summary, the data are suggestive of detrimental effects on cognitive processes, particularly short-term learning and executive functioning. However, larger sample sizes are required to demonstrate statistically a more specific pattern of cognitive effects."

Hrvoje Lalić, Andrica Lekić and Biserka Radošević-Stašić, "Comparison of Chromosome Aberrations in Peripheral Blood Lymphocytes from People Occupationally Exposed to Ionizing and Radiofrequency Radiation," ***Acta Medica Okayama, 55,*** **pp.117-127, April 2001.**

"The genotoxic effects of occupational exposure to ionizing and non-ionizing radiation were investigated in 25 physicians and nurses working in hospitals and in 20 individuals working at radio-relay stations.... The data showed that total number of chromosome aberrations in people exposed to ionizing and radiofrequency radiation...were almost equally higher than those of non-irradiated subjects....Acentric fragments comprised the most frequently seen type of aberration....A positive correlation between the total number of chromosome aberrations and cumulative 6-years dosage was also found. The data emphasized the dangerous effects of prolonged exposure to both types of radiation and indicated that chromosomal aberration analysis should be obligatory for individuals working at radio-relay stations....The findings in this study are particularly interesting, because both groups of workers were exposed to doses of ionizing and non-ionizing radiation that were well below the accepted standards for exposure to radiation....[T]he examinees working in radio-relay stations were exposed to the power and frequency of electromagnetic waves that usually did not exceed the permitted values of 10 W/m^2. The analysis was made by blind as-

Phone Radiation and Cancer: A Proposed Mechanism

Peter French, Ronald Penny, Jocelyn Laurence and David McKenzie, "Mobile Phones, Heat Shock Proteins and Cancer," ***Differentiation, 67,*** **pp.93-97, June 2001.**

"[T]here is a testable mechanism by which mobile phone exposure could lead to cancer, and that link is via the heat shock response. Mobile phones emit RF energy at levels which are demonstrably potentially capable of triggering the heat shock response. Recurrent exposure through frequent mobile phone use could lead to chronic expression of [heat shock proteins] in the exposed brain tissue of regular mobile phone users. Chronic overexpression of heat shock proteins is reported to be associated with both induction and promotion of cancer....It is therefore critical that the hypothesis that RF energy at mobile phone-relevant SAR levels acts as a cell stress on human brain cells and tissues is tested experimentally as a potential mechanism for cancer development. Such a mechanism provides a solid hypothesis for the observed nonthermal effects of RF radiation on mammalian cells, and would need to be considered in designing future epidemiological studies." (See also *MWN,* S/O00.)

sessment of exposure....However, it should be noted that the present study was conducted on a small sample of examinees and in order to be verified, would need to be replicated, in particular as regards the effect of radiofrequency radiation." (Full text available at: <www.lib.okayama-u.ac.jp/www/acta/acatcontents55_2.htm>.)

Ingrid Nordenson, Kjell Hansson Mild et al., "Chromosomal Aberrations in Peripheral Lymphocytes of Train Engine Drivers," ***Bioelectromagnetics, 22,*** **pp.306-315, July 2001.**

"A pilot study of 18 engine drivers indicated a significant difference in the frequency of cells with chromosomal aberrations (gaps included or excluded) in comparison with seven concurrent referents (train dispatchers) and a control group of 16 office workers. The engine drivers had about four times higher frequency of cells with chromosome-type aberrations (excluding gaps) than the office workers ($p<0.01$) and the dispatchers ($p<0.05$)....In a follow-up study, another 30 engine drivers showed an increase ($p<0.05$) in the frequency of cells with chromosome-type aberrations (gaps excluded) as compared with 30 referent policemen....[T]he results of the two studies support the hypothesis that exposure to MF at mean intensities of 2-15 ∝T [20-150 mG] can induce chromosomal damage." (See also *MWN,* J/F85, S/O88 and J/A96.)

Pascale Fabbro-Peray, Jean-Pierre Daures and Jean-François Rossi, "Environmental Risk Factors for Non-Hodgkin's Lymphoma [NHL]: A Population-Based Case-Control Study in Languedoc-Roussillon, France," ***Cancer Causes and Control, 12,*** **pp.201-212, April 2001.**

"The following factors were independently and significantly related to NHL as a result of the multivariate analysis: a previous hematopoietic malignancy (OR_a=11.5, 95% CI 2.4-55.4), a history of hives (OR_a=1.7, 95% CI 1.2-2.2), benzene exposure >810 days (OR_a=4.6, 95% CI 1.1-19.2), daily welding (OR_a=2.5, 95% CI 1.2-5.0) and activity of radio operator (OR_a=3.1, 95% CI 1.4-6.6)....Younger age at onset was also associated with an increased risk of NHL. On the other hand, duration of exposure showed a paradoxical and unexplained protective effect.... The odds ratio associated with [radio operator activity] remained increased after adjustment for all other factors. As with welding, younger age at onset increased the risk, while duration of exposure decreased the risk....The paradoxical protective effect of duration of exposure for these two factors could be explained by measures taken in the French industry. Indeed, the mobility of workers is encouraged when their occupations appear to pose a high risk to their health; and welding is considered a high risk activity for the eyes."

P. Boscolo et al., "Effects of Electromagnetic Fields Produced by Radiotelevision Broadcasting Stations on the Immune System of Women," ***Science of the Total Environment, 273,*** **pp.1-10, June 12, 2001.**

"The object of this study was to investigate the immune system of 19 women with a mean age of 35 years, for at least two years (mean=13 years) exposed to EMFs induced by radiotelevision broadcasting stations in their residential area. In September 1999, the EMFs (with range 500 kHz-3 GHz) in the balconies of the homes of the women were (mean ± S.D.) 4.3 ± 1.4 V/m. 47 women of similar age, smoking habits and atopy composed the control group, with a nearby resident EMF exposure of < 1.8 V/m....We may conclude that exposure to EMFs induces a modification of immune parameters in humans. EMF exposure inhibits a Th1-like cytotoxic immune response without a dose-response effect, while the enhancement of a Th2-like immune response is not demonstrated. "

Meeting Notes

Thermoregulation Workshops

Dr. Joe Elder is helping organize a *Temperature Workshop* for the WHO EMF project to be held in Geneva, October 16-17. Elder, who recently retired from the EPA and joined Motorola's research labs in Plantation, FL, as director of biological research, told *Microwave News* that a small number of biologists will be invited to help define temperature limits for cells, tissues and organs. "These limits are not necessarily RF-induced," he said. One of the objectives will be to produce a WHO report. Dr. Eleanor Adair of Brooks Air Force Base in San Antonio is putting together a second workshop on thermal regulation, which will address RF/MW effects. Members of both ICNIRP and IEEE SCC-28 will attend, she said. That meeting will be held next spring, but other details including title and date have yet to be finalized.

EBEA Meeting in Helsinki

The European Bioelectromagnetics Association (EBEA) is set to meet in Helsinki, September 6-8. The preliminary scientific program is at <www.occuphealth.fi/e/project/ebea2001>.

Radio Vatican, EMFs & Mobile Phones

On September 4, Italian researchers will present the latest epidemiological results of a study on childhood leukemia rates near the Radio Vatican antennas in Cesano outside Rome at the *13th Conference of the International Society for Environmental Epidemiology* (ISEE2001). The meeting will be held in Garmisch-Partenkirchen, which is an hour south of Munich. The same day, Dr. Anders Ahlbom will review the EMF–cancer association and WHO's Dr. Michael Repacholi will discuss the role of transients in the development of childhood leukemia. That afternoon, Dr. Raymond Neutra will chair a session on the results of the California EMF Program (see p.5) titled "The Marriage of Epidemiology and Decision Analysis." In a planned poster presentation, Drs. Andreas Stang and Karl-Heinz Jöckel of the University of Essen will give advice on how to deal with the media on a "sensational topic" like the health effects of mobile phones. One tip: "Become immune to unqualified critics, especially from people who have never read the publication." In January, they published a paper on the possible link between mobile phones and eye cancer (see *MWN,* J/F01). A copy of the program and abstracts of the papers are available at the conference's Web site: <www.gsf.de/epi/gap2001/ISEE>. The abstracts are also in the July issue of *Epidemiology.* For more information about the meeting, call: (49+89) 5482340 or fax: (49+89) 54823444.

Olden in Australia

Dr. Kenneth Olden, the director of the U.S. NIEHS, was the special guest speaker at a July 6 workshop sponsored by the Electricity Supply Association of Australia (ESAA) in Melbourne. Olden reviewed the EMF RAPID program and his report to Congress (see *MWN,* J/A99).

Across the Spectrum

I believe, in the ultimate analysis, that it is hubris to think that no phenomenon is valid unless we understand its mechanism of action.

— Dr. T.V. Rajan, chairman, department of pathology, University of Connecticut Health Center, Farmington, noting that digitalis was used for 200 years to treat cardiac problems without any idea of the mechanism of action, and that "billions of human doses" of diethylcarbamazaine have been dispensed to treat lymphatic diseases over the last 50 years even though "we have absolutely no idea how the drug works," in a commentary, "The Myth of Mechanism," *The Scientist,* p.6, June 25, 2001, also available at <www.the-scientist.com/yr2001/jun/comm_010625.html>

"Physicists in particular have lost a lot of clout, and they've even lost a lot of esteem in the public eye, and I think that's reflected in the fact that they're now being more ignored in their advice."

— Dr. David Cassidy, science historian, Hofstra University, Hempstead, NY, quoted by James Glanz, "Sure, It's Rocket Science, But Who Needs Scientists?" *New York Times,* Week in Review, p.1, June 17, 2001

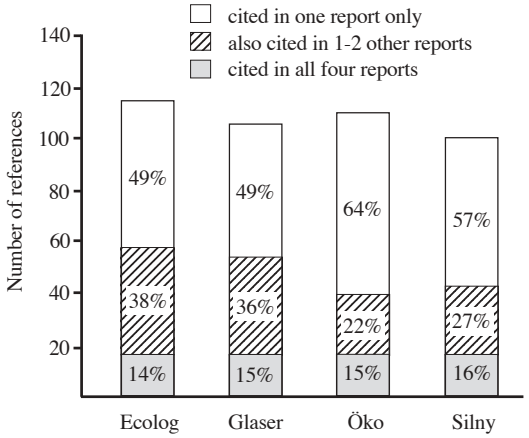
"The law is very clear. The health factor is not something that a zoning board in New Jersey has jurisdiction over. But we all recognize that the government has done studies and set standards in the past that have come back to haunt us. So that perception of there being a health risk lurking out there makes people uncomfortable, uneasy, and therefore not as prone to purchasing a home and spending the same amount of money they would if the tower wasn't there."

— Bruce Whitaker, lawyer, Ramsey, NJ, who represents homeowners fighting a proposed Verizon and AT&T cellular tower in nearby Ho Ho Kus, quoted by George James, "The Gift of Gab Comes at a Cost — As Cell Phone Use Grows, So Do Battles Over Towers," *New York Times,* New Jersey, p.10, June 24, 2001

"We understand the technology to a certain extent, but not 100%."

— Statement of Sony, quoted by Alexandra Harney and Christopher Brown-Humes, "Sony's Handset Gremlins Spell Trouble for Ericsson Alliance: A String of Recalls Has Hit the Japanese Giant's Reputation and Shares," *Financial Times* (U.K.), p.21, July 11, 2001 (see p.18 and *MWN,* J/F99)

Each Singing from a Different Song Book

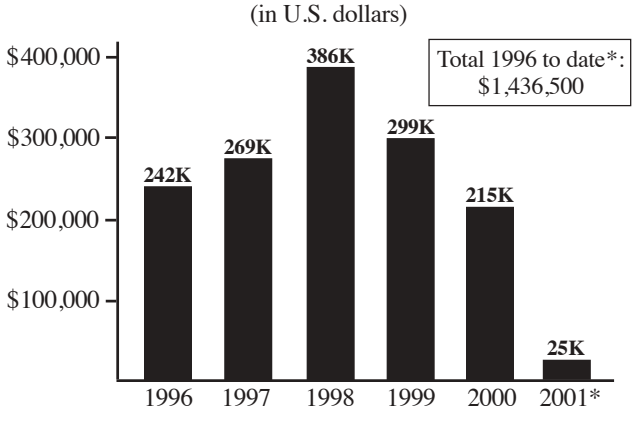


— Comparison of references to the scientific literature in reports on mobile phone radiation and health completed last year by the Ecolog Institute, Hannover; Dr. Roland Glaser, Humboldt University, Berlin; the Öko-Institut, Darmstadt; and Dr. Jiri Silny, University of Aachen. Adapted from an analysis prepared by the Jülich Research Center for T-Mobil, a Darmstadt-based wireless carrier which also commissioned the four reports. The reports and the Jülich analysis, which was added to the Web on July 5, 2001, are available in German at <www.fz-juelich.de/mut/projekte/pro_emf.html> (see p.10; also *MWN,* M/J01)

"Everyone likes power, but no one likes power generation or delivery."

— Spencer Abraham, U.S. Secretary of Energy, at the Edison Electric Institute's annual meeting, on June 5 in New Orleans, quoted by Kathleen Davis, "Gridlock: America's Regional Transmission Structures Scout for Solutions," *Electric Light & Power,* p.18, July 2001

Funds Received by the WHO EMF Project



Source: WHO International EMF Project * Through May 7

"Dangerous? Yes, I *definitely* think it's dangerous. Could you hold on? I have another call."

— Frank Bruno, in his car, Long Island, NY, on using a mobile phone while driving, quoted by Michael Powell, "NY to Motorists: Put the Phone Down and Drive, Buddy," *Washington Post,* p.A3, June 29, 2001

Michael Persinger, a professor of neuroscience at Laurentian University in Sudbury, Ontario, has been conducting experiments that fit a set of magnets to a helmet-like device. Persinger runs what amounts to a weak electromagnetic signal around the skulls of volunteers. Four in five people, he said, report a "mystical experience, the feeling that there is a sentient being or entity standing behind or near" them. Some weep, some feel God has touched them, others become frightened and talk of demons and evil spirits. "That's in the laboratory," Persinger said. "They know they are in the laboratory. Can you imgine what would happen if that happened late at night in a pew or mosque or synagogue?"

— Shankar Vedantam, "Tracing the Synapses of Our Spirituality," *Washington Post,* p.A1, June 17, 2001

UPDATES

ITALY

A Guide... Italy has been a hotbed for concerns over non-ionizing radiation, as we have reported in our last two issues. *Elletrosmog,* as it is called there, has prompted some of the strictest exposure standards in Europe. Luca Ramacci and Giovanna Mingati have written a detailed guide to the health and regulatory issues. They cover ordinances and judicial decisions at both the national and local levels. *Inquinamento Elettromagnetico (Electromagnetic Pollution),* 255 pages, costs L.32,000 (approx. US$15.00) from Sistemi Editoriali, based near Naples. (It is only available in Italian.) To order, call (39+081) 8043920, Fax: (39+081) 8043851, or go to: <www. sistemieditoriali.it>.

MELATONIN

MRI Gives Up on Melatonin Hypothesis... Power-frequency magnetic fields do not depress melatonin levels in humans. So say Drs. Charles Graham and Mary Cook on retiring from the Midwest Research Institute (MRI) in Kansas City, MO. For 20 years, Graham directed MRI's EMF research lab, where volunteers were exposed under carefully controlled conditions to investigate possible impacts on behavior, cardiac function and, most recently, on melatonin. He never saw a consistent melatonin effect, but he had long maintained that it would be premature to dismiss the EMF–melatonin link (see *MWN,* M/A97, N/D99 and J/F00). Now, Graham has changed his mind. "We've looked at both men and women across different age groups, field intensities and exposure durations," he told *Microwave News* in June. "One would expect to see some hint of an effect, but we didn't." In his final melatonin studies, Graham, working with Cook and MRI's Dr. Antonio Sastre, exposed volunteers to a circularly polarized 28.3 ∝T (283 mG) 60 Hz field on one of two nights spent at the lab. The field was switched on or off every hour, and during the "on" hours it cycled on and off at 15-second intervals. As a control, each volunteer spent the other night at the lab with EMF levels no higher than 2 mG. They found no EMF-related changes in melatonin levels in hourly blood samples or in concentrations of the melatonin metabolite 6-OHMS in urine samples taken the following morning. The findings for women aged 19-35 years appear in the May issue of *Environmental Health Perspectives (109,* pp.501-507, 2001), while the results for older women are in press at the *Journal of Pineal Research*. The issue may be settled at MRI — which, in any case, has no money to continue such research — but others are not yet ready to throw in the towel. "While the experimental studies of acute exposure have not shown a suppression, the observational studies in real-world settings generally have," Dr. Richard Stevens of the University of Connecticut, Farmington, told *Microwave News*. (Stevens was the first to formulate the melatonin hypothesis linking breast cancer to EMFs and/or light-at-night; see *MWN,* J/F 87.) One of these observational studies was carried out by Stevens and Dr. Scott Davis of the Fred Hutchinson Cancer Research Center in Seattle, who found melatonin suppression among women exposed to power line fields at home (see *MWN,* N/D97). Their paper will soon appear in the *American Journal of Epidemiology*. Dr. James Burch of Colorado State University, Ft. Collins, who has himself reported melatonin suppression among utility workers (see *MWN,* M/A97 and M/A00), sides with Stevens. "Obviously, there's a big difference between exposures in a lab and in a real-world environment," Burch said in an interview. MRI's Sastre countered that he and Graham and Cook are well aware of such variations. "Could it be harmonics or transients? We cannot rule that out," he told *Microwave News*. But the MRI team argues that such possibilities are speculative and points to the "inherent lack of control over potentially confounding variables in field studies." They contend that their findings are "consistent with a growing body of evidence" indicating that EMFs have "little or no effect" on melatonin. Sastre, who has now assumed the helm at MRI's EMF lab, is willing to live with the remaining uncertainties. "It's time to move on," he said.

"MICROWAVE NEWS" FLASHBACK

Years 20 Ago

• Breaking ranks with ANSI and NIOSH, the EPA considers adopting a frequency-independent RF/MW exposure standard in order to simplify enforcement.

• The Electromagnetic Radiation Management Advisory Council finds that former personnel at the U.S. embassy in Moscow can anticipate no deleterious biological effects from MW exposures.

Years 10 Ago

• Telephone line workers have higher mortality rates from leukemia than other telephone company employees, report Dr. Genevieve Matanoski and colleagues at the Johns Hopkins University public health school in Baltimore.

• Dr. Gilbert Omenn, of the University of Washington, Seattle, the chairman of the Electric Power Research Institute's scientific advisory panel, ranks the public health risks of EMFs as similar to those associated with "eating peanut butter."

• Michelle and Ted Zuidema sue San Diego Gas & Electric, charging that EMFs caused their daughter to develop kidney cancer and that the utility's power lines lowered the value of their home.

Years 5 Ago

• Exposure to electric fields is a potentially critical factor to understanding cancer risk, says Dr. Tony Miller of the University of Toronto after finding that utility workers exposed to high levels of magnetic *and* electric fields have 11 times the expected rate of leukemia.

• The FCC adopts final health and safety regulations for exposure to RF/MW radiation similar to those recommended by the NCRP ten years earlier, including a requirement that the SAR of all new cell phones not exceed 1.6 W/Kg.

• Taking a cue from fellow TV man Jon Palfreman, John Stossel argues that people get much more radiation from moonlight than power lines. Dr. Charles Polk calls the argument "propaganda."

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NEUROSTIMULATORS

Diathermy Alert... Medtronic has issued a safety alert to warn users of its neurostimulation devices that they risk "severe injury or death" if they are treated with shortwave, microwave or ultrasound diathermy. Energy from the diathermy unit can be transferred to the neurostimulator and cause extensive tissue damage. In its May 18 alert, Medtronic cites two cases of patients with implanted deep brain stimulator systems who received shortwave diathermy therapy and suffered severe brain damage. Both became comatose. The alert is at <www.medtronic.com/neuro/diathermy_alert/alert_patients.html>.

PEOPLE

Dr. **Asher Sheppard**, a consultant based in Redlands, CA, is the new president of the Bioelectromagnetics Society (BEMS). Dr. **Frank Prato,** of the University of Western Ontario in London, Canada, will take over from Sheppard at next year's BEMS meeting, which will be held in Quebec City, Canada, June 23-27. Drs. **Stefan Engstrom**, **Leeka Kheifets**, **Joseph Roti Roti**, **James Ryaby** and **Shoogo Ueno** have been elected to the BEMS board of directors....Dr. **Laurent Bontoux** has moved to the Directorate of Science Strategy of the European Commission's Joint Research Center in Brussels. Previously he was with DGXII on Science, Research and Development. **Callum Searle** of DG Research will now be monitoring the EC mobile phone studies...On July 13, **Ron Petersen** accepted a buyout offer and retired from Lucent Technologies-Bell Labs in Murray Hill, NJ. He will continue to work with numerous standards groups: Petersen is vice president for non-ionizing radiation at the NCRP, chairs IEEE SCC-34 on Electromagnetic Energy Product Performance Safety and is the executive secretary of IEEE SCC-28, the International Committee on Electromagnetic Safety. **Paul Testagrossa** and **Alice Fahy-Elwood** remain members of Lucent's RF/MW group. ...Professor **Veli Santomaa**, a principal scientist at Nokia's research center in Helsinki, is retiring on September 1. He has been at Nokia, the world's leading manufacturer of mobile phones, for seven years....Dr. **Gene Sobel** has left the West Coast to become the director of statistics for the NCI gynecologic oncology group at the Roswell Park Cancer Institute in Buffalo, NY....A team led by Dr. **James Burch** of Colorado State University in Ft. Collins has won the Adolph Kammer Merit in Authorship Award from the American College of Occupational and Environmental Medicine (ACOEM) for a paper on the importance of polarization in suppressing melatonin levels in electric utility workers. The award recognizes the most outstanding paper published in ACOEM's *Journal of Occupational and Environmental Medicine*. The paper was the subject of a cover story in *Microwave News* last year (see *MWN*, M/A00; see also p.15)....Dr. **René de Seze** has moved from the University of Montpellier in Nimes to the National Institute for the Industrial Environment and Hazards (INERIS) in Verneuil-en-Halatte, which is north of Paris. De Seze has also recently been appointed an associate editor of *Bioelectromagnetics*.... Dr. **Dean Astumian** has joined the physics department at the University of Maine, Orono. Previously, he was at the University of Chicago. Astumian's article "Making Molecules into Motors" appears in the July issue of *Scientific American*....In our last

issue we reported that Dr. **Gerri Lee**, formerly with the California EMF program (see p.5 and p.18), was now working for Hoffman-LaRoche. She has recently joined AstraZeneca, a large drug company, as a senior epidemiologist. She will be dividing her time between the two coasts....Dr. **David Erwin**, 55, died of can-cer on June 1. His career at Brooks Air Force Base (AFB) in San Antonio began in 1977. He worked on microwave health effects for 15 years. At the time of his death, he was the Director of the Air Force Institute for Environment, Safety and Occupational Health Risk Analysis.

STANDARDS

New Chair at SCC-28... Dr. John Osepchuk is retiring as the chair of IEEE SCC-28, the International Committee on Electromagnetic Safety, on September 1. Dr. Eleanor Adair of Brooks AFB, presently the cochair, will take over from Osepchuk. Ron Petersen will continue as executive secretary (see p.16). Osepchuk said that he will be an ex officio member of the SCC-28 Executive Committee. Meanwhile, Dr. John D'Andrea of the Naval Health Research Center at Brooks AFB, the cochair of subcommittee 4 on safety standards for human exposures, said that he expects to have a complete draft of the revised ANSI/IEEE RF/MW exposure standard by the late fall.

THE NETHERLANDS

Health Council: New Report, Same Advice... The Health Council of the Netherlands concludes that power-frequency EMFs are "not likely" to cause childhood leukemia — even though pooled data analyses led by Drs. Anders Ahlbom and Sander Greenland show a "consistent association" (see p.2). In its first annual update on EMFs and RF/MW radiation, a 12-member panel chaired by Dr. Eric Roubos of the University of Nijmegen reviews those studies that have appeared since last year, when the council issued two detailed reports that discounted health risks from EMFs and GSM radiation (see *MWN,* M/J00 and N/D00). The panel states that it finds no reason to alter its earlier conclusions. The full text of *Electromagnetic Fields: Annual Update 2001* is available in Dutch and English at <www.gr.nl>.

VIDEOS

StrayVoltage... Stetzer Electric has produced a video that presents the concerns of Wisconsin farmers over stray voltage. The 20-minute video, *Beyond Coincidence: The Perils of Electrical Pollution,* details what has happened to a number of farm families and their cattle. A copy of the video tape is available for $12.00 (including shipping) from Stetzer Electric Inc., 520 West Broadway, PO Box 25, Blair, WI 54616, (608) 989-2571, Fax: (608) 989-2570, Web: <www.stetzerelectric.com>.

NRPB on Mobile Phones... The U.K.'s National Radiological Protection Board has produced a 30-minute video, *Mobile Telephony and Health,* on the current state of knowledge on the possible impacts of phones and towers. A copy is available for £6.00 from: Information Services, NRPB, Chilton, Didcot, Oxon OX11 0RQ, U.K., or by phone from Jane True at (44+1235) 822742.

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As We Go To Press

U.K. Panel: TETRA Mobile Radio Safe

It is "unlikely" that radiation from digital mobile radios used by public safety services poses any special health risks, according to a report prepared for the U.K.'s National Radiological Protection Board (NRPB).

The board's Advisory Group on Non-Ionizing Radiation, chaired by Sir Richard Doll, issued its findings on the terrestrial trunked radio, or TETRA, system on July 31.

The radios have a power output of up to 3 W, operating at 400 MHz, pulse modulated at 17.6 Hz. The review was prompted by last year's Stewart commission report (see *MWN,* M/J00), which flagged 16 Hz as a potentially troublesome modulation frequency, based on evidence of effects on calcium ions.

The Doll panel reached a different conclusion. Calcium ion effects are "much disputed," its report states, adding that "no associated health risk has been identified." The panel calls for new studies to resolve the issue.

While acknowledging that experimental data on users' radiation exposures are "very limited," Doll's group predicts that SARs from TETRA handsets will not exceed 10 W/Kg — the limit specified by the NRPB for all users of mobile phones and by ICNIRP for occupational exposures only.

Alasdair Philips, a consultant based near Cambridge, lambasted the Doll panel's conclusions. "They basically still think of people as dead slabs of meat with a cooling system," he told the BBC (July 31).

The full text of the 40-page report is at <www. nrpb.org.uk>.

Keeping Current: Follow-Up on the News

◆ In our last issue, we highlighted the new epidemiological study on EMF-induced spontaneous abortions by Dr. De-Kun Li of Kaiser Permanente, which will appear in the November issue of *Epidemiology.* Li also wrote a summary of his results for the California Department of Health and it is available now in Appendix 6 of the draft report of the EMF Program (see p.5). Appendix 5 is Dr. Gerri Lee's companion miscarriage study. Go to: <www.dhs.ca.gov/ehib/emf/RiskEvaluation/riskeval.html>.

◆ Dr. Gerard Hyland's 40-page report for the European Parliament, *The Physiological and Environmental Effects of Non-Ionizing Electromagnetic Radiation,* can be downloaded from the Web site of Caroline Lucas, a Green Party member of the parliament from the U.K. Go to: <www.carolinelucasmep.org.uk/news/mobilemasts_11072001.asp>.

◆ The July issue of *Epidemiology* (pp.472-473) has a spirited exchange on the pooled analysis of childhood leukemia data by UCLA's Dr. Sander Greenland and coworkers (see p.2 and *MWN,* S/O99). Kent Jaffa of PacifiCorp in Salt Lake City, UT, writes that the study is "unreliable" because of problems with pooling methods. The Greenland team counters that Jaffa's arguments are based on "errors of logic, statistics and fact."

◆ On July 4, Sony pulled 560,000 mobile phones off the Japanese market because a design flaw caused the battery to overheat. The company put the cost of the recall at ¥12 billion, or $97 million. In 1998, Sony recalled 60,000 phones that could exceed FCC exposure guidelines (see *MWN,* J/F99). (See also p.14.)

◆ Richard Capriola of Weinstock & Scavo in Atlanta filed a class-action lawsuit in Georgia state court on June 8 to ensure that every mobile phone comes with a hands-free kit. The Atlanta firm is working with Peter Angelos's legal team (see *MWN,* M/J01).

◆ On June 15, Australia's National Health and Medical Research Council (NHMRC) announced its latest grant for research on mobile phone safety: A$300,000 (US$155,000) to Dr. Kathy Rose of the University of Sydney for a two-year study on vision and hearing effects. In Adelaide, exposures have been completed and tumors are being tallied in the NHMRC-funded repeat of the Repacholi mouse study, according to the July 25 *Advertiser* (see *MWN,* M/J97 and M/A01).

◆ At any given daytime moment during the week, about 500,000 drivers of passenger cars are talking on hand-held cell phones, according to a survey by the National Highway Traffic Safety Administration, released on July 23.

VIEWS ON THE NEWS

'EMFs Are Possible Carcinogens' Is Not News — Or Is It?

IARC is the most influential authority on what may cause cancer. So it was surprising that, when its EMF panel classified power-frequency fields as possible carcinogens (see p.1), a lot of journalists chose to look the other way.

A search of the English-language press turned up just one news article, in Australia's *Canberra Times*. Some European papers — for example, France's *Le Figaro* and Sweden's *Svenska Dagbladet* — ran short items. In the U.S., there was only silence.

What are we to make of this utter lack of interest? Could it be that the general and scientific press have a double standard when it comes to covering EMFs?

Two of the IARC panelists, Dr. Nick Day of the U.K. and Dr. Elizabeth Hatch of the U.S., had previously released their own epidemiological studies, both of which were widely reported as showing *no* leukemia risk in children. Yet this summer in Lyon, they agreed with the others that EMFs are possible carcinogens.

The *New Scientist* greeted Day's 1999 study with an editorial headlined IT'S OFFICIAL. POWER LINES DON'T GIVE CHILDREN LEUKEMIA. When IARC issued its press release in June, the magazine ignored it.

After Hatch's and Dr. Martha Linet's 1997 NCI study was published, *Science*'s Gary Taubes suggested that it would be the obituary for the EMF–cancer link. At press time, *Science* has yet to announce the resurrection.

Clearly, the IARC decision *is* news — news that should not be ignored. It's time to clear the air of all the disinformation which has been circulated over the years. It's time to acknowledge that EMFs do pose possible health risks and to find out how great those risks actually are.

BEMS Needs a New Compass

The Bioelectromagnetics Society (BEMS) is in danger of fading into oblivion.

The June annual meeting was a depressing affair. Attendance was down 25% from last year. The long rows of blank poster boards were an ever-present reminder of those who canceled their trips to St. Paul. Who can blame them? Walking the deserted streets near the hotel, one felt the entire local population had decided that they too would rather be somewhere else.

The few interesting papers were all from Europe. Not too surprising, given that there is no money for research in the U.S. Sessions were padded with tutorials and reviews of old controversies. All in all, it was a pretty stale affair.

If BEMS wants to survive it will have to reinvent itself. Hazard research must continue, but the society should also embrace those working on electromedicine. One reason BEMS has kept its distance from this promising field is that some fear that it would be a tacit recognition of more complex — read politically unacceptable — effects.

BEMS has money in the bank to see it through hard times. Those times are here now and the society must invest in its future.

And at the very least, given that annual meetings are big moneymakers, they should be held in places that people might actually want to visit.

Keeping an Eye on the Usual Suspects

• It's breathtaking to watch **George Carlo** rise like a phoenix. Just when we thought he would fade away like his soon-to-be-remaindered book, he's back with money in his pocket. Or almost. If the judge approves the proposed settlement in the *Busse* case, as appears likely (see p.6), Carlo will get a $250,000 bankroll to continue harassing the cell phone industry and a $150,000 insurance policy in case he should get into legal trouble again — call it a get-out-of-jail-free card. To be sure, we think that the industry needs more policing, but Carlo's tactics are so self-serving that they have come close to undoing the safety debate. One needs to look no further than the FDA–CTIA research project — known as the CRADA to some, and as an international laughingstock to others — to see how Carlo has managed to maneuver the FDA's only health effort into doing the wrong studies for the wrong reasons. Carlo's latest opening came when his insurance company decided that it had had enough and walked away leaving $1,400,000 on the table. It didn't take long for the *Busse* lawyers and Carlo to work out a 70-30 split and for the settlement papers to be signed. Unless the complaints get a lot louder, the checks will soon be in the mail.

• **Bob Park**'s most recent (July 13 & 27) ravings about EMFs in his weekly *What's New* e-mail letter sound as if they were dictated from the post-surgery recovery room. They may well have been. Last summer a tree fell on Park while he was jogging, necessitating a series of major operations. If the tree was a message from above to give his biases a rest, Park didn't get it. His columns are embarrassing to read: The facts are garbled, out-of-date and/or just plain wrong. When the errors are pointed out, he looks the other way. It's time for the leaders of the American Physical Society to take responsibility for Park, their chief lobbyist, and put him out to pasture, where he can froth at the mouth in private.

MICROWAVE NEWS is published bimonthly. • ISSN 0275-6595 • PO Box 1799, Grand Central Station, New York, NY 10163 • (212) 517-2800; Fax: (212) 734-0316; E-mail: <mwn@pobox.com>; Web: <www.microwavenews.com> • Editor and Publisher: Louis Slesin, PhD; Managing Editor: Douglas Barnes, PhD; Editorial Assistant: Danielle Catalano; Consulting Editor: Jon Swan; Copy Editor: Roy Thomas Jr. • Subscriptions: $325.00 per year ($350.00 Canada & Foreign, U.S. funds only); Single copies: $60.00 • Copyright © 2001 by Louis Slesin • Reproduction is forbidden without written permission.

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Vol. XXII No. 4 A Report on Non-Ionizing Radiation July/August 2002

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California EMF Program To Issue Strongest Health Warning Yet

But Final Report Offers No Policy Advice

After spending more than $7 million over the last eight years, the California Department of Health Services (DHS) will soon issue the strongest warning to date on the potential health risks from exposure to power-frequency electromagnetic fields (EMFs).

Drs. Raymond Neutra, Vincent DelPizzo and Geraldine Lee, who wrote the report, conclude that they "are inclined to believe" that EMFs are a cause of childhood leukemia, adult brain cancer, amyotrophic lateral sclerosis (ALS) and miscarriages. (See p.4 for their general conclusions.)

The final report of the EMF Program, which runs more than 500 pages including appendices, has not yet been released, but *Microwave News* has obtained a copy. It "is slowly working its way through the bureaucracy," said Neutra of the DHS, who led the program. He expects to submit it to the California Public Utilities Commission (PUC) "at the end of the summer."

"We lowered a few of the risk estimates, but overall the conclusions in the final report are very similar to those in the draft," said DelPizzo, who served as research director of the EMF program before retiring recently to Reno, NV.

The report does not include recommendations on how to protect against any of the identified health risks.

(continued on p.3)

Germany Promotes Low-SAR Phones, Endorses Precautionary Approach

The German government is promoting low-radiation mobile phones. A phone with a specific absorption rate (SAR) of 0.6 W/Kg or less, averaged over 10 g, can now be labeled as an environmentally friendly product.

This new SAR guideline is the strictest in the world — more than three times tougher than the one recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

The introduction of a "Blue Angel" label (see illustration on p.8) is "a positive step for [the phone] industry and the consumer," the Federal Environment Ministry stated on June 14. The label is designed to help those who "have questions about possible health hazards from mobile phone radiation but do not want to do without such devices," the ministry explained.

The Federal Radiation Protection Office has also endorsed the new label. "Our goal is to minimize possible risks through precautionary policies," said Wolfram König, the head of the radiation office.

The new initiative will serve as an incentive for manufacturers to consider

(continued on p.8)

Conflicting EMF Breast Cancer Studies Resolved; Genetic Variability Is the Key, German Lab Reports

One of the most contentious — and nastiest — disputes over electromagnetic field (EMF) cancer risks may soon be resolved.

Members of Dr. Wolfgang Löscher's lab in Hannover, Germany, have shown that different substrains of the same strain of rats have very different responses to power-frequency EMFs.

In a presentation at the Bioelectromagnetics Society's (BEMS) annual meeting in Quebec City, Canada, on June 24, Dr. Maren Fedrowitz of the School of Veterinary Medicine in Hannover reported that two substrains of Sprague-Dawley rats had markedly different sensitivities to 50 Hz magnetic fields, as well as to DMBA, a known chemical carcinogen. One strain had significantly more DMBA-induced tumors than the other, which, for its part, had significantly enhanced growth of mammary tumors following EMF exposure.

Over the last decade, Löscher has conducted a large number of experiments showing that EMFs can promote the development of breast cancer in rats (see *MWN,* J/A93, J/F95 and S/O 99). But these findings have been challenged by some American scientists.

Dr. Gary Boorman of the National Institute of Environmental Health Sciences (NIEHS) in Research Triangle Park, NC, has been Löscher's leading critic. After Drs. Larry Anderson and James Morris of the Battelle labs in Richland, WA, were unable to repeat the German experiments, Boorman, who had arranged for their replication effort under the congressionally mandated research program known as EMF RAPID, made it clear that he had no confidence in Löscher's work (see *MWN,* M/A98).



DR. MAREN FEDROWITZ IS WORKING WITH PROF. WOLFGANG LÖSCHER

Relations between Löscher and the NIEHS deteriorated as the institute dismissed the German work in favor of Battelle's. Boorman and Dr. Jerry Williams of Johns Hopkins University in Baltimore publicly disparaged Löscher's studies as being fundamentally flawed. Löscher responded with accusations that Boorman was waging a dirty tricks campaign against him (see *MWN,* N/D98).

In its final report to the U.S. Congress, the NIEHS tried to put the issue to rest by concluding that there is "strong evidence" that EMFs do not promote breast cancer (see *MWN,* J/A99 and S/O99). This report was largely written by Dr. Christopher Portier. Portier was later promoted to associate director of the National Toxicology Program, which is administered by the NIEHS.

But, at the same time, Löscher and Anderson began working together to see if they could explain the divergent results. They later published a joint paper citing genetic variability as one of a number of possible hypotheses. "The data from the two labs suggest that the rats used in the Battelle study might be more sensitive to the carcinogenic effect of DMBA than the European rats, but possibly less sensitive to any influence of magnetic field exposure," they wrote in the September 2000 issue of *Environmental Health Perspectives* (see *MWN,* S/O00).

The new work "seems to go a long way to resolving the differences," Anderson said after Fedrowitz's presentation in Quebec. "It supports my and Wolfgang's suspicions about what was going on," he said in a later interview.

The lack of animal data to support the epidemiological evidence has cast doubt on the EMF–cancer link. "It would have been nice to have these results during the IARC deliberations," Anderson said, prompting Dr. Bernard Veyret of the University of Bordeaux to comment publicly, "This was a key element in the IARC decision."

Both Anderson and Veyret were members of the International Agency for Research on Cancer (IARC) panel that last summer unanimously concluded that EMFs are possible human carcinogens, largely based on epidemiological evidence (see *MWN,* J/A01). The panel might have classified EMFs as a "probable" or "known" human carcinogen with supporting animal data.



"This supports our suspicions"
— Dr. Larry Anderson

Löscher told *Microwave News* that he is now planning to repeat the DMBA breast cancer study using the same substrain of Sprague-Dawley rats used by Battelle.

More support for the significance of genetic makeup comes from a set of cellular experiments carried out by Dr. Anna Wobus's group at the Institute for Plant Genetics and Agricultural Research in Gatersleben, Germany.

Wobus's group found that 50 Hz fields caused changes in the expression of a number of different genes, Dr. Franz Adlkofer of the VERUM Foundation in Munich said at the BEMS meeting. "The genetic background may determine whether or not stem cells respond to ELF EMFs," he said. Wobus is part of the EC's REFLEX research group, which is coordinated by Adlkofer.

Adlkofer has previously reported that Wobus has found that RF/MW radiation at an SAR of 1.5 W/Kg could affect a number of different genes — but only in those cells that were p53 deficient (see *MWN,* N/D01). Wild type cells did not respond, however. He calls the p53 tumor suppressor gene "the guardian of the genome."

More generally, these two new sets of German findings may finally explain why so many biological experiments with electromagnetic radiation yield contradictory results. The inability of different labs to repeat studies has led many skeptics to dismiss the whole field of non-ionizing radiation health research. Some call them Cheshire cat effects, after the now-you-see-it-now-you-don't apparition in *Alice in Wonderland*.

Years ago, a multi-lab international effort called the Henhouse Project, sponsored by the U.S. Office of Naval Research, showed that pulsed magnetic fields could upset the development of eggs from some strains of chickens but not those from other strains (see *MWN,* M/A88).

Kaiser Miscarriage Study: A Chorus of Skeptics

Dr. De-Kun Li's critics are on the march. His epidemiological study linking miscarriage to EMF exposures above 16 mG has become the target of skeptical, even hostile, criticism.

Sir Richard Doll attacked Li's study in a March 25 posting on the Web site of the U.K.'s National Radiological Protection Board (NRPB). Li's findings do not provide "worthwhile evidence of an increased risk," wrote Doll, adding that they probably do not "even justify further investigation." Drs. David Coggon and Anthony Swerdlow, members of NRPB's Advisory Group on Non-Ionizing Radiation (AGNIR), which Doll chairs, and NRPB's Dr. Colin Muirhead also signed the commentary.

Li and colleagues at Kaiser Permanente in Oakland, CA, have reported that pregnant women exposed even briefly to magnetic fields over 16 mG face miscarriage risks up to six times greater than women with lower exposures (see *MWN,* M/J01 and J/F 02). In an accompanying commentary, Dr. David Savitz of the University of North Carolina, Chapel Hill, argued that Li's finding could be due to behavioral differences between women who are pregnant and women who are not.

Doll pointed to "severe limitations" in Li's study — specifically, possible selection bias and the absence of a dose-response trend — and cited Savitz's arguments with approval.

The U.K.'s Drs. Denis Henshaw and Mike O'Carroll immediately alerted Doll that Li had tested and refuted Savitz's hypothesis. Henshaw is a physics professor at the University of Bristol and Mike O'Carroll is an emeritus professor of applied mathematics who is now a leader of Revolt, a power line activist group.

Soon after, a more temperate version of the commentary appeared on the NRPB Web site — and this time, it was signed by Doll on behalf of the entire AGNIR. The group stated that the evidence for an increased risk was not "substantial" — rather than not "worthwhile" — and noted the response to Savitz from Li and Dr. Raymond Neutra of the California EMF project, which had sponsored the Kaiser study (see p.1).

In interviews with *Microwave News,* Li said that he felt the British commentary was "pretty hostile" and Neutra opined that, "Anything that is so controversial and contrary to people's assumptions triggers a critical response."

Though removed from the NRPB Web site, Doll's original comments have taken on a life of their own. Electric utilities in California circulated them and the BEMS newsletter published long excerpts in its March/April issue.

Even though Doll had toned down his comments, the NRPB continued to cast doubt on Li's results, echoing Savitz's original arguments. "Women who are more likely to have miscarriages... behave differently," NPRB spokesperson Dr. Michael Clark told BBC Radio's Alex Kirby on its *Costing the Earth* program aired on April 25.

On the same broadcast, Dr. John Swanson of the U.K.'s National Grid Co. was more cautious, however, arguing that Li's results deserve to be taken seriously and should be followed up. "As a responsible industry, we are prepared to test this result," he said.

In May, Savitz, Li and Neutra participated at an EPRI workshop. "My basic skepticism and uncertainty remain," Savitz told *Microwave News* after the workshop, which was described by Dr. Robert Kavet, EPRI's EMF manager, as an "internal business meeting" (see *MWN,* M/A02).

EPRI, which does research for the electric utility industry, states that it will "investigate whether sources of bias such as differential exposure misclassification and uncontrolled confounding have contributed to the associations" identified in the Kaiser miscarriage study. EPRI expects to have results ready for publication by the end of 2004, according to a project description posted on its Web site, <www.epri.com>.

In April, Neutra responded to Doll's criticisms in letters sent to the NRPB and to the editor of *Epidemiology,* where Li originally published his findings. The journal has declined to publish the response and the NRPB has not posted it on its Web site.

Neutra and Li sent a similar letter to the BEMS newsletter in May; Neutra displayed it on a poster board at the BEMS annual meeting. As of early August, the letter had not appeared in print.

California EMF Report *(continued from p.1)*

"At this stage, our role is to tell the PUC how certain we are that there is a problem and how serious we think the problem is," Neutra told *Microwave News*. "We are also laying out the pros and cons of different policy options, which the PUC can use if it holds regulatory hearings." Neutra said that PUC hearings have been requested.

DelPizzo sees no contradiction between the report's conclusions and its lack of policy advice. "People have a right to be warned," he said in an interview, "but whether a major effort to reduce EMFs is appropriate must still be decided."

Neutra, DelPizzo and Lee write that they see a greater probability of a health risk than do "the majority of the members of scientific committees convened to evaluate the scientific literature" by the U.S. NIEHS, the U.K. NRPB and IARC. Lab studies "might have failed to pick up a mechanism," the three researchers explain, and therefore they are unwilling to downplay the epidemiological evidence, which is central to their outlook.



DR. RAYMOND NEUTRA LEADS THE CALIFORNIA EMF PROGRAM

To those who argue that EMFs in the home or workplace are too weak to cause health effects, they respond that such arguments "depend on assumptions about biological systems that may or may not be sophisticated enough to reflect reality and rule out an effect."

For Alzheimer's disease, male and female breast cancer, adult leukemia, heart disease and suicide, they conclude that the evidence is weaker but that a link to EMFs cannot be ruled out.

A draft of the report, dated April 2001, was released for comment last summer, and elicited numerous reactions both favorable and critical (see *MWN,* J/A01 and J/F02). In May 2002, the

revised document won final approval from the program's 11-member Science Advisory Panel. Some panel members expressed reservations, however, arguing that the report's conclusions overstate the strength of the evidence pointing to health risks.

While the final version is very similar to last year's draft, the executive summary uses more general language to express the authors' degree of confidence. For example, the draft stated that:

> It is "*more than 50% possible*" that EMFs at home or at work could cause a very small increased lifetime risk...As this phrase implies, there is a chance that EMFs have no effect at all [emphasis in original].

The final version states:

> All three of the DHS scientists are inclined to believe that EMFs can cause some degree of increased risk...

It also lists the three authors' individual opinions on each type of health risk (see table below). The draft forced readers to guess who thinks what.

The final report is cautious about ways of reducing exposures, pointing to "uncertainty" over the "aspect of the 'EMF mixture,' if any," that should be mitigated (see box at right). It adds that individual decisions affecting exposures, such as choosing a home or jogging route, should balance the "uncertain" risks posed by EMFs against such "certain risks" as fire, flood or crime.

EMF mitigation measures are also discussed in the analysis of policy options accompanying the report. This appears to be generally unchanged from last year's draft. It concludes that "inexpensive" measures to reduce EMFs — such as restringing power lines and changing wiring in homes and schools — can be justified on a cost-benefit basis.

Lee has also left the California health department. She is now with AstraZeneca, a large pharmaceutical company.

The California program is the last major effort in the U.S. on the health effects of EMFs. No other research is under way or planned at this time. In July, the PUC advised Neutra that the program can continue up to another year until it has spent its remaining $100,000.

Putting Risks and Mitigation Strategies in Perspective

"There are ways to avoid...uncommon accumulated exposures by maintaining a distance from some appliances, changes in home wiring and plumbing and power lines. However, to put things in perspective, individual decisions about things like buying a house or choosing a jogging route should involve the consideration of certain risks, such as those from traffic, fire, flood and crime, as well as the uncertain comparable risks from EMFs."

"[E]pidemiological studies primarily implicate the magnetic fields or something closely correlated with them. Some researchers think that associated high- or low-frequency stray contact currents or charged air pollution particles are the true explanation rather than magnetic fields. The actions one would take to eliminate the field are not always the same as one would take to eliminate the currents or the charged particles....This additional uncertainty about what aspect of the mixture might need to be mitigated will thus provide a challenge for policymakers."

Excerpts from the Executive Summary of the California EMF Report

An Evaluation of the Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring, Electrical Occupations and Appliances will be placed on the EMF program's Web site, <www.dhs.cahwnet.gov/ehib/emf>, when it is released to the public.

California EMF Report's Conclusions

• To one degree or another, all three of the DHS scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's disease [ALS] and miscarriage.

• They strongly believe that EMFs do *not* increase the risk of birth defects or low birth weight.

• They strongly believe that EMFs are *not* universal carcinogens, since there are a number of cancer types that are not associated with EMF exposure.

• To one degree or another they are inclined to believe that EMFs do *not* cause an increased risk of breast cancer, heart disease, Alzheimer's disease, depression or symptoms attributed by some to a sensitivity to EMFs.

However,

• All three scientists had judgments that were "close to the dividing line between believing and not believing" that EMFs cause some degree of increased risk of suicide,

Or

• For adult leukemia, two of the scientists are "close to the dividing line between believing and not believing" and one was "prone to believe" that EMFs cause some degree of increased risk.

The table below presents the individual estimates of the three EMF program scientists' "degree of certainty" (1-100) that EMFs increase the risk of each outcome. Several are lower than the estimates given in the draft report (see MWN, *J/A01).*

	childhood leukemia	adult leukemia	childhood brain cancer	adult brain cancer	female breast cancer	male breast cancer	miscarriage	ALS	Alzheimer's disease
Raymond Neutra	54	52	11	51	11	39	51	52	20
Vincent DelPizzo	95	85	45	80	49	45	56	55	40
Geraldine Lee	65	40	20	60	15	20	59	55	15

Federal Judge in Newman Brain Tumor Suit Will Decide if Phones Must Be Sold with Headsets, May Also Hear Other Cancer Cases

Catherine Blake, the federal judge presiding over the *Newman* mobile phone–brain cancer lawsuit, will also decide the class-action cases that would force phone manufacturers to provide consumers with hands-free kits.

Industry lawyers are now asking that other brain cancer lawsuits filed around the country be moved to her Baltimore courtroom — which would put Blake in charge of essentially all U.S. litigation on mobile phones and health.

Blake will decide by "the end of the summer" whether to allow Dr. Christopher Newman's case to be heard by a jury, a clerk working for Blake told *Microwave News* in early August. In February, Blake held a weeklong *Daubert* hearing on the scientific evidence linking mobile phone radiation to brain cancer (see p.7 and *MWN,* M/A02).

The headset suits were transferred to Blake last October 31 by the Judicial Panel on Multidistrict Litigation in Washington, which assigns cases in the federal court system. Motorola and the other defendants had requested that they be moved to federal court. On June 21, 2002, Blake denied motions filed by lawyers at the Peter Angelos firm in Baltimore, among others, to return the suits to the five state courts in which they were originally filed (see *MWN,* N/D00 and M/J01).

Demanding that manufacturers supply headsets with mobile phones is "a disguised attack on federal law in an area of national importance," Blake writes, referring to the Telecommunications Act of 1996, which gives the Federal Communications Commission (FCC) sole authority to set exposure limits for wireless technology (see *MWN,* M/A96). Therefore, she ruled, a federal court should have jurisdiction.

If lawsuits to require headsets were successful in some states but not in others, Blake noted, the result would be a patchwork of state and local RF/MW safety requirements, contrary to the 1996 law.

While Blake only ruled on a procedural question, her decision offers hints on how she might decide the substantive issues in the headset cases.

For instance, Blake contends that any court deciding these cases "necessarily must evaluate" whether the FCC rules "adequately protect the public's health." On this point, Blake emphasizes that a federal appeals court upheld the FCC's RF/MW guidelines two years ago after they were challenged by a coalition of activists (see *MWN,* M/A00). The similarities between that case and the headset lawsuits "cannot be ignored," she writes.

Reviewing the appeals court's decision, Blake endorses its finding that the FCC rules embody "carefully considered judgments" on the appropriate balance between health protection and the development of wireless technology.

Indeed, Blake argues that the plaintiffs chose to bring their lawsuits in state court because they recognized "the unlikelihood of success in federal court."

Blake also writes that the FCC had "considered and rejected a headset requirement." She refers to a statement on the joint FCC and Food and Drug Administration consumer information Web site: "Since there are no known risks" from mobile phone radiation, "there is no reason to believe that hands-free kits reduce risks" (see *MWN,* M/J02). The defense pointed this language out to Blake in a May 6 letter.

The multidistrict litigation panel will also decide whether to transfer to Blake the other personal injury lawsuits alleging that phone radiation causes brain cancer. In a July 3 filing with the panel, defense lawyers argued that the cases belong in Blake's court because they also turn on health issues.

In late July, the panel issued a conditional order to transfer the cases. The plaintiffs' lawyers can challenge this order, and several of them have told *Microwave News* that they will do so (see box below). The panel could hold a hearing on the matter at its next meeting, which is scheduled for September.

Jeffrey Morganroth of Morganroth & Morganroth in Detroit, who represents plaintiffs in six separate brain tumor lawsuits now before Judge Thomas Penfield Jackson of the federal district court in Washington, says that the defendants broke an agreement not to file any further motions until Jackson has decided whether to return these lawsuits to the District of Columbia court where they were originally filed (see *MWN,* N/D01 and M/A02). Defense attorneys counter that their request is not covered by the agreement, which Jackson had sanctioned.

Brain Tumor Lawsuits: New and Renewed

On May 30, lawyers for Brian Barrett revived his lawsuit against Nokia, BellSouth Mobility and the CTIA, which charges that his brain tumor was caused by mobile phone radiation. Barrett first sued early last year, but his attorneys at Weinstock & Scavo in Atlanta withdrew the suit "without prejudice" last December (see *MWN,* J/F01 and N/D01).

"We believe that recent developments in the science strengthen our case," explained Richard Capriola of Weinstock & Scavo. He pointed to Dr. Lennart Hardell's testimony in the *Newman* case and the fact that Hardell's epidemiological study linking phone use to brain cancer has been accepted for publication (see p.7 and *MWN,* M/A02 and M/J02).

Two weeks later, on June 14, Andrew Horn filed a complaint against Motorola, Verizon and others in Texas state court in San Antonio. Horn, a 24-year-old Houston resident, contends that his brain cancer is due to his use of his Motorola phone. He is represented by Patrick Haines of the Lanier law firm in Houston.

At the defendants' request, both cases have been moved to U.S. federal court. They might end up being heard by Judge Catherine Blake in Baltimore (see story above). Both Capriola and Haines told *Microwave News* that they will seek to return them to state courts.

«Eye on Europe»

Germany's research effort on mobile phone EMFs is getting under way. The **Federal Radiation Protection Office** (known as BfS) is "in the process of awarding grants," Dr. **Anne Dehos** of BfS' Institute for Radiation Hygiene told *Microwave News*. But she declined to say which proposals were selected until all the contracts have been finalized. Last summer, the government announced the four-year, €8.5 million ($8.5 million) effort (see *MWN,* J/A01, see also J/F02). Among those who have been funded is Dr. **Alexander Lerchl**, a professor of biology at the International University Bremen. Lerchl has received three grants, with a total budget of approximately €800,000. In two different experiments, leukemia-prone mice will receive lifetime exposures to 900 MHz GSM (0.4 W/Kg) or 50 Hz magnetic fields (10 mG, 1G, 10 G). The animals will be exposed 24 hours a day. In his third study, Lerchl will investigate the effects of 900 MHz signals on isolated hamster pineal glands.

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The **French** government report, *Mobile Telephones, Base Stations and Health: Current State of Knowledge and Recommendations,* is now available in English. Written by a panel chaired by Dr. Denis Zmirou (it is known as the **Zmirou Report**) and released last year, the 250-page report was translated by **MCL** in London for the **GSM Association**. Zmirou's committee recommended a precautionary approach to the use of mobile phones and asked manufacturers to reduce exposures "to the lowest possible level compatible with service quality" (see *MWN,* J/F01). It is available free on MCL's Web site, <www.mcluk.org>.

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BUWAL, the **Swiss** environment agency, has settled on a compromise, if somewhat complex, plan on how to apply its exposure limits to closely spaced base station antennas. The new scheme is more lenient than the one used in **Zurich**, but stricter than the approach favored by the wireless industry. Zurich has been treating telecom antennas within 100 meters of each other as a single source when applying the national precautionary limits of 4 V/m at 900 MHz (6 V/m at 1800 MHz). (In the past, we have incorrectly stated that BUWAL had issued a similar proposal, when it had only stated that antennas "in close proximity" — not within 100 m — should be treated as a single source; see *MWN,* S/O01 and M/A02.) BUWAL's new administrative guidelines, issued on June 28, advise local officials to treat antennas located on the same rooftop as a single source. In all other situations, both an antenna's distance from neighboring antennas *and* the transmitter power of nearby antennas should be taken into account. For example, for low-power antennas such as those commonly used in urban areas, antennas as close as a few meters from each other would be considered as separate sources, provided they are on different buildings. **SICTA**, the Swiss wireless industry lobby, had asked that antennas be considered as separate sources as long as they do not belong to the same network. "From now on," SICTA contends, "antennas in urban areas can only be operated at low power levels," requiring more antennas and imposing "high additional costs." Nevertheless, the trade group has accepted the rules because they will bring legal certainty and because BUWAL, at the same time, abandoned a proposal to include additional safety factors to compensate for measurement uncertainties. Zurich and other local governments are not bound by the new advice, but BUWAL warned that more or less stringent rules might be challenged in court as unreasonable. The guidelines are available, in German only, at <www.buwal.ch>; they will soon be translated into French and Italian.

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COST 281, the European group that encourages scientific cooperation on research on the potential health effects of mobile

Four Swedish Professors Assert Phones Are Safe

Once again, professors at the Karolinska Institute have written to a leading Swedish newspaper to try to convince the public that mobile phones are safe.

MOBILE PHONES ARE NOT DANGEROUS ran the headline in the July 18 *Dagens Nyheter* (*Today's News*). Phone radiation does not entail any cancer or genetic risks, wrote three researchers from the Karolinska and a fourth from Stockholm University.*

One of the four, Dr. Magnus Ingelman-Sundberg, also signed a letter last year that attacked Swedish scientists for making public statements about health risks associated with mobile phones (see *MWN,* S/O01). He is vice chair of the Karolinska's Institute of Environmental Medicine, where Drs. Anders Ahlbom and Maria Feychting are leading the Swedish component of IARC's mobile phone cancer study (see p.7 and *MWN,* J/F98 and M/A00).

The four researchers advised that occasional alarming reports about mobile phone cancer risks should be ignored.

On August 7, *Dagens Nyheter* ran a response from Jan Åberg, who lives in Trollhåttan and teaches classes on electrical safety. "We may be facing an environmental catastrophe, if we do not apply the precautionary principle" he wrote. Åberg also wonders how the four professors can be so certain that they are right given that they don't do research in the field.

* Drs. Björn Cedervall, Magnus Ingelman-Sundberg and Hans Wiksell, all of the Karolinska Institute in Stockholm, and Dr. Robert Nilsson of Stockholm University. Cedervall is associate professor of medical radiation physics in the department of oncology and pathology. Ingelman-Sundberg is professor of molecular toxicology at the Institute of Environmental Medicine. Wiksell is adjunct professor on the clinical applications of electromagnetic energy in the department of urology. Dr. Robert Nilsson is with the department of genetic and cellular toxicology at Stockholm University.

phones, will hold its next meeting at the Royal Society in **London**, November 12-13. It will host a seminar on ***Subtle Temperature Effects of RF EMFs***. Details are still being worked out; for more information contact Gerd Friedrich of the FGF, the German mobile phone industry group, at <info@fgf.de>.

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Germany has launched its own Internet database on **telecom antennas**, but access will be limited to authorized government officials. In contrast, similar sites in Switzerland and the U.K. are open to all (see *MWN,* M/J02). Only officials involved in planning, zoning or health care can use the German Web site. They can obtain a lot of detailed information, including locations, frequencies, output powers and antenna patterns. Even for these officials, however, access is limited to the specific areas for which they are responsible. The Regulatory Agency for Telecommunications and Post in Bonn maintains a database covering 51,000 sites, including those for mobile phones, radio and TV. Military and intelligence facilities are excluded. While the public cannot use the site, officials are allowed, at their discretion, to pass information along to others. In announcing the launch of the database on June 20, Matthias Kurth, the agency head, called it "a further step toward making the sometimes controversial discussion of antenna siting more substantive." More information is available, in German, at <www.regtp.de>.

NCRP Revives Committee on RF/MW Health Effects

The National Council on Radiation Protection and Measurements (NCRP) is reviving its committee on the biological effects of radiofrequency and microwave (RF/MW) radiation. The NCRP's board of directors disbanded the panel last year because its work was proceeding too slowly (see *MWN,* S/O01).

"I have been asked to chair a reconstituted committee," Dr. James Lin told *Microwave News*. Lin, of the University of Illinois in Chicago, was the original chair of the committee, which was first set up seven years ago to review the health effects literature and to recommend exposure guidelines (see *MWN,* S/O95).

"The board asked Jim to tell us what has been done and what needs to be done," said Ron Petersen, NCRP's vice president for non-ionizing radiation and a member of its board of directors. Petersen is a consultant based in Bedminster, NJ.

Lin said that he will recommend a slate of candidates for membership. The list will be presented to the NCRP's board of directors at its next meeting, which will be held September 11-12 at the council's offices in Bethesda, MD. Lin declined to reveal who he would like to invite to serve on his committee.

"The goal is to make a unique contribution," said Dr. Tom Tenforde, the newly installed president of the NCRP. The board suggested a number of important areas for the committee to focus on, he added, including a "critical analysis of other existing guidelines" and ways to communicate its findings to the public.

"We have some ideas on possible funding sources," Tenforde said.

« Wireless Notes »

Drs. **Lennart Hardell** and **Kjell Hansson Mild**'s paper on the incidence of brain tumors among users of cell phones is now scheduled for publication in the August issue of the ***European Journal of Cancer Prevention,*** Mild told *Microwave News*. The paper, which is at the heart of the Newman brain tumor lawsuit, had originally been expected to appear in the journal's June issue (see *MWN,* M/A02).

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ICNIRP's committee on **epidemiology**, chaired by Dr. **Anders Ahlbom** of the Karolinska Institute in Stockholm, has started working on a new review of the epidemiological literature on RF/MW health effects. "We are planning to focus on methodology," Ahlbom told *Microwave News,* explaining that this should help the interpretation of upcoming and future studies. He plans to complete the review by next summer. Dr. **Leeka Kheifets** of the WHO's EMF project and Dr. **Patricia Buffler** of the University of California, Berkeley, joined the committee in March.

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IEEE's Committee on Man and Radiation, known as **COMAR**, also is questioning the efficacy of devices that claim to protect users of mobile phones. "Independent tests on a number of such devices show them to be ineffective," according to a COMAR statement published in the May/June issue of the *IEEE Engineering in Medicine and Biology Magazine*. COMAR endorses the use of hands-free kits to move handsets away from the body for those who wish to reduce their exposures "for whatever reason." In addition, it advises that digital phones usually entail lower exposures than older analog models because the digital sets use less power. Earlier this year, the Federal Trade Commission took legal action against a number of companies that market **phone shields** for making false claims (see *MWN,* M/A02). The primary authors of the COMAR statement are Dr. **C.K. Chou** of Motorola, Dr. **Ken Foster** of the University of Pennsylvania and Prof. **Pere Riu** of the Technical University of Catalonia in Barcelona. The statement is also available on the Internet at <www.seas.upenn.edu/~kfoster/protective.htm>.

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Disney and **Motorola** are teaming up to tap the 6-to-12-year-old consumer electronics market. They will roll out the first products — a **two-way radio** and a 2.45 GHz **cordless phone** — in the fall, with others to follow next year. Motorola states that the walkie-talkies will have a range of up to two miles. And in late July, Disney announced that it is launching a service which will allow customers in Taiwan to download images of Mickey, Donald and Goofy onto their phone screens. In 2000, Disney pledged not to license its characters for use on cell phones "until there is reliable evidence establishing the absence of any [health] risk." Disney recently reaffirmed this commitment to *Microwave News* (see *MWN,* N/D00 and M/J02).

WHO's Brundtland Backs Repacholi's EMF Project

In recent months, Dr. Gro Harlem Brundtland, the director-general of the World Health Organization (WHO), has repeatedly spoken out in favor of a precautionary approach to the use of mobile phones, while the WHO's International EMF Project has demurred.

Brundtland is expressing "her personal views" and "she is not questioning the existing WHO position," Jon Liden, Brundtland's communications advisor, told *Microwave News*. Her remarks "do not constitute in any way a change in WHO's recommendations or position or amount to any conflict on this issue with the organization," he stated.

Drs. Michael Repacholi and Leeka Khefeits, who manage the EMF program in Geneva, have taken the position that more research is needed and that those who are concerned about possible radiation risks should limit their calls and use hands-free sets (see *MWN,* M/J02, also J/A00). But that is as far as they are willing to go. Repacholi argues against applying precautionary policies to mobile phones (Germany has just done so however; see p.1) and against limiting the use of phones by children.

At a July 1 press conference in Oslo held in connection with the conference of the International Union Against Cancer, Brundtland said: "I would be cautious about letting children use mobile phones for hours every day because we don't know enough about the damage." Her comments were picked up by newspapers and television networks all over the world.

She made similar remarks in an interview with the Norwegian press in March (*MWN,* M/A02). These were later picked up by Swedish but not by English language newspapers.

In July, when the story did spread further, the Mobile Manufacturers Forum (MMF), an industry trade group with close ties to the project, issued a statement endorsing the views of the project. "Brundtland's statements are her personal opinion and are certainly inconsistent with [the] official position of the WHO," the MMF stated.

With respect to power-frequency EMFs, the project last year shifted its opinion and endorsed a policy of prudent avoidance, while still rejecting the application of the precautionary principle (see *MWN,* S/O01).

Germany Promotes Low-SAR Phones *(continued from p.1)*

the precautionary principle when developing future generations of mobile phones, predicts Gerd Billen, who chairs the committee that oversees the ministry's label program. The panel has 13 members from government, industry and labor, consumer and environmental groups.

The environment ministry and the radiation protection office are urging manufacturers to apply for the label.

Phone makers, however, immediately dismissed the initiative as "inappropriate and nonsensical." BITKOM, a trade association whose members include Motorola, Nokia, Siemens and Sony Ericsson, stated that the initiative "lacks any scientific basis." The label implies that phone radiation is harmful and that there is a greater health risk from those phones that do not meet the new SAR requirement — but any mobile phone is safe if it meets ICNIRP's 2.0 W/Kg guideline, BITKOM stated.



"Environment label for low radiation"

Manufacturers have opposed labels for low-radiation phones since Jürgen Trittin, the German environment minister, first proposed them last year (see *MWN,* J/A01). Most phones sold in Europe include SAR information inside their packaging.

The Blue Angel Web site* states that the ICNIRP limit protects against established health hazards. But, it adds, in light of the precautionary principle, minimizing exposure is appropriate because of "indications of harmful health effects" at lower levels. According to the radiation protection office, 15% of the phone models marketed in Germany have SARs of 0.6 W/Kg or less.

The Blue Angel label is controlled by the environment ministry and is administered by the German Institute for Quality Assurance and Certification (known as RAL) in Saint Augustine, near Bonn. The oversight panel selects the product categories for which Blue Angel labels can be offered and approves the requirements for each category.

Labels may be displayed on scores of environmentally friendly products — for example, heaters that meet standards for energy efficiency and paper products with a high percentage of recycled fibers.

To be certified as environmentally friendly, phones must also meet requirements for recycling.

TCO'01 Mobile Phones, the certification standard launched last year by the Swedish white-collar union, TCO, specifies a maximum SAR of 0.8 W/Kg (see *MWN,* J/F01). TCO also requires that phones meet other criteria, including a standard for "telephone communication power." The German label requires only that a phone's performance be "adequate."

The federal radiation office's endorsement of this new SAR limit may portend major implications for the harmonization of radiation standards. The office has been closely associated with ICNIRP for many years. Dr. Jürgen Bernhardt, who retired in 2000 after a long career at the office's Institute for Radiation Hygiene, is a former chair of ICNIRP and is currently its vice chair. The office's Rüdiger Matthes is ICNIRP's scientific secretary, and Dr. Jutta Brix, a biologist there, is a consulting member of the commission.

*Go to <www.blauer-engel.de>. Portions of the site are in English.

IEEE RF/MW Exposure Limits: Revise or Stand Pat?

The Risk Assessment Working Group (RAWG) of the IEEE's International Committee on Electromagnetic Safety (ICES), better known as SCC-28, is still trying to reach consensus on how to revise its RF/MW radiation exposure standard (see MWN, *J/F02).*

The current standard, designated C95.1, has two sets of limits based on a maximum specific absorption rate (SAR) of 0.4 W/Kg for workers and 0.08 W/Kg for the general population. ICES applies these two tiers to what it calls "controlled" and "uncontrolled" environments, respectively.

These limits are based on the view that there is no "reliable evidence of hazardous effects" below a whole-body average SAR of 4 W/Kg. A safety factor of ten was then added for controlled environments, with an additional safety factor of five for uncontrolled exposures.

Reprinted below are excerpts from e-mails, obtained by Microwave News, *which have been exchanged within the RAWG.*

"I have no doubt that 0.4 W/Kg is entirely safe for everyone regardless of exposure duration, and that this value could well be chosen for a lower or only tier MPE."

— Dr. Marvin Ziskin
Temple University Medical School, Philadelphia

"I too believe that 0.4 W/Kg is safe for all, in all possible circumstances."

— Captain Greg Gorsuch,
Bureau of Medicine and Surgery, U.S. Navy, Washington

"There is a lot of talk about 4 W/Kg being a threshold for a nonhazardous effect, somehow tending to minimize the importance of the finding since we are presumably trying to set a standard to protect against adverse biological effects. Let me remind all of us that the 'threshold' discussed may be 'nonhazardous' in the context of the very short duration exposures used in determining it. But...most of the researchers who have developed these data agree that this threshold would turn into a really hazardous threshold *if* the exposure had been longer...So, sometimes, I sense that we are sort of talking like the 4 W/Kg figure is no big deal, but we know better."

— Richard Tell, Richard Tell Associates Inc.,
North Las Vegas, NV, and chair, RAWG

"Practically speaking, I think that you are going to be stuck with a two-tier approach with limits more or less similar to ICNIRP....If the level was 0.4 W/Kg for both public and occupational, the standard would instantly be dismissed in favor of ICNIRP. If the limit was 0.08 W/Kg for both occupational and public, people would applaud — but then you would soon be facing proposals for a new tier at 0.01 W/Kg for the general public."

— Dr. Kenneth Foster, University of Pennsylvania, Philadelphia

"I do not like the concept of stating a level (0.4, 0.08) and then trying to come up with a rationale for that number. This is crazy and logically backwards....If we cannot find a better rationale than the current one, which is weak, then let's not change the current standard. Don't grasp at straws. This is too important."

— Dr. Mays Swicord, Motorola, Plantation, FL

"Right now, the ICES approach to RF standards is not that different from the approach taken by ICNIRP....However, if ICES takes a significant departure from C95.1 and from ICNIRP, the struggle for international harmonization will be set back enormously....I believe that standards harmonization is good....My opinion is similar to that [of] Mays Swicord."

— Dr. Michael Murphy, U.S. Air Force
Research Lab, Brooks AFB, San Antonio

"We are obsessed by our own definition of 'science.' This standard is a lot more than science whether we like it or not. There have always been politics and sociology in the setting of MPE limits. Where do you think the lower public MPEs come from? Not quite the tooth fairy."

— James Hatfield, Hatfield & Dawson Consulting Engineers, Seattle

"When government does make a decision about risk for the public (e.g., pollution laws), I think they generally try to be more conservative than we in OSHA would be for healthy worker populations. That is why I still advocate at least two tiers if we want our standard to address all populations, including infants and the elderly."

— Robert Curtis, Occupational Safety and
Health Administration (OSHA), Salt Lake City

"A standard would be 'extremely conservative' if it protected to an extreme degree. In my judgment, a factor of 10...is not 'extreme.'"

— Dr. Asher Sheppard, Asher Sheppard Consulting, Redlands, CA

"I think the term 'extremely conservative' is actually a fair description for the 0.4 W/Kg whole-body-average SAR limit. I've come to this conclusion by comparing the 0.4 W/Kg heat load to other sources of heating that are routinely accepted by the community without any qualms, including for example: increasing the ambient air temperature by a few degrees; stepping out into the sunshine; hugging your children; and almost any form of physical exertion, including tapping out these words on my computer."

— Dr. Vitas Anderson, EME Australia Ltd., Melbourne

"I don't support the use of ALARA in RF standards. ALARA implies that lower levels are safer than higher, such as in the stochastic hazard of ionizing radiation [IR]. There is no analogy with RF, there are good reasons to believe that there are true thresholds with RF below which there is no effect at all even across a large population. Using ALARA in RF weakens its importance in IR. We have deliberately removed it from the Australian and NZ standards for that reason."

— Dr. David Black, Enviromedix IT Medicine,
Auckland, New Zealand

"C95 standards don't have to be perfect, but must be protective, enforceable and practical."

— Dr. Aviva Brecher, U.S. Department of
Transportation, Cambridge, MA

Abbreviations:

ALARA: as low as reasonably achievable

ICNIRP: International Commission on Non-Ionizing Radiation Protection

MPE: maximum permissible exposure

The Talk of BEMS: Divergent Mobile Phone Studies in the International Spotlight

It's not often that two papers presented at the BEMS annual meeting* command international media attention. But that's what happened this year with two studies that have very different implications for the safety of mobile phones.

CELL PHONES SAFE, U.S. STUDY FINDS was the headline in the June 26 *Globe and Mail*, a national Canadian newspaper. Two days later, the *Financial Times* warned ALARM BELLS RING FOR MOBILE PHONE MAKERS, echoing an item that had run a week earlier in the *Wall Street Journal,* as well as many other news outlets, both in the U.S. and Europe (see box, p.11, and p.13).

The *FT* and the *Journal* were referring to the work of Dr. Dariusz Leszczynski of the Finnish Radiation and Nuclear Safety Authority, known as STUK, in Helsinki. He has shown that mobile phone signals can change the way a large number of different genes are expressed. This may help resolve the ongoing controversies over microwave radiation links to cancer and leakage through the blood-brain barrier.

The *Globe and Mail* story was about a study carried out by Dr. Joseph Roti Roti in which rats were exposed for two years to two different types of mobile phone signals — analog and CDMA. He found that the rats showed no increase in spontaneous brain tumors or other types of cancer.

Iridium Signal: No Effect on Cancer Rates in Rats

A second, two-year animal exposure study, also reported at the BEMS meeting, showed that the 1.6 GHz radiation emitted by Motorola's Iridium phones did not increase brain cancer in rats.

"There is no evidence of increased tumors in the exposed animals," said Dr. Larry Anderson of the Battelle labs in Richland, WA. Indeed, he added, there is no suggestion of any toxic effect.

A group of 36 pregnant Fischer-344 rats was exposed in the far field for two hours a day, seven days a week at an SAR of 0.16 W/Kg. The exposures continued until the offspring were 23 days old. The Battelle team then selected three groups of 90 males and 90 females from the 720 offspring: These were exposed for two hours, five days a week in the near field over the next two years. The rats were placed in tubes in a carousel configuration, resulting in SARs in the brain of approximately 0.16 W/Kg and 1.6 W/Kg. The third group served as controls.

The Iridium satellite phone service went bankrupt in August 1999 after Motorola had invested more than $5 billion in the project. The Iridium system is still in limited operation; it is now being marketed to specialized users.

Anderson told *Microwave News* that he would soon submit his final report to Motorola and would then prepare a paper for publication. (See also p.2.)

Roti Roti, who is at Washington University in St. Louis, exposed rats to an average SAR of 1.25 W/Kg for four hours a day, except on weekends and holidays. "We tried to mimic a high level of exposure that humans might experience," he said.



"I have convinced myself that this is real"
— Dr. Dariusz Leszczynski

The fact that either of these two studies was headline news is a story in itself. STUK had not alerted the press and Leszczynski had already published his results weeks earlier in *Differentiation* (see *MWN,* M/J02). Indeed, Leszczynski had presented much of the data at last year's BEMS meeting (see *MWN,* J/A01).

Coverage of Leszczynski's work took off after a BBC reporter, on a hunt for the latest scoop on mobile phones and health, was directed to him.

There is no mystery about how the Roti Roti study got into the news. His media office issued a press release, as it turned out, on the same day that CNN ran a detailed story on Leszczynski's work. Roti Roti says that Motorola, which sponsored his study, did not ask him to send out a press release — nor did the company ask him to help counter the publicity generated by Leszczynski's findings. It came about, he explains, due to a series of serendipitous events.

In his press release, Roti Roti stated that, "As far as I can tell from the work so far, the greatest hazard with cell phones is driving a car while talking on one."



"I have no reason to believe that cell phones are not safe"
— Dr. Joseph Roti Roti

Leszczynski's work "should be followed up," Roti Roti told *Microwave News,* adding that he would be asking Motorola for the funds to do so himself. "It certainly raises an interest scientifically." Nevertheless, Roti Roti concluded, "I have no reason to believe that cell phones are not safe."

Leszczynski argues that his and Roti Roti's results are not necessarily contradictory. "I'm not saying mobile phone radiation can cause tumors; rather, that it might help damaged cells develop." But Leszczynski does question whether Roti Roti's rats were exposed to real-world conditions. They lived in a "very special protected environment," he said, pointing out that they did not encounter chemicals or other types of radiation.

Others at BEMS voiced similar concerns about the utility of

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* *24th Annual Meeting of the Bioelectromagnetics Society* (BEMS), June 23-27, 2002, Quebec City, Canada.

† *EMF Science Review Symposium: Breakout Group Reports for Clinical and* In Vivo *Laboratory Findings,* April 6-9, 1998, Phoenix, AZ, NIEHS Publication No.98-4400. It is available on the EMF RAPID Web site, <www.niehs.nih.gov/emfrapid>. (See also p.2.)

two-year bioassays, the type of brain cancer study Motorola commissioned from both Roti Roti and Battelle (see box on p.10). "Rats are not a particularly good model for brain cancer," said Dr. Gregory Lotz of the National Institute for Occupational Safety and Health in Cincinnati. He pointed to a report† from a symposium held under the EMF RAPID program, which concluded that the statistical power of animal studies may be limited by the rats' low incidence of spontaneous brain tumors.

Leszczynski's work has its critics too. For instance, it has been suggested that his exposure system may not adequately control the temperature of the exposed cells — that is, the effects he observes may be a thermal response rather than a result of the electromagnetic signal. To help resolve this possibility, Dr. Niels Kuster's group at IT'IS in Zurich built Leszczynski a new exposure system (see *MWN,* M/J02).

In Quebec City, Leszczynski told *Microwave News* that he had run the experiment three times with Kuster's new equipment and had gotten similar results. "It's reassuring," he said. "It's enough to give me some peace of mind that I'm going in the right direction."

"I have convinced myself that this is real," he added. "Mobile phone radiation triggers a stress response in the cell — it's nothing unusual."

At the BEMS meeting, Dr. Franz Adlkofer of the VERUM Foundation in Munich bemoaned the fact that nothing had yet been done to test the possible effects of 3G mobile phone technology. Adlkofer, who coordinates the REFLEX project in which Leszczynski participates, said that, "This is gross negligence" given the hundreds of billions of euros that have been spent on the launch of 3G.

BEMS Journal To Publish IEEE Literature Reviews

BEMS will publish the literature reviews generated by the IEEE's International Committee on Electromagnetic Safety (ICES), also known as SCC-28. They will appear in a supplement to *Bioelectromagnetics,* the society's journal.

The U.S. Air Force will pay for the cost of the supplement, approximately $15,000, according to Dr. Ben Greenebaum, the editor of *Bioelectromagnetics*.

"I am optimistic that the issue will appear in the first half of 2003," Greenebaum told *Microwave News*. "My feeling is that if the basic premises get out there in black and white, it will be a basis for public discussion."

Dr. Asher Sheppard, the immediate past president of BEMS, compared the move to ICNIRP's publishing the rationales for its standards in *Health Physics*. "The papers will be thoroughly reviewed. The society is not taking sides," said Sheppard, a consultant based in Redlands, CA, who is a member of the journal's editorial board.

More than a dozen "white papers" have been or are in the process of being drafted — most of them by Motorola and Air Force staffers. Copies can be downloaded from the subcommittee's Web site, <grouper.ieee.org/groups/scc28/sc4/main.html>.

Assessing the Leszczynski Study

"I don't think anyone can say whether there are or are not safety problems."

— Dr. Dariusz Leszczynski, Finnish Radiation and Nuclear Safety Authority, Helsinki, quoted by Gautam Naik, "Human Cells May Be Affected by Mobile Phone Radiation," *Wall Street Journal*, June 20, 2002

"If the blood-brain barrier is even temporarily affected by mobile phone radiation, it might have long-term health effects."

— Leszczynski, quoted by Duncan Graham-Rowe, "Phone Safety Debate Reignites," *New Scientist*, June 29, 2002

"At the moment, there is no scientific support for introducing any sort of limitation either on the use of mobile phones or setting new safety limits."

— Leszczynski, quoted in "Fresh Fears over Mobile Phones," *BBC News* (U.K.), June 19, 2002

"I advocate [a precautionary approach] even more strongly now than two years ago, because of the evidence that has been coming out since then....I don't care if it's nonthermal or thermal, what I'm worried about is whether there are effects."

— Sir William Stewart, chair, U.K. Independent Expert Group on Mobile Phones, *New Scientist*, June 29, 2002

"It's difficult for me to believe that nonthermal effects exist."

— Dr. Mays Swicord, Motorola, Plantation, FL, *New Scientist*, June 29, 2002

"This is good work, and another part of the jigsaw, but the Stewart group was well aware of the possibility of biological effects. You can't go straight from a biological effect to a health effect. It's a big leap."

— Dr. Michael Clark, NPRB, Chilton, U.K., in "Mobile Phone Radiation 'Harms Brain Barrier,'" *The Times* (U.K.), June 19, 2002

"If repeated in the intact body, it has horrific implications."

— Dr. Alan Preece, University of Bristol, U.K., quoted by J. Pickrell, "Cell Phone Buzz," *Science News*, June 29, 2002

"The implications here for health are zero."

— Dr. Michael Repacholi, World Health Organization, Geneva, *New Scientist*, June 29, 2002

"You cannot look at one study in isolation. You need to look at all studies in their totality."

— Jo-Anne Basile, CTIA, Washington, "Finnish Study Concludes Radiation Disrupts Cell Activity," *RCR Wireless News,* June 24, 2002

"Everyone has been working on this for years, but nothing has stood up."

— Dr. Garth Price, Telstra, Australia, quoted by Garry Barker, "Health Peril Played Down," *The Age* (Australia), June 21, 2002

FROM THE FIELD

Meeting Notes

• The health effects meeting in **Catania** in **Sicily**, originally scheduled for July, will now be held in September. Among those on the preliminary program are Drs. Carl Blackman, Martin Blank, Settimio Grimaldi, Lennart Hardell, Henry Lai, Wolfgang Löscher, Fiorenzo Marinelli, Kjell Hansson Mild, Paolo Perfetti, Elihu Richter, Stanislaw Szmigielski and Mikhail Zhadin, as well as members of the organizing committee — Drs. **Livio Giuliani**, **Michael Kundi** and **Wilhelm Mosgoeller**. The main goal of the meeting, which is being arranged by Italy's National Institute for Prevention and Work Safety, is to have "a critical discussion of the evidence in the different research fields and a discussion of the possibilities to include this evidence in a comprehensive risk assessment." The invitation notes criticisms of **ICNIRP** for its failure to include a variety of epidemiological and other health studies in its exposure guidelines.

• Even though the Electricity Supply Association of Australia's **(ESAA)** August 9 workshop is advertised as being about power-frequency EMFs, a preliminary program suggested that the results of the replication of the "Repacholi" mobile phone cancer study would be released (see *MWN*, M/J97 and S/O98). But this is not to be. The Australian government, which is funding the experiment, has barred Dr. **Tim Kuchel** of the Institute of Medical and Veterinary Science in Adelaide from discussing his findings prior to publication, the ESAA told us. Kuchel did not respond to a query as to when he will reveal the results, but sources told *Microwave News* that the paper has been submitted.

• The proceedings of the international symposium on ***Light, Endocrine Systems and Cancer: Facts and Research Perspectives,*** held last May 2-3 at the University of Cologne, have been published in *Neuroendocrinology Letters*. The journal is offering a discount price of $49.50, instead of the regular $64.00. Go to <www.nel.edu/Press/Light-Endocrine-Cancer.htm>. In addition to the papers presented at the meeting, there are also four evaluations — by Drs. **Charles Poole**, **Christopher Portier**, **Till Roenneberg** & **Robert Lucas** and **Vladimir Anisimov** & **Johnni Hansen**. Poole, an epidemiologist at the University of North Carolina, Chapel Hill, predicts that this research area will soon be transformed into one associated with "big-time, managed science" and that then, "Researchers on light at night and cancer will quickly find what they have been seeking: the darkness at the end of the tunnel." In his comments, NIEHS' Portier has only one footnote — to "I Got Rhythm," the Gershwin song from the 1930 Broadway show *Girl Crazy*. These evaluations, as well as the abstracts of the papers, can also be downloaded at no charge from the university's Web site, <www.uni-koeln.de/symposium 2002>.

New/Revised Listings

August 9: **Electricity Supply Association of Australia Scientific Workshop 2002: Standard Setting for Power-Frequency EMF,** Melbourne, Australia. Contact: Carmel Pannowitch, ESAA, PO Box 1823Q, Melbourne, VIC 3001, Australia, (61+39) 670-1014, Fax: (61+39) 670-1069, E-mail: <pannowitch@esaa.com.au>.

September 13-14: **EMF Scientific and Legal Issues: Theory and Evidence of EMF Biological and Health Effects,** Catania, Sicily, Italy. Contact: Dr. Livio Giuliani, E-mail: <l-giuliani@libero.it>, Dr. Michael Kundi, E-mail: <michael.kundi@univie.ac.at>, Dr. Wilhelm Mosgoeller, E-mail: <wilhelm.mosgoeller@univie.ac.at>; or Eva Marsalek, Tel./Fax: (43+02243) 87366, E-mail: <eva.marsalek@utanet.at>. Originally scheduled for July 5-6.

"MICROWAVE NEWS" FLASHBACK

Years 20 Ago

• The eighth unexplained cluster of adverse pregnancies among VDT operators is reported — at Surrey Memorial Hospital in Vancouver, Canada.

• In a letter to the *New England Journal of Medicine,* Dr. Samuel Milham publishes the first epidemiological link between leukemia and occupational exposure to EMFs.

• The ANSI RF/MW exposure standard is "pro-industry," says Dr. Nicholas Steneck of the University of Michigan in a paper presented at the annual meeting of the Bioelectromagnetics Society.

Years 10 Ago

• Dr. Keith Florig of Resources for the Future in Washington argues in *Science* that the U.S. could "justify" spending on the order of $10 billion a year on EMF mitigation and that the need for a federal research program is "particularly acute."

• ELF EMFs can block melatonin's ability to control the growth of breast cancer cells, Dr. Robert Liburdy reports at an international conference on EMFs in biology and medicine.

• In Disney's new film, *Honey, I Blew Up the Kid,* power line and RF/MW radiation stimulate the "kid" to grow and grow and grow.

Years 5 Ago

• The National Cancer Institute dismisses any association between childhood leukemia and living near power lines. An accompanying editorial advises against "wasting" any more money on EMF research.

• The NAS–NRC questions the validity of a Michigan Tech University report that ELF EMFs enhance tree growth. Later, committee members say they are not so sure about the basis of their criticism.

• Swiss Re warns that EMF litigation could threaten the entire insurance industry. Its electrosmog report notes that a shift in public attitudes on acceptable risks could cause juries to favor plaintiffs.

Across the Spectrum

"More studies that directly investigate the effects of mobile phone use in the human population are urgently needed....With an estimated 1.6 billion mobile phone users worldwide by the end of 2005, even a small association of mobile phone use with brain cancer could have massive implications, for mobile phone users and the industry alike."

— Editorial, "The Million Dollar Question,"
***Lancet Neurology,* p.201, August 2002**

"Certainly everyone is entitled to have their opinion, but what really matters is science. The independent, peer-reviewed science all indicates that there is no health risk."

— Marc Choma, director of communications, Canadian Wireless Telecommunications Association, Ottawa, referring to Dr. Gro Harlem Brundtland's concerns over mobile phone health risks, quoted by Heather Sokoloff, "WHO Chief Gives Warning Despite Lack of Proof of Health Risks," *National Post* (Canada), July 2, 2002 (see p.8)

Alice Stewart, who has died aged 95, achieved worldwide fame and changed medical practice through her tenacious investigations...Stewart showed a clear connection between leukemia before the age of 10 and the mother's exposure to x-rays during early pregnancy....But it was aggressively opposed by many physicists and radiobiologists, by the committees of the International Commission for Radiation Protection...

— Anthony Tucker, obituary for Dr. Alice Stewart,
***The Guardian* (U.K.), June 28, 2002**

"The cost will be huge and hard to imagine."

— Dr. C.K. Chou, Motorola, Plantation, FL, commenting on a Chinese proposal to adopt a 1 W/Kg SAR standard for mobile phones (see *MWN,* M/J02), quoted by Hou Mingjuan, "Phone Radiation Rule Under Fire," *China Online,* <www.chinaonline.com>, June 20, 2002; Mingjuan identifies Chou as a "science adviser" to the Mobile Manufacturers Forum (MMF), see <www.mmfai.org>

"So now there's kind of a passing of the baton."

— Jo-Anne Basile, vice president for external and industry relations, Cellular Telecommunications and Internet Association, Washington, commenting on the Leszczynski study and the "drying up" of RF/MW research in the U.S. as the effort has increased in Europe, interviewed by Steve Young, *Lou Dobbs Moneyline,* CNN, June 25, 2002 (see p.10)

Letters to the Editor

More Reasons Children May Be at Risk

June 25, 2002

To the Editor:

I read with great interest your report on the Rome meeting on the possible risks of mobile phones to children (*MWN,* M/J02). My institute at the University of Vienna and Physicians for a Healthy Environment (a nongovernmental organization) have produced an information booklet on *Mobile Phones and Children,* sponsored by the Austrian Green Party. It discourages the use of mobiles by children.

The arguments are similar to those that have been put forward by others. In addition, however, it relies on a fact that has not been previously stressed and, to my surprise, appears not to have been discussed in Rome. A child's skull is not only thinner and surely has different dielectric properties because it has more blood vessels — it also contains many more stem cells which can form blood cells.

Hence, if RF/MW radiation has an influence on the development of cancer, its effects will be greater in children for two reasons. First, the most vulnerable cells are only millimeters from the antenna. (To my knowledge, nobody has calculated the SAR within the bone marrow of the skull.) And second, the earlier in life a malign transformation occurs, the more likely it will result in a clinical malignancy.

Prof. Michael Kundi
Institute of Environmental Health, University of Vienna
Kinderspitalgasse 15, A-1095 Vienna, Austria
<michael.kundi@univie.ac.at>

Holding Firm Seven Years Later

June 14, 2002

To the Editor:

Dr. Robert Adair's ongoing dispute with Drs. Richard Albanese and Kurt Oughstun over the Air Force's PAVE PAWS radar [see *MWN,* M/A02 and M/J02] reminds me of another controversy over non-ionizing radiation.

In 1995, Adair and 13 other scientists including six Nobel laureates filed an amicus brief in the *Covalt* case. In *Covalt v. SDG&E,* the Covalt family sued the San Diego electric utility for lost property values and potential health effects due to elevated EMF levels from nearby power lines [see *MWN,* N/D95, also M/A95 and S/O96]. The brief swayed the court with false arguments that EMFs are not a risk factor for cancer.

Since then, several major changes have taken place. Most notably, in June 2001 the International Agency for Research on Cancer (IARC) unanimously voted to classify EMFs as a Category 2B carcinogen, that is, a possible human carcinogen. At about the same time, the California Department of Health Services (DHS) reached a similar conclusion in a draft report based on a five-year investigation of possible EMF health effects [see *MWN,* J/A01].

It is time for Adair and the others to retract this brief. Their ultimately incorrect scientific opinion about EMF health risks carried much weight before the California courts and in the court of public opinion. If Adair is indeed a good scientist, he will recognize that consensus has been reached, and that it differs from the view offered in the *Covalt* brief. If Adair will not revisit his opinion, I will never believe anything *he* says again.

Cindy Sage
Sage Associates
1396 Danielson Rd., Santa Barbara, CA 93108
<sage@silcom.com>

Dr. Robert Adair offered the following response:

June 19, 2002

To the Editor:

Ms. Sage vs. six Nobel laureates (two in medicine)? I judge it no-contest. And the conclusions expressed in their amicus curiae are not challenged by statements of "not impossible" by less eminent groups.

Robert Adair, PhD
Department of Physics, Yale University, New Haven, CT 06520
<adair@hepmail.physics.yale.edu>

Hot New Papers

Roger Santini et al., "Symptoms Experienced by Users of Digital Cellular Phones: A Study of a French Engineering School," ***Electromagnetic Biology and Medicine, 21,*** **pp.81-88, 2002.**

"A survey study, using a questionnaire, was conducted in 161 students and workers in a French engineering school on symptoms experienced during use of digital cellular phones. A significant increase in concentration difficulties ($p<0.05$) was reported by users of 1800 MHz (DCS) cellular phones compared to users of 900 MHz (GSM) cellular phones. In users of cellular phones, women significantly ($p<0.05$) complained more often of sleep disturbance than men. The use of both cellular phones and VDT significantly ($p<0.05$) increased concentration difficulties. Digital cellular phone users also significantly ($p<0.05$) more often complained of discomfort, warmth and pricking of the ear during phone conversations as a function of calling duration per day and number of calls per day."

Reprints: Dr. R. Santini, National Institute of Applied Sciences, Villeurbanne, France, E-mail: <**roger.santini@free.fr**>.

J. Van de Kamer and J. Lagendijk, "Computation of High-Resolution SAR Distributions in a Head Due to a Radiating Dipole Antenna Representing a Hand-Held Mobile Phone," ***Physics in Medicine and Biology, 47,*** **pp.1827-1835, May 21, 2002.**

"SAR distributions in a healthy female adult head as a result of a radiating vertical dipole antenna (frequency 915 MHz) representing a handheld mobile phone have been computed for three different resolutions: 2 mm, 1 mm and 0.4 mm....For an effectively transmitted power of 0.25 W, the maximum averaged SAR values in both cubic- and arbitrary-shaped volumes are, respectively, about 1.72 and 2.55 W/Kg for 1g and 0.98 and 1.73 W/Kg for 10 g of tissue. These numbers do not vary much (<8%) for the different resolutions, indicating that SAR computations at a resolution of 2 mm are sufficiently accurate to describe the large-scale distribution. However, considering the detailed SAR pattern in the head, large differences may occur if high-resolution computations are performed rather than low-resolution ones. These deviations are caused by both increased modeling accuracy and improved anatomical description in higher resolution simulations. For example, the SAR profile across a boundary between tissues with high dielectric contrast is much more accurately described at higher resolutions....Thus, for strongly inhomogeneous regions high-resolution SAR modeling is an absolute necessity."

Reprints: Dr. Jeroen Van de Kamer, University Medical Center Utrecht, The Netherlands, E-mail: <**jeroen@radth.med.uu.nl**>.

V.N. Binhi and A.V. Savin, "Molecular Gyroscopes and Biological Effects of Weak Extremely-Low-Frequency Magnetic Fields," ***Statistical, Nonlinear and Soft Matter Physics (Physical Review E), 65,*** **051912 (10 pp.), May 2002.**

"The molecular interfering gyroscope is a challenger for solving the *kT* problem as a probable mechanism of magnetobiological effects [MBEs]. ...The role of molecular gyroscopes could probably be played by short sections of polypeptides and nucleic acids built inside globular proteins or in cavities between associated globules. In this respect, it is interesting to look at the Watson-Crick pairs of nitrous bases (adenine-thymine and guanine-cytosine) that bind the DNA strands into a double helix as well as some other hydrogen-bound complexes of nitrous bases. ...Generally speaking, the fact that the molecular gyroscope model gives a physically consistent explanation of MBEs proves indirectly its real grounds. Further studies should verify whether this conclusion is correct. In any case, today, the interfering molecular gyroscope is a single available mechanism to give explanations that would be physically transparent and generally agreeable with experiments."

See also new books, *MWN,* M/J02, and <www.biomagneti.com>.
Reprints: Dr. V.N. Binhi, Russian Academy of Sciences, Moscow, E-mail: <**Binhi@biomagneti.com**>.

Vatican Radio Linked to Leukemia

Paola Michelozzi et al., "Adult and Childhood Leukemia near a High-Power Radio Station in Rome, Italy," ***American Journal of Epidemiology, 155,*** **pp.1096-1103, June 15, 2002.**

"Vatican Radio is a very powerful station located in a northern suburb of Rome, Italy. In the 10 km area around the station, with 49,656 residents (in 1991), leukemia mortality among adults (aged >14 years; 40 cases) in 1987-1998 and childhood leukemia incidence (eight cases) in 1987-1999 were evaluated. The risk of childhood leukemia was higher than expected for the distance up to 6 km from the radio station (standardized incidence rate=2.2, 95% confidence interval: 1.0, 4.1), and there was a significant decline in risk with increasing distance both for male mortality ($p=0.03$) and for childhood leukemia ($p=0.036$)....The results of the study show an excess within 2 km of the radio station and a decline in risk with distance from the site both for leukemia mortality among male adults and for leukemia incidence among children. However, the number of cases is small, and the excess mortality from leukemia was found only among men, whereas no significant increase was observed among women."

See *MWN,* M/A01, M/J01, S/O01 and M/J02.
Reprints: Dr. P. Michelozzi, Department of Epidemiology, Lazio, Italy, E-mail: <**salute@asplazio.it**>.

Allan Smith et al., "Arsenic Epidemiology and Drinking Water Standards," ***Science, 296,*** **pp.2145-2146, June 21, 2002.**

"In conclusion, when there is such direct human epidemiological evidence that a substance causes cancer, we should focus on margins of safety, avoiding extensive statistical manipulations of data and excessive debate about potential uncertainties. Prudent public health decisions should not wait until there is proof of serious cancer risks at low exposure."

Reprints: Dr. Allan Smith, University of California, Berkeley, School of Public Health, E-mail: <**ahsmith@uclink4.berkeley.edu**>.

Reba Goodman and Martin Blank, "Insights into Electromagnetic Interaction Mechanisms," ***Journal of Cellular Physiology, 192,*** **pp.16-22, July 2002.**

"Low-frequency (<300 Hz) EMFs induce biological changes that include effects ranging from increased enzyme reaction rates to increased transcript levels for specific genes. The induction of stress gene HSP70 expression by exposure to EMFs provides insight into how EMFs interact with cells and tissues....Biological studies with *in vitro* model systems have focused, in general, on the nature of the signal transduction pathways involved in response to EMFs. It is likely, however, that

EMFs also interact directly with electrons in DNA to stimulate biosynthesis. Identification of an EMF-sensitive DNA sequence in the HSP70 promoter, points to the application of EMFs in two biomedical applications: cytoprotection and gene therapy. EMF induction of the stress protein hsp70 may also provide a useful biomarker for establishing a science-based safety standard for the design of cell phones and their transmission towers....Our finding that weak EMFs can stimulate the synthesis of stress proteins indicates that cells view EMFs as potentially harmful, rather than benign. In that sense, cellular studies have provided important evidence to complement the epidemiological studies. The results of those cellular studies have also pointed to a molecular mechanism, thereby neutralizing a frequent argument in this controversy....The EMF-induced stress response offers a more reliable and realistic biological criterion for establishing cell phone safety standards than tissue heating."

See also: Goodman-Blank "hot paper," *MWN,* N/D99.
Reprints: Dr. Reba Goodman, Columbia University Health Sciences, New York, NY, E-mail: <**rmg5@columbia.edu**>. At press time, a pdf is available free from the journal's Web site: <www.interscience.wiley.com/jpages/0021-9541>.

Review of 18 Mobile Phone Cognitive and Sleep Studies

Denise Hamblin and Andrew Wood, "Effects of Mobile Phone Emissions on Human Brain Activity and Sleep Variables," ***International Journal of Radiation Biology, 78,*** **pp.659-669, August 1, 2002.**

"Direct comparison of the 18 studies of human brain responses to mobile phone emissions is difficult because of differing experimental protocols....Since most evidence is that RF energy at these levels does not lead to significant heating of tissue, many investigators have suggested more subtle alterations in calcium binding to membranes, permeability of the blood-brain barrier, nervous system information processing, neurotransmitters and learning processes. These effects have been suggested to originate from modified, and perhaps adapted, intercellular processes and communication due to EMFs interacting with the cell membrane surface of glycoproteins. On the other hand, some investigators believe that even a slight temperature increase in brain tissue may underlie a mechanism by which GSM-type signals may improve blood flow, hence exciting neural activity and synaptic transmission and affecting brain function. One area that may hold implications for the studies reviewed is combined exposure with other coexisting frequencies....As concomitant EMF exposures may hold implications for the results of studies under current review, it is of paramount importance that they are considered....It is difficult, if not impossible, to extrapolate to long-term effects of cumulative exposure. As many of the acute effects observed in the studies reviewed here appear transitory, restricted and reversible, the possibility of cumulative effects seems unlikely. Long-term studies are required to completely address the concerns of public health....The most consistent finding in this area has been the enhancement of alpha power as seen in EEG recordings and during cognitive tasks. These findings are confined to the experimental arrangements under which they were observed, but do demonstrate that mobile phone emissions could have an effect on human brain activity and sleep variables both during and after exposures at one extreme of normal phone use."

See also: C. Cook, A. Thomas and F. Prato, "Human Electrophysiological and Cognitive Effects of Exposure to ELF Magnetic and ELF Modulated RF and Microwave Fields: A Review of Recent Studies," *Bioelectromagnetics, 23,* pp.144-157, February 2002.
Reprints: Dr. A. Wood, Swinburne University of Technology, Melbourne, Australia, E-mail: <**awood@swin.edu.au**>.

Chung-Yi Li, Pei-Chun Chen, Fung-Chang Sung and Ruey-Shiung Lin, "Residential Exposure to Power-Frequency Magnetic Field and Sleep Disorders Among Women in an Urban Community of Northern Taiwan," ***Sleep, 25,*** **pp.422-426, June 15, 2002.**

"The [difficulty initiating sleep] prevalence was significantly associated with bedroom magnetic field exposure of ≥2 mG (odds ratio (OR): 1.20, 95% confidence interval (CI) =1.02-1.40). The [difficulty maintaining sleep] prevalence was significantly higher for women with background exposure of ≥2 mG (OR: 1.28, 95% CI=1.04-1.56)."

Reprints: Dr. Ruey Lin, National Taiwan University College of Public Health, Taipei, E-mail: <**linrs@episerv.cph.ntu.edu.tw**>.

Tongzhang Zheng et al., "Occupation and Risk of Non-Hodgkin's Lymphoma [NHL] and Chronic Lymphocytic Leukemia [CLL]," ***Journal of Occupational and Environmental Medicine, 44,*** **pp.469-474, May 2002.**

"We analyzed data from two population-based, case-control studies of NHL performed in Kansas and Nebraska. A total of 555 incident NHL cases, 56 CLL cases and 2,380 population-based controls were included in the analysis. Information on occupation and other confounding factors was collected through telephone interviews. Study pathologists reviewed slides of tumor tissues in all cases....A significantly increased risk of NHL was also observed among metalworking machinery and equipment workers, fabricators, assemblers, welders and solderers.... Our study also found an increased risk for male electrical and electronic equipment repairers who had worked at their job for 10 or more years (OR: 2.8, 95% CI=0.9-8.3) and also among women (OR: 5.6, 95% CI=0.9-34.7). An increased risk of NHL for all major histological types was also observed for telephone communication industry workers, with a significant association for small lymphocytic NHL and CLL. A potential association between exposure to electromagnetic fields and NHL risk has been proposed by several investigators, although the hypothesis continues to be widely debated..."

See also: Fabbro-Peray and Cano "Hot Papers," *MWN* J/A01 and S/O01, respectively.
Reprints: Dr. Tongzhang Zheng, Yale University School of Public Health, New Haven, CT, E-mail: <**tongzhang.zheng@yale.edu**>.

K. Vangelova, M. Israel and S.Mihaylov, "The Effect of Low-Level Radiofrequency Electromagnetic Radiation on the Excretion Rates of Stress Hormones in Operators During 24-Hour Shifts," ***Central European Journal of Public Health, 10,*** **pp.24-28, June 2002.**

"Twelve male operators at a satellite station for TV communications and space research were studied during 24-hour shifts....[O]ur data indicate considerable effect of 24-hour occupational exposure of RF EM radiation on stress hormones. The low-level exposure evoked pronounced stress reaction with changes in the circadian rhythm. The variability of catecholamines secretion increased under the RF exposure."

Reprints: Dr. Katia Vangelova, National Center of Hygiene, Medical Ecology and Nutrition, Sofia, Bulgaria, E-mail: <**KatiaVangelova@yahoo.com**>.

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REQUEST FOR PROPOSAL

The Cellular Telecommunications & Internet Association (CTIA) is soliciting proposals for research to be conducted under the Cooperative Research and Development Agreement (CRADA) with the U.S. Food and Drug Administration (FDA) for the second phase of research, specifically studies to improve exposure assessment that will both aid in the interpretation of existing studies and enhance the utility of any future epidemiological studies needed to assess the possible health effects of radio frequency energy (RF) from wireless phones.

A copy of the full Request for Proposal (RFP) is available on-line at www.wow-com.com/rfp or by calling the CTIA CRADA administrator at 202-785-0081.

CTIA
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Cellular Telecommunications & Internet Association

UPDATES

PAVE PAWS

NAS-NRC Measurement Advice... In a July 22 letter to the U.S. Air Force (USAF), Dr. Frank Barnes, chair of the National Academy of Sciences-National Research Council (NAS–NRC) panel that is charged with assessing potential health effects of RF radiation from the PAVE PAWS radar on Cape Cod, recommends the types of measurements to be carried out. For instance, Barnes wants to see "a comparison of waveforms from a radar utilizing a reflector antenna and waveforms similar to PAVE PAWS." Barnes is at the University of Colorado, Boulder. The letter is on the Web site of the National Academy Press, <www.nap.edu>. (For more on the PAVE PAWS controversy, see *MWN,* S/O00 and M/A02, and the items below.)

STANDARDS

Current Limits Questioned... Writing in *IEEE Spectrum,* a magazine that rarely runs criticisms of IEEE standards, Raymond Kasevich calls for RF/MW radiation exposure limits to be revised "using all of the available results and information—not just the data that fit previously held assumptions." He would like the work of Drs. Richard Albanese, Henry Lai and Dariusz Leszczynski to be taken into account (see item below and p.10). "The telecommunications industry, which is in deep denial, needs to face reality," he writes. Kasevich, chief scientist of CS Medical Technologies in Great Barrington, MA, offers his opinion in the magazine's August issue.

IEEE Says No to Brillouin Precursors... The subcommittee of ICES (SCC-28) revising the IEEE RF/MW exposure standard has moved not to include Brillouin precursors in its deliberations — thus dismissing the work of Drs. Richard Albanese and Kurt Oughstun, who have suggested that Brillouin precursors created by the PAVE PAWS radar could pose a health risk (see *MWN,* M/A02 and M/J02).The panel made the decision at a meeting on June 29 in Quebec City following the BEMS conference, in response to a motion from Raytheon's Arthur Varanelli, which was seconded by Dr. Eleanor Adair, who recently retired from the U.S. Air Force. The motion stated that there is no "evidence in the peer-reviewed scientific literature supporting Brillouin precursors as being biologically important at RF frequencies." Dr. John Osepchuk, formerly of Raytheon and past chair of SCC-28, said that the issue is "99% politics and 1% science."

PEOPLE

Professor **Shoogo Ueno** of the Biomedical Engineering Department at the University of Tokyo is the new president-elect of the Bioelectromagnetics Society (BEMS). He will take over from the current president, Dr. **Frank Prato** of the University of Western Ontario in London, Canada, at BEMS' next annual meeting, to be held in Maui, Hawaii, in June 2003. Ueno is also the chair of Japan's Committee to Promote Research on the Possible Biological Effects of EMF....Dr. **Ken Foster** has written a biographical paper about his mentor Dr. **Herman Schwan**, with special emphasis on his scientific work. Foster is in the bioengineering department at the University of Pennsylvania in Philadelphia, the department that Schwan was instrumental in establishing in

1973. "Herman P. Schwan: A Scientist and Pioneer in Biomedical Engineering" appears in the *Annual Review of Biomedical Engineering, 4,* pp.1-27, 2002. The article features a full-page picture of Schwan, but due to an editing error, he is identified as Foster....Dr. **Gunnhild Oftedal** has joined the faculty of technology at Sør-Trøndelag University College in Trondheim, Norway. Oftedal, who collaborated with Dr. **Kjell Hansson Mild** on the Scandinavian mobile phone–headache study (see *MWN,* M/J98), says that she plans to continue to work on EMF issues in cooperation with Prof. **Anders Johnsson** at the Norwegian University of Technology, also in Trondheim, where she used to work.

ANTENNAS & DIPLOMACY

Cyprus Shifts Stance... On July 3, Cyprus' foreign and environment ministers asked the British military not to proceed with plans for two new antennas to be used for intelligence-gathering at the U.K. military base there. They warned that the 320-foot towers — and a huge wire net connecting them — would "seriously harm the environment" on the Mediterranean island by damaging a marsh that is internationally recognized as a wildlife habitat. The British countered that its base is not in the protected area and rejected as "unrealistic" a Cyprus government proposal to relocate the towers, according to the July 3 *Cyprus Mail*. Previously, government officials had rebuffed public and parliamentary opposition to the project based on health concerns (see *MWN,* J/A01 and S/O01). Clashes between British military police and some of those protesting the towers have continued. The member of parliament who was arrested last year for scaling one of the existing towers, thereby sparking a riot, was arrested again. This time, he entered the construction site, climbed a bulldozer and refused to come down.

SOLAR POWER SATELLITES

Plants Growing in the Beam...NASA is once again investigating space solar power (SSP) — a plan to collect solar energy with satellites and beam it down to Earth with 2.45 GHz or 5.8 GHz microwaves (see *MWN,* S/O01). Dr. Jay Skiles of the NASA Ames Research Center near San Jose, CA, is investigating whether microwaves will interfere with plants growing near the 100 km^2 (39-square-mile) ground-based receiving antenna (known as a rectenna). The power density at the center of such a receiving array would reach 23 mW/cm^2, according to one estimate, dropping to 1 mW/cm^2 at the edge of the rectenna and 100 $\mu W/cm^2$ at the protective fence. In an experiment that ended in early June, Skiles exposed alfalfa plants to 2.45 GHz radiation at power densities of 0.1-4 mW/cm^2 and monitored the levels of chlorophyll, as well as of carbon dioxide and oxygen, in the air. Preliminary results will be reported later this summer, he told *Microwave News*. This was essentially a pilot study, Skiles said. "Now we are set to move ahead with plants growing in real-world conditions." He expects to begin these experiments at both 2.45 GHz and 5.8 GHz this summer....Earlier this year, NASA, the National Science Foundation and EPRI issued a request for proposals on "impacts of microwaves on living and nonliving systems," among other topics related to SSP (<www.nsf.gov/pubsys/ods/getpub.cfm?nsf02098>). The deadline for proposals was June 15.

Cell Towers

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