radar and cancer."

This year, however, the VA announced that it will honor all NHL-related disability claims from Vietnam veterans—following the March 1990 release of a Centers for Disease Control study showing that Vietnam veterans are at an increased risk for NHL. Those serving on ships off the Vietnam coast have the highest risk, according to the report. Kathy Ford expects her husband's claim will now be approved, but the Fords have not yet received official notification.

Ford's legal complaint, which was served on October 17, names AT&T, GE, Raytheon, GTE Products Corp. and Lockheed, all makers of shipboard radars for the Navy, as defendants.

Sweeney expects that the defendants will try to use the military contractors' defense authorized by a 1988 U.S. Supreme Court decision, *Boyle v. United Technologies*, but he believes that the case is "clearly outside the limits of the doctrine," primarily due to the contractors' failure to warn the government of the real risks involved.

"I have no doubt of the causal relationship between Ford's exposure and his illness. He had a particularly intense exposure, unusual even for a military man," Sweeney told *Microwave News*.

Atop the Chrysler Building

For several months in 1980, Michael Dowgiallo installed lights on the exterior of the tower of the Chrysler Building in New York City. During that time, Dowgiallo claims that he was exposed to high levels of RF/MW radiation from FM antennas and MW transmitters, often just a few inches away from him.

Dowgiallo's supervisor had expressed concerns about the safety of working near the RF/MW transmitters, according to Dowgiallo, but was subsequently assured by Eastern Communications of Long Island City, NY, the owner of the equipment, that the transmitters posed no hazard to workers. In a December 15, 1980 letter to JKC Realty, the owner of the Chrysler Building, however, Eastern stated that its antennas were "HOT" and could be "considered dangerous up to a ten-foot radius" and that, "Exposure to this type of radiation at a distance of less than eight to ten feet for protracted periods of time may have effects that will not show up for years."

In 1979, an employee collapsed while working near FM transmitting equipment on the 77th floor of the Chrysler Building. The Occupational Safety and Health Administration (OSHA) did an RF survey and found a maximum level of 2.5 mW/cm^2 about six feet from an antenna element. OSHA concluded—based on its then current standards—that workers inside the building were not at risk from excessive RF exposure, but recommended that workers not be allowed within six feet of the radiating antenna element.

Dowgiallo was diagnosed with stomach cancer in 1988 at the age of 39. Although it has not typically been linked to EMF exposures, Dr. Genevieve Matanoski of Johns Hopkins University reported in 1989 four cases of stomach cancer among approximately 9,000 New York Telephone Co. central office technicians (who were exposed to complex EMFs), where none were expected (see *MWN*, N/D89).

Dowgiallo's complaint was served on October 25. Dowgiallo and his wife Sharon name JKC Realty, Eastern Communications, the International Brotherhood of Electrical Workers Local No.3 and Robert B. Samuels, Inc. (his employer) as defendants. They have also filed a workers' compensation claim.

For more on RF/MW litigation, see *MWN*, D82, J/F83, Jn84, My85, S/O85, J/F86, M/J86, S/O86, M/A88, M/J89 and S/O89.

White House Holds Up EPA Report (continued from p.1)

himself was involved in the negotiations.

An earlier draft of the EPA report, *Evaluation of the Potential Carcinogenicity of Electromagnetic Fields*, released last June, concluded that studies of extremely low frequency (ELF) EMFs and leukemia, lymphoma and brain cancer among children and workers "show a consistent pattern of response that suggests, but does not prove, a causal link" (see *MWN*, M/J90). The report attracted widespread public interest when *Microwave News* reported that EPA staffers had recommended that ELF EMFs be classified as "probable human carcinogens" and radiofrequency and microwave radiation be classified as "possible human carcinogens." The report was issued without any classifications following a March meeting at the White House.

The forthcoming draft of the EPA report—called the "external review draft"—also does not include any classifications of the carcinogenicity of EMFs because of "uncertainties" about the mechanism of interaction. The draft concludes that epidemiological studies "show a consistent pattern of response which suggests a causal link" (see p.7 for excerpts).

Three EPA officials attended the November 26 meeting at the White House: Drs. Erich Bretthauer, the assistant administrator for research and development, William Farland, the director of the Office of Health and Environmental Assessment (OHEA) and Robert McGaughy, the lead author of the document. Bretthauer refused to be interviewed by *Microwave News*, Farland did not respond to phone calls and McGaughy said that he could not comment on the meeting.

Calls to Bromley's office were referred to OSTP's Dr. Kenneth Yale, who did not answer requests for comment.

The White House request for EPA to wait for the CIRRPC review follows a similar request from the Air Force (see p.7). In an October 2 letter to EPA, Brigadier General Paul Gleason of the Office of the Air Force Surgeon General opposed publication of the EPA report until both the CIRRPC review and an analysis by the National Research Council of the Air Force's Ground Wave Emergency Network (see p.9) are completed.

Gleason's letter accompanied a 33-page blistering critique of the EPA report which charges the authors with having "biased the entire document toward EMF-induced carcinogenicity." The Air Force concludes that, "It is astonishing that the

Excerpts from EPA's EMF Report

The following is excerpted from the Executive Summary of the forthcoming external review draft of EPA's report, Evaluation of the Potential Carcinogenicity of Electromagnetic Fields, *dated October 1990 and obtained by* Microwave News *in November.*

In conclusion, several studies showing leukemia, lymphoma and cancer of the nervous system in children exposed to magnetic fields from residential 60 Hz electrical power distribution systems, supported by similar findings in adults in several occupational studies also involving electrical power frequency exposures, show a consistent pattern of response which suggests a causal link....

At this time, such a characterization regarding the link between cancer and exposure to EMFs is not appropriate because the nature of the interaction between EMFs and biological processes leading to cancer is not understood....

Because of these uncertainties, it would be inappropriate at this time to classify the carcinogenicity of EMFs in the same way as the agency does for chemical carcinogens....With our current understanding, we can identify 60 Hz magnetic fields from power lines and perhaps other sources in the home as a possible, but not proven, cause of cancer in humans....

U.S. EPA would place its imprimatur on this report."

Gleason stated that, "If published, the report will contribute to needless public anxiety, and have serious impacts on capabilities and costs of Air Force programs."

The SAB will assemble a panel of experts to review the draft report at a public meeting in the Washington area on January 14-15 and, if necessary, January 16 (if the release of the report is not delayed further). Dr. Genevieve Matanoski of the Johns Hopkins University School of Hygiene and Public Health in Baltimore, MD, will chair the SAB's Non-Ionizing Electric and Magnetic Fields Subcommittee of the Radiation Advisory Committee. Dr. David Bates of Vancouver, Canada, will be the vice chairman.

Kathleen Conway, the SAB staff officer responsible for the review, told *Microwave News* that there will be as many as 18 experts on the panel. At press time, the selection process had not yet been completed.

Conway said that she had received numerous nominations for membership on the panel. For example, she said that EPA had been sent recommendations from the Edison Electric Institute, the Electric Power Research Institute, the White House (see p.8) and Crowell & Moring, a Washington, DC, law firm which has represented a number of utilities in power line siting battles. "We considered over 200 experts," Conway said.

The SAB is being cautious about the makeup of the EMF panel because of the attention being paid to another SAB committee, which is investigating the health risks of environmental (passive) tobacco smoke. A number of the members of that committee are consultants to the cigarette industry and EPA came close to removing one antismoking advocate from the panel after complaints from the Tobacco Institute.

Copies of EPA's draft report will be available from: Dr. Robert McGaughy, [RD-689], OHEA, EPA, 401 M St., SW, Washington, DC 20460, (202) 382-5898.

U.S. Air Force Labels EPA Report Biased and Political

The October 2 Air Force review of the Environmental Protection Agency (EPA) cancer assessment document—prepared by a team of "radiofrequency (RF) effects scientists" led by Drs. David Erwin and James Merritt at the Brooks Air Force Base School of Aerospace Medicine, TX—begins with a quote from the Roman historian Tacitus: "Some believe all manner of hearsay evidence; others twist truth into fiction; and both sorts of error are magnified by time." The Air Force argues that the EPA authors present "no evidence of causation between electromagnetic fields (EMFs) and cancer, but rather argue as if this hypothesis were accepted fact."

The Air Force claims that the authors "consistently neglect the majority of negative studies and concentrate most of their discussion on weak positives of dubious value." Blasting the report's statements on the "consistency" of the evidence and on the need for more research, the Air Force charges that "these are political statements and not scientifically derived conclusions."

"Our reviewers of this document are convinced that there is no suggestion that EMFs present in the environment today induce or promote cancer," the Air Force concludes.

The Air Force dismisses the report's section on extremely low frequency (ELF) epidemiological studies, claiming that, "The overall weight of epidemiologic evidence is so slight as to be almost nonexistent; certainly not sufficient to justify further large expenditures of scarce research resources."

With regard to the report's survey of animal studies, the Air Force argues that any credible effects are most likely due to heat-induced stress, rather than to "some other property of RF radiation." The Air Force even suggests that ELF effects on the pineal gland are heat-related.

In contrast to most EMF researchers, government officials and industry representatives, the Air Force maintains that, "In general, there is sufficient research being carried out in various laboratories commensurate with the urgency of the problem."

Letter-Writing Campaign

One member of the Air Force team that wrote the report appears to be on a one-man crusade to correct what he perceives as published errors about EMFs. Dr. James Jauchem has had a flurry of letters published in popular and scientific journals—for instance, *Nature* (October 4), *The Lancet* (October 6), *The Bulletin of the Atomic Scientists* (November 1990), *Science* (November 9) and the *British Journal of Haematology* (see p.9). In general, Jauchem criticizes the "lay media" for providing "misinformation on the alleged hazards of EMFs." Not surprisingly, his statements closely parallel some of the arguments presented in the Air Force review of the EPA cancer assessment. Jauchem, a research physiologist, has written a number of papers in recent years on the thermal effects of RF radiation.

Interagency Panel Asks for New EMF Health Review

The Committee on Interagency Radiation Research and Policy Coordination (CIRRPC), an offshoot of the White House Office of Science and Technology Policy, is undertaking a new review of electromagnetic field (EMF) health effects.

A new subpanel on the health effects of EMFs is being chaired by Dr. Robert McGaughy of the Environmental Protection Agency (EPA), the lead author of EPA's EMF cancer assessment (see p.1 and *MWN*, M/J90). In an interview with *Microwave News*, McGaughy said that the subpanel has been asked to assemble "an authoritative review of the health effects of low frequency EMFs"—at both power line (15–180 Hz) and VDT (10–30 kHz) frequencies—"to guide federal agencies on what should be done about this problem."

One of the panel's first decisions was to commission a literature review by an outside group of experts. Dr. Charles Susskind of the University of California, Berkeley, will chair the review group. McGaughy noted that Susskind's survey will include not only cancer but also central nervous system, reproductive and developmental effects. Susskind is also a member of EPA's Science Advisory Board.

White House Recommendations to EPA on EMF Experts

Reprinted below is a memorandum from Dr. Allan Bromley, President Bush's science advisor, to William Reilly, the administrator of the Environmental Protection Agency (EPA). No attempt has been made to correct any of Bromley's errors of fact—for instance, Dr. Toler is in the midst of a major study of microwave effects on mice—not ELF effects on rats.

Bob Adair, referred to by Bromley, is Dr. Robert Adair, a professor of physics at Yale University and an outspoken skeptic about ELF field effects (see MWN, *J/F90 and M/J90). Before moving to Washington, DC, Bromley was also a Yale physics professor.*

THE WHITE HOUSE
WASHINGTON

August 2, 1990

Memorandum for the Honorable William K. Reilly
From: D. Allan Bromley
Subject: ELF Studies

As promised, I am sending you herewith a list of people whom I would recommend as persons whom you might consider as very knowledgeable ones in the area of alleged non-ionizing, non-thermal biological effects of low intensity, low frequency electromagnetic radiation. They cover a wide range of age, experience, background, etc.

I also enclose, to keep your file of Adair papers up-to-date, a recent comment regarding alleged biological effects of static magnetic fields. Bob Adair is also someone whom you might want to keep in mind. He is very bright, uninhibited and someone who can be abrasive when he feels that the situation deserves it.

This is a very difficult area that I am sure you agree requires careful treatment if we are to serve the public well.

Some Good People for ELF Studies

A.W. (Bill) Guy (about 60), Prof. of Electrical Engineering and Bioengineering, University of Washington, Seattle. Guy is very competent, very low-key, highly respected in the field. Formerly president of the Bioelectromagnetics Society, second awardee of their D'Arsonval Medal. Expert on antenna theory, microwaves, etc., especially energy depositions of microwaves in humans. Guy was PI in an extensive study funded by the Air Force (School of Aerospace Medicine, Brooks Air Force Base, San Antonio) of effects of microwaves on rats where rats were exposed for their lifetimes—one and two years—and about 150 biological endpoints were measured.

Kenneth Foster (about 35), Associate Prof. of Bioengineering, University of Pennsylvania. Foster is a very bright, very sound, younger biophysicist specializing in the electrical properties of biological materials—especially at the cellular level. (I believe that his PhD is in physics.)

William Pickard (about 50), Prof. of Electrical Engineering at Washington University, St. Louis. Pickard has made substantial contributions to our knowledge of the electrical properties of biological materials, experimental and theoretical. Bill is a Harvard PhD in applied physics and is very bright and very sound. (Pickard and Foster wrote a *Scientific American* article to the effect that there are no significant biological effects from low intensity microwaves.)

John deLorge (about 50), Naval Aerospace Medical Research Laboratory, Pensacola, Florida. Psychologist, radiation effects on primates. Director of programs, alternate to Skip Kerschner on CIRRPC committee [see above].

W. Gregory Lotz (about 38), NAMRL, Pensacola, Florida. Endocrinologist who works with whole animals, primates, etc. Conducted excellent ELF study on rhesus monkeys. Intelligent and sensible, very able.

John Bergeron (about 55), General Electric. Biophysicist, very good.

Herman Schwan (72), Prof. Emeritus Department of Bioengineering, University of Rochester, member National Academy of Engineering. Almost father of the field in the U.S.

Sol M. Michaelson (about 65), Prof. Dept. of Radiation Biology and Biophysics, University of Rochester. A grand old man of the field.

Mort Miller (about 40), Prof. Radiation Biology and Biophysics, University of Rochester. Biophysics with emphasis on biology. Very good.

E.L. Carstenson, Prof. Electrical Engineering, University of Rochester. Has written decent semipopular book on effects of ambient electromagnetic fields.

Eleanor Adair, Fellow John B. Pierce Foundation, New Haven. Ellie has some interesting capabilities concerning the effects of magnetic fields on primates.

Allan Grodzinski, MIT. Was funded by Air Force (but they ran out of money). Good man with excellent research facilities.

James Toler, Georgia Tech. Funded by Air Force to conduct major study of ELF fields on rats.

In a telephone interview, Susskind said that he is working with McGaughy's subpanel in selecting the other members of his committee, which he hopes to assemble by January. McGaughy would like Susskind's report in six months. "The federal agencies want this report pretty fast," McGaughy said. When asked about the schedule, Susskind would only say that, "We will try to complete the report during 1991."

This is the second time CIRRPC has commissioned a review on non-ionizing radiation. In 1985, Dr. Ross Adey of the VA Hospital in Loma Linda, CA, was asked to review the current state of knowledge (see *MWN*, N/D85), but CIRRPC later refused to release his report. In a July 24, 1990 memorandum, Dr. Alvin Young of the Department of Agriculture, the chairman of CIRRPC, noted that Adey's report was not published "because of its lack of balance," with too much emphasis placed on non-thermal effects. In 1987, Adey included many of the recommendations from his draft CIRRPC report in his testimony before a congressional subcommittee (see *MWN*, N/D87).

The other members of the CIRRPC subpanel are: Dr. Imre Gyuk of the Department of Energy; Dr. Charlotte Silverman and John Monahan of the Food and Drug Administration; Dr. Sheldon Weiner of the Occupational Safety and Health Administration; and Lt. Commander H.F. Kerschner of the U.S. Navy, representing the Department of Defense. According to McGaughy, Weiner originally requested the new EMF review.

UPDATES

BIOLOGICAL EFFECTS

EMF–Chemical Synergy..."Bioelectromagnetic research reveals clear evidence of joint actions at cell membranes of chemical cancer promoters and environmental electromagnetic fields. The union of these two disciplines has resulted in the first major new approach to tumor formation in 75 years...," according to Dr. Ross Adey of the VA Medical Center in Loma Linda, CA. Reviewing current research on the bioeffects of ELF fields and RF/MW-modulated radiation—with a special emphasis on cell membrane interactions—Adey argues that it is "increasingly clear" that EMFs acting alone or with chemical environmental pollutants "may constitute a potential health hazard," and that "it is of paramount importance that the significance of these issues no longer be ignored." See "Joint Actions of Environmental Non-Ionizing Electromagnetic Fields and Chemical Pollution in Cancer Promotion," *Environmental Health Perspectives, 86*, pp.297-305, 1990.

MWs and Leukemia Debated... Two recent letters in the *British Journal of Haematology* question the conclusions of a case report on acute leukemia following exposure to MW radiation by French physicians in the October 1989 issue (see *MWN*, N/D89). Dr. James Jauchem of the Air Force School of Aerospace Medicine (see p.7) argues that MW effects in other research cited by the authors could have been thermally induced. He concludes that "inadequately reported single incidents of supposed links between microwaves and cancer serve to confuse rather than enlighten researchers and the lay public." In response, Dr. Eric Archimbaud of the Hôpital Edouard Herriot in Lyon, the lead author of the case report, cites more recent studies of MW-induced genetic damage and points out that currently recognized risk factors for this type of leukemia were first suspected in isolated cases before being confirmed by formal studies. The journal also includes a letter from Drs. B. Hocking of Telecom Australia in Melbourne and M. Garson of St. Vincents Hospital in Fitzroy, Victoria, criticizing the findings of Archimbaud and his colleagues. See "Leukaemia Following Exposure to Microwaves: Analysis of a Case Report," *British Journal of Haematology, 76*, pp.312-314, 1990.

MEETINGS

EPRI on Epidemiology & Dosimetry...EPRI will sponsor two EMF workshops in early 1991, one on epidemiological studies and the other on exposure assessment. The epidemiology session will be held February 5-8 in Carmel, CA, and will be chaired by Dr. Patricia Buffler. The purpose of the workshop is "to plan the third generation studies," according to EPRI's Dr. Leonard Sagan. Dr. John Peters told *Microwave News* that he hopes to present the results of his EMF–childhood leukemia study at the workshop (see *MWN*, N/D89 and S/O90 and p.3). The second workshop, which will also be in Carmel, will address the understanding of dose at the cellular and subcellular levels. The organizers of the meeting, to be held March 19-22, are Drs. Richard Phillips (chairman), Charles Rafferty, Thomas Tenforde and Howard Wachtel.

MILITARY

NRC's GWEN Committee... The National Research Council (NRC), an arm of the National Academy of Sciences, has assembled a panel of experts to assess the potential health effects of VLF radiation from the USAF Ground Wave Emergency Network (GWEN). The NRC's move was prompted by a request from the USAF, which was acting on concerns raised by Congressmen Lewis Payne (D-VA) and Les Aspin (D-WI) (see *MWN*, M/J90). Dr. Thomas Tenforde of Battelle Pacific Northwest Labs, Richland, WA, is the chairman of the panel. The other members are: Dr. Keith Florig of the Arms Control & Disarmament Agency, Washington, DC; Dr. Om Gandhi of the University of Utah, Salt Lake City; Dr. Michael Ginevan of Versar, Inc., Springfield, VA; Dr. George Harrison of the University of Maryland Medical School, Baltimore; Dr. Maureen Henderson of the Fred Hutchinson Cancer Research Center, Seattle, WA; Dr. Ross MacDonald of the University of North Carolina, Chapel Hill; Dr. Regina Santella of Columbia University, New York, NY; Dr. Thomas Slaga of the University of Texas System Cancer Center, Smithville; Dr. Jan Stolwijk of the John Pierce Foundation, New Haven, CT; and Dr. Howard

Wachtel of the University of Colorado, Boulder (currently a visiting scientist at EPRI). Dr. Raymond Cooper, the study director at the NRC, told *Microwave News* that the panel held its first meeting on December 14, 1990 and that its report should be completed by September 30, 1991.

USAF OKs PAVE PAWS Modification... The USAF says that it has solved its problem with the PAVE PAWS radar at Robins Air Force Base in Georgia. In 1988, the USAF admitted that radiation from the phased array radar could accidentally ignite electro-explosive devices (EEDs) aboard aircraft landing at the base (see *MWN*, J/A88, N/D88, J/F89 and N/D89). Raytheon, which built the PAVE PAWS radars, has been awarded an $8.6 million contract to install an auxiliary tracker, which will automatically shut off the radar when aircraft pass within a prescribed distance. An environmental assessment has been completed and concludes that the modification will have no significant impact.

OVENS

Popcorn Hazards and More... Drs. Patrick DeRespinis and Larry Frohman, of the University of Medicine and Dentistry of New Jersey, report in the *New England Journal of Medicine* (*323*, p.1212, October 25, 1990) that the overeager consumer of microwave popcorn risks searing his or her eyes, face and hands from a hot burst of steam which can escape from the popcorn bag if it is opened immediately after cooking. DeRespinis and Frohman describe three such cases, two of which were serious enough to require treatment. All of the victims eventually recovered completely. This is not the first report of such injuries—a 1986 letter in the *New England Journal of Medicine* reported that a 10-year-old boy severely burned his eyelids when opening a bag of microwave popcorn (see *MWN*, J/F87)....The November 1990 issue of *Consumer Reports* features a section on microwave ovens, including "Microwave Worries," which explains how to avoid some common operational problems.

PATENTS

EMFs To Regulate Growth... Two patents have been granted to a group of scientists for devices that use magnetic fields to control cellular processes and regulate tissue growth. The first patent (No.4818697, granted April 4, 1989) describes a method for generating a local magnetic field of a particular magnitude and direction to enhance the permeability of ions through membranes. The second patent (No.4932951, granted June 12, 1990) describes a way to use magnetic fields to regulate tissue growth. Both patents were assigned to Life Resonances, Inc., in Bozeman, MT. In the second patent, Drs. Abe Liboff of Oakland University in Rochester, MI, Bruce McLeod of Montana State University in Bozeman and Stephen Smith of the University of Kentucky in Lexington cite particular frequencies and average flux densities as most effective—16 Hz at 2.09×10^{-5} T for stimulating bone growth and 16 Hz at 4.09×10^{-5} T for retarding bone growth. In the second patent, they write that, "While the exact mechanism by which growth characteristics of the target tissue are affected by the present invention is not fully understood...remarkable results are achieved."

The Cookie Monster... Microwave cooking could become a spectator sport with the advent of the "exploding cookie." Donald Boehm and Richard Fazzolare's patented design (No.4948602, granted August 14, 1990) describes a biscuit with a hollow inside filled with chocolate. When cooked in a microwave oven, the filling boils over the top and flows down the sides of the cookie, giving "the appearance of a volcano erupting." If all that excitement leaves you in need of a comforting cup of coffee, you might try a recently patented "tea bag" (No.4948601, also granted August 14) for brewing coffee one cup at a time. According to the inventor, retired NASA astrophysicist Gideon Serbu, the microwave radiation heats the coffee grains faster than the water surrounding them, creating the natural turbulence necessary to brew coffee. A detachable frame holds the bag below water level to keep it from floating to the top of the cup and losing its flavor to the air. Copies of the patents can be obtained for $1.50 each from: Patent and Trademark Office, Washington, DC 20231.

PEOPLE

Dr. **Samuel Milham Jr.** of the Washington state Department of Health is the recipient of the Robert Strom Foundation's first annual Humanitarian Award for making the greatest contribution to the public's understanding of EMF bioeffects. **Robert Strom**, a Boeing EMP technician who developed leukemia, launched the foundation with funds he received in a settlement with Boeing (see *MWN*, S/O90)....Dr. **Jocelyne Leal** of the Ramón y Cajal Hospital in Madrid, Spain, the president of the European Bioelectromagnetics Association, who had an accident in Madrid last June, is now back working in her lab....For their five-part series in the April 9–13 *Potomac News* on the Army's EMP testing at Woodbridge, VA (see *MWN*, M/J90), **Gary Craig** and **Kevin Carmody** have won the Southern Journalism Award for environmental reporting among newspapers with a circulation of 30,000 or less. Craig is now at the *Times Union* in Rochester, NY, and Carmody is at the *Daily Progress* in Charlottesville, VA....The newest senator from Minnesota is **Paul Wellstone**, coauthor (with Barry Casper) of the 1981 book, ***Powerline: The First Battle of America's Energy War***, an account of a heated siting conflict in rural Minnesota in the 1970s....Dr. **Joseph Bowman**, who worked on EMF epidemiological studies at the University of Southern California, will leave in January for NIOSH in Cincinnati, OH, where he will continue to study occupational exposures to ELF EMFs....Dr. **Ernest Albert** of George Washington University Medical Center died in late August due to complications following a liver transplant. A past president of the Bioelectromagnetics Society, Albert was also a member of the Scientific Advisory Panel of the New York State Power Lines Project.

RESOURCES

More from Paul Brodeur... The November 19 issue of *The New Yorker* features an update by Brodeur to his July 9 piece on the Guilford, CT, cancer cluster. The piece, titled "Department of Amplification," is also a response to criticism from the Connecticut Department of Health Services (CDHS), among others. Brodeur cites as further evidence of a cluster a CDHS map—originally displayed at an August public meeting (see *MWN*, S/O90)—of the locations of the homes of 29 Guilford residents who had brain and/or central nervous system tumors between 1968 and 1988. He points out that 17 of these 29 cases were among people living near high-voltage or high-current lines. At the end of November, the CDHS announced that it would ask the Connecticut Academy of Science and Engineering to investigate the pattern of brain tumor cases in Guilford.

VDTs

Macworld* Goes to Washington...Macworld* has forcefully renewed its demand for more government ELF EMF research and regulation. Editor Jerry Borrell kicked off the campaign with a special report in the July issue—"Could Your Computer Be Killing You?"—which included EMF measurements of Macintosh-compatible monitors and an article by Paul Brodeur. The latest salvo, in the December issue, includes two new articles, one by Borrell and the other by "Conspicuous Consumer" columnist Deborah Branscum. In addition, all 500,000 copies include two fluorescent orange write-in cards. Some readers will receive cards addressed to Senator Barbara Mikulski (D-MD), chairwoman of the appropriations committee that oversees the Environmental Protection Agency, and to Senator Albert Gore (D-TN). Others will get cards addressed to Dr. Allan Bromley, science advisor to the President (see p.1), and to Rep. Robert Roe (D-NJ), chairman of the House Committee on Science, Space and Technology. Each of the cards reads, in part: "I am writing to express my concern about the federal government's lack of activity on the issue of ELF (extremely low frequency) emissions from personal computer monitors. I urge you in the strongest possible terms to direct the appropriate groups...to develop an interim standard that will limit the exposure of users of personal computers to ELF emissions."

Hand-Held Radio Risk *(continued from p.1)*

by many cellular phones (though at power levels less than 7 W), the specific absorption rate (SAR) would be 14–17 W/Kg in eye lens tissue and 19–21 W/Kg in brain tissue. At 1.5 GHz, the SARs would be 32 W/Kg and 29 W/Kg for eye lens tissue and brain tissue, respectively.

Kuster and Balzano's model points to an inconsistency in the 1982 American National Standards Institute (ANSI) limits for human exposures to radiofrequency and microwave (RF/MW) radiation, which specify both a maximum partial body exposure of 8 W/Kg, and an exemption for devices with an input power of 7 W or less operating at 300 kHz–1 GHz.

Whether to retain the 7 W exclusion clause is one of the most contentious issues in the ongoing revision of the ANSI limits. In 1989, it was deleted by the subcommittee charged with rewriting the standard at a meeting held in Tucson, AZ (see *MWN*, S/O89). Balzano, a member of the subcommittee, argued against retaining the exclusion and voted for its deletion—even though Motorola is the leading manufacturer of land mobile equipment in the world, including hand-held two-way radios and cellular telephones.

The exclusion clause was reinstated at a poorly attended meeting held in Seattle, WA, later last year in what one subcommittee member called "a peculiar process"—indeed, many subcommittee members could not say how and why it had been revived. The "final draft" of the proposed revision, as circulated last June, specifies both the partial body limit* of 8 W/Kg and the 7 W exemption, which was even extended to encompass the frequency range 100 kHz–1.5 GHz.

"I strongly oppose the exclusion clause because it could authorize devices which can induce SARs of 100 W/Kg or greater in the eye tissue," Kuster told *Microwave News*. "The electromagnetic fields from hand-held radios and cellular phones are the strongest high frequency fields to which the public is exposed, so it is ridiculous, if not negligent, to allow exclusion clauses for these devices based on a limited number of experiments," he said.

Balzano and Kuster expressed surprise that there was so little interest in their results at the BEMS meeting—while the ANSI limits were still under debate.

Last year, Drs. Robert Cleveland of the Federal Communications Commission and Whit Athey of the Food and Drug Administration reported that experiments with models of the human head indicated that ANSI's 8 W/Kg limit could theoretically be exceeded with 800 MHz hand-held radios operating at power levels as low as 3–4 W (see *MWN*, S/O89 and *Bioelectromagnetics, 10*, pp.173-186, 1989). They concluded, however, that users of such communication devices would ordinarily not transmit for periods long enough to cause the six-minute time-averaged exclusion limit to be exceeded.

Hand-held radios (transceivers) operate at various frequencies, including 150 MHz, 450 MHz and 800-900 MHz, with power levels normally ranging from about 1–2 W. Some units use higher powers, including many military units. Most hand-held cellular telephones operate at power levels of 0.6 W, while those which have their antennas mounted apart from the mouthpieces typically operate at power levels of 3 W. Cellular telephones operate at 800-900 MHz.

*Under the proposed revision, the 8 W/Kg limit applies to critical tissues like the eye and the brain and to "controlled environments." In "uncontrolled environments," the limit is 1.6 W/Kg. In each case, the dose is averaged over 10 grams of tissue. It is not clear whether the use of a hand-held communication device constitutes a controlled or an uncontrolled environment. A number of subcommittee members contacted by *Microwave News* said that they are not sure.

NEW PUBLICATIONS

Books

M.J. Allen, S.F. Cleary and F.M. Hawkridge, ***Charge and Field Effects in Biosystems—2,*** New York, NY: Plenum Press, 1989, 389 pp., $89.50. This collection of papers from a June 1989 symposium includes several on EMF bioeffects, with notable contributions from Soviet, Chinese and Japanese researchers (see *MWN*, S/O89).

Roger Coghill, ***Electropollution: How To Protect Yourself from It,*** Wellingborough, U.K.: Thorsons Publishing Group, 1990, 192 pp., $9.95. A review of the nature of EMFs and their health effects by a British consultant based in Wales, with suggestions for reducing exposures.

S.B. Field and J.W. Hand, editors, ***An Introduction to the Practical Aspects of Clinical Hyperthermia,*** London, U.K.: Taylor & Francis, 1990, 572 pp., $143.00. A comprehensive treatment of the clinical applications of hyperthermia, with a chapter on safety considerations for patients and operating personnel by Dr. C.K. Chou.

Giorgio Franceschetti, Om P. Gandhi and Martino Grandolfo, editors, ***Electromagnetic Biointeraction: Mechanisms, Safety Standards, Protection Guides,*** New York, NY: Plenum Press, 1989, 223 pp., $49.50. Among these lectures from a May 1988 meeting on *Worldwide Non-Ionizing Radiation Safety Standards: Their Rationales and Problems* in Capri, Italy, are a comparison of international RF/MW safety standards by Drs. Grandolfo and Kjell Hansson Mild and an overview of RF bioeffects by Dr. Stephen Cleary.

A.J. Baden Fuller, ***Microwaves: An Introduction to Microwave Theory and Techniques,*** 3rd edition, Oxford, U.K.: Pergamon Press, 1990, 310 pp., $56.00 (hardcover), $28.00 (paperback). Devoted primarily to microwave theory, circuits and waveguides. The author recommends that exposure limits for the general population be lower than 200 $\mu W/cm^2$, the level adopted by IRPA, NCRP and several states.

Om P. Gandhi, editor, ***Biological Effects and Medical Applications of Electromagnetic Energy,*** Englewood Cliffs, NJ: Prentice Hall, 1990, 573 pp., $75.00. A collection of reviews of EMF bioeffects, touching on everything from nomenclature to guidelines and standards.

John W. Gofman, ***Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis,*** San Francisco, CA: Committee for Nuclear Responsibility, Inc., 1990, 455 pp., $29.95. A critique of the motives and methods of the "radiation community" by a well-known radiation expert who is a professor emeritus of medical physics at the University of California, Berkeley. He argues that small doses of ionizing radiation over a long period of time are no less dangerous than acute exposures, and that estimates of cancer risk from low-level exposures are inadequate for public safety.

Sanford Lakoff and Herbert F. York, ***A Shield in Space? Technology, Politics and the Strategic Defense Initiative,*** Berkeley, CA: University of California Press, 1989, 409 pp., $35.00. The authors argue that the decision to pursue "Star Wars" was motivated by politics, not science.

Y.T. Lo and S.W. Lee, ***Antenna Handbook: Theory, Applications and Design,*** New York, NY: Van Nostrand Reinhold, 1988, >1,800 pp., $149.95. A textbook on antennas, including chapters on medical applications, interference, EMP and measurements.

M.E. O'Connor, R.H.C. Bentall and J.C. Monahan, editors, ***Emerging Electromagnetic Medicine,*** New York, NY: Springer-Verlag, 1990, 307 pp., $45.00. Seventeen well-illustrated papers from a May 1989 FDA conference at the University of Tulsa, OK (see *MWN*, M/J89), on EMF theory and mechanisms, cellular and animal studies and clinical applications.

Fritz-Albert Popp et al., editors, ***Electromagnetic Bio-Information,*** 2nd edition, Baltimore, MD: Urban & Schwarzenberg, 1989, 259 pp., $72.50. An in-depth examination of some of the possible mechanisms by which organisms might use and be affected by EMFs. Ten years after the first edition and with interest growing rapidly, the foreword concludes that this once controversial discipline is now "on the right track."

Banmali Rawat and Zhou Siyong, editors, ***Proceedings of the 2nd International Symposium on Recent Advances in Microwave Technology,*** Oxford, U.K.: Pergamon Press, 1990, 660 pp., $184.00. A collection of papers on microwave measurements, measuring systems and medical applications from a 1989 meeting in Beijing, China.

Merrill Skolnik, editor, ***Radar Handbook,*** 2nd edition, New York, NY: McGraw-Hill Publishing Co., 1990, 1,199 pp., $87.50. A reference book on radar technology, including phased array and over-the-horizon systems.

U.S. Congress, Office of Technology Assessment, ***Neurotoxicity: Identifying and Controlling Poisons of the Nervous System,*** OTA-BA-436, Washington, DC: U.S. Government Printing Office, 1990, 361 pp., $15.00. A review of research on, and regulation of, neurotoxic chemicals.

Tim Weiner, ***Blank Check: The Pentagon's Black Budget,*** New York, NY: Warner Books, 1990, 272 pp., $21.95. On billion-dollar defense projects that are kept secret from the public.

Patricia M. Whitaker-Azmitia and Stephen J. Peroutka, editors, ***The Neuropharmacology of Serotonin, Annals of the New York Academy of Sciences, 600,*** 718 pp., 1990. A collection of papers on the role of serotonin in physical and behavioral functions and dysfunctions, including depression, anxiety and suicide (see also *MWN*, M/J88).

Reports

American Statistical Association (ASA), ***ASA Conference on Radiation and Health VIII: Health Effects of Electric and Magnetic Fields: Statistical Support for Research Strategies,*** Final Report, May 1990. Copies are available for $15.00 from: Lee Decker, ASA, 1429 Duke St., Alexandria, VA 22314, (703) 684-1221. A broad overview of the research to date on the health effects of EMFs. Drs. Dan Bracken, Granger Morgan, Lee Rosen, Mays Swicord and Gilles Theriault, among others, discuss epidemiological, experimental and animal research, and outline the problems to be considered when designing future research projects. The role of statistics in facilitating measurement, analysis and risk assessment is emphasized.

David Charron, ***Magnetic Fields in the Workplace*** (P90-5E), Canadian Centre for Occupational Health and Safety (CCOHS), March 1990; ***Radiofrequency Radiation in the Workplace*** (P89-24E), CCOHS, November 1989. Copies are available free in Canada, for $3.50 in the U.S. and for $4.00 elsewhere from: CCOHS, 250 Main St. East, Hamilton, Ontario L8N 1H6, Canada, (416) 572-2981. These two reports on non-ionizing radiation health risks to workers include summaries of the exposure limits in Canada and elsewhere and recommendations on how to avoid unnecessary exposure.

Lynne De Merritt, ***Siting of Power Lines and Communication Tow-***

ers: A Bibliography on the Potential Health Effects of Electric and Magnetic Fields (CPL Bibliography 257), Council of Planning Librarians, March 1990. Copies are available for $16.00 plus shipping from: American Planning Association, 1313 E. 60th St., Chicago, IL 60637, (312) 955-9100. A compilation of references—targeted to planning professionals—that provides sources of information to assist those addressing community concerns on the location of communication towers and power lines. Includes references to both the scientific and the nonscientific literature.

IIT Research Institute, ***Compilation of 1989 Annual Reports of the Navy ELF Communications System Ecological Monitoring Program*** (Technical Report E06620-4), three volumes, August 1990. Order from: National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161. The most recent findings from the ongoing program to determine if the U.S. Navy's ELF submarine communications system is affecting the ecology of Wisconsin and Michigan. Data collection for the study of the Wisconsin transmitting facility was completed in 1989; this report includes the results and conclusions of the bird community research. Summary reports for the rest of the Wisconsin studies were published separately and are also available from NTIS. A final report based on the data collected over the entire term of the project should be available by the end of this year.

Paul Landsbergis and Eric Scherzer, ***A Worker's Guide to Electromagnetic Radiation,*** Oil, Chemical and Atomic Workers (OCAW) Union 8 Resource Center, 1990. Copies are available for $5.00 from: OCAW District 8 Resource Center, 1155 W. Chestnut St., Union, NJ 07083, (201) 687-1322. A booklet to provide workers with a basic understanding of what is currently known about the hazards of EMF exposure. It covers the controversies surrounding research and regulations relating to health effects, including a useful discussion of the problems inherent in epidemiological research, and concludes with a section on how local unions can begin to confront the problem.

Alvin Leonard et al., ***Electric and Magnetic Fields: Measurements and Possible Effects on Human Health, from Appliances, Power Lines and Other Common Sources,*** Special Epidemiological Studies Program (SESP), California Department of Health Services (CDHS), 1990. Order from: SESP-CDHS, 2151 Berkeley Way, Room 704, Berkeley, CA 94704, (415) 540-2669. Subtitled "What we know, what we don't know in 1990," this report concentrates on EMFs in the home. It includes a number of tables and charts as well as a section on a suggested protocol for measuring residential EMFs. The authors conclude that a strategy of prudent avoidance should be adopted by concerned home owners.

Rolf Lindgren, ***High Voltage Power Lines, Health and Environment, Current Knowledge and Research Status 1989,*** Vattenfall Kraftledningar AB, first published in 1986, revised 1990. Single copies of the report are available free from: Rolf Lindgren, Vattenfall Kraftledningar AB, Nya Tingstadsgatan 1, S-422 44 Hisings Backa, Sweden, (41+31) 51.37.60. Published by the Swedish State Power Board (Vattenfall), this is a layman's guide to understanding EMF issues. The well-illustrated glossy report provides a thorough explanation of what EMFs are and where they come from and addresses the question of whether EMFs pose a threat to human health.

Oregon Department of Energy, ***Report on Human Health Effects from Exposure to 60 Hz [EMFs] from High Voltage Power Lines,*** April 1990. A limited number of copies are available free from: Dr. Tom Meehan, Oregon Department of Energy, 625 Marion St. NE, Salem, OR 97310. This report, which was prepared by a panel of five experts, was presented to the Energy Facility Siting Council, an independent state agency with the authority to set standards (see *MWN*, M/A89 and p.4). Several panel members felt that there is now "credible evidence which suggests that low levels of ELF EMFs may cause health risks to people"; the evidence is "weak, incomplete, often inconsistent and inconclusive. But it cannot be ignored." The panel members concluded that "not enough is known to set definitive or permanent standards now." They recommended limiting power line EMF exposures to status quo levels. Members of the panel included Drs. Clarissa Beatty (retired) and William Morton, Oregon Health Sciences University; Dr. Bill Guy, University of Washington School of Medicine; and Drs. Jose Reyes and René Spée, Oregon State University.

U.S. Congress, ***Electric Power Lines: Health and Public Policy Implications*** (No.101-13), Oversight Hearing Before the Subcommittee on General Oversight and Investigations of the Committee on Interior and Insular Affairs, U.S. House of Representatives, 101st Congress, Second Session, March 8, 1990. A limited number of copies are available from the subcommittee, Washington, DC 20515. The transcript of the March 8 congressional hearing called by Rep. Peter Kostmayer (D-PA), the chairman of the subcommittee (see *MWN*, M/A90). It includes the prepared testimony of research experts, industry representatives, government officials and individual citizens, their responses to questions and some written statements and letters to the subcommittee which were submitted after the hearing took place.

U.S. Congress, ***Federal Research on Electromagnetic Radiation*** (No.136), Hearing Before the Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science, Space and Technology, U.S. House of Representatives, 101st Congress, Second Session, July 25, 1990. A limited number of copies are available from the subcommittee, Washington, DC 20515. The expert testimony of scientific researchers, industry representatives and regulatory officials present at this July hearing, called by subcommittee chairman Rep. James Scheuer (D-NY). Included is a draft of the bill, H.R. 4801, introduced by Rep. Frank Pallone (D-NJ), which would have required the Department of Energy to investigate ways of reducing EMF exposure at home and in the workplace and to establish a comprehensive public information program on issues related to EMFs (see *MWN*, J/A90). No action was taken on the bill before Congress adjourned.

Khizar Wasti, ***Monitoring of Ongoing Research on the Health Effects of High Voltage Transmission Lines,*** Bureau of Toxic Substances Information, Virginia Department of Health (DOH) and State Corporation Commission, March 15, 1990. Order from: Virginia DOH, James Madison Building, 109 Governor St., Room 918-922, Richmond, VA 23219, (804) 786-1763. "[I]t has not been established that [EMFs] can cause an increased incidence of leukemia in humans," concluded Dr. Khizar Wasti in the Virginia DOH's fifth annual report on EMF bioeffects research (see *MWN*, M/A89). The 29-page report is a survey of bioeffects literature published in 1988-89, including reports from the Office of Technology Assessment, the California Public Utilities Commission and the IEEE Task Force (on power frequency EMFs), as well as IRPA's interim guidelines for 50/60 Hz EMFs.

New Reports from EPRI will be featured in our next issue.

CONFERENCES

1991 Conference Calendar

January 15-19: **Coherent and Emergent Phenomena in Biomolecular Systems,** NATO Advanced Research Workshop, University of Arizona, Tucson, AZ. Contact: Stuart Hameroff, Advanced Biotechnology Lab, University of Arizona, Tucson, AZ 85724, (602) 626-6295.

January 16-18: **Hazardous Radiofrequency Electromagnetic Radiation: Evaluation, Control, Effects and Standards,** Washington, DC. Contact: Shirley Forlenzo, Continuing Engineering Education Program, George Washington University, 801 22nd St., NW, #T308, Washington, DC 20052, (202) 994-8530, or (800) 424-9773.

January 17-18: **Exploring the EMF Dilemma: Prudent Avoidance & Public Involvement,** San Francisco Airport Marriott, Burlingame, CA. Contact: NewsData Corp., Box C900928, Queen Anne Station, Seattle, WA 98109, (206) 285-4848.

January 30-31: **Scientific Workshop on the Health Effects of Electromagnetic Radiation on Workers,** Cincinnati, OH. Contact: Phil Bierbaum (R-2), National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226, (513) 841-4321.

February 3-7: **IEEE Power Engineering Society (PES) Winter Meeting,** Penta Hotel, New York, NY. Contact: IEEE Society Special Services, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (201) 562-3882.

February 4-8: **Health Physics of Non-Ionizing Radiation,** Battelle Conference Center, Seattle, WA. Contact: Dr. John Leonowich, Mail Stop K3-70, Battelle Pacific Northwest Labs, PO Box 999, Richland, WA 99352, (509) 375-6849.

February 11: **Workshop on Recent Developments in the Health Consequences and Clinical Applications of Low Frequency Electromagnetic Fields,** NIEHS, Research Triangle Park, NC. Contact: Dr. Lee Rosen, NIH, 5333 Westbard Ave., Room 2A11B, Bethesda, MD 20892, (301) 496-7568.

February 25-26: **The Debate: Electric & Magnetic Fields—An Issue for the 1990s,** Arlington, VA. Contact: Transmission & Distribution Magazine, EMF Conference, 5072 West Chester Pike, Box 556, Edgemont, PA 19028, (215) 359-1249.

February 28-March 3: **9th Annual International Symposium on Man and His Environment in Health and Disease,** ***Special Focus on EMF Health Effects,*** Dallas, TX. Contact: American Environmental Health Foundation, 8345 Walnut Hill Lane, Suite 205, Dallas, TX 75231, (214) 361-9515.

March 12-13: **IEEE 1991 National Radar Conference,** Airport Marriott, Los Angeles, CA. Contact: Radar Conference, PO Box 1827, Venice, CA 90294, (213) 647-9346.

March 12-14: **9th International Symposium and Technical Exhibition on Electromagnetic Compatibility,** Zürich, Switzerland. Contact: Prof. P.E. Leuthold, ETH Zentrum-IKT, 8092 Zürich, Switzerland, (41+1) 256-2790.

April 3-4: **27th Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP),** Mayflower Hotel, Washington, DC. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652.

April 4-5: **17th Annual Northeast Bioengineering Conference,** Hartford, CT. Contact: Dr. Martin D. Fox, Electrical and Systems Engineering, University of Connecticut, 260 Glenbrook Rd., U-157, Storrs, CT 06269.

April 11-16: **3rd Annual Meeting of the International Society of Environmental Epidemiology,** Jerusalem, Israel. Contact: Nez Tamara Deutsch, Conference Secretariat, PO Box 61282, Jerusalem, Israel, (972+2) 243577.

April 15-18: **7th International Conference on Antennas and Propagation,** University of York, U.K. Contact: Conference Services, Institution of Electrical Engineers (IEE), Savoy Pl., London WC2R 0BL, U.K., (44+71) 240-1871, ext. 222.

April 15-18: **69th Annual Convention of the National Association of Broadcasters (NAB),** Convention Center, Las Vegas, NV. Contact: NAB Services, 1771 N St., NW, Washington, DC 20036, (800) 342-2460.

April 16-19: **International Conference on Lightning and Static Electricity,** Cocoa Beach, FL. Contact: William Jafferis, Conference Chairman, DL-ESS-22, NASA, Kennedy Space Center, FL 32899, (407) 867-4438.

April 21-25: **Symposia on Cancer, Electromagnetic Fields and Biological Systems,** as part of the **75th Annual Meeting of the Federation of American Societies for Experimental Biology (FASEB),** World Congress Center, Atlanta, GA. Contact: Patricia Burnett, Dept. of Orthopedic Surgery, LSU Medical Center, PO Box 33932, Shreveport, LA 71130, (318) 674-6179.

April 22-24: **7th Annual Meeting of the Electromagnetic Energy Policy Alliance (EEPA),** Radisson Mark Plaza Hotel, Alexandria, VA. Contact: Richard Ekfelt, EEPA, 1255 23rd St., NW, Washington, DC 20037, (202) 452-1070.

April 22-26: **11th International Conference on Electricity Distribution,** Palais des Congrès, Liège, Belgium. Contact: Secretariat, A.I.M., Rue Saint Gilles, 31, B-4000 Liège, Belgium, (32+41) 222946.

April 28-May 2: **Symposium on Microwaves: Theory and Application in Materials Processing,** Cincinnati, OH. Contact: D.E. Clark, Dept. of Mathematical Science and Engineering, 136 MAE, University of Florida, Gainesville, FL 32611, (904) 392-7660.

May 11-15: **26th Annual Meeting & Exposition of the Association for the Advancement of Medical Instrumentation (AAMI),** Washington, DC. Contact: AAMI Education Dept., 3330 Washington Blvd., Suite 400, Arlington, VA 22201, (703) 525-4890.

May 14-16: **Instrumentation/Measurement Technology Conference (IMTC/91),** Omni Hotel, Atlanta, GA. Contact: Robert Myers, IMTC/91 Conference Coordinator, 3685 Motor Ave., Suite 240, Los Angeles, CA 90034, (213) 287-1463.

May 15-17: **Biological Effects and Safety Aspects of Nuclear Magnetic Resonance Imaging and Spectroscopy,** Hyatt Regency, Bethesda, MD. Contact: New York Academy of Sciences, 2 E. 63rd St., New York, NY 10021, (212) 838-0230.

May 29-31: **45th Annual Frequency Control Symposium,** Airport Marriott, Los Angeles, CA. Contact: Clark Wardrip, PO Box 6147, Vandenberg AFB, CA 93437, (805) 865-3214.

June 11-14: **IEEE MTT-S International Microwave Symposium,** Boston, MA. Contact: MTT-Symposium 1991, c/o LRW Associates, 1218 Balfour Dr., Arnold, MD 21012.

June 13-14: **3rd Annual Meeting of the Society for Light Treatment and Biological Rhythms (SLTBR),** Toronto, Ontario, Canada. Contact: Marty McCullough, SLTBR, PO Box 478, Wilsonville, OR 97070, (503) 694-2404.

June 18-21: **5th Joint Magnetism and Magnetic Materials–Intermag Conference,** Pittsburgh, PA. Contact: Diane Suiters, Conference Coordinator, 655 15th St., NW, Suite 300, Washington, DC 20005, (202) 639-5088.

June 23-27: **13th Annual Meeting of the Bioelectromagnetics Society (BEMS),** Little America Hotel, Salt Lake City, UT. Contact: BEMS, 120 W. Church St., Frederick, MD 21701, (301) 663-4252.

June 24-28: **1991 North American Radio Science Meeting and International IEEE/AP-S Symposium,** University of Western Ontario, London, Ontario, Canada. Contact: D. Ruest, Conference Services, National Research Council Canada, Ottawa, Ontario K1A 0R6, Canada.

July 7-12: **9th International Congress of Radiation Research (ICRR),** Sheraton Centre, Toronto, Ontario, Canada. (Includes meetings of the North American Hyperthermia Group and the Radiation Research Society.) Contact: 9th ICRR, 1891 Preston White Dr., Reston, VA 22091, (703) 648-3780.

July 15-19: **28th Annual International Nuclear and Space Radiation Effects Conference,** Town and Country Hotel, San Diego, CA. Contact: Charles Barnes, Jet Propulsion Lab, MS 303-220, 4800 Oak Grove Dr.,

Pasadena, CA 91109, (818) 354-4467.

July 21-26: **36th Annual Meeting of the Health Physics Society (HPS),** Sheraton Washington Hotel, Washington, DC. Contact: HPS, 8000 Westpark Dr., Suite 400, McLean, VA 22102, (703) 790-1745.

July 21-27: **International Symposium on Charge and Field Effects in Biosystems,** Richmond, VA. Contact: Diane Holmes, Virginia Commonwealth University, Dept. of Chemistry, 1001 W. Main St., Box 2006, Richmond, VA 23284, (804) 367-1298.

July 22-25: **International Microwave Conference/Brazil,** Rio Palace Hotel, Rio de Janeiro, Brazil. Contact: Mauro Assis, Embratel-DDH, Rua da Assembléia, 10-Sala 2201, 20011-Rio de Janeiro-RJ, Brazil, (55+21) 2167108.

July 22-26: **Non-Ionizing Radiations: Health Physics and Radiation Protection,** Massachusetts Institute of Technology (MIT), Cambridge, MA. Contact: Director of Summer Sessions, Room E19-356, MIT, Cambridge, MA 02139.

July 28-August 1: **1991 IEEE Power Engineering Society (PES) Summer Meeting,** San Diego, CA. Contact: IEEE, see February 3-7 above.

August 5-7: **26th Annual Symposium of the International Microwave Power Institute (IMPI),** Hyatt Hotel, Buffalo, NY. Contact: Robert LaGasse, IMPI, 13542 Union Village Circle, Clifton, VA 22024, (703) 830-5588.

August 10-16: **Annual Meeting and Exhibition of the Society of Magnetic Resonance in Medicine (SMRM),** San Francisco Hilton and Towers, San Francisco, CA. Contact: SMRM, 1918 University Ave., Suite 3C, Berkeley, CA 94704, (415) 841-1899.

August 13-15: **IEEE 1991 International Symposium on Electromagnetic Compatibility (EMC),** Hyatt Cherry Hill, Cherry Hill, NJ. Contact: IEEE 1991 International Symposium on EMC, PO Box 609, Lincroft, NJ 07738.

September 17-20: **5th International Conference on AC and DC Power Transmission,** London, U.K. Contact: IEE, see April 15-18 above.

September 22-27: **12th IEEE/PES Transmission and Distribution Conference and Exposition,** Dallas Convention Center, Dallas, TX. Contact: Sarma Maruvada, IREQ, 1800 Montee Ste-Julie. Varennes, Quebec J3X 1S1, Canada, (514) 652-8201.

September 24-26: **13th Annual Electrical Overstress/Electrostatic Discharge Symposium,** Riviera Hotel, Las Vegas, NV. Contact: Terry Welsher, AT&T Bell Labs, 600 Mountain Ave., Rm.3B-321, Murray Hill, NJ 07974, (201) 582-5279.

September 29-October 2: **11th Annual Meeting of the Bioelectrical Repair and Growth Society (BRAGS),** Orange Tree Resort, Scottsdale, AZ. Contact: Ethel Pollack, BRAGS, PO Box 64, Dresher, PA 19025, (215) 659-5180.

September 30-October 3: **Radiation Protection for Man and Environment,** Aachen, Germany. (The meeting commemorates the 25th anniversary of the founding of the German-Swiss Society for Radiation Protection.) Contact: Dr. H. Jacobs, Forschungszentrum, Jülich GmbH, Postfach 1913, 5170 Jülich, Germany, (49+2461) 3188.

October 8-10: **International Conference on Microwaves and High Frequencies,** Nice, France. Contact: Comité Français de L'Électricité, Tour Atlantique – Cedex 06, 92080 Paris–La Défense, France, (33+1) 47.73.66.15.

October 15-18: **1991 EPRI EMF Utility Seminar,** San Jose, CA. Contact: Radiation Studies Program, Electric Power Research Institute, Palo Alto, CA, (415) 855-2320.

October 31-November 3: **13th Annual International Conference, IEEE Engineering in Medicine and Biology Society,** Orlando, FL. Contact: Dr. Joachim Nagel, Dept. of Biomedical Engineering, University of Miami, PO Box 248294, Coral Gables, FL 33124, (305) 284-2442.

December 9-12: **6th International Conference on Mobile Radio and Personal Communications,** Warwick, U.K. Contact: IEE, see April 15-18 above.

Dates and Locations To Be Announced

November: **Annual Department of Energy Contractors Review.** Contact: W/L Associates, 120 W. Church St., Frederick, MD 21701, (301) 663-1915.

December: **1st Meeting of the European Bioelectromagnetics Association.** Contact: Dr. Jocelyne Leal, Departamento de Investigacion, Hospital Ramón y Cajal, Madrid 28034, Spain, (34+1) 358-1365.

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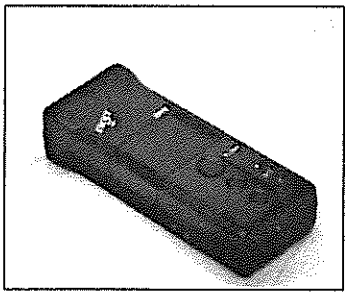
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DOE Maps Out National EMF Research Agenda

Moving quickly to assert its new role as the lead federal agency on electromagnetic field (EMF) health research, the Department of Energy (DOE) is preparing a national agenda to coordinate federal, state and private research programs. DOE's EMF budget remains uncertain, however, despite talk of a major increase in research funding.

"It's time to mobilize and become more active," DOE's Dr. Robert San Martin announced at a DOE workshop on *Development of a Coordinated Research and Communication Program on Potential Health Effects of Electric and Magnetic Fields*, held November 20-21 in Arlington, VA. A DOE assistant secretary, Michael Davis, the highest-ranking DOE official at the workshop, agreed: "Clearly, not enough has been done to satisfy questions about adverse health effects." San Martin, who, as deputy assistant secretary for utility technologies, is responsible for the department's $5 million EMF research budget, outlined what he called an "ambitious" schedule, which would put the new agenda into place as early as next spring.

Most workshop participants were pleased by the new sense of importance given to EMF research. Many were encouraged by the fact that Secretary of Energy Admiral James Watkins had signed the invitations to the workshop himself. Indeed, the issue has caught the interest of top-level Bush Admin-

(continued on p.14)

IEEE OKs New ANSI RF/MW Limits; Work Begins on ELF Standard

The Institute of Electrical and Electronics Engineers (IEEE) has approved revisions to the American National Standards Institute (ANSI) guidelines for human exposures to radiofrequency and microwave (RF/MW) radiation. On September 26, the IEEE Standards Board endorsed the guidelines drafted by its Standards Coordinating Committee (SCC) 28 for frequencies between 3 kHz and 300 GHz.

The new standard, designated C95.1–1991, replaces the one adopted by ANSI in 1982 (see *MWN*, S82). In the absence of federal rules, the limits have been the de facto U.S. exposure standard. The 1991 guidelines will likely assume equal importance.

The key differences between the old and the new standards are:

• The exposure limits for workers and the general public are no longer identical. Instead, separate guidelines are specified for "controlled" and "uncontrolled" environments. Uncontrolled areas are defined as those where individuals "have no knowledge or control of their exposure."

• The exposure limits have been doubled to 10 mW/cm^2 above 1.5 GHz and

(continued on p.15)

« Power Line Talk »

After five years of writing proposals, Dr. **Richard Stevens** of the Battelle Pacific Northwest Labs may finally get the funds he needs to investigate the association between female **breast cancer** and exposures to light-at-night and/or EMFs. An announcement is not expected until February, but Stevens told *Microwave News* that, "Funding is very probable because the reviewers gave us a good enough score to put us in the money." Stevens will be working with Dr. **Scott Davis** of the Fred Hutchinson Cancer Research Center in Seattle, WA, who will be the principal investigator on the four-year case–control study of some 500 women with breast cancer and 500 controls. "I'm really thrilled about this," Stevens said.

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Dr. **Russel Reiter** at last appears to have secured a sponsor for his research. "We've agreed on a two-year contract," **EPRI**'s Dr. **Chuck Rafferty** told *Microwave News* at the DOE meeting in Milwaukee in early November. "Everything is settled but the signature." Reiter will continue his work on isolating the key field parameters that determine the effects of EMFs on the pineal gland. In an interview, Reiter said that he was optimistic that the grant would go through after an October 30 site visit by an EPRI team led by Dr. **Rob Kavet**, a consultant based in Belmont, CA. If all goes according to plan, EPRI will help build a "Cadillac facility" at Reiter's lab at the University of Texas Health Science Center in San Antonio. Despite his international reputation, Reiter has been unable to secure funds up to now—indeed, he had been talking of quitting EMF work if he did not win support soon. To make his point, at the bottom of his Milwaukee abstract, Reiter wrote: "Unsponsored Research."

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Add **Wisconsin** to the list of states considering a temporary **ban on new power lines** because of concerns over possible EMF health effects (see *MWN*, M/J91). On November 6, **Maxine Hough** and eight other state representatives, along with two state senators, introduced legislation calling for a three-year moratorium on new lines above 60 kV. The bill would require the **Wisconsin Public Service Commission** (PSC) to conduct EMF research and measurement surveys during the moratorium. "It is dangerous and foolhardy to build more high voltage power lines...until we have adequate answers to the health concerns," Hough said at an October 7 press conference. Last year, Wisconsin legislators and their staffs were disturbed to learn that EMFs as high as 400 mG had been recorded in the building where they work (see *MWN*, J/F91). Madison Gas & Electric reduced the levels by reconfiguring wires and by redesigning the electrical vault, but average readings of up to 125 mG remain in some areas. Hough's announcement came the same week that the PSC held technical hearings on EMFs as part of its 20-year advance planning process. Among those testifying at the hearings were: Dr. **Abe Liboff**, Dr. **Bruce McLeod**, Dr. **John Moulder**, **Greg Rauch**, Dr. **David Savitz** and **Michael Silva**. At public hearings held later in October, members of the citizens' group Promoting Options for Wise Energy Regulation (**POWER**) pressed the PSC to impose its own moratorium. The PSC's board is expected to issue a strategy for addressing EMF concerns in January. State legislators in Michigan, Rhode Island and Tennessee, as well as local officials in Missouri, Rhode Island, Tennessee and Washington State, have proposed power line bans.

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Meg Gottstein has replaced **Steve Weissman** as the administrative law judge presiding over the **California Public Utilities Commission** (PUC) investigation of potential health effects of EMFs. "Staffing issues and caseloads" were the reason for the switch, Gottstein told *Microwave News*. In her first ruling, issued October 11, Gottstein denied a July 15 motion from the Cellular Carriers Association of California and the **Cellular Telecommunications Industry Association** requesting exemption from the investigation. In their motion, the trade groups asserted that there was no evidence linking their transmission facilities to health risks. They supported their claim with testimony from Dr. **Bill Guy**, who recently retired from the University of Washington, Seattle, Dr. **Don Justesen** of the VA Medical Center in Kansas City, MO, and Dr. **Jerrold Bushberg** of the University of California, Davis, and by pointing to present ANSI and NCRP standards (see p.1). Gottstein wrote that, "While [the cellular industry groups] assert that their conclusions...are unequivocal, other parties to this proceeding have raised questions concerning the adequacy and safety of existing standards, and argue that additional review of scientific evidence and expanded exposure monitoring [are] warranted." At a November 8 meeting, it was decided that the PUC would conduct a "sub-investigation" into health effects from cellular facilities. The PUC began its investigation into EMF health effects in January 1991. In February 1992, the EMF "consensus group" of utility representatives, legislators and members of the public

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Commentary

No More Literature Reviews! No More Research Agendas!

Ask people what needs to be done about the EMF problem and they will answer "more research." Sound advice, but advice only a few can follow because of the lack of available funding.

The frustrations of those seeking grants turned to outrage when, in August, Congress gave the NAS-NRC $600,000 for yet another literature review. They point out that this is more money than any federal agency except the DOE is now spending on EMF research and that this amount is enough to open a couple of labs or support a host of postdocs.

Someone forgot to tell Congress that EPA, after combing through the literature for three years, issued a landmark 460-page review; that the White House has already ordered CIRRPC to repeat the process; that NIOSH commissioned a collection of expert reviews; that at least seven states are mandating their own reviews—Connecticut's alone is costing $150,000, while Maryland and Virginia are paying for annual updates; and that EPRI and NEMA have sponsored their own assessments, as has the U.K.'s NRPB. And, of course, the various branches of the DOD had to have their own reviews.

Then there are the reviews of the reviews. The SAB spent a year going over the EPA cancer report before issuing its own analysis. CIRRPC has canvassed all branches of the federal government for their views of the EPA report and, across the Atlantic, the NRPB has asked a committee to render one more opinion.

EPA and NIOSH have spent most of their scant resources devising lists of research needs. Actually, EPA did this twice: staffers developed their own strategy and then, for good measure, paid HEI $525,000 for a second opinion. (The two sets of priorities are, not surprisingly, quite similar.) Not to be left out, the leaders of BEMS are writing their own agenda. One researcher who has worked on a number of these wish lists commented at the DOE's November workshop in Washington: "They all recommend the same thing. We know what needs to be done."

Despite all the planning, EPA and NIOSH still have not started their own research programs. Ironically, a good number of those shuttling from meeting to meeting—offering opinions on what is and what is not known about EMFs—have been denied research funds. As for those lucky enough to have grants, it is a wonder that their travel schedules leave any time for research.

In controversial areas of environmental policy, decision makers put off the hard choices by asking for more research. In the EMF business, even this tactic is seen as too risky. Instead they ask for reviews and agendas. This kind of cowardice explains why some of the most interesting work in the field has been supported out of researchers' own pockets. Dr. Nancy Wertheimer, Ed Leeper, Dr. Abe Liboff and Dr. Russel Reiter, for example, have worked without grants, yet their contributions are greater than those of many researchers with institutional support.

At the DOE research review in Milwaukee, Dr. Keith Florig of RFF estimated that the EMF problem already costs the U.S. economy $1 billion a year—an amount he believes will keep growing. Even if Dr. Robert Adair and colleagues are right that EMFs pose no health risks, they should recognize that it is too late for categorical denials. It is time they joined those who seek to settle the EMF problem with data, not dictums.

But most of all, it is time to stop stalling and get some work done.

Abbreviations: BEMS—Bioelectromagnetics Society; CIRRPC—Committee on Interagency Radiation Research and Policy Coordination; DOD—Department of Defense; DOE—Department of Energy; EMFs—Electromagnetic Fields; EPA—Environmental Protection Agency; EPRI—Electric Power Research Institute; HEI—Health Effects Institute; NAS-NRC—National Academy of Sciences-National Research Council; NEMA—National Electrical Manufacturers Association; NIOSH—National Institute for Occupational Safety and Health; NRPB—National Radiological Protection Board; RFF—Resources for the Future; SAB—Science Advisory Board.

will submit a report and recommendations to the PUC on power frequency fields—this will serve to "narrow the scope of the investigation," Gottstein said in a telephone interview.

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Two newspapers have now published letters in response to Dr. **Robert Park**'s recent op-ed piece bemoaning "hysterical" reactions to EMFs (see *MWN*, S/O91). A letter by attorney **Kieron Quinn**, which had not appeared before our last issue went to press, ran in the Baltimore, MD, *Evening Sun* on November 6 under the headline, "A Huckster of Junk Science." Dr. **Stephen Cleary** of Virginia Commonwealth University also wrote a letter after the Richmond, VA, *Times-Dispatch* ran Park's piece. Cleary's letter, published September 17, points to the same National Cancer Institute data showing a surge in cancer rates that **Paul Brodeur** cited in his September 6 letter to the *New York Times*. Brodeur's letter still has not appeared in print.

Congress Weighs Large Increases in EMF Funding

Federal funding for electromagnetic field (EMF) research would increase significantly under two new Congressional proposals.

Rep. George Brown (D-CA) is sponsoring a bill to give the Department of Energy (DOE) $70 million over ten years, of which $30 million will come from nonfederal sources. Brown plans to hold hearings in early 1992.

Senator Frank Lautenberg (D-NJ) has proposed giving $45 million to the Environmental Protection Agency (EPA) over four years. Both measures would take effect in fiscal year 1993 (FY93), which begins on October 1, 1992.

Although a similar proposal by Rep. Frank Pallone (D-NJ) has stagnated in the House of Representatives for two years (see *MWN*, M/J90, J/A90 and M/A91), the Brown and Lautenberg initiatives are likely to attract more support. As chairman of the House Committee on Science, Space and Technology, Brown has the seniority to move his legislation onto the floor of the House. Meanwhile, the Lautenberg proposal has already been adopted by a Senate subcommittee.

Brown's bill would transfer lead responsibility for EMF research to DOE's Office of Environment, Safety and Health from its Office of Conservation and Renewable Energy (OCRE), which is planning a national research agenda (see p.1). In a statement, Brown said that his proposal is not meant to stop DOE's planning process, but rather to help "refine it and improve it."

DOE's health office is a more appropriate place for EMF research, since OCRE also promotes electric power use, an aide to Brown explained.

In his statement, Brown protested the way that the DOE was designated as the lead federal agency (see *MWN*, S/O91). "This provision was inserted without benefit of debate and without the involvement of the authorizing committees," he said. Interestingly, no one has yet taken credit for writing this provision.

Brown's National Electromagnetic Fields Research and Public Information Dissemination Act (H.R.3953) would require the federal government to seek contributions from outside sources, such as private companies and states, to cover half of the $60 million research budget. An additional $10 million in federal funds would be earmarked for a public information program.

H.R.3953 also mandates the creation of an interagency committee to coordinate federal research, and would require the National Academy of Sciences (NAS) to evaluate the research each year. The bill's conflict of interest provisions call for an EMF researcher to disclose all related funding sources and to abstain from giving paid testimony and from working as a consultant.

Lautenberg's proposal calls for a new federal EMF research program at EPA, a technical advisory committee to oversee the program and a public information center. The proposal has been approved by the Senate Subcommittee on Toxic Substances, Environmental Oversight, Research and Development and is now pending before the full Environment and Public Works Committee.

Introduced as an amendment to the Environmental Research, Development and Demonstration Authorization Act of 1991 (S.1655), Lautenberg's legislation would provide $8 million for FY93, $10 million for FY94, $12 million for FY95 and $15 million for FY96. At least $1 million each year would be used for public information. The House version of S.1655 does not include a similar amendment.

Lautenberg's proposal surprised many Washington insiders. Earlier this year his spokesman said that the senator had dropped plans for EMF legislation (see *MWN*, J/A91).

Bigger EPA EMF Budget

EPA now has an EMF research budget of $1.94 million for fiscal year 1992 (FY92), an increase of more than $1 million over the amount that its Office of Research and Development received in FY91. FY92 began on October 1.

EPA has not yet determined how the funds will be spent and no decision will be made until the agency completes its research strategy document (see *MWN*, J/A91), an aide to Dr. Ken Sexton, the director of the Office of Health Research, told *Microwave News*. He added that EPA is committed to funding a public–private partnership research effort, like the ones being developed by HEI (see p.6) and by the NERP steering committee (see p.5).

In FY91, EPA gave $525,000 of its $750,000 research budget to HEI.

The EPA research plan will no doubt be affected by DOE's new lead role and its efforts to forge a new national research agenda. EPA and DOE officials have already met to begin coordinating their efforts (see p.1).

California Governor Vetoes $7 Million EMF Bill

On October 14, Republican Governor Pete Wilson of California vetoed legislation that would have required state utilities to fund a $7 million, four-year electromagnetic field (EMF) research, education, training and public information program. The bill, SB920, had passed both houses of the state legislature in September and had widespread support among utilities, labor and environmental groups (see *MWN*, S/O91).

"Given the fact [that] a study was just completed and because there are currently several studies ongoing nationwide, I do not feel that it is prudent for California ratepayers to expend another $7 million," Wilson explained in his veto message. The California Department of Health Services (DHS) is conducting a $2 million EMF study in accordance with legislation passed in 1988 (see *MWN*, S/O88 and N/D88). Both SB920 and the 1988 law were sponsored by Democratic Senator Herschel Rosenthal, the chairman of the Energy and Public Utilities Committee.

In a letter to Wilson, Rosenthal said he was "surprised" by the governor's veto, pointing out that in a 1990 progress report

to the legislature, the DHS had recommended that the state fund further research "into the basic mechanisms of EMF effects, which appear to be inadequately funded, compared to epidemiological and whole animal research." Under the proposed law, new research projects would have received up to 80% of an initial $4 million dollar allotment.

Though the bill had almost unanimous support in both houses of the legislature, an override of the veto is unlikely. "Most members of the assembly were under the impression that the governor supported the bill," Michael Shapiro, a Rosenthal aide, told *Microwave News*. "Overrides are generally not a successful strategy in California. We're really hoping for an agreement," he said.

Most observers are confident that similar legislation will be signed into law next year. In an interview, Dr. Raymond Neutra of the DHS, who is overseeing the state's ongoing EMF research, said that he expects a new EMF bill to be placed on a fast track during the next legislative session. Jack Sahl of Southern California Edison in Rosemead agreed, noting that the governor may not have been aware of the strong utility support for SB920.

Rosenthal is also optimistic. "We are hoping to salvage the whole bill," Shapiro said in a telephone interview. But he went on to explain that Rosenthal might agree to a compromise mandating only EMF education and training for utility personnel, public information campaigns and EMF surveys—20% of SB920 was earmarked for these programs.

NERP's Prospects Improve

The National EMF Research Program (NERP) has gained support from key federal and state officials and has received start-up funding (see *MWN*, J/A91 and S/O91).

The Department of Energy (DOE) has signaled a willingness to include the NERP in its new national research agenda. A DOE deputy assistant secretary, Dr. Robert San Martin, who is responsible for the EMF research program, told *Microwave News* that he expects his department to help fund the NERP if it needs federal backing.

Wertheimer: Research Directions After Peters

Failure to address seasonal variations in current loads may be "the most obvious possible explanation" for the apparent lack of an association between childhood cancer and measured magnetic fields in Dr. John Peters's epidemiological study, Dr. Nancy Wertheimer writes in a recent unpublished analysis.

Peters and coworkers at the University of Southern California (USC) in Los Angeles found a statistically significant doubling of childhood leukemia associated with high current wire codes but did not identify a similar risk with 24-hour and spot magnetic field measurements (see *MWN*, J/F91, M/A91 and S/O91). This is the second U.S. study to replicate Wertheimer and Ed Leeper's original 1979 study that first linked power lines to childhood cancer. A 1988 study by Dr. David Savitz, like Peters's, found a stronger cancer risk association with wire codes than with measured fields.

Pointing out that the seasonal variations were "much discussed" in the early planning stages of the project, Wertheimer expresses surprise that there was no mention of this aspect of the study design when the results were published in the *American Journal of Epidemiology* in November.

Wertheimer is primarily concerned with the interpretation of Peters's study. Press reports have called the results "contradictory," and even USC's November press release said the findings "paint a somewhat confusing picture." Troubled by an emerging "conventional wisdom" that there is no association of childhood cancer with household magnetic field measurements, Wertheimer offers her outlook about both the Peters study and the direction of future research.

She organizes her thoughts around four questions:

• *Are control groups really free of significant EMF exposure?* The problem here is that "average" EMF exposure may entail health risks, yet researchers have done little to obtain a truly low-exposure control group, Wertheimer says. She suggests that current efforts are like studies of cancer risks that com-pare people who smoke two-and-one-half packs a day with those who smoke two packs. EMF risks are often determined simply by dividing measurements into average- and very-high-exposure groups. When the study population is divided into four groups, Wertheimer argues, a comparison of the highest-exposure group with the lowest indicates a greater cancer risk, especially if subjects exposed to bed heaters are removed from the lowest-exposure group.

• *Are researchers looking at the right etiological time period?* Wertheimer favors looking at one or two years prior to diagnosis as the critical period of exposure. Wertheimer and Leeper's original childhood study, among others, supports the hypothesis that this period is a critical time.

• *Are studies obtaining a suitable control group?* Pointing out that some observers, such as Dr. Philip Cole, have suggested that there was a bias in the selection of the control group that minimized the number of high-exposure subjects in the Peters study, Wertheimer adds that "control selection bias can cut both ways—it can reduce *or* increase an observed association."

• *Are researchers measuring the right aspect of EMF exposures?* Wertheimer suggests that the angle of the magnetic field vector may be more important than the field intensity. Here she revisits a topic she addressed last year in a paper at DOE's EMF research review in Denver, CO (see *MWN*, N/D90). She writes of "rather intriguing evidence" in favor of this idea: In previous studies, homes where the average field vector was "vertical" seemed to show little cancer risk, while homes with a "horizontal" average vector did "show a cancer risk that is roughly related to measurement intensity."

Indeed, two representatives of the NERP steering committee were the only outsiders invited to participate at an October 10-11 DOE meeting to develop the department's approach to EMF research. That session was a prelude to DOE's November 20-21 workshop (see p.1).

The California Department of Health Services (DHS) may contribute funds to the NERP if the state approves an EMF research program next year, according to Dr. Raymond Neutra (see p.4). Neutra stipulated, however, that the NERP must coordinate its plans with California's efforts and must enforce a strict conflict of interest policy. DHS Commissioner Dr. Molly Coye is one of three new members of the NERP steering committee; Neutra is her representative.

At its quarterly meeting, held October 16-17 in Washington, DC, NERP's steering committee announced that it will receive funds to cover its operations for one year while a research program is designed. The New York State Energy R&D Authority has promised $75,000 for administrative expenses. The grant was made contingent on the NERP seeking an additional $150,000, but the authority promised to make up any needed funds. The NERP plans to solicit support from state governments, utilities, labor unions and electrical equipment manufacturers, among others; it also plans to add at least one federal official to its roster.

The steering committee set up subcommittees to select a group to administer its work and to develop criteria for selecting an organization to oversee the NERP research program.

The committee's next meeting is planned for February.

HEI Board of Directors Delays EMF Research Plan

The board of directors of the Health Effects Institute (HEI) has delayed the release of the institute's proposed national electromagnetic field (EMF) research agenda pending its revision. The board is seeking "some clear expressions of priority" among the research options, according to HEI President Andrew Sivak.

"The board felt that as a public document, the plan needed a broader context, with more background on EMF research," Sivak told *Microwave News*, adding that he expects to return to the board with a revised document by mid-December.

In an October 30 letter to Dr. Richard Setlow of Brookhaven National Laboratories in Upton, NY, Sivak explained that one board member suggested that HEI provide "a strategic plan, not just a plan of operations." Setlow is the chairman of the feasibility study committee, which helped assemble the agenda.

HEI, based in Cambridge, MA, has been developing the research plans "to provide credible scientific information" on possible health effects from power line EMFs (see *MWN*, M/A91, M/J91, J/A91 and S/091). This work is being sponsored by the Environmental Protection Agency and some electrical utilities. The draft plan, which Sivak presented to the HEI board on October 23, provides both a "short list of research directions" to be pursued if there is limited funding and an expanded list, which is "less constrained by resources."

The short list calls for:

- Identification of a reproducible effect, in a well-controlled biological system, at field intensities relevant to environmental exposure;
- Determination of the initial site of interaction;
- Elucidation of the transduction system;
- Assessment of the health consequences of such an exposure.

Among the key issues identified by HEI are: looking at biological end points other than cancer—such as reproductive and neurobehavioral effects; addressing the argument that the signal-to-noise ratio is too small to make low-level EMF effects plausible; characterizing and standardizing exposure parameters; and attracting top scientists to EMF research.

The draft plan, which was obtained by *Microwave News* after Sivak declined to make it available, signals a certain skepticism about the existence of EMF effects at environmental levels. For instance, the plan notes that, "The overall evidence [for health risks] is inconsistent at best." Nor is HEI confident that "top-line scientists" would be willing to get involved in EMF research, because it is an arena "that is plagued with results that are in apparent violation of physical laws, with no accepted mechanism of interaction, with poor replication of earlier studies, and with effects that are small."

Cancer Epi Studies from Taiwan, Sweden and the U.K.

Taiwan: Childhood Risks Below 1 mG

Drs. Ruey Lin and C.Y. Li of the National Taiwan University have found a statistically significant association between childhood leukemia and *measured* magnetic fields. They also identified a trend toward increased risk with stronger magnetic fields.

In a paper presented at the Department of Energy's research review in Milwaukee, WI, in early November, Lin reported a statistically significant increased rate of leukemia among children exposed to EMFs as low as 0.8-0.9 mG. A nonsignificant doubling occurred at 0.6-0.7 mG and at 0.7-0.8 mG.

Based on five measurements in different rooms in the case houses, the average magnetic field in these homes was 0.83 mG, compared with 0.77 mG in the homes of controls—a statistically significant difference.

Questionnaire data indicated that the households with leukemia cases used electrical appliances more frequently than did the controls. Most of the 146 cases had acute lymphoid leukemia, Lin told *Microwave News* in Milwaukee. There were 305 controls. Lin was the first researcher to report a link between EMF exposure and brain tumors (see *MWN*, Oct84 and J/A85).

Sweden: Few New Clues from Workers

A new epidemiological study from Sweden adds to the body of research showing a link between some, but not all, types of electrical work and leukemia and brain cancer.

"Although a homogeneous pattern of increased risks of leukemia or brain tumor was not noted, the hypothesis that magnetic fields might play a part in the origin of cancer cannot be rejected," concluded Drs. Siv Törnqvist, Bengt Knave and Tomas Persson of the National Institute of Occupational Health in Solna and Dr. Anders Ahlbom of the Karolinska Institute in Stockholm.

The researchers found a number of statistically significant odds ratios (ORs): 5.7 for acute myeloid leukemia among iron and ore miners; 2.8 for chronic lymphoid leukemia (CLL) among power linemen; and 2.1 for all leukemias among telegraph and telephone workers. All linemen combined had an OR of 2.0 for CLL, which is a risk of borderline significance.

Increased rates of all types of brain tumors were identified among iron and steel welders (OR=3.2), among radio and TV repairmen (OR=2.9) and among the general class of welders and flame cutters (OR=1.3). All of these risks were statistically significant or of borderline significance.

All electrical occupations, as a class, did not show an increased risk of leukemia or brain tumors. And none of the occupations showed an excess of both cancer types.

Electromagnetic field (EMF) exposures were estimated primarily by job category. However, the team did take some "limited" measurements at 50 Hz of intensity and duration of exposures.

Power linemen on 400 kV lines and welders probably had the highest magnetic field exposures among those with higher cancer risks. The team argued that, "If magnetic fields were the cause of leukemia and brain tumors, the same effect would be expected in both occupations," but this was not the case. Furthermore, iron and ore miners, who had an elevated leukemia risk, had an average exposure of less than 0.35 mG.

"We have very limited information on intensity and duration of exposure to magnetic fields and other potential risk factors, which most likely vary considerably within, as well as between, the occupational categories we have studied here," the team cautioned.

New Reports from EPRI

The following reports have been published by the Electric Power Research Institute (EPRI). Copies of the reports marked with an asterisk (*) are available from Research Reports Center, PO Box 50490, Palo Alto, CA 94303, (415) 965-4081. Copies of the report marked with a dagger (†) are available from Robert Banks Associates, Inc., PO Box 14574, Minneapolis, MN 55414, (612) 623-4600. There is no charge for most reports requested by EPRI member utilities, U.S. utility organizations, U.S. government agencies and the media.

* J.H. Cooper, ***Single Conductor Transmission Cable Magnetic Fields*** (Report No.EL-7340), August 1991. Price: $500.00. The magnetic fields from buried single conductor cables can vary by as much as a factor of ten, depending on how they are built and installed. Research at EPRI's Waltz Mill Underground Test Facility in Pennsylvania also indicated that existing procedures for calculating field strengths are generally accurate and that soil had little or no effect on aboveground magnetic fields.

****EMDEX II System Documentation*** (EN-7497), 2 vols., September 1991. Price: $200.00 each. The EMDEX system was developed to measure and record long-term personal exposures to EMFs. The new EMDEX II is smaller and easier to use, according to the report. Vol.1 provides details on how to use the meter. Vol.2 is the technical reference manual.

****1990 Annual Report: EMF Health Effects Research Abstracts*** (EN-7460), July 1991. Price: $5.00. This is the second annual report on EPRI's EMF research program. It includes a statement on each of 32 ongoing projects.

†***1991 EPRI EMF Science & Communication Seminar,*** Forthcoming. Price: $250.00. Papers by speakers at this year's EPRI utility seminar, including reviews of research on bioeffects (with emphasis on melatonin), wire codes, measurements, mitigation and risk assessment and communication. Also features visual materials from the workshop presentations.

* John Peters et al., ***Exposure to Residential Electric and Magnetic Fields and Risk of Childhood Leukemia*** (EN-7464), November 1991. Price: $200.00. This is an interim report on the University of Southern California childhood leukemia study, which was widely reported in the press when preliminary results were announced last February. A shorter version of this report was published in the *American Journal of Epidemiology* in November (see *MWN*, J/F91, M/A91, S/O91 and p.5). Peters and coworkers found an elevated cancer risk among children living near power lines, but there was no association with measured EMFs.

* G.B. Rauch, ***Pilot Study of Non-Residential Power Frequency Magnetic Fields*** (EL-7452s), August 1991. Price: $495.00. EPRI researchers describe measurement protocols that were developed after gathering data at more than 34 sites in and around public schools, office buildings, power plants and substations. Techniques to characterize the spatial, temporal and harmonic content of EMF sources are reviewed. "The study showed that visual inspection alone cannot predict all possible magnetic field sources."

* L.E. Zaffanella, ***Field Effect Research at the High Voltage Transmission Research Center*** (HVTRC) (EL-7104), February 1991. Price: $200.00. Presents data from five different studies performed at EPRI's HVTRC, in Lenox, MA. Among the topics discussed are the effects of spark discharges and induced currents from overhead transmission lines and the effects of power frequency magnetic fields on video display terminals.

* L.E. Zaffanella et al., ***Network Analysis of Ground Currents in a Residential Distribution System*** (EL-7369s), August 1991. Price: $295.00. Research at EPRI's HVTRC, cosponsored by Ontario Hydro, found that ground currents in residential distribution systems, which could have a significant effect on residential EMF levels, are only moderately predictable. The uncertainty is attributed to variations in the resistance of water pipe joints, through which grounded currents often flow.

The researchers investigated leukemia and brain tumor deaths among Swedish male workers aged 20-64 between 1961 and 1979. See Siv Törnqvist et al., "Incidence of Leukaemia and Brain Tumours in Some 'Electrical Occupations'," *British Journal of Industrial Medicine*, 48, pp.597-603, 1991.

U.K.: Ambiguous Results Among Adults

Adults who lived within 50 meters of an overhead power line had a slightly elevated risk of developing leukemia or lymphoma—a finding that verged on statistical significance. Dr. J. Youngson of the University of Manchester and Drs. A.D. Clayden, A. Myers and R.A. Cartwright of the University of Leeds concluded that the results show a "suggestion of a trend with distance."

"The results of this study suggest the possibility of an increased risk in the region of 1.3 at high levels of magnetic field or at close proximity to overhead power lines. However, this study lacks the statistical power to detect any small true increase in risk at these calculated levels of exposure to magnetic fields," the team concluded, adding that if there is an increased risk from residential exposures, it is probably "extremely small."

There were ORs of 1.87 and 3.0 for those living in homes with the highest calculated magnetic field levels, 3 mG or more and 10 mG or more, respectively, but these findings were based on small numbers and were not statistically significant. There was neither a significantly increased risk nor a significant trend for the combined data set.

The team calculated magnetic field exposures from the estimated maximum load currents of the overhead lines in the five years prior to diagnosis. Only 4% of the study population had a computed magnetic field exposure greater than 0.1 mG.

The study population included men and women aged 15 or older who were diagnosed with non-Hodgkin's lymphoma or leukemia between 1983 and 1985. The team analyzed 3,144 cases and a matched set of controls, all living in northern England.

See J.H.A.M. Youngson et al., "A Case/Control Study of Adult Haematological Malignancies in Relation to Overhead Power Lines," *British Journal of Cancer*, 63, pp.977-985, 1991. A number of the members of the study team published a study of EMFs and childhood cancer last year (see *MWN*, N/D89).

HIGHLIGHTS

Connecticut Police Ban Hand-Held Radar Units

In a precedent-setting move, the Connecticut State Police have banned the use of hand-held radar devices. On October 10, Lt. Colonel Patrick Tully, chief of the police's Office of Field Operations, ordered that antennas of two-piece radars be mounted on the outside of patrol cars. "Under no circumstances shall the antennas be operational inside the vehicles," he wrote in a departmental memo.

Connecticut's action follows growing national concern about a possible association between police radar and cancer (see *MWN*, M/J91). The number of lawsuits that have been filed by police officers and their families is expected to grow from five to as many as 20 by early next year, according to John Sweeney, the Agoura Hills, CA, attorney who is handling most of the suits (see *MWN*, J/A91 and S/O91).

A spokesman for Tully, Sgt. John Mannion, told *Microwave News* that the department's 70 hand-held units have been shelved and that the department is using only two-piece sets. Only 40 troopers are assigned to radar patrol each day, he said, and the state police have 210 two-piece units, so there will be no reduction in the enforcement of speeding violations.

Tully's action set off a ripple effect among municipal police forces in Connecticut. By mid-November, according to the Manchester, CT, *Journal Inquirer*, 24 police departments had limited or prohibited the use of police radar units. The towns include Shelton and Windsor Locks, where one and two officers, respectively, have filed workers' compensation claims, charging that use of radars caused them to develop cancer. Both towns have rejected the claims, and the three officers plan to appeal to the state workers' compensation agency, according to the *Journal Inquirer*.

At the request of the International Brotherhood of Police Officers (IBPO), the state Department of Health Services (DHS) has agreed to evaluate these and other reported cancer cases. Sam Franzo, an IBPO representative, said that the union is collecting medical information which it will forward to the DHS. In addition, an official with the federal Centers for Disease Control will survey the technical literature, according to the health department. IBPO represents some 1,800 officers in 42 Connecticut police departments.

Franzo plans to push for more action to limit the use of police radars. "We have to have legislation," he told *Microwave News*. "Some police chiefs refuse to believe the claims linking cancer to radar." The chairman of the state General Assembly's Labor & Public Employees Committee, Rep. Joe Adamo (D-West Haven), has promised to investigate.

The state police department, according to Mannion, has conducted two exposure surveys. None of the measured levels exceeded the 5 mW/cm^2 safety level set by the 1982 American National Standards Institute (ANSI) for X-band and K-band radiation. Both surveys were carried out at Retlif Testing Laboratories in Ronkonkoma, NY, and were coordinated by Fred Helene, a consultant based in Wallingford, CT. A report on the test results will be submitted to the state police by the end of the year, Helene said.

Another set of measurements, taken at the Michigan State University Radar Testing Laboratory in East Lansing, reveals

that, under normal operating conditions, exposure levels are less than 1% of the ANSI limit. "We are able to conclude with a high degree of certainty that there is no evidence to support the allegation that police traffic radar operators are at risk due to prolonged exposure," the lead investigator, Dr. David Fisher, reported. *Microwave Exposure Levels Encountered by Police Traffic Radar Operators* (August 30, 1991, No. MSU-ENGR-91-007) is available at no cost from: Fisher, Department of Electrical Engineering, Michigan State University, 260 Engineering Bldg., East Lansing, MI, 48824.

The Michigan State data are consistent with preliminary results released earlier this year by Battelle of Columbus, OH, and by the Institute for Police Technology and Management in Jacksonville, FL (see *MWN*, M/A91).

Radiofrequency and Microwave Radiation Resources

Robert Cleveland and Michael Buccigrossi, ***Trip Report: Measurement Survey, New York, NY, July 31-August 1, 1991,*** unpublished and undated report by the U.S. Environmental Protection Agency (EPA) and the Federal Communications Commission (FCC), 9 pp. Available from: Buccigrossi, EPA Region II, Radiation Branch, 26 Federal Plaza, New York, NY 10278.

This report includes surveys of radiofrequency and microwave (RF/MW) radiation levels near three different types of emitters. The first site had a complex of 12 land-mobile, two-way communications antennas—operating at 43, 46 or 450 MHz and at 75, 90 or 450-500 watts—on top of a residential building. Within five feet of the antennas, readings of 133-265 $\mu W/cm^2$ were recorded. On the main roof of the building, there were "hot spots" as high as 16 $\mu W/cm^2$. Inside a top-floor apartment, levels were less than 0.3 $\mu W/cm^2$, the minimum level the meter can detect. At the second site, a penthouse apartment several hundred feet from a cluster of microwave antennas on top of a nearby building, levels were as high as 8 $\mu W/cm^2$ about 10-20 cm from a metal window frame. Residents of the penthouse had complained of electromagnetic interference to their electronic equipment. Readings of 3-8 $\mu W/cm^2$ and 0.3-1.3 $\mu W/cm^2$ were recorded at two other locations in the penthouse, but there were no other detectable levels in the apartment. Near the third site, another penthouse, there was a cluster of nine cellular antennas. With an effective radiated power of up to 120 watts per antenna, the cluster generated levels of 133-318 $\mu W/cm^2$ directly in front of one of the antennas—these readings dropped to 1.3-2.7 $\mu W/cm^2$ ten feet away. On the rest of the roof, the radiation levels were again less than 0.3 $\mu W/cm^2$.

Robert Cleveland and Edwin Mantiply, ***Electric and Magnetic Fields Near AM Broadcast Towers*** (EPA/520/6-91/020), U.S. Environmental Protection Agency, July 1991, 81 pp. Available for $19.00 from: National Technical Information Service (NTIS), 5285 Port Royal Rd., Springfield, VA 22161, (800) 336-4700, Order No. PB-92-101427.

Measurements of RF radiation taken 1-100 meters from eight AM broadcasting stations generally agreed with predictions made using a computer model—except within several meters of a transmitting tower base or near metal fencing or other metal objects. The model, known as the Numerical Electromagnetic Code (NEC), was developed at the Lawrence Livermore Laboratory in Livermore, CA, to identify regions near transmitting facilities where RF safety limits may be exceeded. The stations, all located in southern California, operate at 550 kHz–1.45 MHz and represent a range of electrical heights and power outputs.

Environmental Science Associates, Inc., ***Gibraltar Peak Communications Site: Environmental Impact Report*** (No. 91-EIR-12), County of Santa Barbara, CA, Resource Management Department, September 1991, 317 pp.

A proposed expansion of the Gibraltar Peak Communications Facilities in Santa Barbara County would result in localized RF radiation levels which would exceed the NCRP recommended exposure limits for the general public and increase the area in which occupational limits are regularly exceeded. Half of the report is an analysis of the health effects of RF radiation by Dr. Bill Guy, a retired professor of bioengineering at the University of Washington, Seattle. Members of a family that was moved from the antenna farm (see *MWN*, M/A91) have filed a $7 million lawsuit against both the owners of the Gibraltar site and a communications firm that operates many of its antennas, according to an article in the October 14 *Santa Barbara News-Press*.

Margaret Garson et al., "A Chromosomal Study of Workers with Long-Term Exposure to Radiofrequency Radiation," ***Medical Journal of Australia, 155***, pp.289-292, September 2, 1991.

There were no statistically significant differences in the rate or types of chromosomal aberrations in the stimulated lymphocytes of 38 radio linemen as compared with 38 controls. The linemen worked for Telecom Australia, erecting and maintaining broadcast, telecommunication and satellite facilities; they were exposed to 400 kHz–20 GHz radiation for an average of 15.4 years. Exposures were below the Australian occupational standard, which limits SARs to less than 1 mW/cm² (see *MWN*, M/A86). Recent tests showed that for frequencies of up to 100 MHz, induced currents from RF exposures were less than 100 mA in each leg.

Health Physics, 61, pp.3-67, July 1991.

Features six papers adapted from presentations at the Health Physics Society's June 1990 summer school, *Assessing Non-Ionizing Radiation Hazards:* Larry Anderson, "ELF: Exposure Levels, Bioeffects and Epidemiology"; John D'Andrea, "Microwave Radiation Absorption: Behavioral Effects"; Robert Kavet and Richard Tell, "VDTs: Field Levels, Epidemiology and Laboratory Studies"; Richard Luben, "Effects of Low Energy [EMFs] (Pulsed and DC) on Membrane Signal Transduction Processes in Biological Systems"; Sol Michaelson, "Biological Effects of [RF] Radiation: Concepts and Criteria"; Ron Petersen, "[RF/MW] Protection Guides."

Jon Klauenberg and James Merritt, "No Evidence for Microwave Interaction with Noradrenergic Neurotransmitter Systems," and Dennis Hjeresen, "Reply," ***Health Physics, 60***, pp. 282-284, February 1991.

Two members of the U.S. Air Force School of Aerospace Medicine's (USAFSAM) division of radiation sciences take issue with Hjeresen's conclusion in a 1989 paper that microwaves can affect noradrenergic neurotransmitters. In his response, Hjeresen, of Los Alamos National Lab, describes how the Air Force, his sponsor, operated: "[A]fter [our] results...were formally submitted to [USAFSAM], pressure was applied, suggesting that we not report significant biological effects of low-power microwave irradiation....The [USAFSAM] has consis-

tently suggested to us that there are no effects of low-level microwave exposure despite evidence to the contrary presented in the peer-reviewed literature. Empirical results from their laboratories would be helpful and might provide a more compelling argument for their position. Because the [USAFSAM] is one of the few remaining funding sources for research in the microwave bioeffects field, a more satisfying scientific response would be sustained by financial support for unrestrained research in this area by independent laboratories."

B.K. Nelson et al., "Marked Increase in the Teratogenicity of the Combined Administration of the Industrial Solvent 2-Methoxyethanol and Radiofrequency Radiation in Rats," *Teratology, 43*, pp.621-634, 1991.

RF radiation acted alone and synergistically with the industrial solvent 2-methoxyethanol (2ME) to cause malformations in the offspring of rats exposed during pregnancy. This team of NIOSH researchers used 10 MHz CW radiation at SARs of 0.8-6.6 W/Kg to maintain a 4°C increase in the rats' rectal temperature. RF exposure alone increased malformations by 30% and 2ME alone increased them by 14%. Together, the RF and the agent caused a 76% increase, "evidence of synergism." Polish researchers have also shown that RF can enhance the action of a chemical teratogen (see *MWN*, J/F87). For other RF teratological studies, see *MWN*, Oct83, Ap84, Jn84, N/D86 and N/D87.

Richard Tell, ***Induced Body Currents and Hot AM Tower Climbing: Assessing Human Exposure in Relation to the ANSI Radiofrequency Protection Guide,*** FCC, Washington, DC, October 7, 1991, 82 pp. Available from: NTIS, see above. Order number was unavailable at press time.

Tests at two AM radio transmitters in Bakersfield and Riverside, CA, showed that the induced body currents in workers climbing the towers can routinely exceed the 1991 IEEE guidelines for "controlled" RF exposures (see p.1). Among Tell's other findings: The range of frequencies in the AM band can account for a threefold difference in the body current and a ninefold variation in the resulting wrist SAR; considerable power reductions—down to a few tens of watts—may be necessary to meet the IEEE guidelines; RF burns can easily occur in workers on hot towers even at power levels as low as 1 kW; and, "Pending the development of additional insight into the issue of body currents and exposure mitigation for hot AM tower work, broadcasters should proceed in a cautious manner with respect to authorizing routine tower work while the tower is energized." The data obtained in this study are consistent with EPA–FCC measurements taken at a Spokane, WA, AM station (see *MWN*, J/A88).

FROM THE FIELD

German Workshop on Mechanisms of EMF Interactions

On September 11-12, 1991, the Deutsche Forschungsgemeinschaft (DFG)—the German equivalent of the U.S. National Science Foundation—held a conference on Interaction Mechanisms of Electromagnetic Fields (EMFs) with Cellular Systems *at the Max Planck Institute for Solid State Research in Stuttgart.*

The statement reprinted below represents a consensus of the 25 biologists, chemists and physicists who participated at the workshop. The statement was drafted by Drs. Werner Grundler, Friedemann Kaiser, Fritz Keilmann and Jan Walleczek and was translated from the German by Walleczek. Grundler is at the Center for Radiation and Environmental Research in Neuherberg, Kaiser is at the University of Darmstadt, Keilmann is at the Max Planck Institute in Stuttgart and Walleczek is a visiting scientist at the VA Medical Center in Loma Linda, CA.

In an interview with Microwave News *following the workshop, Walleczek said that the DFG is planning to sponsor a second meeting next spring in Frankfurt to draft an EMF research plan, with special emphasis on extremely low frequency (ELF) EMF effects. Walleczek anticipates that, if the DFG decides to approve an EMF project, a commitment will be made to a well-funded multiyear research effort.*

After evaluating the current experimental evidence and after discussing possible mechanisms of interaction, it was concluded that there now exists firm evidence that *non-thermal* effects due to EMF exposures can be triggered in living cells under selected conditions.

Over the past 15 years this insight has matured because of the steady increase in the number of positive findings using a variety of different cellular systems. For example, important knowledge has accumulated from gene expression and calcium metabolism in lymphocytes and other cells, cycle times of lymphocytes and yeast cells and investigations of cell differentiation in fibroblasts. In addition, clear responses of the central nervous system and a reduction in the synthesis of the hormone melatonin have been observed.

The applied fields encompass a wide range of frequencies between microwaves and static magnetic fields. Control experiments in which temperatures, frequencies and field intensities were varied—as well as theoretical estimates of field-induced heating—rule out the possibility that the reported observations could be explained by thermal effects.

In addition to the fundamental thermodynamic constraints, theoretical concepts which could play a mechanistic role in the mediation of the observed electromagnetic influences were discussed. These included possible underlying nonlinear processes (nonlinear dynamics), the chemistry of transient radical pair and triplet states and signal transduction mechanisms.

The current state of knowledge does not yet allow a definitive explanation of the experimental findings. On the other hand, *a systematic variation of field parameters* (e.g., frequency, amplitude of the electric and/or magnetic field) in one of the above-mentioned, reproducible biological experiments could lead to significant progress in the theoretical interpretation of the reported results.

Unanimously, it was decided that these talks should continue and that they should include other scientists who could make relevant contributions. There is reasonable hope that this innovative and highly interdisciplinary field of research will receive appropriate financial support in the near future.

EMFs from Light Boxes

To the Editor:

In an attempt to determine whether there are health risks associated with using a light box for viewing photographic transparencies, we measured magnetic field levels from both commercially available and custom-made light boxes at a photo agency in Woodstock, NY. The tests yielded some surprising results: Magnetic fields at a height of 4.5 cm above the viewing surface (the height of an average loupe) in some cases were as high as 60-80 mG. The magnetic field strength is about 6 mG at 30 cm from the surface and drops to less than 2 mG at 62 cm. This means that people editing color transparencies may be

exposed to the same field levels as electricians working with industrial power supplies, underground and overhead power line workers and welders.

Virtually all light boxes have a "ballast"—a device for converting 110 volts AC to the current necessary for a fluorescent bulb—which is the source of strong magnetic fields. A photo editor may spend hours a day within inches of the ballast, which is often located near the center of the box. The cumulative exposure can be substantial.

One option for mitigating these exposures is to remove the ballast from the light box and put it at the end of a cable. Our measurements showed that with the ballast removed the magnetic field strength was a nominal 2-3 mG at the viewing surface. Changing the circuit, however, will invalidate the UL-approved designation of the light box. Another option is to hold the loupe and the transparency away from the light box—only working at the surface when absolutely necessary.

Sincerely,

Mark Antman
The Image Works
PO Box 443
Woodstock, NY 12498

Stewart Maurer, PhD
Department of Electrical Engineering
New York Institute of Technology
1855 Broadway, New York, NY 10023

EMF Exposures Among Aluminum Workers

To the Editor:

Aluminum workers have been a focus of interest concerning occupational EMF exposure in several recent studies [see *MWN*, J/A90]. It has been pointed out that workers in the "potrooms," where the large electrolytic cells are housed, are subjected to strong DC magnetic fields, often in excess of 100 G. We recently had the opportunity to take some preliminary measurements of AC fields: Such measurements revealed fields greater than 100 mG in some regions of the potrooms. These AC fields may be due to the close proximity of the rectifiers and/or the AC ripple.

Sincerely,

Michael P. Milburn, PhD
ELMAG Research & Consulting
203-888 Burrard St.,
Vancouver, BC V6Z 1X9, Canada

UPDATES

COMPATIBILITY & INTERFERENCE

Apache Helicopter and EMI... The Army continues to be criticized for failing to shield its aircraft adequately from potentially dangerous EMI—such charges have been leveled by members of Congress, by the DOD Inspector General and by dozens of newspapers and magazines, including the *New York Times*, the *Washington Post* and *Time*. The latest barrage, fired in an article in the fall issue of *Compliance Engineering* magazine, is aimed at the Army's Apache attack helicopter. William von Achen, *Compliance Engineering*'s editor and the author of the piece, writes that, "The EMI problems that have plagued the Apache are particularly troublesome, since Army officials knew, or should have known, of the potential for such difficulties almost from the project's inception." According to a 1988 Inspector General investigation, von Achen reports, the Apache cannot be deployed from an aircraft carrier because of EMI, and may be susceptible to "commercial microwave, television and airport radar," as well as "combat emitters, such as U.S. and allied missile radar controllers" (see *MWN*, S/O88). Von Achen also reveals that the Apache encountered serious electronic problems during its first combat duty in the 1989 U.S. invasion of Panama. He suggests that the Army—which still requires its aircraft to meet only a 20 V/m immunity requirement, while Navy and Air Force aircraft must meet a much stricter 200 V/m standard—should have known that its EMI shielding was insufficient because of its experience with the Black Hawk helicopter (see *MWN*, N/D87 and N/D88). EMI may have been responsible for a number of accidents and fatalities involving the Black Hawk—though widely reported as fact, these charges have repeatedly been denied by the Army (see *MWN*, S/O91). Furthermore, von Achen reports that Navy engineers found that EMI disrupted steering equipment, automatic flight control systems, AC and DC power systems, fire detection devices, command instrument systems and other electronic components in the Black Hawk. Nevertheless, Army officials sidestepped *Compliance Engineering*'s charges about the Apache, asserting that, "There are no known deficiencies in the EMI area that preclude operational use of the AH-64 (Apache) for all its intended missions." *Compliance Engineering* is published by Dash, Straus & Goodhue, Inc., in Boxborough, MA.

LAW

Attorney Advocates Utility Reform... Utility executives must "return to their proper task—assisting the public—rather than fighting the citizens they serve," states Seattle, WA, attorney Philip McCune in an article in the winter issue of the *University of Michigan Journal of Law Reform*, published in Ann Arbor. McCune argues that growing fear of EMF health effects, coupled with "imperfect legal rules," could result in undue costs to utilities and consumers alike. "Power companies must change their approach to the construction of new power lines if they wish to expand their electrical transmission capacity," McCune writes. His article begins with a discussion of current legal theories governing EMF litigation, including eminent domain and inverse-condemnation proceedings and tort actions for those who have suffered financial, emotional or physical harm from power line EMFs. He then presents a number of "simple solutions" for utilities to allay public concerns and reduce public exposures to EMFs. These solutions include avoiding major population centers when planning transmission lines, purchasing wider rights-of-way, implementing EMF-reduction technologies when designing new lines and increasing community trust through communication. "Reforming public relations strategies and increasing safety will require some added expense, but this should not hinder their implementation," McCune asserts, adding that, "The cost of alternative power line construction

techniques represents a small fraction of the total dollars at stake in the construction of electrical transportation devices today."

MAGLEV

Fire Destroys Test Vehicle... Japanese researchers developing magnetic levitation technology saw one of their trains gutted by a fire that broke out during a test run on October 3, according to an article in the October 17 issue of *Nature*. The fire started when one of the rubber tires, designed to support the train at low speeds, went flat. Though no one was injured in the accident, maglev's status as the commercial transport system of the future may have been dealt a serious blow, according to *Nature*. David Swinbanks, reporting from Tokyo, cites a number of other potential problems with the high-speed rail technology, including difficulty in shielding the insides of the trains from high magnetic fields—there is concern that these fields could stop a pacemaker or present long-term health risks to passengers. Swinbanks goes on to state that "ambitious plans by proponents of the maglev train...must now be very much in question because of the numerous technical hurdles in the way." Yet Japanese Transport Minister Kanezo Muraoka reportedly said that the $23 million vehicle would be replaced and that further testing would go ahead on schedule. Attempts by *Microwave News* to obtain more information on the accident from the Japan Railway Technical Research Institute, which is conducting the tests, were unsuccessful.

MEDICAL DEVICES

Apnea Monitor Recalled... On September 23, Aequitron Medical, Inc., of Minneapolis, MN, issued a recall for its Model 8200CE apnea monitor because EMI could interrupt the device's lifesaving alarm function, according to the October 2 *FDA Enforcement Report*. The Model 8200's EMI susceptibility has been linked to at least 70 deaths and has been the subject of Congressional hearings, a GAO investigation and litigation (see *MWN*, J/A91). More than 12,000 of these monitors have been distributed in the U.S., Canada and Belgium. Despite repeated requests, the company has refused to provide *Microwave News* with information on the recall.

MEETINGS

Australian ELF Workshop... Papers on the biological effects of power frequency EMFs, risk perception and regulation were presented at the Australian Radiation Protection Society's *50 Hz Fields and Health* workshop on October 3-4, 1991, in Sydney. Among the contributors were Australia's Drs. Michael Repacholi and Vincent Delpizzo, the U.S.'s Drs. Jan Stolwijk, Tom Tenforde, Larry Anderson and Granger Morgan and the International Agency for Research on Cancer's Dr. Michel Coleman. The two-volume proceedings are available for $44.00 (Aus.), including postage and handling, from: Graeme Elliott, *Radiation Protection in Australia*, PO Box 128, Rosanna, Victoria 3084, Australia.

NIOSH Proceedings Out... The 229-page compilation of plenary papers and recommendations from NIOSH's January 1991 *Scientific Workshop on the Health Effects of Electric and Magnetic Fields on Workers* has been published (see *MWN*, J/F91 and M/A91). Presented in the booklet, which was edited by NIOSH's Philip Bierbaum and Dr. John Peters of the University of Southern California in Los Angeles, are papers by Dr. Stephen Cleary on *in vitro* studies, Dr. Larry Anderson on *in vivo* research, Dr. Gilles Thériault on epidemiology, Dr. Dan Bracken on exposure assessment and William Feero on EMF management. The volume is available at no cost from: Publication Dissemination, DSDTT, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226, (513) 533-8287.

RESOURCES

OTA on Circadian Rhythms...A new report by the Congressional Office of Technology Assessment (OTA), titled *Biological Rhythms: Implications for the Worker*, asserts that altered circadian cycles can result in reduced productivity, fatigue, stress, insomnia and depression. These effects, common in many shift workers, may be due to abnormal sleep schedules and altered exposure to daylight, which regulate the pineal gland and production of the hormone melatonin. Doses of bright, fluorescent light may help the body adjust to schedule changes, according to the report. OTA concludes that much more research is needed to understand fully the biological effects of circadian rhythms. Copies of the 250-page report (GPO 052-003-01254-5) are available for $11.00 each from: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 783-3238.

Wall Chart... The U.K.'s National Radiological Protection Board (NRPB) is offering a wall chart that illustrates the sources and effects of NIER, together with protection techniques. Single copies of *Non-Ionizing Radiations* are available free from: Publications Office, NRPB, Chilton, Didcot, Oxon OX11 0RQ, U.K., (44+0235) 831600.

ETC...

Microwaves and Murder... An FCC clerk was shot to death outside the agency's Manhattan field office on November 27 by a woman who had previously complained that radiowaves were "interfering with her," and who said that she had been subjected to "illegal surveillance" by the FCC, according to press reports. The suspect, a 53-year-old woman from Greeley, CO, apparently singled out Catherine Forster just because she worked for the FCC. In past incidents, the suspect had threatened to kill an employee at FCC headquarters in Washington, DC, and had to be physically removed from field offices in New York City and Denver, according to an account in the December 2 issue of *Broadcasting*. Richard Smith, head of the FCC's field operations bureau, told *Broadcasting* that bizarre types of behavior, even attacks, are not uncommon, adding that, "This is something we deal with day in and day out." No other FCC employee has been killed in the line of duty.

CONFERENCES

1992 Conference Calendar

January 23-25: **1st Congress of the European Bioelectromagnetics Association,** Brussels, Belgium. Contact: Dr. M. Hisenkamp, Dept. of Orthopedic Surgery and Traumatology, Hôpital Erasme, Université Libre de Bruxelles, Route de Lennik 808, B-1070 Brussels, Belgium, (32+2) 555-3640.

January 26-30: **IEEE Power Engineering Society Winter Meeting,** Hilton Hotel, New York, NY. Contact: Frank Schink, 14 Middlebury Lane, Cranford, NJ 07016, (908) 276-8847.

February 3-7: **The Health Physics of Non-Ionizing Radiation,** Battelle Conference Center, Seattle, WA. Contact: Dr. John A. Leonowich, Battelle Pacific NW Labs, PO Box 999, Mail Stop K3-70, Richland, WA 99352, (509) 375-6849.

March 9-10: **EMF: How Dangerous?** Marriott Hotel, Arlington, VA. Contact: Barry LeCerf, EMF Conference, 5072 West Chester Pike, PO Box 556, Edgemont, PA 19028, (215) 359-1249.

March 10-15: **Congress on Electromagnetic Pollution and Biogeopathogenical Research,** Foz do Iguacu, Brazil. Contact: Dr. José Barbosa Marcondes, Caixa Postal 3321, São Paulo, Cep. 01060, Brazil.

March 12-13: **1992 IEEE 18th Annual Northeast Bioengineering Conference,** University of Rhode Island (URI), Kingston, RI. Contact: Dept. of Electrical Engineering, URI, Kingston, RI 02881.

March 30-April 2: **Biological Effects of Ionizing and Non-Ionizing Radiation: Nuclear, UV, RF/MW, IR and Ultrasound,** George Washington University (GWU), Washington, DC. Contact: GWU, School of Engineering and Applied Science, Washington, DC 20052, (800) 424-9773.

April 1-2: **28th Annual Meeting of the National Council on Radiation Protection and Measurements** (NCRP), Marriott Hotel, Crystal City, VA (outside Washington, DC). Contact: Roger Ney, NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652.

April 5-9: **Meeting of the Federation of American Societies for Experimental Biology** (FASEB), Convention Center, Anaheim, CA. (The International Society for Bioelectricity will participate.) Contact: FASEB Office of Scientific Meetings and Conferences, 9650 Rockville Pike, Bethesda, MD 20814, (301) 530-7010.

April 13-16: **International Magnetics Conference,** Adam's Mark Hotel, St. Louis, MO. Contact: John Nychuis, Purdue University, School of Electrical Engineering, West Lafayette, IN 47907, (317) 494-3524.

April 13-16: **70th Annual Convention of the National Association of Broadcasters** (NAB), Convention Center, Las Vegas, NV. Contact: NAB Services, 1771 N St., NW, Washington, DC 20036, (800) 342-2460.

April 26-May 1: **6th International Congress on Hyperthermic Oncology,** Convention Center, Tucson, AZ. Contact: Joseph Segilia, Conference Services, University of Arizona, 1955 E. 6th St., Tucson, AZ 85719, (602) 621-7724.

May 10-14: **2nd International Workshop on Non-Ionizing Radiation** (NIR), University of British Columbia (UBC), Vancouver, Canada. Contact: Wayne Greene, NIR Workshop, 50/2075 Westbrook Mall, UBC, Vancouver, BC V5Y 1P9, Canada.

May 12-14: **Instrumentation/Measurement Technology Conference** (IMTC), Meadowlands Hilton, East Rutherford, NJ (outside New York City). Contact: Robert Myers, IMTC, 3685 Motor Ave., Suite 240, Los Angeles, CA 90034, (213) 287-1463.

May 17-21: **24th Annual National Conference of Radiation Control Program Directors** (CRCPD), Clarion Plaza Hotel, Orlando, FL. Contact: Terry Devine, CRCPD, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543.

May 17-22: **8th World Congress of the International Radiation Protection Association** (IRPA), Convention Center, Montreal, Canada. Contact: IRPA 8, 2155 Rue Guy, Suite 820, Montreal, Quebec H3H 2R9, Canada, (514) 932-9552.

May 25-27: **1992 International Symposium on Electromagnetic Compatibility,** Xiang Shan Hotel, Beijing, China. Contact: Min Fang, Chinese Institute of Electronics, Nongzhanguan Nanlu No.12, Room 2310, Beijing, 100026 China, (86+1) 5001144, ext.2310.

May 27-29: **46th Annual Symposium on Frequency Control,** Lodge & Convention Center, Hershey, PA. Contact: Michael Mirarchi, Synergistic Management Inc., 3100 Route 138, Wall Township, NJ 07719, (908) 280-2024.

May 30-June 3: **27th Annual Meeting & Exposition of the Association for Advancement of Medical Instrumentation** (AAMI), Marriott Hotel, Anaheim, CA. Contact: AAMI Education Dept., 3330 Washington Blvd., Suite 400, Arlington, VA 22201, (703) 525-4890, ext.214.

June 2-4: **1992 IEEE Microwave Theory and Techniques Society International Microwave Symposium,** Albuquerque, NM. Contact: Mike Little, Rome Air Development Center, RADC/OCTP, Griffiss AFB, NY 13441.

June 9-12: **Conference on Precision Electromagnetic Measurements,** Paris, France. Contact: Ginette Bonami, Société des Electriciens et des Electroniciens, 48 Rue de la Procession, F-75724 Paris Cedex 15, France, (33+1) 45 67 07 70.

June 14-19: **1st World Congress for Electricity and Magnetism in Biology and Medicine,** Walt Disney World Village, Orlando, FL. Contact: W/L Associates, 120 W. Church St., Frederick, MD 21701, (301) 663-1915.

June 23-25: **20th International Power Modulator Symposium,** Hilton Hotel, Myrtle Beach, SC. Contact: Mark Goldfarb, Palisades Institute for Research, 2011 Crystal Dr., Suite 307, Arlington, VA 22202.

July 12-16: **IEEE Power Engineering Society Summer Meeting,** Seattle, WA. Contact: Betty Tobin, Society Special Services, IEEE, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (206) 684-3370.

July 18-25: **1992 IEEE Antennas and Propagation Society International Symposium, URSI Radio Science Meeting** and Nuclear EMP Meeting, Hyatt Regency Hotel, Chicago, IL. Contact: Prof. Piergiorgio Uslenghi, Dept. of EECS (M/C 154), University of Illinois, Box 4348, Chicago, IL 60680, (312) 996-5487.

August 2-5: **27th Microwave Power Symposium,** Marriott Hotel, Washington, DC. Contact: International Microwave Power Institute, 13542 Union Village Circle, Clifton, VA 22024, (703) 830-5588.

August 8-14: **Annual Scientific Meeting and Exhibition of the Society of Magnetic Resonance Imaging in Medicine** (SMRIM), International Congress Center, Berlin, Germany. Contact: SMRIM, 1918 University Ave., Suite 3C, Berkeley, CA 94704, (415) 841-1899.

August 10-14: **Non-Ionizing Radiations: Health Physics and Radiation Protection,** Massachusetts Institute of Technology (MIT), Cambridge, MA. Contact: Director, MIT Summer Session Office, Room E19-356, Cambridge, MA 02139, (617) 253-2101.

August 11-13: **1992 Asia-Pacific Microwave Conference,** Convention Center, Adelaide, Australia. (Held in conjunction with the *5th Australian Millimeter and Submillimeter Wave Symposium.*) Contact: Professor Harry Green, Dean, Faculty of Engineering, University of Adelaide, GPO Box 498, Adelaide SA 5001, Australia.

August 18-20: **1992 IEEE International Symposium on Electromagnetic Compatibility,** Marriott Hotel, Anaheim, CA. Contact: George Kunkel, Spira Mfg., 12721 Saticoy St. South, North Hollywood, CA 91605, (818) 764-8222.

September 1-4: **3rd International Scientific Conference on Work with Display Units,** International Congress Center, Berlin, Germany. Contact: Dr. Ahmet Çakir, Ergonomic Institut fur Arbeits- und Sozialforschung, Soldauer Platz 3, D-1000 Berlin 19, Germany, (49+30) 302 10 50.

September 2-4: **11th International Wroclaw Symposium on Electromagnetic Compatibility** (EMC), Technical University, Wroclaw, Poland. Contact: W. Moron, EMC Symposium, Box 2141, 51-645 Wroclaw 12, Poland, (48+6) 71 48 10 41.

September 6-12: **26th Congress Ampere on Magnetic Resonance,** Vraona

Bay Hotel, outside Athens, Greece. Contact: Dr. F. Milia, Institute of Materials Science, NCSR Demokritos, GR-153 10 Ag. Paraskevi Attikis, Greece, (30+1) 65 22 872.

September 21-24: **8th International Conference on Electromagnetic Compatibility,** Heriot-Watt University Conference Center, Edinburgh, U.K. Contact: Conference Services, Institution of Electrical Engineers (IEE), Savoy Pl., London WC2R OBL, U.K., (44+71) 240-1871, ext.222.

September 22-25: **1992 International Symposium on Antennas and Propagation,** Hokkaido University Conference Hall, Sapporo, Japan. Contact: Yoshio Hosoya, NTT Radio Communication Systems Labs, 1-2356, Take, Yokosuka, Kanagawa, 238-03, Japan, (81+468) 59-3134.

September 23-25: **5th International Conference on Harmonics in Power Systems,** Atlanta, GA. Contact: Nancy Heitman, IEEE Service Center, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (206) 684-3370.

October 5-9: **1992 International Aerospace and Ground Conference on Lightning and Static Electricity,** Atlantic City, NJ. Contact: Mike Cupples, FAA Technical Center, ACD 230, Atlantic City International Airport, NJ 08405, (609) 484-5228.

October 12-13: **Radar 92: International Conference,** Conference Center, Brighton, U.K. Contact: IEE, see September 21 above.

October 13-16: **1992 EPRI EMF Science & Communication Seminar,** Fairmont Hotel, San Francisco, CA. Contact: EMF Health Studies Program, Electric Power Research Institute (EPRI), PO Box 10412, Palo Alto, CA 94303, (415) 855-2320.

October 29-November 1: **14th International Conference of the IEEE Engineering in Medicine and Biology Society,** Le Palais des Congrès, Paris, France. Contact: Robert Plonsey, Dept. of Biomedical Engineering, Duke University, Durham, NC 27706, (919) 660-5124.

November 2-5: **1992 Regional Symposium on Electromagnetic Compatibility,** Hilton Hotel, Tel Aviv, Israel. Contact: Ortra Ltd., PO Box 50432, Tel Aviv 61500, Israel, (972+3) 664825.

November 12-14: **JINA '92 International Symposium on Antennas,** Nice, France. Contact: Dr. J.L. Guiraud, CNET-PAB, Centre de la Turbie, 06320 La Turbie, France.

Dates and Locations To Be Announced

September/October: **11th International Conference on Gyromagnetic Electronics and Electrodynamics,** Crimea, Ukraine. Contact: Dr. L.K. Mikhailovsky, Moscow Power Engineering Institute, 105835 Moscow, E-250, Krasnokazarmennaya, 14, Russia, (7+095) 362-55-32.

November: **Annual Department of Energy Contractors Review,** Contact: W/L Associates, 120 W. Church St., Frederick, MD 21701, (301) 663-1915.

DOE Maps Out National EMF Research Agenda *(continued from p.1)*

istration officials. The White House Office of Management and Budget "is very interested in talking with us—that's a very good sign," San Martin said.

There were mixed messages as to whether there will be a surge in new funds for the national EMF program. At the workshop, San Martin and others from the DOE denied widespread rumors that the DOE EMF research budget would grow to $15 million in fiscal year 1993 (FY93), which begins October 1, 1992. "It seems unlikely to me that there's going to be a massive injection of new federal funds," said Reid Detchon, a senior DOE official.

Representatives from the Environmental Protection Agency (EPA) and other federal agencies agreed with the DOE view that federal funding is likely to remain limited.

Many researchers were critical of the prospect of a no-growth budget. "We're angry and annoyed about the lack of a consistent DOE program. The lack of a consistent federal effort is harming the national program," said Jack Sahl of Southern California Edison in Rosemead, CA. Speaking on behalf of many participants, Dr. Asher Sheppard of the VA Hospital in Loma Linda, CA, called the level of federal commitment "pitiful."

Despite DOE's refusal to promise more research funds, however, senior officials made it clear that an increase is in fact possible if a workable, unified plan is developed. "In such a case, I don't see a problem with resources," San Martin said.

Congress might also provide more funds, according to James Cunningham of the New York Power Authority, who has been actively promoting a national research effort. An additional $3-5 million in new federal research funds per year is "not out of the question," he said (see also p.4).

Workshop participants explored how to expand EMF research even in the absence of a larger budget. Most agreed that the new national effort should include current programs. Many suggested that, overall, 70% of the available funds should be allocated for science, 20% for engineering and 10% for communications.

The new DOE agenda is likely to include the National EMF Research Program (NERP), the proposed public–private partnership (see p.5). John Coughlin, chairman of the NERP steering committee and head of Wisconsin's Public Service Commission, argued that, "We're a necessary part of the mix." In an interview with *Microwave News* San Martin agreed, saying that the DOE might contribute funds to the NERP.

Under the new agenda, as sketched by DOE officials, the DOE would coordinate the work of other federal agencies, state governments and the NERP. The officials suggested that while the federal government might take the lead on scientific research, the electric utilities might do the best job of devising mitigation methods and the states might be best able to manage communications with the public.

Efforts are under way to smooth over differences between the DOE and other agencies with responsibility for EMFs. For instance, on November 4, representatives of the DOE and EPA met in the office of Rep. George Brown (D-CA). But a participant at the meeting said that, "It was clear that DOE and EPA hadn't yet worked out their differences."

Tensions between DOE and other federal officials were heightened by the department's decision not to invite representatives from other federal agencies to an October 10-11 DOE meeting held in preparation for the November workshop.

The DOE is now drafting a strategic EMF implementation plan. Public meetings are scheduled for January and February 1992, and a final research agenda is due by May 1992.

In addition to representatives from seven federal agencies, the 65 participants at the November workshop included experts from state agencies, private and industry research institutions, trade associations and a labor union.

15 GHz for controlled and uncontrolled exposures, respectively.
• The exposure limits still map out the well-known "well shape" for protection against energy absorption at whole-body resonances (30-300 MHz). At these most stringently regulated frequencies, the limits are 1 mW/cm² and 200 μW/cm² for uncontrolled and controlled exposures, respectively. The strictest limit specified in the 1982 standard was 1 mW/cm². The new 200 μW/cm² level is consistent with the 1986 recommendations of the National Council on Radiation Protection and Measurements (NCRP)—though these apply to the general population regardless of the environment (see *MWN*, M/J86).
• The applicable frequency range has been extended to 3 kHz, down from 300 kHz in the 1982 standard.
• Maximum induced currents for 3 kHz–100 MHz are now included to protect against shocks and burns. The most stringent requirements are current limits of 45 mA and 100 mA through each foot for uncontrolled and controlled exposures, respectively, for 100 kHz–100 MHz. At lower frequencies, larger currents are allowed.
• Emitters with an input power of up to seven watts continue to be excluded from the standard for 100 kHz–1.5 GHz. The exclusion does not apply to devices that are attached to the human body, however.

ANSI will publish a request for public comment on the revised standard in the December 27 issue of *Standards Action*, its biweekly newsletter. The comment period will run through February 25, 1992. The C95.1 standard will then be considered by the ANSI Board of Standards Review to determine whether it will become an "American National Standard." Fred Feiner, an ANSI spokesman, explained that any negative comments which have not been resolved by the IEEE will be presented to the board.

The revision of the new standard began in 1983 (see *MWN*, J/A83) and, since then, has been the subject of almost continuous controversy. The work of the SCC-28 group has been criticized on both procedural and substantive grounds (see *MWN*, J/A85, J/A86, J/A87, M/A88, M/A89, S/O89, N/D90 and S/O91).

The IEEE Standards Board also approved a revised standard (C95.3–1991) for the measurement of RF/MW radiation at its September meeting.

Both the C95.1 and the C95.3 standards are in the process of being printed and should be available by early 1992, according to Susan Valinoti of the IEEE Standards Department. Drafts are available now from: Customer Service, IEEE, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (800) 678-IEEE (678-4333). A copy of C95.1 costs $28.00; C95.3 costs $36.50. Add $4.00 for postage and handling for either standard or $6.00 for both. There is a discount for IEEE members.

Chairmen of ELF Subcommittee Named

On November 2 at a meeting held in Orlando, FL, SCC-28 Chairman Thomas Budinger of the Lawrence Berkeley Laboratory in Berkeley, CA, named Dr. John Bergeron and William Feero as the chairmen of the recently formed subcommittee 3 on extremely low frequency (ELF) safety guidelines. Bergeron is with GE Corporate Research and Development in Schenectady, NY, and Feero is with Electric Research and Management in State College, PA.

"The charge of the ELF subcommittee is to develop a scientific consensus on safe exposure guidelines and to identify practical experiments to resolve outstanding questions," Bergeron told *Microwave News*. He hopes that the subcommittee will complete its work within four years.

The subcommittee has set up two task forces: one on epidemiology chaired by Dr. Ralph Buncher of the University of Cincinnati in Ohio and one on biophysics and biology chaired by Dr. Bill Guy, who recently retired from the University of Washington, Seattle. Guy was the chairman of the subcommittee that wrote the 1982 RF/MW standard, and he played an active role in the development of the 1991 revision.

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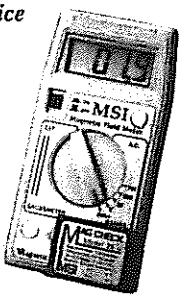
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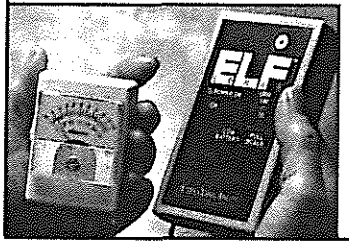
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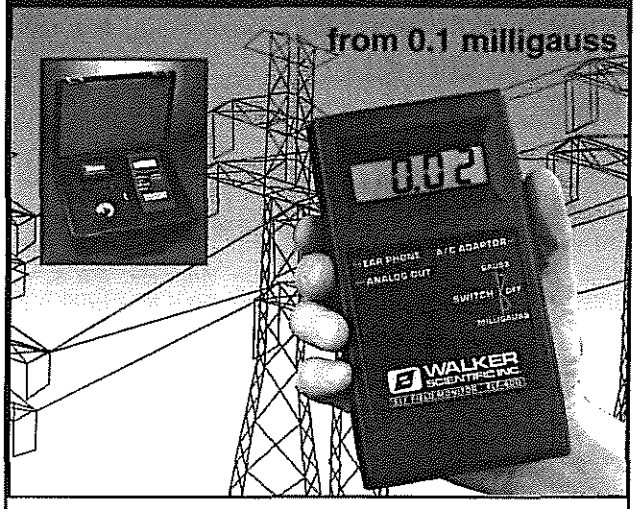
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MICRO WAVE NEWS

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White House Report Argues EMFs Are Not a Public Health Issue

There is "no convincing evidence in the published literature" to support the possibility that exposures to extremely low frequency (ELF) electromagnetic fields (EMFs) are "demonstrable health hazards," and an expanded research effort is not warranted, according to a report prepared for the Bush Administration. "In the broad scope of research needs in basic science and health...concerns over exposures to ELF EMF should not receive a high priority," the report concludes.

"In the scheme of things, this doesn't need additional funding," said Dr. Alvin Young, chairman of the Committee on Interagency Radiation Research and Policy Coordination (CIRRPC), which commissioned the report. "If people were dropping dead from this, it would be different," Young told *Microwave News*. CIRRPC is part of the White House Office of Science and Technology Policy (OSTP).

But even before its release on November 12, the 372-page report prompted sharp criticism. "This is the last thing we need," said a senior federal official with responsibility for EMFs. The official, who requested anonymity, described the document as the "equal and opposite" of the 1990 Environmental Protection Agency (EPA) draft report which concluded that EMFs are probable or possible human carcinogens (see *MWN*, M/J90).

When, in mid-October, CIRRPC asked its member federal agencies for

(continued on p.8)

Commentary from San Diego

The Swedes Come to America

By the time Maria Feychting and Dr. Birgitta Floderus stepped up to the podium at the Department of Energy (DOE) meeting in San Diego on November 12th, millions of Americans—as well as millions of others around the world—had already heard about their landmark studies linking weak EMFs to cancer. *CNN* aired a report on October 13th and replayed it many times the next day on its *Headline News* channel. Details of Feychting and Dr. Anders Ahlbom's and Floderus's results were later featured in *Time* magazine (October 26) and in the *Los Angeles Times* on Sunday, November 8th, the day the conference opened. The following day, the *Times* piece appeared all over the U.S.—in the *Seattle Times*, the *Denver Post* and the *Philadelphia Inquirer*, among many other newspapers.

The CNN broadcasts coincided with the Electric Power Research Institute's (EPRI) *EMF Science & Communication Seminar*. So, when utility managers arrived in San Diego, they had already had a month to mull over the implications of the news from Sweden.

(continued on p.12)

« Power Line Talk »

EMFs top the list of health concerns among readers of *USA Weekend*, Gannett Co.'s Sunday magazine section. In September, the publication solicited questions about possible health hazards, suggesting issues such as pesticides, radon and air pollution, in addition to EMFs. The majority of the responses reflected worries about radiation from power lines and electrical appliances, according to Maryalice Yakutchik, who is writing a cover story on EMFs for the January 3 issue. "They didn't necessarily call it EMF, but they asked about EMF issues: What about my electric blanket? What about the clock radio next to my bed? The concern was very genuine." Yakutchik said her story will respond directly to a dozen or more questions from readers. *USA Weekend* is a supplement in more than 350 Gannett papers, reaching about 15 million readers.

«« »»

By next spring, officials at 35 schools in New York State will know the levels of EMFs in their school yards. The Syracuse, NY-based **Niagara Mohawk Power Corp.** will be estimating EMF exposures at those upstate schools that have transmission lines of at least 69 kV on, or next to, their property, according to Jack Toennies, director of environmental licensing and planning at Niagara Mohawk. The project is part of an agreement between the utility and the state PSC. "The reason for initiating the whole thing is that students, teachers and parents are concerned about EMFs, and this will be a good source of information," said PSC's Dan Driscoll, who praised the utility's efforts. Niagara Mohawk will gauge the distances between various spots in the yards and the power lines and use a computer model to calculate EMF exposures. "It's more efficient and consistent this way," Toennies noted, explaining that it is easier for a technician to measure distances than to measure EMFs. If the estimated exposures are high, or if school officials make a request, Niagara Mohawk will confirm the measurements with an on-site survey. The results will be available by March 31, 1993.

«« »»

Having decided that the term "prudent avoidance" does not adequately describe its approach to EMFs, the **Connecticut Department of Health Services** (DOHS) has chosen what it says is a more "proactive" policy: **voluntary exposure control** (VEC). "Whereas prudent avoidance is a fearsome concept, [VEC] is an empowering one," explained **Carolyn Jean Dupuy**, a DOHS epidemiologist. The VEC policy recommends giving people information about EMFs and letting them decide how best to control their exposures, Dupuy said. The DOHS move follows an April report by the Connecticut Academy of Science and Engineering (CASE) which concluded that it would be "inappropriate" to recommend prudent avoidance (see *MWN*, M/J92). Indeed, Dr. **Michael Bracken**, a professor at Yale University in New Haven and a member of the CASE committee that wrote the report, scorned such a policy. At a July 30 workshop in Connecticut, he said that, "Prudent avoidance legitimizes the notion that there might be health effects when the evidence does not really exist" (see *MWN*, J/A92). Neither CASE nor the DOHS acknowledges a link between EMFs and health effects. "No definitive cause-and-effect relationship between exposure to EMFs and an increase in health risks has been established," wrote DOHS Commissioner Susan Addiss in an October 16 letter to state Senator Cornelius O'Leary. Meanwhile, Dr. **Jan Stolwijk**, also of Yale University and chairman of the CASE committee, has proposed a $400,000 study on childhood cancer and power lines in Connecticut. The CASE report mentions the possibility of doing an epidemiological study on childhood cancer in Connecticut, but notes that there are "limitations" due to the state's population size.

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Would-be home owners are thinking twice about buying houses with power lines in the backyard, but according to an article in the November/December issue of ***Real Estate Today***, the outlook is not necessarily bleak. Author Sharon Tomecek begins by presenting the issue as an obstacle for sellers and realtors: "Properties located near power lines are a new breed of problem." But by the end of the story, Tomecek quotes the owner of an Illinois real estate company who says that power lines can be seen as an advantage: "Sell the privacy that power lines afford. A 15 to 20-foot easement surrounds the line, so your yard doesn't back up to your neighbor's." The down side is that

Brodeur on Cancer at Fresno School

An article by Paul Brodeur in the December 7 issue of *The New Yorker* turns the spotlight on a grade school in Fresno, CA, where as many as 14 present and former employees have developed cancer. The most troublesome aspect of the story: All who developed the disease had worked in the section of the school that is closest to nearby high voltage power lines. Brodeur chronicles the developing awareness of the EMF issue among teachers at the school over the last two years and paints a picture of growing disillusionment with the responses of public health officials—Dr. Raymond Neutra and his colleagues at the California Department of Health Services, in particular.

Interspersed is the history of the EPA report on the potential link between EMFs and cancer. After describing the most recent studies out of Sweden, Brodeur asks whether U.S. authorities will soon take steps to reduce exposures—by routing power lines away from schools and day-care centers, for example. Answering his own question, he argues that, "Given the record of the government and the industry in dealing with the power-line problem thus far...no one should expect that any of this will occur soon, if at all, unless a concerned and determined citizenry forces action."

buyers are concerned about the health effects of EMFs, the aesthetics of power lines and reduced property values. A study by Florida Power & Light found that transmission lines had no effect on the price of property, but a suburban Chicago realtor determined that homes near power lines sell for 10% less and take two-and-a-half times as long to change hands as homes that aren't near power lines, according to the article. Salespeople are approaching the issue in a variety of ways. One firm suggests that agents supply concerned buyers with information about EMFs, while another recommends taking EMF readings.

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Florida's Department of Environmental Regulation (DER) decided at an October 22 meeting not to lower its power line magnetic fields limits, despite pressure from **Hillsborough County**. "I don't feel there's enough evidence yet to let us set different numbers," DER's Buck Oven told *Microwave News*. Oven acknowledged, however, that the present standard—150-250 mG at the edge of a ROW, depending on the voltage of the line—is not a health-based rule. "It's a politically-based rule," he said, explaining that the governor and the state legislature had told the DER to adopt a standard, but that "the philosophy was to maintain the status quo." The county has been battling the DER—first with a lawsuit and then with a proposal for a 3 mG standard—ever since the DER first announced standards in 1989 (see *MWN*, M/A89, J/F90, M/J91, J/F92 and J/A92). A spokesman for the Hillsborough County attorney's office said that there is a "strong likelihood" that the county will refile its suit. At the same time, **Energetics** Inc. has finished the final draft of its mitigation report, which is now under review by the state's EMF task force, according to Ken Klein, manager of the project (see *MWN*, M/A89, M/J90 and J/A92). The report should be issued around the first of the year, he said.

«« »»

Now that the federal government has enacted a National EMF Research Program (NERP) (see p.6 and *MWN*, S/O92), the steering committee for the parallel NERP initiated by state officials must find a new role (see *MWN*, J/A92). The committee will meet in January to discuss its future. In a November 23 conference call, committee members weighed two options: serving as a clearinghouse for the nonfederal matching funds required under the law and providing a link between federal and state officials. The committee also decided to recommend two of its members for the federal NERP advisory committee—**John Coughlin** of the Wisconsin Public Service Commission and **James DuShaw** of the International Brotherhood of Electrical Workers.

A Conversation with Dr. Anders Ahlbom

MicrowaveNews *caught up with Professor Anders Ahlbom at the Department of Energy's annual review of power line research in San Diego in mid-November. Ahlbom is an epidemiologist at the Institute of Environmental Medicine at the Karolinska Institute in Stockholm, Sweden. (For a detailed report on Ahlbom and Maria Feychting's study of residential EMF exposures and cancer, see* MWN, *S/O92.)*

MWN: Where do we stand on the possible link between EMFs and cancer?

Ahlbom: Overall, the childhood leukemia hypothesis has been strengthened. Our study adds weight to the hypothesis.

MWN: Have you always believed that there is a link?

Ahlbom: No. My view has certainly changed over the years. I still remember that when I first read the Wertheimer–Leeper paper, I discarded it. I did not like the design. Later, I was asked to review the Wertheimer–Leeper, Fulton and Tomenius studies, and I still did not take them seriously. Savitz changed my mind. And Peters did a high-quality study.

MWN: What about the Fulton study and the U.K. study by Meyers, Cartwright and Clayden?

Ahlbom: I agree with Nancy Wertheimer's criticisms of the Fulton study, and, unfortunately, the U.K. study has only a small number of exposed subjects.

MWN: Here in San Diego, the main criticism of your study is the small size of your study population.

Ahlbom: It is the weakest part of the study. I regret that Sweden is not bigger.

MWN: You are now going home after hearing all sorts of questions and criticisms about your study. Has anyone said anything that makes you doubt your conclusions?

Ahlbom: No. Overall, we have received support for our methodology and interpretations. We have, of course, received lots of questions and suggestions.

MWN: A few days after your study was released, Dr. Jørgen Olsen of the Danish Cancer Registry announced that he had found an increase in cancer—he reported lymphoma—among children exposed to power line EMFs in Denmark (see p.5). Do you have any plans to compare Olsen's results with yours?

Ahlbom: We have been talking with our Danish colleagues for some time and, as a result, we have used similar study designs. This will allow us to combine the two sets of data and do a small meta-analysis. There are also childhood cancer studies ongoing in Finland and in Norway; when those data are ready, we will add them, too. This last step may take a little time because the Finnish and Norwegian studies are running late.

MWN: What do you make of the fact that you did not observe an increased risk of brain tumors among the EMF-exposed children and adults?

Ahlbom: I can only speculate. I don't know. It's possible that we did not see a risk for brain tumors because our study was too small. It could be that David Savitz—whose study was also

small—saw too many exposed cases and we showed too few. We simply have to wait for more information from other studies.

MWN: And Dr. Birgitta Floderus's finding of chronic lymphocytic leukemia rather than acute myeloid leukemia among EMF-exposed workers?

Ahlbom: Again, I can only speculate. We are talking about small studies, so it is not surprising to see some random variations. Also, you might expect to see different effects in different populations.

MWN: What does your study say about the size of the EMF risk?

Ahlbom: With the limited information we have today and without knowing the appropriate exposure metric, risk analyses are not possible. You can make the following calculation based on the assumption that what we are observing is not an artifact: in Sweden, there are approximately 75 cases of childhood leukemia per year and our study indicates that, of the approximately two cases a year among those who live along a power line corridor, one is attributable to EMFs.

MWN: What about the effects of all the various sources of magnetic fields?

Ahlbom: That's difficult to estimate. If you assume that 10% of Swedish children are exposed to magnetic fields and that EMFs double the risk of leukemia, then you can attribute five to ten cases of leukemia per year to EMFs.

MWN: What can you say about the possible impact of appliances?

Ahlbom: We cannot be certain because we did not do interviews. It was impractical because of the amount of time that had elapsed since some of the cases were reported. We did do 24-hour measurements for a subsample of our study population, and that data must still be analyzed. But we have preliminary indications that the major source of exposure was from power lines.

MWN: Some people are saying that your basic result is that living close to a power line entails a cancer risk.

Ahlbom: I have heard that argument. Certainly distance is a very important parameter for estimating exposures from power lines. It is our version of the Wertheimer–Leeper wire codes, but it's more sophisticated than wire codes. The crudest index of exposure is the distance from the line. The next level of analysis is based on distance and on the type of line. And next is distance, type of line and the load on the line. If you use only distance from the line as the index of exposure, you still see an association with leukemia, but it's not as clear as when you use current-load data.

MWN: Could something other than magnetic fields be responsible for the excess cancers?

Ahlbom: It could be some unknown confounder—I call it the "phantom confounder." It is always possible, but, as long as we don't have a candidate for the confounder, it's not really useful to talk about it. As for currently known or suspected risk factors, they don't seem likely to explain the results.

MWN: Do you think that transients rather than the AC fields could have something to do with the observed effect?

Ahlbom: Transmission lines were the dominant source of exposure in our study. In contrast, the primary exposures in the Wertheimer–Leeper, Savitz and Peters studies were distribution lines. Yet, the results were all similar. That would argue for average field exposure as the key variable.

MWN: What do you think of NUTEK's [the National Board for Industrial and Technical Development] decision to act on the basis of your results?

Ahlbom: I was very surprised. But it was a clever move. It stopped attacks that would have come if NUTEK's Jaak Nõu had said we have to wait for more data. His credibility would have suffered because he told people for five years that we had to wait for the results of the ongoing studies—including our study. Remember that we don't yet know what the regulations or recommendations will be.

MWN: How do you plan to publish your results?

Ahlbom: We will be submitting a paper to a journal in a couple of weeks. This will be only the first in a series of publications. We are writing separate papers on the childhood and the adult study populations. We are also preparing a paper on the details of our methodology.

MWN: Have we now done enough epidemiology?

Ahlbom: I don't think so. Each new epidemiological study provides new, important information to add to the previous ones. There are still only seven studies of childhood cancer and EMFs.

MWN: But some scientists are saying that we must do more to understand the mechanism of interaction.

Ahlbom: There is no question that we need more mechanistic information. It would give us a better metric for assessing exposures and give us a better handle on how large the magnetic field risks really are. But it would be wrong to stop epidemiologic studies.

MWN: How important is it that we don't have a clear picture of the mechanism?

Ahlbom: You must remember that even for cigarettes—while we know there is a lot of chemical exposure—we really don't know what it is about cigarette smoke that causes cancer. The association between EMFs and cancer stands on two legs: an epidemiological leg and a mechanistic leg. Today, the epidemiological leg appears stronger.

MWN: What do you think of the argument that goes: There can't be an association between EMFs and cancer because electric power generation has been growing much faster than childhood cancer rates?

Ahlbom: Those comparisons are based on very crude aggregate data. I don't think that that kind of data can compete with case–control studies or other studies with information on the individual level.

MWN: So where do we go from here?

Ahlbom: People should sit down and see if they have some new ideas. We must not repeat the same studies again. We should try something new.

Danish Studies Offer New Support for EMF–Cancer Link

Two new studies—one residential and one occupational—from the Danish Cancer Registry in Copenhagen add to the growing evidence of a link between magnetic fields and elevated cancer risks.

Dr. Jørgen Olsen and colleagues found that children who lived near high voltage facilities had a significant fivefold increased risk of lymphoma at average exposures of 1 mG or more. This finding is not inconsistent with the Swedish finding of excess childhood leukemia, Olsen told *Microwave News* at the DOE meeting in San Diego in mid-November. On his return to Denmark, he explained that he recently learned that the children in his study had Hodgkin's disease, a subtype of lymphoma. He added that Hodgkin's and leukemia, though different, "both arise from the hematopoietic tissue."

While Olsen's team found a nonsignificant 40% increased risk for leukemia, brain tumors and lymphoma combined at average exposures of 1 mG or more, the risk rose to a statistically significant 5.6 times the expected rate at 4 mG or more. The researchers cautioned that their results were based on small numbers, with correspondingly wide confidence intervals.

Above 4 mG the risks for leukemia and for brain tumors were also elevated—six times the expected rate in each case—but neither was statistically significant.

The Swedish studies have gone a long way toward dispelling some of his lingering doubts about a magnetic field–cancer link, Olsen said. He is now collaborating with Dr. Anders Ahlbom and Maria Feychting, both of the Institute of Environmental Medicine at the Karolinska Institute in Stockholm, on an analysis of the combined Danish and Swedish data (see p.3).

Danish Power Line Blocked

The Danish and Swedish epidemiological studies have prompted a delay in the construction of a 400 kV power line in Denmark until a review of the potential health risks is completed by an expert panel set up by the Minister for the Environment.

"There has been a great deal of discussion about the new cancer studies," Johan Henrik Lous of Elkraft, the Danish power company, told *Microwave News*. The power line would cross the southern part of the island of Zealand, on which Copenhagen is located, and the island of Falster, and establish a link with the German power grid at Rostock. Lous explained that only 33 km of the 108-km line would be AC—the rest would be DC—and that it would cost approximately 20 times more to bury the line than to string it overhead.

The review panel, which is headed by Dr. Carl Wandel, a professor of physics at the University of Århus, is expected to release its report by the end of the year.

Olsen and coworkers surveyed 1,707 children under 15 years of age, diagnosed between 1968 and 1986 with leukemia, brain tumors or lymphoma, and 4,788 controls. Exposures were estimated by distance from the electrical facilities and by current loads—a method similar to that used in the Swedish study.

They estimate that, in Denmark as a whole, high voltage transmission lines expose 4,000 children to 1 mG or more and 600 children to 4 mG or more. Olsen said he plans to submit a paper for publication by the end of the year.

In the occupational study, Danish men who worked at jobs with chronic exposures of more than 3 mG had a significant 64% elevated risk of leukemia. Dr. Pascal Guénel of the Institut National de la Santé et de la Recherche Médicale (INSERM) in Paris, France, and coworkers did not find an increased risk for brain tumors or melanoma, nor did they see a cancer risk for intermittent EMF exposures. Guénel and his Danish colleagues, Drs. Povl Raskmark and Jørgen Bach Andersen from Ålborg University and Elsebeth Lynge from the Danish Cancer Registry, found that the populations at greatest risk were primarily electricians and iron foundry workers.

There was a suggestion of an elevated rate of breast cancer among men but not among women.

The researchers looked at the cancer incidence between 1970 and 1987 among a cohort of 2.8 million working men and women, ages 20-64. They estimated that 18,000 men and 4,000 women had continuous occupational exposures and that 154,000 men and 79,000 women had intermittent exposures of more than 3 mG.

The study has been accepted for publication in the *British Journal of Industrial Medicine*, Guénel told *Microwave News*.

Brain Tumor Recognized as Work-Related Injury in Sweden

A 47-year-old electrician who developed a brain tumor has had his illness recognized as a work-related injury by the Swedish workers' compensation system, marking the first time occupational exposure to EMFs has been recognized as a cause of cancer in Sweden.

The electrician, who worked for 22 years at a steel mill in Borlänge, northwest of Stockholm, was diagnosed in late 1991 with an astrocytoma at the Academic Hospital in Uppsala, according to articles in several Swedish newspapers.

Union representatives filed his claim as a workplace injury after investigators took EMF measurements at the mill, states a report in the November 2 *Arbetsmiljö*, a publication of the Swedish Association of Work Protection in Stockholm. The Borlänge workers' compensation office accepted the claim and the national authorities have said they will not challenge the decision.

The case received prominent notice in the Swedish press. A September 18 story in a local newspaper, *Dala-Demokraten*, "Electrician Job Caused Brain Tumor," called the news "political dynamite" and said the decision "shakes Swedish industry." The tabloid *Aftonbladet* (November 5) stated that "the link between cancer and EMFs has now been established."

All Sides Gearing Up for New Federal Research Program

Planning for the new National EMF Research Program (NERP) is off to a fast start, spurred by congressionally mandated deadlines. By December 24, the Department of Energy (DOE) must outline a five-year, $65 million plan and the Bush Administration must appoint members to two key committees (see box below for complete timetable).

A number of important policy questions must still be answered. The first is how the DOE and the National Institute of Environmental Health Sciences (NIEHS) will work together to sponsor health studies, the key objective of the law. NIEHS is responsible for health research and communications, but the funding is channeled through the DOE, which also retains responsibility for engineering research. The two agencies have formed a task force to oversee the transfer.

"We are committed to a smooth transition," Dr. Gary Boorman, chief of the chemical carcinogenesis branch at NIEHS, told *Microwave News*. Robert Brewer, director of DOE's utility systems division, who is working closely with Boorman, agreed. "We are committed to making this work," he said. Both officials predicted that there will be no immediate dramatic changes in the research program.

The DOE has asked the heads of nine agencies to submit the names of their respective representatives to President Bush for appointment to an interagency committee. This committee will have primary responsibility for setting the federal research and communications agendas. The members of an advisory committee will be more difficult to select, Brewer said, because the law requires that a broad mix of qualifications and interests be represented.

Another question is whether the DOE will sustain its existing research program. According to Brewer, there will be one program. "We have no direction from Congress to do otherwise," he said. But in private briefings, other senior energy officials have said that DOE's research effort may indeed continue.

Whether the DOE will keep its program depends, of course, on funding. Congress has already given the DOE $6 million for its EMF program for the 1993 fiscal year, which began October 1. When Congress appropriates money under the new law in its next session, it will have to decide whether to support both programs—which would entail the provision of an additional $6.5 million, to be matched by nonfederal sources—or simply add another $500,000.

Larry Mansueti, director of technical services for the American Public Power Association (APPA) in Washington, wants additional funding. "Our members want an accelerated research program. That means old money and new money," he said.

Hanging in the balance is what will happen to those investigators who are already funded by the DOE. "As far as I can see,

Timetable for the EMF Research Program: Who? What? When?

Who	Task	Deadline
Secretary of DOE	Establish a comprehensive program	December 24, 1992
The President	Appoint members to the interagency committee*	December 24, 1992
Secretaries of DOE & DHHS	Appoint members to the advisory committee†	December 24, 1992
Secretary of DOE	Agree with NIEHS on research & information programs	April 24, 1993
Interagency committee	Develop a comprehensive program agenda	June 24, 1993
Interagency committee	Recommend research guidelines	June 24, 1993
Interagency committee	Recommend communications objectives	June 24, 1993
Secretary of DOE & Director of NIEHS	Select from solicited proposals	January 24, 1994¶
National Academy of Sciences§	Status reports to interagency & advisory committees	Periodically
Director of NIEHS	Report to interagency committee	June 1, 1995
Interagency & advisory committees	Report to Congress	December 31, 1995
Director of NIEHS	Report to interagency committee	March 31, 1997
Interagency & advisory committees	Final report to Congress	September 30, 1997
Advisory committee	Disband	December 31, 1997

* The interagency committee will consist of nine members appointed by the President, including a representative from each of the following federal agencies: Department of Defense, Department of Energy, Department of Transportation, Environmental Protection Agency, Federal Energy Regulatory Commission, National Institute of Environmental Health Sciences (NIEHS, which is part of DHHS, the Department of Health and Human Services), National Institute of Standards and Technology, Occupational Safety and Health Administration and Rural Electrification Administration.

† The ten-member advisory committee will make recommendations to the interagency committee, to the secretary of the DOE and to the director of NIEHS on the design and implementation of the research program. The advisory committee will include experts on health effects, measurement surveys and mitigation, as well as representatives of state regulatory and health agencies, electric utilities, electric equipment manufacturers, labor unions and the public. The secretaries of the DOE and the DHHS will each select five members.

¶ The selections can be made earlier. The law states, "Within 15 months after the date of the enactment of this act, and as often thereafter as appropriate, the secretary [of the DOE] and the director [of NIEHS] shall, in consultation with the interagency committee, solicit and select proposals to conduct activities under the program." President Bush signed the law on October 24, 1992.

§ The National Academy of Sciences will submit periodic reports evaluating research results and recommending ways to promote communications efforts.

Source: *Congressional Record*, October 5, 1992, pp.H12,138-H12,139.

the current DOE researchers will continue their work," Boorman said. Brewer made a similar commitment. "There will be no break in the continuity of the work. We will provide whatever support is needed," he explained.

Arrangements also have to be made to secure nonfederal matching funds required under the law. A committee has been set up by electric utility groups to aid in soliciting this money, according to Richard Loughery, EMF issue manager for the Edison Electric Institute (EEI) in Washington. "Our credibility is at stake. We lobbied for the program, and we don't want to be seen as slowing things down," he said in an interview with *Microwave News*. Loughery is working with representatives from APPA and the National Rural Electric Cooperative Association.

Earlier this year, the DOE organized a series of workshops as part of its NERP planning process (see *MWN*, M/J92) after Congress designated it the lead federal agency on EMF research—before the switch to NIEHS (see *MWN*, S/O91). Reports from the DOE workshops—*Electric and Magnetic Fields Policy Support Workshop, May 4-5, 1992* (October 1992); *EMF Science and Engineering Research Workshop, June 3-5, 1992* (October 1992); and *National EMF Research and Communication Program: Communication Workshop* (November 1992)—are available from: DOE's Advanced Industrial Concepts Division, CE-232, 1000 Independence Ave., SW, Washington, DC 20585, (202) 586-5377.

President Bush signed the new EMF program into law (Public Law 102-486) on October 24 as part of H.R.776, the Energy Policy Act of 1992 (see *MWN*, J/F92, M/A92, M/J92 and S/O92).

Legal Notebook

NY Utility Wins Appeal in "Cancerphobia" Case

Plaintiffs in one of the nation's most high-profile power line lawsuits—the Marcy-South case—lost their appeal on October 5. The Appellate Division of the New York State Supreme Court in Brooklyn upheld an earlier ruling that denied the landowners compensation for losses in property value due to fear about the health effects of EMFs (see *MWN*, S/O89). The case—*Zappavigna v. New York Power Authority* (NYPA)—has come to be known for the claim of economic losses due to "cancerphobia."

The court also reversed a lower-court ruling ordering payment of "consequential damages" to one of the plaintiffs for visual and noise pollution from the power line (see *MWN*, J/F90), but it increased slightly the award for direct damages resulting from the condemnation for a right-of-way (ROW). The landowners' claims on cancerphobia were heard together, but damage awards are being decided individually, according to plaintiff lawyer Michael Gurda of Gurda, Gurda & Smith in Middletown, NY. Donald Zappavigna's case was the first the appellate division ruled on. Many of the other appeals are pending.

"We're very disappointed," said Robert Isseks, an attorney who worked with the plaintiffs on the appeal. "There's a reasonable basis for fear and the records show there's also sufficient basis for loss in property value." Isseks said he could not comment on whether the landowners would petition the state's highest court for a rehearing.

"There's no basis in this record to award damages based on cancerphobia, and the court agreed," Tom Watson of Crowell and Moring in Washington, who is representing the NYPA, told *Microwave News*. Watson noted that there is "a continual flow of new science" about the health effects of EMFs, but that the evidence presented in the Marcy-South case did not justify the plaintiffs' claims.

After the court first rejected the landowners' allegations in 1989, Gurda pointed out that the decision might have been different if he had been permitted to introduce the Savitz epidemiological study linking EMFs and cancer (see *MWN*, S/O89). "The fact is that ever since the claim was brought, people have been more concerned and there is more factual data available," he said recently.

The $66 million lawsuit was originally filed in January 1987 by 55 landowners who claimed that NYPA's 345 kV Marcy-South transmission line would reduce property values by creating a 206-mile-long "cancer corridor" (see *MWN*, M/A87). In September 1989, the New York Court of Claims rejected the cancerphobia charge but awarded direct and consequential damages to Donald Zappavigna. The NYPA appealed the decision, and plaintiff lawyers responded by filing a cross appeal, again raising the issue of EMF health risks.

The appellate court upheld the decision to award Zappavigna direct damages—and decided to increase the amount from $53,352 to $61,801—but disallowed the $41,215 awarded for consequential damages. The NYPA allocated a 150-foot ROW plus an additional easement of 50 feet on each side of the power line to protect against falling trees. The line, which has been energized, stretches south from Marcy to East Fishkill.

A landowner claim that was not heard with the cancerphobia cases was rejected in May 1991. John Cameron, an attorney in Goshen, NY, said that his clients, Harold and Jeanne Jonas, focused on direct loss of property value rather than on scientific evidence about EMF health risks. "We saw what happened with Gurda's clients. For every witness they had, NYPA had another saying the opposite. If people know about the controversy and are spooked by it, we're entitled to damages." Cameron filed an appeal in April of this year.

Trial Date Set for Zuidema Case

A closely watched EMF lawsuit involving a child with cancer is scheduled for trial in March. The plaintiffs in *Zuidema v. San Diego Gas & Electric* (SDG&E) claim that the utility should be held accountable for failing to warn its customers about the potential health effects of EMFs.

Ted and Michelle Zuidema allege that their daughter Mallory developed nephroblastomatosis and Wilms' tumors—kidney cancer—as a result of exposure to EMFs *in utero*. Their

Lawyers Seek To Show That EPRI Delayed Key EMF Studies

Attorneys representing a child with alleged EMF-related injuries and the Trial Lawyers for Public Justice (TLPJ) are seeking documents which they say will show that EPRI tried to avoid finding any EMF health risks. TLPJ is representing Citizens Concerned About EMFs, a California group.

The plaintiffs' lawyers in *Zuidema v. SDG&E* (see p. 7) have accused EPRI of selectively sponsoring studies that would show no link between EMFs and health risks. "The plaintiffs' charge is that EPRI...refused to fund... researchers whose studies might have shown a positive correlation between [EMF] exposure and biological effects...[and] funded only studies that it thought had a strong probability of not showing a correlation," according to a statement by the Washington-based TLPJ.

EPRI denies the charge. "Nonsense," said spokeswoman Barbara Klein. "EPRI's policy is to find out the truth about EMFs, and we do everything possible to achieve that."

In a legal skirmish, EPRI requested a protective order to shield its documents, disputing the "relevance and proper scope" of the Zuidemas' requests for information. TLPJ then filed a motion to intervene, but its request was denied by Superior Court Judge Judith Haller, who referred EPRI's motion to Judicial Arbitration & Mediation Services Inc. (JAMS) in San Diego.

"We are most interested in seeing a record of the basis for EPRI's decisions to fund or not fund studies," said Aaron Simon, one of the Zuidemas' lawyers. On October 27, Judge Ben Hamrick of JAMS granted EPRI's request, with certain exceptions. He required EPRI to release by November 10 a list of applicants for grants prior to 1990, and ordered that other documents requested by the plaintiffs be reviewed later by the California Superior Court.

"The EPRI–TLPJ dispute is a sideshow to the real issue—what science can tell us about the health effects of EMFs," said Greg Barnes, an SDG&E attorney.

claim was filed in California Superior Court in San Diego in May 1991 (see *MWN*, J/A91).

"By 1986 or so, the state of science and public concern was such that SDG&E knew or should have known about the dangers of EMFs," said Michael Withey of the Seattle law firm of Schroeter, Goldmark & Bender, adding that the utility should have done its own research independent of that done by the Electric Power Research Institute (EPRI). SDG&E Assistant General Counsel Greg Barnes stressed that the utility has abided by its commitment to keep its customers up to date on EMF research, and has urged the California Public Utilities Commission to encourage studies in addition to those sponsored by EPRI (see box). "It's disappointing that the attention we get is for the lawsuit, and not for our EMF center or anything else," Barnes said. SDG&E's EMF center, which arranges residential EMF surveys for customers, was established in April 1991.

During Michelle Zuidema's pregnancy and until Mallory was three, the family lived in a house in which EMFs were estimated to have been 3.5-17 mG. Withey said that doctors for the Zuidemas have ruled out other environmental factors and heredity as possible causes of the cancer. The results of the recently published Swedish study—which found that children exposed to magnetic fields of 3 mG or more in their homes had close to four times the expected rate of leukemia (see *MWN*, S/O92)—will be very important to the suit, said Dr. Richard Piccioni, an independent consultant who is working on contract for the Electromagnetic Radiation Case Evaluation Team (EMRCET). Plaintiff lawyers Withey and Aaron Simon, of the firm of Kazan, McClain, Edises & Simon in Oakland, CA, are both members of the group, which seeks cases with the potential to establish legal precedent (see *MWN*, M/A91). Withey acknowledged, however, that proving that EMFs caused or promoted the child's condition would probably be the toughest part of the case.

Withey said that if he cannot prove causation but does succeed in establishing SDG&E's liability for failing to warn its customers about a potential health threat, "It will establish an important legal precedent....I hope it will open the minds of people in the electric power industry to change their conduct and engage in a serious effort to mitigate and warn customers so there aren't future claimants."

The plaintiffs' expert medical witnesses will include Dr. Sam Milham, retired from the Washington State Department of Health, Dr. David Ozonoff of the Boston University School of Public Health and Dr. Peter Wright, an oncologist in Seattle. A spokesman for SDG&E declined to disclose who the utility's witnesses will be.

White House Report *(continued from p.1)*

reviews, EPA raised some of the most strenuous objections. In a letter to Young, EPA's Dr. William Farland and Margo Oge recommended that the report be accompanied by a cover letter indicating that the conclusions are those of the authors—an eleven-member panel under the direction of Oak Ridge Associated Universities (ORAU)—not those of the client agencies. The Public Health Service similarly suggested that CIRRPC should include a letter outlining the document's limitations.

"The report doesn't say that this is the view of the federal government," said Young, who is director of the office of agricultural biotechnology at the Department of Agriculture. The transmittal letter, sent to federal agencies on November 10, notes that the agencies "had no role in developing or reviewing the document prior to publication. The report therefore represents the viewpoints of the panel and does not necessarily reflect a consensus of the scientific community or of the federal government."

"I am not a bit surprised that some people are upset by this

Federal Agencies on the CIRRPC Report

The following are excerpts from the comments filed by federal agencies in response to CIRRPC's report on the potential health effects of ELF EMFs.

Department of Defense (DOD)

For many DOD individuals responsible for health and safety, the [report's] confirmation of the long-standing conventional view that commonly encountered ELF field levels are not sufficient to cause adverse human health effects is a reassuring conclusion....

Other DOD individuals associated with the electromagnetic biological research arena may [be concerned] that the report minimizes findings of positive effects, especially *in vitro* studies in cell lines, even though there is no clear extrapolation of these findings to a conclusion of causal links at the human level. Such *in vitro* findings do presuppose the existence of physical phenomena which may have important consequences beyond their intrinsic scientific interest. The [report's] basic conclusion for the absence of health effects should not be used for justifying the lack of importance for this line of research.

...Nevertheless, we consider the report to be a comprehensive and careful review of current knowledge, and support the conclusions and recommendations [of the authors].

—William Flor, Captain, U.S. Navy, Defense Nuclear Agency

Department of Energy (DOE)

Information and analyses presented...adequately support the report's conclusion that the published literature fails to provide convincing evidence that exposures to [various sources of ELF EMF] are hazardous....

We believe that the final paragraph of the report [concluding that a major expansion of the national research effort is not warranted] is susceptible to misinterpretation as failing to support any continued research on ELF EMF. Accordingly, CIRRPC should make it clear that it is appropriate to...attempt to resolve public concerns about potential dangers of ELF EMF to human health.

—Dr. Paul Ziemer, Assistant Secretary for Environment, Safety and Health

Environmental Protection Agency (EPA)

Based on our preliminary review, we believe that there is a lack of support for some of the conclusions reached in the Executive Summary. For example, the report reaches a conclusion that "ELF EMF does not appear to constitute a public health problem" and that "this review does not provide justification for a major expansion of the national research effort."...We believe that the basis for this statement is not adequately supported given discussions of research needs and the uncertainty of public health impacts stated in several chapters.

In view of the lack of a peer review and apparent errors and inconsistencies, the letter transmitting this report for public release should emphasize that the contractor report represents only the views of the panel of authors and *not* those of the federal agencies.

—Dr. William Farland, Director, Office of Health and Environmental Assessment, and Margo Oge, Director, Office of Radiation and Indoor Air

National Institute of Standards & Technology (NIST)

...NIST is aware of the years of research which have been conducted in this field....Although the focus of much of this research has been to provide convincing evidence as to whether or not there is a hazard, the most that these investigations have appeared to have been able to do is to rule out some processes and to demonstrate that the effects, if any, are not large. Thus, the report's conclusion is not surprising. For completeness, it should also be noted that there is no convincing evidence that these exposures are not health hazards.

—Robert Hebner, Deputy Director, Electronics and Electrical Engineering Laboratory

National Science Foundation (NSF)

...The executive summary of the section "Epidemiologic Studies of Cancer" does not mention the need for any further studies in this area, yet the chapter in the report devotes a page to "Future Studies."...The executive summary, in this case, seems to miss an important conclusion of the report.

We have not been able to read the report in all its details, given the time available for comment, but assume that we would have found more such problems given more time. We have no reason, however, to disagree with the major conclusions of the report.

—Dr. Philip Harriman, Program Director, Genetics

Public Health Service (PHS)

- The ORAU document is incomplete in important aspects such as the omission of numerous peer-reviewed citations.
- The Executive Summary is inconsistent with some of the detailed conclusions in the body of the report and the report indulges in speculation.
- The report recommends minimal additional research on unanswered health issues even though recent studies further suggest a problem and there is a great public demand for factual answers.
- The PHS recommends that this document be transmitted to the various agencies by CIRRPC for their own use with a cover letter recognizing the limitations of the document.

—Incorporating comments from the Food and Drug Administration, National Cancer Institute and National Institute for Occupational Safety and Health

report," Young said, explaining that a number of those who commented on it are dependent on a federal commitment to research in this field. He predicted, however, that the report, which cost about $500,000, "will be accepted in the government policy arena."

Many of the agency reviews struck a positive tone. The Department of Energy noted some "inconsistencies and errors," but it endorsed the conclusion that there is no convincing evidence that ELF EMFs are hazardous. The Department of Defense was also supportive, but it stressed the importance of further research. (For excerpts of responses from these and other agencies, see box above.)

The executive summary of the report emphasizes the uncertainties inherent in the scientific methods used to assess EMF health risks. The authors describe shortcomings of the epidemiological studies of EMFs and cancer, point to difficulties in identifying the origins of pregnancy complications, and object to the lack of "converging epidemiological and biological support for the occasionally reported adverse health effects...."

The report also gives weight to several general arguments against the possibility of adverse EMF health effects. Prominently discussed is the idea that even strong EMFs "would not

induce current densities [in human tissue] comparable to those naturally occurring in the body." This is a view championed by Dr. Robert Adair of Yale University in New Haven, CT, who reviewed the relevant section of the report—a chapter by Dr. William Bennett Jr., also of Yale.

Several agencies complained that this theory is presented uncritically. The National Institute of Standards and Technology (NIST), for example, pointed out that the only reference in this section is to a paper by Adair. This "denies the reader a more representative picture of the research efforts...that are under way," NIST wrote.

The executive summary also makes the case—laid out in more detail in Bennett's chapter—that cancer statistics run counter to the epidemiological evidence. Since "per capita electricity consumption increased exponentially in this century," this should be reflected in cancer rates for the general population if EMF exposure is a cancer risk, the report states. Barring strong countervailing trends in other risk factors, "we should be witnessing an observable epidemic of childhood cancers. However, there is little, if any, evidence of such an epidemic...." This theory was put forward most recently by particle physicist Dr. David Jackson of the University of California, Berkeley, and it has prompted objections from epidemiologists (see *MWN*, M/J92). Jackson was not part of the ORAU panel, but his assistance is acknowledged in the report. Contrary arguments are not presented (see *MWN*, J/F91, J/A91 and J/A92).

In his chapter on epidemiology, Dr. Dimitrios Trichopoulos, chairman of the department of epidemiology at the Harvard University School of Public Health in Boston, makes a similar point about cancer trends. Indeed, in January 1991, he presented his calculations to EPA's Science Advisory Board (SAB), which was reviewing the agency's draft EMF–cancer report. At that time, Dr. Genevieve Matanoski of the Johns Hopkins University School of Hygiene and Public Health in Baltimore, chair of the SAB panel, took exception, calling Trichopoulos's assumptions "extreme" (see *MWN*, J/F91).

The report's overall recommendation that research efforts need not be expanded prompted the most consistent objections. A report in the November 26 *Nature* sums up critics' views that this conclusion "seems to run counter to [the report's] individual chapters, which urge dozens of new studies." Indeed, the November 10 transmittal letter admits that, "The panel also noted areas of scientific interest that may warrant consideration for further research. These specific areas are described in the topical chapters, but may not be found in the Executive Summary."

A section on EMF effects on pineal gland function, for example, suggests "a critical need for more studies at both the *in vivo* and *in vitro* level related to the...exposure parameters...that may be important in inducing the observed changes." But Dr. Russel Reiter, coauthor of this section, told *Microwave News* that this should not be seen as a contradiction of the overall conclusions. The report merely opposes a "major expansion" of research, said Reiter, of the University of Texas, San Antonio. "You cannot imagine the length of time we deliberated over words and sentences in the executive summary and conclusions," he explained. "It was a consensus document....I like the final product."

The CIRRPC report was first requested by Sheldon Weiner of the Occupational Safety and Health Administration (OSHA) in 1989, but it gained importance in late 1990, when the President's science adviser, Dr. Allan Bromley, asked that formal release of the EPA report be delayed until CIRRPC could review it (see *MWN*, N/D90). CIRRPC provided an assessment of the EPA report in August 1991 (see *MWN*, S/O91). When ORAU was put in charge of the review, some suggested that the move was an attempt to avoid scrutiny; the panel's meetings were closed to the public (see *MWN*, J/A91).

Copies of *Health Effects of Low-Frequency Electric and Magnetic Fields*, June 1992, are available for $25.00 from: U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402, (202) 783-3238 (refer to publication 029-000-00443-9).

FROM THE FIELD

NCRP SC89 Membership

In our May/June issue we announced the formation of the National Council on Radiation Protection and Measurements (NCRP) Scientific Committee 89 (SC89) on "Non-Ionizing Electromagnetic Fields." This committee will serve as an umbrella group that will oversee three subcommittees: SC89-1 (formerly SC67), "Biological Effects of [Static] Magnetic Fields," SC89-2 (formerly SC78), "Practical Guidance on the Evaluation of Human Exposures to Radiofrequency Radiation" and SC89-3 (formerly SC79), "Extremely Low Frequency Electric and Magnetic Fields." For more on NCRP's work on non-ionizing radiation, see MWN, *D83, Ap84, J/F86 and M/J92. Members of the committees are as follows:*

SC89—Tom Tenforde (Chairman), Battelle Pacific Northwest Laboratory, Richland, WA; Ross Adey, VA Hospital, Loma Linda, CA; James Cleaver, University of California, San Francisco; Bill Guy, professor emeritus, University of Washington, Seattle; Everett James Jr., Vanderbilt University Medical Center, Nashville, TN; James Lin, University of Illinois, Chicago; Gilbert Omenn, University of Washington, Seattle; David Sliney, U.S. Army Environmental Hygiene Agency, Aberdeen Proving Grounds, MD; Jan Stolwijk, Yale University School of Medicine, New Haven, CT; Richard Tell, Richard Tell Associates Inc., Las Vegas, NV.

SC89-1—Dennis Mahlum (Chairman), National Research Council, National Academy of Sciences, Washington, DC; John Baum, Brookhaven National Laboratory, Upton, NY; John de Lorge, Navy Aerospace Research Center, Pensacola, FL; Karl Illinger, Tufts University, Medford, MA; Charlotte Silverman, FDA, Rockville, MD; Tom Tenforde, Battelle Pacific Northwest Laboratory, Richland, WA; Thomas Budinger (Adviser), University of California, Berkeley.

SC89-2—Richard Tell (Chairman), Richard Tell Associates Inc., Las Vegas, NV; Howard Bassen, FDA, Rockville, MD; Jules Cohen, Jules Cohen & Associates, Washington, DC; David Conover, National Institute for Occupational Safety & Health, Cincinnati, OH; Carl Durney, University of Utah, Salt Lake City; Ronald Petersen, Bell Labs, Murray Hill, NJ.

SC89-3—Ross Adey (Chairman), VA Hospital, Loma Linda, CA; Carl Blackmen, EPA, Research Triangle Park, NC; David Carpenter, NY State Department of Health, Albany, NY; William Feero, Electric

Research and Management Inc., State College, PA; Richard Lovely, Battelle Pacific Northwest Laboratory, Richland, WA; Richard Luben, University of California, Riverside; Martin Misakian, National Institute of Standards and Technology, Gaithersburg, MD; Mary Ellen O'Connor, University of Tulsa, OK; Richard Phillips, W/L Associates, Spokane, WA; David Savitz, University of North Carolina, Chapel Hill; Charles Ehret (Adviser), Argonne National Laboratory, Argonne, IL

HIGHLIGHTS

Technician Exposed to MW Radiation Files $5 Million Suit

A technician who was injured by microwave radiation from an illegal satellite uplink has filed a $5 million lawsuit against the owners of the transmitter. Keith Angstadt, an employee of Mutual Broadcasting Systems Inc. in Arlington, VA, is suing Multicomm Telecommunications Inc.—a subsidiary of Amway Corp., which is also named as a defendant. A trial is scheduled to begin next March in Arlington County circuit court. Parties in the case are in the process of deposing witnesses.

Angstadt was injured on May 31, 1990, during the course of routine maintenance of Mutual Broadcasting's rooftop transmitting and receiving equipment. When he went to investigate the source of an "unusual sound" he heard coming from one of the antennas, he was accidentally exposed to 6 GHz microwaves from an illegally rigged transmitter owned by Multicomm, according to his complaint. Multicomm had illegally converted a receiving antenna to a transmitter after being denied a permit from the Federal Communications Commission, said Roy Mason of the Baltimore law firm of Mason, Ketterman and Morgan, who is representing Angstadt.

Soon after the accident, Angstadt began to experience hot flashes and burning sensations on his skin and consulted doctors at Johns Hopkins University medical school's Wilmer Institute, a world-famous center for eye research. They deduced that the retinas of his eyes had sustained 5 mW/cm^2 of continuous wave radiation for two 15-minute periods, and they concluded that he had "suffered more microwave exposure than any human being ever studied by scientists," according to Mason. Angstadt is now color-blind and lacks night vision (see *MWN*, S/O91). A second technician, who worked with Angstadt and who was also injured by the radiation, has not filed a lawsuit.

"Multicomm knew or should have known of the particular risks and danger associated with the conversion and assembly of this makeshift microwave transmitting antenna....[and] that the plaintiff was likely to come in contact with leaking microwave radiation," Mason charged.

Multicomm, which is based in East Salt Lake City, UT, did not respond to repeated calls from *Microwave News*. Bert Hultink, litigation counsel for Amway, said that the subsidiary has filed for bankruptcy: "I think it was a direct result of the Angstadt suit." He declined to comment further. Amway is based in Ada, MI. Other defendants in the suit include Royal Communications Corp. of Urbana, IL, which installed the antenna, and Vertex Communications Inc. of Kilgore, TX, which manufactured it.

Dr. Jennifer Lim, Henry Kues and coworkers at the Wilmer Institute describe the results of their examinations of the two workers in a paper they have submitted for publication. A number of other microwave injury cases are currently pending (see p.13 and *MWN*, N/D90 and J/A92).

ANSI OKs RF/MW Standard; Questions Makeup of Committee

The American National Standards Institute (ANSI) has adopted the revised radiofrequency and microwave (RF/MW) radiation safety guidelines that were approved by the Institute of Electrical and Electronics Engineers (IEEE) in September 1991 (see *MWN*, N/D91). But before okaying the new limits, ANSI's Board of Standards Review (BSR) revived questions about the balance of the IEEE panel that developed them.

After meeting on October 1, the BSR requested more information from the IEEE about the makeup of Standards Coordinating Committee 28 (SCC28), which develops non-ionizing radiation health standards for the IEEE. At issue were charges, formally raised in early 1991 by Dr. Mays Swicord of the Food and Drug Administration's Center for Devices and Radiological Health in Rockville, MD, who wrote at the time that, "It is generally recognized that the current membership is not balanced in representing government, industry and the general public." (Similar objections had previously been raised; see *MWN*, S/O89 and J/A90.) "The BSR placed further action on hold pending resolution of these issues," the board's secretary, Beth Somerville, wrote in an October 2 letter to the IEEE.

SCC28's membership as of May 1990 "was determined to be balanced," according to a response prepared by Dr. John Osepchuk of Raytheon Co. in Lexington, MA, who is executive secretary of the committee. "There was concern, however, about the large representation...of the military and lack of a *breadth* of nonmilitary members" (his emphasis). A membership subcommittee chaired by Dr. Jay Brandinger, then of SRI International, "analyzed the problems and made recommendations," resulting in an expansion of the membership, Osepchuk wrote. Brandinger never issued a formal report, however.

The guidelines were formally approved by ANSI on November 18 and will be designated ANSI/IEEE C95.1-1992.

"I still think it's a problem," Swicord said in a telephone interview. "I'm not convinced that increasing the size of the committee is the answer." Swicord explained that the committee risks becoming too large to function well.

Separately, an objection that was raised by Hammett & Edison Inc. (H&E), an engineering consulting firm in San Francisco, about the standard's 100 MHz cutoff point for limiting

induced body currents did not delay the standard. H&E has argued—in letters to the IEEE in 1990 and to ANSI in February of this year—that the cutoff should not fall in the middle of the commercial FM broadcast band (see *MWN*, M/J92). The firm has lobbied for a 40 MHz cutoff, which would cover frequencies used by TV and AM radio but exclude FM radio entirely.

ANSI's BSR did not consider this issue. Dr. Om Gandhi of the University of Utah, Salt Lake City, cochair of SCC28's Subcommittee 4, which drafted the new rules, described it as "an objection after the fact," adding that the issue could be considered in the next revision of the standard. H&E's Dane Ericksen said his firm is considering filing an appeal of the BSR decision.

Commentary from San Diego *(continued from p.1)*

With all this priming, the Swedish studies were *the* topic of conversation in San Diego—from the opening cocktail party on Sunday night to Thursday morning, when the Swedes finally made their presentations. In addition to keeping up with the press coverage, most of those who came to the meeting already had copies of the full reports from Sweden. In fact, there was little else to talk about—except perhaps the Star Trek convention which greeted those checking into the hotel on Sunday afternoon. Because of the persistent scarcity of research funds, no one else had much new science to report.

A frequent topic of conversation was how the U.S. electric utility industry and public health officials will react to the Swedish government's decision to recognize the EMF–cancer risk and set health standards in the 2-4 mG range, a level that would have been unthinkable only a few years ago. And many speculated about how the industry would respond to the growing public anxiety over EMFs.

In interviews with the press, utility leaders generally praised the Swedish efforts, but cast some doubt over their reliability, due to the small size of the study populations. A few uninformed critics tried to make something out of the fact that the Swedes had failed to find an association between current spot measurements and past cancer incidence; those who resurrected this argument from the postmortems of the Savitz and Peters studies had not grasped the elegance of the Swedish study design.

"It is becoming more and more likely that there is something associated with living near high power lines," EPRI's Dr. Stan Sussman told *Time* magazine. And, in an interview in San Diego with the *San Francisco Chronicle* (November 13), Sussman said that the studies marked "important advances in our understanding of the issue." Richard Loughery of the Edison Electric Institute told the Associated Press (November 13) that, "Something is out there that cannot be explained away." But no one was suggesting the tough measures that are being embraced by the Swedes.

Utilities *are* reducing EMF exposures, albeit quietly, without conceding that there is a health risk. "It's being done, but no one is willing to admit it," said Dr. Kelly Gibney of BC Hydro, referring to large Canadian utilities such as Hydro Quebec and Ontario Hydro, as well as his own company. "We would look foolish if we didn't reduce EMFs," he said.

Similarly, Jack Sahl of Southern California Edison (SCE) said that his company has been using low-field designs for new power lines and substations for the last year and a half. "This is an important issue and we will continue to take it seriously," he said. But he maintained that there would be no policy shift as a result of the Swedish studies.

Even before the DOE meeting, Cindy Sage had tried to convince SCE to follow Sweden's lead. On October 29th, Sage, a consultant based in Montecito, CA and a member of the California Public Utilities Commission's (PUC) EMF Consensus Group, asked the PUC to "require reasonable-cost field reduction measures" when exposures at the edges of rights-of-way exceed 2 mG. The highest priority should be to reduce EMF levels in schools and day care centers, she stressed.

In his response, filed with the PUC on November 20th, Sahl noted that the Swedish studies "have not been completed" and "have not been published in the scientific literature, and the normal peer-review process has not been completed." For good measure, he added a professional rebuke: "Ms. Sage is not qualified to offer scientific reviews of these epidemiological studies."

Sahl has failed to learn a key lesson from his Swedish counterparts. By immediately announcing that they would tackle the EMF problem with new health standards and mitigation strategies, Rolf Lindgren of Vattenfall, the state utility, and Jaak Nõu of NUTEK, the government energy agency, avoided a predictable confrontation.

Sahl's comments come across as business as usual—precisely the perception the Swedes sought to avoid. Why should Americans wait for the studies to be peer-reviewed and published if the Swedish government and utilities felt no such need? Why not start drafting plans now to protect children and other high-risk groups? And why should the views of a utility manager like Sahl have any more authority than those of a consultant like Sage?

Sage's proposals for power lines in California are just the beginning. Activists across the country are demanding action on EMF risks—real or perceived—citing the Swedish studies in public hearings, newspaper columns and legal proceedings.

Concerns about cancer have spread to other sources of EMFs. In San Francisco, people are asking questions about the

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safety of the region's electric transit system, BART. And some in the computer industry are worried about video display terminals: "Just as black lung slowly but surely felled scores of coal miners, [EMFs] radiating from our [computer] systems may be killing us day by day," writes a columnist in the December issue of *PC Computing*.

And, of course, there are the EMFs from myriad appliances, such as hair dryers, dishwashers and electric blankets. The *Wall Street Journal* highlighted this problem in a front-page, second-section article on November 13th, under the headline "Study Suggests Electric Razor Link to Cancer." The story was based on a paper by Dr. Richard Lovely and coworkers from the Battelle Pacific Northwest Lab in Richland, WA, which was presented in San Diego shortly before the Swedes gave their talks. Using data collected in the mid-1980s for a study sponsored by the New York Power Line Project, Lovely found that men who used electric razors had twice the expected rate of leukemia.

The fact that the *Journal* devoted 20 column-inches to the preliminary Battelle findings—but only mentioned the Swedish studies in passing—shows once again that the press follows unpredictable rules in the way it covers EMFs. In this case, the *Journal* was no doubt looking for a news peg, but, in the process, it missed the more important story. In another display of peculiar news judgment, the *Journal* turned to Victor "I-bought-the-company" Kiam, the head of Remington Shavers, to rebut the Battelle study.

Writing in the *Seattle Post-Intelligencer* on November 20th, Dr. A.A. Afifi, the dean of the School of Public Health at the University of California, Los Angeles and a member of the advisory committee for EPRI's EMF program, summed up his position this way: "Most public health officials agree there is insufficient evidence to conclude that normal exposure to EMFs is hazardous or that there is a cause-and-effect relationship between cancer and exposure to EMFs."

Clearly, as long as public health and utility officials in the U.S. cling to the status quo, the EMF controversy will continue to rage unabated on this side of the Atlantic.

DOE and EPRI's *Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity* took place in San Diego, November 8-12, 1992.

UPDATES

COMPATIBILITY & INTERFERENCE

Utility Suspects EMI from GWEN... Virginia Power has changed the frequency of the communications system used on two of its power lines after they picked up a radio signal from an outside source, according to the utility's Robert Morton. The signal was similar to that from the USAF's Ground Wave Emergency Network (GWEN), Morton said, but he stressed that he was unable to identify it. "There are a lot of things out there—it could have come from the Coast Guard or the Navy." Although the interloping signal, which appeared in April, did not disrupt electrical service, Virginia Power decided to make the adjustment as a precaution against future EMI, Morton told *Microwave News*. GWEN program officer Lt. Col. Stephen Martin said that he has never received complaints from power companies about EMI. But he did say that it is possible that the interference came from GWEN, which operates at 150-175 kHz. Virginia Power's communications system—which helps the utility check, prevent and correct problems in power transmission—uses some of the same frequencies (90-200 kHz). The GWEN communications system, which is designed to withstand the EMP from a nuclear attack, is tested for six seconds hourly, according to the USAF. There are 54 GWEN transmitters in operation, including one in Virginia; 42 more are planned but are on hold, pending a National Academy of Sciences study on the health effects of VLF radiation from GWEN that is expected to be released soon (see *MWN*, M/J90 and N/D90).

INTERNATIONAL

Israeli RF/MW Cancer Case... An Israeli man has filed a claim alleging that his prolonged and intensive work with RF/MW radiation transmitters caused him to develop eye cancer. Itzhak Glicksman, 42, was diagnosed with melanoma in his right eye in 1990, 14 years after he began working at Elisra Electronics Systems Ltd. in Israel. The exact nature of the transmitters and how long Glicksman worked with them could not be revealed due to concerns over national security, Glicksman's attorney, Dr. Richard Laster of the Jerusalem firm of Laster & Gouldman, told *Microwave News*. But he did say that the transmitters operated in the range of 0.2 to 18 GHz, with output powers between 200 W and 2 MW. For at least six years, Glicksman worked up to 14 hours a day with the equipment—he was often positioned only 20 cm away—and he was exposed to radiation levels of 20-40 mW/cm^2. "There is no reason...that shortwave radiation, which is suspected of being a carcinogen, cannot be included in the list...of materials that can cause melanoma in the eye," Laster said. He filed the claim with Israel's Social Security Department in January 1991. It was rejected and is now under appeal, he said. Laster also noted that another Elisra employee, who worked near antennas and high-intensity transmitters, had recently been diagnosed with cataracts in both eyes. Cases of eye cancer have also been found in police officers exposed to traffic radar (see *MWN*, M/A91).

POLICE RADAR

GE Named as Defendant... Attorneys for David Berndt, a police officer in Grand Rapids, MI, have added General Electric Co. as a defendant in Berndt's lawsuit, which alleges that use of hand-held radar guns caused his testicular cancer. Jack Sweeney, cocounsel for Berndt, explained that GE makes the Gunn-effect diode used by MPH Industries of Owensboro, KY in its radar devices. The diode is the source of the radar signal, Sweeney said. "All along, GE has had more knowledge of the hazards of

microwave radiation" than the small companies that market police radar equipment, he added. As far back as the early 1980s, GE faced lawsuits over alleged radar injuries (see *MWN*, Ap81 and D82). Two other defendants, Kustom Signals Inc. and Decatur Electronics Inc. have been dropped from the case, leaving just GE and MPH (see *MWN*, M/A92)....The trial date in another case Sweeney is handling—that of Officer Eric Bendure, formerly with the Petaluma, CA police department (see *MWN*, J/A92)—has been pushed back to January 4 from November 10, due to scheduling problems and the illness of a witness.

VDTs

Finnish Pregnancy Study... What would be considered prudent for pregnant women who work at video display terminals (VDTs)? That was the question Finland's Dr. Marja-Liisa Lindbohm faced at the *Work With Display Units '92* conference in Berlin, Germany, in early September, when she presented the final results of her study of miscarriages among women exposed to VDT EMFs. "When you use a VDT, it would be better to have the lowest possible magnetic field," Lindbohm replied, cautioning that the results of her and Dr. Maila Hietanen's study need to be confirmed. Lindbohm and Hietanen, both of the Institute of Occupational Health in Helsinki, found a threefold increase in miscarriages among women exposed to VDT magnetic fields of 3 mG or more (see *MWN*, M/A92 and M/J92). Dr. Kjell Hansson Mild of Sweden's National Institute of Occupational Health estimated, on the basis of surveys, that 25% of Swedish VDTs expose operators to more than 3 mG—and 50% expose them to more than 2 mG. There are no comparable estimates for the U.S. because of the lack of any systematic measurements in this country. Lindbohm and Hietanen's paper was published in the November 1 *American Journal of Epidemiology*.

CONFERENCES

1993 Conference Calendar

January 31-February 5: **1993 Winter Meeting of the IEEE Power Engineering Society** (PES), Columbus, OH. Contact: PES Special Services, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (908) 562-3881.

February 2: **Industry Update Seminar: Non-Ionizing Electromagnetic Radiation at Radiofrequencies**, Beltsville, MD. Contact: Rachel Riley, Biospherics Inc., 12051 Indian Creek Ct., Beltsville, MD 20705, (301) 419-7878.

March 2-4: **8th Annual Winter Convention of the Cellular Telecommunications Industry Association** (CTIA), Convention Center, Dallas, TX. Contact: Norman Black, CTIA, 1133 21st St., NW, 3rd Floor, Washington, DC 20036, (202) 785-0081.

March 9-11: **10th International Symposium & Technical Exhibition on Electromagnetic Compatibility** (EMC), Federal Institute of Technology, Zurich, Switzerland. Contact: EMC Zurich '93, ETH Zentrum-IKT, CH-8092 Zurich, Switzerland, (41+1) 256-2790.

March 18-19: **19th Annual Northeast Bioengineering Conference**, New Jersey Institute of Technology (NJIT), Newark, NJ. Contact: Dr. Stanley Reisman, Electrical and Computer Engineering Dept., NJIT, University Heights, Newark, NJ 07102.

March 20-25: **1993 Joint Meeting of the Radiation Research Society** (RRS) and the **North American Hyperthermia Society**, Dallas, TX. Contact: Laura Fleming Jones, RRS, 1891 Preston White Dr., Reston, VA 22091, (703) 648-3780.

March 22-23: **1993 EMF Conference**, Crystal Gateway Marriott Hotel, Arlington, VA. Contact: Jayne Mixon, *T&D* Magazine, Intertec Publishing Corp., PO Box 12901, Overland Park, KS 66282, (913) 967-1865.

March 28-April 2: **11th Symposium of the Bioelectrochemical Society**, University of Basel, Basel, Switzerland. Contact: Dr. Dieter Walz, Biozentrum, University of Basel, Klingelbergstrasse 70, CH-4056 Basel, Switzerland, (41+61) 267-2224.

March 30-April 2: **8th International Conference on Antennas and Propagation**, Heriot-Watt University, Edinburgh, U.K. Contact: IEE Conference Services, Savoy Pl., London WC2R OBL, U.K., (44+71) 240-1871.

April 2-3: **30th Annual Rocky Mountain Bioengineering Symposium**, Holiday Inn Market Square, San Antonio, TX. Contact: Dr. John Enderle, Dept. of Electrical Engineering, North Dakota State University, Fargo, ND 58105, (701) 237-7689.

April 7-8: **29th Annual Meeting of the National Council on Radiation Protection and Measurements** (NCRP), Crystal City Marriott, Arlington, VA. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652.

April 13-16: **1993 International Magnetics Conference**, Stockholm, Sweden. Contact: INTERMAG '93, c/o Congrex (USA) Inc., 7315 Wisconsin Ave., Suite 606W, Bethesda, MD 20814, (301) 469-3355.

April 18-22: **71st Annual Convention of the National Association of Broadcasters** (NAB), Convention Center, Las Vegas, NV. Contact: NAB Convention Registration, 1771 N St., NW, Washington, DC 20036, (800) 342-2460.

April 20-22: **1993 IEEE National Radar Conference**, Boston, MA. Contact: Fritz Steudel/DD-22, Raytheon Co., 430 Boston Post Rd., Wayland, MA 01778, (508) 440-6408.

April 28-30: **2nd Annual EMC/ESD International**, Sheraton Tech Center, Denver, CO. Contact: Gary Breed, *EMC Test & Design*, 6300 S. Syracuse Way, Suite 650, Englewood, CO 80111, (800) 525-9154.

May 4-6: **7th International Ionospheric Effects Symposium**, Old Town Ramada Inn, Alexandria, VA. Contact: Dr. John Goodman, SRI International, 1611 N. Kent St., Arlington, VA 22209.

May 8-12: **28th Annual Meeting & Exposition of the Association for the Advancement of Medical Instrumentation** (AAMI), Sheraton Boston Hotel & Towers, Boston, MA. Contact: Education Dept., AAMI, 3330 Washington Blvd., Suite 400, Arlington, VA 22201, (703) 525-4890, ext. 210.

May 16-20: **1993 National Conference on Radiation Control**, Westin St. Francis, San Francisco, CA. Contact: Conference of Radiation Control Program Directors Inc., 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543.

May 17-21: **12th Annual Conference on Electricity Distribution**, International Conference Centre, Birmingham, U.K. Contact: IEE, see March 30 above.

May 18-20: **IEEE Instrumentation and Measurement Technology Con-**

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