HIGHLIGHTS

NTIA Seeks New Home for ERMAC

The National Telecommunications and Information Administration (NTIA) has not asked for funds to continue working on the bioeffects of non-ionizing radiation in its fiscal year 1983 appropriation request. If Congress approves NTIA's $12.4 million budget, the Electromagnetic Radiation Management Advisory Council (ERMAC) will go out of existence unless it is transferred to another agency.

Testifying before the Senate's subcommittee on communications on March 22, Assistant Secretary of Commerce for Communications and Information Bernard J. Wunder, Jr., said NTIA proposed "to terminate [its] past role as coordinator of federal research concerning the biomedical and relafed effects of non-ionizing radiation." This role, he continued, "is important, but it may be more appropriately undertaken by an agency with direct responsibilities in the health, environmental protection or other safety-related fields, not by the Department of Commerce, whose basic mission is to foster business, trade and increased industrial production."

NTIA's spectrum policy, planning and management programs will continue as will the work of the Frequency Management Advisory Council (FMAC). In fact, NTIA's spectrum management activities will grow from $7.8 million in FY82 to $8.2 million in FY83.

ERMAC was established in 1968-69 to give advice "on the side effects and adequacy of control of electromagnetic radiation from communications." ERMAC moved to the Department of Commerce in 1978 when the Office of Telecommunications Policy was transferred from the Executive Office of the President to the then newly formed NTIA.

Hearings on New Radiation Bill

A Senate subcommittee held hearings on the Federal Radiation Protection Act of 1982 on April 29. The bill (S.2284), introduced by Senator John Glenn (D-OH), would set up two new interagency panels to coordinate radiation research and regulation. It would cover both ionizing and non-ionizing radiation.

A proposed Federal Council on Radiation Protection would take over the Environmental Protection Agency's authority to set health standards and would review other regulations set by all levels of government. Two special working groups of the council would pay special attention to occupational and medical exposures to radiation.

Its counterpart, a Federal Conference on Research Into the Biological Effects of Radiation, would devise an agenda for all bioeffects research and review all federally sponsored research costing more than $250,000.

The secretary of the Department of Health and Human Services would be the chairman of the council, and the director of the National Institutes of Health would chair the conference. Two members of the public would sit on each panel.

A staff aide at the subcommittee on energy, nuclear proliferation and government processes of the Senate Committee on Government Affairs called the Glenn proposal an attempt to create a Radiation Policy Council (RPC) "with teeth." The RPC was set up in 1980 by President Carter, but closed down last year when the Reagan administration cut it from the federal budget. (See *MWN,* October 1981.)

Those testifying before the subcommittee on April 29 represented largely government agencies and private groups interested in ionizing radiation.

A similar measure (S.1938) was introduced in 1979 by Senators Glenn and Abraham Ribicoff (D-CT). Hearings were held on March 20, 1980. The bill was never passed.

Link Between RF/MW and Cancer Found Inconclusive

A blue-ribbon committee in Multnomah County, OR, has determined that Dr. William Morton's study linking the incidence of certain cancers and radiofrequency/microwave radiation levels is inconclusive. The group of public health professionals was set up to review Morton's statistical study of Portland residents after he reported preliminary findings late last year.

The committee found two major weaknesses in the study. First, it questioned the accuracy of extrapolating exposure levels for areas of the city from 36 fixed point measurements. Second, the committee challenged Morton's comparison of cancer rates in different parts of the city. The area with the strongest association between cancer and radiation had a small population and a very small number of cases, making the rate of cancer highly susceptible to change.

In its recent report to the county, the committee recommended that studies be done with more data on exposure levels. It also asked that the county require operators of broadcast facilities to measure and keep records of RF/MW radiation levels.

Morton, of the University of Oregon's Health Sciences Center in Portland, submitted his report earlier this year to the Environmental Protection Agency's Experimental Biology Division, which is conducting its own review. (See *MWN,* January/February 1982.)

Multnomah County To Propose RF/MW Standard

The Multnomah County Planning Commission expects to recommend a general population radiofrequency/microwave (RF/MW) exposure standard to the Board of County Commissioners this month. A preliminary proposal modeled after the pending Massachusetts standard sets a 200 uW/cm^2 limit for the 30-300 band, rising to a maximum of 1 mW/cm^2 for frequencies above 1500 MHz and to 20 mW/cm^2 for those below 3 MHz. The averaging time for measuring exposures would be one hour, rather than the 30 minutes proposed for Massachusetts. (See *MWN,* March 1982.) In addition, a peak power limit would be set at ten times average power levels.

According to Larry Epstein of the county's Department of Environmental Services, the board should rule on a standard by June 1. Multnomah's moratorium on new broadcast sources expires in the end of May. (See *MWN,* January/February 1982.)

Microwave News will provide a full report on the standard next month.

RCA's Satcom EIS: Critical Comments

Reviewers of the draft environmental impact statement (EIS) for RCA's proposed satellite communications station on Bainbridge Island, WA, contend its report on microwave bioeffects is biased, incomplete and misleading. The document, prepared by CH2M Hill Inc. of Seattle, will now be

edited before Kitsap County issues the final version. Though no major revisions are planned, Rick Kimball of Kitsap's Department of Community Development said the final document expected this June should show "the full range of opinion on the health effects issue."

Responses to the EIS came from members of the microwave community, local agencies and Bainbridge residents. As of the end of April, an assessment by the Environmental Protection Agency's (EPA) Richard Tell and Dr. Joe Elder was still awaiting the approval of EPA's regional administrator in Seattle.

Almost all of the reviewers addressing radiation issues focus on the statement's health effects report prepared by the Battelle Human Affairs Research Center in Seattle, WA. (See also letters on p. 8.) These comments were solicited by Jerome Hellmuth, a leader of the local group opposing RCA. The reviewers strongly criticize the Battelle report for stating that continuous low-level microwave exposure is safe without noting that very little low-level effects research has been done.

Comments on the Battelle Review

Paul Brodeur, author of *The Zapping of America*: "The section of the draft EIS entitled 'Battelle Review of the Biological Effects of Microwave Radiation' is so full of errors, omissions, and unfounded assertions as to be almost worthless as a document for assessing the possible consequences of chronic exposure to low-level microwave radiation."

Allan Frey, Randomline, Inc.: "This EIS reads to me like a cut-and-paste job from the statements and writings of those who have been paid to testify that exposure to such energy is safe." Frey charges that the authors took the views of Dr. Jana Pazderova-Veljupkova on Eastern European epidemological studies out of context and presented them in a misleading way.

Dr. Rochelle Medici, a psychologist in private practice in San Marino, CA: "This review is stunningly incomplete and misleading. It is biased in the sense that negative results are stressed over and over again; results are all interpreted in terms of heating phenomena; major and key studies are omitted; Soviet studies are set up as 'straw men'...." Medici also criticizes the review for repeatedly assuming that the relationship between non-ionizing radiation exposure levels and possible bioeffects is linear: "It is precisely the question of nonlinearity of effect that has *not* been resolved by the research now available."

Professor Nicholas Steneck, a historian at the University of Michigan: "The EIS does not meet even minimum criteria of objectivity...." It presents "an adversarial position, not a value-free survey that can be used to debate and establish policy." He concludes that the review's flaws "render the objective material presented in the EIS unusable."

Dr. Milton Zaret, an ophthalmologist in Scarsdale, NY: "The EIS purports to be a learned study but, unfortunately, it is not. Instead of science it is merely propaganda couched in scientific language." Zaret cites the work of Dr. Maria Sadcikova. He also registers a complaint over placing his work in a section titled "Journalistic Coverage".

* * *

Hellmuth has compiled more than 100 pages of comments, including those excerpted above, and will supply the volume at cost ($20). Contact: Jerome Hellmuth, Bucklin Hill School, PO Box 356, Bainbridge Island, WA 98110.

Cool Reception for Review of Calcium Research

A review of the effects of non-ionizing radiation on calcium in the brain is causing a furor in the microwave community.

Writing in *Neuroscience & Biobehavioral Reviews* (*5*,503,1981), Drs. Robert Myers and David Ross challenge the reliability of key research on calcium efflux in brain tissue by low frequency modulated fields. The work in question was begun by Drs. Ross Adey and Suzanne Bawin some ten years ago and has since been replicated by Dr. Carl Blackman.

Myers, of the University of North Carolina medical school, and Ross, of the University of Texas, set out to evaluate the data from an "unbiased and 'non-involved' viewpoint" and conclude:

> In this field, a number of questionable practices render many of the reports published thus far extremely difficult to interpret: the discarding of variant data, the conversion of actual data into percentage or other scores, debatable statistical procedures used by workers in this field, and the variation in [calcium] ion efflux of a sham control. Because of these uncertainties, the issue of whether calcium flux in CNS tissue is determined by a radiation "window" for frequency and amplitude remains open to further research.

Their analysis of research on the possible breakdown of the blood brain barrier (BBB) by microwaves led them to believe that "results published to date strengthen the view further that a local deflection in cellular temperature or other tissue artifact may be responsible for a regionally selective violation of the BBB."

Many members of the bioelectromagnetics community were upset by the paper — though most were unwilling to speak on the record. Dr. Don Justesen, of the VA Medical Center in Kansas City, MO, did say however that the paper would be discussed at the BEMS meeting in Los Angeles in June. "A decision will be made on whether there should be a response at that time," he said.

Reached at his office in San Antonio, TX, Ross said the calcium research should be able to withstand review from outside the field. John Mitchell of the air force, which sponsored the review, said that it was only a "small part" of the air force's calcium work. "The objective is to determine how much research the air force should be doing in this area," he said.

Some critics of the article questioned whether it had been peer reviewed. A spokeswoman for the journal confirmed that all papers are reviewed before publication.

Side Effects Working Group Meets Again; Ocular Effect Disclosed

After a long hiatus, the Side Effects Working Group met in Washington, DC, on April 20 to brief participating federal agencies on recent developments in radiofrequency and microwave (RF/MW) radiation programs. The National Telecommunications and Information Administration's (NTIA) Janet Healer chaired the meeting attended by representatives of some 13 agencies.

At the meeting, a representative of the navy disclosed that research it sponsored at the Johns Hopkins University's Applied Physics Laboratory (APL) had found cellular changes

in the corneal endothelial layer of the rabbit's eye following exposure to 2450 MHz radiation at 10 mW/cm² for four hours. APL's Dr. Samuel Koslov first disclosed this finding last December but refused to specify its precise nature at that time. (See *MWN,* January/February 1982.)

Most of the meeting was devoted to reviewing the research and regulatory budgets of the agencies; many of these have suffered in the present budget climate. There were also updates on the proposed Massachusetts standard and the US-USSR cooperative research agreement.

This was the first meeting of the inter-agency group in at least five years. The next meeting is tentatively scheduled for July.

The working group is part of the Technical Subcommittee of NTIA's Interdepartment Radio Advisory Committee (IRAC), which was set up in 1922 to manage the electromagnetic spectrum. Dr. Paul Tyler of the Defense Nuclear Agency is the secretary of the working group.

Pregnancy Problems in Ottawa

Seven out of eight pregnancies among workers at the solicitor-general's office in Ottawa have ended abnormally. During the last three years, four women have miscarried, one has given birth two months early and two babies have been born with respiratory diseases. All seven women worked on video display terminals (VDTs). An eighth woman who did not use a VDT gave birth to a healthy baby.

Dr. Ian Marriott, senior consultant for the health department's public health service, said there will be a three-week investigation of employee health problems in the office. Marriott has already ruled the terminals out as a possible concern, however, because, as he told the Canadian Press news service, the study of VDT health hazards "has been done so often by so many people around the world."

The Public Service Alliance of Canada, the union representing the women, has requested an independent inquiry and is seeking official assurances that pregnant women can be reassigned to non-VDT work. According to the union's Stewart Skinner, the official policy of the solicitor-general's office is that there is no need for transfers because no hazard exists. Unofficially, however, pregnant women have been granted alternate work since last November. The union has asked Donald Johnson, president of the Treasury Board, which acts as the employer for the federal government, to clarify this policy.

Since news of the cluster broke in the Ontario press April 7, employees at the Ontario Workmen's Compensation Board (Local 1750 of the Canadian Union of Public Employees) and at the Ontario Legislature's library have won the right to non-VDT work during pregnancy.

Other clusters of pregnancy problems among clerical workers have been reported in Canada from two work places in Toronto and one in Montreal, and in the US from offices in Dallas, TX, Atlanta, GA, and Renton, WA. (See *MWN,* November 1981, January/February and April 1982.)

RFI Amendments to the Communications Act

New amendments to the Communications Act would permit the Federal Communications Commission (FCC) to contract with private laboratories to test transmitters for radio-frequency interference (RFI) potential and would end the licensing of CB operators, among other provisions.

The mark up of the Communications Technical Amendments Act of 1981 (H.R.5008) by the House subcommittee on telecommunications, consumer protection and finance is scheduled for early May. The measure is designed to increase the efficiency of the FCC; it has nothing to do with restructuring the nation's telecommunications system, which is being considered by the same subcommittee.

The proposal introduced by Congressmen Timothy Wirth (D-CO) and Allan Swift (D-WA) would let laboratories test new equipment in order to speed up the FCC's approval process. The rapid growth in the number of new devices has created a backlog of applications. At present, the FCC provides the testing service free of charge, but that might change.

A companion measure, the Amateur Radio Service and Private Land Mobile Radio Services Act of 1981 introduced by Senator Barry Goldwater (R-AZ), passed the Senate by a voice vote on September 25. The Senate bill (S.929) would require the FCC to set performance standards for audio and visual devices to reduce their susceptibility to RFI. If the Wirth amendments are approved, the two bills will go to a House-Senate conference to iron out their differences.

An earlier visit of the House amendments would have empowered the FCC to turn off interfering RF transmissions. This provision was dropped when the FCC accomplished the same goal by administrative rule. (See *MWN,* January/February 1982.)

Wirth, the chairman of the House subcommittee, held hearings on H.R.5008 on November 19, 1981.

NBS Workshop on Electromagnetic Calibration

The National Bureau of Standards (NBS) has scheduled a workshop to work out the technical requirements for accrediting laboratories that provide electromagnetic calibration services. The workshop will run from 1:00 pm on July 1 to 5:00 pm July 2 at NBS in Boulder, CO.

The workshop is designed to encourage discussion on the criteria to be used to evaluate labs under the National Voluntary Laboratory Accreditation Program (NVLAP). Last January, NBS formally agreed to include electromagnetic calibration services as part of NVLAP. (See *MWN,* January/February 1982.)

The workshop is open to the public, though interested parties must notify NBS of their intention to attend by June 1. NBS is expecting from 20 to 50 participants. For more information contact: Robert Gladhill, NVLAP Project Leader, NBS, Technology Bldg., Room B06, Washington, DC, 20234, (301) 921-2427.

US-USSR Behavioral and CNS Effects Workshop

The National Institute of Environmental Health Sciences (NIEHS) will host a workshop on the behavioral and central nervous system (CNS) effects of microwave radiation for American and Soviet scientists May 25–28 in Research Triangle Park, NC. The meeting is part of the on-going US-USSR cooperative program on biological effects of microwave radiation. Professor Michael Shandala, the director of the Institute of General and Communal Hygiene in Kiev, will head the Soviet delegation.

The workshop will review recent research results on the effects of both microwave and power line radiation. Dr. Donald McRee, the chairman of the US delegation, said that he anticipated there would be discussions on the design of sensitive

tests for behavioral and CNS effects at the meeting.

The other US scientists invited to attend the workshop are: Drs. Ross Adey, Ernest Albert, Carl Blackman, Don Justesen, Richard Lovely, Sol Michaelson, Clifford Mitchell, Mays Swicord and Howard Wachtel.

The workshop is open to the public. For more information contact: Dr. Donald McRee, NIEHS, PO Box 12233, Research Triangle Park, NC 27709, (919) 541-3382.

Research Papers from the Soviet Union

The Ukrainian Ministry of Health in Kiev, USSR, published a slim volume, *Hygiene in Populated Areas,* in 1981 (No. 20 in the Republican Interdepartmental Collection). The papers address a variety of environmental issues including air and water pollution, chemical wastes, pesticides and radiation. Listed below are those papers dealing with non-ionizing radiation. The titles were translated by *Microwave News.*

- Yu.D. Dumansky, L.G. Andrienko, N.P. Gordynya, S.A. Lyubchenko, "Electric Transmission Lines as a Source of Radiation of an Electromagnetic Field, and Questions of Environmental Hygiene."
- I.S. Bezdolnaya, "The Effect of 50 Hz Electromagnetic Fields on the Formation and Flow of Complex Forms of Conditioned Reflexes in White Mice."
- M.G. Shandala, M.I. Rudnev, E.I. Obukhan, V.Ya. Akimenko, N.N. Chernenky, "The Effect of an Electromagnetic Field in the Superhigh Frequency Range (2375 MHz) on Various Functional and Morphological Indices in Ontogenesis."
- G.I. Vinogradov, N.M. Gonchar, N.G. Belonozhko, A.A. Zheleznyak, E.I. Vinarskaya, "Immunological and Hematological Effects of Low-Intensity Electromagnetic Fields in the Superhigh Frequency Range."
- S.M. Kochergin, "The Hygienic Study of an Electromagnetic Field of 20–22 kHz Frequency (Electric Construction)."
- S.V. Zotov, "Conditioned-Reflex Behavior in Animals Under the Influence of a Low-Intensity Pulsed Electromagnetic Field in the Superhigh Frequency Range."
- I.P. Los, L.A. Tomashevskaya, N.G. Nikitin, "Comparative Characteristics of the Biological Action of Electromagnetic Fields in the 3 cm and 8 mm Ranges."

Michael Shandala, a well-known microwave researcher, is also the co-author of a paper titled "The Quantitative Dependence of Indices of the Health of a Population on the Quality of the Environment."

UPDATES

Biological Effects....Dr. C.E. Easterly of Oak Ridge National Laboratory's Health and Safety Division has just issued a report, *Biological Effects of Static Magnetic Fields: A Selective Review with Emphasis on Risk Assessment* (No. ORNL/TM-7860). He concludes that "three areas exist for which adequate information can be found to begin modelling: disease induction, reproduction and development, and cardiovascular response." It is available from the National Technical Information Service (NTIS), Springfield, VA 22161....The Office of Naval Research (ONR) has awarded Professor William F. Pickering of Washington University, St. Louis, MO, $212,000 for a 30-month study of the effects of "monochromatic and polychromatic" electromagnetic radiation on the membrane system of Characean algae. Pickering will be measuring the resting potential of the cells following exposure to bursts of CW and trains of pulsed radiation at frequencies between 10 MHz and 1 GHz as well as in the X-band (8–12 GHz)....Volume V, Numbers 2–4 of NTIA's digest of the bioeffects literature from October 1980 to June 1981 has been published. The report covers the period when work on the digest was temporarily suspended. (See *MWN,* April 1982.) The report (NTIA-CR-82-16) is available from NTIS....Dr. Howard Wachtel of the University of Colorado, Boulder, is scheduled to talk on "Microwave Modulation of Neural Activity" in Bethesda, MD, on May 11 at the seminar series funded by ONR....Wachtel will also be the moderator of a workshop on "Resolving Problems Associated with Electrodes with EM Fields" at the BEMS meeting to be held in Los Angeles at the end of June. Two other workshops are also planned: "Hyperthermia" and "Measurement Techniques for 60 Hz Electromagnetic Field Exposure Systems," moderated by Drs. F. Kristian Storm of UCLA and William Kaune of Battelle respectively. For more information contact: Pat Wright, BEMS, 1 Bank Street, Gaithersburg, MD 20878, (301) 948-5530....The use of NMR to study the eye, featured in last month's issue, was also a cover story in the April 3 *Science News.*

Communications....The FCC's FY83 budget request has been cut by $2,454,000 from FY82 to $74,446,000. But $538,000 has been added for processing some 6,000 low-power TV applications....If you missed the March 31 Private Operational-Fixed Microwave Forum, the FCC will copy its videotape onto your ¾" or ½" video cassettes. Contact: John Small, FCC Private Radio Bureau, (202) 632-7179.... MCI Communications Corp. plans on joining ICS Communications in a new company to provide mobile radio in Los Angeles, CA ....Europeans are interested in cellular radio markets too. SRA Communications of Sweden is now offering its switching, control and base station system in the US....To minimize frequency coordination needs, the US and Canada have divided up the 806–821/851–866 MHz bands along the border....Dr. Robert K. Crane from the Thayer School of Engineering at Dartmouth College, Hanover, NH, gave an April 21 tutorial in Washington, DC, on propagation limits at 1–300 GHz for the FCC's Office of Science and Technology. Propagation phenomena, such as absorption and scattering, affect the reliability and interference potential of transmission systems....The April 8 *New Scientist* explains Britain's frequency crunch and the mounting friction between the BBC and mobile radio users. The BBC is lobbying to speed up WARC's timetable for clearing mobile users from the 97.6–108 MHz band by 1995.

Compatibility & Interference....The FCC has proposed a rule defining FM broadcasters' responsibility for remedying blanketed interference. This occurs when receivers near an FM station are unable to pick up other stations and is exacerbated when FM transmitting antennas are located in downtown urban areas. In 1980, the commission received more than 800 interference complaints. FCC action came in response to a petition from the Association of Federal Communications Consulting Engineers. Comments are due June 29. ...The FCC has issued a bulletin on its rules for computers. Bulletin OST 54, March 1982, describes the regulations that limit radio emissions from computers and other devices using digital circuitry that could interfere with radio and TV communications. The FCC notes it received a complaint from the police of a western state alleging that a coin-operated electronic game was disrupting highway police communications at 42 MHz. Another case of RFI involved a popular personal computer which affected TV reception in nearby homes. The bulletin is designed to accompany OST 52, issued in June 1981. Copies are available from the FCC's Consumer Assistance Office, Washington, DC 20554, (202) 632-7000....NBS has published *Methods of Suppressing Automotive Interference* (SP 480-44). It focuses on radio systems using narrow-band FM communications in the 25–900 MHz frequency range and the most common sources of RFI, including ignition systems and electric motors. It is available from the National Technical Information Service, Springfield, VA 22161 for $6 (prepaid), order No. PB 82-165259....The record of the June 4 and 10, 1981, hearings before the subcommittee on international operations of the House Committee on Foreign Affairs, *Region 2 Administrative Radio Conference on Medium Wave Frequency (MF) Broadcasting,* is now available. The subcommittee addressed two

principal issues at the hearing: channel spacing for AM radio and the problem of interference from Cuban stations. Among the documents entered into the record are interference maps for Florida broadcasters prepared by Jules Cohen & Associates of Washington, DC. ...The FCC has tested the effects of a 1 kHz reduction in channel spacing on receiver performance and sensitivity. The results are reported in a technical memorandum (No. OST TM82-1), *AM Receiver Performance for 10 kHz and 9 kHz Signal Spacings.* For more information contact FCC's Hector Davis at (301) 725-1585....The Radio Technical Commission for Aeronautics (RTCA) has issued a report on the interference of FM stations to airborne systems. Report No. DO-176, *FM Broadcast Interference Related to Airborne ILS, VOR and VHF Communications* recommends ways of limiting the problem. A copy is available for $16 plus $3 postage and handling in the US, Canada and Mexico or $6 elsewhere from RTCA, Suite 655, 1717 H Street, NW, Washington, DC 20006, (202) 296-0484. All orders must be prepaid....The *New York Times* reports on the growing interference from unlicensed pirate radio stations in its April 24 issue. The piece cites WBUZ-FM operating out of Long Island, NY, at 103.1 kHz.

EMP....The AF's Electronic Systems Division is developing a new nuclear-resistant communications technique that uses ground wave and operates at low frequencies, slightly below the commercial radio broadcast band, according to a report in the April 26 *Aviation Week and Space Technology.* The system, developed by R&D Associates of Marina del Rey, CA, will soon connect SAC and Aerospace Defense Command HQ with 11 SAC bomber bases....Clay Burdick of SAI Technology in San Diego, CA, describes the design of VDTs and keyboards that can survive EMP and other nuclear radiation in the March *Military Electronics/Countermeasures*....In contract news, the air force in Kirtland, NM, has awarded BDM Management Services Co. of McLean, VA, $16.3 million for EMP testing, and the Naval Surface Weapons Center in Silver Spring, MD, is negotiating with Kaman Science Corp. of Colorado Springs, CO, to support its tacamo EMP hardness assurance program.

Government....ERMAC and FMAC are still working on their statements which would assure the public that there is nothing to fear from low levels of non-ionizing radiation. (See *MWN,* January/February 1982.) ERMAC's Dr. Sam Koslov has completed a draft which is a synthesis of the council member's submissions. The present draft does not specify a number at which exposures are safe. Instead, it refers to those levels found in EPA surveys of US cities as being without risk. Koslov's version will now be reviewed by the full ERMAC membership. FMAC discussed its statement at a meeting held in Washington, DC, on April 30. It appears they have not progressed as far as ERMAC. A NTIA spokesman said that FMAC has no firm timetable for completing its draft....Senator Clairborne Pell (D-RI) described the case of Charles Day to the members of the Senate Judiciary Committee's subcommittee on agency administration on April 14. Some believe that microwaves were responsible for Day's death (see *MWN,* April 1982)....The new agreement among FDA's Bureau of Radiological Health, Bureau of Medical Devices and Bureau of Biologics became effective on April 1. BRH will now assume greater responsibility for radiation-emitting devices such as those used for NMR, hyperthermia and diathermy. The radiology section of the Obstetrics-Gynecology and Radiologic Devices Panel will be transferred from BMD to BRH and will be converted to an advisory committee for all BRH devices. For a copy of the agreement contact: Documents Management Branch (HFA-305), FDA, Room 4-62, 5600 Fishers Lane, Rockville, MD 20857. And for more information contact BRH's Robert Phillips, (301) 443-3426....The FCC has proposed that authorization for speed-detection radar units be included as part of the mobile radio station authority issued to police licensees in an effort to reduce paperwork. (See 47 *FR* 16661, April 19.)

Litigation....The trial of *Leo Schuerman* v *Pacific Telephone* has been continued from May 10 to September 27. Schuerman is charging the telephone company with nuisance, trespass and conducting a hazardous activity in the building of a point-to-point microwave relay system from Los Angeles to San Diego. (See *MWN,* April 1982.)

Medical Applications....NCI has prepared a transcript of the March 17 pre-solicitation conference on its hyperthermia quality assurance program. The institute has also assembled a short list of references on the state-of-the-art and the facilities available at BRH. For more information contact: Dr. Thomas Strike, Division of Cancer Treatment, NCI, Bethesda, MD 20205, (301) 496-5297....Clini-Therm Corp. announced that it has temporarily suspended its engineering operations, including its work on hyperthermia systems, pending the completion of new financing. In a telephone interview, Phillip Berry, the company's president, said he expects some good news soon.... Scientists at Corning Glass Works in Corning, NY, have been granted a patent for the use of iron crystals to focus RF energy in cancer heat treatment. More work on the new system will be carried out at Mount Sinai Hospital in New York City....The *IEEE Transactions on Biomedical Engineering* is planning a special issue on hyperthermia and cancer therapy. A late 1983 publication date is anticipated. For more information contact: Dr. John Strobehn, Thayer School of Engineering, Dartmouth College, Hanover, NH 03755....There is a report on the first Oxford meeting on topical NMR in the April 22 *New Scientist*....A group from University College, London, and Oxford Research Systems survey the NMR applications to *in vivo* studies of muscle composition and metabolism in the March 27 *Lancet*....The *Journal of Microwave Power* is planning a special issue on electromagnetic techniques in medical diagnosis and imaging. For more information contact: Dr. Carl Durney, Department of Electrical Engineering, University of Utah, Salt Lake City, UT 84112....The workshop on *Medical Applications of Electromagnetic Energy* scheduled for June 18 in Dallas, TX, will feature three invited papers: Dr. Ian Pykett of MGH in Boston on NMR, MIT's Dr. Alan Barrett on radiometry and imaging, and Dr. Gilbert Nussbaum of the Mallinckrodt Institute on hyperthermia. For more information contact: Dr. Gordon Short, BSD Medical Corp., 420 Chipeta Way, Salt Lake City, UT 84108, (801) 582-5550....Researchers at the University of Pennsylvania have devised an electrical device to straighten teeth in half the time now required, according to an item in the April 16 *Wall Street Journal.* The device emits a tiny electric current that stimulates movement of the bony sockets holding the teeth. It may one day be used to treat gum disease and to help denture wearers.

Military Systems....The AF's Electronic System Command at Hanscom AFB is testing a new radar that can automatically diagnose its own problems. The AN/FPS-117 radar is designed to replace those at the Alaskan Air Command. The fully automatic unit can give range and position of aircraft 200 miles away at a height of up to 100,000 feet....DoD cancelled its Autodin II military data transmission system. Western Union was the prime contractor for the new automatic digital network which became operational last year. DoD has awarded Bolt, Baranek & Newman a contract to set up a new network. Western Union has protested the decision to GAO....The use of synthetic aperture radar on the F-15 fighter is described in the April 26 *Aviation Week & Space Technology*....The AF has awarded three $4 million contracts for designs of the new Milstar satellite communications system to TRW, Lockheed and Ford Aerospace, according to the April 19 *Aviation Week*....Lt. Col. John Alexander told a reporter for *Omni* that he sometimes carries around a matchbook-size transmitter, an ELF generator, to interfere with Russian ELF radiation attempting to jam our brain signals. The Pentagon official is quoted in the magazine's April issue.

Ovens....DOE has decided not to set energy efficiency standards for most major household appliances including microwave ovens. In announcing its proposed rule (47 *FR* 14424, April 2), DOE states that such standards "would not result in a significant conservation of energy or be economically justified." Congressman Richard Ottinger (D-NY) condemned the move as "among the worst and most conspicuous anti-consumer actions taken by this administration." He announced that he would introduce legislation that would give the

states the authority to set their own efficiency standards. DOE will hold hearings on its proposal in Chicago May 11-12 and in Washington, DC, May 18-21. Written comments are due by June 16 and reply comments by August 2.... Microwave oven shipments in March were up a little from March 1981: 304,600 vs. 299,800. The total for the year is 918,000, down nearly ten percent from last year.

Power Lines....DOE's power lines research program has been cut out of the administration's FY83 budget, though Congress could restore the funds later this year. Meanwhile, program head Alec Bulawka has moved over to the department's photovoltaics project and has been replaced by Ken Klein. Copies of last year's *Project Resumés: Biological Effects From Electric Fields Associated with High Voltage Transmission Lines,* are available from Klein: DOE, Forestal Building, Mail Stop 5E 052, Washington, DC 20585....The New York State Overhead Power Lines Project will allocate up to $500,000 for epidemiological studies of 60 Hz radiation. It may attempt to replicate Dr. Nancy Wertheimer's study of 60 Hz fields and the incidence of childhood cancer, but the state will delay issuing an RFP until it completes a reanalysis of Wertheimer's data. Fifteen other research contract awards were announced at an April 27 meeting in Albany. (See *MWN,* April 1982.)...The Minnesota Environmental Quality Board (MEQB) has approved the first stage of a $86,000 retrospective study of dairy cattle health and performance near power lines and is continuing from last year its monitoring of electric fields and ion currents near the lines. According to George Durfee, manager of the state's Power Plant Siting Program, the board will use the data as well as the final recommendations of a scientific advisory panel to reevaluate power line siting and operating permit requirements late this year.

Satellite Communications....Hughes Aircraft's proposal for a satcom station in Brooklyn was approved by local Community Board 5 on April 28. The New York City Planning Commission will now hold a public hearing on the plan May 19. Another hearing before the Board of Estimate will follow. (See *MWN,* April 1982.)...The King County Department of Planning and Community Development will hold another hearing on Alascom's proposed satcom station for Vashon Island, WA, on May 4 in Seattle....The hearing record for *Satellite Communications/Direct Broadcast Satellites,* held December 15, 1981, is now available from the House Energy and Commerce Committee....According to an FCC report prepared to help form US policy for the International Telecommunications Union conference next year, the US will need between 68 and 205 DBS channels by the year 2000....Oak Industries has leased transponder space from Telsat Canada for the direct-to-home pay TV it plans to offer in 1983. United Satellite acquired its satellite space for DBS earlier this year. ..."Biznet," the two-way satcom service being launched by the US Chamber of Commerce, worries some public interest groups. An article in the April 13 *Wall Street Journal* examines their fears....Hughes Aircraft has captured a billion-dollar contract to build up to 16 Intelsat VI satellites despite strong protests from Ford Aerospace and Communications....The Intelsat VIs will "act like giant telephone switchboards in the sky," explains an April 15 article in *New Scientist* on how the satellites will route calls to different destinations from space....A report on last month's IASU conference in Dallas, TX, appears in the April 12 *Broadcasting*.... FCC Commissioner Joseph Fogarty believes the domestic satellite market should be regulated until a truly competitive marketplace exists. In an April 22 speech, Fogarty said RCA's failure to lease five out of eight transponders offered for $13 million each demonstrated that the tariff was excessive.

Technology....OTA Director John Gibbons told the transportation subcommittee of the House Appropriations Committee that the FAA's National Airspace System Plan is a "significant and bold" proposal but lacks a "clear statement of priorities and contingencies." He based his assessment on the new OTA study, *Airport and Air Traffic Control System.* The FAA is planning a 10-year, $10-billion upgrading of the system, including widespread use of the microwave landing system. The report concludes that the MLS "will provide more precise and reliable guidance for landing in adverse weather conditions" and "will lead to more efficient airport capacity."...The possibility of using RF heating of oil shale to tap the huge deposits in Western states is reviewed in the February 22 *Chemical Engineering.* Texaco, Raytheon, and IITRI are all working on processes....MIT's Henry Kolm and Peter Mongeau review railgun technology in the April *IEEE Spectrum*....The use of lasers instead of microwaves to transmit energy collected by solar power satellites is discussed in a series of papers in the most recent issue of *Space Solar Power Review* (Vol. 3, No. 1)....An AP story filed from Peking on April 30 discloses that China has started using radar to catch speeders....Ronald Seaman and Michael Studwell of Georgia Tech will present a paper on "Electromagnetic Surveillance of Baggage for Agricultural Contraband" at the May 12 meeting of the University of Kentucky's 16th annual conference on security technology.

VDTs....Several of the Bell Canada VDTs that emitted X-rays above background levels in company checks (see *MWN,* April 1982) are being rechecked at the government's special, low-level X-ray testing facility in Ottawa. Dr. Ernest Letourneau of the Health Protection Branch of Canada's Department of Health and Welfare said the initial readings were probably the result of a procedural error and that the new tests are just a precautionary measure. Bell's readings ranged from 0.08 to 0.23 mR/hr, with a variation of 0 to 0.14 mR/hr above background....In a new program started in December, Letourneau's branch has tested about 50 other VDTs for low-level X-rays....Toronto City Hall VDTs will be tested regularly for radiation leaks. According to a brief notice in the April 15 Toronto *Star,* the city's executive committee decided on the move because some of the terminals are already ten years old. (A cluster of miscarriages among workers at a provincial government office in Toronto's Old City Hall received wide publicity last month.)...An *International Forum on the Effects of Low-Level EM Radiation and the Question of VDTs* is scheduled for June 4 at the University of Ottawa to coincide with the *First International Symposium on the Biological Effects of Electromagnetic Radiation.* Registration before May 20 is $175 (Canadian) and $200 (Canadian) thereafter. Contact: Professor William Kuhns, Department of Communications, University of Ottawa, Ottawa, Ontario K1N 6N5, (613) 231-3365....COMAR's position paper on VDTs is slated to come up for approval before the IEEE Technical Activities Board in late May. The paper concludes: "There is no cause for concern regarding hazards associated with emissions of ionizing and non-ionizing radiation from video display terminals. Improved application of stress-reducing biotechniques and the education of the operator are the areas where expenditures of additional resources would be most beneficial."..."Tomorrow's Technology, Today's Headache," a slide-sound presentation on VDTs produced for NYCOSH, is available for rental ($25) or sale ($75). Contact: Shop Talk Productions, 155 West 72 Street, New York, NY 10023, (212) 580-1881.

Etc....The IEEE's Committee on Man and Radiation's (COMAR) position paper on "Human Exposure to Microwaves and Radiofrequency Electromagnetic Fields" has been approved by the IEEE and is now available from the institute's Washington office. Contact: Edith Carper, 1111 19th Street, NW, Washington, DC 20036, (202) 785-0017. The paper had been the subject of a dispute between some members of COMAR and the IEEE's Committee on Social Implications of Technology (CSIT)—see *MWN,* October 1981. Since then, CSIT has been upgraded into a full IEEE society (SSIT) with Robert Bogumil as president. Bogumil offers some additional thoughts on the revised COMAR statement in an open letter to COMAR chairman Dr. Om Gandhi. They appear in the first issue of SSIT's new quarterly magazine, *Technology and Society,* dated March. Meanwhile COMAR is completing another position paper on VDTs. See VDT Update for details....The 1981 annual report of the National Council on Radiation Protection and Measurements (NCRP) has been released. One interesting fact buried on page 33 indicates that its report No. 67 on the properties, measurement and biophysical interactions of RF fields (see *MWN,* October 1981) was NCRP's best seller of 1981....French researcher Dr. Andre Berteaud of the CNRS is visiting Professor Ernest Albert's laboratory at George Washington University for six months beginning April 1.

LETTERS

To the Editor: My motive in writing is to point out the irony that after 40 years experience and ten years of escalating research into the biological effects of microwaves, the January/February 1982 issue carries on page five Dr. Koslov's "violent objections" to a standard of 5 mW/cm² ABOVE 1.5 GHz, while on the very next page Professor Grant is quoted as saying that although 10 mW/cm² may be adequate above 1 GHz, it is too high BELOW 1 GHz!

If these workers were economists, this would be quite understandable, but for supposedly scientific experts it seems to underline the degree of prejudiced intuitive interpretation which is going to be typical of this field for some time.

Thank you for your energies in maintaining an informative and balanced source of information in this important area.

Michael Hulley (SM-IEEE)

21809 Diller Lane, Boyds, MD 20841

To the Editor: Several telephone calls recently have come in from colleagues, all of whom have declared their disbelief that I authored or co-authored the review of biological effects of microwaves for the EIS re RCA's proposed satellite uplink in Bainbridge Island, WA. (See *MWN,* April 1982.) I share their disbelief from the near-perfect perspective of personal knowledge.

The specifics are: RCA contracted with CH2M Hill, Inc., of Seattle, to perform the EIS. CH2M, in turn, obtained the services of Bill Guy as a subcontractor to provide analytical projections of uplink-associated field strengths on Bainbridge Island and to provide a review of the pertinent literature on biological effects. Bill Guy, in turn, asked me to help with the latter, which I did. But my *draft,* never completed, was not used by CH2M Hill in compiling the draft EIS they released for external review in connection with the Bainbridge Island siting. Rather, CH2M Hill contracted with staff of the Battelle Human Affairs Research Center in Seattle, WA for the biological-effects review. Bill Guy had no part in this review, nor did Richard Phillips or any other scientific staff of the Battelle Pacific Northwest Laboratories, which are located in Richland, WA.

Don R. Justesen

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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.*

DoD RF/MW Review *(continued from p. 1)*

the ACGIH standard. The proposed ANSI standard spans the frequencies between 300 kHz and 300 GHz, while that of the ACGIH reaches down to 10 kHz.

A similar position was taken by John Mitchell, chief of radiation physics at the air force's School of Aerospace Medicine at Brooks AFB, TX. Mitchell submitted comments to McDermott as the chairman of the Tri-Service Electromagnetic Radiation Panel.

Wood said that his report had not been submitted yet, and he refused to comment on the air force position. McDermott refused to discuss the army's view.

The air force is in the midst of revising its own occupational safety and health standard. A proposal by the School of Aerospace Medicine and the Occupational Environmental Health Laboratory at Brooks would bring the air force standard into line with the new ANSI standard. The air force proposal is now under review and should emerge in two or three months.

On February 11, about a dozen representatives of both the medical and user microwave communities assembled at the Pentagon to discuss the new standards.

Meanwhile, the committee that drafted the new ANSI standard has now officially submitted it to ANSI for final approval. The ACGIH standard was to be discussed at a meeting of its physical agents committee on April 22–23. The meeting was cancelled and has been rescheduled for sometime during the week of June 6–11 at the joint conference of the ACGIH and the American Industrial Hygiene Association in Cincinnati, OH.

Pulsed Magnetic Fields *(continued from p. 1)*

in the current density to ±20% of the mean. The system is similar to one used in clinical trials in England to treat non-union fractures.

This new research builds on the well-known work of Drs. Ross Adey, Suzanne Bawin and Carl Blackman on calcium efflux from brain tissue induced by 16 Hz amplitude modulated radiofrequency fields. In a telephone interview, Blackman commented that this "was very interesting work which opens up a line of research using a well-defined biological system."

Dixey and Rein offer the following hypothesis to explain the induced release of noradrenaline by the pulsed magnetic field: "The cation binding sites on the outer surface of the plasma membrane may be highly sensitive to such weak stimuli and that subsequent cooperative changes in [calcium ion] binding may influence membrane stability, thereby promoting [calcium ion] entry and vesicular release." That is, they suggest weak magnetic fields could damage the surface of the cell membranes.

By adding magnesium ions to the medium, they eliminated the observed effect. They speculate that the release occurs via a secretory mechanism similar to the one in which calcium ion fluxes are involved. They deem this possibility unlikely, however, given the weakness of the electric field.

Further studies will be necessary to test their theory and to explore the frequency of dose dependence of the experimental system. Once replicated, such research on cultured PC12 cells may become a powerful complement to experiments that probe the effects of low frequency pulsed magnetic fields on whole animals.

In 1975, Dr. Bernard Servantie and co-workers reported that white rats exposed to a 3 GHz pulsed microwave field with a pulse repetition frequency (PRF) between 500 and 600 pulses per second for ten days at an average power density of 5 mW/cm² (peak power of 150 kW) resulted in a frequency synchronous to the PRF on the occipital EEG. They found that the frequency persisted for a few hours after the irradiation was terminated. (*Ann. NY Acad. Sci. 297,* 82, 1975)

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MICRO WAVE NEWS

Vol. III No. 4 A Monthly Report on Non-Ionizing Radiation May 1983

INSIDE...

HIGHLIGHTS pp.2-5

Three States Hold Hearings on VDTs
Air Force and Navy to Fund VLF Hazard Study
ANSI C63: Progress on EMC Standards
BSD's Hyperthermia Unit Nears Approval
Narda To Develop Navy Radiation Hazard Meter
Over-the-Horizon Radar EIS
Project ELF Radiation Survey
RF/MW Exposure Limits Proposed in Oregon
Zurich EMC Symposium
WHO Non-Ionizing Radiation Protection Report
URSI Meeting on MM Waves Bioeffects
NAS Studies on Atmospheric Electricity and Emergency Communications Systems

LETTERS p.8

CONFERENCE CALENDAR p.8

UPDATES pp.5-8

Biological Effects
Communications
Compatibility & Interference
EMP and Microwave Weapons
Government
International
Litigation
Measurement
Medical Applications
Ovens
Power Lines
Satellite Communications
Standards
VDTs
Etc.

ANSI Exploring RFI Standards for Home Electronic Equipment

The American National Standards Institute (ANSI) has set up a task group to explore ways of meeting a congressional mandate to reduce radiofrequency interference (RFI) to home electronic equipment. The group, working under the chairmanship of American Bell's Don Heirman, will suggest methods of enhancing the immunity of television sets, radios and personal computers from spurious radiation.

Members of ANSI's C63 Committee on Radio-Electrical Coordination decided to form the ad hoc panel at an April 6 meeting in Washington, DC, after the Federal Communications Commission's (FCC) Robert Ungar urged industry to design consumer products with greater immunity to RFI. "The FCC will act if no one else does," he said, "but we have neither the staff nor the resources to devote to this —and we certainly cannot do this in a short amount of time." Ungar is with the commission's Office of Science and Technology.

Congress authorized the FCC to set minimum performance RFI standards in the Communications Amendments Act of 1982 (see *MWN*, September and October 1982). The commission is not *required* to set standards, however —it can opt for alternatives like warning labels. Whatever the approach, Congress cautioned that it expects "the number of interference complaints recorded and investigated by the commission to be significantly reduced." (In fiscal year 1982, the FCC received over 60,000 complaints of RFI to home entertainment equipment.)

In a telephone interview from his office in Holmdel, NJ, Heirman said that he has asked the task group to assemble in Washington during the week of May 9. He plans to discuss FCC needs at the June 23 meeting of the Institute of Electrical and Electronics Engineers' (IEEE) Standards Board. In addition to Heirman, the members of the group are Harold Gauper of General Electric, Eb Tingley of the Electronics Industries Association's Consumer Electronics Group and FCC's Daniel Yates.

The ANSI C63 committee has also invited a representative from the American Radio Relay League (ARRL) to join the task group. Perry Williams, ARRL's Washington area coordinator, said that Hugh Turnbull would participate. Turnbull is the chairman of the league's RFI task group. Both Williams and Turnbull said they were "delighted" by the ANSI initiative and are prepared to accept a "meaningful" voluntary approach because it would be quicker than a government solution. ARRL lobbied for the RFI provisions when the amendments were still in congressional committee.

Professor Ralph Showers of the University of Pennsylvania, the chairman of the

(continued on p. 8)

To Our Readers

Microwave News is expanding to 12 pages. Beginning with the July/August issue, all our reports will be printed in larger type to make reading easier. In addition to providing more room for news, the new format will enable us to add a small classified ad section. For information on placing a notice in *Microwave News*, please call us at (212) 794-9633.

HIGHLIGHTS

Three States Hold Hearings on VDTs

Video display terminal (VDT) workers, owners and manufacturers gathered at hearings in three states last month to discuss proposed safety regulations. Although the VDT measures are hotly debated, with labor pro and business con, legislative committees in Massachusetts, New York and Oregon appear to favor some type of action.

In Massachusetts, the Committee on Commerce and Labor recommended passage of House Study Bill No. 2267 after an April 20 hearing. If the measure is approved, a group will be set up this summer to investigate VDT safety issues. A second house bill (No. 2658) containing specific rules for VDT use and work place design is in abeyance.

New York's April 14 hearing left Assemblyman Frank Barbaro convinced that VDT legislation is needed and he plans to introduce a bill in early May. (At Barbaro's invitation, the Assembly Labor Committee will hear a VDT presentation from the New York Committee for Occupational Safety and Health on May 10.) Meanwhile, the NY Senate Labor Committee has decided not to consider a bill proposed by Senator Joseph Montalto: Senate Bill No. 4314 would have required employers to furnish "a radiation protection jacket or blanket" to pregnant VDT operators upon request.

Oregon's Senate Labor Committee has yet to act on Bill No. 568. Members heard from 40 witnesses at a seven-hour hearing on April 25. Observers say the committee is sympathetic to worker and union requests for legislation and anticipate that the bill, with slight modification, will go to the senate.

For a brief review of these bills and proposals in several other states, see our April issue.

Air Force and Navy To Fund Study of VLF Hazards

The air force and navy will soon sponsor a joint study of hazards associated with exposures to very low frequency (VLF) radiation (10 kHz to 3 MHz). Four bids were received in response to a November request for proposals, and, according to William Hurt at the Air Force School of Aerospace Medicine in San Antonio, TX, an award will be announced in June or July.

One of the project's main objectives is to recommend "realistic" occupational and general population safety standards for VLF radiation. These will be defined either by conditions that produce induced currents resulting in perception, shock, fibrillation or burns, or a 0.4 W/Kg whole-body specific absorption rate (SAR) or 8 W/Kg local SAR in any one gram of tissue, whichever is the most restrictive.

The research project does not include any experimental studies of the biological effects of VLF radiation. The contractor will estimate induced body currents and calculate SARs produced by electric fields as a function of frequency, as well as measure radiation levels at specific sites near sources operating at 20, 50, and 100 kHz as well as 3 MHz.

This effort is a continuation of three preliminary studies (*VLF Hazards Analysis*) funded by the air force and completed last summer by (1) O.P. Gandhi and I. Chatterjee at the University of Utah, Salt Lake City; (2) A.W. Guy and C.K. Chou at the University of Washington, Seattle; and (3) D.J. Schaefer, W.B. Warren and F.L. Cain at the Georgia Institute of Technology in Atlanta. All three found the existing data base on the bioeffects of VLF radiation to be very limited. As Guy and Chou note, "The current status of research is very similar to that of microwave research in the early 1960s." They found that the majority of the available studies are from the Soviet Union.

The three reports are not readily available. Those interested in obtaining copies should contact William Hurt, AF School of Aerospace Medicine, Brooks AFB, TX 78235, (512) 536-3749. The Utah group published some of their results in the December 1982 issue of the *Proceedings of the IEEE*.

ANSI C63: Progress on EMC Standards

Members of the American National Standards Institute's (ANSI) C63 committee assembled in Washington, DC, on April 6 to consider a wide range of pending electromagnetic compatibility (EMC) issues (see *MWN*, December 1982). The one major item of new business was the formation of a special task group to consider ways of improving the immunity of home electronic equipment from radio frequency interference (RFI) - (see story on p.1).

The chairman of C63, Professor Ralph Showers of the University of Pennsylvania, announced that he plans to hold a vote on the revised ANSI C63.4 standard, which includes "Open Area Test Sites" (OATS), by August. Don Heirman of American Bell (Holmdel, NJ) circulated the tenth draft of the OATS document, which he has now integrated into the body of the C63.4 standard on methods of measuring radio noise emissions (10 kHz-1 GHz). All subcommittee 1 comments on the draft are due by June 1.

In an update on the activities of the International Special Committee on Radio Interference (CISPR), Herbert Mertel of EMACO (San Diego, CA) said that there is intense interest in Europe —especially in the Scandinavian countries— on the development of immunity standards for electronic products. This has resulted in numerous requests for draft standards and documents. The committee decided that only abstracts of working papers would be made available and that Mertel will act as the contact for foreign inquiries. Mertel also announced that CISPR subcommittee A will soon issue a document on test sites.

Wallace Amos of Burroughs Corp. (Paoli, PA) reported that subcommittee B failed to agree on a standard for data processing equipment. He said that he believes emission limits will have to be lower than those adopted by the Federal Communications Commission (FCC) if an international consensus is to be reached. Because no subcommittee B meetings are planned before 1984, he added, new standards could not be adopted before 1985.

FCC's Art Wall explained that there is a growing difficulty in distinguishing between the equipment addressed by CISPR's subcommittees B and F (B is on industrial, scientific and medical equipment, and F is on motors, household appliances and lighting apparatus). He cited computers as an example: they fit into both groups. New classification schemes could be based on power, or site of use (home vs. office). T. Lamont Wilson, a consultant based in Louisville, KY, will chair a task group to formulate a US position on the Band F problem.

Before the full committee met, members of ANSI C63's subcommittee 1 received the second draft of *Immunity Measurements: Procedures and Equipment for Electronic Products*, which was prepared by Heirman. The subcommittee voted unanimously to recommend that it be issued as a separate document instead of as additions to the C63.2 and C63.4 standards. "In that way all the immunity material will be in one place," explained Heirman. The proposal was passed on to the full C63 committee, which has yet to act on the proposal. Members of the immunity task force are expected to comment on the draft by June 1; Heirman would like to schedule a vote by late June and forward the document to the parent committee by September.

EMACO's Mertel detailed his progress in writing a national EMC standard. While there is still some question as to what will be included in the text and what will be incorporated by reference, he hopes to complete a first draft by August 1, and finish the document by next year.

Subcommittee 1 Chairman Edwin Bronaugh attempted, unsuccessfully, to recruit a chairman for a new task group to set limits on RF emissions and susceptibility of medical devices. Bronaugh, who is with Electro-Metrics (Amsterdam, NY), was able to set up two other task groups: Harold Gauper of GE (Schenectady, NY) will head a panel on the interpretation of quasi-peak measurements, and Marge Stone of AEL Industries (Farmingdale, NJ) volunteered to chair a group on extending C63.4 to automatic test equipment, including spectrum analyzers and automatic scanning receivers.

Richard Schulz of the IIT Research Institute (Annapolis, MD) announced the publication of two new handbooks he prepared for the Electromagnetic Compatibility Analysis Center (ECAC) under a contract from the Air Force Electronic Systems Division: *EMC Standards Manual, Revision 4,* (No. ECAC-HDBK-82-043) and *Radiation Hazards Manual, Revision 2,* (No. ECAC-HDBK-82-005). Both volumes are dated November 1982 and can be ordered from the National Technical Information Service (NTIS), Springfield, VA 22161. (Order numbers and prices were not available at press time.)

The next meeting of both the full C63 committee and subcommittee 1 will be on August 26, following the EMC Symposium (see Conference Calendar, p.8).

BSD's Hyperthermia Unit Nears Approval

The Food and Drug Administration's (FDA) Radiologic Devices Panel has found BSD Medical Corp.'s hyperthermia unit to be "approvable" for marketing subject to certain conditions. Dr. William Dirksen, BSD's director of research and regulatory affairs, said that he was "very pleased" with the FDA's decision and that the company is now negotiating with the agency on labelling language. The label will stipulate how the unit can be used in cancer treatment.

If BSD's hyperthermia system wins approval, it would become the first commercially available radiofrequency and microwave (RF/MW) heat treatment for cancer therapy in the United States. Two years ago, the FDA refused to okay the Magnetrode unit developed at Henry Medical Electronics and the University of California Medical School in Los Angeles (see *MWN*, May 1981).

The BSD-1000 hyperthermia unit operates at any frequency between 50 and 1,000 MHz and can use a variety of local applicators, either singly or in combination, to heat tumors with RF/MW energy. It is designed to operate in a RF-isolated screen room.

Before the BSD unit can be marketed, it must still win a positive recommendation from the advisory panel as well as official approval from the FDA. The panel's most recent decision was reached over the telephone; final approval can only come at a formal meeting. FDA's Dr. Robert Phillips, the panel's executive secretary, expects a meeting will be held in early summer.

At a December 9 meeting, the radiology panel voted two to one against granting BSD's application for premarket approval pending more data on its efficacy. Specifically, the panel objected to the lack of statistical controls in the clinical data presented by BSD (see *MWN*, January/February 1983). Dirksen said that BSD submitted the necessary information to the panel, and that formed the basis for its revised opinion. BSD is based in Salt Lake City, UT.

Narda To Develop Radiation Hazard Meter for the Navy

The Naval Surface Weapons Center in Dahlgren, VA, has awarded Narda Microwave Corp. a $200,000 contract to develop a meter for measuring radiation exposures in the 2 MHz to 40 GHz frequency range. The radiation hazard test set, designated AN/PSM-46, is part of the navy's Combat Readiness Electromagnetic Analysis Measurement (CREAM) program.

The meter will be keyed to the new American National Standards Institute (ANSI) C95.1-1982 safety standard, and will display radiation levels as a percentage of the maximum permissible exposure levels —independent of the number of incident signals, their frequency, direction, polarization or modulation characteristics.

Although the navy is still using a flat 10 mW/cm^2 exposure standard, the adoption of a new standard identical to ANSI's is under consideration. According to Lt. Roby Enge of the Naval Medical Command, the proposed revision is still in draft form and is now being reviewed by the navy's operational and medical commands.

Paulo Perini, a staffer with the CREAM program, points out that the lower frequency limit for the test set is 2 MHz, in contrast to 300 kHz for the ANSI standard, because there are no radiation sources below 2 MHz aboard navy ships.

The Narda contract was signed April 1 and runs nine months. The navy will then evaulate the test set and decide how to proceed. Narda is based in Hauppauge, NY.

Also in April, Loral Corp. of New York City bought Narda Microwave Corp. for approximately $45 million in stock. Loral is a major producer of electronic warfare systems.

Over-the-Horizon Radar EIS

The air force has released a draft environmental impact statement (EIS) for the construction and operation of its west coast over-the-horizon backscatter (OTH-B) radar. The system, which operates in six frequency bands between 5 and 28 MHz, can detect aircraft flying at any altitude at a distance of 500 to 1,800 miles.

The air force is considering two sites in Oregon for the transmitting antenna; the location of the receiver will be in northern California. According to the EIS, the calculated average power densities at ground level outside an exclusion fence would not exceed 100 uW/cm^2 for any OTH-B frequency: "Predicted values of average power density at ground level are less than 2 uW/cm^2 for all inhabited areas in the general vicinity of the two candidate transmitters." The air force notes that the validity of its computation methods was confirmed by measurements made in June 1981 at the experimental OTH radar station in Maine. No impacts on pacemakers outside the exclusion fence are anticipated.

The air force anticipates there will be no radiofrequency interference (RFI) in high frequency amateur bands and maritime or aeronautical mobile bands. Land mobile radio will be affected within three or four miles of the transmitter, with some AM and

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FM interference within about two miles. There may be some RFI in international broadcast bands, but the air force cannot predict when or where. In addition, harmonics could interfere with very high frequency air-to-ground communications within a few miles and omnirange (VOR) receivers within 30 miles. In both these instances, however, the air force says mitigation measures could prevent unwanted RFI.

Comments on the EIS are due by June 10. For more information, contact Mr. Ro Raffa, Electronic Systems Command, Hanscom AFB, MA 01731, (617) 271-7976.

The air force is in the process of building a full-scale OTH-B in Maine on the site of the now dismantled experimental OTH radar system (see *MWN*, September 1982) and has begun planning a third, south-looking system. In addition, the Naval Electronic System Command is developing an OTH radar that can be moved by ship, aircraft or truck.

Project ELF Radiation Survey

The IIT Research Institute (IITRI) staff has measured the electric and magnetic fields associated with the navy's Clam Lake ELF facility in Wisconsin. Radiation levels associated with both the Project ELF antennas at 76 Hz and low voltage power lines at 60 Hz were measured at more than 50 locations within a 25-mile radius of the navy facility. IITRI is based in Chicago, IL.

In general, the data show that magnetic and electric fields are higher near buildings than in open areas. The maximum 76 Hz magnetic field one mile from the ELF antennas was 1.4 milligauss in an inhabited location and 2.4 milligauss along a highway. At distances greater than ten miles from the facility, the maximum magnetic fields were 0.48 milligauss (inhabited) and 0.23 milligauss (uninhabited). There was little difference between the intensity of the magnetic fields measured inside and outside at each location.

For 76 Hz electric fields, the maximum recorded values in the soil near the Clam Lake station were 0.08 V/m (inhabited) and 0.03 V/m (uninhabited). In the air, the levels were 0.12 V/m (indoors, inhabited) and 0.16 (outdoors, inhabited) and 0.094 V/m (uninhabited). At more than 10 miles from the antennas, the maximum values in the soil were: 0.0013 V/m (inhabited) and 0.017 V/m (uninhabited); and in the air: 0.01 V/m (indoors, inhabited), 0.021 V/m (outdoors, inhabited) and 0.03 V/m (uninhabited).

In an analysis of the IITRI survey results, Dr. Nancy Wertheimer and Ed Leeper, who have linked weak levels of power line radiation with cancer, consider the 0.48 milligauss level to be "surprising" and suggest that the "fields are being dispersed by some means quite different from the usual field dispersal from power lines—perhaps by leakage of ELF currents into power lines and other conducting channels." They urge more study of these dispersal mechanisms. Wertheimer and Leeper's studies indicated that homes with an increased cancer risk had a median magnetic field of about 1 milligauss (see *MWN*, March 1983).

Public RF/MW Exposure Limits Proposed in Oregon

Oregon State Senators Steve Starkovich and Tony Meeker have introduced legislation to limit public exposure to radiofrequency and microwave (RF/MW) radiation. Under the proposed law, the state would adopt the Multnomah County standard for 100 kHz to 300 GHz radiation, which at its strictest level (for the 30 to 300 MHz band) limits exposures to 200 uW/cm^2.

The Senate Energy and Environment Committee plans to hold a public hearing on the measure in early May. According to Starkovich's aide Jim Edmonds, "chances for the bill reaching the senate in its current form are slim." Edmonds said the hearing would be valuable in itself as a state-wide forum for discussing radiation hazard issues.

Senate Bill 623 incorporates the exposure standards adopted in Multnomah County Ordinance 330. Modeled after Massachusetts' proposed standard, the county's 200 uW/cm^2 limit rises to 1 mW/cm^2 for frequencies above 1500 MHz and to 20 mW/cm^2 for those below 3 MHz. (See *MWN*, May, June and July/August 1982.) *The Oregon law would not cover portable sources emitting* 100 watts or less (ERP), any source emitting 7 watts or less, and industrial, scientific and medical equipment. A state-wide program would be set up to identify sources and measure radiation levels.

The bill was drafted at the request of People Against the Tower (PAT), a citizens' group seeking the removal of a large UHF TV tower in Silverton, OR. A PAT spokesman explained that some residents are pushing for a radiation exposure rule "as a matter of principle." The proposed standard would have no effect on Silverton, where estimated radiation exposures are no more than 1 uW/cm^2.

Zurich EMC Symposium

More than 100 papers were presented to an audience of 510 at the 5th *Electromagnetic Compatibility Symposium and Technical Exposition,* held in Zurich, Switzerland, March 8-10. A review of the proceedings reveals the wide range of topics covered by the participants — everything from models to measurements and shielding to standards.

One of the most significant trends is the growing attention to electromagnetic pulse (EMP) radiation. Over a dozen papers, many from European researchers, addressed EMP interactions. One engineer said he was surprised to see such interest in what was once an overlooked type of nuclear weapon radiation.

Here are some highlights from the published papers:

- On the basis of satellite-generated very low frequency (VLF) radiation data, K. Bullough and A. Cotterill of the Dept. of Physics at the University of Sheffield, England, estimate that power line harmonic radiation "may be responsible for the secular increase, which varies from 5 to 25 percent, in thunderstorm occurrence over southern Canada in the period 1935 to 1970 relative to that in the period 1900 to 1935."
- Michel Sirel of the Societe Les Cables de Lyon in Paris offers a new view of EMP propagation below ground. His experimental work leads him to conclude that at a depth of 500 meters in granite soil, an EMP signal has a much greater amplitude than predicted by theory.
- A study of radiation risks in the amateur radio service by two Polish reseachers concludes that, with a good transmitter and a properly installed antenna, amateur stations do not present a public hazard, even taking into account the strict Polish electromagnetic radiation standards.
- A.C.D. Whitehouse of the UK Home Office's Directorate of Radio Technology makes a strong case for international EMC standards. Two examples: When CB radios were imported into the UK, they caused severe RFI problems, especially to radio and TV receivers. The government later introduced its own CB equipment, with an FM modulation in contrast to the earlier AM modulated sets. But there were enough old CBs around to force the government to consider immunity standards. Also, conflicting regulations on electric lawn mowers vitiated EMC precautions. A safety standard required the mowers to have a cord of minimum length, but the cord produced resonant effects that invalidated the results of RFI testing.
- J.F. Fisher of Xerox in El Segundo, CA, describes a method of correlating surface currents with radiated fields for frequencies above 30 MHz as a way of avoiding costly open field radiation testing. Fisher used a current sensor to estimate emissions from

large and small copiers and from a word processor with very reasonable accuracy.

Those interested in obtaining a copy of the symposium proceedings should contact: T. Dvorak, EMC Proceedings Editor, ETH Zentrum —IKT, 8092 Zurich, Switzerland.

WHO Non-Ionizing Radiation Protection Report

The World Health Organization's (WHO) European Regional Office has published a report on the health effects of non-ionizing radiation. *Non-Ionizing Radiation Protection* is a 267-page compilation of papers that cover the spectrum from ultraviolet to ELF. Each chapter includes recommendations for avoiding hazardous exposures and is annotated with extensive references.

Radiofrequency (RF) and microwave (MW) radiation effects are reviewed by Professor Sol Michaelson of the University of Rochester, NY. Michaelson recommends efforts be made "to minimize the impact" of RF/MW sources in the environment, adding that "voluntary action in this direction may avoid the necessity for mandatory regulation." He notes that "information is available only for a limited range of [MW] frequencies and is lacking on the effects of repetitive and chronic exposure, and on the dose and frequency dependence of effects in biological systems."

For 50 and 60 Hz radiation, Professor R. Hauf of the Research Institute of Electropathology, Freiburg, West Germany, concludes that 20 kV/m electric fields and 240 A/m magnetic fields are safe, as are those produced by transmission systems operating at voltages of up to 420 kV. Although Hauf believes fields from systems with even higher voltages are not hazardous, he recommends that epidemiological studies "should be continued, especially on workers exposed to 800 kV systems..."

Other chapters examine ultraviolet, optical and infrared radiation, lasers, and ultrasound, as well as regulations and enforcement procedures.

Non-Ionizing Radiation Protection (WHO Regional Publications, European Series No. 10, 1982), edited by M.J. Suess, is available for $15.75 including postage from the WHO Publications Center, 49 Sheridan Avenue, Albany, NY 12210, or from your nearest WHO distribution office.

URSI Symposium on Bioeffects of MM Waves

URSI's Working Group on Measurements Related to the Interaction of Electromagnetic Fields with Biological Systems is organizing a symposium on *Techniques in Studies of Biological Effects of Low-Level Millimeter Waves* to be held September 4-6 near Munich, West Germany.

According to Professor Saul Rosenthal, the chairman of the working group, the attendees will specify biological end points and exposure systems for bioeffect studies of low intensity millimeter waves. The objective, he said, is to ensure that "the results of an experiment done anywhere in the world are clear, making replication more feasible."

Rosenthal hopes to organize other, similar meetings to select parameters for experiments in other frequency ranges.

The symposium will resemble a Gordon conference, with no published proceedings in order to encourage a free exchange of ideas. Although attendance is by invitation only, interested experts are encouraged to apply. Some 30-40 scientists are expected.

For more information contact the symposium chairman, Dr. Fritz Keilmann, Max-Planck Institut fur Festkorperforschung, 7000 Stuttgart 80, West Germany or Professor Saul Rosenthal, Polytechnic Institute of New York, Route 110, Farmingdale, NY 11735, (516) 454-5074. URSI stands for the International Union of Radio Science.

NAS-NRC Studies on Atmospheric Electricity and Emergency Communications Systems

The National Academy of Sciences (NAS) has begun a study of the atmospheric electrical environment. The Geophysics Study Committee of the NAS's National Research Council (NRC) will review recent advances in lightning and cloud physics and electrical phenomena in the atmosphere from an interdisciplinary perspective.

One topic to be addressed by the committee is a revision of lightning protection methods. Recent measurements of electromagnetic signatures indicate that lightning current rise times are about an order of magnitude faster than the present engineering test standards.

The chairmen of the study group are Dr. E. Philip Krider of the Institute of Atmospheric Physics at the University of Arizona, Tucson, and Dr. Raymond Roble of the National Center for Atmospheric Research in Boulder, CO. Background scientific papers for the study will be presented at the American Geophysical Union meeting in Baltimore this June.

The NRC's Committee on Review of National Communications System Initiatives in Support of National Security Telecommunications Policy has published an interim report on the problems of establishing an emergency communications system in an increasingly competitive industry. Electromagnetic pulse (EMP) effects will be addressed in a second interim report due later this year. (Another NRC committee is studying the EMP threat to electronic systems, see *MWN*, April 1983.) The committee is chaired by Professor Louis Rader of the University of Virginia.

National Joint Planning for Reliable Emergency Communications is available from the National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418.

UPDATES

Biological Effects...Three researchers at the University of Rochester School of Medicine believe they have experimental support for the new RF/MW ANSI safety standard. Writing in the April 15 issue of *Science*, Drs. Norbert Roberts, Jr., Shin-Tsu Lu and Sol Michaelson report finding no significant changes in the viability or function of human mononuclear leukocytes (white blood cells) up to one week after a two-hour exposure to 2450 MHz continuous wave (CW) radiation. Because the ANSI standard is based on a committee consensus that hazardous effects are associated with a whole-body average specific absorption rate (SARs) above 4 W/Kg and because the Rochester group exposed the leukocytes to an SAR equivalent to 4 W/Kg, they interpret their results as presenting "no evidence that current safety standard recommendations are inappropriate." They are careful to acknowledge the limited applicability of their studies: "Direct extrapolation to the in vivo setting with many physiological, homeostatic, integrated systems is not appropriate," and later, "Not completely excluded are potential microwave-induced effects resulting from exposure at similar SARs but different wave forms (frequencies, modulations and so on)." Nevertheless, they clearly state the opinion that: "earlier reports of possible microwave effects on human leukocytes ...should not form a basis for the resetting of safety standards." Three studies are cited as these "earlier reports." Two are by Dr. W. Stodolnik-Baranska of the Medical Academy of Warsaw, Poland, and appear in *Nature* (*214*, 102, 1967) and in *Biologic Effects and Health Hazards of Microwave Radiation* (Warsaw: Polish Medical Publishers, 1974). The third paper is by Dr. Przemyslaw Czerski and details some of his work at the National Research Institute of Mother and Child in Warsaw, Poland (he is now at the FDA's National Center for Devices and Radiological Health in Rockville, MD), and is published in the *Annals of the New York Academy of Sciences* (*247*, 232, 1975). In all three studies, Stodolnik-Baranska and Czerski used *pulsed*, not CW, 2950 MHz microwaves. The

two most recent studies specify the same pulsing characteristics: a 1200 Hz repetition rate with a 1 microsecond pulse width. The Polish researchers used wave forms that the Rochester group says cannot be "excluded" from being biologically active. In a telephone interview, Michaelson told *Microwave News* that while, in his opinion no one has really demonstrated a difference in biological activity between pulsed and CW radiation, enough people do believe that "a direct comparison may not be appropriate." Thus the Polish and Rochester work may not be comparable, which leaves open the question of the adequacy of present standards for pulsed fields....A new study, which will appear soon, shows the importance of modulation in producing an effect from exposure to RF/MW radiation. Drs. Daniel Lyle, Patricia Schechter, W.Ross Adey and Robert Lundak have observed an inhibition of immune function, specifically T-lymphocyte cytotoxicity, in the presence of a 450 MHz field sinusoidally amplitude modulated at 60 Hz. (A T-lymphocyte is one type of leukocyte or white blood cell.) They report that, "The unmodulated carrier wave did not affect cytotoxicity." The effect was weaker at lower and higher modulation frequencies, indicating the existence of a frequency "window" effect centered at 60 Hz. The paper has been accepted for publication in *Bioelectromagnetics* (Volume 4, Number 3) and is scheduled to appear late this summer. Lyle is based at the University of California, Riverside....The air force has awarded Drs. Ernest Albert and Frank Slaby $186,000 for a two-year study of the interaction of microwaves with the secretory products (e.g. ACTH) of the anterior pituitary cells using electron microscopy and biochemical assays. The two researchers, who are with the Department of Anatomy at George Washington University, will use radiation between 900 MHz and 3 GHz at power densities ranging from 10 uW/cm^2 to 100 mW/cm^2....The Bioelectromagnetics Society (BEMS) has scheduled workshops on the bioeffects of 60 Hz electromagnetic fields, the use of TEM cells in dosimetry studies, the effects of RF radiation on calcium movement and the interaction of RF radiation with thermophysiology and homeostasis at the June BEMS meeting in Boulder, CO; see Conference Calendar.

Communications...An FCC proposal for relocating 12 GHz private microwave operators displaced by DBS has received plenty of bad reviews. Broadcasters fear a commission plan to allocate spectrum space by the technical characteristics of transmission rather than by type of use may land some 12 GHz orphans on their turf at 2 and 7 GHz, and lead to congestion and coordination problems. Comments submitted on the proposal are summarized in the April 4 *Broadcasting*....The *IEEE Journal of Oceanic Engineering* will devote its July 1984 issue to ELF communications. For more information, contact M.L. Burrows, MIT Lincoln Laboratory, PO Box 73, Lexington, MA 02173....To meet the fast-growing demand for cordless phones, the FCC has proposed to temporarily allocate frequencies at 46 and 49 MHz. Telephones operating at these frequencies could be marketed for six years while the commission seeks a permanent home for cordless service....The FCC has eliminated many restrictions on FM radio subcarrier use, clearing the way for new radio paging services.

Compatibility & Interference...The FCC is getting ready to crack down on manufacturers and retailers of microcomputers that fail to meet commission RFI standards, according to a story in the April 25 *Electronic News*. Joseph Casey, the chief of the FCC Field Operations Bureau's investigation branch, cited 1982 surveys which indicated some 30 percent of the 317 RF devices tested violated emission limits —most of the offending equipment was personal computers and peripherals. Commission staff issued 44 citations to vendors; penalties can go as high as $2,000 per violation per day. Casey said another survey will begin soon....Even if your computer meets FCC standards, routine emissions may be strong enough to be detected and decoded by sophisticated listening equipment. In an April 5 article in the *New York Times*, William Broad provides some details about the Tempest program, which the super-secret National Security Agency describes as "an unclassified short name referring to investigations and studies of compromising emanations." With respect to how close one must get to a computer to decode its RF signals, Broad quotes Anthony Genova of Chomerics Inc. in Woburn, MA, as saying that "500 feet is not unreasonable at all."...Rome Air Development Center at Griffiss AFB, NY, is seeking proposals for a yearlong study of the possible EMI/EMC impacts of using monolithic microwave integrated circuits in critical command, control and communications systems....The FCC has adopted final rules for devices that act as interfaces between TV receivers and personal computers or video games. The rules are published in the March 29 *Federal Register* (48 *FR* 13029)....The Underwriters Laboratories has begun EMI testing at its new facility in Melville, NY....Two researchers at the Tokyo Central R&D Labs in Japan have published a paper on "Properties of High Frequency Conducted Noise from Automotive Electrical Accessories" in the February issue of the *IEEE Transactions on Electromagnetic Compatibility*.

EMP and Microwave Weapons...William Broad's cover story on EMP, "The Chaos Factor," in the January/February issue of *Science 83* sparked a number of letters, including one from Defense Secretary Caspar Weinberger. He assured readers that the US has taken steps to protect "certain critical communications systems" from EMP, permitting a "flexible" response to an enemy attack. In another letter, Charles Kinney, a former analyst at the army's Training and Doctrine Command at Fort Monroe, VA, relates his frustrations in trying to alert army staff to the possible threat of a Soviet "directed EMP or high power microwave, coherent beam of immense peak power." He goes on to note that DoD's Directed Energy Program now includes radiofrequency weapons—research "being done under classified wraps at an accelerated pace." (The letters appear in the March issue.) Kinney also wrote an article about particle beam, laser and microwave weapons for the February issue of *Military Electronics/Countermeasures*. He must have gotten his message across: In its recent report, *Soviet Military Power*, DoD notes that: "Indications of Soviet interest in radiofrequency technologies, particularly the capability to develop very high peak-power microwave generators, indicate [sic] that the Soviets intend to develop such a weapon." (p.75) The *Washington Post* confirmed the US is also busy working on these technologies. In an April 17 front page story, Walter Pincus reported that EMP bombs are being developed at the Lawrence Livermore and Los Alamos National Laboratories. And a team from Lawrence Livermore will present a paper on "Dynamic Characteristics of Intense Short Microwave Propagation in Atmosphere and Air Breakdown Threshold" at the classified HEART conference on July 21 in Oak Ridge, TN (see Conference Calendar on p.8)....Daniel Stein, a physicist at Princeton University, writes about EMP weapons policy in the March *Bulletin of Atomic Scientists*....Corning has developed glass dielectric capacitors that have significant immunity to EMP. For more information, contact Corning's Ronald Demcko at (919) 876-1100.

Government...At an April 14 meeting in Washington, DC, EPA's Office of Radiation Programs offered a working draft of its RF/MW exposure guidance for review by an inter-agency group. EPA staff briefed the group on progress toward completing the proposed guidelines, which are due this fall....As expected, the charter of NTIA's Frequency Management Advisory Council (FMAC) has been renewed for another two years. For more information, contact Charles Hutchison at NTIA, (202) 377-0805.

International...Last month we reported that the Standards Association of Australia (SAA) has proposed new RF/MW safety limits identical to the revised 1982 ANSI standard for workers. For the general population, the limits would be a factor of ten lower. The Australian Council of Trade Unions (ACTU) has now filed comments objecting to the SAA draft. The ACTU wants the standard's frequency range to be extended down to 50 Hz because of recent reports linking power line radiation to leukemia. Citing an ongoing study of the health of radio linemen by the Australian Postal and Telecommunications Union, the ACTU states that there is already evidence confirming the existence of "radiowave disease." The council argues: "The conclusion reached by the [SAA] that non-thermal effects are insignificant and can be ignored is a view that cannot be sustained, is not scientifically or medically valid and is certainly not shared by either the ACTU or bodies like NIOSH or WHO." The ACTU offers a counterproposal: the adoption of the new Soviet standard for occupational exposures (25 uW/cm^2 for 8 hours for 300-3,000 MHz, see *MWN*, November 1982 for details) and 10 uW/cm^2 for the general population.

Litigation...Marc Moller, a lawyer with Kreindler & Kreindler in New York City, will be the luncheon speaker at the International Microwave Power Institute symposium in Philadelphia on July 20 (see Conference Calendar on p.8 for details). He will discuss "Litigation Implications of Microwave Exposure and Personal Injury Claims." Moller was the lead attorney on the Engel-TACAN pancreatic cancer suit, which was settled out of court last December (see *MWN*, January/February 1983).

Measurement...The proceedings of the *1982 Conference on Precision Electromagnetic Measurements* appear in the March issue of *IEEE Trans-*

actions on Instrumentation and Measurement. The collection includes more than 60 papers presented at the Boulder, CO, meeting last June 30-July 1....NBS expects to complete its draft laboratory accreditation handbook for electromagnetic calibration services by the fall. Details on its relationship to a possible Measurement Assurance Program (MAP) are still being developed (see *MWN*, November 1982). For more information, contact: NBS' John Locke, (301) 921-3431....Among the papers scheduled to be presented at the International Microwave Power Institute (IMPI) symposium in July (see Conference Calendar on p. 8 for details), there are three on measurement techniques. Edward Aslan of Narda Microwave Corp. in Hauppauge, NY: "An Inexpensive Leakage Monitor;" Arnold Bucksbaum of Amana Refrigeration Inc. in Amana, IA: "A Leak Source for Evaluating Radiation Monitors;" and Billy Nesmith of FDA's National Center for Devices and Radiological Health in Rockville, MD: "Performance Evaluation of High-Power Survey Instruments."

Medical Applications...At the University of Pennsylvania, Professors Shiro Takashima and Toshio Asakura have succeeded in reversing the sickling of red cells with a pulsed low frequency field, a first step towards a temporary treatment for sickle cell anemia. Their working hypothesis is that the field causes changes in the cell membrane inducing an uptake of water. According to their report in the April 22 *Science*, the field strength was high: 3.5 kV/cm with a pulse duration of 5 milliseconds and an interval of 1 second. In a telephone interview, Takashima said that once the ground work is completed, they would like to run some experiments with rabbits or rats. For the moment, however, they must overcome the problem posed by the lysing of the red cells after 30 minutes of exposure....Two papers on applicators for hyperthermia treatment appear in the March issue of *Physics in Medicine and Biology*. Dr. J. Conway of Sheffield University in the UK assesses a small microwave diathermy applicator for treating tumors and a team from the University of Utah in the US presents applicator designs for regional and whole-body hyperthermia....The American Association of Physicists in Medicine (AAPM) has published *Physical Aspects of Hyperthermia*, edited by Dr. Gilbert Nussbaum of Washington University School of Medicine in St. Louis, MO. The volume, which consists of papers used at the AAPM's 1981 summer school at Dartmouth College, is available for $50 from the American Institute of Physics, Dept. BN, 335 East 45 Street, New York, NY 10017....The Association for the Advancement of Medical Instrumentation is holding a session on "Hyperthermia Therapy for Cancer" at its annual meeting on May 23. And there will be a workshop on "Hyperthermia for Cancer Treatment" on May 31 just before the *International Microwave Symposium* begins in Boston. For information on the latter course, contact MIT's Professor P. Lele (617) 253-5235. For details on both conferences see the calendar on p.8.

Ovens...Details of a microwave oven injury have been reported by Dr. Henry Fleck, associate professor of rehabilitation medicine emeritus at Albert Einstein College of Medicine in Bronx, NY. Writing in the April issue of the *Bulletin of the New York Academy of Medicine*, Fleck describes the burns suffered by a 51-year-old woman who opened the door and stuck her hands and forearms into the still active oven. In the process of retrieving a food dish, she was exposed to radiation from the oven's 600-watt magnetron for a few seconds. Over four years after the 1977 accident, the woman still experienced pain when her hands and forearms were exposed to radiant energy. Fleck suggests that a "simple neon tube" should be incorporated into microwave ovens as a radiation detector. This would enhance their safety, he argues, especially as they wear down....The May issue of *Consumer Reports* features a survey of 17 popular models of counter-top microwave ovens tested for speed, efficiency, cooking uniformity, convenience and accuracy of controls and safety. The Panasonic and Quasar scored highest in overall quality. All units met federal safety standards for radiation leakage....The Association of Home Appliance Manufacturers reports that the microwave oven industry had its best March in history: some 356,500 ovens were shipped, a 20 percent increase over last year. Nearly a million microwave ovens have been shipped so far this year....According to an April 11 report in *Home Furnishings Daily*, the microwave industry is gearing up for a strong second quarter also.

Power Lines...The New York State Power Lines Project's scientific advisory panel will consider funding three epidemiological studies on the health effects associated with exposure to 60 Hz fields. At its March 27 meeting, the group reviewed over ten pre-proposals and requested full proposals from Dr. Lowell Sever of Battelle in Richland, WA; Dr. Tim Byers of the State University of NY, Buffalo; and Drs. Jerome Barancik, Sam Morris and Leonard Hamilton of the Brookhaven National Laboratory in Upton, NY. The panel also reviewed a report by consultant Dr. Annemarie Crocetti on the advisability of reanalyzing Dr. Nancy Wertheimer's data linking power line radiation to cancer: Crocetti has recommended that the project fund a new study modeled after Wertheimer's. The panel's Dr. James Stebbings has asked Dr. Richard Hamman at the University of Colorado, Denver, to submit a proposal for this study. Project administrator Michael Rampolla hopes to receive all the proposals by the end of May.

Satellite Communications...On April 28, New York City's Board of Estimate gave final clearance for Teleport, a massive satellite communications complex. A joint venture of the Port Authority of New York and New Jersey, Merrill Lynch and Western Union, Teleport could accommodate up to 17 earth stations at its Staten Island site and cost hundreds of millions of dollars (see *MWN*, January/February 1983). Construction is scheduled to begin almost immediately.

Standards...The Institute of Electrical and Electronics Engineers (IEEE) has issued standard 475-1983 *Measurement Procedure for Field Disturbance Sensors*. The standard describes a method of measuring the RF radiated field strength (including the fundamental frequency and its second and third harmonics as well as any non-harmonic spurious emissions) from intrusion alarm, microwave-type sensors in the frequency range 300 MHz-40 GHz. It also specifies how to measure power line noise between 30 and 300 MHz. A copy of the standard, which was developed by the IEEE's Electromagnetic Compatibility Society, is available for $6 from Margaret Lynch, IEEE, 345 East 47 St., New York, NY 10017....The Electronic Industries Association's (EIA) Committee on Electron Tube Safety has developed two new standards: *Recommended Practice for Measurement of X-Radiation from Projection Cathode Ray Tubes* (RS-500) and *Recommended Practice for Measurement of X-Radiation from Non-Raster-Scanned Direct View Cathode Ray Tubes* (RS-502). Copies are available for $5 each from EIA, Standard Sales Dept., 2001 Eye St., NW, Washington, DC 20006.

VDTs...Newspaper Guild labor contracts may be the first in the US to guarantee VDT workers the right to alternative work during pregnancy. In a report prepared for the guild national convention in June, the union's executive board advises that "locals have the option to seek provisions enabling pregnant employees to be reassigned from working conditions the employee believes may be hazardous to her unborn child or herself by reason of her pregnancy."...The union has also written model VDT legislation which would require shielding plastic-cased terminals to reduce radiation emissions. The main concern of the proposed regulations, however, is ergonomics. The proposed guild legislation includes guidelines for lighting, furniture and terminal design, annual eye exams and hourly breaks from VDT work....A survey of workers at Harvard University's medical, dental and public health schools links VDT use to headaches, stress and eye, neck and back pain. A report on the study by the United Auto Workers (UAW) Committee on New Office Technology for the Harvard Medical Area and a list of guidelines for VDT use are available from the Boston UAW at (617) 236-1793....A committee set up under the American National Standards Institute's (ANSI) Safety and Health Management Board has begun work on a VDT ergonomics standard. The ten-member group, chaired by Professor Harry Snyder of the Virginia Polytechnic Institute, in Blacksburg, plans to have a draft standard ready for circulation and review by year-end, but is unlikely to submit a final guideline to ANSI for some time. The committee includes members of the academic community and representatives from IBM, Digital Equipment, Tectronics and Hewlett Packard....The Planetary Association for Clean Energy (PACE) is sponsoring a second VDT conference in Ottawa, October 21-23. For information, contact PACE, 100 Bronson Ave., Suite 1001, Ottawa, Ontario, Canada K1R 6G8, (613) 236-6265. Concern over possible ELF radiation hazards was a major topic at last year's conference....Dr. T.J. Stobbe of West Virginia University will chair a session on ergonomics and the office environment on May 24 at the *American Industrial Hygiene Conference* in Philadelphia, May 22-27....As reported last month, VDT tests at Surrey Memorial Hospital in Vancouver, BC, focused on the pulsed, very low frequency (VLF) radiation emitted by flyback transformers. Asked about measurements made in the US, Bill Murray of NIOSH told *Microwave News* that he knew of no meter that can

accurately measure these emissions in a work place, and that NIOSH relies on FDA laboratory tests to estimate VLF radiation exposure. Growing concern that reported clusters of pregnancy problems among VDT users may be linked to pulsed VLF radiation has not altered NIOSH's position that there are no VDT radiation hazards and that no further radiation testing is warranted. Murray explained that VDT emissions can't produce significant heating, and that teratological studies at NIOSH "show no evidence of non-thermal effects."...An article in the April *Harvard Medical School Health Letter* based on material from Michael Smith at NIOSH states that the clusters are "quite likely to be the result of a statistical accident, not VDT exposure." Other concerns, however, require attention: "The VDT is not just another piece of office equipment; it changes the nature of the work people do. Most potential health problems caused by VDTs can probably be averted by planning that takes account of the operators' needs. Lighting and furniture at the worksite may need to be rearranged or redesigned to prevent eyestrain and postural stresses. Operators need to have frequent breaks, to be able to move about, to work at a variable pace, and to meet the requirements set by human capacity, not a computer's. There are many opportunities to avoid becoming a 'terminal case'."

Etc...Last December we noted the publication of *Risk/Benefit Analysis: The Microwave Case* by San Francisco Press. One of the papers in this collection, written by Dr. Zory Glaser and Christopher Dodge, contained some editing and printing errors. A corrected copy is available from Glaser, Division of Risk Assessment, FDA (HFX-130), 12709 Twinbrook Parkway, Rockville, MD 20857. Please include a 6x9 self-addressed, stamped envelope. ●

ANSI RFI Task Group *(continued from p.1)*

C63 committee, said that the IEEE Standards Board had asked C63 to take up the RFI immunity problem noting that if ANSI did not, the IEEE would. Showers advised the committee to accept the challenge. The C63 members then unanimously agreed to develop standards and recommended practices, as appropriate, taking into account the interests of manufacturers, users, consumers and government agencies.

The task group's priority list of home electronic equipment is, in order of importance: TV receivers including videotape cassette recorders, hi-fi equipment including radio receivers, personal computers and other personal entertainment equipment. (For other news of C63 activities, see p.2.)

ARRL's Williams said that he also wants the ANSI group to explore touch control lamps, cordless telephones and radio controlled lighting systems. Turnbull would like to add smoke detectors, security systems and "non-Bell" telephones to the list. ●

LETTERS

To the Editor: We much appreciated receiving a copy of *Microwave News* [March 1983] in which our electromagnetic field studies were discussed. This is a new research area, most intriguing and challenging, which naturally elicits controversy.

At present we have sent 17 abstracts of EMF studies performed in different species, for past and future meetings, and have five papers (two published, one in press in the *Journal of Anatomy* confirming our initial findings, and two more submitted for publication).

We are already in correspondence with Richard Tell and look forward to further exchange of ideas and information with others who commented on our work in the *Microwave News* article which was very useful for our group.

Jose M.R. Delgado, MD

Departamento de Investigacion, Centro Ramon y Cajal, Ctra. de Colmenar, KM.9, Madrid 34, Spain.

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

CONFERENCE CALENDAR

- 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 22-27: *American Industrial Hygiene Conference*, Philadelphia Civic Center, PA. Contact: AIHA, 475 Wolf Ledges Parkway, Akron, OH 44311.
- 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, 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 5-9: *International Conference on Nonlinear Electrodynamics in Biological Systems*, VA Hospital, Loma Linda, CA. Contact: Research Service (151), Jerry L. Pettis Memorial Veterans Hospital, 11201 Benton Street, Loma Linda, CA 92357.
- June 7-9: 3rd *International Conference on Satellite Systems for Mobile Communications and Navigation*, London, UK. Contact: Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, United Kingdom.
- June 12-16: 5th Annual *Bioelectromagnetics Society Meeting*, University of Colorado, Boulder, CO. Contact: BEMS, 1 Bank Street, Gaithersburg, MD 20878.
- June 19-23: 28th Annual *Health Physics Society Meeting*, Baltimore Hilton Hotel and Convention Center, Baltimore, MD. Contact: HPS, 4720 Montgomery Lane, Suite 506, Bethesda, MD 20814.
- June 21-23: *International Conference on Lightning and Static Electricity*, Fort Worth Hilton Hotel, TX. Contact: Nick Rasch, FAA Technical Center, ACT-340, Atlantic City Airport, NJ 08405.
- July 3-8: 7th *International Congress of Radiation Research*, Amsterdam, Netherlands. Contact: Dr. J.J. Broerse, Radiobiological Institute TNO, PO Box 5815, 2280 HV Rijswijk, Netherlands.
- 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.
- July 18-22: 18th Annual *Microwave Power Symposium*, Franklin Plaza Hotel, Philadelphia, PA. Contact: International Microwave Power Institute, Tower Suite 520, 301 Maple Avenue West, Vienna, VA 22180.
- July 21-22: 2nd Annual *Hardened Electronics and Radiation Technology (HEART) Conference*, Oak Ridge National Laboratory, Oak Ridge, TN. Classified clearance required to attend. Contact: James E. Gover, Div. 2155, Sandia National Laboratories, Albuquerque, NM 87185.
- 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. de Electricidad y Electronica, Facultad de Ciencias Fisicas, Ciudad Universitaria, Madrid (3), Spain.
- September 4-6: *URSI Symposium on Techniques in Studies of Biological Effects of Low-Level Millimeter Waves*, Herrsching, West Germany (near Munich). Contact: Professor Saul Rosenthal, Polytechnic Institute of New York, Route 110, Farmingdale, NY 11735.
- September 12-14: 36th Annual *Conference on Engineering in Medicine and Biology*, Hyatt Regency Hotel, Columbus, OH. Contact: Alliance for Engineering in Medicine and Biology, 4405 East-West Highway, Suite 210, Bethesda, MD 20814.
- October 2-5: 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.
- October 4-6: 7th *International Colloquium on Prevention of Occupational Risks due to Electricity: The Prevention of Electrical Accidents by Influencing Human Behavior*, Cologne, West Germany. Contact: Secretariat of ISSA-Section and Colloquium, Berufsgenossenschaft der Feinmechanik und Elektrotechnik, Gustav-Heinemann-Ufer 130, D-5000 Koln 51, West Germany.

MICRO WAVE NEWS

Vol.IV No.4 A Monthly Report on Non-Ionizing Radiation May 1984

INSIDE...

HIGHLIGHTS pp.2-6

CISPR: Information and ISM Equipment EMC

Microwaves Affect DNA

PEMF Treatment for Shoulder Pain

ARRL Seeks FCC RF/MW Safety Action

BEMS Workshops and ANS C95 Meeting

UPDATES pp.7-12

Electric Blankets and Fetal Loss □ NTIA and EPA's RF/MW Guidance □ ARRL on Cable TV RFI □ Radar Disability Award □ NIOSH Draft Standard □ Maine Rejects VDT Rules □ Project ELF □ State RF/MW Rules □ NMR Approvals □ WVEU-TV Saga Continues □ CRS Power Lines Report □ VDT Legislation □ Hyperthermia Notes □ New Name at FDA □ Neurobehavioral Workshop, Wroclaw Symposium and NAB Meeting □ NBS Reports □ Special IEEE Publications □ Bioeffects, Power Lines and VDT Resources □ and more...

Conferences p.11

Short Courses p.6

Classifieds p.5

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.

VDT-Pregnancy Clusters Prompt NIOSH Research

Investigators from the National Institute for Occupational Safety and Health (NIOSH) have agreed to inspect an Alma, MI, telephone company office where 17 of 32 pregnancies among operators ended abnormally during a 16-month period. The cluster of suspected video display terminal (VDT) related pregnancy problems in Alma is the third to be made public this year (see *MWN*, March and April 1984) and the eleventh since 1980.

Researchers at NIOSH and the federal Centers for Disease Control (CDC) have long discounted a possible VDT-problem pregnancy link. But now NIOSH officials say that an epidemiological study focussing on VDT work has become a "very high priority." Dr. J. Donald Millar, director of NIOSH, is expected to outline the planned study when he testifies before a congressional subcommittee evaluating VDT health and safety on May 15.

Recent news reports in *The Wall Street Journal* (April 6), *Business Week* (April 23) and *Computerworld* (April 30) have quoted NIOSH officials as saying that the study will begin soon, but interviews with these officials revealed that major issues remain unresolved. A study population has not yet been identified, the study questionnaire lacks final approval and the lead researcher on the project, Dr. Jane Gordon, will be leaving the agency in June, before the study is underway.

Michigan Cluster

Long distance operators in the Alma office of General Telephone of Michigan, a subsidiary of GTE, first reported their cluster in the spring of 1983, according to H. Max Preston, the company's state vice president and general manager. Through their union, the International Brotherhood of Electrical Workers (IBEW), the workers informed the company of the unusually high number of miscarriages, birth defects and other problem pregnancies that had occurred between December 1981 and March 1983.

The state's Radiological Health Services Division (RHSD) tested 51 terminals at the site for ionizing radiation emissions, at the request of IBEW. In a letter to the union, Robert Skowronek of RHSD reported that "no ionizing radiation was detected" and that, "in our opinion, the use of these video display terminals does not pose a radiation exposure hazard for employees."

Recent publicity about the cluster led the company to ask NIOSH to visit the site. Dr. Peter Lichty, a medical officer in NIOSH's Hazard Evaluations and Technical Assistance Branch (HETAB) who is investigating the cluster, told *Microwave News* that a team of researchers would make an initial site inspection on May 8 and follow up with a second visit later.

General Telephone's Preston said in a telephone interview that the company is concerned that all the publicity has "heightened concerns among workers that had been allayed by the state's tests."

(continued on p.12)

CISPR: Information and ISM Equipment EMC

Progress towards two new electromagnetic compatibility (EMC) standards—for information technology equipment (ITE) and for industrial, scientific and medical (ISM) equipment—was made at the meetings of the International Special Committee on Radio Interference (CISPR) and its six subcommittees held in Paris, France, March 5-17.

Information Technology Equipment

CISPR's Subcommittee B on "Interference from ISM Radiofrequency Apparatus" released a document on ITE standards, which will be issued as an International Electrotechnical Commission (IEC) "six months' draft rule" (CISPR is a special committee of the IEC). The document, which specifies emission limits and measurement techniques, will now go to each member country for approval.

Art Wall of the Federal Communications Commission (FCC) reports that there are several minor differences between the FCC's Part 15 rules for computers and other digital equipment and the CISPR proposal, but that they are "basically the same." He predicts that the CISPR standards will be accepted by the member nations.

If so, the FCC will have to go through formal rule making proceedings before they can be adopted in the US. Speaking at the *1984 IEEE National Symposium on Electromagnetic Compatibility,* in San Antonio, TX, on April 24, Wall said that he "would not be surprised if industry petitioned the FCC to adopt the CISPR rules." Wall, who is the chief of the RF Devices Branch in the FCC's Office of Science and Technology, added that the commission "might act alone, but given our work load, it will be quicker if industry petitions."

The Computer and Business Equipment Manufacturers Association (CBEMA) has been anxious to have an international standard and may well petition. In 1977, in response to FCC's original proposals for limiting computer radiofrequency interference, CBEMA wrote: "Worldwide compatibility is desirable, not only from a technical viewpoint but also for reasons of international comity. There are, in addition, economic considerations inasmuch as it is costly to comply with different, inconsistent standards using different measurement techniques and different kinds of measurement equipment."

In a telephone interview, CBEMA's William Hanrahan said that the group still favored international standards and that there was a "good possibility" that CBEMA would petition the FCC if the CISPR limits are reasonable. Hanrahan had not yet seen the numbers that emerged from the Paris meetings. "We will be discussing this question in the coming weeks," he said.

At a CISPR plenary meeting, the Canadian delegation proposed that a new subcommittee be established to deal with ITE. There has been some dispute over whether Committee B or F has jurisdiction over ITE (see *MWN,* May 1983). A report outlining the merits of a new subcommittee is being prepared for consideration at next year's CISPR meeting.

One change in defintion was made in Paris: according to EMACO's Herb Mertel, the term "data processing equipment" was changed to "information technology equipment" to include devices connected to telephone lines.

ISM Equipment

Subcommittee B delegates failed to reach a general agreement on emissions from ISM equipment at the CISPR meetings. Some progress was made as a 90 dB ceiling gained preliminary acceptance for frequencies below 1.6 MHz. (The CISPR measure is relative to 1 uV/m at 30 meters; 90 dB is equivalent to 31.6 mV/m.) There was no consensus for limits at higher frequencies, however.

ISM equipment is a broad category which includes microwave ovens, induction and dielectric heaters, RF welders and diathermy units.

Setting emission limits for ISM equipment is complicated and controversial, and the stakes riding on the outcome are high. The Interim Working Party 1/4 of the International Radio Consultative Committee (CCIR) is writing new standards and CISPR is participating in that effort (see *MWN,* September 1983). Unlike CISPR standards, which are essentially voluntary, CCIR limits would have the status of an international treaty and would be mandatory.

The US out-of-band limits for ISM equipment, set by the FCC in Part 18 of its regulations, are generally considered to be lenient: 10 uV/m at one mile from the source in industrial areas. In 1978, the commission proposed tightening these limits to 900 uV/m or less at 30 meters for frequencies below 1 GHz (43*FR*46326). These proposals, which were similar to the then current CISPR limits, were opposed by US manufacturers and they are still on hold at the FCC pending the outcome of international deliberations.

Given that the CISPR and the FCC specify limits measured at different distances from the source, an attenuation model is needed if the two are to be compared. What the appropriate model should be is also the subject of some controversy.

Indeed, in its proposed 1978 ISM rules, the FCC advised that it had not attempted to convert various field strength limits to a standard distance because "there is some disagreement about how the value should be extrapolated. We do not want to get into this argument."

For example, if you assume that the signal decreases with the square of the distance, 10 uV/m at one mile is equivalent to 89 dB at 30 meters. According to this model, the new CISPR limit of 90 dB is essentially the same as the present FCC limits. But if you assume that the signal decays with the cube of the distance, the FCC's 10 uV/m standard translates to 125 dB at 30 meters. Under this latter model, CISPR's proposed 90 dB limit is significantly stricter than the current FCC standard.

Although a consensus is developing on standards for emissions at low frequencies, US delegates believe that the CISPR proposals above 1.6 MHz are too harsh. Unless a compromise is reached within CISPR, some participants

fear that CCIR will adopt mandatory limits that are too stringent.

For emissions above 1.6 MHz, which is at the top of the AM radio band, European representatives favor limits in the 60 dB range. Lamont Wilson, a consultant to US companies who attended the CISPR meetings, opposes this move. In a telephone interview, he said that as far as he is concerned the limits for the higher frequencies "are up in the air."

In a series of telephone interviews, US delegates to the CISPR meetings suggested that the disagreement is based on the different enforcement rules in Europe compared to those in the US. For instance, they maintained that in a number of European countries, the government must pay for repairs if a source of radiofrequency interference is discovered which complies with the national limits.

The ISM document, which is a briefing rather than a voting document, will now be reviewed by the US's Subcommitee B technical advisory committee, chaired by the FCC's Herman Garlan. Garlan is about to retire after 44 years with the commission.

Immunity Measurements

In the third major development at the Paris meetings, a working group of Subcommittee E on "Interference Characteristics of Radio Receivers" proposed using the open strip line or parallel plate as the preferred method of measuring the susceptibility of electronic equipment.

According to Gilbert Hermeling, a former RCA staffer and now a consulant to the Electronic Industries Association, who attended the Paris meetings, the TEM cell would be allowed as an alternative method under the CISPR rules.

This action reverses the position taken by the Subcommittee E working group at last year's meeting in Kristiansand, Norway. At that time, the closed TEM cell was the preferred technique and the strip line was the alternative method.

The US delegates favor the TEM cell as the standard technique because it is more accurate and is already in common use. On the other hand, many European countries still use the strip line and do not want to incur the expense of switching over to the TEM cell.

The matter is by no means settled. The working group will issue a new draft document and it will be discussed again at the 1985 meeting.

Other Actions

Subcommittee A on "Radio Interference Measurements and Statistical Methods" has issued two draft six months' rules: CISPR/A(Central Office)28, *Amendment of CISPR Publication 16 to Provide for the Measurement of Screening Effectiveness*, applicable to measuring instrumentation for 10 kHz to 1 GHz; and CISPR/A(Central Office)30, *Amendment of CISPR Publication 16 to Provide For Measurement of Total Radiated Power from Apparatus Operating in the Microwave Range*, (reverberating chamber method). Copies of all the six-months' rules should be available this month.

CISPR has also recently released a new amendment to CISPR 13-1975: Amendment No.1-1983, *Limits and Methods of Measurement of Radio Interference Characteristics of Sound and Television Receivers*. It is available for $13.00 (prepaid) from the International Sales Dept., American National Standards Institute, 1430 Broadway, New York, NY 10018.

Future Meetings

The next CISPR meeting will probably be held in Sydney, Australia, either in May or September 1985. The 1986 meeting may be in San Diego, CA.

This year's meeting included a celebration of the committee's 50th anniversary. CISPR was founded in Paris in 1934 under the sponsorship of the IEC.

Microwaves Affect DNA

Researchers at the Food and Drug Administration's (FDA) Center for Devices and Radiological Health and the University of Maryland have shown that microwaves can affect DNA, the basic genetic material of all living systems.

In an invited paper presented at the annual meeting of the American Physical Society on March 28, FDA's Dr. Mays Swicord reported the "first observation of microwave energy absorption by DNA in the 8-12 GHz frequency range."

A number of researchers have already reported experimental data indicating that non-ionizing radiation can alter genetic systems. But many observers are dubious about these effects because the energy of microwave photons is too low to cause biological interactions through currently accepted mechanisms.

Now, Swicord and Dr. Christopher Davis and Glen Edwards of the University of Maryland in College Park have found that "direct excitation of the DNA molecule by electromagnetic radiation in the radiofrequency range is not only possible, but indeed does occur." Their experiments "further suggest that from physical considerations, low-level athermal microwave genetic effects are conceptually possible."

Using a technique called dielectrometry, the researchers measured the absorption coefficients of DNA in a saline solution. They discovered not only that the DNA was an efficient absorber of microwave energy, but also that the degree of absorption was dependent on the length of the DNA chain.

In a telephone interview, Swicord said that they had observed chain length resonance modes. "For a *specific* number of base pairs of DNA, you have a *specific frequency* that will resonate with the molecule," he explained. For example, if a given DNA chain resonates at a particular frequency, a chain with twice as many base pairs will resonate at half the original frequency.

Swicord's data conform to a theory developed by Dr. Earl Prohofsky of Purdue University in Lafayette, IN. Prohofsky calculated that nucleosomes, which have only a few hundred base pairs, would resonate at 40 GHz.

Swicord cautioned that "any jump from these physical measurements to observed biological effects is still highly speculative." But he added that "it is possible that some of

the genetic effects that have been observed could be explained by these new results."

Dr. Friedrich Kremer of the Max Plank Institute for Solid State Physics in Stuttgart, West Germany, has shown that millimeter waves (64-69 GHz) can cause an impairment of the puffing pattern of the giant chromosome of a midge (see *MWN*, October 1983). At somewhat lower frequencies, approximately 41 GHz, Dr. Fritz Keilman, also of the Max Planck Institute, and co-workers found that non-thermal levels of radiation can affect the growth rate of yeast (see *MWN*, December 1982).

At microwave frequencies, a team led by FDA's Dr. Przemyslaw Czerski has demonstrated that 0.915, 2.45 and 9.45 GHz radiation changes the chromosomes of male mice during spermatogenesis (see *MWN*, October 1983).

Dr. Abe Liboff of Oakland University in Rochester, MI, has reported that extremely low frequency (ELF) radiation (10 Hz-4 kHz) can enhance DNA synthesis (see Biological Effects Update on p.7). Swicord said that he suspects the mechanism of interaction for ELF radiation is different from that at higher frequencies.

Swicord's group has already published a paper on the enhanced DNA absorption in *Biopolymers, 22,* 2513, 1983. Glen Edwards will present new data on the base pair/frequency relationship at this summer's Bioelectromagnetics Society annual meeting.

PEMF Treatment for Shoulder Pain

Rotator cuff tendinitis, a common cause of shoulder pain, has been treated effectively with pulsed electromagnetic fields (PEMFs). In a paper published in the March 31 *Lancet,* a team from Addenbrooke's Hospital and Strangeways Research Labs in Cambridge, England, reports that PEMF therapy is beneficial for patients who do not respond to conventional therapy.

The new study marks two important milestones in the development of PEMF therapy. While PEMFs have been used to accelerate bone repair, to regenerate nerves and to heal skin ulcers, this is their first application to rotator cuff tendinitis. Second, the Cambridge paper is the first published report of a double-blind controlled study for any type of PEMF treatment.

Drs. Allan Binder, Graham Parr and Brian Hazleman of Addenbrooke and Dr. Sylvia Fitton-Jackson of Strangeways used Electro-Biology's (EBI) coil to administer single pulses of 73 ± 2 Hz to the shoulders of patients whose injuries had persisted for more than three months.

The 29 patients who participated in the study were divided into two groups: 15 were treated with PEMFs for eight weeks while the 14 patients in the control group were fitted with dummy coils. Neither patients nor researchers knew who had the active coils. After four weeks, the coils of the control group were activated for four weeks of treatment —without breaking the double-blind code. The therapy sessions varied from three to ten hours a day.

At the end of the first phase of the experiment (after four weeks), there was a statistically significant improvement in all the measures used to assess treatment success. A similar improvement was found among the control group after their four weeks of PEMF therapy.

All the patients were monitored for eight weeks after the coils were removed. Of the 29 patients, 19 were symptomless at the end of 16 weeks. Among the remaining ten, two became symptomless, three had "only minor residual disability," and five still experienced either pain and tenderness or felt no improvement. The research team concluded that "more than 70 percent of patients improved on PEMF therapy."

No side effects were reported in the course of the study, though many patients found the coils to be "cumbersome and uncomfortable." In a pilot study, which has not been published, one patient suffered neck pain and "neurological deficit" in the arms—a condition which was connected to a prior ailment. This patient's shoulder improved with PEMF therapy. The pilot study had an overall 67 percent success rate.

PEMF therapy for certain types of persistent and severe shoulder pain could become quite popular. According to the researchers, rotator cuff tendinitis is "extremely common" and, while most cases respond to local corticosteroid injections, 23 percent of those referred to the shoulder clinic at Addenbrooke did not respond or derived only temporary benefit from conventional therapy. The Cambridge group suggests that PEMFs could also be useful in the treatment of other chronic tendon lesions.

ARRL Seeks FCC Decision On RF/MW Safety

The American Radio Relay League (ARRL) has asked the Federal Communications Commission (FCC) to complete its rule making on radiofrequency and microwave (RF/MW) radiation safety. The commission issued a notice of proposed rule making in January 1982 on procedures for ensuring that its licensees do not create RF/MW radiation hazards (see *MWN*, March 1982). No final action has followed.

According to the ARRL's counsel, Christopher Imlay, the league filed its request "more out of frustration than out of hope." The March 20 petition echoes broadcast industry comments filed in 1982, which urged the commission to adopt an interim exposure standard while the Environmental Protection Agency (EPA) develops its RF/MW guidelines.

The league argues that "the absence of any clear guidelines from the commission" will make it impossible to answer mounting public concern over potential RF/MW health hazards and that the situation will foster more siting disputes and state and local rule making.

Although the commission has yet to set a date for the release of a final action, officials maintain the commission has not backed away from setting an RF/MW safety policy. Peggy Reed, the commission's deputy chief scientist for policy, told *Microwave News* that "this area is getting a lot of attention here" and explained that the delay is in part a result of "the increasing complexity of this issue." Reed noted that when the notice was released, the commission

thought the Occupational Safety and Health Administration's 10 mW/cm² exposure guideline could be used, but that this is no longer considered an available option (see *MWN*, March 1984).

Contrary to Reed's assurance that work is continuing, the league maintains in its petition that it has been informed that the commission is "deferring action" until EPA adopts its general population exposure guidance. Though EPA plans to publish proposed exposure limits this June, the league warns that "a substantial amount of time—possibly another two years—is likely to pass before [EPA] releases a final recommendation."

FCC staff would not confirm that the commission has decided to wait for EPA, but the schedule for RF/MW safety rules does not appear in the FCC's current semi-annual "unified agenda of federal regulations." (The agenda appeared in the April 19 *Federal Register*, 49*FR*16598.) The word from the deputy scientist's office is that the omission was an administrative oversight.

The league, while pushing for an interim standard, opposes using guidelines which are more restrictive than the American National Standards Institute (ANSI) 1982 standard. ARRL would therefore most likely oppose EPA's proposed guidance because it is rumored to be ten times lower than ANSI's. EPA is expected to propose a 100 uW/cm² limit for resonant frequencies.

FCC officials said they do not know how long it will take to respond to ARRL's petition.

BEMS Workshops and ANS C95 Meeting

If you are planning to attend the *6th Annual Meeting of the Bioelectromagnetics Society* (BEMS) in mid-July, be prepared for a hectic week. In addition to the 180 papers accepted for presentation at the daily technical sessions, a symposium and two workshops are being organized for the evening hours. Before the BEMS meeting gets underway, there will be a meeting of the American National Standards (ANS) Committee C95.

On Sunday, July 15, the eve of the formal opening of the conference, Dr. Don Justesen will host a symposium on the biological effects of low frequency pulsed magnetic fields. The starting point for the evening's discussion will be Dr. Jose Delgado's studies with chicken embryos (see *MWN*, March and November 1983), though the Spanish researcher will be unable to attend the BEMS meeting, according to Justesen.

For the following evening, Dr. Eleanor Adair is organizing a workshop on the "Pound Proposal." Four years ago, Harvard University Professor Robert V. Pound argued that much of the energy used to heat buildings could be saved if people were warmed up instead of the space that surrounds them. In a paper published in the May 2, 1980, *Science*, he outlined how this could be accomplished with microwaves of centimeter wavelengths because in the 40-90 GHz fre-

(continued on p.6)

CLASSIFIEDS

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quency range, 95 percent of the incident radiation is absorbed by the skin. With such shallow penetration, Pound believes that non-thermal effects would be unlikely. Adair plans a discussion of the economic and technical feasibility of the idea, its medical implications and the ethical and legal questions associated with pilot studies using human subjects. Pound is planning to attend.

On Tuesday night, a panel will discuss the range of issues, from political to scientific to legal, raised by the use and regulation of radiofrequency and microwave radiation. Richard Tell of the Environmental Protection Agency and Robert Cleveland of the Federal Communications Commission are assembling representatives from federal agencies, industry and the general public to field questions from the audience. They want to focus on "real life situations," that is, "Where are people being exposed and how much of a problem is there with regard to both potential hazards and economic impact of corrective actions?" A lively interchange is expected.

The American National Standards Committee on Radiofrequency Radiation Hazards, C95, has scheduled a meeting for Sunday, July 15 at 2 pm at the Omni International Hotel.

Among the agenda items are reports on the status of the revisions of the American National Standards Institute (ANSI) exposure limits (C95.1-1982) and of the measurement guidelines (C95.3-1979 and C95.5-1981). A new draft standard covering hazards to electric blasting caps will also be presented.

The BEMS meeting will be held at the Omni International Hotel in Atlanta, GA, July 15-19. Rooms should be reserved directly with the hotel at 1 Omni International, Atlanta, GA 30335, (800) 241-5500, or (404) 659-0000 in Georgia. For more information about the meeting, contact Marsha Ryan at BEMS, 1 Bank St., Suite 307, Gaithersburg, MD 20878, (301) 948-5530.

SHORT COURSES

June 11-15: ***Computer Aided Design of Microstrip Circuits and Antennas,*** Boulder, CO. Fee: $650. Contact: Prof. S.W. Maley, EE Dept., University of Colorado, Campus Box 425, Boulder, CO 80309, (303) 492-7004.

June 11-15: ***The Modern Geometrical Theory of Diffraction,*** Columbus, OH. Fee: $750. Contact: Richard Frasher, Ohio State University, Engineering Short Courses, 2070 Neil Ave., Columbus, OH 43210, (614) 422-2651.

June 13-15: ***Biological Effects of Transmission Lines and Substations,*** Chicago, IL. Fee: $685. Contact: Ms. Hargett, Professional Development Services (PDS), 4 Professional Dr., Suite 148, Gaithersburg, MD 20879, (301) 926-2797.

June 18-19: ***Electrical Accidents Involving Power Lines,*** Washington, DC. Fee: $475. Contact: PDS, see June 13 above. Repeated ***June 21-22:*** Denver, CO.

June 18-22: ***Antennas and Arrays,*** Washington, DC. Fee: $875. Contact: Contact: George Harrison, Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC. Repeated ***August 13-17:*** Ottawa, Canada.

June 19-21: ***Seminar on Mutual Design of Overhead Transmission Lines and Railroad Communications and Signal Systems,*** Washington, DC. Fee: $100 (approx.). Contact: John Dunlap, Electric Power Research Institute (EPRI), PO Box 10412, Palo Alto, CA 94303, (415) 855-2305. Repeated ***September 11-13:*** Atlanta, GA.

June 19-22: ***Grounding & Shielding,*** Chicago, IL. Fee: $815. Optional fourth day for $235. Contact: Don White Consultants Inc. (DWCI), Star Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030. Repeated ***July 17-20:*** Boulder, CO; ***August 14-17:*** Ottawa, Canada; ***September 18-21:*** San Diego, CA; ***October 23-26:*** Atlanta, GA.

June 19-22: ***Communication Satellite Antenna Technology,*** Burlington, MA. Fee: $850. Contact: Ann Beekman, Southeastern Center for Electrical Engineering Education (SCEEE), Central Florida Facility, 11th & Massachusetts Ave., St. Cloud, FL 32769, (305) 892-6146.

June 20-22: ***Mobile Cellular Telecommunication Systems,*** Washington, DC. Fee: $695. Contact: GWU, see June 18 above.

June 25-27: ***Design Methods for Emission and Susceptibility Control,*** Sunnyvale, CA. Fee: $695. Contact: Jim Hill, EMXX Corp., 6706 Deland Dr., Springfield, VA 22152, (703) 451-4619.

June 28-29: ***EMC Laboratory Experience Workshop,*** Mariposa, CA. Fee: $695. Contact: EMXX, see June 25 above.

July 10-13: ***Advanced EMC Workshop,*** Philadelphia, PA. Fee: $995. Contact: DWCI, see June 19 above.

July 11-13: ***Communication Satellite Systems – The Earth Station,*** Washington, DC. Fee: $695. Contact: GWU, see June 18 above.

July 16-20: ***Microwave Antenna Measurements,*** Atlanta, GA. Fee: $800. Contact: Dept. of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-2400.

July 17-18: ***Radar Principles for the Non-Specialist,*** Washington, DC. Fee: $625. Contact: GWU, see June 18 above.

July 31-August 3: ***Antenna Theory and Design,*** Myrtle Beach, SC. Fee: $645. Contact: SCEEE, see June 19 above.

August 6-10: ***Non-Ionizing Radiations: Biophysical and Biological Basis, Applications and Hazards in Medicine and Industry,*** Cambridge, MA. Fee: $950. Contact: Office of Summer Session, Room E19-356, MIT, Cambridge, MA 02139.

August 7-9: ***Grounding & Interference Control in Buildings and Electrical/Electronic Facilities,*** Philadelphia, PA. Fee: $785. Contact: DWCI, see June 19 above.

August 14-15: ***EMI Diagnostics & Fixes,*** Virginia Beach, VA. Fee: $635. Contact: DWCI, see June 19 above.

August 27-29: ***Electromagnetic Pulse and Its Effects on Systems,*** San Diego, CA. Fee: $695. Contact: GWU, see June 18 above.

September 10-11: ***EMI Testing Workshop: Commercial,*** Philadelphia, PA. Fee: $595. Contact: Michele Elkes, R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1965. Repeated ***October 29-30.***

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UPDATES

BIOLOGICAL EFFECTS

Electric Blankets and Fetal Loss... Dr. Nancy Wertheimer has found a significant increase in fetal loss among users of electric blankets — a less than significant increase was also observed among users of water beds — as compared to controls who did not heat their beds. Wertheimer, who is with the Department of Preventive Medicine and Biometrics at the University of Colorado Medical School in Denver, reports that the incidence of fetal loss "showed a significant seasonal skewing, most concentrated in the months when cold nights are increasing (September through January)." In addition, live births among those using electrically heated beds had longer gestation times but not higher birth weights. She concludes that "this tendency and the excess fetal loss both seemed to be associated with high electric blanket settings used by the mother rather than those used by the father." Wertheimer will be presenting these results in a talk at the New York Academy of Sciences in New York City on May 16 and in a poster paper at the annual meeting of the AAAS, which will be held in New York City during the last week of May. Dr. Sol Michaelson of the University of Rochester School of Medicine and Dentistry is also on the academy's May 16 program. He will talk on the "Influence of Power Frequency Electric and Magnetic Fields on Human Health." According to Michaelson, a careful review of the information available on the possible risks associated with EM fields from overhead power lines indicates that "if a hazard is determined, it is not from the electric or magnetic field per se, but other factors." He emphasizes that, "it is imperative that we recognize the fact that practical decisions must be made on the basis of *what is known* rather than what is postulated or assumed without any rational basis."

Resources...NIEHS' Drs. Don McRee and H.G. Davis have been studying "Whole-Body and Local Dosimetry in Rats Exposed to 2.45 GHz Microwave Radiation" and have found that local SARs in the brain can be two to three times higher than the whole-body SARs. With respect to studies on fetal development, they recommend measuring the SAR in the uteran area because "it would probably be different from the average whole-body SAR of the adult pregnant rat." Their results are described in the February 1984 *Health Physics*....Dr. Abe Liboff's paper on the effects of time-varying magnetic fields on DNA synthesis (see *MWN*, October 1983) appears in the February 24, 1984 *Science*....A new chapter in the ongoing debate on an organism's thermoregulatory response to microwave radiation has been written by EPA's Dr. Christopher Gordon. His response to a critique by a group from the John Pierce Foundation led by Dr. Eleanor Adair appears in the recently released December 1983 issue of *The Journal of Microwave Power*. Adair et al.'s comments were in the journal's June 1983 issue and Gordon's original paper appeared in the June 1982 issue....A report from a symposium on "Human Cataract Formation," held in London, England, in October 1983, was published in the December 15, 1983 *Nature*....A research group from England has measured the relative permittivity and conductivity of the cerebellum, cerebrum and brain stem of mice in the 72 MHz-5 GHz frequency range. The details are in the August 1983 issue of *Physics in Medicine and Biology*.

COMPATIBILITY & INTERFERENCE

ARRL on Cable TV... The American Radio Relay League (ARRL) has issued a collection of materials on cable TV RFI, including instructions on how to deal with local cable operators whose systems leak interfering signals. The ARRL and the National Cable Television Association (NCTA) have formed a special committee to review reported cases of cable TV RFI in an effort to stem what had become a source of mutual antagonism (see *MWN*, March 1984). To get a copy of the ARRL booklet, *Cable Television Interference: Working Materials for the Radio Amateur*, send $6.00 and a 9x12 inch self-addressed envelope with $1.20 in postage affixed to CATVI Desk, ARRL, 225 Main St., Newington, CT 06111.

WVEU-TV Saga Continues... The FCC is still waiting for WVEU-TV and 23 land mobile radio services operating from the roof of Atlanta's Peachtree Plaza Hotel to resolve a three-year-old RFI dispute. Last year the commission ordered the TV station to pay for relocating the frequencies used by the mobile services (see *MWN*, October 1983). This March, the commission warned that it will not reconsider its initial ruling, despite WVEU-TV's latecomer status, and said the matter must be resolved within 90 days. Everyone with an antenna on the roof has submitted comments on the order, and these are now being reviewed by the commission.

GOVERNMENT

NTIA & EPA's Guidance... The impact on government agencies of EPA's soon to be proposed RF/MW radiation exposure guidance is being evaluated by NTIA's Ad Hoc Committee 189. The interagency group, which was set up under the Interdepartment Radio Advisory Committee (IRAC) last summer and is comprised of representatives from 14 federal agencies, has met six times to date. Its principal tasks are to develop analytical models to predict radiation levels produced by different types of transmitters —paralleling work nearly completed by EPA — and to review each agency's internal assessment of the guidance. According to NTIA's Paul Russo, the committee chairman, no models will be ready before June, when EPA is scheduled to publish the proposed guidance. He does hope to give EPA a synthesis of agency comments before the proposal is released, however. NTIA, which provides all frequency assignments for federal agencies, has yet to define its role in aiding guidance implementation. Several staffers suggested that the engineering models could be used to screen for potential problems during the analyses NTIA performs for all proposed federal broadcast facilities. In general, however, NTIA believes each agency will have to tackle compliance independently, though Russo notes, "we would like to be the focal point for these efforts." The agency receives

6,000 to 7,000 requests each month related to the frequency assignment process.

State RF/MW Rules... Connecticut's Assembly Bill 5675, which would establish ANSI's 1982 RF/MW exposure guidelines as a state standard, is about to reach the full Assembly for a vote as we go to press (see *MWN*, April 1984)....Oregon has taken an unusual position. Instead of trying to stem the proliferation of local exposure standards, Oregon legislators have opted to leave standards setting to local authorities. After considering broader action, in July the legislature passed Senate Bill 623, which requires only that the state investigate non-ionizing radiation health effects. The brief measure was incorporated into Chapter 755 of the state statutes. A year earlier, Oregon's Multnomah County became the first US locality to adopt public exposure rules (see *MWN*, July/August 1982). Though hotly debated before approval, no compliance problems have arisen from that standard, which at its strictest level sets a 200 uW/cm^2 limit for exposures in the 30-300 MHz band.

New Name at FDA... Most people still call it BRH (for the Bureau of Radiological Health) but eighteen months ago, FDA was reorganized and the unit was consolidated with another bureau at the agency to become the National Center for Devices and Radiological Health (see *MWN*, November 1982). Now the "National" has been dropped and it will be called simply the "Center for Devices and Radiological Health." According to an FDA spokesman, the change, which took effect on March 16 and appeared in the March 19 *Federal Register* (49 *FR* 10166), was made because the word "national" had created "misperceptions about the range of the center's activities and authorities."

LITIGATION

Radar Disability Award... Former radar technician Frederick Becker has been awarded work-related disability benefits by the Veterans Administration Board of Appeals in Washington, DC, and is about to file a product liability suit against the manufacturers of the equipment he worked on while in the Navy. In a decision reached last fall (Docket No. 83-22 605, October 3, 1983), the VA board found "a reasonable probability that the veteran developed posterior subcapsular cataracts as the result of his rather extensive exposure to microwave radiation in connection with his training and duties with electronic and radar equipment." Becker, now 45 years old, discovered he had cataracts in 1978, 12 years after leaving active service as a technician for airborne early warning radar systems on an EC-121K aircraft. Becker estimated that during a two-year period he received 4,800 to 5,000 hours of radiation exposure. In addition to approximately $5,000 in retroactive benefits, Becker will receive monthly, cost-of-living adjusted disability payments, now set at $250. An original disability claim was rejected by the Colorado VA Board of Appeals in April 1983. Robert Pafundi, Becker's attorney, told *Microwave News* that he is about to file a product liability suit on his client's behalf in Federal District Court in Denver, CO. The personal injury claim will name a number of equipment manufacturers as defendants. Pafundi's law firm —Sweeney, Pafundi and Scanlon of Westlake Village, CA— is also handling the VA disability claim of Joseph Coatney (see *MWN*, December 1982).

MEASUREMENTS

NBS Reports... Last fall we announced the publication of a NBS technical note, *A Method to Quantify the Radiation Characteristics of an Unknown Interference Source* (see *MWN*, November 1983). Now NBS researchers Mark Ma and Galen Koepke have prepared a companion report that details the uncertainties in interference testing caused by such factors as background noise, equipment limitations and measurement inaccuracies. *Uncertainties in Extracting Radiation Parameters for an Unknown Interference Source Based on Power and Phase Measurements*, (Technical Note 1064) is available for $3.75 (prepaid) from the Government Printing Office (GPO), Washington, DC 20402. Order No. 003-003-02497-0....NBS has also released two other technical notes: *Reference Flat Pulse Generator* (TN 1067) by J.R. Andrews, B.A. Bell and E.E. Baldwin. It describes a step-like waveform generator for characterizing the response of oscilloscopes, transient recorders and automatic test equipment. Available from GPO for $4.50 (prepaid); Order No. 003-003-02527-5. *Design and Error Analysis for the WR10 Thermal Noise Standard* (TN 1071) by William Daywitt, who details the construction of the waveguide horn antenna and isothermal cavity for the first national reference standard in the frequency range 75-110 GHz. Available from GPO for $3.75 (prepaid); Order No. 003-003-02538-1.

MEDICAL APPLICATIONS

NMR Approvals... On March 30, the FDA approved the first two NMR imagers for marketing as being "safe and effective." Technicare Corp. of Cleveland, OH, and Diasonics of Milpitas, CA, won the right to sell their units nine months after the FDA's Radiologic Devices Panel recommended agency approval (see *MWN*, July/August 1983). The panel had also recommended that Picker International's NMR imager be approved, but FDA has yet to act on its application. Picker is based in Highland Heights, OH. FDA's Dr. Robert Phillips would only say that the agency was working on Picker's request. Meanwhile, the Radiologic Devices Panel has scheduled a meeting for May 17 in Rockville, MD, to consider an unspecified number of other NMR premarket approval applications.

Hyperthermia Notes...FDA's Medical Radiation Advisory Committee met on April 30-May 1 and was briefed on hyperthermia. Among those invited to participate were Dr. J. Robert Stewart of the University of Utah Medical Center in Salt Lake City; Tom Drennan of the University of Washington Hospital in Seattle, WA; Dr. Gerald Hanks of the Radiation Oncology Center in Sacramento, CA; Louis Stripling of BSD Corp. in Salt Lake City, UT; and Dr. Bhudatt Paliwal, the chairman of the American Association of Physicists in Medicine's Hyperthermia Committee. For more information, contact Robert Morton at (301) 443-

4600....The Independent Broadcasting Authority in the UK is giving its old 405-line transmitters to British hospitals to be used in hyperthermia treatment. The March 29 *New Scientist* reports that the transmitters, which will be phased out by the end of the year, operate at frequencies up to 200 MHz....Also in the UK, the Institution of Electrical Engineers and the Hospital Physicists' Association sponsored a meeting on *Electromagnetic Techniques for the Detection and Treatment of Malignant Disease* on April 2. Nine papers were presented, including one by Professor J.C. Bolomey of Ecole Superieure d'Electricite in France on "Microwave Tomography and Its Potential Applications to the Control of Hyperthermia Treatment." Contact: IEE, Savoy Place, London WC2R 0BL....RF heat treatment has been found to be highly effective against ringworm, a fungal disease of the skin which affects dogs, cats, horses and humans. A report in the April issue of *Companion Animal News,* a publication of the Morris Animal Foundation in Englewood, CO, notes that the heat treatment "takes 30 seconds per application, requires one treatment and in tests has been 100 percent effective."

MEETINGS

Neurobehavioral Workshop... Drs. Richard Lovely and Mary Ellen O'Connor are organizing *Electromagnetic Waves and Neurobehavioral Function: A Workshop,* to be held August 19-23 in Corsendonk, Belgium, which is an hour from Brussels. Lovely describes the goal of the meeting as bringing together researchers from diverse fields who normally do not interact with each other. Topics to be covered include physiological, anatomical, behavioral and toxicological responses to EM fields, as well as circadian rhythms and homing and navigation in animals. One day of the meeting will be devoted to occupational medicine and human clinical studies. Attendance, which is strictly limited to 32 participants due to space limitations, is by invitation only. For more information, contact Lovely at Battelle Pacific NW Labs, PO Box 999, Richland, WA 99352, (509) 375-2269....Another conference of related interest is being planned by EPA and Johns Hopkins University. *Cross Species Extrapolation in Neurotoxicology* will be held in Raleigh, NC, June 7-8. The meeting is directed to those studying toxic chemical risks. Contact: Dr. Zoltan Annau, Neurobehavioral Toxicology Program, Dept. of Environmental Health Sciences, Johns Hopkins University, 615 N. Wolfe St., Baltimore, MD 21205.

Wroclaw Symposium... The program for the *7th International Wroclaw Symposium on Electromagnetic Compatibility,* which will be held in Poland, June 18-20, has been released. Among the papers scheduled to be presented are: "Natural Electromagnetic Earth Field at ELF" by a group from the Siberian Department of the Academy of Sciences, USSR in Ulan-Ude; "Shielding Efficiency of Reinforced Concrete Against EM Radiation [including EMP]" by J. Bruchin of the Swiss Federal Office of Energy; "Measurement of the 50 Hz Noise Level in Urban and Rural Environments" by a team at Mickiewicz University in Poznan, Poland; "Differences of Biological Effects of Simple and Combined Electromagnetic Fields" by H. Mikolajczyk of the Institute of Occupational Medicine in Lodz, Poland; and "Membrane Effects of Low Intensity Millimeter Range Irradiation" by a group at the Institute of Radioengineering and Electronics of the Academy of Sciences of the USSR, Moscow. A copy of the symposium record is available for $40.00 (US), prepaid, from: EMC Organizing Committee, Box 2141, 51-645 Wroclaw 12, Poland. Checks should be made payable to "Wroclaw Technical University."

NAB Sessions... There was a session on non-ionizing radiation chaired by Jules Cohen on April 30 at the *62nd Annual Convention of the National Association of Broadcasters.* Raytheon's John Osepchuk discussed the "Electromagnetic Energy Policy Alliance— A Source of Facts;" Verle Blaha of Holaday Industries on "Measuring Broadcast Signals;" AT&T Bell Labs' R.C. Peterson on "Public Exposure to RF Radiation — Perceived or Real Risk? A Case in Point;" Robert Hargrove of Nixon, Hargrove, Derans & Doyle served as a legal advisor. At a May 1 session on "Broadcast Interference," Jules Cohen proposed solutions to the channel 6/educational broadcast interference problem; NAB's Edmund Williams described TV antenna preamps, a local FM broadcaster concern; William King of Jules Cohen and Associates discussed land mobile interference to TV channels 14 and 69; Robert Culver of Lohnes & Culver addressed RF lighting and its potential impact on AM broadcasters; and NAB's Ralph Justus reviewed broadcast RFI to aeronautical navigation and communications. Lisa Stevenson of Koteen & Naftalin was the legal advisor for this latter session.

Call for Papers... The *1985 Instrumentation/Measurement Technology Conference* will be held at the Hyatt Regency in Tampa, FL, March 21-22. The theme for the meeting is "Understanding Measurement Methods." Contact: Dr. Norris Nahman, Electromagnetic Fields Division, NBS, Mail Code 723.03, Boulder, CO 80303...*1985 International Symposium on Electromagnetic Compatibility,* to be held at the Hilton in Wakefield, MA, August 20-22. The theme here is "EMC, A Universal Goal." Contact: Dr. Donald Weiner or Dr. Gerald Capraro, Dept. of Electrical and Computer Engineering, 111 Link Hall, Syracuse, NY 13210.

MILITARY SYSTEMS

Project ELF... The Navy has suffered two setbacks in its efforts to resume work on Project ELF, its submarine communication system, while it prepares an environmental impact statement (EIS) (see *MWN,* March 1984). After agreeing to the Navy's request for a reconsideration of her January 30 verdict, US District Court Judge Barbara Crabb reaffirmed her decision on April 5. At the same time, she ruled that the Navy could continue to operate its Clam Lake facility. The Navy then took its case to the US Court of Appeals for the Seventh Circuit in Chicago, IL. On April 24, a three-judge panel refused to lift Judge Crabb's injunction pending the completion of the Navy's formal appeal. Oral arguments by attorneys for the Navy and the State of Wis-

consin before the Court of Appeals are scheduled for the week of May 28....A Navy contract for evaluating the data on health and biological effects of ELF collected by IIT Research Institute (IITRI) (see *MWN*, March 1984), is about to be signed, although the Navy has not yet picked a contractor to write the actual impact statement. Rumors about the Navy setting up a "blue ribbon" panel to review the new EIS were neither confirmed nor denied by a Navy spokesman. The official announcement that the Navy is preparing a supplement to its 1977 EIS appeared in the March 26 *Federal Register* (49 *FR* 11233)....The Naval Electronic Systems Command in Washington, DC, has released a new report, prepared by IITRI, detailing EM exposure levels from both power lines (60 Hz) and the ELF antenna (76 Hz) near the ELF facilities in Clam Lake, Wisconsin, and near the Navy's planned facility in Republic, Michigan. A previous study investigated only the field intensities near Clam Lake (see *MWN*, May 1983). The IITRI study found that the fields generated by the ELF transmitter near Clam Lake are "very low." The report includes a tabulation of 33 cases of judicial and state regulatory agency decisions related to ELF fields and their effects on health and the environment. One noteworthy finding of the surveys in both states was that, "There is no consistency in the relationship between indoor and outdoor [magnetic flux densities] measurements. In some locations the magnetic field was higher indoors, while in others the opposite was found. A copy of the Navy report, *Representative Electromagnetic Field Intensities Near the Clam Lake (WI) and Republic (MI) ELF Facilities*, January 1984, is available for $5.25 (prepaid) from the National Technical Information Service, Springfield, VA 22161....Much has been written about the need for the ELF system to signal orders for a nuclear attack to submerged submarines. In the March *Bulletin of the Atomic Scientists*, William Arkin of the Institute for Policy Studies observes, "One of the least known purposes of the ELF system is communication with submarines on covert missions in the Arctic and under the ice cap."

OCCUPATIONAL HEALTH

NIOSH Draft Standard...NIOSH staffers in Cincinnati, OH, have completed a draft of the agency's recommended occupational standard for RF/MW radiation (see *MWN*, March 1983). At the end of March, NIOSH assembled five experts to review the draft, which is said to be 40 pages long with approximately 100 pages of appended tables listing bioeffects data. There is no official date for the release of an external review draft, but a NIOSH spokesman said that the agency hopes to have it ready by this summer.

POWER LINES

CRS Report...A recently published report by Christopher Dodge of the Congressional Research Service provides an overview of bioeffects research on power line radiation, especially of the recent reports linking it to leukemia and genetic effects; it also outlines federal activity in this field. On balance, the report indicates that a better managed and better funded federal research program is needed. In reviewing what is known about ELF fields, Dodge states that while available information does not explicitly link electromagnetic field exposures to health problems, a growing body of evidence suggests "subtle interactions between very weak electromagnetic fields and biological systems at the level of the cell." The author goes on to point out that there is "no single federal agency responsible for assuring public safety and comfort in the proximity of overhead transmission lines, and no federal standards exist setting quantitative limits for [high voltage transmission line] field exposures." The 34-page report includes a summary of literature reviews for electromagnetic field bioeffects. Copies of *High Power Voltage Lines and Extremely Low Frequency Communications Systems: Health and Safety Concerns*, No. 84-579 SPR, are available from your congressman's Washington or local office.

Resources...A detailed description of the experimental setup used in Dr. Wendell Winter's study on the effects of low level 60 Hz fields on human tumor cells (see *MWN*, April 1984), which found that certain exposures significantly increased cell growth rates, has been prepared by Jeffrey Lucas and Melvin Johnson of the Southwest Research Institute. Copies of the paper, which was presented on April 25 at the *1984 IEEE National Symposium on Electromagnetic Compatibility* in San Antonio, TX, are available from the authors at SwRI, Post Office Drawer 28510, 6220 Culebra Road, San Antonio, TX 78284....Results from the first phase of Dr. Charles Graham's study of the "Influence of 60 Hz Fields on Human Behavior, Physiology and Biochemistry" are outlined in the minutes of the March 26 meeting of the New York State Power Lines Project. Graham found that 90 percent of his subjects could not detect fields below 9 kV/m and that 70 percent could not detect fields of less than 12 kV/m. For copies of the minutes and a status report on all 16 project-funded studies, contact Project Administrator Michael Rampolla at the Center for Laboratories and Research, New York State Department of Health, Albany, NY 12201, (518) 474-7888.

VDTs

Maine Rejects Rules... Maine officials rejected proposed VDT work rules April 25 by a 4-3 vote. The rules would have required periodic rest breaks, adjustable equipment and furniture, glare control, regular eye exams for operators and other measures. Only public employees would have been covered. Last June, state legislators passed the first VDT law in the US, which directed labor department officials to study health and safety issues and to propose rules, if necessary. The Occupational Safety and Health Board in Augusta, which made the decision against mandatory standards, will consider voluntary guidelines at a meeting later this year.

Legislation... Connecticut, the other state that passed a VDT law in 1983, is considering another bill that would establish a task force "to develop a code of conduct" for the use of VDTs. Substitute House Bill 5763 was approved by the Committee on Labor and Public Employees on April 11

and currently is awaiting action by the full House of Representatives....The California Assembly's Labor and Employment Committee approved recently-introduced legislation, Assembly Bill 3175, which is now being considered by the Ways and Means Committee. The proposal would require radiation shielding of terminals, non-VDT work during pregnancy, employer-provided eye exams and regular rest breaks. State officials are preparing a fiscal impact statement, and Ways and Means has scheduled a public hearing on the measure for May 23. An aide at the committee reports that interest in the bill is growing....A special committee of the Oregon Senate is in the midst of six meetings on VDT health and safety. At the three meetings held to date — on February 22, April 2 and May 7 — committee members decided to focus on ergonomics and vision, and eliminated radiation-exposure risks from their deliberations....The Wisconsin Assembly completed its recent legislative session without considering the first VDT bill to be introduced in the state, Assembly Bill 1076. Nevertheless, three state agencies completed fiscal impact reports on the proposal, which would have required radiation testing, adjustable furniture and equipment, periodic eye exams and other measures.

Resources... The Canadian Center for Occupational Health and Safety (CCOHS) has published an annotated VDT bibliography covering scientific literature, public policy reports and newspaper and trade journal stories. The 48-page booklet is divided into six primary areas, including electromagnetic emissions and adverse effects on reproduction, and is printed in both English and French. *Visual Display Terminals: An Occupational Health and Safety Bibliography with Selected Annotations,* is available at no cost from Paul Gallina, CCOHS, 250 Main Street East, Hamilton, Ontario L8N 1H6, Canada.

ETC...

Special Issues...A number of IEEE publications have featured special issues in recent months. Here is a list of the most notable. The March 1984 *Transactions on Magnetics* contains the papers presented at the *2nd Annual Symposium on Electromagnetic Launch Technology* held in Boston, MA, in October 1983. The January 1984 issue of the *IEEE Transactions on Biomedical Engineering* is devoted to hyperthermia and cancer therapy. The proceedings of the *Conference on the Computation of Electromagnetic Fields* held in Genoa, Italy, May 30-June 2, 1983, appear in the November 1983 *IEEE Transactions on Magnetics*. The October 1983 issue of the *Proceedings of the IEEE* is on global navigation systems, including papers on Loran-C, Navstar and Omega. And the second part of the September 1983

CONFERENCES

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.

June 4-8: ***International Conference on DC Power Transmission,*** Hyatt Regency Hotel, Montreal, Canada. Contact: Eileen Dornier, IREQ, 1800 Montee Ste-Julie, Varennes, Quebec, Canada J0L 2P0, (514) 652-8512.

June 5-7: ***International Conference on Lightning and Power Systems,*** London, UK. Contact: Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, UK, (01) 240-1871, ext. 222.

June 18-21: ***1984 Power Electronics Specialists Conference,*** Gaithersburg, MD. Contact: Frank Oettinger, NBS, Room B344, Technology Bldg., Washington, DC 20234, (301) 921-3541.

June 25-28: ***1984 International IEEE/AP-S Symposium and National Radio Science Meeting,*** Westin Hotel, Boston, MA. Contact: Professor Harold Raemer, Dept. of Electrical Engineering, Northeastern University, Huntington Ave., Boston, MA 02115.

June 26-28: ***7th International Symposium and Exhibition on Electromagnetic Compatibility,*** Wroclaw, Poland. Contact: W. Moron, EMC Symposium, Box 2141, 51-645 Wroclaw 12, Poland.

June 26-28: ***1984 International Conference on Lightning and Static Electricity,*** Hyatt Orlando Hotel, Orlando, FL. Contact: J.J. Fisher, US Naval Air Systems Command, PO Box 15036, Arlington, VA 22215, (202) 692-7788.

July 2-6: ***1984 Nuclear EMP Meeting,*** Baltimore Hilton Hotel, Baltimore, MD. Contact: Dr. Arthur Sindoris, Harry Diamond Labs, 2800 Powder Mill Rd., Adelphi, MD 20783.

July 2-6: ***4th International Symposium on Hyperthermic Oncology,*** Aarhus, Denmark. Contact: Dr. Jens Overgaard, Institute of Cancer Research, Radiumstationen, DK-8000 Aarhus C, Denmark.

July 9-12: ***9th Annual Conference of the Australian Radiation Protection Society,*** Darwin, Australia. Contact: Ian Prince, C/GPO Box 1701, Darwin, NT 5794, Australia.

July 15-19: ***6th Annual Bioelectromagnetics Society Meeting,*** Omni International Hotel, Atlanta, GA. Contact: BEMS, 1 Bank St., Gaithersburg, MD 20878, (301) 948-5530.

July 15-20: ***IEEE Power Engineering Society: 1984 Summer Meeting,*** Washington Plaza, Seattle, WA. Contact: Jack Richardson, Puget Sound Power & Light Co., 10608 NE Fourth St., Bellevue, WA. 98008, (206) 453-6800.

July 22-25: ***21st Annual Conference on Nuclear and Space Radiation Effects,*** Broadmoor Hotel, Colorado Springs, CO; followed by ***July 26-27:*** ***1984 Hardened Electronics and Radiation Technology (HEART) Conference,*** Fort Carson Army Base, Colorado Springs, CO. Contact for both meetings: B.D. Shafer, Division 2114, Sandia National Labs, Albuquerque, NM 87185, (505) 846-0629.

July 29-August 4: ***8th International Biophysics Congress,*** Bristol, England. Contact: Meon Conferences Services, Petersfield, Hampshire GU32 3JN, England, (0730) 66561.

July 30-August 3: ***Gordon Conference on Bioelectrochemistry,*** Tilton School, Tilton, NH. Contact: Dr. Alexander Cruickshank, Gordon Research Center, University of Rhode Island, Kingston, RI 02881, (401) 783-4011.

August 13-14: ***Industrial Applications of Computed Tomography and NMR Imaging,*** Hecla Island, Manitoba, Canada. Contact: Optical Society of America, 1816 Jefferson Place, NW, Washington, DC 20036, (202) 223-8130.

August 19-23: ***Electromagnetic Waves and Neurobehavioral Function: A Workshop,*** Corsendonk, Belgium. Contact: Dr. Richard Lovely, Battelle Pacific NW Labs, PO Box 999, Richland, WA 99352, (509) 375-2269.

UPDATES

IEEE Transactions on Microwave Theory and Techniques is a cumulative index of MTT symposia held between 1952-1983.

On the Eighth Day... The April 19 *Wall Street Journal* recounts how James Jaeger, the president of Cincinnati Microwave Inc., which markets the Escort radar detector, speeded up the company's annual meeting. He offered the following history of the firm: "The earth cooled. The dinosaurs ruled the earth, died and became oil. The US created the 55-mile-an-hour speed limit, and the Escort came into being. Are there any questions?"

CORRECTION

Oven Sales... Microwave oven shipments in 1983 ran 50.2 percent over 1982 levels. A story in our April issue misreported the increase, although the chart accompanying the story provided the correct number.

NIOSH VDT Research

(continued from p.1)

NIOSH Study

Several factors led NIOSH to move forward with its plans for an epidemiological study, which has been under consideration since late 1982 (see *MWN*, November 1982). Anxiety over VDT health hazards has spread as reports of new clusters have surfaced and media coverage has increased. In addition to the eight clusters reported from 1980 through 1983, 9 to 5, The National Association of Working Women, said in February that its 1983 survey of more than 800 VDT users nationwide turned up 15 clusters, including the three reported this year (see *MWN*, March 1984).

Dr. Philip J. Landrigan, director of NIOSH's Division of Surveillance, Hazard Evaluation and Field Studies, said that the agency is still looking for a study population, although negotiations are underway with several federal agencies and private companies where VDTs are used in large numbers. The negotiations will take "at least several months" and could take much longer, he said.

Gordon, who has led the study through its planning stages, said in a telephone interview that negotiations were "moving slower than expected." Gordon also explained that the study questionnaire has not yet been approved by the Office of Management and Budget (OMB), although OMB has okayed a similar questionnaire. She cautioned that it could take several additional months to get final approval if OMB requires changes in the form.

Landrigan does not believe that Gordon's departure will cause delays. Another epidemiologist from her branch will take over the study, he said. Funding for the study, which he estimated at $100,000 over three years, will be allocated from within the division's budget and will not require specific congressional approval.

The planned study will involve at least 3,000 and perhaps as many as 5,000 VDT operators, according to Landrigan. Researchers will collect and compile the data; the analysis will then take six to eight months.

NIOSH's first attempt at an epidemiological study fell through last summer. For several months in late 1982 and early 1983, Dr. Michael Rosenberg, then head of the reproductive health section at the agency, maintained that VDT-related questions from NIOSH would be added to a study on pesticides and pregnancy being done by a private group in California. Later it was revealed that no commitment had been made by the group to include VDTs, and Rosenberg was forced to retract his statements (see *MWN*, June and July/August 1983). After this setback, NIOSH officials started planning an in-house study.

Other Investigations Continue

NIOSH is making progress on its ongoing investigations of two clusters. A final report is expected soon on the cluster at Southern Bell in Atlanta that NIOSH learned about last year (see *MWN*, April 1984). In a preliminary report on his findings, NIOSH medical officer John Morawetz wrote to the company last November 7: "At this point, there appears to be a statistically significant cluster of miscarriages among women working on the 5th floor (six miscarriages out of 15 pregnancies, as compared to 19 out of 135 pregnancies...before working at [the Southern Bell office])....Preliminary analysis of the data seems to indicate that this cluster, although statistically significant, was most likely a random occurrence."

Dr. Lichty, who is looking into the cluster at the United Airlines Reservations Center in San Francisco as well as the one in Alma, sent a letter to United on April 5, 1984 recapping his site inspection of March 19. "We have no recommendations for you based on our first visit," he wrote.

Dr. Jim Melius, director of HETAB, told *Microwave News* that NIOSH has not learned of clusters other than those currently under investigation. Three other clusters have been reported in the US; another five occurred in Canada, where concern about VDT-related pregnancy risks first surfaced.

Plans for an epidemiological study in Canada have progressed slowly. In a recent report on its VDT research, Ontario Hydro recommended a four-year, $500,000 epidemiological study but said that it could not pay more than 20 percent of that cost (see *MWN*, January/February 1984). Bob Facey, a spokesman for the electric utility, said negotiations have generated little outside interest in the study to date.

A spokesman for the American College of Obstetricians and Gynecologists plans to tell the House Committee on Education and Labor's subcommittee on health and safety that radiation emissions from VDTs could not have caused the eleven reported clusters. In testimony to be delivered on May 8, he will not dismiss the possibility that other aspects of VDT work, including stress and equipment design, might have caused the problem pregnancies.

The subcommitee has held a series of hearings on VDT health and safety and will continue the process into the summer. NIOSH Director Millar is one of several witnesses scheduled to testify in May and June.●

MICRO WAVE NEWS

Vol.V No.4 | A Monthly Report on Non-Ionizing Radiation | May 1985

INSIDE...

HIGHLIGHTS pp.2-8

Communications Radiation: A Focus of Concern

ELF and Leukemia: Two New Studies and an Evaluation

FM EMI to Aircraft

WHO-IRPA Criteria Document on Magnetic Fields

AIBS ELF Report

EXCERPTS pp.6-8

AIBS Report on ELF Radiation

FROM THE FIELD p.11

A Report from Dr. Hans-Arne Hansson's Laboratory at the University of Goteborg: Research on the Bioeffects of Radar Radiation

UPDATES pp.8-9

Virginia Power Line Report ▫ EMI from HVDC Converter Stations ▫ New Air Force RF/MW Safety Standard ▫ Washington Notes ▫ Zurich EMC Proceedings ▫ EMC-EMI Review from NBS ▫ ELF and OTH-B in U.K. ▫ BRAGS Transactions ▫ and more...

Conferences p.5

Classifieds p.12

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.

FAA Radar Technician Claims Microwaves Caused Brain Tumor

A former radar technician has filed a $1.5 million claim against the Federal Aviation Administration (FAA), alleging that he developed a brain tumor following prolonged exposure to microwave radiation. Two other technicians, based at the same FAA installation in Albuquerque, NM, have also developed tumors, as well as endocrine problems.

Andrew Loesch, 54, maintained TACAN equipment for 16 years at various FAA sites in Oklahoma, Texas, Alaska and, for the last seven years, New Mexico. In 1981, after years of assorted health problems, Loesch was diagnosed as having a brain tumor, which doctors have been unable to control with surgery, radiation treatments and chemotherapy.

In an administrative claim filed with the FAA on April 4, Loesch asserts that "the long-term exposure of microwave radiation resulting from his employment with the FAA caused this brain tumor."

In a telephone interview, Loesch's attorney, Michael Allison of De-Layo and Olson in Albuquerque, said that a lawsuit is being planned against the manufacturers of the radiation-emitting equipment.

Coworkers Have Similar Ailments

Two of Loesch's coworkers, Eugene Shrouf and Ervin Kreischer, have similar medical complaints.

Shrouf, 63, had a benign brain tumor (pituitary adenoma) removed in 1983. He now suffers from hypothyroidism, low testosterone and adrenal damage. In a telephone interview, Shrouf said that his adrenal cortex is badly impaired, forcing him to take medication daily. He worked with TACAN and VOR equipment for 14 years.

Kreischer, 65, had a malignant prostate tumor removed by radical surgery in 1978. Two years later, a second tumor was found, which was successfully treated with radiation therapy. Also in 1980, Kreischer suf-

(continued on p.10)

Swedish Studies Show Changes in Brain Chemistry of Radar Workers

Electromagnetic fields can induce biochemical changes in the brains of radar workers, according to reports from Dr. Hans-Arne Hansson's laboratory at the University of Goteborg in Sweden. Using newly devised analytical techniques, Hansson has shown that radar technicians develop abnormal protein patterns in their cerebrospinal fluids (CSF). Rabbits exposed to pulsed microwaves show similar signs of nervous system damage.

Hansson studied male radar workers, exposed to 1-10 GHz radiation, and found that they suffered an increased frequency of "frontal lobe neuropsychiatric symptoms" and retinal changes. An analysis of their CSF revealed the presence of an "abnormal protein band" — one which they report has not been found in patients with other neurological disorders.

(continued on p.11)

Communications Radiation: A Focus of Concern

Interest is growing in the health effects of radiofrequency and microwave (RF/MW) radiation from communications facilities. Detailed below are several recent developments.

Vernon, NJ

The long-simmering dispute in Vernon, NJ, is coming to a boil as a consensus is emerging that a health problem exists in the community. Sources indicate that there is a large excess of children with Down's Syndrome in Vernon. Residents contend that the cluster of adverse pregnancy outcomes is related to radiation from three satellite communications stations and scores of point-to-point relay towers; state and corporate officials flatly dismiss this allegation.

Last summer the New Jersey Department of Health released a study discounting citizen claims that there was an abnormal rate of birth defects among babies born in Vernon (see *MWN*, September 1984). Dissatisfied with the study, Citizens Against the Tower (CAT), a local group which is fighting any expansion of communications systems in the area, began its own research. They turned up three times the number of Down's Syndrome cases identified by the state health department, mostly among women under 30 years of age.

CAT took its case to the state's Department of the Public Advocate, which acts as an ombudsman for citizen complaints. Researchers there ran an independent investigation that confirmed CAT's list of Down's cases, and also verified another CAT claim that there were three cases of mole pregnancies (ova which develop abnormally) in the Vernon area.

In a series of interviews, informed sources said that there were at least seven cases of Down's Syndrome among 1,653 pregnancies that reached at least 20 weeks gestation in Vernon between 1975 and 1981. (CAT's count stands at nine.) According to last year's state report, only two cases were expected on the basis of a statistical analysis.

In April, the public advocate's office asked the Department of Health to scrap its study and start a new one to include both reproductive histories and the incidence of cancer in Vernon as well as their possible correlation with non-ionizing radiation. Margaret Conomos of the health department acknowledged that she had the new data and told *Microwave News* that a new analysis is underway. She said that it is still "premature" to undertake the full-scale study requested by the public advocate.

Even if there is a large excess of birth problems in Vernon, most experts believe that the radiation levels from the communications sources are far too low to cause any health effects. According to radiation surveys by Hamilton Communications Consultants of Orange, NJ, the maximum power density near an RCA earth station is 5 uW/cm^2 and just a fraction of a microwatt near an American Satellite Company's (ASC) installation. The surveys were commissioned by the companies. (Western Union also has a satcom station in Vernon.)

Similarly, Paul Giardina, chief of the radiation branch in the Environmental Protection Agency's (EPA) regional office in New York City, has told the New Jersey Department of Health that calculations indicate that the RF/MW levels in the community are so low as to be almost immeasurable.

Nevertheless, after checking and eliminating all other environmental factors, CAT's Elise Kreindler maintains that RF/MW radiation could well be responsible for the community's ills. She argues that the cases of Down's are clustered on the ridges in Vernon — in direct line with the satcom antennas. In addition, she contends that most of the Down's children were conceived during a period of bad weather. "In times of rain and fog, the satellite stations turn up their power," Kreindler told *Microwave News*, and "it's likely that the radiation levels were higher than generally believed."

ASC is seeking to expand its facilities in Vernon and is directly affected by the Vernon controversy. Midway through an April 13 zoning board meeting, ASC unexpectedly withdrew its request for a permanent variance and is now only asking for temporary permission to operate a new 7-meter antenna. Another board meeting is scheduled for May 11.

On April 16, the Federal Communications Commission (FCC) denied a request by CAT to force ASC to prepare an environmental impact statement (EIS) for its proposed expansion. In its decision, the FCC stated that the radiation emissions were far too low to force FCC action: "Given the fact that the worst case values of radiation in areas of public access are less than 1/800th of the permissible ANSI limit at the fence line, and less than 1/70,000th of the permissible limit at the public road bordering ASC's property, we find CAT's unsupported allegation unpersuasive."

Cougar Mountain, WA

As in Vernon, residents of Cougar Mountain, WA (20 miles east of Seattle), are trying to block the expansion of new communications sources. Members of the Cougar Mountain Residents Association (CMRA), many of whom have property next to an antenna farm, are concerned about the potential long-term health effects of RF/MW radiation, and are fighting a proposed addition of a five megawatt UHF-TV station by KONG TV, Inc. The antenna farm already has ten FM stations as well as land-mobile base stations and point-to-point relays.

Dr. David Reynolds, a retired professor of electrical engineering at the University of Washington in Seattle, measured RF/MW levels as high as 822 uW/cm^2 inside a residence near the antenna farm in June 1984. That reading, taken in the family bedroom, was near a metal lamp; in other parts of the house, levels ranged between 146 and 450 uW/cm^2. A reading of 2,263 uW/cm^2 was taken at the base of one of the FM towers, inside the antenna farm's fence.

Armed with these results, CMRA is trying to convince the local authorities to force anyone seeking to site a new antenna on Cougar Mountain to draft an EIS.

A number of applications for new broadcast sources are pending as local officials wrestle with the radiation problem. Initial decisions by the county to require EIS's have been reversed, and a hearing examiner recently gave KONG TV a permit to build its new 300-foot tower. CMRA is now seeking relief in court: on April 29, CMRA asked the King County Superior Court to reverse the decision.

FCC-EPA Agreement

Controversies between broadcasters and local residents such as those in Cougar Mountain and Honolulu, HI, (see *MWN*, January/February 1985) have prompted the EPA and the FCC to work together more closely.

In the last month, senior FCC and EPA staffers have approved an inter-agency agreement, which formalizes their cooperative arrangement. Under the agreement, the EPA and the FCC will conduct measurement surveys at specific sites and the EPA will help "develop FCC expertise in prediction methodology and measurement procedures."

This agreement, which took effect on April 1, will last for six months and is likely to be renewed.

The first site visit under the new agreement will be to Cougar Mountain. EPA's Richard Tell and FCC's Dr. Robert Cleveland are planning to take measurements there in May.

Hot Spots List

The *Washington Post* created quite a stir when it published a list of 231 sites in U.S. cities where FM stations cause RF/MW radiation levels to exceed the American National Standards Institute's (ANSI) guidelines in publicly accessible areas (see *MWN*, January/February 1985). Though based on 1980 data compiled by the EPA, some of the information was confirmed by a recent EPA questionnaire.

Staffers at the EPA and the FCC fumed on seeing the list in the April 17 *Post's* "Health" section. The release hurt the move for inter-agency cooperation as FCC staffers blamed the EPA for promoting the RF/MW safety debate from local siting issues into national news, according to agency officials who asked to remain anonymous.

An EPA press officer said that he had been flooded with calls from all over the country. And EPA's Office of Radiation Programs tried to seal itself off from the controversy by limiting public statements.

NAB Meeting & Petition

At the time the hot spot list hit the newsstands, nearly everyone with a direct interest in the matter was attending the annual meeting of the National Association of Broadcasters (NAB) in Las Vegas, NV.

On April 16, at a session on non-ionizing radiation, Edward Minkel, managing director of the FCC, told an audience of nearly 100 that the FCC is taking the RF/MW radiation issue "very seriously." He concluded, "I feel confident that the broadcast industry will continue to be very responsive in this area and will take action to prevent any possible negative impact on the public's health."

According to a report in the April 22 *Broadcasting*, EPA's Tell told the NAB that the average cost of reducing radiation exposure at each of the 231 sites where the ANSI limits are exceeded will be upwards of $3,000 a year for each of the next six years.

On April 19, the NAB asked the FCC to reconsider parts of its decision to require new or modified facilities to prepare EIS's if their radiation levels will exceed the ANSI limits (see *MWN*, April 1985). A similar petition was also filed with the FCC by the TV Broadcasters All Industry Committee, a New York City-based broadcasting group.

Among the points raised by the NAB are that the "Technical Bulletin" planned by the FCC should be circulated for public comment while still in draft form, that the effective date of the rules be delayed from October 1, 1985 to June 1, 1986 or 90 days after the release of the final technical bulletin and that the commission should reconsider its decision not to preempt state and local RF/MW standards.

Resources

Of related interest are two recent papers:

- M.L. Daley, et al., "Community Fear of Non-Ionizing Radiation: A Field Investigation," *IEEE Transactions on Biomedical Engineering, 32*, 246, March 1985. A team from the Pacific Northwest reports on a field study in the Portland, OR, area where four children in the same class developed cancer. The odds against this cluster were 66,000 to one and, in the absence of any known cause, some citizens blamed a relatively new microwave communications system (operating at 12.43 GHz). Measurements were made and values were found to be "several orders of magnitude below any safety standard in the world." The team advises: "In our experience, theoretical calculations of existing environmental levels of radiation are not accepted by the general public. Community concerns are best alleviated by empirically documenting the levels of radiation within the area of concern."

- S. Tofani, et al., "Analysis of Environmental Pollution by Radiofrequency Radiation from Teleradiocommunication Devices," *Health Physics, 48*, 475, April 1985. Researchers from the National Health Service in Ivrea, Italy, have devised a program for use on a personal computer that can forecast field levels produced by communication repeaters. A copy of the program is included in the paper.

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ELF and Leukemia: Two New Studies and an Evaluation

Two letters published in the April 6 *Lancet* detail further findings on the possible link between working in electrical occupations and developing leukemia.

Milham: Radio Operators

Dr. Samuel Milham, who first identified a link between occupational exposure to electric and magnetic fields and leukemia (see *MWN*, July/August 1982), has now uncovered "further support for the hypothesis that electromagnetic fields are carcinogenic."

Milham found a higher-than-expected incidence of myeloid leukemia after analyzing (using proportionate mortality ratios) the death certificates of 1,691 members of the American Radio Relay League (ARRL) from California and Washington state who died between 1971 and 1983. He did not see a parallel increase for other types of leukemia.

In a telephone interview from his office at the Department of Social and Health Services in Olympia, WA, Milham said that the observed association with one specific cell type led him to believe that electromagnetic fields are having some kind of effect. "The excess number of myeloid leukemias is much more significant than if I had seen a general excess of leukemia," he explained.

Milham is now testing his hypothesis that there is a relationship between exposure to low frequency radiation and the development of cancer, using a data base on amateur radio licensees compiled by the Federal Communications Commission. Those results should be completed by the end of the summer, he said.

Electrical Workers in New Zealand

Researchers in New Zealand have confirmed previous reports of an increased risk of leukemia among male electrical workers (see *MWN*, March, June and December 1983 and October 1984).

N.E. Pearce and coworkers at the National Health Statistics Centre in Wellington found an unexpectedly high rate of leukemia among electronic equipment assemblers and radio and television repairmen. The total number of cases (546) was too small for a study of specific cell types. Of the 18 cases in electrical occupations, only four were acute myeloid leukemia — fewer than expected.

The New Zealand team suggests that radiation may not have been responsible for the excess number of cancer cases because the two groups of workers were also exposed to metal and chemical fumes.

EPRI Evaluation of Wertheimer Study

The Electric Power Research Institute (EPRI) has released evaluations of the 1979 paper by Dr. Nancy Wertheimer and Ed Leeper that first linked exposure to extremely low frequency magnetic fields with childhood cancer and the follow-up paper by Dr. John Fulton and coworkers that did not support that finding.

An Evaluation of Published Studies Analyzing the Association of Carcinogenesis with Exposure to Magnetic Fields by H.D. Roth of H. Daniel Roth Associates is highly critical of Wertheimer and Leeper's methodology. Among the key problems spelled out in the report are the inadequate validation of their assumptions and methodology regarding exposure to ELF magnetic fields and the use of inappropriate statistical methods for data analysis. Roth found some of the same problems in the Fulton study.

In a telephone interview, Roth refused to answer questions about his study, saying only that "the report speaks for itself."

The EPRI report is the second analysis of the Wertheimer-Leeper study. The first, by Dr. Annemarie Crocetti, was commissioned by the New York State Power Line Project (see *MWN*, June 1983).

A copy of the EPRI report, No. EA-3904 (March 1985), is available for $10.00 from Research Reports Center, PO Box 50490, Palo Alto, CA 94303, (415) 965-4081.

FCC Seeks To Limit FM EMI to Aircraft Equipment

The Federal Communications Commission (FCC) has proposed new rules to enhance the compatibility of FM radio broadcasts with very high frequency (VHF) aircraft navigation and communication systems. The rules would only apply to new FM stations; existing stations would be exempt unless they alter their facilities in ways that could increase the likelihood of electromagnetic interference (EMI). A spokesman for the Federal Aviation Administration (FAA) said he was disappointed with the FCC proposal.

The FCC states that the rules are needed because the potential for interference is increasing. Although there have been no accidents attributed to EMI, there have been cases of radio noise in the cockpit radio speaker.

The FCC does not believe that broadcast radiation from AM radio and television stations is a source of EMI and has exempted them from the proposal. According to Kathryn Hosford of the FCC's Mass Media Bureau's Engineering Policy Branch, only general aviation, not commercial aircraft, are at risk from FM EMI.

Gerald Markey, acting manager of the FAA's Spectrum Engineering Division, challenged both of these propositions. In a telephone interview with *Microwave News*, he said that, while AM radio is probably not a problem, TV may cause EMI. Markey also argued that all aircraft, including commercial airliners, are at risk from FM interference. "I have the data to prove it," he said.

The FCC places much of the responsibility for the problem on aircraft equipment: "The major cause of the incompatibility between the radio services is the inability of aviation receivers to reject the strong broadcast signal." Hosford said that this is a receiver problem and that "improvements in the avionics would eliminate EMI."

Here again, Markey disagrees. He explained that it is

hard for an aircraft receiver to read a 10 watt signal from an ILS localizer when there is a 100 kW FM station broadcasting in the area. "They were just not built for that," he said.

"There must be a reasonable solution to the overall problem," he added. "We are trying to cooperate, but many of the safety margins have been given to the broadcasters." The FAA has no plans to issue its own rules, Markey said, but the agency will file comments on the FCC's proposals.

According to Hosford, the net effect of the proposal is that FM stations would not be able to locate inside instrument landing system (ILS) or VHF omni-range (VOR) service areas. On "average," she said, stations would have to be more than 29 miles from the end of an airport runway.

The FM broadcast band at 88-108 MHz is adjacent to the aviation VHF band at 108-137 MHz — ILS localizers and VORs operate at 108-112 MHz and 108-118 MHz, respectively. Aircraft communications use the whole 108-137 MHz band.

At press time, the FCC proposal had not yet been printed in the *Federal Register*. Comments are due by October 11 and reply comments by December 11, 1985. For more information, contact Hosford at (202) 632-5414.

WHO-IRPA Criteria Document on Magnetic Fields

The World Health Organization (WHO) and the International Radiation Protection Association (IRPA) have started work on a new criteria document on "Static and Time-Varying Magnetic Fields."

According to Dr. Przemyslaw Czerski of the Food and Drug Administration, a draft of the document should be ready for review following a working group meeting in May. The current schedule calls for the criteria document to be released in 1987.

In addition to Czerski, the members of the working group include Professor J. Bernhardt, Dr. B. Bosnjakovic, Dr. Michael Repacholi and David Sliney; Dr. V. Ya Akimenko of the Kiev Scientific Institute of General and Communal Hygiene in the U.S.S.R. and Dr. Tom Tenforde of the Lawrence Berkeley Lab in California will consult with the working group as "invited experts."

Immediately before the WHO-IRPA working group meeting, Bernhardt is hosting a *Symposium on the Status of Research on the Biological Effects of Static and Extremely Low Frequency (ELF) Magnetic Fields* at the Federal Health Office's Institute for Radiation Hygiene in Neuherberg, Germany, on May 13-15.

The symposium, which is by invitation only, will bring together some 40 researchers from around the world for discussions of the applications of magnetic fields, bioeffects research, biophysical mechanisms, exposed populations, epidemiological studies and unresolved questions.

Also, before the symposium, beginning on May 6, IRPA's International Non-Ionizing Radiation Committee (INIRC) will meet in Nueherberg to plan its work for the coming year. On the agenda are: electric field exposure guidelines, with special emphasis on power line frequencies, safety aspects of nuclear magnetic resonance (NMR) imaging and the WHO-IRPA magnetic fields document.

At the end of 1984, WHO and IRPA released *Environmental Health Criteria 35: Extremely Low Frequency (ELF) Fields* (see *MWN*, December 1984).

CONFERENCES

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

June 3-7: **1985 IEEE MTT-S International Microwave Symposium,** Cervantes Convention Center, St. Louis, MO. Contact: John Bogdanor, McDonnell Aircraft, Bldg. 66, Box 516, St. Louis, MO 63166, (314) 232-3936.

June 6-7: **Automatic RF Techniques Group,** St. Louis, MO. Contact: Robert Nelson, Div. 724, NBS, 325 Broadway, Boulder, CO 80303, (303) 497-5736. Held in conjunction with IEEE MTT-S Symposium.

June 10-13: **10th 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, BC, Canada. Contact: Mr. K. Charbonneau, Conference Services, National Research Council, Ottawa, Ontario K1A 0R6, Canada, (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 10-13: **International Symposium on the Hazards of Light: Myths and Realities,** Manchester, UK. Contact: Dr. R.P.F. Gregory, Dept. of Biochemistry, The Medical School, University of Manchester M13 9PT, UK.

July 14-19: **1985 Summer Meeting of the IEEE Power Engineering Society,** Vancouver, BC, Canada. Contact: PES Special Activities, IEEE, 345 East 47th St., New York, NY 10017, (212) 705-7895.

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.

AIBS Report on ELF Radiation

In its report released in March, the American Institute of Biological Sciences' (AIBS) Committee on the *Biological and Human Health Effects of Extremely Low Frequency (ELF) Electromagnetic Fields* unanimously agreed that:

- ELF electric and magnetic fields can, at least in some frequency and intensity combinations and under certain circumstances, cause a variety of effects at any of several levels of biological organization of plants and animals or in vitro preparations.
- Additional research on coupling of living systems to ELF electric and magnetic fields, on mechanisms of interactions, and on responses of biological material to such fields will be necessary to gain a more nearly complete understanding of the biological significance, if any, of interactions of these fields with living systems.

With respect to the Navy's ELF communications system, the AIBS panel unanimously concluded that:

- It is unlikely that exposure of living systems to ELF electric and magnetic fields in the range of those associated with the Navy's ELF Communications System can lead to adverse public health effects or to adverse effects on plants and animals.
- Because of certain ambiguities in the scientific literature, the Navy should continue to monitor the literature and respond appropriately to any significant new information.

According to Captain Ronald Koontz, program manager of the Navy's ELF Communications System, the Navy will decide on whether to prepare a supplemental environmental impact statement on the ELF system on the basis of the comments it receives on the AIBS report (see *MWN*, March, July/August and September 1984).

The Navy has requested comments on the report by July 1. Copies are available from the National Technical Information Service (NTIS), Springfield, VA 22161, (703) 487-4650. NTIS Order No. ADA152731. (Note: some people are having problems obtaining the report from NTIS. Koontz told *Microwave News* that he has remedied the situation and that he welcomes all comments, even those that do not meet the July 1 deadline.)

Excerpts from the summary and conclusions of the 289-page AIBS report are reprinted below.

Excerpts of AIBS ELF Report

"Coupling of Living Organisms to ELF Electric and Magnetic Fields" by William T. Kaune, Battelle Northwest (Chapter 2).

Unfortunately, the ability to estimate internal electric fields resulting from the exposure to external electric and magnetic fields is still rather limited. Exposure to external fields in the air has received the most attention, and a considerable number of techniques and data are available for homogeneous models. However, virtually nothing quantitative is known about the effects on induced-current distributions of the nonhomogeneous electrical structures of living organisms. For example, it might be predicted that induced current would concentrate in the cardiovascular system because blood is a considerably better conductor at ELF frequencies than most other tissues. However, for this to happen, current would have to pass through the walls of the blood vessels and, as far as is known, no data are available on the electrical properties of these tissues. It can reasonably be expected that knowledge of ELF electric and magnetic field dosimetry will be greatly expanded in the next few years.

"Possible Biophysical Mechanisms of Electromagnetic Interactions with Biological Systems" by Mays L. Swicord, Food and Drug Administration (Chapter 3).

...Unfortunately, no proposed theories to date clearly explain how electric or magnetic fields can cause the experimentally observed effects in biological systems....

The concept of cyclotron resonance proved to be useful for Liboff in predicting ELF experimental results....Additionally, one can now conceive of how the system may be overdriven creating a power window. Too large a field could disturb the resonant condition for order....

The concept of externally imposed order (the external fields encouraging the system to order randomly distributed energy) may have application to interactions with large molecular structures, such as membranes, or macromolecules, such as DNA. This concept is not too far removed from Frohlich's suggestions concerning Bose-Einstein condensation....

The theoretical prediction of field interactions with the DNA molecule by Van Zandt, Kohli and Prohofsky (1982) is perhaps the only theoretical model that has been confirmed by experimental measurements. The experimental work was performed at frequencies above 400 MHz, and thus, its applicability to ELF effects is in question. A resonant length at ELF frequencies would be comparable to the entire length of the DNA molecule in a chromosome, which would be on the order of 1 cm. Conceptually, it is possible to excite such a molecule, but it seeems rather speculative....

Two concepts — electrochemical processes and solitons — definitely have applicability for ELF effects, but are too general at this point and have no experimental confirming evidence....

At most, the mechanisms suggest that field interactions resulting in a biological response are physically conceivable....The connection between mechanisms and observed biological effects has not been made. Thus, no useful predictive theory currently exists in the assessment of hazards of electric or magnetic fields.

"Biological Effects of ELF Magnetic Fields" by T.S. Tenforde, University of California, Berkeley (Chapter 4).

Although a wide variety of biological effects resulting from exposure to ELF magnetic fields have been reported in studies on cellular, tissue and animal systems, the only phenomenon consistently replicated is the induction of magnetophosphenes. The minimum field intensity required to induce magnetophosphenes using a sinusoidal time-varying field is 10 mT, and this level is significantly greater than the ELF magnetic field intensities to which humans are routinely exposed....

A large number of investigations have been carried out during the past two decades to assess the biological effects of ELF magnetic fields...These studies have led to both positive and negative findings of ELF magnetic field effects, and there is little consist-

ency among reports from different laboratories. An example of the difficulty in interpreting these studies is provided by the many reports on animal behavior in ELF magnetic fields. A majority of the investigations carried out with low field intensities have indicated the occurrence of behavioral alterations, whereas nearly all of the studies conducted with higher field intensities have provided no evidence for field-associated effects on animal behavior....

In the context of analyzing the potential biological effects of the extremely low intensity magnetic fields produced by the ELF Communications System, two general conclusions can be made....

• Although numerous behavioral, physiological and biochemical effects of ELF magnetic fields have been reported on the basis of laboratory studies, very few of these experiments were carried out using low field intensities comparable to those associated with the ELF Communications System. The reports which indicate that measurable perturbations of biological processes occur as a consequence of exposure to extremely low intensity fields must currently be viewed with caution until the results have been established by independent replication in other laboratories.

• Recent epidemiological studies suggest that a correlation may exist between cancer incidence and exposure to the power frequency magnetic fields present in residential and industrial environments....The methodological and dosimetric deficiencies of the published epidemiological studies are numerous, and the available evidence that a correlation exists between cancer incidence and ELF magnetic field exposure cannot be regarded as conclusive. A critical need exists for carefully designed epidemiological and laboratory studies to clarify this issue.

"Cellular Studies of Effects of ELF Electric and Magnetic Fields" by Asher R. Sheppard, VA Medical Center and Loma Linda University (Chapter 5).

The following conclusions can be drawn from in vitro studies of cellular systems:

• A review of the experimental data shows that electric and magnetic fields of various strengths, frequencies, and waveforms can alter biochemical and physiological functions in cellular systems. It is difficult to be precise in the extrapolation from in vitro exposure conditions to in vivo. However, it is clear that in many cases the in vitro exposure conditions could not occur for any environmental exposure, and in other cases the tissue-level field strengths are at the level of some exceptional environmental exposures that could not be achieved by the ELF Communications System. Generally, the system's electric and magnetic fields are so weak that very few studies examined fields at that level.

• The quality of the research conducted with ELF fields varies considerably. A few findings have been replicated or studied intensively enough to be accepted as without obvious artifact or experimental error. Much of the research is at a preliminary level and requires further intensive study before results can be accepted without serious question.

• With the exception of studies on magnetophosphenes and bone growth, the functional or biochemical changes seen in vitro have not been closely linked to in vivo conditions, nor has the expression of the laboratory observations in a whole organism been established.

• At the very low field strengths typical of the ELF Communications System antenna environment, only the calcium efflux studies appear to involve similar strength electric fields. Only the studies of slime mold mitotic cycle, fibroblast growth, and chick embryogenesis involve magnetic fields like those of the system, and these occur only close to the antenna wire.

• None of the in vitro studies or other studies of cellular systems indicates that significant functional changes might occur in organisms subjected to the electric and magnetic fields in air near the ELF Communications System's antenna.

• On the basis of an analysis of the literature on biological effects of ELF electric and magnetic fields on cellular systems, and despite the considerable uncertainties on issues of biological interests and importance, there is essentially no probability of deleterious biological effects on organisms exposed to the ELF Communications System's fields in air.

"Interaction of ELF Electric and Magnetic Fields with Neural and Neuroendocrine Systems" by Larry E. Anderson, Battelle Northwest (Chapter 6).

Numerous studies have been initiated to determine to what extent an electrical environment containing electric or magnetic fields of 1 to 300 Hz poses a health hazard to living organisms (particularly to humans). The biological effects reported in many of the experiments have not yet confirmed any pathological effects, even after prolonged exposures to high strength (100 kV/m) fields or high intensity magnetic (10 mT) fields. Areas in which effects have been demonstrated appear to be primarily associated with the nervous system, including altered neuronal excitability, altered circadian levels of pineal hormones and indications of transient arousal responses. In addition, in several instances where unconfirmed or controversial data exist, observed effects may or may not be real (e.g., changes in serum catecholamines or corticosteroids, morphology of brain tissue, and changes in electroencephalographic wave forms). It is not yet known whether these and other putative effects are due to a direct interaction of the electric field with tissue or to an indirect interaction, e.g., a physiological response due to detection or sensory stimulation by the field....

Results to date have demonstrated various neurological effects in specific species exposed in the laboratory to a wide range of field strengths. The extrapolation of specific effects that occurred under controlled laboratory conditions to a general assessment of the health risk for a human population exposed to electric or magnetic fields is very tenuous....

...Experimental results to date show no clear implications of health risks to humans exposed to a range of from 1 to 300 Hz electric fields. The amount of data on comparable magnetic fields is still too minimal to make such an assessment.

"Hematologic and Immunologic Effects of Extremely Low Frequency Electromagnetic Fields" by Ralph J. Smialowicz, U.S. Environmental Protection Agency (Chapter 7).

Many of the studies reviewed here are flawed because of poor experimental design and statistical analysis of the data. In those studies that appear to be well designed and adequately analyzed, no clear, consistently reproducible and physiologically significant effects of ELF fields on the hematologic or immunologic systems or on their cellular elements have been demonstrated. The reported alterations caused by ELF fields have, for the most part, been found to be transient and mild in nature. The fact that no consistent effects have been observed even when similar exposure conditions and experimental parameters have been used indicates that low level ELF field induced effects are very subtle and consequently may be of little or no physiological significance as regards the hematopoietic and immunologic systems.

"Reproductive and Developmental Effects in Mammalian and Avian Species from Exposure to ELF Fields" by Neil

EXCERPTS

Chernoff, U.S. Environmental Protection Agency (Chapter 8).

Given the criteria for adequate evaluation, it is impossible to draw any definitive conclusions concerning the effects of ELF fields on reproduction or development in either avian or mammalian studies. Although a number of studies have reported possible agent-related findings, few of these studies have dealt with dose-response phenomena, and none have been clearly replicated by different research groups....

The exposure of mammalian species to magnetic fields indicates a possible increased growth rate (Grissett 1979), but the experimental design does not allow for definitive conclusions on this point. In avian species, studies have indicated that such fields produce adverse effects (Delgado et al. 1982; Ubeda et al. 1983), but the nature of the internal variability and lack of dose-response data in these studies again do not allow for definitive conclusions.

"Human Studies of Carcinogenic, Reproductive and General Health Effects of ELF Fields" by David A. Savitz, University of Colorado School of Medicine, Denver (Chapter 9).

The studies of residential exposures, in balance, contain preliminary suggestions of an elevated risk of cancer that have not yet been thoroughly refuted or confirmed. The studies of Wertheimer and Leeper (1979, 1982) and Tomenius, Hellstrom and Enander (1982) are sufficiently credible to raise the interest that has ensued but are inadequate in demonstrating that ELF fields cause cancer in humans. In spite of a lack of support from laboratory studies, the possibility that ELF magnetic fields act as cancer-promoting agents remains a hypothesis worthy of further study....

The studies of cancer among occupationally exposed groups contain more reports of lower quality and even fewer details. The letters to the editor provide suggestions of some modest increase in leukemia occurrence among workers in "electrical occupations," bur are inherently weak due to a reliance on broad occupational titles. These studies constitute very limited evidence to address the question of whether ELF fields are related to cancer risk. Until the exposure patterns of appropriate workers are assessed in relation to subsequent cancer risk, the presence or absence of an association cannot be resolved with any certainty.

The available literature on human cancer risk related to electric and magnetic field exposures does not support the presence of a causal association. Rather than a literature of methodologically sound but contradictory studies, a more accurate characterization of this literature is a predominance of methodologically flawed and inconclusive positive reports....

The literature on the human health effects of ELF fields does not provide any convincing indication of a threat based on studies of cancer, reproductive outcomes or general health....

...Continued examination of this issue is needed, which should culminate in more credible, conclusive results than have yet been produced.

"Potential Effects on Natural Biota in Operating an Extremely Low Frequency Communications System" by Robert G. Lindberg, University of California, Los Angeles (Chapter 10).

- The ecological risk of operating the redesigned USN ELF Communications System is low. The risk is probably less than that projected in the National Academy of Sciences [NAS] 1977 evaluation.
- The complexity of ecological systems makes it impossible to rule out the possibility of some component of the ecosystem responding to electromagnetic fields generated by the ELF Communications System. The prediction of low risk is an assumption that should be verified through ecological research conducted in concert with operation of the ELF Communications System.
- Research published since 1977 does not alter the conclusions drawn by the [NAS] in 1977 nor does it negate their recommendations for additional research on the effects of ELF electromagnetic fields on biological systems.
- Ecological effects, if detected, in the vicinity of the operating ELF systems will be subtle not catastrophic; may require a long time to develop; and are of secondary importance to changes produced by the construction of the Communications System.

UPDATES

COMPATIBILITY & INTERFERENCE

EMI From HVDC Converter Stations...A new study by the International Engineering Co. of San Francisco, CA, indicates that a scale model approach is "a practical and cost-effective method to study EM effects" from high voltage direct current (HVDC) converter stations. The study, funded by EPRI, found that "valve-hall screening is effective in containing EM waves but that conductors through building walls provide a path for some EM energy to reach the converter station exterior." A copy of the report, *Radio Interference From HVDC Converter Stations* (No. EL-3712), which includes an extensive annotated bibliography, is available for $26.50 prepaid from Research Reports Center, PO Box 50490, Palo Alto, CA 94303.

GOVERNMENT

Washington Notes... The FDA has reorganized the Center for Devices and Radiological Health's Office of Science and Technology. Sources indicate that the move was designed to put more emphasis on the regulation of medical devices — at least partially at the expense of radiation research....The Frequency Management Advisory Council (FMAC) met in Washington, DC, on April 10. Among the topics covered were spectrum requirements for a U.S. space station, RF/MW radiation bioeffects, high-definition TV and preparations for discussions on the HF broadcasting band at the upcoming World Administrative Radio Conference (WARC). FMAC has nominated new members to enhance the council's expertise in bioeffect issues; they are awaiting official approval. For more information, contact NTIA's Charles Hutchison at (202) 377-0805....The FCC has issued a "Report and Order" on obtaining recognition of and protection against harmful EMI for communication satellites in geostationary orbit in preparation for the next Space WARC meeting in August. The text of the FCC notice appears in the March 21 *Federal Register* (50 *FR* 11418)....The FDA has reduced some of the paperwork needed to apply for exemptions from requirements

to post radiation safety warnings on microwave ovens. For details, see the April 5 *Federal Register (50 FR 13565)*.

INTERNATIONAL

OTH-B and ELF Antenna in the U.K.... The British Ministry of Defence is exploring the possibility of siting an over-the-horizon backscatter (OTH-B) radar in northern Scotland to enhance its air defense systems. The OTH-B, which is based on U.S. technology, is still in the early stages of testing, but government officials hope to announce its development formally by early next year, according to a report by Chris Mullinger in the April 2 *Scotsman*. The defense ministry is also planning an extremely low frequency (ELF) transmitter in Scotland to improve submarine communications. The *New Scientist* magazine reported on March 14 that government officials have refused to comment on a report issued by a University of Sussex researcher that there are 11 potential sites for the 40 km antenna. But the researcher, Malcolm Spaven, working with a local disarmament group, apparently plans to oppose construction of the transmitter because he claims that it is unnecessary. The Ministry of Defence has stated only that it is considering two or three mainland sites.

MEASUREMENT

EMC-EMI Review... Four members of NBS's Electromagnetic Fields Division in Boulder, CO, have published a major article, "A Review of Electromagnetic Compatibility/Interference Measurement Methodologies," in the March issue of the *Proceedings of the IEEE*. Mark Ma, Motohisa Kanda, Myron Crawford and Ezra Larsen present a summary of radiated emission and susceptibility measurement techniques. In their 25-page review, they weigh the pros and cons of some of the most popular methods: open area sites, TEM cells and reverberating and anechoic chambers.

MEETINGS

Zurich EMC Proceedings...*Attendance at the Zurich* EMC symposium in March broke all records, attracting 845 participants and exhibitors, compared to totals of 629 in 1983 and 529 in 1981. The People's Republic of China sent six representatives to Zurich — China's first time at the EMC symposium. Of the 116 papers presented, 34 were from the U.S., less than in 1983. The proceedings of the *6th Symposium and Technical Exhibition on EMC*, a 636-page volume with the texts of the papers, are available for *100 Swiss francs (about $37.00)*, includes postage, from Dr. T. Dvorak, EMC Symposium, ETH-Zentrum-IKT, 8092 Zurich, Switzerland, (411) 256-2790.

BRAGS Transactions... Last year's meeting of the Bioelectrical Repair and Growth Society (BRAGS) was in Kyoto, Japan (November 5-8). Those who were unable to go can now get a copy of the *Transactions*, which includes the abstracts of the 54 papers presented and the 28 posters, by sending $25.00 (including postage) to BRAGS, PO Box 64, Dresher, PA 19025, (215) 659-5180. *Transactions* from past years are still available. 1981: $10.00; 1982: $18.50; 1983: $20.00.

POWER LINES

Virginia Report... The Virginia legislature has approved a resolution calling on the state to formalize its oversight of the health and safety concerns posed by high voltage transmission lines. *Senate Joint Resolution No. 126* asks the State Corporation Commission (SCC) and the Department of Health to monitor ongoing research and the health department to report its findings to the General Assembly each year. The resolution is just the latest development in an eleven-year debate that began when the Appalachian Power Co. asked the SCC for permission to build a 765 kV powerline from Jackson's Ferry to Axton. Following commission approval in 1978, Citizens for the Preservation of Floyd County (CPFC) appealed the decision, but it was upheld by the state's Supreme Court. State Senator Madison Mayre brought the issue before the legislature in 1984, and a seven-member subcommittee, chaired by Mayre, was set up to see if state power line regulations were needed (see *MWN*, November 1984). The subcommittee's report, *The Health and Safety Effects of High Voltage Transmission Lines*, (Senate Document No. 11) recommends that the SCC hold a hearing on health and safety issues for all proposed 765 kV power lines in the affected localities. (It also includes selected testimony from the subcommittee's hearings.) Meanwhile, the battle against the Appalachian Power Co. line goes on. CPFC's Betty Yapp told *Microwave News* that in mid-April the group petitioned the SCC to reconsider the need for the line. For more information about the joint resolution and the subcommittee report, contact Ms. Terry Mapp Barrett, Division of Legislative Services, 910 Capitol St., PO Box 3-AG, Richmond, VA 23208, (804) 786-3591.

STANDARDS

AF Safety Standard... Last October 12, without fanfare, the U.S. Air Force adopted new safety standards for exposure to RF/MW radiation. The standard has two parts: (1) the ACGIH standard for occupational exposures; and (2) the ANSI standard for the general population. According to Lt. Col. John Burr of the AF Medical Service Center at Brooks AFB, TX, the somewhat less stringent occupational standard was adopted because access to restricted areas can be limited for certain personnel (such as those under 55 inches in height). The ANSI standard covers the families of servicemen living on Air Force bases, for example. Burr explained that both standards are based on a maximum whole-body specific absorption rate (SAR) of 0.4 W/Kg, but the maximum permissible levels vary for different exposed populations. AFOSH 161-9 replaced the previous 10 mW/cm^2 standard, last revised in 1978. Burr is also the chairman of a Department of Defense (DoD) working group, with representatives from the Air Force, Army and Navy, which is coordinating new standards for all of DoD (see *MWN*, May 1982). He said that the group's work should be completed by the end of the year. A copy of the new Air Force standard is available from Burr at AF Medical Service Center/SGPA, Brooks AFB, TX 78235.

fered a heart attack that has left him severely incapacitated. Last year, he developed bone cancer and had additional radical surgery.

Kreischer worked on TACAN and VOR equipment at the FAA facility in Albuquerque for 20 years, from 1960 until he retired at the end of 1980. When asked if he thought his ailments were connected to his exposure to microwave radiation, he said that initially he had not thought so, but he is reconsidering in light of recent findings suggesting such a link.

When asked the same question, Shrouf said that "It's more than just a coincidence that between the three of us working at the FAA in Albuquerque, we have many of the same effects that showed up in the University of Washington long-term study."

According to Shrouf, he, Loesch and Kreischer spent the most time working on TACAN, ILS and VOR equipment in the FAA's Albuquerque office.

Loesch's claim follows a series of recent reports indicating possible links between microwave radiation and cancer and endocrine disorders (see *MWN*, July/August 1984 and March 1985), brain tumors (see *MWN*, October 1984) and biochemical changes in the brain (see *MWN*, December 1984 and story on p.1).

The claim was filed with the FAA's Southwest Regional Office in Fort Worth, TX. Ms. Gerry Cook, a FAA public information officer in Fort Worth, said that Loesch's legal papers had been received and were under review. She said that it would be premature to comment further but added that it is likely that the claim would be referred to the FAA's Washington office.

Shrouf and Kreischer said that they are exploring an approach other than legal action in order to win compensation for their injuries. Neither would comment on their plans, however.

TACAN stands for "tactical air navigation;" TACAN equipment operates at 1.025-1.213 GHz. Many TACAN systems also emit some X-ray radiation from the rectifier tubes in the high voltage power supply. VOR is the abbreviation for "very high frequency omni-range."

Parallels to Engell Case

The link between TACAN radiation and cancer first surfaced in the early 1970's when two technicians at the Naval Air Rework Station at Quonset Point, RI, both developed pancreatic cancer and endocrine disorders.

In March 1977, Robert Engell filed a $4.5 million suit against ITT, Raytheon, General Dynamics, Varian Associates and Rockwell International. All of the defendants settled out of court. The financial details of the agreements were never revealed, though Engell's attorneys told *Microwave News* at the time that Engell was satisfied with the settlement (see *MWN*, January/February 1983).

ITT was the last defendant to settle; the company reached an agreement with Engell's attorneys on December 23, 1982 — just before a jury trial was about to begin in U.S. District Court in Hartford, CT.

Following the disclosure that the technicians — who worked side by side — both developed pancreatic cancer, the Navy and the National Institute for Occupational Safety and Health (NIOSH) started a study of TACAN radiation and its possible impact on maintenance technicians. Paul Brodeur describes the Navy-NIOSH study, as well as the FAA's participation, in his 1977 book, *The Zapping of America*.

Working Conditions Detailed

In a telephone interview, Loesch described the working conditions at the FAA in Albuquerque. From 1969 until 1976, his desk was 10-12 feet from an active TACAN klystron tube. He also worked on VOR and instrument landing system (ILS) equipment. "One or more times a month, for a period of about three hours," he said, "I sat directly in the radiation pattern for the purpose of accuracy measurement of the ILS. This was normal procedure and went on for seven years."

Loesch said that he thought that VOR radiation was less serious than that emitted by TACAN.

In his administrative claim, Loesch relates how he brought the issue of excess stray radiation from the TACAN facilities at Dalhart and Amarillo, TX, to the attention of his superiors in March 1962: at that time, he "perceived this stray radiation as a technical problem, but had no idea that it presented a threat to his health," according to Allison, Loesch's attorney.

Less than a week later, T.J. Edwards of the FAA's Fort Worth, TX, office replied by memorandum that the stray radiation described by Loesch might be common at other TACAN facilities. Pending further internal discussions, Edwards asked Loesch to stop working on the radiation problem until he received new instructions.

According to Loesch, no one ever contacted him again about radiation emissions from TACAN during his next 14 years at the FAA.

Kreischer said that he was never informed about possible radiation risks.

Loesch's court papers detail his medical problems over the last 12 years. In July 1974, Loesch had his first episode of complete numbness in his right leg, arm and hand; over the next six months, he had six more attacks of right-side numbness. These episodes continued to occur over the following years.

In early 1976, Loesch retired from the FAA with a medical disability. On April 27, 1981, he suffered a grand mal seizure and his doctors found he had a brain tumor. Later that year, the tumor was removed surgically, and Loesch was given radiation therapy.

In mid-1982, Loesch's episodes of numbness returned with greater severity; his vision and motor skills deteriorated. In 1983-1984, he had a series of acute seizures. In May 1984, a CT scan indicated that the tumor had recurred. Doctors at the Mayo Clinic confirmed this diagnosis and found the tumor to be inoperable.

Loesch has also filed a medical malpractice suit against the doctor who read his brain scan in 1976. The doctor who diagnosed his tumor in 1981 told him that it should have been detected in 1976. ●

Hansson on Radar Workers (continued from p.1)

Hansson and coworkers have also observed similar CSF changes in rabbits exposed to pulsed microwaves. In a paper presented at a workshop last summer, Hansson reported: "The results of these studies [with rabbits]...suggested that even humans occupationally exposed to microwaves of moderate to high intensity could be at risk of brain damage."

Hansson's paper will be included in *Electromagnetic Waves and Neurobehavioral Function*, to be published by Alan Liss, Inc. of New York City in the early fall. Hansson will present the data on the radar workers and the rabbit experiments at the Bioelectromagnetics Society meeting in San Francisco, CA, June 16-20.

Report from Hansson's Laboratory

Reprinted below is a report of a recent visit to Dr. Hans-Arne Hansson's laboratory at the University of Goteborg in Sweden by Dr. Thomas Rozzell of the Office of Naval Research's London branch office.

Preliminary results from Sweden suggest that high-level microwave exposure may affect certain proteins in the brains of radar maintenance technicians.

I recently visited the University of Goteborg, where I had extensive conversations with Dr. Hans-Arne Hansson of the faculty of medicine. Hansson described in some detail the changes that he and other members of the faculty, in the Department of Neurology, have observed in a number of radar workers and laboratory animals exposed to high-level microwaves. While these results are preliminary now, Hansson and his team have a number of replicates and are in a position to discuss the data. In this article, I will give details of these new findings, but stress again that they are preliminary.

As a physician, Hansson serves the military complex at Goteborg by providing medical care two mornings per week for enlisted persons and officers. Part of the group that he sees comes from the radar school. This is a school that trains radar operators and maintenance personnel. In a visit to the school, I observed the physical layout of the radar equipment, including antennas, generators and operating consoles. I also discussed the current safety regulations with officials at the school.

Within the last two years, Hansson has seen about 11 radar maintenance technicians who were long-time (15 years or more) employees of the school. These men all had symptoms of central nervous system damage. Many were unable to perform the jobs properly and had a number of complaints that led Hansson to send them to the Department of Neurology for a more thorough examination, which included an analysis of the protein patterns in their cerebrospinal fluid (CSF). He decided to do this as a result of some observations that he had made in rabbits whose heads had been exposed to high levels of microwaves.

The analysis of the CSF of the radar workers showed the same changes in the protein patterns as was found repeatedly in the rabbits. In order that the reader might better understand the significance of these findings, I will discuss some details of the procedure.

CSF plays a role in maintaining stability in the central nervous system. It has a characteristic crystalloid and colloid composition. Changes in the composition of the CSF reflect changes in the metabolism of the brain, in the cerebrovascular state and in the CSF hydrodynamics. Proper analysis of CSF can indicate pathologically degenerative brain diseases. The majority of the proteins normally present in CSF are derived from serum, and the protein content in CSF is about 1/200 of that in serum. This difference is maintained through the relative impermeability of the blood-brain barrier (BBB) to large macromolecules like proteins. Passage through the BBB seems to depend on both filtration and vascular transport.

A technique has been developed at the University of Goteborg to separate CSF proteins. It is essentially an affinity chromatography method that employs isoelectric focusing as an analytical electrophoretic system (Wikkelso, 1982). In this method, the CSF-specific protein fraction is separated into approximately 30 protein bands by isoelectric focusing. It is possible to accurately identify prealbumin, microglobulin and beta-trace proteins. If there are changes in the proteins — either qualitatively (i.e., there are new ones present or old ones missing) or quantitatively — they are readily seen by this technique. Since CSF has been studied for many years and taking it is relatively routine in a large number of diagnostic procedures in neurology, there is quite a bit known about the "normal" pattern of CSF proteins. The method is used as a complementary diagnostic tool in degenerative central nervous system disease.

When Hansson began studying rabbits, he exposed them for 1 hour at an average power level of 55 mW/cm^2, using 3.07 GHz microwaves pulsed at 300 Hz (the pulse width was 1.4 us). While the average power was 55 mW/cm^2, the peak power was approximately 1,000 mW/cm^2. He reported that the specific absorption rate was measured in the rabbit brain and found to be 20 W/Kg average. Exposures were to the right side of the head while the animal was restrained but not anesthetized. During this time, the brain temperature rose about 1 [degree Celsius].

When the CSFs of these rabbits were analyzed (blindly) by the neurochemist at the Department of Neurology, it was found that there were different patterns of proteins in the exposed animals than in the controls. These are not subtle differences requiring a lot of expertise to observe. They are very dramatic, with very different bands which I could clearly see with my untrained eye. Furthermore, upon microscopic examination of the brain on the exposed side of the head, it could be seen that there are morphological changes in the glial cells. Here again, these are very dramatic and not difficult to see. As evidence of this, Hansson let me look at some slides — and without knowing what I was observing, I could readily see and describe the difference between sets of brain tissue that (I later learned) came from different sides of the head of an exposed animal and tissue that came from the brain of an unexposed animal. Without prompting, I was able to adequately describe the differences. If I could see them, they must be real.

While it is certainly not clear at this time exactly what the changes in the CSF of the radar workers mean, it does point to a possible new effect of high-level microwave exposure. Unlike the situation with the rabbits, there are no brain tissue samples to study in the humans. Recently, the radar school in Goteborg has instituted substantial changes in its maintenance procedures. A number of safety measures and devices are in place that should prevent anyone from being exposed to operating radar at levels above the human exposure standards. These measures include new standards as well as new interlocks that prevent activation of radar units while personnel are working near the antennas.

This is an area that I will watch. Hansson has promised to keep me informed as he accumulates more data. At the moment, there are only about 11 patients in the sample, and he feels he needs at least twice that many before any concrete statement can be made.

Wikkelso, C., *Cerebrospinal Fluid Proteins in Degenerative Neurological Disorders*, PhD Thesis, Department of Neurology, University of Goteborg, Sweden, 1982.

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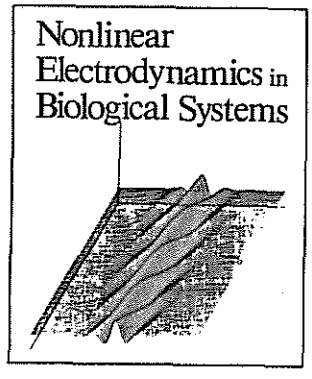
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INSIDE...

HIGHLIGHTS pp.2-8

Repacholi Steps Back from WHO EMF Project
Did U.S. Pull Plug on EMF Research Too Soon?
U.K. Hands-Free Dispute Still Unsettled
SAR Search: Test Protocol • Lin on 1g vs. 10g
Dutch Panel Nixes Precautionary Limits
TCO To Set SAR Limits for Mobile Phones
Germans Find Phone Signals Inhibit Tumors
Results of German Experiment on Internet
Industry To Sponsor DMBA Study in China
China Opts for ANSI/IEEE SAR Limit
Phone Signal Has Persistent Effect, Say Swiss
Kuster on SARs in Swiss Sleep Study
Wireless Notes:
EMI on German VIP Plane • Cell Phone Class Action Suits • Are Teens Trading Habits?
Swiss Move Toward 4 ∝W Exposure Limit
Disney Pulls Mickey Off Wireless Phones

EMF NEWS pp.8-10

Sensing Weak EMFs in Swiss Study
U.K: Cancer, Power Line Distance Not Linked
IARC To Review EMF Cancer Data in June
James Trosko Talks with Microwave News

FROM THE FIELD pp.11-15

How Australian Headache Probe Was Blocked Across the Spectrum
Hot New Papers: IEEE Mobile Phone Issue
Flashback: 5, 10, 15 Years Ago
Letters: Hopkins on Suder Award • Hocking
2001 Conference Calendar (Part I)

UPDATES pp.16-18

FDA on Anti-Theft EMI • EMP Panel • Prostate Shrinker Burn • Charles Polk Dies • Australia Stops DNA Study • German Cow-Tower Report
Keeping Current: Follow-Up on the News

VIEWS ON THE NEWS p.19

Knowledge, Politics and Power
2001 Wish List

Weak EMFs Alter Gene Expression, Implicated in Tumor Promotion

An extremely-low-frequency electromagnetic field (ELF EMF) can alter gene expression at levels as low as 40-50 mG and, in some ways, act like a tumor promoter, according to a new study from Dr. James Trosko's lab at Michigan State University (MSU) in East Lansing, MI.

"I went into this with some skepticism," Trosko told *Microwave News*. "Initially, we did not believe it....We repeated the experiment 25 times."

"ELF EMF fields mimic some of the properties of known chemical tumor promoters such as TPA," Trosko and coworkers report in the October issue of *Environmental Health Perspectives (108,* pp.967-972, 2000). He stressed that more work needs to be done before it is clear whether EMFs have *all* the properties of a cancer promoter (see p.10 for an interview with Trosko).

Nevertheless, Trosko has shown an ELF EMF effect on gene expression. If replicated, it would go a long way towards settling a controversy that has raged for many years (see, for example, *MWN,* J/A94 and M/J95).

The new results caught many observers by surprise and have already prompted much interest — both because the effects occurred at very low levels and because of the international reputations of members of the research team. Trosko, a well-known cancer investigator, is the former chief of research at the Radiation Effects Research Foundation in Hiroshima, Japan. Dr. Hiroshi Yamasaki of Kwansei Gakuin University in Nishinomiya, Japan, one of his

(continued on p.9)

Mega-Lawyer Peter Angelos Joins Mobile Phone–Cancer Fray

Peter Angelos, who has won billions of dollars in damages from the tobacco and asbestos industries, is set to play a leading role in litigation alleging that cellular phones cause brain cancer. This marks the first time that the wireless industry will face an attorney with substantial resources. Angelos's firm, based in Baltimore, has 110 lawyers and offices in six states.

On December 6, Angelos signed an agreement to work with Joanne Suder of Baltimore, the attorney who filed suit last August on behalf of Dr. Christopher Newman, a physician with brain cancer (see *MWN,* S/O00). Angelos will become cocounsel on the Newman case. "We will file no less than ten other cell phone lawsuits," a member of the firm told *Microwave News*. "We have been researching this issue for over a year," he said.

Suder had already agreed to work with Michael Weinstock of Weinstock & Scavo in Atlanta as well as with Michael Allweiss of Lowe, Stein in New Orleans (see p.7). These collaborations will continue.

Last summer Angelos told *Business Week* (August 14) that he was looking "very intensively" at wireless phone litigation. He stressed that he would not get involved unless he was "90% sure" he could win.

Citing Criticisms and Overwork, Repacholi Steps Back from WHO EMF Project

Dr. Michael Repacholi is relinquishing day-to-day management of the World Health Organization's (WHO) International EMF Project.

"The main reason for the change is to put the criticisms to rest," Repacholi told *Microwave News*. "I don't want the program to be tainted and so it's better to let someone else run it." He also cited the demands on his time. "I have been trying to do two jobs and it just isn't working," he said.

The four-year-old project has attracted more than a bit of controversy. Repacholi's critics argue that he downplays low-level effects and favors standards that are based only on thermal effects. These advocates say that the EMF project has too many ties to corporate and military interests.

Its admirers, on the other hand, say that the project has succeeded in writing a viable research agenda and in coordinating the various national agencies that sponsor EMF and radiofrequency and microwave (RF/MW) health studies.

Dr. Christopher Portier, the acting director of the Environmental Toxicology Program at the National Institute of Environmental Health Sciences (NIEHS) in Research Triangle Park, NC, gave the WHO EMF project high marks. "It's a good program," he said in an interview, noting that the main problem from his point of view is that it deserves more financial support.

Repacholi's organizational accomplishments have not been matched by comparable success in gaining support for the worldwide adoption of the ICNIRP exposure standards under the banner of "harmonization." Recently, he has been at the center of a new controversy over the proper use of the precautionary principle. He has lobbied against the strict Swiss and Italian precautionary exposure limits and, as a member of the U.K.'s Stewart panel on mobile phones, he argued against the recommendation that children be discouraged from using mobile phones (see p.8 and *MWN,* J/F00 and M/J00).

When asked to name his critics, Repacholi pointed to New Zealand's Dr. Neil Cherry, who has long campaigned for strict exposure standards (see *MWN,* M/A97 and M/A00), the Swiss group that is seeking his ouster (see *MWN,* S/O00) and *Microwave News,* which has run editorials questioning the project's ties to the wireless industry and the U.S. Air Force (see *MWN,* M/A97 and N/D98).

Cherry, of Lincoln University in Canterbury, has emerged as Repacholi's most outspoken adversary. For example, in testimony to a committee of the Australian senate in September, Cherry accused Repacholi of "misrepresentation and deliberate misinformation" of bioeffect research results. Repacholi responded that Cherry's accusations are "so ludicrous that they are not worth the time to debate."

With respect to some of the funding issues raised by *Microwave News,* Repacholi said that "under certain circumstances" he has accepted contributions from industry associations and professional societies, "but only as long as any single contributor did not have too much influence." On the $50,000 a year the project has received from Motorola through the Royal Adelaide Hospital in Australia (see *MWN,* J/A99), Repacholi noted that the money came from the Mobile Manufacturers Forum, known as the MMF, of which Motorola is a member.

Repacholi said that his project has won praise from Dr. Ken Olden, the NIEHS director. He said that Olden met with WHO Director-General Dr. Gro Harlem Brundtland in Geneva about a year ago and told her that, "The EMF project is a model that the WHO should use for other programs" (see also *MWN,* S/O00).

In October 1999, Repacholi took over as the coordinator of WHO's Occupational and Environmental Health program. He has continued to run the EMF project, which is part of that broader program. When appointed, the new manager of the EMF project will report to Repacholi and also work on ionizing radiation issues. He expects that his replacement will be on the job by February or March.

"The real hard work of the EMF project has been done," Repacholi said. "It's a management job now, with the WHO setting the policy."

Repacholi set up the EMF project in January 1997 with support from the governments of Australia, Ireland and the U.K. The project currently has a budget of $600,000 a year, all from sources outside the WHO except for some funds for secretarial and administrative support.

One of Repacholi's first priorities for the future will be to build up WHO's ionizing radiation program, but his new duties go beyond radiation issues. Repacholi also oversees WHO's work on air pollution and climate change as well as occupational health in general. "I have a lot on my plate," he said. "There is a lot of reorganizing that needs to be done."

The WHO posted a vacancy notice for a manager of its radiation programs on November 3. While this is for a two-year position, Repacholi said that the appointment is renewable. The deadline for applications was December 1.

U.S. Withdrew Funding for EMF Research "Too Early"

"The Americans poured water on the [EMF] issue too early," WHO's Dr. Michael Repacholi told *Microwave News*. The epidemiological results are "serious" and "have to be addressed," he said.

Repacholi explained that he was swayed by the two new analyses pooling data from past epidemiological studies, which show a consistent link between childhood leukemia and EMFs from power lines (see p.13 and *MWN,* S/O00).

Turning to RF/MW radiation, Repacholi reiterated his view that his lymphoma-mouse experiment showed that cell phone radiation "can exert a significant carcinogenic effect" (see *MWN,* M/J97 and J/A00). He added that, "We did everything we could do to make sure it was done right," and said that in his view, "If it is repeated, it would be a major development."

Radiation from Hands-Free Sets: Standoff Continues in the U.K.

The U.K. Consumers' Association (CA) continues to advise against the use of hands-free sets with mobile phones, arguing that use of an earpiece can magnify radiation exposures. Meanwhile, manufacturers and other test labs maintain that the CA's tests are flawed.

"It's clear that consumers can't rely on hands-free kits to reduce radiation emissions at the brain," said Helen Parker, the editor of CA's magazine, *Which?* Her comments came on the release of the latest results from the CA's test lab, ERA Technology Ltd. (see *MWN,* M/J00). In August, the U.K. Department of Trade and Industry (DTI) publicized measurements by the SARTest lab which showed large reductions in radiation exposures with the use of the hands-free sets (see *MWN,* S/O00).

Dr. Mike Manning of SARTest in the U.K. and Chris Zombolas of EMC Technologies in Australia believe that ERA used the wrong probe to measure electric fields. "The *Which?*–ERA methodology is fundamentally flawed," said Zombolas. Manning explained that if he uses the same probe as ERA he can also see higher radiation exposures. But the "funny things they found" go away with the appropriate measuring equipment, he said.

Dr. C.K. Chou of Motorola and Veli Santomaa of Nokia each told *Microwave News* that they too believed that ERA had used the wrong measurement probe.

The DTI hosted a meeting on November 29 to try and work out the differences in results between the CA–ERA and the other test labs. While the CA did attend, ERA engineers did not. The CA did not respond to requests for comment. Manning said that he thinks the DTI will continue to work to resolve the controversy. "The DTI wants consensus," he said, "It's a top priority."

A summary of the CA's latest test results are at: <www.which.net/whatsnew/pr/nov00/general/handsfree.html>.

SAR Search

• IEEE subcommittee **SCC-34/SC-2** approved a **protocol** for testing radiation exposure from mobile phones in voting that ended November 29. Thirty-two members voted in favor (15 with comments), while three voted against it and four others abstained. The group will meet December 7-8 at Motorola's offices in Plantation, FL, to resolve the issues raised in the comments and by those who voted "no".

• A **10g** SAR of 2 W/Kg is equivalent to a **1g** SAR of 4-6 W/Kg, according to Dr. **James Lin** of the University of Illinois, Chicago. In his first published statement on the desirability of averaging over 1g rather than 10g, Lin states, "Simply put, the absorbed energy averaged over a defined tissue volume of 10g is artificially low, compared to a 1g SAR. The 1g SAR is a more precise representation of localized microwave energy absorption, and a better measure of SAR distribution inside the head" (see *MWN,* J/A00). Lin's comments appear in the October issue of *IEEE Antennas and Propagation Magazine*.

Dutch Panel Advises Against Precautionary Limits for Towers

The precautionary principle should not be used as a basis for RF/MW exposure limits that protect against possible nonthermal effects, the Health Council of the Netherlands advises in a recent report.

Any precautionary measures must be based on a "reasonable suspicion" of health risks, argues a 12-member panel appointed by the council. Such health risks would be "virtually impossible" at the levels found near base stations, concludes the panel, chaired by Dr. Eric Roubos of the University of Nijmegen.

The report came in response to a September 1999 request from the Dutch ministers for housing and for health, which was prompted by public concerns about radiation from cellular towers. The council measured radiation levels near a GSM antenna and found them to be "far below" the 49 V/m limit (636 ∝W/cm^2) recommended by the council in 1997 (see *MWN,* M/J97).

GSM Base Stations is available in English and in Dutch on the Internet as PDF files, at: <www.gr.nl>.

Sweden's TCO To Set SAR Guidelines for Mobile Phones

Sweden's union of white-collar workers, known as TCO, will soon propose radiation limits for mobile phones.

TCO is known around the world for its strict EMF emission standards for video display terminals (VDTs). It plans to use the same approach for mobile phones, according to Jan Rudling, the head of TCO Development in Stockholm.

TCO has not disclosed what SAR limit it will adopt, but it will probably be below the U.S. standard of 1.6 W/Kg averaged over 1g of tissue and the ICNIRP limit of 2.0 W/Kg averaged over 10g of tissue. "You can get radiation a lot lower" than the U.S. or European limits, asserted Clare Hobby of TCO's information center in Chicago, pointing to the large range of SARs among phones now on the market.

An important difference between VDT and mobile phone radiation is that a VDT's emissions are an unnecessary by-product and could in principle be reduced to zero, while a wireless phone cannot function without radiating a signal. Although TCO wants the standard "to be tough," Hobby stressed in an interview, "we don't want to jeopardize performance."

TCO will also specify the procedure for measuring SARs. Both CENELEC and the IEEE are working on standardized procedures for testing wireless phones (see box at left and *MWN,* J/A00 and S/O00). Whatever protocol is used, an independent laboratory will conduct all testing of phones for TCO certification, according to Hobby.

TCO's standards for VDTs were first issued in 1992, amid widespread concern and considerable scientific uncertainty about possible health effects of radiation from computer terminals. They were the brainchild of Per Erik Boivie, Rudling's predecessor at

TCO. Boivie had previously played a central role in the development of MPR2, the Swedish VDT guidelines issued in 1990, which became the *de facto* worldwide standard.

Working closely with manufacturers on MPR2, Boivie pushed for limits based on what was technically feasible rather than on what would be "safe." Boivie was convinced, however, that emissions could be reduced even further, which led to the TCO standards that were significantly stricter than MPR2 (see *MWN,* M/A95). TCO issued revised standards in 1995 and 1999.

Although MPR2 and the TCO limits were voluntary, manufacturers could not afford to ignore them. The union's one-and-a-half million members, many employed by the Swedish government, constitute a large portion of the country's market for VDTs. Today, 50-60% of the VDTs sold in Europe and 35-40% of those purchased in the U.S. are TCO-certified, Rudling told *Microwave News*. Most others comply with MPR2.

The new phone guidelines could be "as great a success as the TCO certification of VDTs," said Boivie, who is now an occupational health consultant based in Stockholm.

TCO Development expects to complete a draft of the new standard in early December, which it will circulate for comment to interested parties, including phone manufacturers. It hopes to complete its work on the guidelines in February or March, in time for a public launch at CeBIT, an information technology trade show in Hannover, Germany, March 22-28.

Like TCO's standards for VDTs, the phone standard will also include requirements for energy efficiency, ergonomic performance and recyclability.

TCO's interest in a phone standard was prompted, Rudling said, by the explosion of mobile phone use in the workplace: "Many employees now have mobile phones as a working tool and the number is rapidly increasing."

Wireless Signal Said To Inhibit Growth of Breast Cancer; Researchers Mum But Follow-Up Studies Are Under Way

A GSM mobile phone signal inhibited chemically-induced mammary tumors in rats in a German experiment completed over eighteen months ago.

The Deutsche Telekom–funded study has not yet been published, and the researchers, Drs. Christian and Hella Bartsch of the University of Tübingen, have declined to speak publicly about their results or even the experiment's design.

But their findings are taken very seriously by the wireless industry: The Bartsch study and parallel research by Dr. Bernard Veyret (see *MWN,* J/A99) are now the subject of industry-funded follow-up studies in Austria and China. A related study is being sponsored by a Japanese trade group.

The Bartsches themselves have twice repeated their original experiment, but no information has been available on these results. A paper based on the first experiment alone had been accepted for publication in *Radiation Research*—but was withdrawn this fall so that the two replication studies could be included.

Microwave News first asked Christian Bartsch about his study in July of 1999. In June of this year, he said that he expected a paper to be accepted for publication "within the next few days," and that he would then provide a copy. But this did not happen.

Details of the Bartsches' original experiment have leaked out via the Web site of the WHO International EMF Project (see box at right). "Mean latency time for detection of the first tumor in each [RF/MW-] exposed animal was significantly elevated compared to sham-exposed animals," the WHO stated. *Microwave News* has confirmed this independently from another source.

"We are currently requesting the WHO...to remove their information about us from their Web site," Christian Bartsch told *Microwave News* on November 10. Bartsch explained that he and Hella Bartsch do not want to discuss their experiments until their new paper is reviewed and accepted for publication.

"A publication of all results is on the way," promised Dr. Torsten Gailus of Deutsche Telekom in Darmstadt. In an interview, Gailus said that Deutsche Telekom provided the funding for all three of the Bartsches' experiments.

German Results Posted by WHO

Some months ago, the WHO International EMF Project's Web site posted a description of the first DMBA-mobile phone experiment by Drs. Christian and Hella Bartsch, at <www-nt.who.int/peh-emf/database.htm>. It is reprinted below. The sentence with the results was deleted from the site in late November after Microwave News *asked the German team to confirm its accuracy.*

Christian Bartsch was sharply critical of the WHO for making this information public. He told Microwave News *that these "preliminary" findings were "partly confidential." Bartsch stated that some figures were "incorrectly cited," and that they should not be relied on.*

Mean latency times for malignant tumors alone are apparently listed in reverse order in the WHO summary. Microwave News *asked Dr. Ken Foster, then working for the EMF Project in Geneva, about the discrepancy last summer. After three weeks he suggested that we contact the Bartsches directly, citing the press of his other work.*

900 MHz (GSM) EXPOSURE IN DMBA–INDUCED RAT MAMMARY TUMOR BIOASSAY

Sprague Dawley (female) rats given a single i.g. [intragastric] dose of DMBA (50 mg/kg) at day 51 and exposed (non-restrained in plastic cages) to a 900 MHz (GSM) signal at 18 to 75 mW/cm^2 from day 51 until day 400. Weekly mammary tumor palpation beginning 7 weeks after DMBA administration continued for 1 year. Mean latency time for detection of the first tumor in each exposed animal (n=60) was significantly elevated compared to sham-exposed animals (n=60) for benign+malignant tumors (218 days vs. 137 days, p=0.019) as well as for malignant tumors only (137 days vs. 279 days, p=0.015). A final report and manuscript are in preparation.

Industry To Sponsor Replication of DMBA Experiment in China

Dr. Huai Chiang of Zhejiang University in Hangzhou, China, is also planning a replication study of the effects of mobile phone signals on DMBA-induced breast cancer in rodents. The study will be jointly funded by the MMF and the GSM Association.

"We will do the same experiment as the ARCS," Chiang told *Microwave News*.

Dr. Mays Swicord, of Motorola in Ft. Lauderdale, FL, which is an MMF member, said that the Chinese study would cost about $500,000. Planning began when Swicord visited Chiang's lab last February with Drs. Larry Anderson of the Battelle Pacific National Labs in Richland, WA, Niels Kuster of IT'IS in Zurich and Sakari Lang of Nokia in Helsinki.

Kuster's lab will provide the exposure system and collaborate with Chiang's group on engineering issues, Swicord said, while ARCS works with them on the biology. "Kuster already has a Chinese grad student from that lab working with him," he noted.

Both Chiang and Swicord said that they hoped to have a contract signed by the end of the year, and that experimental work should begin sometime in 2001. "Key to the timing will be the delivery of the exposure system," said Swicord, noting the multiple demands on Kuster's lab.

Bartsch did say that the results from *all* animal studies — his own and others — give him "the impression that...solid tumors may not be stimulated" by weak, athermal RF signals. It remains to be seen, he added, whether this applies to humans or to "leukemia and lymphoma, which may indeed be different and by far more relevant."

But might RF/MW exposure *inhibit* solid tumor development in animals? When asked, Bartsch declined to comment.

Bartsch's initial experiment is not the first to show that a mobile phone signal may inhibit tumor development. Dr. Ross Adey had a similar result with his 1996 study of chemically-induced brain tumors in rats (see *MWN,* M/J96, J/A96 and S/O99).

In one of the two DMBA experiments by Veyret's group at France's University of Bordeaux, the number of mammary tumors declined significantly as RF/MW exposure increased, in three groups of rats subjected to GSM signals of different strengths (see *MWN,* J/A99). In Veyret's other experiment, conducted at higher exposure levels, there was a small, nonsignificant increase among RF/MW-exposed animals as a whole.

Bartsch's work began prior to Veyret's, but Veyret told *Microwave News* that he started independently. His group had completed an RF/MW cancer promotion study with the chemical benzo(a)pyrene, which found no effect, and in a November interview Veyret said that a DMBA study was the next logical step. Veyret's group presented their DMBA results at the 1999 meeting of the Bioelectromagnetics Society in Long Beach, CA; he said that after double-checking their histopathology, they are now submitting this work for publication.

The need to repeat these DMBA experiments was first identified by the Mobile Manufacturers Forum (MMF), which listed DMBA work under "replication studies" in its December 1998 list of priority research projects (see *MWN,* J/F99). This aroused some curiosity among other researchers, since most did not know that such experiments had been conducted (see *MWN,* J/A99).

In May 1999, the MMF selected Dr. Robert Hruby of the Austrian Research Center in Siebersdorf (ARCS) to conduct this first replication effort, and in March 2000 the European Commission announced that it would provide partial funding (see *MWN,* M/A00). The rest will come from the MMF and the GSM Association.

The two industry groups have now agreed to fund a second DMBA replication study, this one in China (see box at left).

Yet another DMBA study is under way in Japan, this one on promotion of skin cancer. Japan's Association of Radio Industry and Business (ARIB) is funding a $255,000 experiment by Dr. Tomoyuki Shirai of Nagoya City University Medical School, in which mice are exposed to a 1.5 GHz "personal digital cellular" signal. Shirai told *Microwave News* that he began work in October 1999, and expects to have results by the end of this year.

The RF/MW exposure system for the Austrian and Chinese labs will be designed and built by Dr. Niels Kuster of IT'IS in Zurich (see also p.6). Kuster said that the animals will receive whole-body exposures while running free in their cages, as was the case in the Bartsch study.

China To Adopt ANSI/IEEE SAR Limit for Mobile Phones

China's Ministry of Health plans to set an SAR standard of 1.6 W/Kg for radiation exposures from mobile phones. Like the ANSI/IEEE limit, SARs would be measured over 1 g of tissue.

"The final draft is under discussion and it will probably be adopted in 2001," Professor Zhao-Jin Cao told *Microwave News*. Cao, who is with the Institute of Environmental Health Monitoring within China's Ministry of Health, is the chair of the working group that is developing the mobile phone standard.

China currently has one of the strictest RF/MW standards in the world. The health ministry limits long-term exposures to less than 10 ∝W/cm^2 above 300 MHz (see *MWN,* S/O99). This is 20-100 times more stringent than the ANSI/IEEE exposure limit.

Asked to reconcile the planned adoption of the IEEE SAR limit for cell phones with the strict exposure standard for all sources, Cao replied that it was at least partially "a concession to international trade." "We want to trade mobile phones," he said.

China is a huge market for cellular phones. There will be more than 155 million users by 2002 according to estimates cited by the *New York Times* (November 24). The newspaper also noted that Motorola derived $3 billion, or 10%, of its 1999 revenues from sales of phones and other products in China.

Dr. Huai Chiang of Zhejiang University Medical College in Hangzhou added that, "The SAR standard does not contradict our national standard because cell phone exposures are very short."

Cao said that China would follow either the IEEE or the CENELEC measurement protocol, both of which are expected to be completed in 2001 (see p.3).

Mobile Phone Radiation Can Have Persistent Effect; Swiss Team Says Effects Occur Deep Inside the Brain

For the first time, researchers have shown that mobile phone radiation can cause changes in brain function that persist for some time after exposure. "The present results demonstrate that exposure during waking modifies the electroencephalogram [EEG] during subsequent sleep," write Dr. Peter Achermann and colleagues at the University of Zurich.

The structure responsible for this effect appears to be "deep inside the brain," Achermann told *Microwave News*.

The Swiss scientists observed significant changes in the EEG readings of sleeping volunteers who had been exposed to a GSM signal for half an hour immediately before they went to bed. Writing in the October 20 issue of *NeuroReport (11,* pp.3321-3325, 2000), they conclude that this finding "lends support to previous reports on effects...on physiological and psychological variables" such as "sleep and cognitive function, as well as blood pressure and heart rate" (see *MWN,* J/A98, M/A00, M/J00 and J/A00).

This point was underlined by a *NeuroReport* editorial, which appears in the same issue. "These results show that even a short exposure to the electromagnetic fields emitted by cellular telephones can affect brain physiology," writes Dr. Michael Petrides of the Montreal Neurological Institute at McGill University in Canada.

The part of the brain which produces this effect does not appear to be in the "gray matter" or cortex — the outer part of the brain which controls most "higher-level" mental activity. Instead, Achermann said, the radiofrequency and microwave (RF/MW) signal appears to affect deeper structures such as the thalamus. The thalamus, the brain stem and other structures beneath the cortex are several centimeters below the skull, and control heartbeat and other less conscious functions. The Zurich results suggest that "subcortical regions may contain the most sensitive structures to EMF."

Despite this apparent sensitivity, it is not at all clear that a mobile phone in normal use would produce the same effect: The RF/MW field used in this experiment was designed to expose the interior of the brain to more radiation than would normally be the case (see box at right).

The study was carried out by Dr. Alexander Borbély's group at the University of Zurich, whose members are widely regarded as among the world's top experts on sleep research. The EEG changes they observed were much the same as those observed in their previous study, in which subjects were exposed to a GSM signal *during* sleep (see *MWN,* N/D99).

While the effect seen in the latest study occurred after RF/MW exposure, they note that it is "transitory": The increase in EEG power was gone by the end of the study's three-hour sleep period. There were no changes in the amount of time needed to fall asleep, in subjective assessments of sleep quality, or in the normal progression of the stages of sleep (such as "REM sleep," with the "rapid eye movement" that characterizes dreaming).

"It is difficult to assess whether our findings have broader implications for users of mobile phones," said Achermann. "Conclusions about possible adverse effects on human health are premature because the underlying mechanisms are unknown," his paper states.

In their previous experiment, the Swiss researchers had applied the GSM signal at the top of the head, giving equal exposure to both left and right sides of the brain. In the new study they centered the field just above one ear. Since the RF/MW radiation was focused on the side of the head closest to the antenna, they expected to see EEG effects on one side of the brain but not the other.

To their surprise, Achermann and colleagues found that the EEG changes were equal on both sides of the brain, no matter which side was exposed. This "symmetrical" effect suggested that structures in the middle of the brain, below the cortex, might be involved.

This was supported by the type of changes seen in volunteers' EEGs. In both this study and the previous one, RF/MW exposure increased EEG power in a frequency range characterized by "sleep spindles" — a type of EEG signal produced during a particular stage of deep sleep. "Since the thalamus is centrally involved in the generation of sleep spindles," the researchers point out, "it represents a prime candidate for an EMF-sensitive subcortical structure."

While not discussed in the *NeuroReport* paper, data from the study's exposure assessment also strengthen this hypothesis. Ex-

SARs in Swiss Sleep Study

"The specific absorption rates [SARs] in the thalamus were close to 1 W/Kg," said Dr. Niels Kuster, who designed the exposure system for the University of Zurich study. "This is at least 10 and probably closer to 100 times higher than would be normal with a mobile phone," Kuster told *Microwave News*.

Kuster noted that the exposure system was configured to give a relatively uniform exposure to one half of the cortex. The Zurich sleep researchers expected that any EEG changes would be centered in that side of the head, but this was not the case. "Initially we were not concerned about exposure of the thalamus," Kuster said. "But when they saw the results they started to speculate about deep brain effects, since the thalamus region is exposed to about the same SARs as the cortex."

Kuster explained that a more uniform exposure of the cortex was achieved with a planar antenna 11 cm away from the head, resulting in a field that penetrated more deeply without exceeding 1 W/Kg anywhere in the brain. The relatively high exposures deep within the brain were due to the fact that the head is curved, Kuster stated. "When you move the source farther away, the energy that penetrates the head is slightly directed towards the center," he said.

Kuster is director of the Foundation for Research on Information Technologies in Society (IT'IS) in Zurich.

posure measurements conducted with a model head "revealed a high level of absorption in subcortical structures, which may even exceed the level at the cortex," Achermann told *Microwave News* (see box p.6).

There are thus three separate pieces of evidence pointing to this region of the brain as the source of the effect: the bilateral nature of changes in EEG, the type of changes observed, and the fact that this region received high radiation exposures from the signal used in this experiment.

Achermann and colleagues suggest further studies to define the parameters that control the EEG effect, in particular field strength, frequency and modulation. More broadly, Achermann said that more research is needed "to investigate the mechanism of action." He added that animal studies might be useful in this regard.

A mild sleep-promoting effect observed in the previous study (with less time spent awake after volunteers initially fell asleep) was not observed in the more recent experiment. The researchers had hypothesized that this effect may have been dependent on a "slight sleep disturbance" due to volunteers being in an unfamiliar setting. This was minimized in the latest experiment by changes in the protocol, including restricting sleep the night before to four hours so that subjects would fall asleep rapidly.

The full text of the *NeuroReport* article is available as a PDF file at: <www.neuroreport.com>. (Choose "tables of contents," then select vol.11, no.15.) In addition, the Borbély group has a Web site with a summary of both studies and a comparison of their results: <www.unizh.ch/phar/sleep/handy/index.htm>.

« Wireless Notes »

Interference from a mobile phone may have caused the pilot of a plane carrying **Joschka Fischer**, **Germany**'s foreign minister, to abort a landing at Tegel airport in Berlin. The Airbus A310 was making its final approach when its instrument landing system failed, according to reports in the German press. Because visibility was limited, the pilot pulled the plane out of its descent at an altitude of 500 meters and circled around. On the second approach the instruments worked without any glitches and the plane landed safely. A check of the navigation system after the passengers left the plane in Berlin found no problems, and the aircraft then returned to its base near Cologne without incident. The *Berliner Morgenpost* (September 20) reported that an autopilot malfunction "typical of disturbances caused by mobile phones" occurred shortly after the flight began, prompting the crew to ask passengers to make sure that all electronic devices were turned off. But according to the German air force, which operates the plane, "there is no proof" that a phone was at fault for the aborted landing. "The incident has been investigated thoroughly," a spokesperson for the Luftwaffe told *Microwave News*. "The cause could not be determined." In the U.S. and the U.K., the use of wireless phones is restricted on board commercial airliners once they have left the gate (see *MWN*, S/O96, S/O99 and J/A00).

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A class action **mobile phone lawsuit** filed in Louisiana state court last May has been removed to federal court. The suit names 21 manufacturers and service providers as defendants. It is not a personal injury case but rather asks that the cellular phone industry be required to pay for a headset and medical monitoring for every user, as well as damages for emotional distress from "the use of the cell phone in its unprotected and unsafe condition." Plaintiffs' attorney **Michael Allweiss** of Lowe, Stein, Hoffman, Allweiss & Hauver in New Orleans told *Microwave News* that the first hearing is scheduled for January. Allweiss is collaborating with **Joanne Suder** of Baltimore, whose law firm has now teamed up with the mega-firm of Peter Angelos (see p.1). In other litigation, the *Busse* case — a mobile phone suit now stripped of all claims except invasion of privacy — was briefly one of the largest class actions in the U.S. An Illinois judge certified the proposed class of virtually all Americans who have ever owned a cellular phone, but wireless industry defendants obtained an emergency stay of that order from the Illinois Su-

Swiss Phone Radiation Rules: From Emission to Exposure Limit

Switzerland is moving toward a 4 V/m public exposure standard for RF/MW radiation from wireless phone base stations.

A federal ordinance that took effect last February set a precautionary limit of 4 V/m (4 $\propto$W/cm^2) for 900 MHz radiation from each mobile phone site — one of the strictest standards in the world (see *MWN*, J/F00). It defines a site as all antennas "attached to the same mast or located in close proximity, e.g., on the roof of the same building."

But now, local government officials responsible for enforcing the law are defining "close proximity" in a way that further increases the area within which base stations are handled as one site. In Zurich, antennas are treated as a single site if they are within 100 meters of each other, according to the Zurich daily, *Tages-Anzeiger* (November 8).

This approach "effectively turns the source limit into an exposure standard," said Dr. Michael Burkhardt, who follows regulatory affairs for the Zurich-based mobile phone carrier diAx.

The Federal Agency for Environment, Forests and Landscape (known as BUWAL) is working on an advisory statement on how to determine whether antennas comply with the ordinance. In an interview, the agency's Dr. Stefan Joss said it will be issued in early 2001. There is some speculation that BUWAL will endorse Zurich's approach for the entire nation, but Joss declined to comment on what the advisory would say.

An English translation of the *Ordinance Relating to Protection from Non-Ionizing Radiation* is now available as a PDF file at BUWAL's Web site. Go to: <www.buwal-recht.ch/index-en.htm>.

preme Court, said Norm Sandler of Motorola in Washington.

«« »»

Could teenagers be substituting mobile phones for cigarettes? Clive Bates, director of the U.K.'s **Action on Smoking and Health**, and Dr. Anne Charlton, an epidemiologist at the University of Manchester, think so. "We argue that the mobile phone is an effective competitor to cigarettes in the market for products that offer teenagers adult style, individuality, sociability, rebellion, peer group bonding and adult aspiration," they write in the November 4 issue of the ***British Medical Journal***. Among 15-year-old boys and girls in Britain, the proportion who smoked at least weekly fell from 30% in 1996 to 23% in 1999. Bates and Charlton link this to the dramatic rise in mobile phone ownership, which among Britons aged 15-24 has roughly doubled each year since 1997 and now exceeds 70%. Dr. Gerard Hastings, director of the **Center for Tobacco Control Research** in Glasgow, believes that the idea "is pure speculation," but "quite plausible" nonetheless. "You've got to recognize that kids use mobile phones in much the same way they use tobacco — for social reasons," Hastings told BBC-TV on November 3. Both products can be used "to look hip and cool," he said.

Mickey Mouse Will No Longer Be Used To Market Cell Phones

The Walt Disney Co. has stopped licensing its characters for use on cellular phones. In a November 22 statement, Disney stated that "the well-being of our customers is our first priority" and that this new policy would remain in effect "until there is reliable evidence establishing the absence of any [health] risks."

The Disney announcement came a day before the airing of *Cell Phones and Kids* on national television by ABC News. (Disney owns the ABC television network.)

Dr. Colin Blakemore of the U.K.'s Oxford University told ABC that it is "irresponsible" to use images of Mickey Mouse to sell mobile phones to children. Such marketing campaigns have stirred controversy in Australia and in the U.S. (see *MWN,* N/D99). Blakemore was a member of the Stewart panel in the U.K., which recommended that children be discouraged from using mobile phones (see *MWN,* M/J00).

Dr. John Moulder, of the Medical College of Wisconsin in Milwaukee and a frequent industry consultant, told ABC that he does not know of any evidence that children are at any greater risk from cell phones.

EMF NEWS

Sensitivity to Low-Level EMFs Is Real, Swiss Researchers Say

People can tell when they are being exposed to weak EMFs, according to researchers in Switzerland. But those who claim to be electrosensitive are no more able to detect such exposures than are "normal" controls.

Although many people complain that they experience distressing symptoms when close to EMF sources, most previous studies have found that under controlled conditions electrosensitive subjects cannot discern whether or not they are being exposed (see *MWN,* M/J00). These results are cited to support the view that electrosensitivity is a psychological — not physical — condition.

Researchers at the Institute for Hygiene and Applied Physiology at the Federal Institute of Technology (ETH) in Zurich disagree. "A purely psychosomatic reaction or placebo effect can be dismissed," concluded Dr. Helmut Krueger, Christopher Müller and Dr. Christoph Schierz in a paper presented at the Bioelectromagnetics Society's (BEMS) annual meeting in Munich last June. They provided further details of their work at an October 20 seminar at the ETH.

The team intermittently exposed 49 electrosensitive volunteers and 14 controls to 50 Hz EMFs at levels ranging from 40 mG to 60 mG. Neither the volunteers, who were awake, nor the researchers knew when the fields were switched on.

Both the electrosensitive and the control groups could tell when the field was on more often than would have been expected by chance — a finding with a high degree of statistical significance ($p=0.007$).

In each group, some volunteers had scores well above average. But the researchers stressed that these results do not support a difference between the two, since roughly the same fraction of each group discerned the fields. They cautioned that there were some inconsistencies. "Subjects could detect the fields at one time and not another," Müller told *Microwave News*.

In the second experiment, electrosensitive volunteers were exposed to 20-60 mG EMFs while sleeping in their own homes. The intermittent exposures lasted for roughly three weeks, and subjects did not know when the fields were switched on. Subjects awoke feeling significantly better and more alert when they had been exposed than when not. The exposures had no effect on sleep quality or the subjects' sense of well-being during the day.

In the third part of the project, the ETH team monitored 35 electrosensitive volunteers exposed to 20-60 mG fields while asleep at home, and found that six of them consistently moved away from the field when it was switched on. This result is also statistically significant. These findings suggest EMFs can be detected "either consciously or unconsciously," the researchers argued in a paper presented at the *3rd International Conference on Bioelectromagnetism* in Bled, Slovenia, in early October.

In this last experiment, Müller and colleagues also monitored heart rate and heart rate variability (HRV) and found no change during exposure.

The Swiss researchers have submitted a paper on the results with awake subjects to *Bioelectromagnetics*. Papers describing the sleep experiments and synthesizing all the project results are in progress, Müller said.

Childhood Cancer, Distance from Power Lines Not Linked in U.K.

Childhood leukemia is not related to distance from power lines in the U.K., according to the latest paper from the U.K. Childhood Cancer Study (UKCCS).

As in their previous report on measured magnetic fields (see *MWN,* N/D99 and J/F00), the investigators found no link between childhood leukemia and calculated magnetic field levels. The authors acknowledge, however, that the statistical power of the new analysis is "limited." For proximity alone, they also report no increase in risk.

Only 102 of the 6,770 children in the study lived within 50 meters of an overhead line of 11 kV or greater. Eighteen children had calculated magnetic field exposures of 2 mG or more from power lines or other sources outside their homes.

"We have now taken a hard look at whether the distance a child lives from power lines could be associated with cancer, and we find this not to be the case," said the study's lead investigator, Dr. Nicholas Day of the University of Cambridge.

One part of the paper attempts to address the theory advanced by Dr. Denis Henshaw of the University of Bristol, who holds that electric fields around power lines ionize molecules in the atmosphere and thus make cancer-causing pollutants more likely to adhere to human tissue (see *MWN,* M/A96, N/D99 and S/O 00). The new UKCCS analysis reports an odds ratio of 1.42 for acute lymphoblastic leukemia (ALL) among the 95 children who lived within 400 m of a 275 kV or 400 kV line (CI=0.85-2.37). The researchers acknowledge that they did not "consider the direction of the prevailing wind," an important part of Henshaw's hypothesis.

Henshaw told *Microwave News* that while this was only "a partial test" of his theory, the new data are quite consistent with it. Henshaw called the UKCCS finding "extremely interesting," and asserted that the risk was "just short of statistical significance."

The new UKCCS paper appears in the December issue of the *British Journal of Cancer (83,* pp.1573-1580, 2000); a paper on the UKCCS's overall methodology appeared in the March 2000 issue *(82,* pp.1073-1102, 2000).

The UKCCS data on measured magnetic fields were included in the pooled analysis of nine different studies led by Dr. Anders Ahlbom of the Karolinksa institute in Stockholm, which found a significant increase in risk at exposures above 4 mG (see *MWN,* S/O00).

IARC Cancer Review Set for June 2001 in Lyon

The International Agency for Research on Cancer (IARC) will assemble a working group to evaluate the cancer risk posed by static and extremely low frequency (ELF) EMFs in Lyon, France, June 19-26.

A group of 20-25 experts has been invited to review published work on exposure, dosimetry, epidemiology and animal experiments as well as other relevant data and to prepare a first draft of what will be an IARC *Monograph on the Evaluation of Carcinogenic Risks to Humans* of such fields. During the Lyon meeting, the document will be discussed and revised until an agreement is reached on the final contents of the monograph.

The National Institute of Environmental Health Sciences (NIEHS) followed a similar process for its EMF review in 1998. Using IARC's criteria, an NIEHS working group concluded that ELF EMFs are "possible human carcinogens" (see *MWN,* J/A98).

"Representatives of governments, regulatory agencies and other organizations are welcome to attend and participate in the discussions," IARC's Dr. Robert Baan, based in Lyon, told *Microwave News*. A summary will be posted on the IARC Web site soon after the meeting, Baan stated.

The World Health Organization is planning to set up a task group to evaluate noncancer health effects of static and ELF EMFs in 2002.

Weak EMFs Implicated in Tumor Promotion *(continued from p.1)*

coauthors, is a former chief of IARC's Unit of Multistage Carcinogenesis in Lyon, France.

"It's a serious study and we want to get confirmation," said Dr. Michael Repacholi, the head of the WHO's EMF project (see p.2). "You have to get an equally prestigious lab to replicate it," he said, adding that such a replication attempt needs to be completed by June when an IARC panel meets to consider the cancer risk posed by EMFs (see box above).

Some were quick to express their doubts, however. Even before the Trosko paper was published, Dr. Johnathan Kiel of the RF/MW team at Brooks Air Force Base in San Antonio cited it as a possible example of "phantom phenomena" in an opinion piece published in the July/August issue of the *Bioelectromagnetics Society Newsletter.*

The Trosko study was sponsored by EPRI in Palo Alto, CA. "We are in the process of trying to find another good and independent lab to see if we can replicate the results," said a spokesperson for Dr. Leeka Kheifets, who runs the EMF program for the electric utility research group.

Repacholi said that he is actively encouraging EPRI to repeat the study. But if EPRI does not, it is not clear who will. "Right now we are not doing any ELF studies," said Dr. Russell Owen, the chief of the radiation biology branch at the Food and Drug Administration in Rockville, MD. Nor is the National Institute of Environmental Health Sciences currently planning any follow-up work, according to Dr. Christopher Portier, the acting director of the NIEHS' Environmental Toxicology Program in Research Triangle Park, NC.

Trosko's group exposed an abnormal type of immature red blood cells to 60 Hz magnetic fields ranging from 10 mG to 10 G for four days and monitored how many cells differentiated — that is, how many evolved into a more mature, developed state. One of the hallmarks of a tumor promoter is the ability to block differentiation.

For exposures at 50 mG and higher, the EMFs caused a statistically significant ($p<0.001$) inhibition of differentiation. The MSU team found that the effect was dose-dependent with a maximum inhibition at approximately 50 mG.

Yamasaki told *Microwave News* that it is difficult to compare the action of EMFs to chemical promoters "because we have no clue for the mechanisms of action of EMFs."

Trosko said that he had been sufficiently confident that there would be no EMF response that he was reluctant to put one of his students on this project, explaining that no-effect studies do not help them find jobs.

This new experimental result is not the first to show an effect *in vitro* at very low magnetic field levels. In 1992, Dr. Robert Liburdy reported that EMFs can block the anti-cancer action of melatonin at 12 mG, a finding that has been repeated in four other labs (see *MWN*, J/A92, M/A96, J/A98 and J/A99).

Dr. James Trosko Talks with Microwave News

***MWN*:** Is it correct to interpret your new results as indicating that 60 Hz EMFs can act as a tumor promoter?

JT: Our results indicate that 60 Hz EMFs have some properties of known chemical tumor promoters, in that they can block cell differentiation. Whether they can actually act as tumor promoters would depend on whether they meet all the other criteria needed to actually be able to promote a preexisting initiated cell. Remember, our studies were not designed to test whether or not EMFs could be carcinogenic, but whether EMF exposure could induce a biological effect. Our results showed it could have a biological effect, but I stress that this does not necessarily mean that it would cause health effects, such as cancer.

***MWN*:** Were you surprised by the findings?

JT: Yes, indeed. I was surprised because our initial expectation was that there would be no biological effect. We ran the initial experiment 19 times and used several different endpoints — and then did several additional different kinds of experiments — just to convince ourselves that the results were reliable.

***MWN*:** Epidemiological studies have long pointed to the possibility that EMFs can act as cancer promoters. So, why were you skeptical that EMFs can have biological effects?

JT: The epidemiological studies did not convince me that there is a biological basis for ELF EMFs to influence human cancers. I believed that ELF EMFs could not induce DNA damage or cause mutations to initiate the cancer process. If ELF EMFs could have an influence anywhere in the complex process of carcinogenesis — that is, initiation, promotion and progression — it was most likely to affect promotion. Promotion involves the alteration of gene expression, but studies on the effects of ELF EMFs on gene expression have had mixed results.

***MWN*:** Why do you think you succeeded when so many others have failed to see anything at the 25-50 milligauss level?

JT: Promotion is a very complex process and not all promoting agents act the same way. The conditions have to be just right. The timing and duration of the exposures are very important. Another key factor is that one must exceed certain thresholds to overcome the natural suppression of uncontrolled cell proliferation. Lastly, the alteration of gene expression is not easily tested. There are as many reasons for failure as there are different experiments. I cannot say why others succeeded or failed. In our case, I guess we just chose the right biological system.

***MWN*:** How hard do you think it will be to determine the mechanism of EMF interactions?

JT: That, of course, is the next step. Since there are many signaling pathways — mechanisms by which a cell can be stimulated to proliferate, differentiate or die — it will take a stroke of genius or just a lot of hard work to uncover the one that ELF EMFs might affect.

***MWN*:** You found a fairly clean dose-response relationship. Did this help convince you that this was a real effect?

JT: Yes, of course! With other agents, such as chemicals, one normally looks for a dose relationship. In this case, the dose effect is really an exposure effect. That is, there is an exposure below which there seem to be no biological effects but above which there can be an effect.

***MWN*:** The EMF effect reached a maximum inhibition of cell differentiation at about 50 mG, which is quite low. What does that tell us?

JT: Quite frankly, I'm not sure because I still do not know the underlying mechanism by which the magnetic field can interfere with gene expression. It simply might be the minimum magnetic field exposure needed to induce an ionic current that could interfere with the signaling that occurs at the cell membrane.

***MWN*:** Have you asked EPRI, which sponsored your EMF study, to renew your grant?

JT: It was made clear last year, when EPRI renewed my grant, that it was very unusual for anyone to be supported for more than two years. I received funding for three years. Since the ELF EMF issue was taken off the "radar screen" last year after the National Academy of Sciences and RAPID reports, it is highly unlikely the National Institutes of Health [NIH] or the National Science Foundation [NSF] would fund this kind of research. I must move on to other areas of research.

***MWN*:** One of your conclusions is that more work needs to be done to find out whether ELF EMFs can act as a tumor promoter in humans. If you were a program manager at the NIH or the NSF, would you fund such studies?

JT: Putting our and other EMF findings in perspective, I would not support many more studies given the relative risks posed by many other potentially hazardous agents to which humans are exposed. Any such studies would have to be based on hypothesis-driven, biologically based, mechanistic ideas.

***MWN*:** So, do you think these EMF studies will get done?

JT: No.

How Telstra's Lawyers Quashed Medical Inquiry Into Mobile Phones and Headaches in Australia

In January 1995, Dr. Bruce Hocking, then the chief medical officer (CMO) of Telstra, Australia's state-controlled telecommunications company, set up neurological examinations for four employees who complained that they suffered headaches while using mobile phones. Soon afterwards, Hocking learned that Telstra's legal department had cancelled the appointments without informing him. On February 10, Hocking was told that his position had been abolished. He left Telstra, then known as Telecom Australia, in April 1995 after 18 years as its CMO. Three years later, Hocking raised his concerns about the company's conduct in a letter to Senator Richard Alston, the government minister in charge of the Department of Communications and the Arts. Alston's department was responsible for safeguarding the public against harmful effects of RF/MW radiation until July 1998, when the Department of Health assumed that responsibility. Alston has been an outspoken skeptic on possible health hazards of mobile phone radiation (see MWN, *M/A97 and M/J97). On September 22 of this year, Hocking, who is now an occupational health consultant based in Melbourne, cited the 1995 episode in testimony before the Australian senate's Committee on the Environment, Communications, Information Technology and the Arts, which is conducting a formal inquiry on mobile phones and health (see, most recently,* MWN, *S/O00). On October 3, Hocking sent the committee copies of his 1995 exchange with the Telstra legal department and his 1998 correspondence with Alston's ministry. These documents are excerpted below.*

March 1, 1998

Dear Minister,

I wish to raise with you an ethical issue that concerns Telstra.

I was previously the CMO to Telstra. I received several inquiries from people, including staff, who said they were experiencing adverse health effects when using mobile phones. I referred a group of such staff for an independent opinion by a professor of neurology. The appointments were cancelled by Telstra's legal department. I protested this action, as per the attached [memo dated February 27, 1995], but was ignored.

I have much thought about the correctness of Telstra's actions and have now decided to seek your views.

Yours sincerely,
Bruce Hocking

Hocking sent Alston a copy of his February 1995 memo to Jane Slatter, the head of Telstra's legal department, questioning the cancellation of the neurological exams, as well as Slatter's response, dated March 9.

February 27, 1995

To: Jane Slatter, Group General Counsel

Following the phone conversation of Tuesday 14th February, I note the following regarding the four staff who have recently complained of headaches/facial symptoms after using mobile phones.

1. These kinds of symptoms were first noted two years ago by three other staff. A neurologist did not find consistency in relation to phones.

2. Subsequently I have spoken to about four customers with similar complaints and have been impressed at their sincerity and cohesive history. I am persuaded there may be an effect which warrants investigation. I disagree that headaches are "nebulous" symptoms. Whilst they are common, good history taking can reveal diagnostic patterns.

3. The four staff have produced written statements which give rise for concern and in my view should be taken seriously. I believe referral to a neurologist, as with the first three cases, is appropriate.

4. Any protocol for managing complaints should be employee/customer centered, not phone centered, as the best way of managing risk for the individual and the company.

5. I sense a strong conflict of interest in these matters between our duties to the shareholder, the employees and our customers. I believe this is an appropriate matter to refer to the Telstra ethics committee.

Please discuss further.

Dr. Bruce Hocking, Chief Medical Officer

March 9, 1995

To: Dr. Bruce Hocking, CMO

...I hope to be able to address the issues set out in your memorandum by early next week.

Regards,
Jane Slatter, Group General Counsel

Hocking did not supply the senate committee with any further correspondence from Slatter in response to his memo. In July 1998, Hocking received a reply to the letter that he had sent Alston that March.

July 13, 1998

Dear Dr. Hocking,

I refer to your letter of March 1, 1998....The minister has asked me to respond on his behalf. I apologize for the delay in responding....

Telstra has advised that in early February 1995 the Telstra Electromagnetic Radiation (EMR) Steering Committee endorsed a strategy for handling complaints about headaches related to the use of mobile phones, which involved referral to the Manager, National Health, Safety and Environment Branch for assessment by appropriate experts, such as an ergonomist. The strategy then required that information arising from that assessment was to be provided to the CMO who would, if appropriate, arrange for a medical examination.

Telstra has further advised that appointments were made for four staff to attend a neurologist in mid-February but they were cancelled following intervention by the Legal Directorate on the basis that the referral to a neurologist at that point was inconsistent with the endorsed strategy....

While the information supplied by you (and supported by Telstra's records) makes it clear that there was some dispute between you and other Telstra employees about the appropriate handling of these cases, it is not obvious that the other employees were seeking to avoid a proper examination of the health issues raised by the employee complaints....

Yours sincerely,
John Neil, Assistant Secretary
Enterprise and Radiocommunications Branch
Department of Communications and the Arts

July 25, 1998

Dear Mr. Neil,

Thank you for your letter (July 13, 1998)....I would like to make the following comments....

Medical Matters. The Telstra procedure for having health complaints assessed to see if they should be referred to the chief medical officer is absurd. Only a doctor can properly assess health complaints, not an ergonomist or lawyer etc. I was not consulted about such a procedure allegedly developed in February 1995 when I was CMO (and would not have agreed to it).

Process. It is acknowledged by Telstra that the appointments for four staff to attend a neurologist were cancelled by the Legal Directorate on the grounds of process. However since the CMO had already determined that there was reason to send the staff for expert opinion this should have outweighed the views of other nonmedical staff and the referrals proceeded. Did the four staff eventually see a neurologist? If not, I do not consider the Department should accept that Telstra has good processes in place to monitor health issues associated with RFR.

I would be interested in the Minister's views on the above and would be pleased to discuss it further if you wish.

Yours sincerely,
Bruce Hocking

This time, Neil's reply was more direct.

August 17, 1998

Dear Dr. Hocking,

....Comcare Australia reviewed Telstra's handling of the health complaints from staff in 1995, as raised in your letter, and concluded that Telstra appeared to have met its obligations under the Occupational Health and Safety (Commonwealth Employment) Act....

Yours sincerely,
John Neil

Very recently, Hocking offered his view of the episode in a letter to the Australian Senate committee investigating mobile phone safety. The letter accompanied the documents excerpted above.

October 3, 2000

...I consider it irrational to claim the appointments I made in early January 1995 were cancelled because of failure to follow an "endorsed strategy" since such a process did not then exist and was only being drafted in March....Moreover, line management has the legal duty of care with regard to [occupational health and safety] of staff and the referrals had been approved by their [human resources] manager, so a proper process had been followed....

Yours sincerely,
Bruce Hocking

Hocking was one of the first to draw attention to reports of headaches among mobile phone users, along with researchers in the U.K. and Sweden (see MWN, *N/D95). Since then, he has collected and analyzed more than 40 such reports (see* MWN, *M/J97) — not including the four Telstra employees. In his testimony on September 22, 2000, Hocking stated that government agencies are having "great difficulty" getting reports of health problems among phone users. He added that he is "not aware of companies having detailed investigation procedures" for such complaints. Transcripts of hearings from the senate inquiry on mobile phones and health, including Hocking's testimony, are available as PDF files at: <www.aph.gov.au/hansard/senate/commttee/s-ecita.htm>.*

In addition to Hocking's paper, reports linking mobile phone use to headaches include an epidemiological study in Norway and Sweden (see MWN, *M/J98 and J/A00), clinical case studies from the U.K. (see* MWN, *J/A00) and survey data from Singapore (see p.13 and* MWN, *J/A00).*

Across the Spectrum

"Wherever we go, we will be immersed in a sea of low-level, pulsed microwave signals."

— Dr. Ross Adey, professor of neurology, Loma Linda University School of Medicine, CA, quoted by David Kirkpatrick in "Q: 5, 10, 25 Years Out — What Impact Will Broadband Technology Have on Business, on Society, on the Way We Live?" *Fortune,* Special Issue on the Future of the Internet, p.266, October 9, 2000

"I, too, tell my son that he should not hold his cell phone next to his head for so long."

— The unnamed CEO of a large Swiss telecom company, quoted by André Kienzle in "Mobile Phone Antennas: A Rift Runs Through the Country" (in German), *Cash* (Switzerland), November 3, 2000

"A lot of new towers will be built in core markets."

— Steven Dodge, CEO, American Tower Corp., Boston, at the *3rd Annual Tower Summit and Trade Show,* October 29-November 1, Las Vegas. He expects at least three broadband tenants on each of his company's towers by 2005. Quoted by Hilary Smith in "Tower Companies Sitting on Top of Mountain," *RCR Wireless News,* p.1, November 6, 2000

"A result of [the] phenomenal growth [in the complexity of microprocessor chips] has been the steadily decreasing power at which electronic devices are susceptible to severe disruption and damage. This steadily lowering threshold brings tears of joy to HPM-weapon designers."

— Fred Levien, "Directed Energy," *Journal of Electronic Defense,* p.44, November 2000 (see p.16)

Mobile Phones and Health: Three U.S. News Magazines Weigh In

Get an earpiece. Make sure the antenna is outside your car. Hang up when signal strength is bad.

— Claudia Kalb and Karen Springen in "Is Your Cell Really Safe? Worries About a Link Between Cell Phone Radiation and Brain Cancer Still Can't Be Dismissed, Says a New Study," *Newsweek,* p.63, August 7, 2000

Quit worrying. Scientists familiar with the research — even some of those responsible for the disturbing findings — generally say users can rest easy.

— Stacey Schultz and Kenneth Terrell in "Could Your Phone Cause Cancer? Don't Get Hung Up on It," *U.S. News & World Report,* p.54, August 28, 2000

Can your cell phone really give you cancer? The best answer science can offer so far is maybe. Researchers have discovered that cell-phone radiation can cause subtle, short-term biological effects in humans...but their full significance remains to be determined.

— John Greenwald in "Do Cell Phones Need Warnings?" *Time,* p.67, October 9, 2000

Hot New Papers

Sin-Eng Chia, Hwee-Pin Chia and Jit-Seng Tan, "Prevalence of Headache Among Hand-Held Cellular Telephone [HP] Users in Singapore: A Community Study," *Environmental Health Perspectives, 108,* pp.1059-1062, November 2000.

"Headache was the most prevalent symptom among HP users compared to non-HP users, with an adjusted prevalence rate ratio of 1.31 (CI=1.00-1.70). There is a significant increase in the prevalence of headache with increasing duration of usage (in minutes/day). Prevalence of headache was reduced by more than 20% among those who used hands-free equipment for their cellular telephones as compared to those who never use the equipment. The use of HPs is not associated with a significant increase of CNS symptoms other than headache." (These authors also have a letter on headaches in the November 4 *British Medical Journal, 321,* p.1155-1156, 2000; see also p.11 and *MWN,* J/A00.)

Sander Greenland et al., "A Pooled Analysis of Magnetic Fields, Wire Codes and Childhood Leukemia," *Epidemiology, 11,* pp.624-634, November 2000.

"We obtained original individual data from 15 studies of magnetic fields or wire codes and childhood leukemia....[I]f an effect exists below 0.2 ∝T [2 mG], it is probably too small to reach consensus about it via epidemiologic investigation alone. In contrast, both our categorical and trend analyses indicate that there is some association comparing fields above 0.3 ∝T [3 mG] to lower exposures, although there are as yet insufficient data to provide more than a vague sense of its form and its possible sources. We believe individual-level studies that focus on highly exposed populations would be needed to clarify this association." (See *MWN,* S/O99 and S/O00.)

Glen Reeves, "Review of Extensive Workups of 34 Patients Overexposed to Radiofrequency Radiation," *Aviation, Space and Environmental Medicine, 71,* pp.206-215, March 2000.

"Our extensive psychological evaluation and psychometric testing of patients found several patients who complained of fatigue, generalized weakness, irritability, decreased memory and concentration, and weight changes. However, these seem to reflect a personal 'coping style' of long duration or else manifestation of pre-exposure organic dysfunction, rather than an acute change attributable to RFR overexposure. The Soviet and East European studies were concerned with chronic exposures at low levels of RFR, while our study focused on people with documented single [permissible exposure level] excesses."

Joyce Nicholas et al., "Flight Deck Magnetic Fields in Commercial Aircraft," *American Journal of Industrial Medicine, 38,* pp.548-554, November 2000.

"Magnetic fields measured on the flight decks of four aircraft types during normal commercial operation varied with type of aircraft, stage of flight and pilot location. The similarity between broadband [40-800 Hz] and harmonic [100-800 Hz] resultant values suggests that the fields being measured lay in the harmonic range. The higher harmonic frequencies could have biological significance in that higher frequencies

Spotlight on Mobile Phone Dosimetry in IEEE Collection

Research groups from around the world working on mobile phone SARs have contributed papers for a special issue of the *IEEE Transactions on Microwave Theory and Techniques*.

The journal's November issue has two parts: One features 29 papers on the "Medical Application and Biological Effects of RF/MW." The other has 15 papers on "RF/MW Applications in Medicine."

In addition to the papers on mobile phone dosimetry, the biomedical collection also includes new details of the U.K.'s Dr. David de Pomerai's studies on nonthermal heat shock responses in worms and some preliminary results on 60 GHz effects on mice by France's Dr. André Bellossi.

The tables of contents for both parts are at: <www.ieee.org/organizations/pubs/pub_preview/mtt_toc.html>.

"Microwave News" Flashback

Years 15 Ago

• A Texas jury orders Houston Lighting & Power Co. to pay Klein Independent School District more than $25 million for "reckless disregard" of children's health in siting a 345 kV power line across school property.

• The Centers for Disease Control recommend an "intensive examination" of the elevated rate of Down's Syndrome in Vernon, NJ—home to a large number of satellite uplink stations.

• Researchers at the New York State Department of Health Laboratories in Albany find that 9 weeks of exposure to 60 Hz EMFs alters the balance of neurotransmitters in monkeys.

Years 10 Ago

• The U.S. government delays the public release of the EPA's draft assessment on EMFs and cancers. Commenting on the draft, the Air Force states that it remains "convinced" that EMFs do not induce or promote cancer.

• Two separate $25 million lawsuits are filed in New York by an electrician and a former U.S. Navy radar technician who claim they developed cancer from on-the-job exposure to RF/MW radiation.

• California's Public Utilities Commission instructs Southern California Edison Co. to follow a policy of prudent avoidance and limit EMFs from 220 kV power lines in the Mojave Desert.

Years 5 Ago

• Gerald Corcoran, lead defense attorney for Atlantic Electric Co. in NJ in an EMF cancer lawsuit, drops out of the case after receiving death threats, which the utility alleges came from plaintiff John Altoonian.

• Sweden becomes the first country to adopt a national policy of prudent avoidance to limit human exposure to EMFs.

• Scientists in Australia, Sweden and the U.K. report that an increasing number of people are complaining about getting headaches while using mobile phones for short periods of time (see p.11).

induce stronger currents in human tissues. Total block time [the time from when the plane leaves the gate before takeoff until the plane returns to the gate after landing] exposure to the pilots, including time spent in bunks, lavatories or passenger compartments, varies in terms of geometric harmonic mean as follows: Boeing 737/200 (analog technology), 12.7 mG; Boeing 747/400 (CRT technology), 11.0 mG; Airbus 320 (CRT technology), 8.1 mG; and Boeing 767/300ER (mixed analog and CRT), 6.7 mG."

Kari Jokela, "Restricting Exposure to Pulsed and Broadband Magnetic Fields," *Health Physics, 79,* pp.373-388, October 2000.

"The exposures measured inside the magnetic-type anti-theft gates were also relatively high. The peak limits for the general public, and in some cases even the occupational limits, were exceeded. High exposures were also measured outside the gate, because in most cases there is no shield that prevents the spreading of the field outside. For the general public, the exposure is short and incidental, but a permanent exposure close to the occupational reference levels is possible when the cash desk is located within 1 m of the gate, which is not an uncommon situation. In the case of metal detector gates, the measured peak magnetic fields inside the gate exceeded the general public reference levels, but remained below the occupational levels."

R. Eveson, G. Timmel, B. Brocklehurst, P. Hore and K. McLauchlan, "The Effects of Weak Magnetic Fields on Radical Recombination Reactions in Micelles," *International Journal of Radiation Biology, 76,* pp.1509-1522, November 2000.

"In some cases, weak magnetic fields (less than about 1 mT [10 G]) have been shown to influence the concentrations of the radicals that escape geminate [pair] recombination within the micelle and become free radicals in the surrounding medium....It is clear that the effect of a modest applied magnetic field is strongly dependent on the structure, dynamics and volume of the space in which the radicals are confined....It is barely conceivable that biological systems in general are so finely balanced that a small change in radical concentration might have a direct effect. However in the presence of an efficient amplification mechanism, the situation could change, as it might if a field was applied to a system in which the defense mechanism was already severely challenged."

World Health Organization Working Group, "Evaluation and Use of Epidemiological Evidence for Environmental Health Risk Assessment: WHO Guideline Document," *Environmental Health Perspectives, 108,* pp.997-1002, October 2000.

"These guidelines identify a set of processes and general approaches to assess available epidemiological information in a clear, consistent and explicit manner. The guidelines should also help in the evaluation of epidemiological studies with respect to their ability to support risk assessment and, consequently, risk management."

Sandra Cecconi et al., "Evaluation of the Effects of Extremely Low Frequency Electromagnetic Fields on Mammalian Follicle Development," *Human Reproduction, 15,* pp.2319-2325, November 2000.

"Pre-antral follicles were cultured for five days and exposed to [15 G, square-wave] ELF EMFs at...33 or 50 Hz. ELF EMF application did not affect follicular growth over a three-day culture period, but on day five the growth of 33 Hz-exposed follicles was significantly reduced when compared with controls, while the 50 Hz-exposed follicles were not significantly affected. However, ELF EMFs severely impaired antrum formation at both frequencies....These results suggest that ELF EMF exposure might impair mammalian female reproductive potentiality by reducing the capacity of the follicles to reach a developmental stage that is an essential prerequisite for reproductive success."

Letters to the Editor

Johns Hopkins Attorney Clarifies Suder Law Firm Award

October 18, 2000

To the Editor:

I am quite disturbed by the last sentence in "Baltimore Doctor Files Cell Phone–Brain Cancer Lawsuit" *(MWN,* S/O00), which states that the plaintiff's attorney, Joanne Suder, "won a $2.5 million judgment against Johns Hopkins Hospital" in an unrelated case. You omitted several important facts which I stated when I was interviewed.

First, the $2.5 million was not a judgment. A jury returned a verdict for that amount. We have filed post-trial motions asking that the verdict be set aside or reduced. The judge has not yet ruled on those motions, but she must reduce the verdict to $350,000 to reflect the cap on non-economic damages as required by Maryland law.

Second, Joanne Suder did not win the verdict because she did not try the case herself. Another attorney employed by her firm handled the trial from start to finish.

I do not see the purpose in your having to include the sentence about the Hopkins case at all, unless you are attempting to legitimize Ms. Suder's law practice. Whether that be the motivation or not, you should at least get the facts straight if you put otherwise irrelevant information into the article in your publication.

Richard Kidwell
Managing Attorney, Claims/Litigation
Johns Hopkins Health System Corp.
600 N. Wolfe St., Baltimore, MD 21287
(410) 955-7949

An earlier draft of the article included the facts noted by Mr. Kidwell, but space limitations forced us to edit the story for length. As Suder's firm launches a set of cell phone lawsuits, some of which may be tried before juries in other states (see p.7), we believe that the firm's record in other personal injury cases is relevant.

Australia's Bruce Hocking on Mobile Phone Case Report

October 21, 2000

To the Editor:

The "Wireless Note" in *Microwave News* (S/O00) re our paper* on permanent dysaesthesiae in a mobile phone user misses the critical point that we found associated neurological changes in two anatomically separate nerve root distributions (trigeminal and cervical) on the scalp on the affected side in the area exposed to fields from the phone. Therefore the unpleasant feelings he felt were not "all in the mind," and the phone was likely causal.

Bruce Hocking, MD
9 Tyrone St., Camberwell, VIC 3124, Australia
(61+3) 9809-1096; E-mail: <bruhoc@connexus.net.au>

*Bruce Hocking and Rod Westerman, "Neurological Abnormalities Associated with Mobile Phone Use," *Occupational Medicine, 50,* pp.366-368, July 2000.

2001 Conference Calendar (Part I)

Part II will appear in our next issue.

January 8-11: **International Union of Radio Science (URSI) National Radio Science Meeting,** University of Colorado, Boulder, CO. Contact for Commission K, Electromagnetics in Biology and Medicine: Dr. Frank Barnes, University of Colorado, Boulder, CO 80303, (303) 492-8225, E-mail: <frank.barnes@colorado.edu>, Web: <cires.colorado.edu/ursi>.

January 10-14: **20th Annual Meeting of the Society for Physical Regulation in Biology and Medicine (SPRBM),** Embassy Suites Hotel, Charleston, SC. Contact: Gloria Parsley, 2412 Cobblestone Way, Frederick, MD 21702, (301) 663-4556, Fax: (301) 694-4948, E-mail: <gloriaparsley@aol.com>, Web: <www.SPRBM.org>.

January 15-17: **WHO/Israel Government Seminar: Bioeffects and EMF Standards Harmonization,** Contact: Dr. Ehud Ne'eman, Sacker Medical School (7th fl.), Tel Aviv University, Ramat-Aviv 69978, Tel Aviv, Israel, (972+3) 641-4807, Fax: (972+3) 642-9883, E-mail: <env_rad@netvision.net.il> or <shaiela_k@yahoo.com>, Web: <www.who.int/peh-emf/meetings.htm>.

January 28-February 1: **2001 IEEE Power Engineering Society (PES) Winter Meeting,** Hyatt Regency, Columbus, OH. Contact: Dr. Tai Wong, AEP, 700 Morrison Ave., Gahanna, OH 43230, (614) 883-7235, Fax: (614) 883-7222, E-mail: <twong@aep.com>.

February 9: **Extremely Low Frequency Electromagnetic Fields Interactions with Living Matter.** Workshop organized by the Bioelectromagnetics Society (BEMS), Catholic University of America, Washington, DC. Contact: Dr. Ewa Czerska, (301) 594-1212, ext.119, E-mail: <emc@cdrh.fda.gov> or Dr. Lee Rosen, (301) 435-1171, E-mail: <lu2@cu.nih.gov>.

February 20-22: **14th International Zurich Symposium & Technical Exhibition on Electromagnetic Compatibility (EMC Zurich '01),** Federal Institute of Technology, Zurich, Switzerland. Contact: Dr. Gabriel Meyer, ETH Zentrum, IKT-ETF, CH-8092 Zurich, Switzerland, (41+1) 632-2790, Fax: (41+1) 632-1209, E-mail: <gmeyer@nari.ee.ethz.ch>, Web: <www.emc-zurich.ch>.

March 7-9: **WHO/Peru Government: Americas Regional Seminar on Bioeffects and EMF Standards Harmonization,** Lima, Peru. Contact: Dr. Michael Repacholi, WHO, Avenue Appia 20, 1211 Geneva 27, Switzerland, Fax: (41+22) 791-4123, E-mail:<repacholim@who.int>, Web: <www.who.int/peh-emf/meetings.htm>.

March 16-21: **2001 Annual Meeting of the Environmental Mutagen Society (EMS),** Paradise Point Resort, San Diego, CA. Contact: David DeMarini, U.S. EPA, 86 Alexander Dr., MD-68, Research Triangle Park, NC 27711, (919) 541-1510, Fax: (919) 541-0694, E-mail: <demarini.david@epa.gov>, Web: <www.ems-us.org/meetings>.

March 22-23: **The Radio Frequency Spectrum: Managing Community Issues,** Coogee Beach Holiday Inn, Sydney, Australia. Contact: Prof. Marcela Bilek or Prof. David McKenzie, Dept. of Applied Physics, University of Sydney, Australia, (61+2) 9351-2351, Fax: (61+2) 9524-1744, E-mail: <M.Bilek@Physics.usyd.edu.au> or <rfspectrum@magicdatabases.com>, Web: <www.cfi.unsw.edu.au/rfconference.html>.

March 26-28: **40th Annual Meeting of the Society of Toxicology (SOT),** Moscone Center, San Francisco, CA. Contact: SOT, 1767 Business Center Dr., Ste. 302, Reston, VA 20190, (703) 438-3115, ext.326, Fax: (703) 438-3113, E-mail: <clarissa@toxicology.org>, Web: <www.toxicology.org>.

April 2-4: **International Symposium on Electromagnetics in Biology and Medicine,** sponsored by URSI Commission K, Electromagnetics in Biology and Medicine, University of Tokyo, Japan. Contact: Dr. Shoogo Ueno, Dept. of Biomedical Engineering, Graduate School of Medicine, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan, (81+3) 5841-3563, Fax: (81+3) 5689-7215, E-mail: <ueno@medes.m.u-tokyo.ac.jp>.

April 9-11: **American Power Conference 2001,** Marriott Downtown, Chicago, IL. Contact: Conference Coordinator, 1421 S. Sheridan Rd., Tulsa, OK 74112, (918) 831-9160, Fax: (918) 831-9161, E-mail: <apcconf@pennwell.com>, Web: <www.apc-pennwell.com>.

April 17-20: **11th International Conference on Antennas and Propagation (ICAP 2001),** University of Manchester Institute of Science and Technology, Manchester, U.K. Contact: ICAP Secretariat, Institution of Electrical Engineers (IEE), Savoy Pl., London WCR2 OBL, U.K., (44+207) 344-8425, Fax: (44+207) 240-8830, E-mail: <icap@iee.org.uk>, Web: <www.iee.org.uk/Conf/ICAP>.

April 20-27: **2001 American Occupational Health Conference (AOHC),** Moscone Convention Center, San Francisco, CA. Contact: Betty Kehler, c/o SLACK Inc., 6900 Grove Rd., Thorofare, NJ 08086, (856) 848-1000, ext.381, Fax: (856) 848-3522, E-mail: <bkehler@slackinc.com>, Web: <www.slackinc.com/exhibits/aohc>.

April 21-26: **National Association of Broadcasters Annual Convention (NAB 2001),** Las Vegas, NV. Contact: Ann Marie Cumming, 1771 N St., NW, Washington, DC 20036, (202) 429-5476, Fax: (202) 429-4199, E-mail: <irc@nab.org>, Web: <www.nab.org>.

April 21-27: **9th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine (ISMRM)** and **18th Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB),** Glasgow, Scotland, U.K. Contact: ISMRM, 2118 Milvia St., Ste. 201, Berkeley, CA 94704, (510) 841-1899, E-mail: <info@ismrm.org>, Fax: (510) 841-2340, Web: <www.ismrm.org>, <www.esmrmb.org>.

April 29-May 2: **33rd National Conference on Radiation Control,** Anchorage, AK. Contact: Lin Carigan, Conference of Radiation Control Program Directors, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543, Fax: (502) 227-7862, E-mail: <pgorman@crcpd.org>, Web: <www.crcpd.org>.

April 30-May 4: **1st International Seminar: Measurements and Criteria for Standards Harmonization in the Field of EMF Exposure,** Varna, Bulgaria. Contact: Dr. Michel Israel, National Center of Hygiene, 15 Dimiter Nestorov St., Sofia 1431, Bulgaria, (359+2) 596-154, Fax: (359+2) 958-1277, E-mail: <M.Israel@nch.aster.net>, Web: <www.who.int/peh-emf/meetings.htm>.

May 1-3: **2001 IEEE Radar Conference,** Westin at Perimeter, Atlanta, GA. Contact: Dr. Mark Richards, Georgia Tech Research Institute, SEAL, 7220 Richardson Rd., Smyrna, GA 30080, (770) 528-7758, Fax: (770) 528-7728, E-mail: <mark.richards@gtri.gatech.edu>, Web: <www.atlaessgrss.org/radarcon2001>.

May 13-17: **2001 URSI International Symposium on Electromagnetic Theory,** Victoria, Canada. Contact: Pierre Lamoureux, National Research Council, 1500 Montréal Rd., Bldg. M-19, Ottawa, Ontario K1A 0R6, Canada, (613) 993-9431, Fax: (613) 993-7250, E-mail: <URSI-B2001@nrc.ca>, Web: <www.nrc.ca/confserv/URSI-B2001>.

May 20-23: **2nd International Symposium on Nonthermal Medical/Biological Treatments Using Electromagnetic Fields and Ionized Gases (ElectroMed 2001),** Renaissance Portsmouth Hotel, Portsmouth, VA. Contact: Nell Reece, Eastern Virginia Medical School, (757) 668-6406, Fax: (757) 668-6476, E-mail: <electromed2001@ece.odu.edu>, Web: <www.ece.odu.edu/electromed2001>.

May 20-25: **IEEE Microwave Theory and Techniques Society (MTT-S) International Microwave Symposium (IMS2001),** Phoenix, AZ. Contact: Prof. Samir El-Ghazaly, Dept. of Electrical Engineering, Arizona State University, PO Box 877206, Tempe, AZ 85287, (480) 965-5322, Fax: (408) 965-8325, E-mail: <sme@asu.edu>.

June 2-7: **American Industrial Hygiene Conference & Expo,** New Orleans, LA. Contact: Carol Tobin, AIHA, 2700 Prosperity Ave., Ste. 250, Fairfax, VA 22031, (703) 849-8888, Fax: (703) 207-3561, E-mail: <ctobin@ aiha.org>, Web: <www.aiha.org/constaff.html>.

June 4-9: **4th International Kharkov Symposium on Physics and Engineering of Millimeter and Submillimeter Waves,** Kharkov, Ukraine. Contact: MSMW 2001, c/o IRE NASU, 12 Ac. Proskura St., Kharkov 61085, Ukraine, (380+572) 441-105, E-mail: <msmw2001@ire.kharkov.ua>, Web: <ire.kharkov.ua/MSMW2001/msmw.htm>.

June 10-14: **23rd Annual Meeting of the Bioelectromagnetics Society (BEMS),** Radisson Hotel, St. Paul, MN. Contact: Dr. John Male, 2412 Cobblestone Way, Frederick, MD 21702, (301) 663-4252, Fax: (301) 694-4948, E-mail: <BEMSoffice@aol.com> and <bems@delasallecenter.org>, Web: <www.bioelectromagnetics.org>.

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UPDATES

EMI FROM ANTI-THEFT SYSTEMS

FDA Asks for Posting of Signs... The FDA is recommending that retailers post signs advising customers if they are near an electronic anti-theft system. Such security systems, often hidden from view, have been reported to cause electromagnetic interference (EMI) with implanted medical devices (see *MWN,* S/O 97 and N/D98). "The FDA believes that implant wearers should be notified whenever and wherever electronic anti-theft systems are in use," the FDA's Center for Devices and Radiological Health in Rockville, MD, stated in a letter to manufacturers. It asked the companies to provide retailers with signs or labels not only when new systems are installed, but also to all those with anti-theft systems already in operation. The agency's advice, which is not binding, called for language such as ELECTRONIC ANTI-THEFT SYSTEM IN USE, with signs to be visible "before an individual enters the monitored area." This will help implant wearers to "avoid lingering around or leaning on such systems," both of which increase the risk of EMI, the FDA said. "We endorse this recommendation," said Lee Pernice, spokesperson for Sensormatic in Boca Raton, FL, a leading maker of anti-theft devices. This stand represents a turnaround for Sensormatic, which had not supported earlier proposals from cardiologists such as Drs. Michael McIvor and Peter Santucci for the posting of signs (see *MWN,* S/O98 and N/D98). Sensormatic consultant Dr. Warren Harthorne told an FDA committee in 1998 that, "If you start placing signs in stores, you're going to have a rash of hysterical patients who will then have symptoms that they never would have had otherwise." But this November Pernice told *Microwave News* that the company's opposition had not been to signs *per se,* but only to "putting up *warning* signs." McIvor, whose practice is in St. Petersburg, FL, told *Microwave News* he was pleased by the FDA's statement: "It's definitely a step in the right direction." He said his most recent research has shown that "the pulsing of the signal is the key variable" in the likelihood of interference. The FDA letter, issued August 15, cited past reports of anti-theft systems causing EMI with pacemakers, neurological stimulators and implantable defibrillators, with consequences that included serious pain and even unconsciousness. The FDA noted, however, that the chance of interference is very low and that most interactions have "little or no significant effect on implant wearers." The agency's letter is available on the Web at <www.fda.gov/cdrh/comp/guidance/1170.pdf>, or by calling (800) 899-0381 and asking for document shelf number 1170.

EMP WEAPONS

Concerns over EMP Attack... The U.S. Congress wants a new assessment of the risks posed by electromagnetic pulse (EMP) weapons. In the defense appropriations bill signed into law on October 30, the Department of Defense and the Federal Emergency Management Agency are directed to set up a nine-member commission to evaluate the threat to military and civilian electronics of an EMP attack by Russia, China, North Korea or other potentially hostile states. Last year, Reps. Roscoe Bartlett (R-MD) and Curt Weldon (R-PA) each held hearings on U.S. vulnerability to EMP weapons (see *MWN,* N/D99). "A member of the Russian Duma recently told me, 'You know if we really

wanted to hurt you, we would set off an atomic weapon at high altitude above your country and produce an EMP that would destroy your entire electrical power grid, computers and telecommunications infrastructure including satellites'," Bartlett said at his hearing in June 1999. Bartlett was the lead author of the provision establishing the commission. Worries about EMP were widespread during the 1980s, and during those years the military spent billions of dollars "hardening" its systems against EMP. In 1984, the National Academy of Sciences issued a detailed assessment of the EMP threat (see *MWN,* S84). The new commission's report is due in early 2002.

MEDICAL APPLICATIONS

Warning on Microwave Prostate Shrinker... Devices like the Prostatron, which use microwaves to shrink an enlarged prostate gland, can cause serious thermal injuries, according to the FDA. In an October 11 "Public Health Notification," FDA's Center for Devices and Radiological Health (CDRH) outlines 16 reports of microwave-related burns: ten cases of intestinal damage, some requiring a colostomy, and six cases of "clinically significant tissue damage to the penis," leading in at least one instance to "partial amputation." Enlargement of the prostate, or benign prostatic hyperplasia, becomes increasingly common with advancing age. It occurs in 10% of 40-year-old men, but in 80% of 80-year-olds. Since 1996, some 25,000 treatments have been performed in the U.S. with the Prostatron, made by EDAP Technomed Inc. in Burlington, MA (see *MWN,* M/J96), and a similar device also approved by the FDA. An antenna contained in a urethral catheter irradiates the prostate, heating it to temperatures greater than 113˚F (45˚C) and eliminating excess tissue (see *MWN,* N/D95). Among the factors the CDRH identifies as contributing to injuries are incorrect placement of the device and overuse of anesthesia, which limits the patient's "ability to communicate pain." In its recommendations, the CDRH stresses that the doctor should remain with the patient throughout the 30- to 60-minute procedure and reduce or interrupt the radiation if "the patient complains of excessive pain or anything unusual occurs." The full text of the CDRH advisory is on the Internet at <www.fda.gov/cdrh/safety/bph.html>.

PEOPLE

Dr. **Charles Polk** died on November 6 at the age of 80. Born in Austria, Polk taught at the University of Rhode Island, Kingston, for over 40 years. He was chair of its department of electrical engineering from 1959 to 1979. During that time, he also served as acting director of the engineering division at the National Science Foundation in Washington. A former president of the Bioelectromagnetics Society, Polk was a member of the 1998 NIEHS Working Group on EMFs and had been invited to play a similar role for IARC next summer (see p.9). He is perhaps best known as the coeditor of the *CRC Handbook of Biological Effects of Electromagnetic Fields,* now in its second edition. The family has requested that donations in his memory be sent to the Center for Victims of Torture, located in Minneapolis. Charles Polk was a good friend to *Microwave News* and we join the many others who mourn his passing.

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As We Go to Press

German Tower Study Inconclusive

A two-year study of the effects of mobile phone radiation on dairy cattle in Germany has yielded no conclusive findings, according to a report released at the end of November.

University researchers compared the behavior, milk output and reproductive health of herds at 38 farms, some near wireless base stations and some not (see *MWN,* J/A98). A review panel agreed that the study failed to control for possible confounders, including variations in breeds and the impact of a viral infection.

In August, a national TV news program described the study's findings as "explosive," a claim that was denied by the state government of Bavaria, which directed the study (see *MWN,* S/O00).

Australian Phone–DNA Study Flap

The Australian government will not pursue findings suggesting that mobile phone radiation promotes DNA repair, according to press reports. Dr. Pamela Sykes of Flinders University in Adelaide found that mice exposed to 900 MHz radiation for 30 minutes daily for 25 days had less DNA damage, the *Sydney Morning Herald* reported on November 29.

A spokesperson for the National Health and Medical Research Council (NHMRC) told the *Herald* that the study was discontinued because the results did not support Sykes's original hypothesis — that radiation exposure would *increase* DNA changes.

Sykes's research was sponsored under the government's five-year, Aus$4.5 million investigation of phone safety (see *MWN,* N/D 96 and J/A98; for more on apparent beneficial effects, see p.4).

Keeping Current: Follow-Up on the News

◆ On December 8, the U.K. Department of Health announced that it will sponsor £7 million (about $10 million) of research on the possible health effects of mobile phone radiation. On the same day, it released two leaflets. *Mobile Phones and Health* highlights the uncertainties about health risks of mobile phones and discourages their use by children. The second leaflet addresses base stations. The leaflets are at: <www.doh.gov.uk/mobilephones/index.htm>.

◆ Results of the NCI's epidemiological study of wireless phone use and brain cancer are expected "by the end of this year or early next year," according to the September 20 *Journal of the National Cancer Institute*. NCI's Dr. Peter Inskip noted that it may still be too early to assess long-term risks of cellular phone use.

◆ The California EMF Program will stop responding to telephone inquiries about EMFs next year. Staff at the Department of Health Services has been spending an estimated 10-20 hours a week on questions from the public.

◆ Rep. Edward Markey (D-MA) has asked for an advance copy of the report on mobile phones and health that the General Accounting Office is preparing for Sen. Joseph Lieberman (D-CT). Markey did not ask for any changes in the report's objectives, an aide told *Microwave News*.

◆ COST 244bis, the European program on "Biomedical Effects of EMFs," came to a close on November 20. Dr. Dina Simunic of Zagreb University in Croatia, who administered the program, said that she is now setting up a dosimetry lab for mobile phones. A final report on the eight-year COST effort is due soon.

◆ The November 25 issue of the *Lancet* features two "seminars" on mobile phones: The U.S.'s Dr. Kenneth Rothman addresses the epidemiological evidence on health effects and the U.K.'s Dr. Gerard Hyland addresses the physical and biological issues. For the same issue, Dr. Philip Dendy, a medical physicist in Cambridge, U.K., provides a commentary titled, "Mobile Phones and the Illusory Pursuit of Safety."

◆ *Tesla: Master of Lightning,* a new documentary, is scheduled to be aired on public television in mid-December.

◆ CTIA has a new name. The "I" no longer stands for industry. It's now the Cellular Telecommunications *and Internet* Association.

◆ At the end of November, Dr. George Carlo's book, *Cell Phones: Invisible Hazards in the Wireless Age: An Insider's Alarming Discoveries About Cancer and Genetic Damage,* was available through BarnesandNoble.com, though the site's synopsis inexplicably read: "This is a biography of the French novelist."

VIEWS ON THE NEWS

The Politics of Information: Public Health vs. Private Control

There's an old saying that, "Information is power." That's certainly true for mobile phone health research.

Suppose wireless phone radiation were shown conclusively to cause cancer. Just to delay the news by six months could be worth billions of dollars. And as the tobacco and global warming debates show, corporations are not inclined to passively accept the findings of science when it hurts their bottom line.

What's good for the balance sheet is not always good for public health. And that's a conflict that is played out every day—in small increments, in slow motion, in ways that may not be dramatic but are still corrosive in their effects.

Let's take the example of the work of Drs. Christian and Hella Bartsch, funded by Deutsche Telekom (DT) (see p.4). Their first experiment yielded important results and made waves among wireless industry insiders. It was identified as a key topic for industry-funded replication, worthy of no fewer than four follow-up studies—two in the Bartsch lab and two elsewhere. But few people were allowed to know what the original study found.

The public was excluded, as was the scientific community at large. Only DT had access to the data, and they shared it with few others. Though the experiment was completed nearly two years ago, both DT and the Drs. Bartsch have refused to say anything about its results or even describe the study protocol. If a summary had not temporarily appeared on the WHO's Web site, we would still have no idea what they found.

There was no good reason to keep this information secret. We have now lost a year and a half in which other researchers could have used this knowledge to sharpen their own investigations. And clearly, the question of wireless health effects is too complex to be resolved by one lab working alone.

But when industry has advance knowledge of research results, it has more power to define what comes next. PR departments have time to figure out how to spin the results and shape public opinion. (Remember Motorola's memo on "war-gaming Lai-Singh"? See *MWN,* J/F97.) This in turn affects political decisions about the pace and funding of research.

Corporate spin sometimes extends into the wording of a published paper. In 1998 Dr. Michael McIvor told *Microwave News,* "When Sensormatic saw an advance copy of the abstract, they wanted me to change the wording" (see p.16 and *MWN,* N/D98).

Like the Bartsches, Dr. Ross Adey has observed a tumor-inhibiting effect from a digital phone signal. Motorola's attempt to limit Adey's discussion of this finding was the talk of the 1996 BEMS meeting (see *MWN,* J/A96).

Did DT play a role in delaying the publication of the Bartsch study? Unfortunately, the company does not have a record of openness and transparency—so we may never know. DT has been one of the most secretive firms in the mobile phone industry, perhaps exceeded only by France Telecom. The inevitable consequence is that journalists and the public are not sure when the company's statements can be trusted.

An account of the conflicts of interest in this case would not be complete without mentioning the role of Dr. John Moulder. The journal to which the Bartsch study was submitted is *Radiation Research,* one of the principal journals for RF/MW health studies, and Moulder is the associate editor with primary responsibility for non-ionizing radiation. Yet Moulder is also a paid consultant to the wireless industry in several different countries.

This is conflict of interest, "squared." It's bad enough that Moulder gets payments from the mobile phone industry while acting as a gatekeeper of scientific information. It's worse that this adds to the industry's advantage. Does anyone think that Moulder does not draw on his privileged access to research when he acts as a corporate consultant? Does he somehow "forget" the findings of a study which the rest of us may not read for another year? We doubt it.

Medical and scientific journals have strict standards about disclosing potential conflicts of interest for authors of research papers. *Radiation Research* should at least apply the same principle to its editors. We would suggest going further. Notice of conflicts of interest is good. Not to have them is better.

Cellular phone companies and their consultants should not have advance knowledge of research results. We need a level playing field in access to information. Until we have it, private interests will continue to have an unhealthy advantage.

Our Wish List for 2001

- No more attempts to dismiss concerns about the safety of mobile phones or power lines by saying, "It's impossible to prove a negative." The same goes for the "absence of conclusive proof" of ill effects. These sound bites ignore the very real evidence of health risks from non-ionizing radiation. When you hear these words, you are being scammed.
- Mobile phone SARs to be displayed on the box. Not inside the box. *On the box*.
- A serious, detailed epidemiological study of radar workers, carried out by civilian public health professionals.
- For the 12 mG EMF effect on melatonin, first shown by Dr. Robert Liburdy and replicated in four other labs, to get the attention it deserves.
- Final agreement on a protocol for measuring cell phone radiation exposures. This one had better come true!

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MICRO WAVE NEWS

Vol. XXI No. 6 A Report on Non-Ionizing Radiation November/December 2001

INSIDE...

EMF NEWS pp.2-3

Power Line Talk:
New Look at Henshaw Theory • Miscarriage Papers • No Cancer–Electric Blanket Link
Defense Experts in NSA Brain Tumor Suit
Working at Night May Be a Breast Cancer Risk
U.K. Doll Panel: More ALS in Electrical Jobs

HIGHLIGHTS pp.4-10

Eye on Europe:
EC Report • Animal Studies Begin • COST 281 Rips Hyland • Waiting for U.K. Project • 3G v. Salzburg Limits • L'Affaire Santini
PERFORM–B: Three Replications Under Way
Antitheft Devices May Harm Kids, Gandhi Says
Ukraine: Young Get More Phone Headaches
Star Criminal Lawyer Files Brain Cancer Suit
Lawyers Stop Study, Win $1 Million Payday
Wireless Notes:
Frustration in Australia • Kids at Risk? • Newman Defense Experts • Acoustic Kitty
NAS–NRC To Study PAVE PAWS Radiation
Standards Watch: Korea, Japan & Australia

FROM THE FIELD pp.10-15

IEEE SCC-28's Q&A on Nonthermal Effects
No BBB Effect, Says Wireless Industry Witness
Letters: Chou and Lin on NCRP RF Panel
Hot New Papers: GSM Affects Mouse DNA
New Books • Across the Spectrum
Flashback: 5, 10, 20 Years Ago
2002 Conference Calendar (Part I)
Meeting Notes: ICNIRP, ARPS & PIERS

UPDATES pp.16-18

Animal Compass • RR EMI • People • TETRA
Tumor Lawyer Folds • Cops Fear TETRA
Keeping Current: Follow-Up on the News

VIEWS ON THE NEWS p.19

CTIA Follows Big Tobacco's Agenda
Our 2002 Wish List

Headaches from Mobile Phones: French Scientist Offers Mechanism

Dr. Pierre Aubineau thinks he knows why so many cell phone users are getting headaches.

In addition to looking at what the radiation may be doing inside the brain, Aubineau, the director of research at the University of Bordeaux's National Center for Scientific Research, is focusing on the dura mater and the other membranes that surround the brain — these are collectively known as the meninges. He has shown that when rats are exposed to GSM radiation, the dura mater becomes inflamed. Aubineau points to a theory — advanced by Dr. Michael Moskowitz of Harvard Medical School in Boston — that such an inflammation in humans would lead to a severe headache.

When the skulls of the exposed rats were opened, Aubineau and his collaborator Dr. Fatma Töre found that proteins had leaked out of the local blood vessels into the meninges and into the brain.

"The proteins act as irritants," Aubineau told *Microwave News*. "They cause inflammation and edema, which can bring on a headache."

These new findings, which were first reported at the European Bioelectromagnetics Association meeting in Helsinki in early September, could, if confirmed, explain why mobile phone users are more likely to complain of headaches — as reported in many epidemiological surveys carried out around the

(continued on p.6)

Memo from Brussels

European Mobile Phone Projects Renew Debate Over Low-Level Effects

Now that the European mobile phone research program is well under way, old arguments over the existence of low-level radiation effects are taking center stage. The gulf between the two sides was much in evidence at a *Workshop on EMFs, Mobile Telephony and Health* held in Brussels on October 29.

Radiation effects "can no longer be denied," said Prof. Franz Adlkofer of the Foundation for Behavior and Environment in Munich. Adlkofer is coordinating the European Commission's (EC) REFLEX project on *in vitro* experiments. On the other hand, France's Dr. Bernard Veyret and Finland's Dr. Jukka Juutilainen, who are in charge of two other projects, PERFORM–B and CEMFEC, respectively, do not believe the case for any significant effects has been made. (For a list of projects and their participants, see p.4 and *MWN*, M/A00.)

Take, for instance, their different opinions over genetic changes. At the workshop, Veyret said that DNA breaks are "very unlikely." Juutilainen agreed: "It seems very unlikely that there are direct genotoxic effects." Veyret is at the

(continued on p.5)

« Power Line Talk »

The U.K.'s National Radiological Protection Board (**NRPB**) has initiated a formal inquiry into Dr. **Denis Henshaw**'s hypothesis that charged particles near power lines are responsible for childhood leukemia and other ailments. The move represents a sharp change in outlook: Five years ago, the NRPB dismissed his ideas as "implausible" and "purely speculative" (see *MWN,* M/A96). Henshaw, a physicist at the University of Bristol, posits that pollutants pick up an electric charge near high-voltage power lines, making them more likely to be deposited on the skin and in the lungs (see *MWN,* J/F00). For instance, he estimates that electric fields could be responsible for as many as 400 lung cancer cases a year in the U.K. (see *MWN,* M/A01). NRPB's newly established five-member panel will advise what kinds of research are needed to evaluate Henshaw's hypothesis, according to the board's Dr. **Michael Clark**. Dr. **Lawrie Challis**, an emeritus professor of physics at the University of Nottingham, will chair the group. The other panel members are Drs. Adrian Bailey of the University of Southampton and William Gelletly of the University of Surrey, as well as Dr. Michael Bailey and Jon Miles of the NRPB staff. The panel, which held its first meeting in September, will report to NRPB's Advisory Group on Non-Ionizing Radiation (AGNIR), chaired by Sir **Richard Doll** (see p.3). AGNIR itself will decide if the epidemiological and experimental evidence supports Henshaw's ideas. In its report on EMFs and cancer released earlier this year, the Doll group broke with NRPB's previous skepticism and called for more research on the Henshaw hypothesis (see *MWN,* M/A01). "I am very pleased," Henshaw told *Microwave News*. But he expressed disappointment that there is no one on the panel who is an authority on air pollution.

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Drs. **De-Kun Li**'s and **Gerri Lee**'s studies on EMFs and miscarriages will appear in the January issue of ***Epidemiology***. Both found a higher risk of spontaneous abortions among women who had been exposed to magnetic fields in excess of 14-16 mG (see *MWN,* M/J01). Li's paper, originally scheduled for the November issue, was delayed to allow Dr. **David Savitz** of the University of North Carolina, Chapel Hill, to write an accompanying editorial. This will be Savitz's third editorial on EMFs in recent months — and his last for a while, he told us. Li said that his and Dr. **Raymond Neutra**'s response to Savitz is slated for the March issue of *Epidemiology*. The studies by Li, who is with Kaiser Permanente, and Lee, who recently joined AstraZeneca, were sponsored by the California EMF Program, which is headed by Neutra (see *MWN,* J/A01). Some see Li and Lee's use of a metric that captures *maximum* magnetic field exposures, rather than the usual reliance on time-weighted averages, as a breakthrough.

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Women who use **electric blankets** or mattress covers do not have an elevated risk of developing **breast cancer**, according to a new study by **Jane McElroy** of the University of Wisconsin, Madison, which appears in the November issue of *Epidemiology (12,* pp.613-617, 2001). Her results are the latest to point away from an association between electric blankets and breast cancer (see *MWN,* S/O91, J/F95, S/O98 and J/A00) — leading some to close the book on such a link. In an accompanying editorial (pp.598-600), Dr. **Leslie Bernstein** of the University of Southern California in Los Angeles writes that, "It is unlikely that future studies will alter the weight of the current evidence." McElroy's team asked 1,949 women with breast cancer and 2,498 controls to complete a questionnaire covering a number of known and suspected risk factors for breast cancer. All the cases and controls were between 50 and 79 years old — 93% were postmenopausal. McElroy found that current users had a statistically significant *reduced* risk of breast cancer compared to those who had never used such electrical devices. But she discounts this potential protective effect as "unlikely."

Defense Names Experts in NSA Brain Tumor Case

Tydings & Rosenberg, the Baltimore law firm that is representing Electro-Matic Products Co. against claims by two former National Security Agency (NSA) workers with brain tumors, has named its expert witnesses. Tommy Grimes and Thomas van Meter are charging that they developed cancer after using the company's degaussing equipment, which emits strong magnetic fields.

Those expected to testify for the defense are:

- Dr. Darrell Bigner, Duke University, Durham, NC
- Dr. Peter Burger, Johns Hopkins University, Baltimore
- Dr. Dan Bracken, T. Dan Bracken Inc., Portland, OR
- Dr. Philip Cole, University of Alabama, Birmingham
- Dr. David McCormick, IIT Research Institute, Chicago
- Dr. Kim McKinzey, Oakland, CA
- Dr. John Moulder, Medical College of Wisconsin, Milwaukee
- Dr. Robert Patterson, Temple University, Philadelphia
- Dr. Joseph Roti Roti, Washington University, St. Louis
- Dr. Vijayalaxmi, University of Texas Health Science Center, San Antonio
- Dr. Steven Walter, McMaster University, Hamilton, ON, Canada.

The law firm of Peter Angelos in Baltimore, which is representing Grimes and van Meter, has already announced its experts (see *MWN,* J/F01; also p.8 and M/A00). The case is being heard in Maryland state court.

The deadline for pretrial motions is in mid-December, according to Harold Walter of Tydings & Rosenberg. He told *Microwave News* that he plans to file a motion but declined to give any details. Earlier this year he said that he planned to ask the court to dismiss the charges.

Working at Night Emerges as Breast Cancer Risk

Two new studies point to a small, but significant, increase in breast cancer among women who work the night shift. These findings lend new support to the hypothesis that exposure to light at night (LAN), which can suppress melatonin levels, is a risk factor for breast cancer.

Dr. Scott Davis and Dana Mirick of the Fred Hutchinson Cancer Research Center in Seattle and Dr. Richard Stevens of the University of Connecticut, Farmington, found that breast cancer risk increased by 14% for each night a week a woman did not sleep through the night. Those who worked the graveyard shift at least once in the ten years before diagnosis had a 60% higher rate of breast cancer. Their results, based on 763 women with breast cancer and 741 controls, appear in the October 17 issue of the *Journal of the National Cancer Institute (JNCI, 93,* pp.1557-1562, 2001).

There was no association between breast cancer risk and the number of times a subject got up and turned on the light, the amount of time a light was on during the night or the ambient light level in the subject's bedroom.

In the same issue of *JNCI* (pp.1563-1568), a team at Harvard Medical School in Boston, MA, led by Dr. Eva Schernhammer, report that postmenopausal nurses who had regularly worked on rotating night shifts for 30 or more years were 36% more likely to develop breast cancer, a significant increase. There was a 66% increase among premenopausal women with at least 20 years of nighttime shift work, and a 34% increase with 15 years or more — but these estimates are based on small numbers of cases.

In an accompanying editorial (pp.1513-1515), Dr. Johnni Hansen of the Danish Cancer Society in Copenhagen notes that these and the previous epidemiological studies on breast cancer, which used various indirect measures of LAN, "consistently point to an increased risk."

There is an "urgent need" for more research on the relationship between LAN, night work and "cancers that may be influenced by melatonin," Hansen concludes.

Stevens first suggested 15 years ago that exposures to LAN and/or electromagnetic fields (EMFs) could promote breast cancer by depressing melatonin levels (see *MWN,* J/F87). Stevens, Davis and Mirick have previously reported lower melatonin levels among women living in homes with elevated levels of EMFs (see *MWN,* N/D97 and S/O01). A second paper, on breast cancer and EMFs, will be published next year in the *American Journal of Epidemiology.*

The possible links between light, hormones and cancer will be addressed at a symposium at the University of Cologne, Germany, May 2-3 (see p.14).

Electrical Worker Data Point to ALS Risk, U.K. Doll Panel Says

Exposure to power-frequency EMFs is "unlikely" to cause Parkinson's disease, but employment in electrical occupations may be associated with amyotrophic lateral sclerosis (ALS), according to an analysis released by the National Radiological Protection Board (NRPB) on November 8. The NRPB's Advisory Group on Non-Ionizing Radiation (AGNIR), chaired by Sir Richard Doll, could neither confirm nor exclude an EMF link to Alzheimer's disease (see box at right).

A number of epidemiological studies have linked electrical work to ALS — widely known as Lou Gehrig's disease. The Doll panel places the greatest confidence in the 1986 study by Drs. Dennis Deapen and Brian Henderson, both of the University of Southern California (USC) in Los Angeles: They reported a close to fourfold greater risk of ALS among those in electrical occupations (see *MWN,* S/O86). This association is supported in six of the eight published EMF–ALS studies (for some examples, see *MWN,* N/D95, J/F97 and M/J97).

Like others before them, members of the Doll panel caution that it is very hard to untangle the roles of EMFs and electric shocks. For instance, Dr. Cristoffer Johansen of the Danish Cancer Society in Copenhagen, who found a higher than expected rate of ALS among Danish utility workers, could not come up with a suitable metric to separate these two types of exposure (see *MWN,* J/A98; also S/O00).

The Doll group found the EMF–Alzheimer's association difficult to assess given some of the conflicting findings among the various completed studies (see *MWN,* J/A94, J/F97, M/J97 and S/O00). Very few studies have investigated an EMF connection to Parkinson's.

In general, the Doll panel's conclusions are similar to those reached in the draft report of the California EMF Program. The California team found an EMF–ALS association to be probable and a link to Alzheimer's to be possible (see *MWN,* J/A01).

Main Findings of U.K. Report on Neurodegenerative Disease

"There is no good ground for thinking that exposure to extremely-low-frequency electromagnetic fields can cause Parkinson's disease and only very weak evidence to suggest that it could cause Alzheimer's disease. The evidence that people employed in electrical occupations have an increased risk of developing amyotrophic lateral sclerosis is substantially stronger, but this could be because they run an increased risk of having an electric shock rather than any effect of long-term exposure to the fields *per se*."

From *ELF Electromagnetic Fields and Neurodegenerative Disease (Documents of the NRPB, 12 (4),* pp.3-24, 2001). Copies are available for £11 (approximately US$15.75) from the NRPB Information Office, Chilton, Didcot, OXON OX11 0RQ, U.K., (44+1235) 822742, Fax: (44+1235) 822746, E-mail: <information@nrpb.org.uk>. The report's main conclusions and recommendations are available free of charge at the NRPB's Web site, <www.nrpb.org.uk>. (See also p.17.)

HIGHLIGHTS

« Eye on Europe »

The EC's **Scientific Committee on Toxicity, Ecotoxicity and the Environment** (CSTEE) does not believe that the existing data on carcinogenic and other nonthermal effects justify adopting exposure standards that differ from those of **ICNIRP**. Two years ago, the EU's Council of Ministers endorsed the ICNIRP standard (see *MWN,* J/A99). With respect to ELF EMFs, the committee agrees with the IARC committee that there is "limited" evidence of carcinogenicity, which falls short of "being considered causal." It also found that reports that certain people are hypersensitive to EMFs "require confirmation" and do not provide a basis for tighter limits. CSTEE's 13-page *Opinion on Possible Effects of EMF, RF and MW Radiation on Human Health* is available at: <europa.eu.int/comm/food/fs/sc/sct/out128_en.pdf>.

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The first animal cancer studies under **PERFORM–A**, one of the EC's mobile phone research projects, are under way (see *MWN,* M/A00). **RBM** in Ivrea, **Italy**, began exposing half of the animals in its repeat of the **Australian Pim1** transgenic mouse experiment (also known as the Repacholi study) at the end of October. The exposure of the other half is scheduled to begin in early December. During the first week of November, power was turned on in the 900 MHz and 1.8 GHz, two-year mouse bioassays at the **Fraunhofer** institute in Hannover, **Germany**. The experimental setups for the three rat studies are nearing completion at **IT'IS** in Zurich. They are slated to get under way early next year.

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The **COST 281** committee on the potential health implications of mobile telecom systems has issued a scathing critique of Dr. **Gerard Hyland**'s report to the European Parliament. COST 281 concludes that Hyland's report, which points to health risks from low-level electromagnetic radiation, is "unbalanced, uncritical and suffers from a narrow selection of partly outdated literature and arbitrary postulates." The committee also states that "Hyland fails to base his conclusions on sound scientific data." The report was not unanimous. A number of reviewers asked Dr. **Norbert Leitgeb**, the chair of COST 281, not to release it in its present form. The critique is at: <www.cost281.org/activities.php>. Hyland's report is on the Web site of **Caroline Lucas**, a U.K. member of the European Parliament: <www.carolinelucasmep.org.uk>. (For more on the low-level effects debate, see p.1.)

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The **U.K. Department of Health** (DOH) has yet to reveal who has won **grants** for mobile phone **research**. The DOH announced that there was an "urgent need for further research" when the Stewart panel issued its report in May 2000 (see *MWN,* M/J00). But those who applied for money are still waiting. The DOH told *Microwave News* that the list of awards will be released when the contract negotiations have been completed.

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Austrian mobile phone operators are signaling that they want to renegotiate their 3G licenses unless they get relief from the strict limits for emissions from mobile phone towers adopted in **Salzburg** (see *MWN,* J/A00). The government "should not take money for licenses and then prevent the networks from being built," Kurt Lüscher of Telefonica told Austria's financial daily, *Wirtschafts Blatt* (November 8). In a September 25 letter, the federal government advised the carriers to take their complaints to court, explaining that, while it can set guidelines, it lacks the authority to fix exposure limits.

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A storm is brewing in **France** in what may soon become known as the *Affaire Santini*. In November, Dr. **Roger Santini** of the National Institute of Applied Sciences in Lyons was accused of using stolen letterhead — he denies it. Santini and those rallying to his side say that he is being maligned because of a study pointing to health risks from mobile phone towers. Santini is the author of *Téléphones Cellulaires: Danger?* Stay tuned.

PERFORM–B Under Way: Three Replication Experiments

Six European labs, working in pairs, are trying to repeat or put to rest three experimental findings. The two-year, $2.4 million project, under the leadership of France's Dr. Bernard Veyret at the University of Bordeaux, is being funded in part by the Mobile Manufacturers Forum and the GSM Alliance and in part by government agencies in each of the participating countries. Dr. Niels Kuster of IT'IS in Zurich will handle the dosimetry for the six experiments with the assistance of Dr. Theodoros Samaras of the Aristotle University of Thessaloniki in Greece, under a $650,000 contract.

Ornithine Decarboxylase (ODC) Activity *in Vitro*

Dr. Bernard Billaudel of the University of Bordeaux and Dr. Jonne Naarala of the University of Kuopio, Finland, will each receive $250,000 to repeat Dr. Ted Litovitz's experiment showing varying effects on ODC activity depending on the modulation of the 835 MHz carrier wave *(Bioelectromagnetics, 18,* pp. 132-141, 1997).

Sister Chromatid Exchange (SCE) *in Vitro*

Dr. Carmela Marino at the ENEA in Rome, Italy, and Dr. David Lloyd of the NRPB, in Chilton, U.K., will receive $325,000 and $220,000, respectively, to repeat Drs. Annemarie Maes and Luc Verschaeve's GSM genotoxicological study *(Mutation Research, 393,* pp.151-156, 1997). (See *MWN,* N/D96.)

Behavioral Performance *in Vivo*

Dr. Zenon Sienkiewicz at the NRPB and Dr. Jean-Christophe Cassel of the University Louis Pasteur in Strasbourg, France, will receive $230,000 and $465,000, respectively, to repeat Dr. Henry Lai's experiment on the performance of rats in a radial arm maze *(Bioelectromagnetics, 15,* pp. 95-104, 1994). Sienkiewicz will use mice and Cassel rats. (See also *MWN,* M/J00.)

This project is known as PERFORM–B. It was originally part of a package of proposals submitted to the European Commission by the mobile phone industry (see *MWN,* J/A 99). Only the project on animal studies, PERFORM–A, was funded, however (see item at left and *MWN,* M/A00).

University of Bordeaux; Juutilainen is at the University of Kuopio.

But in his review of the REFLEX studies completed to date, Adlkofer pointed to the work of Prof. Rudolf Tauber at the Free University of Berlin, who has shown single- and double-strand DNA breaks in HL-60 cells following a 24-hour exposure to 1.8 GHz radiation at 1.3 W/Kg. These "impressive" effects are not due to an increase in temperature, Adlkofer told *Microwave News*.

Adlkofer also cited the work of STUK's Dr. Dariusz Leszczynski in Helsinki, which shows microwave-induced changes in gene expression (see *MWN,* J/A01; also p.15). By the end of the REFLEX project, Adlkofer said, "I am sure we will have shown effects on gene expression."

Adlkofer then turned to Dr. Anna Wobus's experiments at the Institute for Plant Genetics and Agricultural Research in Gatersleben, Germany, which show that radiation effects are dependent on the genetic makeup of the biological target. She saw no effect with wild-type cells, he said, but there was a clear effect when the cells lacked certain genes.

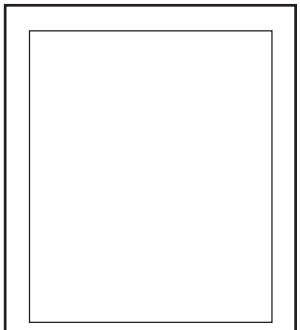
"Genetic background might be decisive," Adlkofer concluded, noting that millions of people have damaged genes.

Veyret, who is also a member of the REFLEX project, allows that some of these studies may alter the bioeffects landscape. He called Leszczynski's work on gene expression a "rather important finding." Veyret is also collaborating with Dr. Pierre Aubineau, whose new experimental results suggest why users of mobile phones get headaches (see p.1). In Brussels, Veyret cautioned that the new headache finding "must be confirmed."

Adlkofer is not yet convinced that the effects being reported necessarily point to a health risk. "I do not claim that there is a health hazard," he said. "But we do have a key to go forward and plan our future work."

"I was very skeptical at the start," Adlkofer added. "With a high probability, I thought it wouldn't be worth continuing."

Near the end of the workshop, Adlkofer said he was "astonished" that his team has found any effects at all, given the very ambiguous results of animal and epidemiological studies. At which point, Dr. Joe Elder chimed in, "So am I." Elder recently left the U.S. Environmental Protection Agency to join Motorola. "If you ask me if they are true," Adlkofer replied, "I am convinced that there are changes in gene expression."



"I was very skeptical."
— Dr. Franz Adlkofer

"You can say something about their significance, given the animal studies," countered Elder.

Adlkofer gives a great deal of credit to the EC for sponsoring mobile phone research and is skeptical that the industry is interested in getting to the bottom of the problem. "Without the EC, we could not have done this," he said. "We are responsible only to science."

Many experiments remain to be done, and the controversy is a long way from being settled.

The meeting was arranged by the EC and COST281 (see p.4). Some of the presentations are available at <www.cost281.org>, though, at press time, Adlkofer's was not among them.

Children Could Be at Risk from Antitheft Devices, Gandhi Says

Small children may face health risks from the magnetic fields produced by antitheft systems, according to Dr. Om Gandhi of the University of Utah, Salt Lake City. He warns that the induced currents in a child's brain and spinal cord could be several times greater than in an adult and could exceed safety limits designed to protect central nervous system tissue.

Gandhi argues that because children are smaller, their heads pass closer to the system's strongest fields, which are at waist level for adults. For a security gate operating at 30 kHz with a field of 150 ∝T (1.5 G), he calculates a maximum induced current of 98.9 mA/m^2 in the brain of a five-year-old and 64.6 mA/m^2 in that of a ten-year-old — both in excess of the 60 mA/m^2 limit set by ICNIRP. In an adult's brain, this same gate would induce a current of 17.6 mA/m^2.

Gandhi and his postdoc, Dr. Gang Kang, present these calculations in the November issue of *Physics in Medicine and Biology (PMB, 46,* pp.2759-2771, 2001). But in an interview with *Microwave News,* Gandhi emphasized that the estimates — which are based on computer models — should be interpreted as pointing to a potential problem rather than an actual hazard.

Gandhi said that he has "no way of knowing" the intensity of the fields produced by actual antitheft systems and that the assumptions in his model "may or may not be correct." The calculations, he said, are for a hypothetical device with "typical" design parameters — a strategy chosen to protect the proprietary interests of the manufacturers. Nevertheless, in the published paper, Gandhi writes that ICNIRP's limits for magnetic fields "may often be exceeded for most of the [antitheft] devices."

The findings drew the attention of the U.K. press in early October when the Institute of Physics in London, which publishes *PMB,* called on those who make antitheft systems to "limit the strength of their magnetic fields."

Sensormatic Electronics Corp. in Boca Raton, FL, which makes acousto-magnetic systems that operate at 58 kHz, stated that all its products "comply with applicable worldwide regulatory standards," including ICNIRP's.

John Davies, senior vice-president for research and development at Checkpoint Systems Inc. in Thorofare, NJ, said that most of his company's products operate at 8.2 MHz and use "a much lower power level" than the equipment modeled by Gandhi. Davies explained that the signals used must be kept low in order to insure compatibility with other electronic equipment in stores.

Previously, concerns have been raised on the possibility that antitheft systems can cause interference with implanted cardiac pacemakers (see *MWN,* S/O97 and N/D98).

world (see box at right).

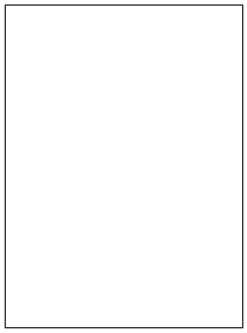
In addition, the French results could help settle the often contentious controversy over whether microwaves can increase the permeability of the blood-brain barrier. "We see leakage through the blood-brain barrier," Aubineau said.

Drs. Leif Salford and Bertil Persson at Sweden's Lund University, for instance, have long contended that very low levels of microwaves can cause chemicals to leak through the barrier (see *MWN*, J/A92). Others, like Dr. Stanley Rapoport of the U.S. National Institute of Aging, argue that these and similar studies are "flawed" (see box, p.10).

"This is not a repeat of the Salford study," pointed out Dr. Bernard Veyret, who is also at the University of Bordeaux and is collaborating with Aubineau. He said that the Bordeaux study is "more relevant to cell phones" than the Salford-Persson work.

Aubineau and Töre exposed the heads of rats to 900 MHz GSM radiation with a loop antenna for two hours. They have run three experiments — with average specific absorption rates (SARs) in the brain of 2 W/Kg, 0.5 W/Kg and 0.15 W/Kg. They point out that exposures in the dura, which is closer to the skull, are higher. For instance, at 0.5 W/Kg, it would be approximately 4 W/Kg in the dura.

"I would be surprised if this is a heat effect," Aubineau said. "It is possible at 2 W/Kg, but unlikely at 0.5 W/Kg." But Aubineau concedes that he does not yet have any temperature measurements. These will be carried out early next year, he said.



"We see leakage through the blood-brain barrier."

— Dr. Pierre Aubineau

"The effect is clearly not due to stress, because you can see the same result with anesthetized animals," he added.

"At 0.5 W/Kg, we saw much more leakage in the dura than in the brain," Aubineau said, noting that, while it was clear that chemicals were passing through the blood-brain barrier at 2 W/Kg, only a little leakage was observed at 0.5 W/Kg. The experiment at 0.15 W/Kg was completed at the end of November and the results are not yet available.

Aubineau warned that if there are changes in the barrier at very low SARs, they could lead to a major health impact. "Even a small break in the blood-brain barrier can start bad things," he said.

"I was very surprised to find an effect at such low power levels," Aubineau said. "When I started, I had a negative opinion and I thought that I would see nothing. But now I'm really interested and I'm planning to do many other experiments."

The work in Aubineau's lab is part of the two-year, $1.6 million COMOBIO research program, sponsored by the National Network for Telecommunications Research, which is now coming to a close. (COMOBIO is short for Communications Mobile et Biologie.) Veyret is optimistic that the French government will sponsor a continuation effort, known as COMOBIO+. In the interim, Veyret said, France Telecom and Bouygues Telecom are providing bridge funding.

A meeting will be held in Paris on December 21 at which the participants of the COMOBIO program will present the results of their work.

Aubineau and Veyret were members of the committee that prepared a report on mobile phones and base stations for the French government. The report, which was released earlier this year, called for a precautionary approach toward possible health risks (see *MWN*, J/F01).

Some of Aubineau's results, as well as those of the other seven projects, are posted on the COMOBIO Web site. Go to: <www.tsi.enst.fr/comobio/resultats/SP6.html>.

Young Phone Users in Ukraine Report More Headaches

Young women are more likely to complain of headaches and fatigue after using a mobile phone, according to a soon-to-be published survey in the Ukraine.

Dr. Victoria Datsenko of the Marzeyev Institute of Hygiene and Medical Ecology in Kiev found that phone users in their 20s and 30s had significantly more central nervous system (CNS) symptoms, compared to controls. The rate was 4.4 times higher among those in their 20s. Women in these two age groups were more likely to have complaints than men. Overall, those who used mobile phones were close to twice as likely to report CNS symptoms, a significant increase over nonusers.

"We cannot explain the difference between the young and the old or between women and men," Datsenko told *Microwave News*. Her study is based on interviews with 759 subjects (407 cases and 352 controls).

A Nordic Mobile Telephone (NMT) system, operating at 450 MHz, was introduced in the Ukraine in 1993. GSM service began two years later. Datsenko said that among those who had used mobile phones for two years or more, NMT users had significantly more CNS symptoms than those with GSM phones.

A Scandinavian study of NMT and GSM phone users also found that symptoms were more common among those under 40. "In general, younger people complain about more symptoms than older people," Dr. Gunnhild Oftedal, of the Norwegian University of Science and Technology in Trondheim, told *Microwave News* (see *MWN*, M/J98 and J/A00).

In the Ukrainian study, exposures were estimated with power-density measurements rather than with specific absorption rates. NMT phones entailed much higher radiation levels than GSM phones: 316-1,000 $\propto$W/cm^2 and 20-159 $\propto$W/cm^2, respectively.

Datsenko presented her results at the *13th Conference of the International Society of Environmental Epidemiology* in Garmisch-Partenkirchen, Germany, on September 4. Her paper will appear in *Environment and Health*, a peer-reviewed Ukrainian journal. It will be in Ukrainian with an abstract in English and in Russian.

For other reports on mobile phones and headaches, see *MWN*, N/D95, N/D96, M/J97, M/J98, N/D98 and J/A00.

High-Profile Criminal Lawyer Takes on Wireless Industry

Criminal defense attorney Mayer Morganroth of Morganroth & Morganroth in Detroit is taking on most of the leading players in the wireless industry. On November 15, Morganroth filed a $1.5 billion lawsuit on behalf of Michael Murray, a 34-year-old Motorola technician with a brain tumor.

Many more cases are planned. "We will file ten more lawsuits by the end of February," said Sheldon Miller of Lopatin, Miller in Detroit, who is working with Morganroth. These could later be consolidated into a class action, according to Jeffrey Morganroth, Mayer's son.

A flurry of personal injury suits was also predicted last year by Joanne Suder of Baltimore, another member of Murray's legal team, when she filed an $800 million lawsuit on behalf of Dr. Christopher Newman (see *MWN,* S/O00). But this was the only mobile phone case her firm initiated. The Newman case is now being handled by Peter Angelos in Baltimore (see p.8). Angelos has no connection to the Murray lawsuit.

In addition to Motorola, Qualcomm and the Cellular Telecommunications and Internet Association (CTIA), the complaint cites the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE) as defendants.

ANSI tailored its RF/MW guidelines to ensure that mobile phones "would be excluded from any testing, compliance or monitoring," according to Murray's complaint, which was filed in Washington, DC. ANSI has recognized the IEEE guidelines as national standards.

Jeffrey Morganroth told *Microwave News* that his firm may file what he called a "public interest" suit against the federal health agencies, including the EPA, FCC and FDA. The objective, he said, would be to force the government to regulate the health risks posed by the wireless industry.

Mayer Morganroth is confident that he can show a link between phone radiation and brain tumors. He told the *Financial Times* (November 14) that, "The experts that are knowledgeable, who have really done the investigations and are independent, are of the solid and firm conviction that cell phones cause brain cancer." In an interview with *Microwave News,* Jeffrey Morganroth said that, "among researchers with no ties to the industry, there is a consensus that mobile phone radiation is harmful."

The wireless industry is unimpressed. "We don't feel the Murray case has introduced any new issues," said Motorola's Norm Sandler. And Tom Watson of Watson & Renner in Washington, who represents the Cingular Wireless group, asserted that, "There is no reliable scientific basis for the plaintiff's position."

Although Mayer Morganroth — working with Miller — won a $19 million verdict in a copyright infringement lawsuit against 20th Century Fox last March, he is best known for his work in criminal cases. He has defended Dr. Jack Kevorkian against charges of assisted suicide, political extremist Lyndon LaRouche against charges of tax evasion and car-maker John DeLorean against charges of drug-trafficking.

According to the complaint, Murray has been permanently disabled by the malignant glioma, which was surgically removed in November 1999. He bought a Motorola StarTac phone in 1993 and a Qualcomm phone in 1996. Murray, who lives in Chicago, also tested wireless phones in his job at Motorola. The fact that Murray works for Motorola is not cited in the complaint. He filed for workers' compensation last year. This claim is still pending.

The complaint also charges that the wireless industry made false claims regarding the safety of phones, conspired to "conceal and suppress" information on possible risks and manipulated RF health research. "Researchers who discovered adverse effects," the complaint states, "lost their funding, were fired, found their reputation damaged and had their work denigrated."

Million-Dollar Payday for Lawyers in Invasion of Privacy Suit

A Chicago judge has approved close to $1.5 million in fees and expenses to lawyers who brought an invasion of privacy suit on behalf of millions of cell phone users. The class action suit, *Busse v. Motorola,* filed in 1996, alleges that an epidemiological study sponsored by Wireless Technology Research (WTR) collected personal information without the users' consent (see *MWN,* J/F96, M/J97 and M/A99).

WTR's insurance company is paying $1.4 million to walk away from the case — the remains of a $2 million policy. The judge granted Dr. George Carlo, WTR's chair, $250,000 to set up a voluntary registry of health complaints from cell phone users. Carlo also receives $150,000 to cover any future litigation costs. Most of the balance will go to Ben Barnow and Alan Goldberg of Barnow & Goldberg and to William Harte, all of whom practice in Chicago. They will still be owed $500,000 after the insurance money is paid out.

The partial settlement, signed by Judge Stephen Schiller on November 26, covers only the actions of WTR and Carlo. The other defendants, including Motorola, the CTIA and Epidemiology Resources, which ran the study, had contested the settlement proposal and are waiting for the court to rule on their motion to dismiss the case (see *MWN,* J/A01). Norm Sandler of Motorola called the arrangement between Carlo and the *Busse* lawyers an "outrageous, creative way to divide up the insurance money."

Carlo said that he will use the $250,000 to start the registry and will then seek matching funds from other sources to keep it going. It will be run by the Safe Wireless Initiative, part of his Science and Public Policy Institute.

At the last moment, two epidemiologists tried to derail the settlement. On October 16, Dr. Joshua Muscat of the American Health Foundation in Valhalla, NY, and Dr. Faith Davis of the University of Illinois, Chicago, petitioned Judge Schiller to reject Carlo's voluntary registry. Muscat said that it would have "no scientific value" and Davis called it "fundamentally flawed." Davis was until last year the research director of the U.S. Central Brain Tumor Registry.

But a month later, Muscat and Davis withdrew their petitions. Muscat was hazy as to why he had changed his mind, saying only that he did so after reading Carlo's description of the registry. Nevertheless, he maintained that "I cannot see how it can possibly work as an early warning system."

« Wireless Notes »

Another researcher has discovered an intriguing RF/MW effect only to find that there is no money to follow it up. Dr. **Pamela Sykes** of Flinders University in Adelaide, **Australia**, has not abandoned all hope, but she is clearly frustrated after being denied support both this year and last. In the November issue of *Radiation Research,* Sykes reports on what she calls a "surprising" observation: Mice exposed to 4 W/Kg GSM radiation for 25 days had fewer changes than expected in their **DNA** — or, more precisely, fewer spontaneous intrachromosomal recombinations (see p.12; also *MWN,* N/D00). This may not be, as it might first appear, a beneficial effect because, Sykes points out in her paper, some proven genotoxic agents can also cause reductions in DNA rearrangements. This project was part of the Australian research program on mobile phone safety administered by the National Health and Medical Research Council (NHMRC) (see *MWN,* N/D96 and J/A98). Sykes told *Microwave News* that when she asked for an extension, the review committee turned her down in part because her results were "inconclusive" due to the small number of mice used in the experiment. In fact, Sykes had wanted the grant renewal in order to be able to repeat the study with a larger number of animals. The committee also explained that her finding of a decrease in recombinations did not support her original hypothesis. "Although it may be interesting, from a perspective of scientific curiosity, to further explore the phenomena...is, however, unfortunately outside [our] scope," the committee wrote, suggesting that Sykes apply to the NHMRC for a grant not specifically tied to RF/MW effects. She did, but once again came up empty-handed. According to Sykes, the NHMRC panel wrote back saying that, while it "recognized the great potential significance" of her results, it considered them "somewhat counterintuitive." Sykes finds this statement — like much of the rest of this story — "amazing."

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Dr. **Om Gandhi** has been making headlines in England telling the press that **children** absorb twice as much radiation from cell phones as adults. CHILDREN AT HIGHER RISK OF MOBILE PHONE RADIATION ran the headline in the November 18 U.K. *Sunday Times*. Gandhi first raised such concerns back in 1996, and at this year's annual meeting of the Bioelectromagnetics Society (BEMS) in St. Paul, MN, he presented computer simulations which showed that the 1g SARs are up to 50% higher for children's heads relative to those of adults. When he got back to Salt Lake City, Gandhi did some more calculations and this fall he submitted his results for publication. "For children, the telephone is closer to the brain, the skull is thinner and therefore the penetration is greater," Gandhi told *Microwave News*. (Gandhi also has a new paper that addresses the risk of antitheft systems to children; see p.5.) Mobile phone radiation risks to children have been a particularly sensitive subject in England ever since a high-level committee chaired by Sir William Stewart recommended that children under 16 years old be discouraged from using mobile phones (see *MWN,* M/J 00). Gandhi's new paper is sure to rekindle a long-running dispute with Dr. **Niels Kuster** of IT'IS in Zurich. In a paper published in the February 1998 issue of *Health Physics,* Kuster and his then-doctoral student, Dr. **Frank Schönborn**, presented their own computer models showing that the SARs for children are within the variation of those for adults. (Schönborn now works at VIAG Interkom, a German mobile phone service provider.) Kuster told *Microwave News* that he is astonished that this issue is back in the news. "The physics suggests and our study demonstrates that there is no significant difference in exposure between adults and children — nor is there any greater penetration in children's brains." Kuster stressed that the fact that SARs go up as the phone gets closer to the head has been known since 1992. The dispute over the risk to children may have some immediate consequences because the IEEE SCC-34 committee developing a protocol for testing mobile phones is using Kuster's models. Gandhi says that the current proposal may not be conservative enough. "I am not being alarmist," Gandhi said. "I'm just trying to be thorough."

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In November, Dr. **Lennart Hardell** of Sweden's Örebro University flew to Baltimore to give testimony on behalf of Dr. **Christopher Newman**, who blames **Motorola**, **Verizon** and others for his brain cancer (see *MWN,* S/O00). Hardell is the last expert for Newman to be deposed (see *MWN,* J/A01). Those slated to testify for the defense include Dr. **Richard Bockman** of Cornell medical school, Dr. **Christopher Davis** of the University of Maryland, Dr. **Paul Doetsch** of Emory medical school, Drs. **Fred Hochberg** and **David Louis** of Harvard medical school, Dr. **Mark Israel** of Dartmouth medical school, Dr. **John Laterra** of Johns Hopkins medical school, Dr. **Martin Meltz** of the University of Texas, Dr. **Mark Nelson** of the University of Vermont medical school and Dr. **Stanley Rapoport** of the National Institute of Aging (see p.10). On February 25, federal Judge **Catherine Blake** will open a hearing in Baltimore to decide what scientific evidence and which expert opinions are admissible under standards set by the U.S. Supreme Court in its 1993 *Daubert* ruling. The Daubert hearing prompted a three-page article in the November 16 issue of *Science,* which revealed that Dr. **Allan Frey**, a consultant based in Potomac, MD, is serving as science advisor to Newman's lawyers, the **Peter Angelos** law firm in Baltimore. Meanwhile, the class-action lawsuits to force manufacturers to provide hands-free sets with all mobile phones (see *MWN,* M/J01) have been consolidated, and they, too, will be heard by Judge Blake.

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Long before the wireless revolution, the **CIA** tried to spy on the Russians using a cat with an implanted transmitter. The tail served as an antenna. The November 4 U.K. *Daily Telegraph* reports on **Project Acoustic Kitty**, which is said to have cost more than $15 million. The cat paid the ultimate price in its first trial outing. As soon as it was released from its van, a taxi ran over it. "There they were, sitting in the van with all those dials and the cat was dead," said former CIA officer Victor Marchetti, the co-author of the classic book, *The CIA and the Cult of Intelligence*.

NAS–NRC To Evaluate Health Impact of PAVE PAWS Signals

The U.S. Air Force (USAF) has asked the National Academy of Sciences–National Research Council (NAS–NRC) to evaluate the possible health impacts of radiation from PAVE PAWS radars.

Under the $1 million, two-year contract, an NAS–NRC committee will decide if data on continuous and pulsed radiofrequency and microwave (RF/MW) radiation can be used to predict the biological effects of high-power, phased array radars. If so, the NAS–NRC committee will offer its opinion as to whether PAVE PAWS radars — like the one on Cape Cod, MA — present a risk to public health. If the data are insufficient, the committee will recommend studies that can help determine the risk.

Drs. Rick Jostes and Evan Douple, the codirectors of the study at the NAS–NRC Board on Radiation Effects Research, are collecting names of possible committee members. "We are shooting for releasing a roster in December," Jostes told *Microwave News*. He declined to reveal the names of any of those under consideration, saying only that they have received some 125 nominations from various sources.

Since 1997, the U.S. Congress has required the NAS to offer the public the opportunity to comment on candidates for study committees. Their names, with brief biographies, are posted on the NAS Web site for 20 days before a final selection is made.

The USAF set up the committee in response to a request by Sen. Edward Kennedy (D-MA) (see *MWN,* J/F01). Kennedy, in turn, is responding to pressure from Cape Cod residents who suspect that the radar plays a role in the higher than expected rates of cancer among residents of the Cape.

The dispute between the USAF and local communities has been simmering for more than 20 years — it began even before the radar became operational in 1980. But the citizens' concerns took on new urgency last year when Dr. Richard Albanese, a USAF physician at Brooks AFB in San Antonio, went public with charges that the biological effects of phased array radiation have never been adequately studied. "This lack of testing makes me nervous indeed," Albanese wrote to the Massachusetts Department of Public Health (see *MWN,* S/O00).

Sharon and Richard Judge of Sandwich, MA, are leading the campaign to move the radar to "a more appropriate location, away from population centers." They have asked the Air Force to declassify Albanese's technical papers and to make them available to the NAS–NRC committee.

The Judges point out that much of the Air Force's Electromagnetic Health and Safety Program at Brooks AFB is secret, available only to those with security clearances. "We want the committee and the public to have access to the work of Albanese and his team," Sharon Judge told *Microwave News*.

Jostes said that any classified data will be available to some members of the committee. "There are people in the RF community who have clearances," he noted, adding that Douple himself has access to classified information.

In August, Douple and Jostes got a taste of the often harsh controversy over the radar at the annual, by-invitation-only Mich-

Standards Watch

• **Korea**'s new radiation health standards, which take effect on January 1, 2002, are a mix of those recommended by ICNIRP and the IEEE SCC-28. The **Korean Electromagnetic Engineering Society** (KEES) had adopted the ICNIRP SAR and exposure standards in 1999, but last year the **Ministry of Information and Communication** (MIC) decided to follow the 1.6 W/Kg SAR standard set by SCC-28 and used by the U.S. FCC. While MIC did adopt ICNIRP's two-tier exposure standard, it left out the guidelines for contact and induced currents and those for pulsed fields. The Korean SAR test method is based on the protocols developed by CENELEC and the IEEE SCC-34, according to Dr. Nam Kim of Chungbuk National University. By the end of the year, SARs for all phones on the Korean market will be made publicly available.

• The **Japanese** Ministry of Public Management, Home Affairs, Posts and Telecommunications (**MPHPT**) will begin enforcing a 2 W/Kg SAR limit for 800 MHz and 1.5 GHz mobile phones on June 1, 2002. The ICNIRP-based limit, which is averaged over 10 g, was adopted on June 1 of this year. Tetsuya Yamano, the assistant director of MPHPT's Electromagnetic Environment Division, said that the new Japanese SAR test method is very similar to the protocol recently adopted by CENELEC (see *MWN,* J/A01).

• In Australia, as of January 1, 2002, *all* portable sources of RF/MW radiation used by the public must comply with a 1.6 W/Kg, averaged over 1g, SAR limit. Mobile, cordless and satellite phones are already covered, but the new rules, adopted by the **Australian Communications Authority** (ACA) in Canberra, will ensure that all other devices with "integral antennas" also meet this SAR standard. The new rules are formally known as the *Radiocommunications (Electromagnetic Radiation — Human Exposure) Standard 2001*. Meanwhile, the interim "flat," or frequency-independent, RF/MW exposure standard is on the way out in favor of looser limits. In March, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) proposed a standard that closely follows the ICNIRP guidelines (see *MWN,* M/A01; also S/O99). ARPANSA has also prepared a draft regulatory impact statement (available at <www.arpansa.gov.au/dr_imp.htm>; comments were due November 23). The statement, which includes a useful recap of the somewhat tortuous history of RF/MW standards in Australia and **New Zealand**, outlines the pros and cons of the various regulatory options — but not the possibility of keeping the interim flat standard. If the proposed standard is adopted, the SAR limit for mobile phones would rise to 2.0 W/Kg, averaged over 10 g. Approval could come as soon as early next year, Dr. John Loy, CEO of ARPANSA, told *Microwave News*. Chris Zombolas of EMC Technologies Ltd. in Melbourne, a leading testing lab, considers this to be too optimistic, however. He predicts that the process will not be complete until late next year. If and when it is approved, the ACA will adopt the new limits, making them legally binding.

aelson conference in Montana. At a session on PAVE PAWS, Dr. John Leonowich of the Battelle Labs in Richland, WA, gave a talk titled "The PAVE PAWS Controversy: A Threat to Real Bioelectromagnetics Science." Dr. Robert Adair of Yale University in New Haven, CT, later spoke on "Voodoo Science Countered: Radiation from PAVE PAWS" (see also *MWN,* J/F01).

Jostes pointed out that last summer he and Douple also met with the Judges to learn about their concerns. "We want to hear a variety of viewpoints," he said.

Meanwhile, in November the USAF released parts of its plan to characterize PAVE PAWS signals in the time domain. These are available at <www.pavepaws.org/health_&_safety.htm>.

This is the second time the NAS–NRC has investigated PAVE PAWS radiation. In 1979, it issued separate reports on the health and the engineering aspects of the radar. The health panel was chaired by Dr. Stephen Cleary of Virginia Commonwealth University in Richmond.

The Cape Cod PAVE PAWS radar operates at 420-450 MHz with a peak power of more than 600 kW and is designed to detect missiles at distances of thousands of miles.

FROM THE FIELD

What Do You Think of Nonthermal Effects? And Other IEEE SCC-28 Multiple Choice Questions

Members of the IEEE's SCC-28 Revision Working Group were asked to complete the following questionnaire prior to a telephone conference call held on November 9. For more on the working group's current proposal to revise the ANSI/IEEE RF/MW exposure standard, see MWN, *S/O01.*

1. ***The RF safety standard should*:** (a) be based on science only; (b) also include sociopolitical considerations; (c) should include other considerations (specify).

2. ***The RF safety standard should be derived from*:** (a) database–peer reviewed publications; (b) possible effects proposed by some scientists; (c) precautionary principle; (d) media comments and demands.

3. ***The RF safety standard should be based on*:** (a) any biological effects reported in the literature; (b) established biological effects not necessarily adverse to health; (c) established adverse health effects; (d) others (specify).

4. ***The safety factors are needed to cover*** (check applicable items): (a) uncertainty in database; (b) uncertainty in measurement; (c) people with different RF sensitivity, including unhealthy people; (d) different exposure time; (e) environmental factors; (f) other factors (specify).

5. ***If there is a threshold of adverse effect, what do you think the safety factor should be, based on our current knowledge?*** (a) 2; (b) 3; (c) 5; (d) 10; (e) 20; (f) 50; (g) 100; (h) 1000; (i) others, such as _____.

6. ***What do you think of the nonthermal effects?*** (a) I don't believe any nonthermal effect; (b) No nonthermal effect has been established (no independently repeatable nonthermal RF effect); (c) I think some nonthermal effects are true; (d) None of the nonthermal effects are proven adverse to health; (e) Some nonthermal effects are adverse to health (specify); (f) For the above question, how do you know that the effects are nonthermal? Explain; (g) Nonthermal effects should be used for RF safety standard setting; (h) Nonthermal effects cannot be used for RF safety standard setting.

7. ***Do you agree that thermal effect is the only established adverse effect for the RF range (except neurostimulation by RF fields and currents for low-frequency RF)?*** (a) Yes; (b) No (explain why not).

8. ***If thermal effect is the only established adverse effect, do you think temperature is more suitable than SAR for determining the basic restriction limits?*** (a) Yes; (b) No (explain).

9. ***Do you agree that microwave hearing effect is an adverse effect?*** (a) Yes; Why? (b) No. Why? (c) other options, such as _____.

10. ***Do you agree that the microwave hearing threshold should be used for setting the limit for pulsed fields?*** (a) Yes; (b) No; (c) other options, such as _____.

11. ***Should include synergistic action with other factors, such as drugs and X-ray?*** (a) Yes; (b) No. Why not?

Studies Showing RF/MW-Induced BBB Leakage Called "Flawed"

Dr. Stanley Rapoport, chief of the Brain Physiology and Metabolism Section at the National Institute of Aging in Bethesda, MD, offered the following opinion in an affidavit for the defense in *Newman v. Motorola et al*. Dr. Christopher Newman alleges that his brain tumor was caused by mobile phone use (see p.8 and *MWN,* S/O00, N/D00 and J/F01):

> "It is my opinion that radiofrequency radiation (RFR) in the frequency ranges and power densities of wireless phones does not increase permeability of the blood-brain barrier [BBB]. It is also my opinion that there is no reasonably accepted mechanism by which an increase in the permeability of the BBB can cause brain cancer....The scientific literature regarding the effects of RFR on the permeability of the BBB is consistently negative. The few positive studies...are methodologically flawed."

In his October 17 affidavit, Rapoport wrote that he has spent nearly 40 years doing research on the BBB and is the author of *Blood-Brain Barrier in Physiology and Medicine* (New York: Raven Press, 1976). Rapoport's fee is $400 per hour, with a maximum of $2,000 per day. (See also p.1.)

Letters to the Editor

More on the Closing Down of NCRP's RF/MW Panel

When Was Motorola's C.K. Chou Asked To Step Down? Chou and Lin Respond

October 26, 2001

To the Editor:

The S/O01 *Microwave News* (p.11 and p.19) mentions my activity regarding NCRP Scientific Committee 89-5. I would like to provide some clarifying information for you and your readers.

In your editorial, you write that, "In January 2000, two years after he joined Motorola, Chou finally conceded the obvious: He had a conflict of interest. When Chou put this in writing, Lin felt he had no choice but to ask him to resign. Work on the report stopped while Chou resisted leaving the committee and Petersen refused to force the issue."

On the contrary, I know the following to be true: In 1995, when I first served as vice-chair of SC 89-5 and was working at the City of Hope National Medical Center, I was responsible for writing Chapter 2, "Exposure Assessment and Dosimetry," and Chapter 7, "Microwave Effects on the Nervous System Including Special Senses." When I began working for Motorola in April 1998, I anticipated a possible perception of a conflict of interest by others and offered to resign from SC 89-5, as well as many other committees. I was asked twice (April 1998 and June 1999) to remain on the committee by both NCRP President Charles Meinhold and SC 89-5 Chair Jim Lin. Therefore, I stayed on the committee. In January 2000, Lin reorganized the committee and invited me to remain as a member. I signed the agreement but indicated that I would finish only Chapter 2, not Chapter 7. I felt it would be more appropriate for someone outside industry to write this chapter — again, because of the potential that others may perceive a conflict of interest. This was accepted and I was appointed a member of SC 89-5. I then heard nothing until June 2001 when Lin informed me that it would be better for me to resign. I sent in my resignation on June 21. I had no reservation at all about resigning because that was what I had wanted to do in April 1998.

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On receiving Dr. Chou's letter, Microwave News *offered Dr. Lin, the chair of the National Council on Radiation Protection and Measurements SC 89-5, the opportunity to respond.*

November 9, 2001

To the Editor:

To the best of my knowledge, the report on p.11 of your S/O01 issue is factual. The decision of the NCRP board of directors that prompted this report is unfortunate and disconcerting.

C.K. Chou's letter to the editor states that, "In January 2000...I signed the agreement [to serve as a member of NCRP 89-5] but indicated that I would finish only Chapter 2, not Chapter 7....I then heard nothing until June 2001..."

Here are some additional facts:

In January 1998, when Chou asked about his status on SC 89-5 after joining Motorola, I replied in writing that, "I would like you to remain on the committee. If at some point you feel the change will affect the committee's deliberations, please let me know immediately."

In January 2000, on my recommendation, NCRP President Charles Meinhold invited Chou to be a member of the reconstituted SC 89-5. Chou's written, one-sentence response stated that "Due to conflict of interest, [I] will only complete Chapter 2, and let others finish Chapter 7." (Chapter 2 is on exposure assessment and dosimetry, and Chapter 7 is on effects on the nervous system.)

In February 2000, I wrote to Meinhold stating that, "The conflict could, potentially, compromise the committee's deliberation on recommendations for exposure criteria. I would, therefore, withdraw my recommendation for Dr. Chou's membership on SC 89-5."

Starting from shortly thereafter, records of correspondence show that Ron Petersen, NCRP vice-president in charge of non-ionizing radiation, was in discussions with Chou concerning his membership on the committee.

James C. Lin, PhD, Professor
University of Illinois, M/C 154
851 S. Morgan St., Chicago, IL 60607
E-mail: <lin@uic.edu>

12. ***The RF safety standard should be*:** (a) one tier; (b) two tiers; (c) other options, such as _____.

13. ***What do you think should be the basis for local SAR limit?*** (a) eye damage; (b) testis damage; (c) brain damage; (d) skin damage; (e) others, such as _____.

14. ***For peak SAR tissue averaging, do you agree that IEEE should change the averaging mass to 10 g?*** (a) Agree; (b) Disagree. Why not?

15. ***Are the MPEs [maximum permissible exposures] in the draft C95.1 acceptable to you?*** (a) Yes; (b) No. Why not?

16. ***Is the peak SAR limit in the draft C95.1 acceptable to you?*** (a) Yes; (b) No. Why not?

17. ***See the 14-issue list below raised by the federal government Radiofrequency Interagency Working Group [see* MWN, *J/A99]. Any other issues which you think we should spend more time discussing in the telephone conference?*** (a) biological basis for local SAR limit; (b) selection of an adverse effect level; (c) acute and chronic exposures; (d) one-tier vs. two-tier guidelines; (e) controlled vs. uncontrolled (applicability of 2 IEEE exposure tiers); (f) uncertainty factors; (g) pulsed (intensity) or frequency-modulated RF radiation; (h) time averaging; (i) lack of peak (or ceiling) limits for induced and contact current; (j) criteria for preventing hazards caused by transient discharges; (k) limits for exposure at microwave frequencies; (1) replication/validation; (m) important health effects literature areas; (n) compatibility of RFR guidelines.

18. ***Any other subjects that you think we should discuss?*** (a) No, we have enough to talk about; (b) Yes. Please specify _____.

Hot New Papers

J. Björk et al., "Are Occupational, Hobby or Lifestyle Exposures Associated with Philadelphia Chromosome–Positive Chronic Myeloid Leukemia [Ph+CML]?" ***Occupational and Environmental Medicine, 58,*** **pp.722-727, November 2001.**

"A case-control study, comprising 255 Ph+CML patients from southern Sweden and matched controls, was conducted....[O]ccupational titles were obtained from national registries, and group level exposure — that is, the exposure proportion for each occupational title — was assessed with a job exposure matrix ....The classification of EMF intensity was largely based on the average intensities for various occupational groups reported by Floderus et al. *[Int J Occup Environ Health, 2,* pp.226-238, 1996]....[T]he overall risk estimate and the risk estimate for long durations of exposure were both increased, whereas no trend with exposure intensity was indicated.... An association with long occupational exposure to EMFs was found (OR 2.3, 95% CI: 1.2 to 4.5)."

M. Crasson et al., "Daytime 50 Hz Magnetic Field Exposure and Plasma Melatonin and Urinary 6-Sulfatoxymelatonin [6-OHMS] Concentration Profiles in Humans," ***Journal of Pineal Research, 31,*** **pp.234-241, November 2001.**

"A double-blind laboratory study was performed to evaluate daytime exposure effects of 100 ∝T root mean square (rms) 50 Hz MF. Three head exposure sessions of 30 min each were performed: sham, continuous and intermittent (15 s on/off cycles). MFs were presented to each subject in early or late afternoon (13:30 or 16:30 hr). 21 healthy male volunteers (20-27 yr old) participated in these 3-weekly experimental conditions. Blood samples were drawn for serum melatonin measurement, hourly at night...under controlled environmental conditions. Urinary excretion of 6-OHMS , the main melatonin metabolite, was measured for a 17 hr period....There were no significant differences in either plasma melatonin or in 6-OHMS excretion profiles in the three experimental conditions. However, a tendency for a smaller increase of night-time urinary 6-OHMS after continuous MF exposure was found (p=0.08), particularly in men with the lower excretion rate of 6-OHMS... (p=0.07). We conclude that this study does not indicate that daytime acute MF exposure influences either melatonin secretion or 6-OHMS excretion. Inter-individual differences in pineal production of melatonin, however, have to be taken into account in further studies....It is, however, too early to conclude that pineal function in humans is unaffected by MF exposure before further examining the MF effect with different experimental and technical characteristics of exposure."

Patrick Mason et al., "Lack of Effect of 94 GHz Radiofrequency Radiation Exposure in an Animal Model of Skin Carcinogenesis," ***Carcinogenesis, 22,*** **pp.1701-1708, October 2001.**

"Because absorption of MMW [millimeter wavelength] energy occurs in the skin, it is to be expected that long-term detrimental health effects, if any, would most likely be manifest in the skin....There are three principal conclusions derived from this study. First, a single MMW exposure (1.0 W/cm^2 for 10 s) that produces a 13-15°C increase in skin temperature does not promote the development of papillomas in DMBA-initiated SENCAR mice. Second, repeated MMW exposures (twice weekly for 12 weeks, 333 mW/cm^2) that produce a 4-5°C increase in skin temperature failed to either promote or act synergistically with TPA to copromote the development of papillomas in this mouse model. Finally, repetitive exposure to MMW alone does not alter the expression of well-recognized early biomarkers and MMW exposure does not affect TPA-induced increases in these indices of epidermal hyperplasia. ...The experiments...address two potential scenarios [for] accidental overexposure. The first is a single accidental overexposure to a relatively

GSM Radiation Can Affect DNA Recombination in Mice

Pamela Sykes et al., "Effect of Exposure to 900 MHz Radiofrequency Radiation [RFR] on Intrachromosomal Recombination in pKZ1 Mice," ***Radiation Research, 156,*** **pp.495-502, November 2001.**

"pKZ1 mice were exposed daily for 30 min to plane-wave fields of 900 MHz [GSM radiation] for one, five or 25 days. Three days after the last exposure, spleen sections were screened for DNA inversion events. There was no significant difference between the control and treated groups in the one- and five-day exposure groups, but there was a significant reduction in inversions below the spontaneous frequency in the 25-day exposure groups....The data...provide the first evidence that pulsed RFR as emitted from digital mobile phones can affect intrachromosomal recombination. We observed a significant 40% reduction in somatic intrachromosomal recombination below the spontaneous frequency after 25 daily 30 min 4 W/Kg exposures. The numbers of animals in the treatment groups were small (n=10 or n=20)... repetition of this study with a larger number of animals/treatment group is required to confirm these observations....The detection of a reduction below the spontaneous inversion frequency in pKZ1 mice treated with RFR is surprising. However, we previously observed that a statistically significant reduction in somatic intrachromosomal recombination in spleen occurs with the pKZ1 mutagenesis model after the mice are exposed to a number of proven genotoxic agents.... There are a number of possible explanations....Somatic intrachromosomal recombination events already present could have been eliminated in response to RFR. This seems unlikely....If somatic intrachromosomal recombination, like other repair mechanisms, is dependent on proliferation, then recombination may be reduced owing to a reduction in proliferation. Although some studies indicate no effect of RFR on proliferations *in vitro,* RFR has been shown to increase and decrease proliferation of cytolytic T lymphocytes *in vitro*. RFR has also been shown to inhibit proliferation of cells of a human astrocytoma line. An effect of RFR on cell proliferation or the cell cycle could have a downstream effect on DNA recombination/repair and hence on genotoxicity....A decrease below the spontaneous somatic intrachromosomal recombination frequency may also occur if RFR has a direct effect on recombination repair enzymes....Whatever the mechanism for the reduction of somatic intrachromosomal recombination below the spontaneous frequency by exposure to RFR, the results of the present study suggest that RFR does have a direct or indirect biological effect on DNA recombination and hence on mutation frequency....If RFR is genotoxic, then it is likely to play some role in either the initiation or progression of cancer. It is also possible that individuals in the population who already possess mutations that make them prone to cancer may be more susceptible to the mutagenic effects of RFR." (See p.8 and *MWN,* N/D00.)

high power density of MMW....The second exposure scenario is that of repeated exposure to lower levels of MMW...Thus, there was no evidence that MMW exposure under these experimental conditions served as either a promoter or a copromoter in a well-accepted animal model of skin carcinogenesis."
(Some members of this USAF team wrote a review article on MMW surface heating last year; see *MWN,* J/F00. They have also worked on the USAF's millimeter wave crowd-control weapon — called active denial technology — which operates at 95 GHz; see *MWN,* M/A01).

A. McCurdy, L. Wijnberg, D. Loomis, D. Savitz and L. Nylander-French, "Exposure to Extremely-Low-Frequency Magnetic Fields Among Working Women and Homemakers," *Annals of Occupational Hygiene, 45,* pp.643-650, 2001.

"The 273 women who participated wore an integrating personal magnetic field exposure meter (AMEX 3-D) that measured their time-weighted average (TWA) exposure. A questionnaire was administered to determine the duration and frequency of electric appliance and machinery use. The geometric mean (GM) of the TWA exposure for employed women was 0.138 ∝T (range 0.022-3.636 ∝T) and for homemakers 0.113 ∝T (range 0.022-0.403 ∝T). Women working in manufacturing and industrial facilities had the highest exposure (GM 0.265 ∝T, range 0.054-3.436 ∝T), while nurses and health technicians (GM 0.134 ∝T, range 0.032-0.285 ∝T) and teachers and school administrators (GM 0.099 ∝T, range 0.035-0.673 ∝T) had the lowest exposures. Job titles, unless very limited in scope and/or environment, self-reported information about equipment use, potential exposure sources, time and distance, were not good predictors of magnetic field exposure. Furthermore, the results show that occupations previously observed to have increased risk of breast cancer, such as teachers, nurses, administrative support and housewives, did not have elevated average magnetic field exposures. Therefore, it is questionable whether exposure to power-frequency magnetic fields is the cause of the increased breast cancer risk seen in these occupations."

Yoram Wolf, Neta Adler and Daniel Hauben, "Exploding Microwaved Eggs — Revisited," *Burns, 27,* pp.853-855, December 2001.

"Careful review of the English language literature through a Medline search from 1966 to 2000 was performed, in search of burns caused by exploding eggs....[A] total of 13 cases were analyzed. The average age of patients was 24.3 years (range, 7-49 years). All patients suffered from superficial burns of the mid and upper face, namely the forehead, periorbital region, dorsum of nose and malar areas. All patients with information available complained of occular disturbances, and three suffered long-term decrease in visual acuity. Long-term skin complications were not reported. In summary, the clinical presentation of a facial injury from an exploding microwave-heated egg is relatively constant and mild."

New Books

Blake Levitt, ed., ***Cell Towers: Wireless Convenience? Or Environmental Hazard?*** 355pp.,$19.95, Markham, ON, Canada: Safe Goods/New Century Publishing, 2001.

The proceedings of a meeting held in Connecticut last year, with a number of useful documents appended.

James Collman, ***Naturally Dangerous: Surprising Facts About Food, Health and the Environment,*** 282pp., $29.00, Sausalito, CA: University Science Books, 2001.

A Stanford chemistry professor brings a skeptic's eye to many of the public's health worries.

Dag Brune, Ragnar Hellborg, Bertil Persson and Rauno Pääkkönen, eds., ***Radiation: At Home, Outdoors and in the Workplace,*** 563pp., 110 Euros, $95.00, Oslo, Norway: Scandinavian Science Publisher, 2001.

Covers the whole spectrum — with chapters on EMFs and mobile phones. Also includes a case study of the *Kvikk* birth defects cluster.

Steven Milloy, ***Junk Science Judo: Self-Defense Against Health Scares & Scams,*** 228pp., $18.95, Washington: Cato Institute, 2001.

The maestro of junkscience.com offers 12 lessons on how to poke holes in studies that point to health risks.

"Microwave News" Flashback

Years 20 Ago

• In a joint study, a British-American team finds elevated rates of suicide in locations with high EMF levels.

• At a meeting on RF/MW radiation and health, Dr. Samuel Koslov of the JHU Applied Physics Lab criticizes ANSI's draft standard as "a grotesque violation" of ALARA, which allows "considerable risk with little benefit to either the industry or military organizations."

• Clusters of miscarriages and birth defects among women who work with VDTs continue to emerge in the U.S. and Canada, casting doubt on government reassurances that the equipment is safe.

Years 10 Ago

• The IEEE approves a revision of ANSI's 1982 RF/MW radiation standard which, for the first time, requires stricter exposure limits for the public than for workers.

• After five years of grant proposals, Drs. Scott Davis of the Fred Hutchinson Cancer Research Center and Richard Stevens of Battelle Pacific Northwest Labs receive funding to investigate the possible link between light at night and female breast cancer.

• The Connecticut State Police bans the use of hand-held radar by officers as concern over a possible cancer link mounts.

Years 5 Ago

• The NAS–NRC concludes that there is "no conclusive and consistent evidence" that residential EMF exposure is a human health hazard. However, it does find a higher than expected incidence of leukemia among children who live near high-voltage power lines.

• To avoid EMI, active cell phones should be kept at least six inches from cardiac pacemakers, according to CTIA–WTR guidelines.

• Reports of headaches among users of mobile phones emerge in the U.S., after similar complaints have been reported in other countries.

2002 Conference Calendar (Part I)

Part II will appear in our next issue.

January 9-12: **International Union of Radio Science (URSI) National Radio Science Meeting,** University of Colorado, Boulder, CO. Contact for Commission K, Electromagnetics in Biology and Medicine: Dr. Frank Barnes, University of Colorado, Boulder, CO 80303, (303) 492-8225, E-mail: <frank.barnes@colorado.edu>, Web: <cires.colorado.edu/ursi>.

January 27-31: **IEEE Power Engineering Society (PES) Winter Meeting,** Hilton Hotel, New York, NY. Contact: Melvin Olken, 445 Hoes Ln., PO Box 1331, Piscataway, NJ 08855, (732) 562-3864, Fax: (732) 981-1769, E-mail: <m.olken@ieee.org>, Web: <www.ieee.org>.

January 29-February 1: **3rd RF Waipuna Meeting,** Waipuna Conference Center, Auckland, New Zealand. Contact: Dr. David Black, Enviromedix, Private Bag 24-904, Royal Oak, Auckland, New Zealand, (64+9) 625-0407, Fax: (64+9) 625-2292, E-mail: <david@enviromedix.co.nz>, Web: <www.enviromedix.co.nz/icoh>.

January 30-February 1: **21st Annual Scientific Conference of the Society for Physical Regulation in Biology and Medicine (SPRBM),** Westgate Hotel, San Diego, CA. Contact: Gloria Parsley, 2412 Cobblestone Way, Frederick, MD 21702, (301) 663-4556, Fax: (301) 694-4948, E-mail: <gloriaparsley@aol.com>, Web: <www.sprbm.org>.

February 8: **Bioelectromagnetics Society (BEMS) Winter Workshop: Epidemiological Considerations in Electromagnetics,** Radisson Barcelo Hotel, Washington, DC. Contact: Ewa Czerska, CDRH, FDA, 9200 Corporate Blvd., Rockville, MD 20850, (301) 594-1212 ext.119, Fax: (301) 480-4224, E-mail: <emc@cdrh.fda.gov>, Web: <www.bioelectromagnetics.org>.

March 17-21: **41st Annual Meeting of the Society of Toxicology (SOT),** Opryland Hotel, Nashville, TN. Contact: Clarissa Wilson, SOT, 1767 Business Center Dr., Ste. 302, Reston, VA 20190, (703) 438-3115, Fax: (703) 438-3113, E-mail: <clarissa@toxicology.org>, Web: <www.toxicology.org>.

March 18-20: **Wireless 2002,** Orange County Convention Center, Orlando, FL. Contact: Michele Solomon, Cellular Telecommunications and Internet Association, 1250 Connecticut Ave., NW, Ste. 800, Washington, DC 20036, (202) 736-3244, <msolomon@ctia.org>, Web: <www.ctiashow.com>.

April 6-11: **National Association of Broadcasters Annual Convention (NAB),** Las Vegas, NV. Contact: Kristie Morris, NAB, 1771 N St., NW, Washington, DC 20036, (800) 342-2460 or (202) 429-4194, E-mail: <kmorris@nab.org>, Web: <www.nab.org>.

April 10-11: **38th Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP),** Crystal City Marriott, Arlington, VA. Contact: Laura Atwell, 7910 Woodmont Ave., Ste. 800, Bethesda, MD 20814, (301) 657-2652, Fax: (301) 907-8768, E-mail: <atwell@ncrp.com>, Web: <www.ncrp.com>.

April 12-19: **Annual American Occupational Health Conference,** Chicago, IL. Contact: American College of Occupational and Environmental Medicine, 1114 N. Arlington Heights Rd., Arlington Heights, IL 60004, (847) 818-1800, Fax: (847) 818-9286, Web: <www.acoem.org/courses/conf2.htm>.

April 15-17: **American Power Conference,** Downtown Marriott, Chicago, IL. Contact: AP Conference, 1421 S. Sheridan Rd., Tulsa, OK 74112, (918) 831-9160, Fax: (918) 831-9161, E-mail: <apc@pennwell.com>, Web: <www.apc-pennwell.com>.

April 22-25: **IEEE Radar Conference,** Hyatt Regency, Long Beach, CA. Contact: Dr. Thomas Miller, Raytheon Co., 2000 E. El Segundo Blvd., El Segundo, CA 90245, (310) 335-6402, Fax: (310) 335-6387, E-mail: <tmiller@west.raytheon.com>, Web: <www.ewh.ieee.org/r6/lac/radar02/index.html>.

April 27-May 2: **Annual Meeting of the Environmental Mutagen Society (EMS),** Hilton Hotel, Anchorage, AK. Contact: Lawrence Loeb, Dept. of Pathology, University of Washington, PO Box 357705, Seattle, WA 98195, (206) 543-9360, Fax: (206) 543-3967, E-mail: <laloeb@u.washington.edu>, Web: <www.ems-us.org/meetings.html>.

April 28-May 2: **International Magnetics Conference (Intermag),** RAI Conference Center, Amsterdam, The Netherlands. Contact: Courtesy Associates, (202) 973-8676, Fax: (202) 973-8722, E-mail: <intermag@courtesyassoc.com>, Web: <www.intermagconference.com>.

May 2-3: **International Symposium on Light, Endocrine Systems and Cancer,** University of Cologne, Germany. Contact: Dr. Thomas Erren, Institute and Polyclinic for Occupational and Social Medicine, University of Cologne, D-50924, Cologne, Germany, (49+221) 4785819, Fax: (49+221) 4785119, E-mail: <tim.erren@uni-koeln.de>, Web: <www.uni-koeln.de/symposium2002>.

May 5-8: **34th National Conference on Radiation Control,** Marriott Madison West, Middleton, WI. Contact: Lin Carigan, Conference of Radiation Control Program Directors, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543, Fax: (502) 227-4928, E-mail: <lcarigan@crcpd.org>, Web: <www.crcpd.org>.

May 6-9: **Annual Conference of the Canadian Radiation Protection Association,** Empire Landmark Hotel, Vancouver, BC, Canada. Contact: Craig Smith, RSO, University of British Columbia, 2065 Wesbrook Mall, Vancouver V6T 1Z1, Canada, (604) 822-7052, Fax: (604) 822-8065, E-mail: <smith@safety.ubc.ca>, Web: <www.hse.ubc.ca/Vancouver/Newweb/VINDEX.html>.

May 18-24: **10th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine (ISMRM),** Convention Center, Honolulu, HI. Contact: ISMRM, 2118 Milvia St., Berkeley, CA 94704, (510) 841-1899, Fax: (510) 841-2340, E-mail: <info@ismrm.org> or <smrt@ismrm.org>, Web: <www.ismrm.org/smrt>.

May 20-23: **IEEE Conference on Ultra Wideband Systems and Technologies,** Wyndham Inner Harbor, Baltimore, MD. Contact: Robert Fontana, 20300 Century Blvd., Germantown, MD 20874, (301) 528-1745, Fax: (301) 528-1749, E-mail: <rfontana@multispectral.com>, Web: <www.uwbst2002.com>.

May 21-23: **IEEE Instrumentation and Measurement Technology Conference,** Hilton Hotel, Anchorage, AK. Contact: Robert Myers, 799 N. Beverly Glen, Los Angeles, CA 90077, (310) 446-8280, Fax: (310) 446-8390, E-mail: <bob.myers@ieee.org>, Web: <www.ieee-imtc.org>.

May 21-24: **International Symposium & Technical Exhibition on Electromagnetic Compatibility,** Beijing, China. Contact: Prof. Liu Dayong, Chinese Institute of Electronics, PO Box 165, Beijing 100036, China, (86+10) 6828-3463, Fax: (86+10) 6828-3458, E-mail: <dyliu@public.bta.net.cn>, Web:

Meeting Notes

• There will be a non-ionizing radiation workshop in Vancouver at the May conference of the Canadian Radiation Protection Association (see also p.16).

• The abstracts of papers presented at September's meeting of the **Australasian Radiation Protection Society** are on its Web site, <www.arps.org.au/AbstractsARPS26.pdf>. Many of them are on ionizing radiation, but some are from the non-ionizing side of the spectrum. For instance, **Jill Wright** of the Queensland government's Division of Workplace Health and Safety reports on an exposure survey of operators of plastic welders and sealers. She found that the Australian limits for 10-400 MHz were exceeded in 78% of the workplaces. There were also presentations by Dr. Ken Joyner of Motorola, Ken Karapidis of ARPANSA and Dr. Alastair McKinlay of the U.K.'s NRPB, among others.

• Dr. **Linda de Jager** of Technikon Free State in South Africa is organizing a session on "Electromagnetics in Biology and Medicine" for the **PIERS** meeting to be held in Cambridge, MA, in June. Contact her at <ldejager@tofs.ac.za>.

<www.cie-china.org/emc2002>.

June 1-6: **American Industrial Hygiene Association Conference and Exposition,** San Diego, CA. Contact: AIHA, 2700 Prosperity Ave., Fairfax, VA 22031, (703) 849-8888, Fax: (703) 207-3561, Web: <www.aiha.org>.

June 2-7: **IEEE Microwave Theory and Techniques Society (MTT-S) International Microwave Symposium,** Washington State Trade and Convention Center, Seattle, WA. Contact: Donn Harvey, Metawave Communications, (425) 702-5816, E-mail: <d.harvey@ieee.org>, Web: <www.ims2002.org>.

June 4-8: **World Conference on Breast Cancer,** Victoria, BC, Canada. Contact: World Conference on Breast Cancer, 841 Princess St., Kingston, ON K7L 1G7, Canada, (613) 549-1118, Fax: (613) 549-1146, E-mail: <brcancer@kos.net>, Web: <www.worldbreastcancerconf.ca>.

June 16-20: **47th Annual Meeting of the Health Physics Society (HPS)** and **2002 American Radiation Safety Conference and Exhibition (ARSCE),** Convention Center, Tampa, FL. Contact: HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101, Web: <www.hps.org>.

June 16-21: **IEEE Antennas and Propagation Society (AP-S) International Symposium on Antennas and Propagation** and **USNC/URSI National Radio Science Meeting,** Hyatt Regency Hotel, San Antonio, TX. Contact: Prof. Robert Nevels, Dept. of Electrical Engineering, Texas A&M University, College Station, TX 77843, (979) 845-7591, Fax: (979) 845-6259, E-mail: <nevels@ee.tamu.edu>, Web: <www.ieeeaps.org/2002APSURSI>.

June 16-21: **Conference on Precision Electromagnetic Measurements (CPEM),** Ottawa, Canada. Contact: CPEM 2002 Management Office, National Research Council Canada, Ottawa, ON K1A 0R6, Canada (613) 993-7271, Fax: (613) 993-7250, E-mail: <CPEM02@nrc.ca>, Web: <www.nrc.ca/confserv/cpem02>.

June 19-21: **35th Annual Meeting of the Society for Epidemiologic Research (SER),** Marriott Resort & Spa, Palm Desert, CA. Contact: SER, PO Box 990, Clearfield, UT 84098, (801) 525-0231, Fax: (801) 587-1002, E-mail: <membership@epiresearch.org>, Web: <www.epiresearch.org/meeting/index.html>.

June 23-27: **24th Annual Meeting of the Bioelectromagnetics Society (BEMS),** Loews le Concorde Hotel, Québec City, Canada. Contact: Gloria Parsley, BEMS, 2412 Cobblestone Way, Frederick, MD 21702, (301) 663-4252, Fax: (301) 694-4948, E-mail: <BEMSoffice@aol.com>, Web: <www.bioelectromagnetics.org>.

June 25-28: **16th International Wroclaw Symposium and Exhibition on Electromagnetic Compatibility,** Wroclaw, Poland. Contact: Dr. W. Sega, EMC Symposium, Box 2141, 51-645 Wroclaw 12, Poland, (48+71) 348-3051, Fax: (48+71) 372-8878, E-mail: <emc@il.wroc.pl>, Web: <www.emc.wroc.pl>.

July 1-5: **Progress in Electromagnetics Research Symposium (PIERS 2002),** Cambridge, MA. Contact: Prof. J.A. Kong, Rm. 26-305, MIT, 77 Massachusetts Ave., Cambridge, MA 02139, Fax: (617) 258-8766, E-mail: <piers@ewt.mit.edu>, Web: <www.piers.org>.

Across the Spectrum

Science for the sake of science...is a costly anachronism. Its successor is science for profit.

—Daniel Greenberg, "At Any Cost: Money Is a Major Motivation in Science Today: Where Does that Leave Truth, Openness and Public Responsibility?" *New Scientist* (U.K.), p.50, October 13, 2001
Greenberg is the author of *Science, Money and Politics,* Chicago: University of Chicago Press, 2001, 540 pp.

"We as scientists do not trust NIEHS to conduct [a] study of cell phone safety based on its record."

— Dr. Ross Adey, Loma Linda School of Medicine, CA, quoted by Becky Gillette, "Raising the Alarm: Concerns Linger About Electromagnetic Fields," *E Magazine,* p.41, November/December 2001

[T]he publication of thousands of reports does not necessarily mean that the knowledge on this issue is sufficient to support the decision-making process, especially for microwave radiation emitted from mobile phones. ...[T]o use the volume of published scientific papers as the reason for not applying the precautionary principle seems premature. In my opinion, the inconclusive, commonly contradictory and anecdotal scientific evidence rather supports the use of the precautionary principle.

— Dr. Dariusz Leszczynski, Radiation and Nuclear Safety Authority (STUK), Helsinki, Finland, commenting on statements by WHO's Dr. Michael Repacholi at the September EBEA meeting in Helsinki, *Lancet* (letter), p.1733, November 17, 2001 (see *MWN,* J/A01 and S/O01)

"[T]he certainty that the study's results were unequivocally negative [has] eroded with the passage of time."

— Dr. David Savitz, University of North Carolina, Chapel Hill, reply to a letter from Dr. Thomas Erren et al., *American Journal of Epidemiology, 154,* p.979, November 15, 2001; Savitz is referring to the National Cancer Institute's 1997 study on EMFs and childhood leukemia (see *MWN,* J/A97 and M/J98)

Mobile Phones: One Is Not Enough

"[The phones] are all different. Like sneakers, bikes, motorcycles and cars — those things all take people places. But do sneakers do what a car does? Of course not. Does a bike? Do you want *one* of them? No. You need them all."

—Frank Nuovo, designer of mobile phones for Nokia (looking at dozens of phones in a shop), explaining why he expects that most consumers will soon own several wireless devices, quoted by Michael Specter, "The Phone Guy: How Nokia Designed What May Be the Best-Selling Cellular Products on Earth," *New Yorker,* p.72, November 26, 2001

The new era of toxicogenomics, made possible by advances in human genomics, promises to revolutionize the practice of public health as it relates to environmental health protection. Understanding human genetic variation and genomic reactions to specific environmental exposures will have a significant impact on our ability to uncover the causes of variations in response to environmental exposures.

— Drs. Kenneth Olden, director, and Janet Guthrie and Sheila Newton, Office of Planning, Policy and Evaluation, National Institute of Environmental Health Sciences, Research Triangle Park, NC, "A Bold New Direction for Environmental Health Research," *American Journal of Public Health,* p.1966, December 2001

"This opens up a whole new area of research in magnetic sense."

— Dr. Michael Walker, University of Auckland, New Zealand, on the discovery of a structure in the brains of Zambian mole rats that processes information on magnetic fields, quoted by Kathryn Brown, "Animal Magnetism Guides Migration," *Science,* p.283, October 12, 2001 (see p.16)

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UPDATES

MAGNETORECEPTION

Reading the Earth's Magnetic Field... Several new papers present a fascinating picture of how animals glean information from their electromagnetic environment. In the November 1 issue of *Nature (414,* pp.35-36), Swedish researchers report that thrush nightingales can distinguish the ambient magnetic field in Scandinavia, at the start of their migration route, from that in northern Egypt, where they pause to build fat reserves before crossing the Sahara desert — a journey of up to 1,500 km. Dr. Thord Fransson of Stockholm University captured birds in Sweden and exposed them to a magnetic field that gradually shifted in intensity and direction until it matched that found in Egypt. On cue, the birds began eating and storing fat — their weight increased significantly compared to controls. Sea turtles can also use magnetic cues for successful migration. In the October 12 issue of *Science (294,* pp.364-366), Drs. Kenneth and Catherine Lohmann of the University of North Carolina, Chapel Hill, describe how loggerhead turtles can distinguish among the magnetic fields in widely separated parts of the Atlantic Ocean. The Lohmanns found that in the lab turtles adjusted the direction in which they moved according to the ambient magnetic fields. Neither the Swedish nor the U.S. groups attempt to explain how the animals can detect these variations in magnetic fields. But in the same issue of *Science* (pp.366-368), researchers from the Czech Republic and Germany suggest how Zambian mole rats can do it. Mole rats, which are blind, have already been shown to use a magnetic sense to position their nests. Now, the team led by Dr. Pavel Němec of Charles University in Prague has discovered how their brains process magnetic cues. By comparing brain activity of mole rats in different magnetic fields, they identified a cluster of cells in which, they believe, individual neurons "respond only to magnetic fields with a distinct range of polarity" — rather than to changes in polarity. While this is the first paper to show the processing of magnetic field information in the brain of a mammal, Němec told *Microwave News,* previous studies have looked at neural activity in fish and birds. "We cannot exclude the possibility that these neurons contain receptors," he noted — but, he added, they are far from being able to identify them. (See p.15.)

PEOPLE

ICNIRP will consider who should replace Dr. **Ulf Bergqvist** at its annual meeting, to be held in May, Dr. **Alastair McKinlay**, the chair of ICNIRP, told *Microwave News*. Bergqvist, who had been a member of the commission since 1992, died in September. The meeting will be held in Vancouver in conjunction with the annual conference of the Canadian Radiation Protection Association (see p.14)....Dr. **Cristina Leske** of the State University of New York, Stony Brook, has been elected to the Institute of Medicine in Washington. Leske is working on an epidemiological study of breast cancer and EMFs (see *MWN,* S/O96)....Dr. **James Melius**, the director of the New York State Laborers Health and Safety Trust Fund and formerly a member of the RAPID program's National EMF Advisory Committee, has been appointed to the Advisory Board on Radiation and Worker Health by President Bush....Dr. **Daniel Wartenberg**, an epidemiologist at the Environmental and Occupational Health Sciences Institute in Pis-

cataway, NJ, ran for the New Jersey state senate on the Democratic line in November. He lost to the Republican incumbent, Walter Kavanaugh....Dr. **Stephen Perry** died on April 12. Perry, a general medical practitioner in central England, was the first to identify a possible link between power line EMFs and suicides (see *MWN,* D81). Perry collaborated with Drs. **Robert Becker** and **Andrew Marino** on many of his early studies. The association was largely discounted for a generation, but last year **Edwin van Wijngaarden** and Dr. **David Savitz** revived the issue when they reported that electrical workers had a higher than expected rate of suicide (see *MWN,* M/A00).

RAILROAD EMI

Report on EPRI Workshop...EPRI is launching a new initiative on an old problem: power line EMFs interfering with railroad signaling systems. For instance, EMI could cause crossing gates to close when no train is approaching — or, more dangerously, cause railway signals to display a green light instead of red. At a workshop in Pueblo, CO, August 21-22, 18 participants set priorities for research and laid the groundwork for future cooperation. According to EPRI, new technologies such as the global positioning system (GPS), mobile phone base stations collocated on pylons and flexible AC transmission systems (known as FACTS) "require a fresh look at this potential electromagnetic compatibility problem area." EPRI, based in Palo Alto, CA, has prepared a report, *EPRI Railroad Communications and Signaling EMC Workshop: Minutes and Appendices*. Not surprisingly, it calls for more research: specifically, on the EMF environment in which signal equipment operates, on the field levels at which such devices are susceptible to interference and on potential problems posed by emerging technologies. EPRI sponsored the 1983 study by Dr. Allen Taflove, then at the IIT Research Institute in Chicago, which showed that railway signals could malfunction and display a "false clear" due to voltages induced by nearby power lines (see *MWN,* S83). The 178-page EPRI Report No.1005197 can be purchased for $2,500 from the EPRI Customer Fulfillment Center at (925) 609-9169.

TETRA

Signal Modulation... The U.K.'s NRPB has issued a technical note to clarify the nature of the signal used in the country's new digital Terrestrial Trunked Radio (TETRA) communication system. Dr. S. Mann of the NRPB and Prof. L. Challis of the University of Nottingham conclude that — contrary to some earlier reports — the radiation from TETRA base stations is not pulsed. TETRA handsets and mobile terminals do pulse with a frequency of 17.64 Hz. (The carrier frequency is in either the 380-395 MHz or the 410-425 MHz band.) In late July, the AGNIR, chaired by Sir Richard Doll, issued a report concluding that the TETRA signals do not pose a health risk (see p.3 and *MWN,* J/A01). The technical note, *Power Modulation Spectra of Signals Used in TETRA*, has been appended to the AGNIR report, which is available at no charge on the NRPB's Web site, <www.nrpb.org.uk>. A print copy of the report will be available soon for £16.50 (approximately US$23.50) from the NRPB; contact: <information@nrpb.org.uk>.

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As We Go to Press

Barrett Mobile Phone Brain Tumor Suit Withdrawn

The lawsuit on behalf of Brian Barrett of Atlanta, who blames mobile phone radiation for his brain cancer, has been withdrawn. Barrett sued Nokia, BellSouth Mobility and the CTIA last January 29 in Georgia state court (see *MWN,* J/F01).

Richard Capriola of Weinstock & Scavo in Atlanta, who is representing Barrett, faced a December 4 deadline for announcing his expert witnesses. According to a source familiar with the case, he instead moved to withdraw the suit "without prejudice," leaving the door open for reviving it at a later date.

Capriola did not respond to repeated requests for comment.

U.K. Police Step Up Criticism of TETRA Phone System

The U.K.'s Police Federation is not satisfied with the government's assurances that TETRA radios are safe, and is threatening to withdraw its support and to boycott the country's new £2.5 billion national emergency communication system (see p.17 and *MWN,* S/O01).

Fred Broughton, the chair of the federation, said that, "We are still awaiting answers to a whole series of questions about the long-term health effects of TETRA technology," the *Guardian* (November 28) reported. "We need the answers now."

For more on the federation's health concerns, see "Airwave: The Urgent Unanswered Questions," in the December issue of *Police Magazine*, available at: <www.polfed.org/magazine>.

Keeping Current: Follow-Up on the News

◆ TCO Development, an offshoot of the Swedish white collar workers' union, has completed its standard for mobile phones, "TCO'01." To qualify for the TCO'01 label, a phone must have an SAR of 0.8 W/Kg or less (averaged over 10 g), and meet a number of environmental and ergonomic criteria (see *MWN,* J/F 01). A copy of the requirements and test methods is available in both Swedish and English at <www.tcodevelopment.com>. The site also has some tips for buying a cell phone.

◆ Germany's Federal Radiation Protection Office has released a brochure summarizing its precautionary advice for mobile phones and base stations — including limiting the use of phones by children. The head of the office, Wolfram König, announced these policies last summer (see *MWN,* J/A01). The brochure is in German and is available at: <www.bfs.de/info/themen>.

◆ The Swedish Energy Authority is considering moving a 400 kV power line in Södra Sandbybor, near Lund, as requested by municipal officials, according to the November 13 *Sydsvenskan,* a daily newspaper in southern Sweden. Magnetic field levels are 75 mG under the line and homes are located 20-30 m away.

◆ The EMR Network has posted a copy of the draft revision of the SCC-28 RF/MW exposure standard on its Web site. Go to: <www.emrnetwork.org/regulation/regulations.htm>. (See also *MWN,* S/O01).

◆ Motorola's Drs. Joe Morrissey, Mays Swicord and Q. Balzano will report on possible EMI from cell phones to medical devices in hospitals in the January 2002 issue of *Health Physics*.

◆ Ever wonder what happens when lightning strikes an airplane? (This is not a rare event.) *Scientific American* tells you on p.104 of its December issue; or go to <www.sciam.com/askexpert>.

◆ The next meeting of the SCC-34 subcommittee developing a protocol for measuring SARs from mobile phones will be held at Motorola's offices in Plantation, FL, on January 14-15.

◆ We are not sure whether this is good news or bad: The Society for Psychical Research in the U.K. says that sightings of ghosts have fallen precipitously over the last 15 years, the *Sunday Express* reports. It blames the introduction of cell phones.

How Big Tobacco Defines Wireless and EMF Health Debates

Headlines that compare cell phones to tobacco may be provocative, but they are unfair. Even though cell phones are now more common than cigarettes, we still don't know if phones are dangerous.

What we do know is that many of the same people, using many of the same tactics, have been working to protect the interests of both the tobacco and wireless industries.

The tobacco industry promoted the concept of Good Epidemiology Practices, or GEP, "to shape the standards of scientific proof to make it impossible to 'prove' that secondhand smoke ...is dangerous," according to a new analysis* by Elisa Ong and Stanton Glantz of the University of California, San Francisco.

In the mid-1990s, under a Philip Morris contract, James Tozzi of Federal Focus in Washington was encouraging the use of GEP, not only for tobacco smoke, but also for EMFs and other agents. In 1994 alone, the company paid Tozzi as much as $610,000.

In 1993, the Cellular Telecommunications and Internet Association (CTIA) hired George Carlo to run its $25 million cell phone health research program. Carlo, who had been a full-time consultant to the tobacco industry and had worked with Tozzi, turned to Tozzi to help draw up what would become the Wireless Technology Research's (WTR) agenda. The following year, Carlo again engaged Tozzi — this time to stage a symposium on cell towers.

Tozzi continued to work on GEP and in 1995 assembled a group of academics and consultants in London to hammer out the working principles for GEP. Carlo was among those invited, as was John Graham, then at the Harvard School of Public Health and now at the Office of Management and Budget.

Over the life of the cell phone program, Carlo paid Graham $420,000 to give WTR a veneer of respectability.

Carlo was soon insisting that any epidemiological studies funded by WTR should be carried out in accordance with GEP.†

Ong and Glantz offer the following warning:

> While every practicing scientist agrees that scientific work should be rigorously done, the scientific, public health and regulatory communities need to be more aware that the "sound science" and "GEP" movement is not simply an effort from within the profession to improve the quality of scientific discourse. This movement reflects sophisticated public relations campaigns controlled by industry executives and lawyers to manipulate the scientific standards of proof for the corporate interests of their clients.

Another element of Philip Morris' GEP strategy was to discredit any epidemiological finding with a relative risk of less than 2. This strategy was welcomed by the electric utility industry, which was seeking to prevent EMFs from being designated as possible human carcinogens. In his 1996 book, *Electric and Magnetic Fields: Invisible Risks,* the late Leonard Sagan of EPRI wrote wistfully: "To some epidemiologists, [a 2-3] level of increased risk is close to the 'noise level.'"

Later, when the CTIA was trying to convince the FDA to set up a cooperative research program—known as a CRADA — it turned to yet another tobacco lobbyist. As reported by *RCR Wireless News,* the CTIA hired Arthur Levine, an attorney at Arnold & Porter who represents Philip Morris, to negotiate the deal with the FDA.

So the next time you see a news story comparing the hazards of using a cell phone to those of smoking cigarettes, remember that the CTIA made that link years ago and has been following the tobacco playbook ever since.

*Elisa Ong and Stanton Glantz, "Constructing 'Sound Science' and 'Good Epidemiology': Tobacco, Lawyers and Public Relations Firms," *American Journal of Public Health, 91,* pp.1749-1757, November 2001. Some of this same ground has been covered by Stewart Fist, the Australian journalist. Fist has posted some of his writings on his Web site, <www.electric-words.com>. Ong and Glantz have also described how the tobacco industry tried to subvert an IARC study on the cancer risk associated with secondhand smoke (see *MWN,* M/J00).

† See, for example, George Carlo et al., "Wireless Technology Research LLC's Public Health Paradigm Approach to Assessing and Managing Health Risks," *Human and Ecological Risk Assessment, 3,* p.10, 1997.

Our Wish List for 2002

Next year, we hope to learn:

- Why the federal agencies that are paid to protect the public from RF/MW radiation don't tell the IEEE SCC-28 committee currently drafting a new safety standard: "Don't bother us until you answer the 14 questions we asked you two years ago." (See *MWN,* J/A99.)
- Why there's been no news from Jack Sahl or EPRI on the EMF–heart disease link. Three years ago, with utility money in hand, Sahl set out to test the Sastre-Savitz hypothesis on heart rate variability. Sahl's last words to us were "We need to do this as quickly as possible." (See *MWN,* S/O98.)
- Why Russell Owen and his superiors at the FDA let the CTIA lead them around by their noses. Why does the agency let Tom Wheeler and George Carlo's long-running farce on mobile phone research continue?
- Why no one in the U.S. or in Europe is making a serious attempt to settle the controversy over whether microwaves can cause leakage through the blood-brain barrier. (Yes, we made this same wish two years ago. And no, we are not impressed with the U.S. Air Force's effort. See *MWN,* N/D99).
- Why so many people who say that their only interest is promoting good science ignore the science that conflicts with their agendas.

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MICRO WAVE NEWS

Vol. XXII No. 6 A Report on Non-Ionizing Radiation November/December 2002

INSIDE...

EMF NEWS pp.2-4

Power Line Talk:
NIEHS Q&A Pamphlet Downplays Risk • U.K. Childhood Cancer Study on E-Fields
California Releases EMF Report
Power Line Worries Stall Canadian School
Calls for Prudent Avoidance
Second Utility Worker Study: No Cardiac Risk
IEEE's New ELF Standard Faces Challenges

HIGHLIGHTS pp.5-10

Eye on Europe:
Stewart Resigns • Research Agendas in U.K., France and Switzerland • Advice for the French • German Doctors Concerned
U.K. Cell Tower Epi Study; COST Disagrees
German Veterans Sue over X Rays from Radar
Litigation Roundup:
Newman Appeal Filed • New Tack in Headset Suits • "Busse" Privacy Claim Loses Again
Nonthermal Effects Due to Modulation...
But Industry Experts Say They Are Impossible
Standards Watch: Australia • EU

FROM THE FIELD pp.10-14

Hot New Papers: No Thermal Noise Limit?
2003 Conference Calendar (Part I)
Meeting Notes: MMF • NRPB • ETH • WHO
Letter: BEMS' Prato Calls for Open Debate
Across the Spectrum: Epi Wrong, Says Park
Flashback: 5, 10, 20 Years Ago

UPDATES pp.15-18

Precautionary Menace • Talking About Risk • NAS–NRC on Nonthermal Weapons • People in China • Baby Monitors • U.K. Siting Code • Tower Bills • NRPB Workplace Survey
Keeping Current: Follow-Up on the News

VIEWS ON THE NEWS p.19

The Coffee Manifesto
Our Wish List for 2003

Are There Nonthermal Effects? Are They Thermal? Does It Matter?

Can microwave radiation cause nonthermal effects? This long-standing question is losing its urgency as more and more experiments are documenting biological effects at such low energy levels that temperature changes are difficult to measure—if they can be detected at all.

Rather, the focus is now on whether biological effects are reproducible in different laboratories. While biophysicists continue to seek a mechanism of interaction, most ongoing research targets the possible effects of radiofrequency and microwave (RF/MW) radiation from mobile phones and their towers. If low-level effects are verified, they would drive risk assessment, standard setting and, no doubt, legal actions.

"It does not matter whether an effect is thermal or nonthermal. We should be talking about *effects*," argued Dr. Dariusz Leszczynski of Finland's Radiation and Nuclear Safety Authority at a meeting on subtle temperature effects held in London in mid-November. The meeting was organized by COST281, the European mobile phone research committee.

Dr. Roland Glaser of Humboldt University in Berlin counters that it does matter. "If it is only a small temperature change, we can forget about it," he told *Microwave News*. "Subtle temperature effects are all around us."

But under certain very specialized circumstances, Glaser allows that biological systems can be acutely sensitive to minuscule temperature changes. He reminded the COST gathering that a rattlesnake can find its prey in total dark-

(continued on p.9)

McDonald's Commissions NCRP Report on Safety of Wireless Towers

The National Council on Radiation Protection and Measurements (NCRP) is preparing a report on the safety of mobile phone radiation to help building owners and managers address potential health risks.

McDonald's, the fast-food giant, requested and is paying for the NCRP report. This is the first time a corporation has sponsored an NCRP report on radiation safety.

An October 29 draft of the report, which is circulating for review and was obtained by *Microwave News*, does not mention McDonald's role or give the names of those who wrote the report.

Microwave News has learned that Dr. Tom Tenforde, the recently installed president of the NCRP, is himself chairing the five-member committee that wrote the draft.

(continued on p.6)

« Power Line Talk »

The National Institute of Environmental Health Sciences (**NIEHS**) has issued an updated version of ***Questions and Answers About EMF: Electric and Magnetic Fields Associated with the Use of Electric Power***. The 64-page booklet introduces the uninitiated to the basics of ELF EMFs — sources, research findings, reviews and standards. The original booklet, issued in 1995 as part of the EMF RAPID program, did not offer an overall assessment of health risks; the new one does. The potential impacts are portrayed as being close to negligible—a view that stands in sharp contrast to that of the new California report (see box at right). "For most health outcomes, there is no evidence that EMF exposures have adverse effects," the NIEHS concludes. With respect to childhood leukemia, the institute allows that "there is some evidence from epidemiology studies" of an association with EMFs, but then adds the following qualifications: "This association is difficult to interpret in the absence of reproducible laboratory evidence or a scientific explanation that links magnetic fields with childhood leukemia." The only step the booklet recommends to reduce exposures is "continued education"— though what this would involve is not spelled out. The institute has backed off its earlier endorsement of prudent avoidance. Three years ago in his report to Congress at the close of the EMF RAPID program, NIEHS Director Dr. Kenneth Olden recommended that electric utilities and appliance manufacturers seek low-cost ways to reduce exposures (see *MWN,* J/A99). Now the NIEHS appears to be more concerned that the public may adopt dangerous strategies to mitigate exposures, warning: "For your own safety, it is important that any steps you take to reduce your exposures do not increase other obvious hazards such as those from electrocution or fire." **Naomi Bernheim**, Dr. **Gary Boorman,** Dr. **Christopher Portier** and Dr. **Mary Wolfe** led the editorial team that revised the booklet. It is available on the Internet at <www.niehs.nih.gov/emfrapid>. The NIEHS also has a limited supply of printed copies; contact: Central Data Management, MD EC-03, NIEHS, PO Box 12233, Research Triangle Park, NC 27709, E-mail: <cdm@niehs.nih.gov>.

«« »»

The **U.K. Childhood Cancer Study** (UKCCS) has found no connection between exposures to power-frequency **electric fields** and childhood leukemia, central nervous system tumors or other types of cancer. Writing in the November 18 issue of the *British Journal of Cancer (BJC, 87,* pp.1257-1266, 2002), Dr. **Nick Day** of the University of Cambridge and coworkers write that their pilot study "can exclude electric field exposure as a cause of a substantial proportion of leukemia or other childhood malignancies." They go on to argue that, "Efforts to uncover the causes of childhood malignancy appear better targeted in other directions." **Alasdair Philips**, a consultant based in Ely, Cambridgeshire, does not think they should give up quite yet. "The UKCCS dataset should now be analyzed with the combined electric and magnetic field metric used by Dr. **Anthony Miller** to investigate occupational exposures," he told *Microwave News*. Philips had strongly urged the UKCCS group to investigate the possible role of electric fields (see, for instance, *MWN,* N/D96). Miller, who retired from the University of Toronto and now does research in Germany, has found much higher risks of leukemia among utility workers exposed to electric fields over long periods of time (see *MWN,* M/J00; also p.3). Miller had previously reported that leukemia rates can be up to 11 times higher for workers exposed to magnetic *and* electric fields (see *MWN,* J/A96). Three years ago, Day's team found no link between magnetic fields and childhood cancer (see *MWN,* N/D99 and J/F00). Later, Day contributed his magnetic field data to the meta-analysis led by Dr. **Anders Ahlbom** of the Karolinska Institute in Stockholm. Using the U.K. data together with those of other investigators, Ahlbom found an EMF–cancer association (see *MWN,* S/O00). Day's magnetic field study has been sharply criticized by Dr. **Denis Henshaw** of the University of Bristol, who argues that electric fields can influence the movement of pollutants and the way they are absorbed by those nearby (see *MWN,* J/F00 and M/A00; also p.3 and p.12). The UKCCS project appears to attract controversy. In the November 9 issue of the *Lancet,* two American researchers dispute the UKCCS's findings that have also exonerated any possible role of radon or gamma radiation (these studies were published in the *BJC* earlier this year). Concerns over the exposure assessments used by the UKCCS prompted the Americans to caution that there remains "doubt as to whether or not radon and gamma radiation have been adequately studied."

California Report Released

In early October, the California Department of Health Services released the EMF program's final report, containing the strongest warning to date on the possible health risks of power-frequency EMFs.

After working eight years and spending more than $7 million studying EMF health effects, the research staff came to believe that EMFs are a likely cause of childhood leukemia, adult brain cancer, ALS and miscarriages (see *MWN,* J/A02).

The report was issued without a press release and, except for a couple of California newspapers, was largely ignored by the U.S. media. (It received more coverage in the U.K.) Nevertheless, power-line activists have been quick to cite the report to support their concerns (see, for example, p.3).

As of late November, the California Public Utilities Commission (PUC) had not decided whether to hold hearings to consider possible policy changes, PUC spokesperson Sheri Inouye told *Microwave News*. The report itself makes no recommendations.

The full text of the report is available on the Internet at <www.dhs.cahwnet.gov/ps/deodc/ehib/emf>. Print copies can be purchased for $35.00 each, plus shipping, from the City Copy Center in Oakland; call (510) 763-0193.

Power Line Concerns Put School on Hold in Canada

Construction of a Catholic school in Edmonton, Canada, has been halted after a local planning board concluded that it would be too close to a 240 kV transmission line.

Officials of Edmonton Catholic Schools (ECS), which runs more than 80 local schools, contend that there is no health risk. "Every expert we talked with and studies we researched did *not* find a link to EMFs and childhood leukemia," Superintendent Dale Ripley stressed in a November 21 letter to parents. ECS is planning to challenge the planning board's decision in court.

The proposed site, 108 m from the line, "would not provide a safe environment" for children, the Edmonton Subdivision and Development Appeal Board (SDAB) ruled on November 8, overturning a zoning permit issued last summer. The available evidence "does establish" that exposures "in the range of 2 mG or greater are associated with higher levels of childhood leukemia," according to the SDAB.

According to the SDAB, magnetic fields of up to 2 mG were measured at the proposed site. ECS estimates that the levels are between 1 and 2 mG.

The SDAB said its decision was influenced by IARC's designation of EMFs as possible carcinogens, as well as by the conclusion of three California EMF Program scientists that they are inclined to believe that EMFs can cause childhood leukemia. In addition, a senior Edmonton health official has called for prudent avoidance in view of the scientific uncertainties.

Lisa Amyotte, the mother of three children who would attend the school, is leading the opposition. At an October 24 SDAB hearing, she argued that magnetic fields in schools should not exceed 1 mG, pointing to survey data indicating that EMFs in most homes are below this level. She noted that, since the early 1990s, Swedish officials have advised against siting schools near power lines (see *MWN,* M/J94, N/D95 and M/J01).

Amyotte introduced a letter advocating prudent avoidance from Dr. Gerald Predy, a physician at Capital Health, which operates Edmonton's public health care system. At Amyotte's request, Drs. David Carpenter, Denis Henshaw, Anthony Miller and Daniel Wartenberg have written to city officials warning against siting a school near a power line (see box at right).

Mary McBride of the British Columbia Cancer Agency in Vancouver is serving as ECS' EMF consultant. She told the SDAB that siting the school near the power line poses no health risk and that such a plan is consistent with prudent avoidance as defined by Dr. Michael Repacholi's WHO International EMF Project.

In an interview with *Microwave News*, McBride said that, in her opinion, the scientific evidence does not justify any policy of prudent avoidance for EMFs. Not enough is yet known about the type of exposures that present a health risk to devise an appropriate policy, she maintains.

McBride's outlook appears to be inconsistent with the policies of the WHO project, however. While Repacholi has argued strongly against the use of precautionary limits, he and the project have endorsed prudent avoidance. In a fact sheet issued last year, the WHO stated that officials "should consider ways to reduce people's exposures" when siting power lines (see *MWN,* S/O01).

McBride is also downplaying the California report's conclusion that EMFs present a broad range of health risks (see p.2). In an interview with the *Edmonton Journal* (October 29), she stated that it had not been peer-reviewed.

Dr. Raymond Neutra, the director of the program, strongly disputed this view. The report underwent "far more extensive and open" review than did other recent assessments of EMF health risks, Neutra told *Microwave News*.

The land for the school, which is adjacent to the power-line corridor, was given to Edmonton Catholic Schools by the city. An earlier plan for the site placed the school 70 m from the line, but it was revised after the city-owned utility, EPCOR, measured magnetic fields of 4.5 mG at this distance. Several more schools, as well as play and sports areas, are planned.

Over the course of the controversy, the *Edmonton Journal* reversed its editorial opinion. On May 25, the editors wrote that "available evidence does not support any concern" for children's safety, but on October 15, they argued that "until we know more about the health effects, power lines should be separated from new developments by sufficient distance" to minimize exposures to "possibly dangerous EMFs."

While the parents' appeal of the zoning permit was pending, ECS began work on the school, which is planned for 400 children at an estimated cost of Can$6.6 million (US$4.5 million).

Prudent Avoidance Endorsed

"It is rarely possible to provide 100% proof for any particular human health outcome as a function of exposure, and proof at this level of certainty certainly does not exist here. However, the evidence that magnetic fields cause leukemia in children is sufficiently strong that, in my judgment, any jurisdiction which knowingly subjects children to this hazard is irresponsible and legally liable for the outcome."

—Dr. **David Carpenter**, School of Public Health, State University of New York, Albany, October 1 letter to the SDAB

"Basically, new buildings, especially schools, should not be built anywhere near high-voltage power lines."

—Dr. **Denis Henshaw**, University of Bristol, U.K., October 3 letter to the SDAB

"I...urge you to take every step possible to ensure that school construction is not close to power lines."

—Dr. **Anthony Miller**, professor emeritus, University of Toronto, Canada (now at the German Cancer Research Center in Heidelberg), December 3 letter to Edmonton officials

"I can make a strong case, based on the data and the studies, that power lines do increase the risk of childhood leukemia....Are you willing to assume the risk that choosing this site may result in several cases of cancer that otherwise would not occur?"

—Dr. **Daniel Wartenberg**, Environmental and Occupational Health Sciences Institute, Piscataway, NJ, October 24 letter to the SDAB

No Increase in Cardiac Risk in Second Utility Worker Study

Male electric utility workers with high EMF exposures did not have a greater risk of dying from sudden heart failure, according to a new epidemiological study led by Dr. Jack Sahl of Southern California Edison (SCE) in Los Angeles.

"Our results provide no support for the hypothesis linking AMI [acute myocardial infarction] mortality to occupational magnetic field exposure," Sahl and coauthors conclude in the November 15 *American Journal of Epidemiology (156,* pp. 913-918, 2002).

Dr. Antonio Sastre of the Midwest Research Institute (MRI) in Kansas City, MO, first proposed the EMF–cardiac link four years ago, based on his finding that 200 mG EMFs could lead to lower heart rate variability (HRV), a common indicator of cardiac risk (see *MWN,* J/A98). Dr. David Savitz found support for this theory using data on 140,000 workers at five U.S. utilities from a previous study (see *MWN,* S/O98).

EPRI commissioned Sahl to do a follow-up with data from his earlier epidemiological study of SCE employees (see *MWN,* M/A93 and J/A93). Looking at roughly the same occupations as those for which Savitz found the highest risks — electricians, line repairmen and power plant operators — Sahl sees no greater AMI mortality in comparison to managers and others whose jobs entail less exposure.

Cumulative exposures, estimated through measurements and job descriptions, were not related to cardiac risk except among those with high exposures in their last five years of work. The trend of increased risk with higher exposures was statistically significant. But Sahl maintains that these higher risks reflect the healthier lifestyles of those who move into managerial positions compared to those who remain in jobs such as line repair, and are not due to differences in EMF exposures.

"We did this analysis to see if we should gear up for a major study on cardiac risk," Sahl told *Microwave News*. "I don't think the results warrant that." Last summer, after working as a consultant for several years, Sahl returned to SCE, California's second-largest private electric utility, as director of health and safety for its power transmission and distribution unit.

Savitz said that it is hard to account for the disparity in the results of the two studies. "There are many reasons either or both studies could have gone astray," said Savitz, who is at the University of North Carolina, Chapel Hill.

For his part, Sastre points to the smaller size of Sahl's cohort compared to that of Savitz: "One does not negate the statistical weight of over 100,000 subjects with a study of 35,000 workers," he told *Microwave News*. Sastre, who is a coauthor of the Sahl paper, would like to do more experiments to better understand the EMF–HRV effect, but he has been unable to find funding. "At this point," he said, "we don't have clear answers from epidemiology or from the lab."

Dr. Birgitta Floderus of the Karolinska Institute in Stockholm is also investigating the link between EMFs and cardiac risk, using data on Swedish twins. Floderus said that her study has been submitted for publication.

IEEE's New EMF Standard Faces Multiple Challenges

The ink is barely dry on its new ELF-EMF safety standard, but the IEEE is already facing challenges. Three formal appeals have been filed contending that the guidelines are flawed.

Ten years after it began its work, ICES (formerly SCC-28) Subcommittee 3 (SC-3) voted in July to adopt the standard, and the IEEE Standards Board approved it two months later (see *MWN,* S/O02). Designated C95.6, the guidelines protect only against acute hazards in the 0-3 kHz frequency range.

In a complaint filed on October 13, David Fichtenberg contends that the standard violates IEEE ethics rules by ignoring evidence of possible long-term effects of EMFs, such as cancer. "The standard should detail the evidence pointing to long-term risks and then explain why there is no need to protect against such risks," Fichtenberg, a resident of Seattle, told *Microwave News*.

Fichtenberg also argues that IEEE's 5 kV/m electric field limit for the public is inadequate because it is known that such fields can cause painful shocks. Fichtenberg previously helped organize an unsuccessful legal campaign to overturn the FCC's RF/MW exposure limits, which are based in part on an IEEE standard (see *MWN,* J/F01).

In a point-by-point rebuttal, Dr. Eleanor Adair, the chair of ICES, states that Fichtenberg's arguments are "disingenuous," "false" and "without merit." She and other members of the committee "strongly disagree" with the charge that ethical rules were breached.

Bob Ashley submitted his own appeal on October 7 disputing the validity of the standard's separate limits for "controlled" and "uncontrolled" environments — a concern also raised by Fichtenberg. Ashley, currently at St. Cloud State University in St. Cloud, MN, has long been involved in the EMF debate and holds patents for power-line configurations to reduce magnetic fields (see *MWN,* J/F92 and J/A00).

Both Ashley and Fichtenberg contend that their concerns about the standard were ignored in discussions within SC-3.

The third complaint was filed by John Bergeron, formerly with General Electric and now a part-time consultant in Schenectady, NY. "I am opposed to concepts that are occult rather than explicit in setting this standard," he told *Microwave News*.

A three-member panel will review the appeals at the December 9 meeting of the IEEE Standards Board, to be held in Coconut Point, FL. The panel then has 30 days to offer a recommendation to the board.

Kent Jaffa of PacifiCorp, the chair of ICES' SC-3, declined to comment, explaining that he did not want to say anything that might compromise the appeal process.

CORRECTION

In our last issue (p.3), we cited the incorrect limit for exposures of arms and legs to 50/60 Hz fields in the IEEE's new C95.6 EMF standard. The maximum permissible exposure levels are 758 G at 50 Hz and 631.7 G at 60 Hz.

« Eye on Europe »

Sir **William Stewart** is no longer watching over the **U.K.** Mobile Telecommunications and Health Research (**MTHR**) Program. At the close of a seminar held in London on November 11 (see p.9), Sir William announced that he is stepping down as the chair of the committee that manages the program because of time constraints — he has been selected to head the newly created Health Protection Agency. Dr. **Lawrie Challis**, the former vice chair of the panel, has replaced Stewart. Challis, an emeritus professor of physics at the University of Nottingham, is also a member of the Advisory Group on Non-Ionizing Radiation (AGNIR) of the National Radiological Protection Board (**NRPB**). In May 2000, a committee chaired by Stewart, with Challis as vice chair, issued what would become a highly influential report. The Stewart report recommended the MTHR research effort, as well as a precautionary approach to mobile phone risks (for instance, it discourages children from using cell phones; see *MWN,* M/J00). One of the report's other recommendations is that the state of knowledge on the possible health effects be reviewed again within three years. That evaluation, which will be written by AGNIR and is due next year, is in preparation.



SIR WILLIAM STEWART RESIGNS



LAWRIE CHALLIS STEPS IN

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Meanwhile, the **MTHR** program is planning to issue its third call for research **proposals**. At the London meeting, the program management committee announced that two areas now have the highest priority: the impact of the precautionary approach to mobile phone health risks on people's risk perception and behavior and an evaluation of past efforts to provide information about such risks. A discussion paper is at: <www.mthr.org.uk>.

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The **French** government report on mobile phones, known as the **Zmirou report**, is also being updated. Like the Stewart committee, the Zmirou panel advocated precautionary policies (see *MWN,* J/F01 and J/A02). The new version is due out in February....At least one member of the committee is still recommending a cautious approach. Dr. **Pierre Aubineau** of the University of Bordeaux advises those who use mobile phones to limit their calls and to try to use phones where communication with the base station can be done at low power. "Personally, I think there is a risk," Aubineau said in an interview on French television (France 2) aired on October 20 — at the same time he acknowledged that there is no proof of a health risk. Last year, Aubineau reported that he could see microwave-induced leakage through blood vessels in the brain and suggested that this could explain the headaches reported by users of mobile phones (see *MWN,* N/D01)....Aubineau's research was part of the national research program known as **COMOBIO** (short for Communications Mobiles et Biologie) and there has long been an expectation that the program would be renewed. Speaking at the London MTHR workshop, Dr. **Bernard Veyret** said that he hoped that COMOBIO+, as the follow-on effort is known, would get under way next year. "Everyone agrees that it should be done, but they still have to find the money," he later told *Microwave News*. Nevertheless, Veyret is optimistic. "It is very likely," he said.

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ETH, the Federal Institute of Technology in Zurich, and mobile phone service providers Orange, Sunrise and Swisscom have

U.K. To Study Cancer Rates near Phone Towers — COST Disagrees

The U.K. mobile phone research program will go forward with an epidemiological study of cancer among children living within 500 meters of mobile phone base stations. Although no official announcement has yet been made, *Microwave News* has learned that Dr. Paul Elliott of the Imperial College of Science, Technology and Medicine in London will lead the new study.

The two-year, case-control study will focus on leukemia and lymphoma among children aged four or younger. It will also include brain tumors and other types of cancer.

At the same time that the Stewart panel was endorsing the new study, the COST281 committee on wireless health risks was working on a "scientific comment" explaining why such a study is a bad idea.

"At present, there is insufficient basis for performing scientifically sound epidemiological studies of the health impact of mobile telecommunication base stations," according to a draft of the comment. In fact, such a study "could be expected to raise rather than lower existing concerns," it contends. The comment, which is being prepared at the request of the Swiss government, is due to be completed soon.

"From a scientific point of view, there is no need for such a study," said Dr. Norbert Leitgeb of Austria's Graz University of Technology, the chair of COST281, during a COST management meeting. "There is a greater need to reassure the public."

The weakest point is the selection of health outcomes for such an epidemiological study, the draft comment states.

For instance, Dr. Tom McManus of Ireland's Department of Public Enterprise, a member of the COST panel, said that the study of sleep problems among those living near the shortwave transmitter in Schwarzenburg, Switzerland, had sensitized the public to this particular endpoint (see *MWN,* J/F96). "I did not sleep well last night, but I blame it on wine, not on a phone mast," McManus said during the COST committee's discussion.

launched the **Swiss Research Foundation on Mobile Communication**. Projects on a broad range of topics — including health and environmental effects and risk management — will be eligible for funding from its research budget of SFr550,000 (US $380,000). A scientific committee chaired by Dr. Heinz Gutscher of the University of Zurich will select the projects. ETH's Dr. Gregor Dürrenberger is also on the committee and will serve as the executive director of the foundation. The president of the board of directors is ETH's Dr. Werner Bächtold, with Dr. Mirjana Moser of the Federal Health Office serving as vice president. Other board members include Dr. Bernhard Aufdereggen of Physicians for Environmental Protection and ETH's Dr. Niels Kuster. The foundation is a continuation of an earlier effort launched in 1999 by ETH and diAx, a service provider that later merged with Sunrise. Ten research projects are ongoing: Results will be presented at the Zurich EMC meeting in February (see p.12). The next deadline for proposals is September 1, 2003. For further details, go to <www.ifh.ee.ethz.ch/Microwave/reco>....Orange, Sunrise and Swisscom are also bankrolling a new **Ombudsman for Mobile Communication and the Environment**, which seeks "constructive solutions" to disputes over the siting of base station antennas, among other problems, as an alternative to lengthy court battles. The ombudsman's office, located in Bern, is staffed by the Swiss Interior Ministry under the direction of Erika Forster-Vannini, a member of the Council of the States, one of the country's two legislative chambers. She is responsible to a board composed of four legislators and a representative of the wireless industry. The office's Web site is <www.omk.ch>.

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More than 200 **physicians** in **Germany** have endorsed a call for stricter RF/MW exposure limits and a ban on the use of mobile phones by children. The signers of the "**Freiburg Appeal**," published by the Interdisciplinary Society for Environmental Medicine (known as IGUMED) on October 9, contend that radiation from mobile phones and base stations, as well as DECT digital cordless phones, is to blame for a "dramatic rise" in health problems among their patients, including cancer, cardiac disorders, neurodegenerative diseases. The text of the appeal is available in German at the society's Web site, <www.igumed.de>, along with a list of the 59 charter signers. A complete list of signers is at <www.elektrosmognews.de>. The EMR Network has posted English, French and Italian translations of the appeal at <emrnetwork.org/news>.

McDonald's NCRP Report *(continued from p.1)*

Tenforde declined to name the other members of the committee. William Beckner, the executive director, did not respond to phone calls.

McDonald's declined to comment or be interviewed.

In a written statement to *Microwave News,* Tenforde said that the report will be made available "upon written request once the [NCRP's] board of directors has approved the report and it is finalized." He anticipates that the report will be ready "reasonably soon."

Tenforde also wrote that, "The report has been subjected to a rigorous peer review and the NCRP committee that drafted the report is in the process of responding to a number of constructive comments and suggestions made by the reviewers."

In October, the U.K. arm of McDonald's confirmed to the British press that 120 of its restaurants are now being used as antenna sites. "There have been 450 medical research studies into mobile phones, none of which has found a link between antennas and ill health," a McDonald's spokesperson told the London *Times* (October 9). The *Sun* (October 8), a tabloid, reported that the company would not reveal how much it is being paid to house the antennas.

The draft NCRP report endorses the RF/MW exposure standards adopted by the Federal Communications Commission (FCC):

> Available evidence and research to date indicate that adherence to the FCC guidelines will avoid adverse effects of RF exposure on the nervous system and animal behavior, effects on vision and the neuroendocrine system, cardiovascular and hematological effects, immune system effects and effects on potentially sensitive tissues involved in reproduction, embryonic development and post-natal development.

The report goes on to state that "recent reviews of the epidemiological literature, including extensive studies on humans exposed to modulated RF signals from wireless communcations systems, have not given any indication of carcinogenic effects." Two reviews are cited in support of this view: one published in 1999 by a team led by Dr. John Moulder (see *MWN,* M/J99) and one by Drs. John Boice and Joseph McLaughlin written for the Swedish Radiation Protection Authority, which was released in September (see *MWN,* S/O02).

"Based on the body of current evidence from laboratory and human studies, there is no basis on which to modify the current FCC guidelines," the draft NCRP report concludes.

The draft notes that some countries follow ICNIRP guidelines, but makes no mention of those that have adopted stricter limits for wireless facilities — Italy and Switzerland, for example.

McDonald's, which has its headquarters in Oakbrook, IL, operates over 30,000 fast-food restaurants in 120 countries.

The NCRP is chartered by the U.S. Congress. Most of its work is done under contract to federal agencies. Corporate sponsors typically support the council with donations of $5,000 per year.

In recent years, the NCRP's handling of non-ionizing radiation (NIR) has repeatedly met with controversy. In the summer of 1999, then-president Charles Meinhold pledged to release a draft of a long-delayed report on EMF health risks by the end of the year (see *MWN,* J/A99). But it has yet to appear. Not long afterward, the council laid off its only NIR staff scientist (see *MWN,* J/F00). Then last year, the committee revising the NCRP's RF/MW exposure guidelines was disbanded — it was later revived, but work has not yet resumed (see *MWN,* S/O01 and J/A 02). A report on modulation effects, begun eight years ago, is still under review (see *MWN,* M/J95).

German Veterans Sue in U.S. over Ionizing Radiation from Radar

German veterans are suing the manufacturers of U.S. military radar systems, claiming that they were exposed to potentially harmful X rays from the radars' electronic components.

The class-action lawsuit filed in Texas state court in El Paso on October 8 also seeks compensation for a similarly exposed U.S. veteran. The plaintiffs could potentially include anyone — of any nationality — who worked near military radars made by Lucent, Raytheon or the other defendants (see box below).

GE, Lucent and Raytheon declined to comment.

Several hundred German veterans have long been seeking compensation for a host of ailments that they believe resulted from working close to radars. Last year, a report commissioned by the German government found that X rays from high-power radar transmitters were responsible for at least some of the cancers among the veterans (see *MWN,* S/O01).

At that time, the German defense ministry stated that it would give "prompt, nonbureaucratic" compensation to those who were injured, but last spring, after only a few claims had been approved, a veterans' group took the ministry to court (see *MWN,* M/A02).

(In November, a Danish workers compensation agency approved a radar repairman's claim that X-ray exposures he received while serving in the air force caused his cancer, according to Danish press reports.)

Reiner Geulen, a Berlin lawyer who is representing the veterans, maintains that the American radar manufacturers share responsibility for their injuries. Prof. Anthony Sebok of Brooklyn Law School in New York City, who is advising Geulen, told *Microwave News* that the U.S. courts are the "appropriate" place for a lawsuit because "the radars were made here and the plaintiffs were trained to use them here."

The lead attorney in the U.S. lawsuit, Jonathan Auerbach of Berger & Montague in Philadelphia, explained that the suit's focus on ionizing radiation is a direct result of last year's report for the German government. "That's the starting point for us in making a case we can win," he said in an interview.

The high-power — greater than 5 kV — transmitter tubes emit X rays and these "were not adequately protected by shields," according to Auerbach's complaint. It also contends that personnel were never warned about X-ray hazards or given protective clothing and that maintenance was routinely carried out while radars were "fully operational."

The potential health risks of X rays from unshielded klystron microwave tubes have been known for decades. In 1960, nine technicians at the Lockport Air Force Station near Buffalo, NY,

Defendants in U.S. Radar Lawsuit

Company	Selected System(s)
General Electric	AN/FPS-7
Honeywell (Bendix)	Ajax Hercules
ITT Industries/ITT Gilfillan	radar components
Lucent (Western Electric)	Nike Ajax & Nike Hercules
Raytheon Co.	Hawk & Patriot

Litigation Roundup

On November 27, lawyers for Dr. **Christopher Newman** notified Judge **Catherine Blake** of the U.S. District Court in Baltimore that they will appeal her dismissal of Newman's suit against **Motorola** and many others in the wireless industry. Newman, represented by **Russell Smouse** and **John Angelos** of the Peter Angelos law firm in Baltimore, alleges that the use of mobile phones caused his brain tumor. Blake dismissed the suit on October 31, a month after rejecting the entire slate of expert witnesses who were prepared to testify on Newman's behalf. She found that the evidence linking mobile phones to cancer has not "gained general acceptance in the scientific community" (see *MWN,* S/O02). The U.S. Court of Appeals for the Fourth Circuit in Richmond, VA, will now review the case.

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Following oral arguments held on November 1, Judge **Blake** is preparing to rule on a motion to dismiss the five class-action lawsuits that would force wireless companies to include a **headset** with every mobile phone. In a shift in strategy, plaintiffs' attorneys, led by the **Peter Angelos** firm, are now playing down the argument that mobile phones are defective because they expose users to potentially harmful radiation — a key claim in the original filings (see *MWN,* M/J 01). All but one of the complaints were amended in September to argue that the wireless industry's assurances of safety violate state laws against false advertising and marketing. Blake might have prompted the move with a June ruling stating that the FCC has the authority to set safety guidelines for mobile phones and that it had "considered and rejected a headset requirement" (see *MWN,* J/A02). Only **Michael Allweiss** of Lowe, Stein in New Orleans is standing firm. In January 2001, a federal judge in Louisiana ruled that his suit, *Naquin et al. v. Nokia et al.,* is not preempted by federal phone safety rules.

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Chicago lawyer **Ben Barnow** has suffered another setback in his lawsuit on behalf of mobile phone users whose privacy, he claims, was invaded by an industry-sponsored epidemiological study. On October 9, an Illinois state court in Chicago once again dismissed ***Busse et al. v. Motorola et al.*** Judge **Stephen Schiller**'s handwritten, one-page order gave no explanation for the decision. Barnow has notified the court that he will appeal, according to defense attorneys. Barnow did not return calls for comment. The lawsuit was filed in 1995 when Barnow, on behalf of Jerald Busse and others, contended that Epidemiology Resources Inc. (**ERI**) had used confidential billing records without obtaining the plaintiffs' consent for what was in effect a test of phone safety. The study was commissioned by Wireless Technology Research (**WTR**), the now-defunct industry research effort led by Dr. **George Carlo** (see *MWN,* J/F96). The human testing claim was dismissed in 1997. Last year, WTR's insurance company settled, giving $1 million to Barnow and $400,000 to Carlo (see *MWN,* J/A01, N/D01 and M/A02).

became seriously ill following X-ray exposure during the installation and testing of a high-power FPS-7 search radar.

The new suit seeks compensation for those who worked close to any of a large number of radars any time between 1958 and 1994. Until a class is authorized, the plaintiffs consist of nine veterans who were trained at a radar school run jointly by the U.S. and German military at Fort Bliss, near El Paso.

Five developed leukemia and skin, bladder and pharyngeal cancer, among other ailments. The other four are healthy but want the defendants to pay for medical surveillance. The German Association To Support the Radar-Injured, which represents nearly 500 radar operators, technicians and mechanics who believe that their health problems are due to X rays or other harmful exposures, is also a plaintiff in the suit.

Auerbach believes that many military personnel from the U.S. and other NATO countries were also exposed to X-ray radiation from radar. A statement posted at <www.bergermontague.com> advises veterans who think that they might have been injured to contact the firm.

In the early 1980s, the U.S. military settled a number of claims brought by servicemen who blamed radar radiation for cataracts and other health problems (see *MWN,* D82).

In September, a new commission requested by the Bundestag, the German parliament, began looking into the dispute under the direction of Wolfram König, the president of the Federal Office for Radiation Protection (see also *MWN,* J/A01).

GSM Modulation Is Key to Nonthermal, Neurological Effects

Two new studies, one with humans and one with birds, show that RF/MW radiation, when modulated, can cause nonthermal, neurological effects.

Drs. Peter Achermann and Alexander Borbély of the University of Zurich have confirmed and extended their previous work showing that mobile phone radiation can affect sleep (see *MWN,* N/D99 and N/D00). In their latest experiment,* they found that a 30-minute exposure to a 900 MHz, 1 W/Kg GSM signal altered electrical activity, both before and after sleep onset, in the brains of 16 young men who served as test subjects. But the Swiss researchers saw no changes when they used continuous-wave (CW) — that is, unmodulated — 900 MHz radiation.

Achermann and Borbély report what they call a "striking" finding — that the digital signal affected the brain's electrical activity for hours after the 30-minute exposure. "Surprisingly," they write, the EEG changes "appeared to increase in the course of the night."

In a second study, with 13 subjects exposed to the same GSM radiation, the Swiss team found that blood flow increased in the parts of the brain that were closest to the simulated handset.

The changes in blood flow, which were demonstrated with PET scans, occurred in the region of the brain that plays a major role in working memory, according to the Swiss researchers.

"Borbély's EEG result can only be interpreted as a nonthermal effect, because it disappears with a CW exposure," said Dr. Niels Kuster. "Even though the digital signal has a greater peak power than the CW signal, the difference in temperature is inconsequential and cannot explain the different effects." Kuster, the director of the Zurich-based Foundation for Research on Information Technologies in Society, is a member of the Borbély study team.

Drs. Robert Beason and Peter Semm, working with avian brains, have shown that GSM radiation increased the rate of neural activity by an average of 3.5-fold, though the rate decreased in some cells. Here again, unmodulated signals had no effect.

"We found a generalized response, not one that is specific to a single type of receptor," Beason told *Microwave News*. "The power was just too low for it to have been a thermal response."

In their paper,† Beason and Semm estimate the SAR to be 0.05 W/Kg in the brains of exposed zebra finches.

Beason joined the U.S. Department of Agriculture's National Wildlife Research Center in Sandusky, OH, on December 1. Semm, who is at the Goethe University in Frankfurt, could not be reached for comment.

*R. Huber et al., "Electromagnetic Fields, Such As Those From Mobile Phones, Alter Regional Cerebral Blood Flow and Sleep and Waking EEG," *Journal of Sleep Research, 11,* pp.289-295, December 2002. A discussion of the findings with many details is at <www.unizh.ch/phar/sleep/handy>.

†R. Beason and P. Semm, "Responses of Neurons to an Amplitude Modulated Microwave Stimulus," *Neuroscience Letters, 333,* pp.175-178, 2002.

Mobile Phone Industry Panel: Nonthermal Effects Impossible

Nonthermal mechanisms are highly unlikely and most likely impossible. That is the consensus of a seminar sponsored by the mobile phone industry at the end of October.

While the meeting was modeled after the Gordon conferences, where discussions are all off-the-record, Dr. Mays Swicord of Motorola offered the following sense of the participants' outlook: "Some mechanisms are impossible and some have inherent limits — that is, they occur at certain field strengths or in certain frequency ranges. In communication bands, none of the nonthermal mechanisms are applicable." Swicord and Dr. Asher Sheppard, a consultant in Redlands, CA, organized the seminar.

Yale University physicist Dr. Robert Adair, who attended the seminar, told *Microwave News* that he would put the odds of finding a nonthermal RF effect at a hundred to one. At power frequencies, the odds are a million to one. "The idea that 3-4 mG power-line fields can have effects is just crazy," he said. (For similar and opposite views from two other physicists, see p.14 and p.11, respectively.)

The six speakers at the meeting were: Drs. Dean Astumian, University of Maine; Q. Balzano, consultant, Annapolis, MD; Frank Barnes, University of Colorado; Kenneth Foster, University of Pennsylvania; Earl Prohofsky, Purdue University; and James Weaver, MIT.

The meeting was closed to the press (see p.12).

ness by sensing a temperature difference of only 0.002°C — this fact is in every zoology textbook, he said. "A very, very small temperature change can have an enormous effect on the nervous system."

On a practical level, discarding the nonthermal label can make a researcher's life much easier—as Leszczynski has himself learned. "Often when you talk about finding a nonthermal effect, it's like a death sentence," he remarked.

In a set of widely publicized experiments, which have become a lightning rod for those who don't believe in nonthermal effects, Leszczynski has reported that mobile phone radiation can activate heat shock proteins (hsp) — also known as stress proteins — at levels that are not associated with heating (see *MWN*, J/A01, M/J02 and J/A02; also p.13).



"We can forget small temperature effects"
— Roland Glaser

At the London meeting, Dr. Theodoros Samaras of Greece's Aristotle University of Thessaloniki provided experimental support for Leszczynski's claim. Samaras said that his calculations and measurements carried out by Jürgen Schuderer of the Foundation for Research on Information Technologies in Society in Zurich showed that the maximum temperature change in Leszczynski's cells is between 0.033°C and 0.045°C. "There are no hot spots," Samaras said, in the cells exposed to 1800 MHz at a maximum specific absorption rate (SAR) of 2 W/Kg.

Moments earlier, Dr. Eleanor Adair, in an invited talk, had pointed out that a temperature change of 0.03°C is too small to be detected in the brain of live mammals, including humans, "by any instrument currently available." Adair recently retired from Brooks Air Force Base in San Antonio and is now back home in New Haven, CT.

Yet, here again, models show that a simple biological system can detect this small temperature difference. Adair said that Dr. Robert Adair, the Yale University physicist and her husband, has recently reported that as few as 100 axons can sense a temperature change of 0.03°C.*

Is There One Reproducible Effect?

At the close of a seminar on the U.K. mobile phone research program,† held the day before the COST workshop,‡ Dr. Edward Grant, a physicist and a former longtime member of the NRPB's Advisory Group on Non-Ionizing Radiation, made it clear that he is willing to "consider novel mechanisms of interaction" to explain a low-level effect. But, he said, "Most scientists agree that before it can be accepted, it must be verified by an independent lab."

Dr. James Metcalfe of the University of Cambridge then asked everyone whether there is a single low-level RF/MW effect which is reproducible and widely accepted. No one accepted the challenge.



Reporting a nonthermal effect is "like a death sentence."
— Dariusz Leszczynski

But two days later at the end of the COST meeting, a senior European researcher—who wishes to remain anonymous—pointed to the hsp effect as the answer to Metcalfe's question.

Researchers from Denmark, the U.K. and the U.S., in addition to Finland's Leszczynski, all reported activation of hsp by nonthermal levels of microwaves at the meeting.

Dr. David de Pomerai of the University of Nottingham in the U.K. said that he had eliminated a temperature increase of greater than 0.2°C in his hsp experiments with worms (*C. elegans*).

"We continue to see a big gap between the action of microwaves and heat alone," de Pomerai said in an interview. When asked whether it mattered if a nonthermal effect was later found to be due to heating, de Pomerai responded, "There would be less public concern, but I am not sure you can dismiss it entirely."

Dr. Sianette Kwee of Denmark's University of Aarhus said that she had found that in order to detect elevated hsp in cells without EMF exposure, they must be heated by 5-8°C.



"We see a big gap between microwaves and heat alone."
— David de Pomerai

France's Dr. Florence Poulletier de Gannes, a member of Dr. Bernard Veyret's lab at the University of Bordeaux, was the only speaker who failed to see an hsp effect. She said that she had not observed changes in the production of hsp in any of the cell models tested. She will soon try again with cells provided by Leszczynski.

Even in the face of the conflicting French data, Dr. Reba Goodman of Columbia University in New York City voiced her frustration that the hsp work was not getting the respect it deserved. "You cannot ignore all these studies anymore," she said.

Goodman distributed a letter she had written to the WHO with Dr. Martin Blank, also of Columbia, which states that the hsp work "certainly suggests that the old safety standards based on thermal responses alone make no biological sense."

De Pomerai closed by offering a positive outlook on the hsp experiments. "Even if our work is confirmed, it is not necessarily a bad thing." He reminded the COST meeting that seven years ago a team at the University of Colorado reported that worms that experienced environmentally induced stress actually lived longer.¶

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* R.K. Adair, "Simple Neural Networks for the Amplification and Utilization of Small Changes in Neuron Firing Rates," *Proceedings of the National Academy of Sciences, 98,* pp.7253-7258, June 19, 2001.

† *Mobile Telecommunications and Health Research Program (MTHR): Research Seminar,* London, U.K., November 11-12, 2002. See also p.5. Abstracts of most of the presentations are at <www.mthr.org.uk/meetings>.

‡ *Subtle Temperature Effects of RF-EMF,* a COST 281 Workshop, London, U.K., November 12-13, 2002. Many of the talks will soon be posted at <www.cost281.org>.

¶ G.J. Lithgow et al., "Thermotolerance and Extended Life-Span Conferred by Single-Gene Mutations and Induced by Thermal Stress," *Proceedings of the National Academy of Sciences, 92,* pp.7540-7544, August 1995.

« Standards Watch »

• The **Australian Communications Authority** (ACA) is moving to adopt **ICNIRP**'s limit for exposures from **mobile phones**. The maximum SAR will increase to 2.0 W/Kg, averaged over 10 g, from 1.6 W/Kg over 1 g under regulations to be introduced early next year, ACA's Stephen Jones in Canberra told *Microwave News*. The new ACA rules will not treat the ear (pinna) as an "extremity" with a higher allowable SAR, an approach taken by the IEEE but not by ICNIRP (see below and *MWN,* J/F01). The ACA is also planning to follow the ICNIRP guidelines in regulating telecom transmitters. Last May, the Australian Radiation Protection and Nuclear Safety Agency (**ARPANSA**) adopted a new set of RF/MW radiation exposure standards based on those of ICNIRP (see *MWN,* M/J02). Until the ACA promulgates its new rules, the long-standing, frequency-independent, or "flat," limit of 200 ∝W/cm^2 for public exposures — originally adopted by Standards Australia in 1985 — will continue to be in effect. The new rules for mobile phones were scheduled to be posted on the ACA's Web site, <www.aca.gov.au>, by early October, but at press time in early December they have yet to be made public. The ACA did announce in October that the base station siting code, *Deployment of Radiocommunications Infrastructure,* originally developed by the Australian Communications Industry Forum, was now official (it is on the ACA Web site; see *MWN,* M/J02). It requires wireless network operators to minimize unnecessary exposures and consider alternatives to siting antennas near "sensitive" locations such as schools.

• The Council of the European Union (**EU**) is developing guidelines for **occupational exposures** to power-frequency EMFs and RF/MW radiation. At an October 8 meeting in Luxembourg, health and labor ministers from the 15 member states agreed that minimum requirements are needed to prevent "a number of potentially acute health effects." The Danish ministers who are the current presidents of the council hope to have a draft ready when their Greek counterparts take the helm at the beginning of 2003, EU spokesperson Luís Amorim told *Microwave News*. The decision to write a standard followed a seminar hosted by the council in Luxembourg on September 20, at which representatives of ICNIRP made the case for using their guidelines. The Danish delegation concluded that the ICNIRP standard "could form the basis" for exposure limits, and recommended that the EU also draft measurement procedures in cooperation with CENELEC, the European standard-setting group. Three years ago, the EU council adopted ICNIRP-based guidelines for exposures of members of the general public (see *MWN,* J/A99).

FROM THE FIELD

Hot New Papers

J. Lass et al., "Effects of 7Hz-Modulated 450MHz Electromagnetic Radiation on Human Performance in Visual Memory Tasks," ***International Journal of Radiation Biology, 78,*** **pp.937-944, September 10, 2002.**

"A homogeneous group of 100 subjects (37 female, 63 male) were randomly assigned to either the exposed ([7 Hz-modulated 450 MHz] 10-20 min, 0.158 mW/cm^2 [0.0095 W/Kg]) or the sham-exposed group. A battery of three different tests measured attention and short-term memory....The results suggest that low-level 7 Hz-modulated microwave radiation has different effects on the cognitive tasks of different complexity levels. These effects might cause a decrease in the number of errors for less complicated neuropsychological tasks and an increase in the errors for more complicated ones."

Reprints: Jaanus Lass, Tallinn Technical University, Tallinn, Estonia, E-mail: <jaanus@cb.ttu.ee>.

Christoffer Johansen, Maria Feychting, Mogens Møller, Per Arnsbo, Anders Ahlbom and Jørgen Olsen, "Risk of Severe Cardiac Arrhythmia in Male Utility Workers: A Nationwide Danish Cohort Study," ***American Journal of Epidemiology, 156,*** **pp.857-861, November 1, 2002.**

"The cohort of 24,056 men employed at utility companies between 1900 and 1993 was linked to the nationwide, population-based Danish Pacemaker Register, and the numbers of persons who had undergone pacemaker implantation between 1982 and 2000 were compared with corresponding numbers in the general population. In addition, the data on the utility workers were fitted to a multiplicative Poisson regression model in relation to estimated levels of exposure to 50 Hz electromagnetic fields. Overall, based on 135 men with pacemakers (140 expected), there was no increased risk of severe cardiac arrhythmia among the utility employees; the risk estimate was 0.96 (95% confidence interval=0.81-1.14). No clear dose-response pattern emerged with increasing levels of exposure to electromagnetic fields or with duration of employment. These results are largely reassuring, since they do not support the hypothesis of a link between occupational exposure to electromagnetic fields and an excess risk of severe cardiovascular arrhythmia leading to permanent implantation of a pacemaker."

Reprints: Dr. Christoffer Johansen, Institute of Cancer Epidemiology, Danish Cancer Society, Copenhagen, E-mail: <christof@cancer.dk>.

Margaret Wrensch et al., "Epidemiology of Primary Brain Tumors: Current Concepts and Review of the Literature," ***Neuro-Oncology, 4,*** **pp.278-299, October 2002.**

"Primary malignant brain tumors clearly represent a heterogeneous group of diseases. Therefore, a workable consensus on classification and increased use of molecular tumor markers in concert with improved surveillance and registration are necessary to characterize homogeneous subgroups of the many heterogeneous categories of primary brain tumors....This concept and others reinforce the notion that [glioblastoma multiforme] is not one but probably many diseases that must be distinguished if progress is to be made in determining etiology....The descriptive epidemiology of brain tumors suggests that a major unaccomplished

task is to formulate and evaluate explanations for the consistently observed sex and ethnic differences for glioma and meningioma. Among the most provocative clues to the etiology of primary brain tumors in adults is the characteristic sex difference, with gliomas being more prevalent among men and meningiomas among women....Further analytic studies of environmental factors (viruses, radiation and carcinogenic or protective chemical exposures through diet, workplace or other sources), when combined with incorporation of potentially relevant polymorphisms that might influence susceptibility, may help us understand this devastating collection of diseases....To conclude, primary brain tumors probably stem from multiple exogenous and endogenous events. To date, the few proven causes (inherited genetic syndromes, therapeutic ionizing radiation and immunosuppression giving rise to brain lymphomas) account for only a small proportion of cases."

Reprints: Dr. Margaret Wrensch, University of California, San Francisco, E-mail: <wrensch@itsa.ucsf.edu>.

J.B. Burch et al., "Melatonin Metabolite Excretion Among Cellular Telephone Users," ***International Journal of Radiation Biology, 78,*** **pp.1029-1036, November 1, 2002.**

"The relationship between cellular telephone use and excretion of the melatonin metabolite 6-hydroxymelatonin sulfate (6-OHMS) was evaluated in two populations of male electric utility workers (Study 1, n= 149; Study 2, n=77)....No change in 6-OHMS excretion was observed among those with daily cellular telephone use >25 min in Study 1 (5 worker-days). Study 2 workers with >25 min cellular telephone use per day (13 worker-days) had lower...mean nocturnal 6-OHMS concentrations (p=0.05) and overnight 6-OHMS excretion (p=0.03) compared with those without cellular telephone use. There was also a linear trend of decreasing mean nocturnal 6-OHMS/creatinine concentrations (p=0.02) and overnight 6-OHMS excretion (p=0.08) across categories of increasing cellular telephone use. A combined effect of cellular telephone use and occupational 60 Hz MF exposure in reducing 6-OHMS excretion was also observed in Study 2....Prolonged use of cellular telephones may lead to reduced melatonin production, and elevated 60 Hz MF exposures may potentiate the effect."

Reprints: Dr. James Burch, Colorado State University, Ft. Collins, E-mail: <james.burch@colostate.edu>.

Ivancica Trosic et al., "Micronucleus Induction After Whole-Body Microwave Irradiation of Rats," ***Mutation Research, Genetic Toxicology, 521,*** **pp.73-79, November 26, 2002.**

"Adult male Wistar rats were exposed for 2 h a day, 7 days a week for up to 30 days to continuous 2450 MHz...radiation at a power density of 5-10 mW/cm^2....Peripheral blood smears were examined for the extent of genotoxicity, as indicated by the presence of micronuclei in polychromatic erythrocytes (PCEs). The results for the time-course of PCEs indicated significant differences ($p<0.05$) for the 2nd, the 8th and the 15th day between control and treated subgroups of animals....In conclusion, an increased micronucleus frequency was seen in peripheral immature erythrocytes of exposed rats, peaking on the 8th day of our experiment, along with a significantly elevated number of PCEs, which peaked on the second experimental day and declined thereafter, to reach control values at the end of the experiment. Such findings are indicators of radiation effects on bone-marrow erythropoiesis and their consequent reflection in the peripheral circulation. The significant elevation of micronucleus frequency on the 8th irradiation day indicates that an adaptive or recovery mechanism in rats appeared during the subchronic irradiation experiment. Inasmuch as micronuclei result from chromosome breakage as well as from spindle disruption, our observations do not provide information concerning the mechanism responsible for their origin."

Reprints: Dr. Ivancica Trosic, Institute for Medical and Occupational Health, Zagreb, Croatia, E-mail: <itrosic@imi.hr>.

Bernhard Liesenkötter, "Analysis of Alleged Harm Due to Digitally Modulated Mobile Phone Radiation," ***Zeitschrift für Medizinische Physik, 12,*** **pp. 198-203, 2002 [paper in German with English abstract].**

"In the public discussion regarding the health risks of mobile phone system radiation, it is emphasized that the pulse slope of digital modulation, as defined in the GSM standard, will cause biological effects.... This paper compares quantitatively the slope of the digital GSM pulses with that of the synchronizing pulse of the television signal. The result shows clearly that the pulse spectrum of the television signal contains that of the GSM signal; in addition, the synchronizing impulse of television exhibits a much steeper slope. Considering the countrywide normal radiation intensities of television and mobile phone systems, it can be stated that the worldwide exposure to the common television signals over more than 50 years can disprove the contention of adverse biological health effects of the pulse slope of digitally modulated radiofrequency."

Reprints: Dr. Bernhard Liesenkötter, University of Applied Sciences Augsburg, Germany, E-mail: <liese@rz.fh-augsburg.de>.

Thermal Noise Limit May Not Be a Limit at All

W.T. Kaune, "Thermal Noise Limit on the Sensitivity of Cellular Membranes to Power-Frequency Electric and Magnetic Fields," ***Bioelectromagnetics, 23,*** **pp.622-628, December 2002.**

"Several authors [Weaver & Astumian, Adair and Bennet] have concluded that thermal electromagnetic noise will be of sufficient magnitude to overwhelm electric and/or magnetic fields induced by environmentally generated, power-frequency [EMFs] in the membranes of living cells located in the bodies of humans. Yet, there are research reports [Harland & Liburdy, Blackman et al., Ahlbom et al. and Greenland et al.] that indicate that living cells may respond to power-frequency electric and/or magnetic field levels well below the limits set by these thermal noise arguments. The purpose of this study is to suggest that published thermal arguments may not make a full accounting of all membrane force fields of thermal origin, and that when such an accounting is made, the net thermal noise fields may be smaller in the power-frequency range than previously thought....[T]he induced membrane field estimates developed in this study are sufficiently large, when compared to the estimated thermal noise fields, to render unwarranted any such suggestion of a thermal noise problem. If the calculations presented in the study are at least approximately correct, there may be no thermal limit on the response of cellular membranes to exposures to environmental levels of [EMFs]. However, this does not mean that these cells will actually respond to such an external exposure....The final determination of whether such responses do occur is a matter for experimental study."

Reprints: Dr. William Kaune, Richland, WA, E-mail: <wtkaune@yahoo.com>.

2003 Conference Calendar (Part I)

Part II will appear in our next issue.

January 7-10: **Progress in Electromagnetics Research Symposium (PIERS),** Singapore. Contact: PIERS Secretariat, 451 Race Course Rd., Singapore 218695, Republic of Singapore, (65) 6299-8992, Fax: (65) 6299-8983, E-mail: <ctmapl@singnet.com.sg>, Web: <www.ece.nus.edu.sg/piers03>.

February 4-6: **DistribuTECH 2003,** Convention Center, Las Vegas, NV. Contact: Jennifer Lindsey, 1421 S. Sheridan Rd., Tulsa, OK 74112, (918) 832-9313, Fax: (918) 831-9875, E-mail: <dtechconference@pennwell.com>, Web: <dt2003.events.pennnet.com>.

February 18-20: **15th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility (EMC Zurich),** Zurich, Switzerland. Contact: Dr. Gabriel Meyer, ETH Zentrum, IKT-ETF, Zurich CH-8092, Switzerland, (41+1) 632-2793, Fax: (41+1) 632-1209, E-mail: <gmeyer@nari.ee.ethz.ch>, Web: <www.emc-zurich.ch>.

February 24-26: **Applying the Precautionary Principle to EMFs,** Luxembourg. Contact: Dr. Leeka Kheifets, International EMF Project, World Health Organization, CH-1211 Geneva 27, Switzerland, (41+22) 791-4976, Fax: (41+22) 791-4123, E-mail: <kheifetsl@who.int>, Web: <www.who.int/peh-emf/en>.

February 27-28: **RF Interactions with Humans: Mechanisms, Exposure and Medical Applications,** Institute of Physics (IOP), London, U.K. Contact: Jasmina Bolfek-Radovani, IOP, 76 Portland Pl., London W1B 1NT, U.K., (44+20) 7470-4800, Fax: (44+20) 7470-4900, E-mail: <registrations@iop.org>, Web: <physics.iop.org/IOP/Confs/ENV>.

March 9-13: **42nd Annual Meeting of the Society of Toxicology (SOT),** Convention Center, Salt Lake City, UT. Contact: SOT, 1767 Business Center Dr., Ste.302, Reston, VA 20190, (703) 438-3115, Fax: (703) 438-3113, E-mail: <sothq@toxicology.org>, Web: <www.toxicology.org>.

March 17-19: **Wireless 2003,** Convention Center, New Orleans, LA. Contact: Michele Solomon, CTIA, 1250 Connecticut Ave., NW, Ste.800, Washington, DC 20036, (202) 785-2842, E-mail: <msolomon@ctia.org>, Web: <www.ctiashow.com>.

March 30-April 3: **International Magnetics Conference,** Boston, MA. Contact: Courtesy Associates, (202) 973-8668, Fax: (202) 973-8722, E-mail: <magnetism@courtesyassoc.com>, Web: <www.intermagconference.com>.

March 31-April 3: **12th International Conference on Antennas and Propagation (ICAP),** University of Exeter, U.K. Contact: ICAP, IEE, Savoy Pl., London WC2R 0BL, U.K., (44+207) 344-5422, Fax: (44+207) 497-3633, E-mail: <icap@iee.org.uk>, Web: <conferences.iee.org/ICAP2003/main.htm>.

April 5-10: **National Association of Broadcasters Annual Convention (NAB),** Las Vegas, NV. Contact: Kristie Morris, NAB, 1771 N St., NW, Washington, DC 20036, (800) 342-2460, E-mail: <kmorris@nab.org>, Web: <www.nab.org>.

April 9-10: **39th Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP),** Crystal City Marriott, Arlington, VA. Contact: Laura Atwell, 7910 Woodmont Ave., Ste.800, Bethesda, MD 20814, (301) 657-2652, Fax: (301) 907-8768, E-mail: <atwell@ncrp.com>, Web: <www.ncrp.com>.

April 14-16: **American Power Conference,** Palmer House Hilton, Chicago, IL. Contact: Jennifer Lindsey, 1421 S. Sheridan Rd., Tulsa, OK 74112, (918) 832-9313, Fax: (918) 831-9875, E-mail: <apcconference@pennwell.com>, Web: <www.apc-pennwell.com>.

April 14-17: **International Conference on Non-Ionizing Radiation (ICNIR),** University of Tenaga National, Malaysia. Contact: Halil Hussain, College of Engineering, University of Tenaga National, Km7 Jalan Kajang-Puchong, 43009 Kajang, Selangor DE, Malaysia, (60+3) 8928-7212, Fax: (60+3) 8926-3506, E-mail: <icnir2003@uniten.edu.my>, Web: <www.uniten.edu.my/go/icnir2003>.

April 18-22: **3rd International EMF Seminar in China: EMFs and Biological Effects,** Guilin, China. Contact: Zeng Qunli, Bioelectromagnetics Lab, Zhejiang University, 353 Yanan Rd., Hangzhou 310031, China, (86+571) 8721-

Meeting Notes

• The ***Review of Progress in Research on Interaction Mechanisms for RF Energy and Biological Systems*** was billed as a **WHO** seminar to be held at the U.S. **FDA** in Rockville, MD, October 30-31. We asked whether we could attend and FDA's **Abiy Desta** immediately invited us. But a number of the invited speakers — Drs. **Dean Astumian**, **Frank Barnes**, **Kenneth Foster**, **Earl Prohofsky** and **James Weaver**, all university professors — balked because, as FDA's Dr. **Howard Cyr** told us, their work was unpublished and they wanted it off-limits to the press. A week before the meeting, the FDA bowed out as the host, because, as Desta explained, the law does not allow the government to close such a meeting. Before you could say "Mobile Manufacturers Forum," the **MMF** had taken over: The seminar was moved across the street to the Doubletree Hotel and our invitation was revoked. According to Motorola's (and MMF's) Dr. **Mays Swicord**, he and Dr. **Asher Sheppard** had drawn up the agenda and then passed it by Cyr and Dr. **Michael Repacholi** for their approval. Why were the WHO and the FDA involved? we asked. "There was a suggestion from the contractors to meet in a neutral environment, so it would not look like a closed-door industry meeting," Swicord replied. Each of the five professors has an MMF contract, Swicord confirmed. Cyr said the FDA was simply responding to a request from the WHO. As for Repacholi, he told us that this was not a WHO meeting, only that WHO was invited to attend (see also p.8).

• On December 5, the **NRPB** is holding an open meeting in Birmingham, U.K. — ***Power Lines and Health: Public Concerns about the Distribution and Use of Electricity***. The session will be chaired by Lord Robert Winston and those attending will include Sir Richard Doll, Dr. Alastair McKinlay and Dr. Michael Repacholi. Half an hour after this meeting ends, the Trentham Environmental Action Campaign, a power line activist group based in Stoke-on-Trent, is having its own meeting at the same conference center with the support of Children with Leukemia, a charity. Profs. Denis Henshaw of the University of Bristol and Mike O'Carroll, of REVOLT, another activist group, will speak at this counter-session, titled ***Addressing the Public Concerns.***

• There will be a session on ***Base Stations and Non-Ionizing Radiation*** on February 18 at the ***Zurich EMC Symposium*** — on the same day as a planned forum on ***Exposure to GSM Radiation***. This latter open meeting is being organized by ETH's Dr. Gregor Dürrenberger, and will feature the results of research projects supported by the Swiss Research Foundation on Mobile Communication (see p.6).

• Only one day (February 24) of the **WHO**'s three-day workshop on the **precautionary principle** will be open to the public. Dr. Leeka Kheifets said that the meeting will address both ELF and RF/MW radiation. It "will be one of the most significant we have held," added Dr. Michael Repacholi.

7094, Fax: (86+571) 8721-7410, E-mail: <zengql@cmm.zju.edu.cn>.

May 2-9: **Annual American Occupational Health Conference,** World Congress Center, Atlanta, GA. Contact: Nancy Olson, AOHC, 1114 N. Arlington Heights Rd., Arlington Heights, IL 60004, (847) 818-1800, ext.366, Fax: (847) 818-9266, E-mail: <nolson@acoem.org>, Web: <www.slackinc.com/exhibits/aohc>.

May 4-7: **35th National Conference on Radiation Control,** Hyatt Regency, Anaheim, CA. Contact: Lin Carigan, Conference of Radiation Control Program Directors, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543, Fax: (502) 227-4928, E-mail: <lcarigan@crcpd.org>, Web: <www.crcpd.org>.

May 10-15: **American Industrial Hygiene Association Conference and Exposition,** Dallas, TX. Contact: Carol Tobin, AIHA, 2700 Prosperity Ave., Fairfax, VA 22031, (703) 849-8888, Fax: (703) 207-3561, E-mail: <ctobin@aiha.org>, Web: <www.aiha.org>.

May 10-15: **Annual Meeting of the Environmental Mutagen Society (EMS),** Fountainbleau Hilton, Miami Beach, FL. Contact: David Eastmond, University of California, Riverside, 5429 Boyce Hall, Riverside, CA 92521, (909) 787-4497, Fax: (909) 787-3087, E-mail: <david.eastmond@ucr.edu>, Web: <www.ems-us.org>.

May 10-16: **11th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine (ISMRM),** Toronto, Canada. Contact: Roberta Kravitz, ISMRM, 2118 Milvia St., Berkeley, CA 94704, (510) 841-1899, Fax: (510) 841-2340, E-mail: <roberta@ismrm.org>, Web: <www.ismrm.org/smrt>.

May 11-16: **IEEE International Symposium on Electromagnetic Compatibility (EMC),** Istanbul, Turkey. Contact: Symposium Secretariat, Ortra Ltd., 1 Nirim St., PO Box 9352, Tel-Aviv 61092, Israel, (972+3) 638-4444, Fax: (972+3) 638-4455, E-mail: <emc2003@ortra.co.il>, Web: <www.ortra.com/emc2003>.

May 13-14: **2nd European Symposium on Nonlethal Weapons,** Stadthalle, Ettlingen, Germany. Contact: Manuela Wolff, Fraunhofer Institut für Chemische Technologie, PO Box 1240, D-76318 Pfinztal (Berghausen), Germany, (49+721) 464-0121, Fax: (49+721) 464-0120, Web: <www.ict.fhg.de/english/events/nlw.html>.

May 15-16: **COST281 Workshop: Mobile Communication Base Stations and Health,** Dublin, Ireland. Contact: Gerd Friedrich, FGF, Rathausgasse 11a, D-53111 Bonn, Germany, (49+228) 726220, Fax: (49+228) 7262211 E-mail: <info@fgf.de>, Web: <www.cost281.org>.

May 17-20: **RF and Thermal Physiology: A Joint Workshop of COST281 and ICES,** Dublin, Ireland. Contact: Gerd Friedrich, see May 15-16 above.

May 20-22: **IEEE Instrumentation and Measurement Technology Conference (IMTC),** Vail, CO. Contact: Robert Myers, 799 N. Beverly Glen, Los Angeles, CA 90077, (310) 446-8280, Fax: (310) 446-8390, E-mail: <bob.myers@ieee.org>, Web: <www.ieee-imtc.org>.

Letter to the Editor

Prato, BEMS President, Calls for Unfettered Debate

October 15, 2002

To the Editor:

Your recent editorial ("Motorola's Junkyard Dog," J/A02) took a "shot" at:

1. Motorola's Dr. Joe Morrissey for a question he asked Dr. Dariusz Leszczynski at the Quebec City Bioelectromagnetics Society's (BEMS) meeting.

2. The BEMS' publications with respect to Motorola's influence on our official peer-reviewed journal and newsletter.

I believe that scientific debate, even passionate debate, fuels our science and quickens discovery. The questions being debated by Drs. Morrissey and Leszczynski are extremely important. A great need within our community is to demonstrate a reproducible biological effect. The discoveries of Dr. Leszczynski are important and must be validated by various forms of replication and, if repeated successfully, the consequences in organisms would need study. To achieve this both scientists need to be free to exchange ideas. I fear that your comments could perhaps interfere with this exchange by creating an interpersonal barrier.

It is not true that Motorola "has a big say about what papers are published," or to any other degree interferes with the editorial practices of the independently edited, peer-reviewed journal *Bioelectromagnetics* or the *Bioelectromagnetics Society Newsletter.* Dr. Mays Swicord, a Motorola scientist and former president of BEMS, is our present newsletter editor, having taken over that position after many years of service by Dr. Mary Ellen O'Connor. One of the five *Bioelectromagnetics* associate editors is Motorola scientist Dr. C.K. Chou, who, at the specific request of the society, has continued in that post since the time he was affiliated with one of the United States' premier cancer centers. The editor-in-chief of *Bioelectromagnetics* is Dr. Ben Greenebaum of the University of Wisconsin and the other four associate editors are affiliated with academic and governmental institutions. Scientific activities of the BEMS journal are conducted under carefully drawn editorial policies carried out with dedication by editor-in-chief Ben Greenebaum and the associate editors, all of whom are overseen by an editorial board, an intersociety journal committee, a publications committee and the board of directors. The newsletter operates under similar BEMS policy guidelines and is likewise subject to society oversight.

In all fields I can think of it is common to have industry scientists working beside scientists from research institutions. (In fact, if you really want a biomedical discovery to be developed for the benefit of society you patent the discovery and then work with industry to further develop it.)

I have just looked at the sponsorship listed in the acknowledgments of the articles in the July and September issues of *Bioelectromagnetics* and compared them to those in the same months in the journal *Magnetic Resonance in Medicine* (*MRM*). There seemed to be two major differences: 1) a lot more grant money for MR research from peer review agencies like the NIH (U.S.), and 2) in MR research a lot of combined industry-academia authorship of articles. Dr. Slesin, my impression from this and a number of other observations is that there is too little money in the science of bioelectromagnetics both from industry and from peer review funding agencies. Motorola, through its scientists, is making a contribution. But we need more such contributions, not fewer. We need excellence in our science and this is hard to achieve without significant funding. Yes, industrial scientists and academic scientists often will have different biases and different pressures. In scientific discussions and in scientific publications, all of our community must be involved; all valid sides must be heard. Dr. Slesin, please encourage the debate among peers rather than help foment barriers to communication.

Frank Prato, PhD, President, Bioelectromagnetics Society
Department of Medical Biophysics, University of Western Ontario,
London, E-mail: <prato@lri.sjhc.london.on.ca>

Across the Spectrum

I was surprised when a communications officer at the FDA's Center for Devices and Radiological Health told me flatly that "there are no known health effects from appliance EMFs" and then refused to let me talk to an FDA doctor to confirm or deny this statement.

— Joyce Slaton, "The Body Electric: Are Electrical Appliances Dangerous to Your Health?" (on the California EMF report; see p.2 and *MWN,* J/A02), *SF Gate* (CA), October 17, 2002 (<www.sfgate.com>)

"The animal studies were prone to falsely exonerate the EMFs. [As for physicists,] they're making assumptions about (human) cell behavior that aren't necessarily true."

— Dr. Raymond Neutra, California Department of Health Services and Director, California EMF Program, quoted by Chris Bowman, "Study Bucks EMF Views: Electromagnetic Fields a Danger, Scientists Say," *Sacramento Bee* (CA), October 18, 2002

"We take this issue extremely seriously, and nobody is trying to hide any of the facts. But exaggerated claims that are not supported by the evidence do not help. After 20 years and £300 million of research, scientists across the world are increasingly coming to the view that there is no major public health risk from exposure to EMFs."

— Dr. John Swanson, EMF science adviser, Electricity Association, London, U.K., quoted in "Statement: California Department of Health Services Research," Electricity Association (U.K.), October 6, 2002

"People who drink more than four units of alcohol a day are probably not doing themselves any good, but we don't want to discourage people from having a few drinks a day if they enjoy it. It does carry a small risk of breast cancer, but there are small risks with everything enjoyable."

— Sir Richard Doll, chair, Advisory Group on Non-Ionizing Radiation, U.K. National Radiological Protection Board, quoted by David Firn in "Alcohol, Not Smoking, Linked to Breast Cancer," *Financial Times* (U.K.), p.4, November 13, 2002

Physicist Park Is Right, and The Epidemiology Is Wrong

"All known cancer-inducing agents, including radiation, certain chemicals and a few viruses, act by breaking chemical bonds to produce mutant strands of DNA. Photons with wavelengths longer than the near-ultraviolet do not have enough energy to break a chemical bond in DNA. Case closed. If epidemiology comes up with a different answer, the study is simply wrong."

— Dr. Robert Park, American Physical Society, Washington, "What's New by Bob Park," October 4, 2002, on the Internet at <www.aps.org/WN/WN02/wn100402.html>

Perhaps the better things to be fretting about are not the EMP weapons but the people trying to scare us about them.

— Lee Gomes, "Despite Rising Alarm, New Zapper Weapons Are Unlikely Threat," *Wall Street Journal,* p.B1, October 21, 2002

"My mom said that mobiles make your brain bad."

— Charlotta Bergius, Helsinki, Finland, explaining why her mother, Heli, has forbidden her to have a mobile phone until she is 12, quoted by Sarah Lyall, "Jacks? Dolls? Yo-Yos? No, They Want Cell Phones," *New York Times,* p.A4, October 24, 2002

"We believe it's irresponsible for a large company even to allude to the effects of using a mobile phone."

— Michael Milligan, secretary-general, Mobile Manufacturers Forum, quoted by George Cole, "A Pocketful of Protection: Specially Developed Clothing Could Shield Mobile Phone Users," *Financial Times,* p.10, Novmber 5, 2002

"MICROWAVE NEWS" FLASHBACK

Years 20 Ago

• NIOSH may soon begin a large-scale study on the possible effects of VDT work on pregnant women, the agency discloses.

• The broadcast industry contends that Massachusetts health officials have yielded to "irrational" public fears by proposing "unnecessarily stringent" RF guidelines.

• The U.S. Navy's Gregory Lotz finds that 225 MHz radiation can cause "severe" hyperthermia in monkeys at SARs of greater than 2.3 W/Kg.

Years 10 Ago

• There is "no convincing evidence" that EMFs are hazardous, and increased funding for research is unwarranted, according to an interagency report prepared for President George Bush.

• Though initially skeptical of a power line–leukemia link, Sweden's Anders Ahlbom says that David Savitz's study changed his mind—an outlook reinforced by his and Maria Feychting's new epi study.

• A workers compensation panel rules that workplace EMFs caused an electrician's brain tumor—the first time such a claim has been accepted in Sweden.

Years 5 Ago

• Exposure to weak residential magnetic fields can reduce nighttime melatonin production in women, reports Scott Davis of the Fred Hutchinson Cancer Research Center in Seattle.

• WTR, the wireless industry's research program, cancels plans for long-term animal studies, bypassing the FDA's advice that such studies "should be given highest priority."

• The expected end of research funding dampens the mood at the Department of Energy's annual EMF review in San Diego. "It's like a wake," observes Charles Graham of the MRI in Kansas City.

BABY MONITORS

Radiation Hazard?... The German consumer magazine *Öko-Test* continues to take a great deal of interest in sources of non-ionizing radiation in the home. Previously, it tested mobile phone headsets and DECT digital cordless phones and advised against using them (see *MWN,* S/O00 and S/O02). In its November issue, *Öko-Test* investigates baby monitors. Radiation measurements for 18 models—most of which use a 40 MHz signal—found levels ranging from 70 to 650 mV/m one meter away. Six of the monitors are rated "subpar" and two "unsatisfactory." These units "have no place in a baby's bedroom," *Öko-Test* states. The magazine finds a Philips model (SBC SC 475 Digital) to be "especially problematic" because its signal is pulsed and because it is always on. This unit, which operates at 1.9 GHz (the same as DECT phones), is transmitting even when the baby is asleep, rather than being sound-activated. Noting that this is the only such monitor on the market, the magazine warns that it would be "a scandal" if this "controversial" technology were to find wider use in nurseries....In an effort to calm public concern over the installation of mobile phone transmitters at its restaurants (see p.1), McDonald's noted that the radiation from such antennas is much weaker than that from baby monitors.

LEGISLATION

Amending the 1996 Telecom Law... Critics of federal tower siting policies have once again renewed their legislative campaign (see *MWN,* N/D97, S/O98 and S/O99). On October 10, Sen. Patrick Leahy (D-VT) introduced two bills, which, if passed, would end the 1996 federal preemption of state and local rules on radiation from telecom antennas. S.3102 addresses broadcast facilities, while S.3103 covers mobile phone base stations. Sens. Jim Jeffords (Ind-VT) and Patty Murray (D-WA) are cosponsors. The same day in the House of Representatives, Rep. Bernie Sanders (Ind-VT) introduced HR.5631 and HR.5632, with essentially the same provisions as their senate counterparts, joined by Reps. Danny Davis (D-IL), Christopher Shays (R-CT) and Tom Tancredo (R-CO). The legislative push was originally planned for last year (see *MWN,* J/A01), but was postponed in the aftermath of September 11. In the meantime, Republicans have taken control of the Senate, putting Sen. John McCain (R-AZ) back in charge of the Commerce Committee, where he has thwarted previous attempts to reduce federal authority. The EMR Network, a supporter of the legislation, has posted all four bills on its Web site, <www.emrnetwork.org>, along with Leahy's statement to the Senate calling for greater local control. You can also download the bills, as well as follow their progress, on Congress's Web site, <thomas.loc.gov>.

MICROWAVE WEAPONS

Nonthermal Weapons... As the RF community debates whether nonthermal effects are real (see p.1), the U.S. military is planning to exploit them in its next generation of "nonlethal" weapons. "Leap-ahead" technologies will "probably be based on more subtle human/RF interactions in which the signal information

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within the RF exposure causes an effect other than simply heating," predicts a report released by the National Academy of Sciences–National Research Council (NAS–NRC) on November 4. Potential effects include "stun, seizure, startle and decreased spontaneous activity," it continues, calling for research on "useful susceptibilities" to ultrashort, ultrawideband and very high peak power signals. The NAS–NRC panel, commissioned by the Joint Nonlethal Weapons Directorate, is chaired by Dr. Miriam John of Sandia National Labs in Livermore, CA, and includes Dr. Clay Easterly of Oak Ridge National Lab in Tennessee. The report also addresses existing applications, including the "active denial" millimeter-wave weapon officially introduced last year by the U.S. Air Force for crowd control (see *MWN*, M/A01). The panel points to the danger of eye injury and "inadvertent exposure of targets at close range" leading to "severe burns or other injuries" as an "area of concern" with the technology. The full text of *An Assessment of Nonlethal Weapons Science and Technology* is available free of charge at <www.nap.edu/catalog/10538.html>. Print copies of the 158-page report are not yet available, but can be ordered for $50 each, or $60 outside the U.S., from the National Academies Press, 500 Fifth St., NW, Lockbox 285, Washington, DC 20055, (800) 624-6242, or on the Web at <www.nap.edu>.

OCCUPATIONAL EXPOSURES

NRPB Measurements... Levels of non-ionizing radiation in many U.K. workplaces exceed the ICNIRP limits, according to a new report from the National Radiological Protection Board (NRPB). In response to a request from the Health and Safety Executive, the NRPB analyzed data from previous surveys and found that "reference levels or basic restrictions may be approached or exceeded" near power-generation equipment, magnetic tape erasers, antitheft systems, and telecommunications antennas, among other sources. "Further work may be required to investigate compliance with the guidelines," the NRPB added in an October 28 announcement accompanying the report. The NRPB is currently considering whether to revise its exposure limits — among the world's highest—to bring them in line with those of ICNIRP. The 60-page report, *Occupational Exposure to Electric and Magnetic Fields in the Context of the ICNIRP Guidelines*, is available free on the Internet at <www.nrpb.org/publications/w_series_reports/index.htm>. Print copies may be purchased for £15 each (US$23), not including shipping, from the NRPB, Chilton, Didcot, Oxon OX11 0RQ, U.K., (44+1235) 822742, Fax: (44+1235) 822746, E-mail: <information@nrpb.org>.

PEOPLE

Prof. **Zhengping Xu** is the new director of the Bioelectromagnetics Lab at Zhejiang University in Hangzhou, China. Prof. **Huai Chiang**, the previous director, will continue to direct two research projects at the lab until they are completed in 2005. Xu, who was trained at Harvard medical school, uses genomic and proteomic techniques to study the biological effects of ELF EMFs and modulated high-frequency radiation. He is also the director

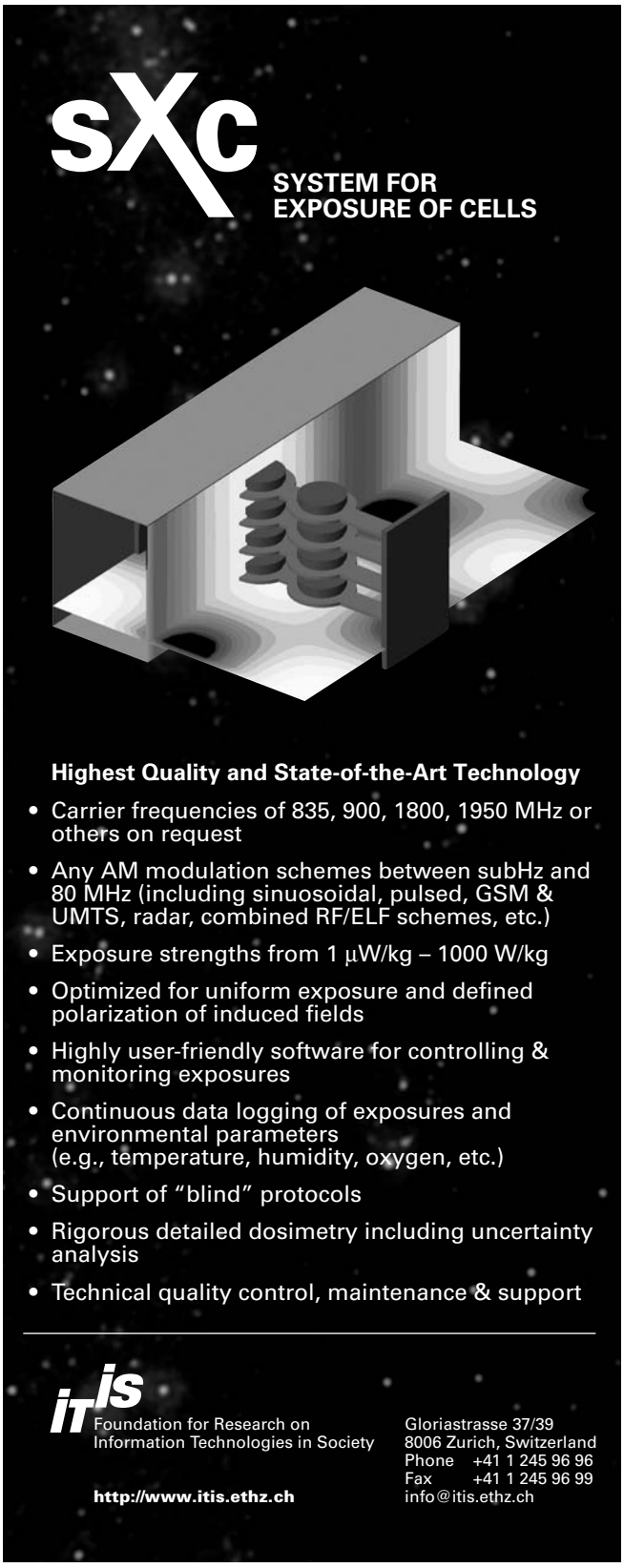
of the Bioelectromagnetics Commission of the Chinese Biomedical Engineering Association.

PRECAUTIONARY PRINCIPLE

The Decline and Fall of Modern Society... Two longtime members of the RF community have written a scalding attack on the precautionary principle, predicting that unless reformulated it will lead to nothing less than the end of Western civilization. Drs. Q. Balzano and Asher Sheppard characterize the precautionary principle as "illogical, irrational and rife with arbitrariness" and describe its application by the U.K. panel on mobile phones chaired by Sir William Stewart as an "egregious" example of how policy decisions can go awry "in a stormy sea of choices." Balzano and Sheppard, who are both consultants to Motorola, are especially distressed that the Stewart committee advised that children should be discouraged from using cell phones. "Because the [panel] misunderstood key scientific knowledge and lacked definitive research data on outstanding questions, fears of unknown risks were amplified unrealistically to generate speculations about the health of children," they write. Balzano and Sheppard call the application of ALARA-like rules to RF exposures from wireless technology an "absurdity," and argue that "ALARA is likely to fan public fears without demonstrable effects on disease risks." (ALARA stands for "as low as reasonably achievable.") Instead, they favor the creation of "scientific fire brigades" that would respond to public concerns under the guidance of government science agencies and funded by the involved industry. They cite with approval the example of the cooperative agreement, or CRADA, between the CTIA and FDA to investigate mobile phone health effects (see *MWN*, N/D99 and M/J01). Balzano and Sheppard conclude their argument, which appears in the *Journal of Risk Research (5*, pp.351-369, 2002), with this dire warning: "Unless current efforts lead to its successful reformulation, the precautionary principle could institutionalize excessive caution and thus deepen rather than alleviate alarm from the doom-laden hypothetical risks called 'perceived threats.' The resulting suppression of innovation and technological progress would inevitably have disastrous effects on society, leaving it susceptible to the decay that over time turns great civilizations into antique ruins."

RISK MANAGEMENT

WHO on Establishing a Dialog... How do you talk about EMF risks? To whom? When? And what do you say? In a new booklet, available free on the Internet, the WHO International EMF project offers some practical advice "to improve the decision-making process by reducing misunderstandings and improving trust through better dialog." It predicts that, "Community dialog, if implemented successfully, helps to establish a decision-making process that is open, consistent, fair and predictable. It can also help achieve the timely approval of new facilities while protecting the health and safety of the community." The project describes possible risks as small, if they exist at all. For instance: "The balance of evidence to date suggests that exposure to low-level RF fields (such as those emitted by mobile phones and



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Electromagnetic Fields a Hazard, Scientists Say

Sacramento Bee (California), October 18, 2002

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their base stations) does not cause adverse health effects. Some scientists have reported minor effects of mobile phone use, including changes in brain activity, reaction times and sleep patterns. In so far as these effects have been confirmed, they appear to lie within the normal bounds of human variation." With respect to ELF EMFs, though classified as a possible human carcinogen by IARC last year, the WHO adds the following perspective: "An example of a well-known agent classified in the same category is coffee, which may increase the risk of kidney cancer, while at the same time be protective against bowel cancer." One of the project's goals is to harmonize national exposure standards. The booklet warns that adopting precautionary limits "undermines the credibility of the science and the exposure limits." The 66-page booklet, *Establishing a Dialog on Risks from Electromagnetic Fields,* can be downloaded from the project's Web site, <www.who.int/emf>. Copies may also be ordered from: Marketing and Dissemination, WHO, 20 Ave. Appia, 1211 Geneva 27, Switzerland, (41+22) 791-2476, Fax: (41+22) 791-4857, E-mail: <bookorders@who.int>.

TOWERS

Planning Rules... The U.K. government has issued a new set of planning rules for the siting of mobile phone base stations. The *Code of Practice* is designed to balance environmental protection and public concerns with the need for increased network capacity, according to a November 11 statement from the deputy prime minister. It noted the Stewart report's call for a precautionary approach but not its recommendation that base station radiation be kept to "the lowest practical levels" in public areas (see *MWN,* M/J00; also M/A01). The new code is available at <www.planning.odpm.gov.uk/telecomms/index.htm>.

Keeping Current: Follow-Up on the News

◆ In her presentation at the London MTHR meeting (see p.5 and p.9) Dr. Leeka Kheifets left no doubt that the WHO EMF project—run by Dr. Michael Repacholi—shares the already widespread skepticism over the recent Australian results that are purported to refute Repacholi's own cancer study (see *MWN,* M/J97 and S/O02). Instead of beginning with the expected overview of the project, Kheifets flashed a slide challenging the reliability of the new results reported by Drs. Tammy Utteridge and Tim Kuchel in *Radiation Research*. Later, Kheifets told *Microwave News* that the project had been no more successful than anyone else in getting the Australian researchers to clarify any of the many outstanding questions and inconsistencies.

◆ The French parliament has issued a report from its Office of Technology Assessment that analyzes the potential health risks associated with mobile phones and towers. The full text of the report, which is only available in French, is at <www.senat.fr/rap/r02-052/r02-052.html>.

◆ On November 18, the U.S. FCC proposed fining A-O Broadcasting Inc. $28,000 for allowing its radio station, KTMN, in Cloudcroft, NM, to violate its RF exposure limits. KTMN's FM antenna is mounted on an observation tower used by the U.S. Forest Service to watch for wildfires. A survey showed that when operating at only 40% of its authorized power, the antenna caused the RF levels on the tower to exceed the FCC limits by 300%. This is the first time the commission has proposed a monetary fine for a violation of its RF rules. A-O has 30 days to appeal.

◆ Prosecutors in Kiel, Germany, have indicted the former head of Hagenuk, the first company to market low-SAR mobile phones, the German Press Agency reported on November 8 (see *MWN,* S/O97 and N/D97). Manfred Schmitt is charged with accounting fraud and other crimes. The company, which he bought in 1995, declared bankruptcy in 1997—and again two years later. Schmitt, now a fugitive, is believed to have left Germany.

◆ *IEEE Transactions on Electromagnetic Compatibility* has issued a call for papers for a special issue on intentional EMI from high-power sources. For more information, contact Dr. William Radasky of Metatech Corp. at <wradasky@aol.com>. The papers are due next June and the issue will be out in May 2004.

VIEWS ON THE NEWS

The Coffee Manifesto

Being exposed to EMFs is no more hazardous to your health than drinking a cup of coffee. That's the message from the World Health Organization (WHO).

After the International Agency for Research on Cancer (IARC) classified power-frequency EMFs as possible human carcinogens last summer, we began to wonder how this ratcheting up of the health risk would play among the skeptics.

We found the answer in a new booklet on communicating EMF risks (see p.17). Inside, the WHO EMF project cites only one other agent designated as a possible carcinogen by IARC — coffee.

WHO's Mike Repacholi and Leeka Kheifets could pick from among 232 IARC possible carcinogens, including carbon tetrachloride, DDT and lead. But most of these appear less benign than coffee and might have prompted some public alarm.

To further cushion the blow, the WHO adds that coffee may be good for you: While acknowledging that it might increase the risk of kidney cancer, the WHO also tells the reader that coffee might protect against colon cancer. And, of course, many of us could not start the day without a good jolt of coffee.

EMFs are famously linked to childhood leukemia. But we had never before considered the possibility that EMF exposure could actually benefit children. Yet, soon afterwards, we came across a fact sheet from the Catholic school system in Edmonton that said just that. Children exposed to EMFs have *lower* rates of cancer, according to the fact sheet. (For the record, that is not our added emphasis.) This is the same school system that reported, "Every expert we talked with and studies we researched did *not* find a link to EMFs and childhood leukemia."

Who on earth have these Canadian Catholics been talking to? The most likely source is Mary McBride (see p.3). She says that the plan to site a new school next to a power line — which she endorses — is consistent with WHO's recommendations.

In its own newly revised EMF booklet, the National Institute of Environmental Health Sciences (NIEHS) thankfully steers clear of the coffee paradigm but still takes a dismissive view of the potential health risks (see p.2).

Four years ago, a panel convened by the NIEHS also designated EMFs as possible carcinogens. Rather than seeing the IARC decision as reaffirmation, the institute's resolve appears to have weakened and it is no longer promoting strategies that would reduce unnecessary EMF exposures.

Chris Portier, who helped draft both the NIEHS and the WHO booklets, seems to have changed his outlook. At last summer's IARC meeting, he was the one who forcefully argued that the animal data, not just the epidemiology, suggest a cancer association (see *MWN*, J/A01). Had he convinced three more of the 21 panel members to join him, IARC would have classified EMFs as *probable* human carcinogens, putting them in a class with benzopyrene, PCBs and UV radiation.

Portier, the associate director of the U.S. National Toxicology Program and the director of NIEHS' Environmental Toxicology Program, has a lot of clout. We wonder why he changed his mind — clearly, he is not impressed by the new California report (see p.2) — and why he now chooses not to give the American public fair warning about EMF health risks.

In the past, both the WHO and the NIEHS have endorsed prudent avoidance, or taking low-cost steps to reduce EMF exposures. That now seems to be history. Today's message is "Don't worry, be happy, have another espresso."

Our Wish List for 2003

Next year, we would like to see:

• A commitment from the U.S. federal government to sponsor ELF EMF and RF/MW radiation research.

• A new editor for papers on non-ionizing radiation at *Radiation Research* — someone who is not a consultant for the electric utility and cell phone industries.

• A moratorium on claims that the Utteridge–Kuchel mouse study is a replication or a refutation of the Repacholi cancer experiment. A little icing on this cake would be an investigation on how the study passed peer review at *Radiation Research*.

• Another moratorium on the well-worn arguments that the epidemiology linking childhood leukemia and power-frequency EMFs has no support from laboratory studies — after all, we now have six labs showing DNA breaks at 50/60 Hz and six others have shown that these fields can inhibit the cancer-controlling action of melatonin. And while we are at it, we should also ask for —

• A commitment by the Edison Electric Institute, American Public Power Association and EPRI, as well as the rest of the electric utility industry, that they will no longer dismiss and ignore the existence of EMF health risks.

• A serious attempt to settle the controversy over microwave-induced leakage through the blood-brain barrier. This is the third year in a row for this particular wish. *Hello!* Is anyone paying attention?

• And under our Christmas tree, we hope Santa will leave us a taste of whatever Q. Balzano and Asher Sheppard were smoking when they penned their over-the-top assault on the precautionary principle (see p.17).

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