(b) One can honestly criticize the way in which the meeting was summarized. I am not sure that any scientific gathering at which diverse points of view are hotly contested can be neatly summarized in a completely objective manner, and perhaps the organizers should have been wise enough not to try. If the manuscripts had been promptly moved toward publication, then the sense of the meeting would have been properly judged by the scientific community. Instead, the organizers chose to delay the proceedings and give us the benefit of *their* conclusions. It is a little disturbing that we have now seen two versions of these conclusions. It is very disturbing to recall the efforts towards the end of the workshop to assemble a group charged with issuing a consensus statement. I am not sure how this group was chosen, but I think it had something to do with who caught the first metro train back from the meeting site.

(c) The statement by Nordén and Ramel might have been more representative of the tone of the workshop if they had seen fit to emphasize the positive instead of the negative. No one denies the lack of an acceptable "physical-chemical" model to explain the ELF interaction but how many still doubt the influence of weak ELF magnetic fields? It may have escaped Nordén's attention that the acceptance of effects per se by the larger scientific community is itself noteworthy and remarkable, quite independent of the poor physical understanding of the underlying mechanism. Science is as much *observing* as it is *understanding*. In physics, especially, one finds wide gaps between experiment and theory. Unfortunately, in the present area, there is a small cadre of theorists who reject the experimental data simply because they cannot frame a proper explanation for the results. Nordén and Ramel have unwittingly acted to reinforce this position by emphasizing the negative, or "controversial" aspects. However, the careful, painstaking efforts of Adey, Blackman, Goodman, etc. should not be forced to suffer the sins of theorists who fail to keep pace.

(d) The conclusions suggest a number of research strategies. Because of concern over the "widely different nature and level of complexity" of the ELF studies, a more "systematic approach" is proposed in which different groups "coordinate their work." It seems to me that the one major previous attempt along these lines, the New York State Power Lines Project (NYPLP), turned into a near fiasco. I recall, in particular, the well-meaning consultants who set up exposure systems and left them in the hands of well-meaning life scientists who didn't have the foggiest notion of what happened when they switched the systems on or off. My opinion is that the most reliable NYPLP experiments were the ones that were *less* coordinated. Good science is done by good scientists, not by good scientific committees.

It is indeed a pity that Nordén and Ramel neglected the meeting's *lengthy discussion on the role of epidemiology. Now that the epi*demiologists have convinced most of us that ELF hazards exist (the Matanoski data persuaded me), is it prudent to spend limited funding on more and more epi studies without comparable expenditures on basic research? There are now 22 epi studies under way worldwide. Are there half as many basic science studies funded? Judging from the little we know of the mechanisms involved, it is unrealistic to assume that epidemiology alone will ever help us untangle what is happening at the *physical, biochemical and physiological levels of inter*action. If we ever hope to do more for the public and the power industry other than suggest "prudent avoidance," a lot more laboratory work has to be done.

Sincerely,
Abraham R. Liboff, PhD
Oakland University, Rochester, MI

Conference Reports from France and Bulgaria

Dr. Charles Polk, professor of electrical engineering at the University of Rhode Island in Kingston, filed the following reports after attending the Bioelectrochemical Society's 10th International Conference on Bioelectrochemistry and Bioenergetics *in Pont-à-Mousson, France, September 24-29, 1989, and the* International School on Electromagnetic Fields and Biomembranes *in Pleven, Bulgaria, October 2-8, 1989.*

Bioelectrochemistry and Bioenergetics–France

A substantial part of this meeting was devoted to the discussion of cell electroporation and closely related topics. The increasing interest in this area has been stimulated by the use of very large electric (E) fields (hundreds of kV/m) to temporarily fuse cells for the transfer of genetic material in preparations where cells are surrounded by a low conductivity fluid.

Efforts directed towards optimizing this technique have led to very active research on membrane behavior. The objective of this research is to understand what happens when porosity is increased substantially—but only for a very brief period—so that the cell remains viable. Some of this work deals with membrane structure and basic membrane processes and is of interest also to those who normally work with the comparatively very low intensity E-fields used in tissue repair. For example, Eberhard Neumann and coworkers at the University of Bielefeld, F.R.G., pointed out that the DNA-counterion system is rapidly polarizable.

J. Teissié of the Center for Biochemistry and Cellular Genetics in Toulouse, France, argued that cell fusion following electroporation is a consequence of a decrease of repulsive hydration forces by the E-field which disturbs the regular organization of water molecules. He indicated that it is normally hydration forces which prevent contact between cell membranes and that these forces, as well as electrostatic repulsion, are opposed by van der Waals forces.

In the context of electroporation and cell fusion, Sianette Kwee of the University of Aarhus, Denmark, identified effects of "low E-fields" as those caused by fields of 20-40 kV/m! In a paper which does not appear in the abstract bulletin, Yuri Chizmadzhev of the A.N. Frumkin Institute of Electrochemistry at the U.S.S.R. Academy of Sciences in Moscow reported that the average time required to change the ion conductivity by an E-field pulse is less than one μsec, while the time necessary to change the average pore diameter is about 10 msec. He indicated that the resealing time (i.e., time required for pore disappearance) is highly variable for different lipid membranes, but is generally above 10 sec.

Several papers addressed photosynthesis, electroluminescence and other effects of visible light in biomembranes. For example, Vlad Brumfeld and Israel Miller of Israel's Weizmann Institute of Science inferred the electrophoretic mobility of rhodopsin molecules inside vesicle membranes from differences in photoluminescence in the presence and absence of "low amplitude" (8 kV/m) msec pulses. Michael Drain and coworkers at Rockefeller University in New York City discussed photogating of ionic currents across a lipid bilayer and showed that currents of large hydrophobic ions depend upon photoinduced charge generation inside the membrane.

The discussion of electrical and electromagnetic stimulation of bone and tissue repair by Heinrich Berg, Martin Blank, Reba Goodman, Ann Henderson, Charles Polk, Sol Pollack, Joseph Spadaro,

Mays Swicord, Tom Tenforde and Bernard Veyret identified two regions of E-field amplitude where effects have been observed. E-fields at frequencies from a few Hz to 100 kHz with amplitudes between 0.01 V/m and 10 V/m have been shown to produce various biological responses. These results are considered non-controversial because the corresponding current densities are well above the endogenous levels (~10^{-3} A/m^2).

Effects at lower field intensities, down to 10^{-6} V/m, such as the calcium efflux "window effects" observed by Ross Adey and Carl Blackman and some of the Goodman-Henderson observations showing modification of cellular protein synthesis, are difficult to explain because they correspond to levels below thermal noise. Probably non-equilibrium thermodynamic processes and processes involving considerable amplification via field effects on enzymes play a role in these "ultra-low" field intensity effects, most of which seem to appear only in the presence of an alternating magnetic (B) field.

Veyret, of the University of Bordeaux, France, reported on experiments designed to explain results obtained with the "Priore apparatus" which produced considerable public discussion in France a few years ago. Apparently, a series of well-controlled experiments by reputable biologists confirmed that this apparatus did stimulate parts of the vertebrate immune system. When Priore died in 1983, detailed information on the electrical and magnetic characteristics of his apparatus was lost—although it is known that the device simultaneously used a steady (DC) B-field and a 9.4 GHz microwave (MW) carrier modulated at various frequencies in the MHz range. Veyret's group now studies only the effects of modulated MWs on the immune system of mice at a power level of 30 μW/cm^2, corresponding to a specific absorption rate (SAR) of 0.015 W/Kg—well below the threshold of 0.4 W/Kg for thermal effects. Veyret's laboratory uses 1 μsec pulses at 1 msec intervals with a 9.46 GHz carrier modulated at various frequencies in the MHz range. Modulations at 21 and 32 MHz stimulate immune response, while modulations at other frequencies between 14 and 41 MHz depress the immune system.

Electromagnetic Fields and Biomembranes–Bulgaria

At this conference more than half of the papers were devoted to electroporation and electrically stimulated cell fusion, reflecting the substantial interest in biotechnology within the eastern bloc countries. Many of these papers came from various agricultural research institutes.

Among the papers dealing with "low" field intensities (i.e., those less than 1 kV/m), I found the following particularly interesting:
(1) A one-hour lecture by Valeri Lednev, head of the Laboratory of Muscle Biophysics at the U.S.S.R. Academy of Sciences' Institute of Biological Physics in Puschino, on "Parametric Resonance" was possibly the most important paper presented at the Pleven conference. It provided a quantitative explanation of the various experiments by Abe Liboff's group, which appears to be theoretically much more plausible than the cyclotron resonance mechanisms proposed by Liboff and Bruce McLeod. Based on earlier (1960) published Russian work, it showed that E- and B-fields at specified frequencies can affect transitions between vibrational states of an ion within the molecule to which it is bound.
(2) Y.A. Kholodov of the Institute of Higher Nervous Activity, U.S.S.R. Academy of Sciences, Moscow, reported on the response of human volunteers exposed during randomly-spaced 60 sec periods to DC B-fields of up to 120 mT and AC B-fields of 0.1-5 mT. Kholodov recorded the subjects' EEGs and their verbal descriptions of sensations, including pain. He pointed out that the melanin pigment in the substantia nigra (where serotonin is produced) is one of the very few paramagnetic proteins.
(3) Ruggero Cadossi of the University of Modena, Italy, summarized information presented earlier at the U.S. BRAGS meeting on the effect of triangular B-field pulses (20 G, 3 msec rise time, 7 msec decay time) on the immune system. He emphasized that the nature of observed effects (i.e., lymphocyte proliferation) critically depends upon when the signal is applied during the cell cycle.
(4) Igor Varayev and O.V. Betsky, both of the Institute of Radio Engineering and Electronics, U.S.S.R. Academy of Sciences, Moscow, reported on a variety of experiments showing interaction of MWs at non-thermal levels with living systems. They observed "resonances" or "window effects" at 41.2 and 70.45 GHz in E-coli (increased rates of cell division), genetic effects in Drosophila at 46 GHz and blocking of the repair mechanism for DNA after radiation damage at 51.7 GHz. In experiments in which E-coli DNA was exposed to polarized E-fields at 51.78 GHz, they observed changes in conformation, but no breaks. Experiments on cell membranes, employing millimeter waves at power levels of 0.5-10 mW/cm^2, showed "resonant frequency effects" only in living, and never in dead, tissue. They also stated that some observed resonance effects correspond to transitions between rotational energy levels in water.
(5) I. Klavinsh of the Institute of Biology, Latvian Academy of Sciences, Riga, U.S.S.R., described his B-field device, which is in clinical use for bone and tissue healing. The system consists of a pair of semiflexible coils and a very compact signal generator which plugs into the European standard 220 V, 50 Hz power outlet. The device generates 1 mT B-field pulses with a rise time of 0.5 msec and a decay time of 0.6 msec, repeated either at 80 Hz or at a rate which varies between 40 Hz and 120 Hz. Klavinsh claimed that variation of the repetition rate is essential to obtain the desired physiological effects.
(6) Fritz Pliquett of Leipzig, G.D.R., reviewed pulse techniques for measuring the electrical parameters of biological tissue—conductivity and dielectric permittivity.

UPDATES

INTERNATIONAL

The Non-Ionizing Decade... The U.K.'s National Radiological Protection Board (NRPB) has included a new chapter on non-ionizing radiation in the fourth edition of its 62-page booklet, *Living With Radiation* (1989). The NRPB takes a conservative view of NIER risks, explaining that epidemiological data are "equivocal" and that the risks of exposure, "if real, are within the range regarded by society as tolerable." The booklet is available for £3.50 from: Her Majesty's Stationery Office (HMSO), Publications Centre, PO Box 276, London SW8 5DT, U.K. (01) 622-3316....An interesting contrast to the booklet is an editorial that appeared in the NRPB's January 1990 *Radiological Protection Bulletin*. The unsigned commentary welcomes the new decade by suggesting that, "The 1990s might be the decade of non-ionizing radiation." For more information, contact: NRPB Information Services, Chilton, Didcot, Oxon OX11 ORQ, U.K., (0235) 831600.

MEETINGS

EMF Effects, West Germany... An international cast of researchers is expected to speak at the April 1-7 symposium on *Electromagnetic Field Effects on Molecules and Biological Cells*, to be held at the University of Bielefeld, F.R.G. Among the topics to be covered are mechanisms of interaction and weak field effects. Contact: Dr. E. Neumann, Faculty of Chemistry, University of Bielefeld, PO Box 8640, D-4800 Bielefeld 1, F.R.G., (0521) 106-2053.

PEOPLE

Dr. **Herbert Pollack**, 84, died on January 2 of cardiac arrest. A charter member of both the Electromagnetic Radiation Management Advisory Council and the Bioelectromagnetics Society, Pollack is most widely remembered as a consultant to the State Department in the 1970s on the irradiation of the U.S. embassy in Moscow. He also advised NASA, the USAF and the Office of Telecommunications Policy and served on a number of ANSI subcommittees setting standards for RF/MW exposures. A faculty member at the George Washington University medical school from 1964 to 1970, and a professor emeritus thereafter, Pollack also consulted on nutrition and health to the Surgeon General, the World Health Organization and numerous other institutions worldwide. He received an MD from Cornell University and a PhD in Physiology from the University of Minnesota.

Professor **T. Dvoràk**, the longtime organizer of the biennial EMC symposia in Zurich, Switzerland, has retired from the Institute for Communication Technology, where he had worked since 1969. The 1991 symposium will be chaired by Dr. **G. Meyer**. Professor **P. Leuthold** will serve as the president of the symposium and Professor **Ralph Showers** once again will be the technical chairman.

RESOURCES

PEMF Review... Dr. Andrew Bassett of the Bioelectric Research Center in Riverdale, NY, has published a comprehensive review of the "Fundamental and Practical Aspects of Therapeutic Uses of Pulsed Electromagnetic Fields (PEMFs)" in *Critical Reviews in Biomedical Engineering* (*17*, pp.451-529, 1989). The paper, which includes 330 references, was refereed by Dr. Ross Adey of the VA Medical Center in Loma Linda, CA.

Ionizing Radiation... The National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) recently issued its fifth report on the health effects of ionizing radiation, which concludes that the risk of developing cancer following exposure to low levels of X-rays and gamma rays is three to four times higher than previously estimated. *Health Effects of Exposure to Low Levels of Ionizing Radiation*, known as *BEIR V*, is available for $35.00 (paperback) or $40.00 (hardcover) from: National Academy Press, 2101 Constitution Ave., NW, Washington, DC 20418, (800) 624-6242, or (202) 334-3313....The Senate's Committee on Governmental Affairs has published *Early Health Problems of the U.S. Nuclear Weapons Industry and Their Implications for Today* (Senate Print 101-63). The 16-page report is available from: U.S. Government Printing Office, Washington, DC 20402.

Mind Control... Larry Collins, the author of *Maze*, a roman à clef on the use of ELF to control behavior (see *MWN*, J/A89), has now written a nonfictional version. See the January 1990 issue of *Playboy*.

STANDARDS

New Zealand RF/MW Standard... The New Zealand government has proposed adopting most of the 1985 Australian RF/MW exposure standard. (The Australian standard covers 300 kHz-300 GHz, but the New Zealand proposal apparently covers just 300 kHz-100 GHz.) Along with the exposure standard, New Zealand is seeking comments on adopting Australia's *Principles and Methods of Measurement—300 kHz to 100 GHz*. The Standards Association of New Zealand has asked for comments on *Radio Frequency Radiation, Part 1: Maximum Exposure Levels—300kHz to 100 GHz* (DZ 6609.1) and *Part II: Principles and Methods of Measurement —300 kHz to 100 GHz* (DZ 6609.2). The Australian standard, *Maximum Exposure Levels—Radiofrequency Radiation—300 kHz to 300 GHz* (AS 2772-1985), is "flat" at 1 mW/cm^2 from 30 MHz to 300 GHz (see *MWN*, M/A86). Comments on the New Zealand drafts were due by February 16. For more information, contact: C. Gorman, Standards Association of New Zealand, Private Bag, Wellington, New Zealand, (04) 842-108.

Order *Microwave News*

[ ] 1-year subscription (6 bimonthly issues) for 250.00 ($285.00 Canada & Foreign).

[ ]____ sets of back issues, 1981-1989, $95.00 per year ($100.00 Canada & Foreign).

Order from: *Microwave News*, PO Box 1799, Grand Central Station, New York, NY 10163, (212) 517-2800. [U.S. Funds Please]

Name_____
Institution_____
Address_____
City_____
State_____ Zip_____

lipids and DNA are all electrically sensitive and their action depends on their topology."

By assuming that a molecule is sensitive to specific frequencies and that a cellular mechanism exists for the signal to elicit a cumulative effect over time, Weaver and Astumian have devised models which show that thresholds for electric field effects can be lowered by a factor of 100,000 below the thermal noise level—to levels as low as 4×10^{-6} V/m at 100 Hz and 10^{-6} V/m at 1 kHz.

In their paper, they illustrate the action of the field this way: "A reaction that is poorly catalyzed may normally proceed at a negligible rate, but the rate may increase significantly upon a field-induced conformation change of the enzyme. Each cycle produces a 'pulse' of product that may accumulate on one side of the membrane...."

The optimal coupling would occur in the range of 100 Hz to 1 MHz, based on the relaxation times of transitions between different structural arrangements of enzymes, according to Weaver and Astumian. Very little research has been carried out on this part of the electromagnetic spectrum, however. "I have always been surprised that people have not focused more on these frequencies," Astumian, a member of NIST's Bioprocessing Metrology Group, said.

When asked about the model's possible implications for magnetic fields, Weaver, who is affiliated with the Harvard-MIT Division of Health Sciences and Technology, replied, "It's hard to make the case for direct low-level magnetic field effects."

Interestingly, the Weaver-Astumian model implies that one would expect to see frequency windows like those identified by Drs. Ross Adey and Carl Blackman. "Amplitude windows are more puzzling," Astumian pointed out.

"Research has been stymied because people have not accepted that these effects could possibly be real," Astumian said. "Now we need a lot of experiments." The other major part of the problem, added Weaver, is that the funding for research has been very poor.

Science magazine is widely read in the scientific community and the Weaver-Astumian paper has attracted much interest—especially as it was featured on the journal's "This Week in Science" page. The entry began, "Do the electric and magnetic fields that are produced by common household appliances, video displays, electric blankets, utility power lines, radar emitters and other sources pose significant hazards to health?"

(Note that figures 2 and 3 on p.461 of the Weaver-Astumian paper are reversed.)

CLASSIFIEDS

Schaefer Applied Technology

200 Milton Street, Unit 8R, Dedham, MA 02026-2917
(617) 320-9900

Model EM1 ELF Magnetic Radiation Detector. Primarily intended for the non-technical customer, but also useful to professionals as a handy initial-survey device because of its convenience, portability and low cost.

Model EM10 Professional Demonstration System. Essentially identical to the Model EM1, with the addition of a cable-connected large-format display. Intended for presentations to cameras or large audiences in educational, corporate, media and legal settings.

To obtain a brochure describing the Model EM1, call 1-(800)-366-5500, ext. 901. For technical information, call 1-(617)-320-9900.

An Opportunity For Almost-Free Targeted Advertising. We will shortly begin to enclose a brief listing of providers of professional ELF-electromagnetic-radiation-related services with each Model EM1 we sell. Interested parties are invited to send a #10 SASE (please, no phone calls) for further information.

Electromagnetic Analysis

- AM, FM, TV Field Measurements and Predictions
- Evaluation of Compliance with FCC Guidelines
- Power Frequency Field Surveys
- Environmental and Industrial Health Studies

Paul C. Gailey
Consulting Physicist

4141 Forest Glen Dr., Knoxville, TN 37919, (615) 974-9829



GENERAL:
The **ELF-50 Field Monitor** is a low-cost, portable, hand-held instrument designed and calibrated to measure low level 60Hz electromagnetic field radiation generated by power lines, video display terminals (VDT's), TV sets, home appliances, industrial machinery and other similar devices.
CALIBRATION TRACEABLE TO NIST (PREVIOUSLY NBS).

WALKER SCIENTIFIC INC.
Rockdale Street
Worcester, MA 01606 U.S.A.
Telephone: (508) 852-3674 / 853-3232
Toll Free: 1-800-962-4638
Telex: 9102508517 / FAX (508) 856-9931
Code Name: "WALKER SCI"

MICRO WAVE NEWS

Vol. XI No. 1 A Report on Non-Ionizing Radiation January/February 1991

INSIDE...

ELF NEWS pp.2-6

Power Line Talk: Cancer Rates Soar • DOE EMF Budget Grows • Rhode Island Weighs Statewide Moratorium • High EMFs in Wisconsin Government Office • NPPA on Public Inquiries • California PUC To Set EMF Policy

EMF Mitigation Gains Momentum

Light Reprimand for NCI Scientists

U.K. Childhood Study Finds No Cancer Risk Below 1 mG

New Reports from EPRI

Norwegian Male Breast Cancer Study p.14

HIGHLIGHTS pp.6-11

EPA Cancer Report:
- **Utility Witnesses Fail To Sway SAB**
- **SAB EMF Panel Members**
- **Congress Keeps a Watchful Eye**
- **How To Order EPA Report**
- **Expert and Public Comments**
- **U.K.'s NRPB Sets Up Its Own Review**

EPA RF-Cancer Study in Hawaii

FCC and FAA Clash Over EMI

OSHA Warns of RF Shocks and Burns

FROM THE FIELD pp.12-13

January 17 (Postponed) Congressional Hearing: Prepared Comments from EPA, NCI and OSTP

UPDATES p.15

New Hypothesis for Henhouse Results • Studies of Maglev Health Effects • Dutch RF/MW Standard • NASA Resets Biological Clocks • MRI Bioeffects Meeting • Medical Microwaves in Yugoslavia • IEEE Seeks Comments on New Standards • European Committee Sets RFI Standard • and more...

CLASSIFIEDS p.16

Epidemiologists Call for Study of EMFs and Female Breast Cancer

Health experts are now placing a high priority on a study of the possible link between female breast cancer and exposures to electromagnetic fields (EMFs). The consensus emerged following the publication of a third report indicating an excess of male breast cancer among EMF-exposed workers.

At a January 30-31 workshop sponsored by the National Institute for Occupational Safety and Health (NIOSH), a panel of epidemiologists added female breast cancer to leukemia, brain tumors and lymphoma as critical targets for future EMF research. NIOSH's *Scientific Workshop on the Health Effects of Electromagnetic Radiation on Workers* was held in Cincinnati, OH.

In a series of interviews with *Microwave News*, workshop panelists and participants expressed almost unanimous support for the new initiative. "I think we should study female breast cancer and EMFs," said Dr. Genevieve Matanoski of the Johns Hopkins University School of Public Health in Baltimore, MD. Similarly, Dr. Samuel Milham of the Washington State Department of Health in Olympia said, "It's time to study female breast cancer vis-à-vis EMFs—absolutely."

Dr. Gilles Thériault of McGill University in Montreal, Canada, the work-

(continued on p.14)

EPA Cancer Report Update: SAB Meets, Congress Keeps Tabs, U.K. Sets Review and Excerpts from Testimony; see pp.6-10.

USC Leukemia Study Supports Denver Wire Code Risks

On February 7, Dr. John Peters of the University of Southern California (USC) presented preliminary results showing a statistically significant association between childhood leukemia in Los Angeles, CA, and wire codes—surrogates for electromagnetic field exposures. The results support previous findings of a wire code–childhood cancer link by Dr. Nancy Wertheimer and Ed Leeper and by Dr. David Savitz.

The data offer "little support" for a link between measured magnetic field exposures and leukemia risk, "some support" for a link to wiring configurations and "considerable support" for a link to children's electrical appliance use, according to a USC statement released by the Electric Power Research Institute (EPRI)—the sponsor of the study. Peters reported the results at an EPRI workshop in Carmel, CA (see p.14).

Peters has declined to comment on the study at this time. The results should be published within four months, according to EPRI. The announcement was made as we go to press; full details in our next issue.

ELF NEWS

« Power Line Talk »

Reports of **soaring cancer rates** are continuing to appear. On January 29, the **American Cancer Society** (ACS) announced that the breast cancer risk for women in the U.S. has risen to one in nine—up from one in ten in 1987. The ACS estimates that this year 175,000 American women will develop breast cancer. *Time* magazine ran an eight-page cover story on breast cancer in its January 14 issue with provocative headlines such as "A Puzzling Plague." The trend is not limited to the U.S: "There is an epidemic of breast cancer, which...appears to be occurring around the globe," Germany's Dr. Lenore Kohlmeier and colleagues conclude in a paper recently published by the New York Academy of Sciences (NYAS) in *Trends in Cancer Mortality in Industrial Countries*. While many researchers suggest that improved detection and the aging of the population may be partly responsible for the higher rates, most agree that there is more to the story. "Something in our environment is contributing," Dr. Marc Lippman of Georgetown University told *Time*. The risk of brain tumors is on the rise as well—and not just among the elderly. Dr. Devra Lee Davis of the National Research Council, one of the editors of the NYAS collection, told the December 11 *New York Times* that the rate of brain cancer among people under 45 increased about 2% each year between 1973 and 1986. Davis noted that some researchers have implicated EMF exposure as a possible brain tumor risk. Davis's results will appear in the April 1991 issue of the *American Journal of Industrial Medicine*. Last August, Davis and colleagues reported a sharp rise in brain and central nervous system cancers among the elderly in the U.S., Japan and four European countries over the past 20 years (see *MWN*, S/O90). And NIH's Dr. Nigel Greig reported in the October 17 issue of the *Journal of the National Cancer Institute* that primary malignant brain tumor incidence among the elderly "increased dramatically" between 1973 and 1985.... All of this appears to have been missed in the executive suites at EPA—hard though it is to imagine after the headline on the front page of the December 10 *Washington Post:* "Cancer Rates in Industrial Countries Rise." Dr. **William Farland**, the EPA official who deleted the "probable human carcinogen" designation from the agency's EMF cancer assessment (see *MWN*, M/J90), told the December 15 *New York Times* that it is clear that an EMF–cancer relationship cannot be too large, because the records of disease in this century do not show notable increases as the country was electrified.

«« »»

The **DOE**'s EMF bioeffects research budget will increase in fiscal year 1992, according to Dr. Imre Gyuk, the agency's program manager. The DOE asked for $5 million, which was approved by the Office of Management and Budget. In the last few years, the budget has been steady at about $3 million (see *MWN*, S/O89). When asked what he would do with the new money, Gyuk replied that he would "flesh out" some of the existing projects which had been "cut to the bone" and also develop some new requests for proposals. The final amount of the increase is now up to Congress.

«« »»

In **Rhode Island**, a local **moratorium on power lines** might soon apply to the whole state. Last October, responding to widespread public concern over the health effects of EMFs, the East Greenwich town council banned all new power lines above 60 kV for three years (see *MWN*, N/D90). In early January, two bills modeled after the East Greenwich ordinance were introduced in the state legislature by Senator Michael Lenihan and by Rep. John Hernandez, both Democrats. If the bills become law, they will impose the three-year moratorium statewide. The Narragansett Electric Company is appealing the East Greenwich action to the Rhode Island Public Utilities Commission (PUC), but this will become moot if the bills are adopted as state law, Amato DeLuca, a Providence-based attorney and the author of the East Greenwich ordinance, told *Microwave News*. According to DeLuca, public opinion in Rhode Island is behind the bills, which have "a decent shot at passing."

«« »»

Wisconsin state legislators are less than eager to go to work since EMFs higher than 100 mG were found in their office building. The levels were detected when workers in one office on the second floor noticed that their video display terminals (VDTs) were behaving erratically. Madison Gas & Electric (MG&E) took measurements in the building and found levels as high as 400 mG near the transformer room directly below on the first floor. MG&E brought the levels down to an average of 25-125 mG in some areas by reconfiguring lines and redesigning the electrical vault, but legislators and their staffs are still concerned, according to Katie McGrath, an aide to state Rep. Tom Seery, who is in charge of the EMF investigation. "People are a little frightened. We've got pregnant women in this building," McGrath told *Microwave News*. Although the initial measurements were taken last spring, most of those working in the building didn't learn about them until a local paper ran the story. Now no one wants to move into the building and those already there have turned down spacious offices with high EMF readings, McGrath said. She added that some legislators have become interested in pursuing state health-based exposure guidelines: "If it hadn't affected the legislative arena, we wouldn't be getting this much attention this fast."

«« »»

The **Northeast Public Power Association** (NPPA) is encouraging member utilities to communicate more with the public about the EMF controversy. "Do not deny the issue," NPPA's EMF task force urges in a list of guidelines for utilities planning to establish EMF policies. The NPPA recommends acknowledging public concerns and sharing information with customers and the media. The guidelines also advise: "Consider proce-

dures for minimizing potential EMF exposure when siting, designing and operating power facilities."

«« »»

On January 15, the **California Public Utilities Commission** (PUC) announced that it will investigate how it should address the issue of EMF health effects. The PUC identified four possible strategies: taking no action, maintaining the status quo while limiting any increase in exposure, instituting "prudent avoidance" and aggressively limiting exposures. Utilities and other interested parties have been requested to submit comments by March 15. Public hearings are also planned. In 1988, the PUC, in conjunction with the state Department of Health Services, launched a state-ordered, $2 million research project on the potential effects of EMFs (see *MWN*, M/J88, S/O88 and J/A89).

EMF Mitigation Projects Gain Momentum

The Electric Power Research Institute (EPRI) has allocated $1 million to study ways of reducing electromagnetic field (EMF) exposures. *Studies of Magnetic Field Management*—one of the most ambitious mitigation efforts planned to date—will identify shielding and grounding systems, as well as the most common sources of EMF exposure, Greg Rauch, who is managing the project for EPRI's Electrical Systems Division, told *Microwave News*.

Other mitigation projects are under way in Sweden and in at least three U.S. states.

Among the mitigation techniques to be investigated by EPRI are:

•*Low-field transmission line configurations:* Including reverse phase, split phase, delta and compact configurations. Tests have already shown that these designs can achieve some field cancellation (see *MWN*, J/F89), but problems, such as increased corona discharge and the need for tower design modifications, remain.

•*Line burial:* Substantial field cancellation can result when the three-phase conductors of transmission lines are very closely spaced within an underground, oil-filled, steel pipe. Cancellation is less efficient for buried, residential, single-phase, primary distribution lines and these lines may cause public exposures.

•*Return current "roundup":* Neutral return currents are often found on water pipes or other conductors in buildings and can cause current imbalances and contribute significantly to background EMF levels.

•*Ferromagnetic shielding:* Ferromagnetic materials can attenuate magnetic fields. Use of this type of shielding would probably be limited to utility workers and others who must spend significant periods of time exposed to high levels of EMFs in the workplace.

•*Robotic equipment:* EPRI has already developed a robotic remote manipulator arm for working on overhead transmission lines and could develop similar equipment for other types of high exposure work.

These approaches have emerged over the last year. For example, utility representatives, EPRI staffers and contractors reviewed them at an April 1990 workshop in Orlando, FL. Much of the research will be conducted at EPRI's High-Voltage Transmission Research Center in Lenox, MA.

A 15-page article in the October/November 1990 *EPRI Journal* illustrates a number of field reduction techniques. In an accompanying editorial, Dr. Narain Hingorani, the vice president of EPRI's Electrical Systems Division, writes that EPRI's mitigation efforts are in response to public concern about possible health effects, which is "creating pressure and expectation for measures to reduce or eliminate such fields before a scientific understanding of the nature and magnitude of the risk is in hand."

EPRI will be coordinating its efforts with the Empire State Electric Energy Research Corporation (ESEERCO), a consortium of New York utilities. In January 1991, ESEERCO announced that it will sponsor two mitigation projects with $200,000 of its own funds and $100,000 from EPRI. A contract has been signed with the IIT Research Institute (IITRI) in Chicago, IL, to compile a catalogue of exposure sources. And negotiations are under way with Professor Stewart Maurer of the New York Institute of Technology in New York City for a ten-month, $95,000 study of ground currents; Maurer would investigate possible changes in grounding regulations and design diagnostic models to identify sources of ground currents and help reduce residential EMF exposures. In the second phase of its effort, ESEERCO will develop the most promising EMF mitigation techniques.

The ESEERCO effort was prompted by the New York Public Service Commission (PSC), which has urged state utilities to conduct a large-scale EMF survey and investigate ways of reducing exposures (see *MWN*, M/A88, M/J88 and J/A89).

Separate mitigation studies are also under way in Florida and in Washington State. Last year, the Florida Environmental Regulatory Commission appointed an independent task force to oversee a two-year, $1 million survey of EMF reduction options (see *MWN*, M/J90). The project, which is being funded by the Florida Electric Power Coordinating Group and administered by the state Department of Environmental Regulation (DER), is an outgrowth of the state's 1989 magnetic field rules proceedings (see *MWN*, M/A89). The DER issued a request for proposals, No.9113, on February 8.

In Washington, the Department of Health is conducting a two-year, $40,000 investigation into the feasibility of mitigation. The project was mandated by a state law enacted in March 1990 (see *MWN*, M/J90).

The Swedish State Power Board (SSPB) is also sponsoring work on mitigation. In a paper, *Reduction of Transmission Line Magnetic Fields—Possibilities and Constraints*, presented at

the August-September 1990 meeting of the Conference Internationale des Grands Réseaux Électriques (CIGRÉ) in Paris, France, SSPB researchers concluded that decreased reliability makes compact configurations impractical over long sections of a line, but that significant field reductions can be achieved using delta and reverse phase configurations. The researchers also investigated the possibility of inducing shield currents on extra wires to cancel fields and found that this type of shielding promises considerable EMF reductions.

NCI EMF Witnesses Get Light Reprimand for Misconduct

Three National Cancer Institute (NCI) staff scientists who were paid to testify at the 1988 Marcy–South power line trial violated National Institutes of Health (NIH) outside income rules, an NIH internal investigation has concluded.

In an October 1989 memo, NIH investigators recommended that the matter be referred to the director of the NCI for "appropriate action." The memo was released to *Microwave News* following a long series of Freedom of Information Act (FOIA) requests first initiated in 1989.

The NIH has repeatedly refused to disclose what action has been taken, citing "a clearly unwarranted invasion of personal privacy." However, a knowledgeable source revealed that the punitive action was "minimal and retroactive"—a temporary ban on outside consulting which was lifted when the investigation was completed.

Recently, rumors have been circulating that the NIH has adopted an unofficial policy barring staff members from receiving income for consulting on electromagnetic field (EMF) issues. The rumors could not be confirmed, however.

In 1987 and 1988, NCI staffers Drs. Stuart Aaronson, Lucius Sinks and Margaret Tucker received $70,250.98, $41,083.42 and $12,978.04, respectively, from Crowell & Moring, a Washington, DC, law firm, for testifying on behalf of the New York Power Authority (see *MWN*, S/O88, N/D88 and J/F89). Crowell & Moring handled the bioeffects portion of the Marcy–South litigation for the New York Power Authority.

According to the memo, the director of the NIH's Division of Management Survey and Review (DMSR) found that Aaronson and Sinks earned more than the amounts stated on their approved requests for outside activity. Tucker and Sinks were found to have been paid for work performed outside the period approved by the NCI—in Sinks's case, the unauthorized fee was substantial. In 1989, Sinks told Jeffrey Mervis of *The Scientist* that NIH rules on outside income are cumbersome and do not serve the public interest (see *MWN*, S/O89).

Aaronson and Tucker refused to comment. Sinks, who left the NCI in August 1989 and is now at Middlesex Memorial Hospital in Middletown, CT, did not return telephone calls.

When asked if the NCI staffers would testify in future power line cases, Crowell & Moring's Tom Watson told *Microwave News*, "I would have no hesitation using them. They're outstanding scientists." Nevertheless, the firm has assembled a new group of expert witnesses who recently spoke on behalf of the Utility Health Sciences Group, which was organized by Crowell & Moring (see p.7 and pp.8-10).

The investigation was handled delicately because Aaronson is one of the top researchers at the NIH. He was listed as one of the institute's ten most-cited scientists of the 1980s in the June 25, 1990 issue of *The Scientist*. At the top of the list was NCI's Dr. Robert Gallo. In December 1989, Representative John Dingell (D-MI), who was investigating alleged misconduct by Gallo in the discovery of the AIDS virus, accused the NIH of repeatedly "[turning] a blind eye to misconduct by senior scientists...." Dingell's investigation was prompted by a November 1989 exposé on Gallo by *Chicago Tribune* reporter John Crewdson. Crewdson has also filed FOIA requests with the NIH

U.K. Study: No EMF–Childhood Cancer Link Below 1 mG

There was no association between the risk of childhood cancer and either the proximity of overhead power lines or calculated magnetic fields, according to a new report by Dr. A.D. Clayden and colleagues at the U.K.'s University of Leeds. "The study reveals little about possible effects of magnetic fields *per se*," the team concluded, however, since more than 95% of the case and control addresses had calculated fields of less than 0.1 mG. Indeed, the assumed background level was 0.1 mG.

The team further noted that, "The study stood no realistic chance of detecting any raised relative risk associated with a field of more than 1 mG, because of the very small numbers of cases and controls in that situation." In fact, only one case and four controls were exposed to over 1 mG.

This is one of the first of the more than 22 major epidemiological studies of EMFs and cancer under way worldwide to report results (see *MWN*, N/D89). Unlike the majority of the other studies, there are no direct measurements of magnetic field strengths, only calculations based on line-network maps and load records. "Weaknesses of the study include the lack of any measurements of magnetic fields at case or control addresses," the team pointed out, adding that direct measurements were ruled out for "ethical reasons."

The study included 374 cases of childhood cancer diagnosed in Yorkshire between 1970 and 1979 and 588 controls.

Preliminary results were first presented by Dr. A. Myers at the International *Conference on Electric and Magnetic Fields in Medicine and Biology* in London, December 4-5, 1985. Among the other authors is Dr. Ray Cartwright who, in an editorial in the *British Journal of Cancer, 60*, pp.649-651, 1989, wrote that EMF exposure risks are "minute...verging on the point of nonexistence" (see *MWN*, J/F90). The new study appeared in the *British Journal of Cancer, 62*, pp.1008-1014, 1990.

for information on Aaronson, Sinks and Tucker concerning outside income violations.

NIH outside income rules revised in September 1988 bar staff members from receiving more than $25,000 a year in outside income from profit-making organizations and from earning more than $12,500 from any one company or law firm. Because the revisions were made when the NCI staffers were already consultants to Crowell & Moring, the DMSR limited the inquiry to whether the staffers had misrepresented the fees they anticipated when requesting approval for outside income.

The following is a brief account of the staff members' violations as related in the NIH memo:

• Aaronson received approval for outside income "not to exceed $25,000" for the period February–December 1988. In 1988, Crowell & Moring paid him $51,875 in fees alone—more than double the approved amount.

• Sinks was paid $10,500 by Crowell & Moring for the last three months of 1987, but he never requested official approval. When asked why he had not submitted a request, he told investigators that it would have taken eight weeks to obtain approval and he was already involved in the case. Sinks did submit a request for "an anticipated fee of $4,000" for the first half of 1988; he earned $29,500 in fees during that period. The DMSR found that, "Sinks clearly violated the conditions governing outside work activities of NIH employees...he received $40,000 in fees even though he received approval to earn $4,000."

• The DMSR concluded that Tucker, for the most part, did not violate outside income rules—except that she began working for Crowell & Moring prior to the period for which she received authorization. The NIH did not investigate the other instances in which Tucker was a Crowell & Moring paid expert witness—in 1988, Tucker testified for at least four other utilities around the country (see *MWN*, J/F89).

The issue of misconduct was originally raised by Dr. Ross Adey of the VA Hospital in Loma Linda, CA, in a December 29, 1988 letter to the director of the NIH following the publication of the Marcy–South expert witness fees in the November/December 1988 issue of *Microwave News*.

New 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, Box 50490, Palo Alto, CA 94303, (415) 965-4081. Those marked with a dagger (†) can be obtained by calling the EPRI "straight line": (415) 934-4212.

*A.A. Afifi et al., ***Proceedings: Discussion of an EMF Protocol*** (EN-6829, Project 2964-6), July 1990. Price: $25.00 ($50.00 overseas). In this report, prepared by Robert S. Banks Associates, Inc. of Minneapolis, MN, the authors argue that the ambiguous findings of many studies of EMF health effects could be clarified by developing an improved protocol for EMF exposure assessment. They summarize the conclusions of epidemiologists and exposure assessment experts who participated in a three-day forum in early 1989: Though there was extensive examination of EMF exposure measurements, no consensus was reached on a single protocol.

*Dan Bracken, ***The EMDEX Project: Technology Transfer and Occupational Measurements*** (EN-7048), November 1990. Price: Vol.1 $25.00; Vol.2 $32.50; Vol.3 $47.50 ($50.00, $65.00 and $95.00 respectively, overseas). Preliminary results indicate general satisfaction with EPRI's EMDEX EMF measurement system. EMDEX is a microcomputer-based digital meter that monitors and records EMF exposures. The project's 50,000 hours worth of exposure data—the most extensive documentation of exposures among utility employees ever—has not yet been fully analyzed.

*D. Briskin and J.S. Feher, ***Research and Development in the 1980s: An Overview*** (OCSP-6894), June 1990. Price: $25.00 ($50.00 overseas). A summary of trends in overall spending on research and development, both nationally and internationally, with an emphasis on developments in the electric utility industry.

†***The Cyclotron Resonance Hypothesis: An EMF Health Effects Resource Paper*** (EN.3014.3.90), March 1990. Single copies are free. A descriptive and mathematical exploration of cyclotron resonance, which has been advanced—most notably by Dr. Abe Liboff—as a possible mechanism of interaction for observed EMF biological effects. This pamphlet details the physical nature of cyclotron resonance, its effectiveness in explaining laboratory results and the experimental and theoretical problems which impede its general acceptance.

†***Health Effects of High-Voltage Direct Current [HVDC] Transmission Lines: An Environmental Briefing*** (EN.3013.3.90), March 1990. Single copies are free. HVDC power lines are a cost-effective and safe way to transport electricity over long distances, according to EPRI, which argues that biological and behavioral research failed to indicate harm to humans or animals "even when exposure levels were much greater than those found within DC transmission line rights-of-way." The report concludes that further research into this area should be given a low priority, while research into the health effects from alternating current (AC) power lines should continue.

*J. Kadvany and L. Merkhofer, ***A Handbook for Communicating Potential EMF Risks*** (EN-7046), Interim Report, October 1990. Price: $32.50 ($65.00 overseas). Designed to help utility personnel respond to the growing number of public inquiries about EMF health risks. According to the authors, prerequisites for using the handbook include a well-defined utility position on EMFs and one or more individuals with a sound knowledge of the issue. A revised edition with more extensive scientific and risk communication information will be issued later this year.

*R. Kavet and J.M. Silva, ***An Alternative Hypothesis for Association Between Distribution Wiring Configurations and Cancer: Planning Phase*** (EN-6863), June 1990. Price: $25.00 ($50.00 overseas). The authors propose that elevated cancer risk among children living near high-current power lines might be due to an increase in carcinogens in drinking water caused by pipe corrosion, and they suggest that "the same external wire configurations that generate higher magnetic fields also lead to larger currents in water pipes used as grounds and thus result in accelerated pipe corrosion...." The report includes some strategies for testing this hypothesis.

****1989 Annual Report: EMF Health Effects Research Abstracts*** (EN-7066), May 1990. Single copies are free. The first annual report on EPRI's EMF program. It includes a statement on each of the

ongoing research projects.

1990 EPRI Utility Seminar: New EMF Epidemiologic Results & Their Implications, 1991. Price: $50.00 for EPRI utilities, government agencies, universities and nonprofit groups; $250.00 for others (air mail postage extra). Order from: Robert S. Banks Associates, Inc., PO Box 14574, Minneapolis, MN 55414. Proceedings of the EPRI-sponsored seminar, held October 15-19, 1990 in Austin, TX. Includes summaries of EMF research at USC and JHU, as well as transcripts of presentations and panel discussions. Also includes tutorials on epidemiology and exposure assessment.

HIGHLIGHTS

Utility Witnesses Fail To Sway SAB Panel at Public Meeting on EPA Cancer Report

Witnesses representing the utility and electronics industries were sharply critical of the Environmental Protection Agency's (EPA) draft report on the cancer threat from electromagnetic fields (EMFs). The industry testimony, presented at a public meeting in Washington, DC, January 14-16, did not appear to convince EPA's Science Advisory Board (SAB) panel charged with reviewing the report. Citizens' groups, on the other hand, supported the EPA effort and encouraged the SAB to back more research on EMF bioeffects. (Excerpts from the statements to the SAB are on pp.8-10.)

The report, which was released December 14, identified EMFs as "a possible, but not proven, cause of cancer in humans" (see *MWN*, N/D90).

While the members of the SAB's EMF panel were reluctant to give their own assessments—preferring to let the panel's final report speak for itself—many expressed their frustrations at the one-sided nature of the industry statements. Despite these critiques, the panelists had a favorable view of EPA's review of the epidemiological data. They were less impressed with the chapter on mechanisms of interactions, however.

"The epidemiological chapter is very complete with respect to the published papers," Dr. Patricia Buffler of the University of Texas Health Science Center said, but added that she would like to see more discussion of classification of exposures. Dr. Genevieve Matanoski of the Johns Hopkins University School of Public Health, who is chairing the panel, agreed, saying that the chapter was "pretty good."

On the other hand, Drs. Granger Morgan of Carnegie Mellon University and Richard Wilson of Harvard University both criticized EPA's review of mechanisms. "I don't think this is a good enough literature review," Wilson said.

After the meeting, EPA's Dr. Robert McGaughy, the project manager for the report, told *Microwave News* that, "There's a lot of rewriting and explaining to be done. We will be more explicit about the uncertainties and that could change the tone of the report." Overall, he said, "I've not heard anything at the meeting to materially change the conclusions of the report."

The panel focused much of its attention on the testimony of the witnesses assembled by the Utility Health Sciences Group, representing more than 85 utilities. The group is being coordinated by Crowell & Moring, a Washington, DC, law firm. In their prepared statements, each—to a greater or lesser degree—discounted the link between EMFs and cancer, but their credibility suffered under questioning by the SAB panel members.

Dr. David Korn of Stanford University School of Medicine, who is also the chairman of the National Cancer Advisory Board, concluded that the data are "soft and noisy" and that the link between EMFs and cancer is "extraordinarily speculative." Following Korn's prepared statement, Drs. Craig Byus of the University of California, Riverside, and Bary Wilson of the Battelle Pacific Northwest Lab questioned him about specific studies. When Korn did not respond, Morgan asked whether he had read the key 20-30 papers on cellular and animal effects—Korn conceded that he had not.

Similarly, Dr. Mark Mandelkern of the University of California, Irvine, told the SAB panel that all the mechanisms of interaction were "implausible" and that "it's hard to understand this phenomenon," but he admitted under questioning that he was not familiar with the papers on EMF effects on melatonin production, which has emerged as a key focus of research interest. Bary Wilson and Morgan, this time joined by Dr. David Bates, the vice chairman of the panel, asked how he could address low-level effects when he did not know the literature. At one point, Mandelkern started to shuffle through his papers in an effort to respond. "How can you argue [your case] when you have to look up what you have read?" Morgan asked.

The absence of a clear mechanism did not lead the panelists

SAB EMF Panel

The members of the SAB's Non-Ionizing Electric and Magnetic Fields Subcommittee are: Dr. Genevieve Matanoski (Chair), Johns Hopkins University, Baltimore, MD; Dr. David Bates (Vice Chair), Vancouver, BC, Canada; Dr. Karim Ahmed, Princeton, NJ; Dr. Patricia Buffler, University of Texas, Houston; Dr. Craig Byus, University of California, Riverside; Dr. Kelly Clifton, University of Wisconsin, Madison; Dr. John DiGiovanni, M.D. Anderson Cancer Center, Smithville, TX; William Feero, Electric Research and Management, State College, PA; Dr. Robert Harris, University of North Carolina, Chapel Hill; Dr. Clark Heath, American Cancer Society, Atlanta, GA; Dr. Nan Laird, Harvard University, Boston, MA; Dr. Granger Morgan, Carnegie Mellon University, Pittsburgh, PA; Dr. Donald Pierce, Oregon State University, Corvallis; Dr. Mary Ellen O'Connor, University of Tulsa, OK; Dr. Charles Susskind, University of California, Berkeley; Dr. Bary Wilson, Battelle Pacific NW Lab, Richland, WA; and Dr. Richard Wilson, Harvard University, Cambridge, MA.

to discount the epidemiological results linking EMFs to cancer. "Lack of mechanisms is a valid criticism of the epidemiological data, but it does not mean we should throw it out," Bates told *Microwave News*. On the third day of the meeting, Bates expressed his frustration at many of those who had discounted the epidemiological studies. "I don't think many of the speakers had carefully read the epidemiological literature—including the U.S. Air Force." On the previous day, the Air Force had presented a blistering attack on the EPA report which was adapted from written comments submitted in October (see *MWN*, N/D90).

Dr. Dimitrios Trichopoulos, the chairman of the Department of Epidemiology at the Harvard University School of Public Health—another utility witness—was less dismissive, noting that causality is a "possibility." Nevertheless, he said that, according to his calculations, if there is a true link between EMFs and childhood cancer, given the electrification of the country over the course of the century, he would have expected an "epidemic" on the order of the one attributed to tobacco smoke. "We don't see it," he said. This prompted Matanoski to point out that there has been a consistent increase in childhood leukemia since the 1930s. She later told *Microwave News* that she thought that the assumptions upon which Trichopoulos based his analysis were "extreme." Dr. Donald Pierce of Oregon State University also said he was not swayed by Trichopoulos's reasoning.

In an interview after the meeting, Bary Wilson told *Microwave News* that the Utility Health Sciences Group witnesses "did not help their cause: They did not read the literature, they came with preconceived notions from their own areas of research and did not seem to consider important findings from other areas."

At the close of the meeting, the SAB panel members divided themselves into three groups to review specific portions of the document: physics and biophysics; epidemiology; and cell biology and mechanisms. The panel will meet again as a whole in April. Matanoski said that she plans to submit the panel's report in June.

Congress Keeps Tabs on EPA EMF–Cancer Report

Congress is actively monitoring the events surrounding the release of and the Science Advisory Board's (SAB) review of the Environmental Protection Agency's (EPA) draft *Evaluation of the Potential Carcinogenicity of Electromagnetic Fields*.

A number of members of the House of Representatives have criticized both the White House for its role in delaying the release of the report and the procedures set up by the SAB for its official review.

More than two weeks after the November 27 publication date, EPA had still not issued the draft report, due in large part to objections raised by President Bush's science advisor, Dr. Allan Bromley (see *MWN*, M/J90 and N/D90). After the White House's involvement was made public, the document was released on December 14, with an agency disclaimer added to the front stating that "there are insufficient data to determine whether or not a cause and effect relationship exists" and that the "review draft should not be construed as representing agency policy or position."

How To Order the EPA Report

Copies of EPA's draft report, *Evaluation of the Potential Carcinogenicity of Electromagnetic Fields* (EPA/600/6-90/005B), are available from: ORD Publications Office, CERI-FRN, U.S. EPA, 26 W. Martin Luther King Drive, Cincinnati, OH 45268, (513) 569-7562, FAX (513) 569-7566.

In this interval, there were turbulent exchanges between Capitol Hill and EPA and the White House. In a December 11 letter to Bromley, Representatives George Brown (D–CA), chairman of the House Committee on Science, Space and Technology, James Scheuer (D–NY) and Frank Pallone (D–NJ) charged that Bromley's "unprecedented decision" to postpone the SAB review of the EPA report is "more likely to fan public concern than to allay it." Bromley, denying that he censored the document, responded on December 17 that his objections were rooted in the wording of the executive summary, which he claimed showed that the authors had determined that there is a causal relationship between EMFs and cancer.

Brown, Scheuer and Pallone also condemned the SAB for the manner in which the witnesses had been scheduled for the January 14-16 panel meeting. By the end of December, almost all of the slots for public comments had been assigned to speakers with ties to the utility industry. Four of the speakers represented the Utility Health Sciences Group, a coalition of more than 85 utilities "dedicated to promoting dialogue on EMF science issues" which was organized by the Washington, DC, law firm Crowell & Moring.

In a December 21 letter to EPA Administrator William Reilly, Brown, Scheuer and Pallone argued that "...the 'stacked deck' appearance of the presentations will destroy the very credibility of the SAB review process," and urged Reilly to "put an immediate halt to the practice of granting to interested parties the right to control who appears before the SAB." Pallone himself ultimately testified at the meeting before the SAB panel (see p.9).

Representative George Miller (D–CA), chairman of the House Interior Subcommittee on Water, Power and Offshore Energy Resources, scheduled a hearing for January 17 on the EPA report and the White House's involvement. "I want to know what the EPA found in its study. And...if Bush Administration officials in fact sought to manipulate the report's scientific findings for political purposes," Miller said. EPA's Erich Bretthauer, Dr. Richard Adamson of the National Cancer Institute and Eugene Wong, Bromley's assistant, were expected to testify, but the hearing was canceled at the last minute due to the Persian Gulf conflict. (For excerpts from their written statements, see pp.12-13.) At this time, there is no word when the hearing will be rescheduled.

Comments on the EPA EMF-Cancer Report

External Peer Review Panel

On June 28, 1990, a peer review panel met in Morrisville, NC, to discuss EPA's draft report on EMFs and cancer. The panel members were asked to consider, among other things, whether the document should contain a classification of cancer risk based on EPA's 1986 cancer risk guidelines (see MWN, *M/J90). The following are excerpted from the panel members' written comments, which were submitted after the meeting. They were released to* Microwave News *under the Freedom of Information Act.*

Dr. Larry Anderson, Battelle Pacific Northwest Lab (BPNL), Richland, WA: Overall the document is quite accurate as to current scientific understanding of the issues....Perhaps the major criticism of the document relates to the organizational mixing of ELF and RF study citations. Biological responses to exposure in varied frequency ranges may demonstrate marked differences....I concur with other members of the panel that it is yet too early to classify EMFs with respect to their carcinogenic potential. Certainly, it should not be designated with an A or B classification. However, sufficient evidence exists to suggest that further vigorous research is appropriate....It is especially important to expand the federal role in this area of research.

Dr. Richard Griesemer, National Toxicology Program, Research Triangle Park, NC: Among the research needs, one area that I think might deserve more attention is the possible effects of EMF exposure on gene expression.

Dr. Richard Luben, University of California, Riverside: [The executive summary] could point out more explicitly that the evidence associated with possible carcinogenicity of non-ionizing EMFs is difficult to classify using the EPA guidelines....[M]y own evaluation of the data is that the human studies provide limited evidence (i.e., suggestive but not conclusive) for the involvement of some component of EMF exposure in development of some human cancers. The animal evidence is clearly inadequate....The supportive evidence offers a number of plausible mechanistic scenarios for cancer induction or promotion, but is currently incomplete and thus inadequate. The above criteria would appear to fit into the category of a B1 carcinogen for EPA classification purposes.

Dr. Raymond Neutra, Department of Health Services, Berkeley, CA: Overall I thought [the document] was excellent....The EPA guidelines for chemical carcinogens hold for a set of agents which are acting by a familiar if not fully understood paradigm. They do not comfortably fit [EMFs]....Thus I agree with EPA that the guideline categories do not apply here and that a dose response assessment should not be made at this time.

Dr. Richard Phillips, W/L Associates, Spokane, WA: Using the weight of all evidence (human and animal data), there is limited evidence that exposure to ELF magnetic fields results in an increased incidence of cancer in humans....At present there are no data from laboratory animal studies. Such information does not really fit the EPA classification scheme that has been used for chemicals—the available data do not fit B1, B2 or C, but it is closest to B2....However, I believe it would be premature to classify the carcinogenicity of ELF magnetic fields at this time....In the interim, we direly need to initiate some lifetime exposures of experimental animals to low-level 60 Hz magnetic fields, particularly for modeling leukemia, brain cancer and breast cancer.

Dr. Charles Poole, Epidemiology Resources, Inc., Chestnut Hill, MA: In my opinion...the deficiencies of the guidelines are serious enough to justify a decision not to classify the human evidence as either "inadequate" or "limited" at the present time. The classification decision should be deferred until the guidelines are improved or until the immense amount of ongoing research has been completed.

Dr. Asher Sheppard, VA Hospital, Loma Linda, CA (did not attend the meeting): The draft document presents the information that leads to the conclusions on epidemiological studies in a thorough, well-balanced and fair manner and the reasoning is logical, well-supported and persuasive. The discussions of *in vivo* and *in vitro* studies have many more difficulties....[C]oncerning the finding that it is inappropriate to classify the carcinogenic potential of fields because a mechanism is unknown, I found this argument unpersuasive....The lack of adequate mechanisms is a weak excuse that would be untenable in the face of strong epidemiological or clinical findings....In summary, I find the arguments specious, but share a reluctance to label the fields as carcinogenic on the basis of weak epidemiological data in the absence of mechanistic understanding. However, I would put aside my misgivings and I find it logical to label fields as "probable" human carcinogenic agents on the basis of the "weight of the evidence." Hence, I reluctantly disagree with the EPA draft position and strongly disagree with its arguments.

Dr. Richard Stevens, BPNL: In a number of places in the text [of the epidemiological section], it seems that the authors are biased in favor of the existence of an effect....I believe that given the current state of evidence, ELF should *not* be classified as B1. At most it should be classified as C, a possible human carcinogen.

Public Comments to the SAB Panel

On January 14–16, 1991, the SAB's Non-Ionizing Electric and Magnetic Fields Subcommittee held a public meeting in Washington, DC (see pp.6-7). The following comments are excerpted from many of the written and oral statements presented at the meeting. Those who spoke before the SAB panel are marked with an asterisk (*). Those who appeared on behalf of the Utility Health Sciences Group are marked with a dagger (†).

****Dr. Eleanor Adair, John B. Pierce Lab, New Haven, CT:*** Most of the epidemiological research is flawed and risk ratios are unpersuasively low....Further, in my view, the "weight of evidence" approach adopted in the document is inadmissible; no amount of mediocre data combined with other mediocre data will generate good or even believable data. I reject this method of analysis totally.

****Dr. Robert Adair, Yale University, New Haven, CT:*** [The chapter on mechanisms of interaction is] not just bad science, it's crackpot science....[The recent work by the U.S.S.R.'s Dr. V.V. Lednev is] crackpot quantum mechanics.

Alexandrians for Safe Electric Power, Virginia citizens' group: [W]e ask for a response from the EPA's [SAB] to the following question...: Would they purchase a home for themselves and their families exposed to the level of ELF EMF readings in the eight-block area of Old Town [levels averaging 20–30 mG with a maximum of 100 mG]?

Dr. C.A.L. Bassett, Columbia University, New York, NY: [With a few exceptions, I] found [the document] to be a well-considered statement at this stage of our collective ignorance.

****Dr. John Bergeron, General Electric, Schenectady, NY:*** If the EPA had chosen skepticism [on the calcium efflux experiments], then there would no longer be *any experimental basis at all for the belief that bioeffects including cancer promotion can be attributed to ambient fields*....I believe it would be in the public interest for the SAB to recommend to the agency that the highest priority laboratory research ought to be a project dedicated to resolving the dispute about calcium efflux.

****Mayor Jim Connors, Scranton, PA:*** Our people want to know whether they should move [away from power lines]....There are a large number of people [here] representing industry....Who is representing the people?

****Richard Doherty, Electronic Engineering Times:*** [U]ntil we establish better instrumentation, which can properly classify the true nature of the beast we suspect of generating harmful effects in living tissue, we are not performing science. We are instead hunting desperately for empirical evidence to support hypotheses while using imprecise and unhoned instruments.

Richard Ekfelt, Electromagnetic Energy Policy Alliance, Washington, DC: Although our review has been limited in view of the short time schedule, we have uncovered sufficient evidence of misunderstandings of physical principles and sloppiness in composition of this draft so as to suggest that it does not meet minimum standards of science and scholarship.

****Dr. David Erwin, U.S. Air Force Armstrong Lab for Human Systems, Brooks AFB, TX:*** In general, there is sufficient research being carried out in various laboratories commensurate with the urgency of the problem....Our reviewers of this document are convinced that there is no suggestion that EMFs present in the environment today induce or promote cancer.

****†Dr. Edward Gelmann, Georgetown University School of Medicine, Washington, DC:*** Using any of the standard scientific criteria we apply to carcinogenesis, there is no support for the notion that power frequency electric and/or magnetic fields can induce or promote cancer or have any effect on tumor progression.

****David Goeller, Environmental Action, Washington, DC:*** The government should be funding the search for these answers. The researchers and reviewers must be independent....The controversy will remain and grow until we get these answers. Are EMFs safe? Are they silent killers? The public has a right to know.

****Dr. Richard Griesemer, National Toxicology Program, Research Triangle Park, NC:*** [The peer review panel found the] evidence is suggestive but inadequate—something less than 'B'....The whole field needs vigorous pursuit....Overall, we thought the study is well-balanced and reflects what is in the published literature.

Barbara Iannucci, Residents Against Giant Electric (RAGE), New Jersey citizens' group: [T]he body of the EPA release detailing suggestive evidence of positive associations now provides a credible source for the ongoing attempt to fill the informational vacuum reflected in public records to date.

****†Dr. David Korn, Stanford University School of Medicine, Stanford, CA:*** The...epidemiological studies...are so subject to procedural and methodological challenge as to be essentially uninterpretable....I believe that the evidence of the possible carcinogenicity of EMFs is vastly insufficient to support any kind of sound decision-making with respect to new cancer regulatory policy.

****Eileen Kotter, East Brunswick, NJ:*** This past October 1990, the families in my neighborhood realized that there appeared to be [four] children experiencing neurological problems....The only common factor that we can discern is that our affected children have been sleeping in rooms with milligauss levels ranging from 22 to 38 and playing in areas where the level is as high as 117.

Dr. James Lin, on behalf of the Committee on Man and Radiation, IEEE: At present, there is no scientific consensus as to which factors, the electric field and/or the magnetic field, are biologically important.

Dr. James Lin, University of Illinois, Chicago: I am disturbed by a melange of frequencies and responses taken from different spectra strung together in the name of NIER.

****†Dr. Mark Mandelkern, University of California, Irvine:*** [All the mechanisms of interaction are] implausible....It's hard to understand this phenomenon.

****Dr. Martin Meltz, University of Texas Health Science Center, San Antonio:*** The committee should consider asking for a complete rewrite of the document.

****Dr. Sol Michaelson, University of Rochester, NY:*** Mayor Connors's [Scranton, PA] anxiety and concern have been needlessly encouraged by the EPA report....Hysteria could cause greater biological effects than EMFs.

Michigan Residents Against Giant Energy (RAGE), Michigan citizens' group: We urge this committee to release this report and its findings, not diluted or influenced by the pressures of corporate politics.

****Rep. Frank Pallone (D-NJ):*** [M]y hope is that this report will serve as the catalyst to federal action that will help...to set the stage for the type of credible, comprehensive research program I believe we desperately need, and which the public increasingly will demand.

Parents Against an Unsafe Environment (PAUSE), Pennsylvania citizens' group: Grass-roots organizations are forming all across the [U.S.] to fight power lines, radio towers and substations....Of particular interest is the fact that power companies are spending a disproportionate amount of money defending their stances compared to the citizens' groups which challenge them.

Dr. Charles Polk, University of Rhode Island, Kingston: I find that the...statement in the "executive summary" [p.1-5, paragraph 1] is very responsible, clear and fully justified.

Joel Ray, coauthor of The Electric Wilderness, ***Ithaca, NY:*** That the mechanisms of interaction of NIER and biological processes are not fully understood should be no argument against classification as a "probable human carcinogen" by EPA on the basis of the weight of the evidence.

****Kirvil Skinnarland, Seattle City Light, Seattle, WA, and the Large Public Power Council (LPPC):*** Reviews of the existing scientific literature have been prepared by numerous organizations, and we in the LPPC believe that the EPA review of previous studies should be the last. There is almost universal agreement that more research is needed. Now is the time to move ahead to the next stage—additional research. We need answers, and we need them sooner rather than later.

Dr. Thomas Tenforde, BPNL: [T]here are still two major problems with the document: one, the literature review is not critical....two,

there is a consistent tendency to give more weight to positive findings of putative [EMF] effects than to studies where no effects were observed....I feel that it would be a serious mistake to release this document in its present form....

*†*Dr. Dimitrios Trichopoulos, Harvard University School of Public Health, Boston, MA:* A widespread and exponentially increasing exposure...would have created a 20th century epidemic of childhood cancer similar to that of lung cancer. There is no such evidence and, accordingly, the proposed association of ELF EMFs with childhood cancer lacks epidemiologic coherence.

**Sharon Webster, Alexandria, VA:* I [have] exercised "ultimate avoidance" by moving my children completely out of a home which had a milligauss level one moderately warm day of 50. This was done at great economic and personal expense....[A]s I looked around at the number of children in the neighborhood with neurological and/or learning disabilities, I felt that I had no choice.

Hawaii, EPA Studying Cancer Near Navy RF Base

The Hawaii Department of Health (DOH) and the Environmental Protection Agency (EPA) are investigating the possibility that radiofrequency (RF) radiation from Navy transmitters may be linked to a cluster of childhood leukemia cases. The Navy communications complex at Lualualei near Honolulu has been the subject of concern among local residents since 1982 (see *MWN*, J/A82, M/J87 and S/O90).

EPA sent a team to the site in late November to take measurements at the request of the DOH. Ed Mantiply of EPA's Office of Radiation Programs (ORP) in Las Vegas, NV, told *Microwave News* that the field levels were consistent with those the Navy measured in 1982. He did not specify the readings, however, explaining that they will not be disclosed until the agency completes its report later this year.

When the Navy took readings in 1982, the highest radiation levels at the boundary of its facility were 83 V/m for very low frequency (VLF) and 1.35 V/m and 4.16 mA/m for low frequency (LF). For high frequency (HF) radiation, the levels were at least 16 times (24 dB) less than the ANSI standard (63 V/m at 30 MHz and 632 V/m at 3 MHz); and for microwaves (MW), they were less than 10 $\mu W/cm^2$.

At that time, the facility included one VLF antenna, one LF antenna and several HF antennas. There were also a number of MW towers.

Dr. Bruce Anderson, deputy director of the DOH, said RF radiation is one of several possible causes of the cluster. Also under consideration in the department's "preliminary investigation" are the more than 1,000 barrels of used motor oil that were dumped improperly in and around the Wainae district where the cluster occurred. The oil contains benzene, a carcinogen, Anderson told *Microwave News*. He also noted that the cluster may have been a random occurrence. The DOH will continue its inquiry for six months to a year before developing any "tentative" conclusions, Anderson added.

U.K.'s NRPB To Review EPA EMF-Cancer Draft Report

The U.K.'s National Radiological Protection Board (NRPB) has set up an advisory group to examine the conclusions of EPA's draft report, *Evaluation of the Potential Carcinogenicity of Electromagnetic Fields*.

The group is chaired by Sir Richard Doll, an epidemiologist at the Imperial Cancer Research Fund (ICRF), and includes: Dr. Valerie Beral, also an epidemiologist at ICRF; Dr. Nicholas Day, a biostatistician at Cambridge University; Dr. Martin Gardner, an epidemiologist at the University of Southampton; Dr. Edward Grant, a physicist at King's College, London; and five NRPB staff members. The group's evaluation is expected to be complete in April. The NRPB, which advises the U.K. government on radiation safety standards, conducts research and directs technical training programs, is based in Chilton, outside of Didcot, Oxon.

Fourteen childhood leukemia cases were recorded for Wainae in the state tumor registry between 1980 and 1984, compared to the two to three cases that would normally be expected, Anderson noted. Nine of the cases were identified and reported in 1987 by the Cancer Research Center of Hawaii (see *MWN*, M/J87). The department learned of the additional cases during the summer of 1990 from local pediatrician Dr. Robert Wilkinson.

The new data were raised by Hawaiian officials at a U.S. Senate hearing held in Hawaii in August, increasing public concern. The hearing by the Senate Government Operations Committee had been called to address waste hazards in the state.

Anderson said that the childhood leukemia rate in the area did not exceed the expected rate during the ten years prior to and the five years following the cluster period, based on the registry records.

The EPA measurements were made using a broadband meter. Mantiply said he also took random extremely low frequency (ELF) electromagnetic field measurements in and around power distribution lines, noting that he did not know the locations of the cancer victims.

Mantiply conferred with Navy officials prior to taking measurements, and Navy staffers traveled with the EPA team and took their own measurements. There were no significant variances between the two sets of readings, Mantiply said.

FCC and FAA Clash Over Avionics-Broadcast EMI

Federal Aviation Administration (FAA) proposals to limit electromagnetic interference (EMI) from radio and television stations are being strongly opposed by the Federal Communications Commission (FCC) and the broadcasting industry. While the FAA is seeking to protect aircraft electronic com-

munications and navigation equipment from potentially hazardous interference, the FCC and broadcasters claim that the new rules are unnecessary and that compliance would be very costly for regulators and industry alike.

Under the proposed rules, the FAA would have to be notified of any construction or alteration of very high frequency (VHF) television transmitting stations or radiofrequency (RF) transmitters operating at frequencies above 30 MHz and with an effective radiated power above 10 kW. The new rules would also classify EMI as a "potential obstruction" to aircraft, restricted by the same rules as physical structures.

"All the new rules do is clarify some gray areas," Gerald Markey, manager of the FAA's Spectrum Engineering Division, told *Microwave News*, adding that, "We have been accused of being conservative, but when it comes to air safety, it's our job to be conservative. If radiation interferes with an aircraft's communication system, we consider it a hazard to aviation."

The FCC does not agree. "While the FCC certainly endorses and shares the goal of improved air safety, we believe the proposed FAA rules would impose substantial additional costs—without offsetting benefits—on the FCC as well as the communications industry," wrote FCC Chairman Alfred Sikes in a January 4, 1991 letter to Samuel Skinner, Secretary of Transportation. The FAA is part of the Department of Transportation.

"Because it failed to consider the legitimate needs and views of the FCC and communications licensees when it prepared its proposed new rules, the FAA has produced proposals that are technically flawed and discriminatory...against communications licensees. These proposed rules wholly fail to serve the public interest," argued the National Association of Broadcasters (NAB) in a joint statement with the Association for Maximum Service Television. The FAA proposals have also met with objections from the land-mobile radio and cellular telephone industries.

FM radio and VHF television transmitters, which operate at frequencies close to the aircraft communications band, would be affected most directly by the new rules.

The FAA and the FCC have been struggling for control over the broadcast spectrum for over a decade. In 1978, Congress directed the FAA to consider EMI. In the years that followed, increased FAA regulation of EMI consistently met with opposition from the FCC and broadcasters.

In 1985, the FCC proposed rules to enhance the compatibility of FM broadcasts with aviation electronics. These rules were criticized as too lenient by the FAA and were never adopted (see *MWN*, My85). Though both agencies acknowledge the need to cooperate, they have yet to agree who has the final say on EMI.

The FAA's notice of proposed rulemaking appeared in the August 3, 1990 *Federal Register* (pp.31,722-31,738).

Try *EMF Papers*, the *Microwave News* clipping service (see p.16)

OSHA Warning on RF Shocks and Burns near AM Transmitters

The Occupational Safety and Health Administration (OSHA) has issued a warning against potential radiofrequency (RF) shocks and burns to longshoremen working near AM radio transmitters.

The September 5 bulletin was prompted by reports of burns suffered by longshoremen while unloading cargo in San Francisco, CA. According to OSHA, a crane cable picked up RF energy from nearby AM radio transmitters and discharged it into the workers. An OSHA health response team measured currents in the cables as high as 200 mA—double the proposed American National Standards Institute (ANSI) exposure limit for controlled environments. (The proposed limit for uncontrolled environments is 45 mA.)

Mac Cheeks, an OSHA spokesman in Washington, DC, told *Microwave News* that the wharf is considered to be a "controlled environment," even though the AM stations are not part of the work site. At a June 1989 meeting of the subcommittee charged with revising the 1982 ANSI RF limits, the definition of a "controlled" environment was a hot topic of debate (see *MWN*, S/O89). Cheeks pointed out that the longshoremen's electric field exposures were only 10 V/m—well below the 1982 ANSI safety limit of 632 V/m at AM frequencies.

In an interview, Bob Curtis, director of OSHA's Health Response Team in Salt Lake City, UT, pointed out that RF shocks and burns occur well below the ANSI contact standards. "It's a real hazard," he said.

OSHA has recommended that dock employers protect workers unloading cargo at the San Francisco site by placing an insulator between the crane hook and the crane cable, by grounding the crane cable or by providing insulating clothing.

Similar shock and burn hazards were documented in 1988 by Paul Gailey, a consultant now based in Salt Lake City, UT, at the H-3 highway site on Oahu, HI, located under an OMEGA transmitter operating at 10–13 kHz (see *MWN*, J/A88). Gailey's report for the U.S. Coast Guard was highly controversial at the time; however, OSHA has since imposed specific requirements at the worksite to protect against RF shocks and burns, according to Curtis.

In 1982, *Chemical Engineering* magazine warned of possible fire hazards at chemical plants located near AM transmitters (see *MWN*, Ap82).

MICROWAVE NEWS is published bimonthly • ISSN 0275-6595 • PO Box 1799, Grand Central Station, New York, NY 10163 • (212) 517-2800; FAX (212) 734-0316 • Editor and Publisher: Louis Slesin, PhD; Senior Editor: Jennifer Goren; Assistant Editors: Matthew Connelly, Barton Biggs; Contributing Editor: Mark A. Pinsky; Copy Editors: Jim Feldman, Peter Pullman; Circulation Director: Barbara Gerson • Subscriptions: $250.00 per year ($285.00 Canada & Foreign, U.S. funds only); single copies: $50.00 • Copyright © 1991 by Louis Slesin • Reproduction in any form is forbidden without written permission.

FROM THE FIELD

Testimony Prepared for the January 17 Congressional Hearing

Rep. George Miller (D-CA), chairman of the House Interior Subcommittee on Water, Power and Offshore Energy Resources, scheduled a hearing for January 17, 1991 to investigate whether the White House's OSTP had interfered with the release of EPA's report on EMFs and cancer. The hearing was canceled at the last minute due to the war in the Persian Gulf. At press time, a subcommittee staffer told Microwave News *that the hearing would be rescheduled in the near future, but could not specify a date.* Microwave News *has obtained the written statements of EPA, NCI and OSTP officials who had been asked to appear. The following are excerpted from their prepared statements.*

[Abbreviations: CDC—Centers for Disease Control; CIRRPC—Committee on Interagency Radiation Research and Policy Coordination; DHHS—Department of Health and Human Services; DOD—Department of Defense; DOE—Department of Energy; DOL—Department of Labor; EMFs—electromagnetic fields; EPA—Environmental Protection Agency; ERD—external review draft; FCCSET—Federal Coordinating Council for Science, Engineering and Technology; NCI—National Cancer Institute; ORD—Office of Research and Development; OSTP—Office of Science and Technology Policy; RF—radiofrequency; SAB—Science Advisory Board]

EPA

Erich Bretthauer, assistant administrator, ORD: [A] meeting was convened by White House staff to inform our federal colleagues of [the EMF-cancer] assessment effort. This briefing occurred March 6, 1990 and included representatives from EPA, OSTP, DOE and DOD and White House staff members, among others. The briefing discussed the report and the process for completion of the document and resulted in a recommendation that other appropriate federal agencies, such as the NCI and CDC, be included in reviewing early drafts of the document.

An extensive internal review process began in March....resulted in an extensively revised draft which was distributed to a panel of external scientific peer reviewers assembled by ORD in June 1990....Approximately 700 copies of this draft were distributed between June and August 1990....Comments from that review as well as others received were considered in the revision to produce the current document, the ERD.

At this same time, recognizing the importance of EMFs, Mr. William Reilly, the administrator of EPA, asked Dr. Allan Bromley, director of OSTP, to look at the EMF issue. Mr Reilly's request was similar to a proposal originally made by DOL....

Printed copies of the ERD were received by EPA in late November and a *Federal Register* notice announcing the SAB meeting and the availability of the draft was signed...on December 13, 1990, and published in the *Federal Register* on December 17, 1990. Copies of the ERD have been made available to the public and press upon request.

I am aware that there are reports that Dr. Bromley's participation in this process held up the release of [the current draft report.] I believe it is important to set the record straight on Dr. Bromley's involvement. Following my offer to brief Dr. Bromley on this report, a request was received to schedule a briefing....Drs. [William] Farland, Robert McGaughy (the EPA document project manager) and I then met with Dr. Bromley on November 26, 1990. At this meeting we informed Dr. Bromley of the findings of the soon-to-be-released ERD and discussed the next steps in the ongoing process of scientific review. Dr. Bromley expressed concern with certain of the studies in the evaluation and with the conclusions that the agency had reached in its evaluation. He indicated that he would inform the administrator of EPA that he felt that the CIRRPC review was critical in the development of a scientific perspective and that he felt that the CIRRPC review should precede the public review of the document. We explained the difficulties with his proposal, but I indicated that I would return to the agency and further consider his recommendation.

On December 5, 1990 I met with Dr. James Mason, assistant secretary for health, DHHS, who chairs the FCCSET committee which oversees CIRRPC, to discuss CIRRPC's review of the report. We also discussed the proposed process for review of the ERD by the agency's SAB. Staff from OSTP and DOE also attended the meeting. Dr. Mason agreed with the proposed process, but expressed reservations concerning certain technical findings of the report. We agreed to meet the next day with technical staff to discuss these concerns. On December 6, 1990, Drs. Farland, McGaughy, John Skinner (my deputy), Peter Preuss (director of my Office of Technology Transfer and Regulatory Support) and I met with Dr. Mason and technical staff from the NCI, CDC and DOE. The primary concern raised by Dr. Mason and these agency officials was that the six-page executive summary did not convey the balanced presentation of the information found in the 381-page report; and, therefore, that it might be unnecessarily alarming to the public. Concerns were also raised about the technical interpretation of some of the studies used in preparing the latest draft. While acknowledging that they had commented on the earliest draft, none of the participants had provided comments on the intermediate "workshop review draft."

Upon further deliberations within the agency, it was decided that the technical concerns expressed by Drs. Bromley, Mason and others should be dealt with by the SAB and CIRRPC review processes and, therefore, we should proceed with the SAB meeting already scheduled for January 14–16, 1991. Further, it was decided to acknowledge the current disagreement among the federal agencies with a "Note to Reviewers" that would be inserted into the document, stating, "Currently there is a disagreement among the reviewers from various agencies about the weight of evidence and the conclusions presented in the executive summary."...

These briefings, meetings and deliberations delayed our own self-imposed deadline for the *Federal Register* notice by approximately three weeks but did *not* affect the planned schedule for the SAB review and did *not* result in any changes to the document. The only change made from the agency's original review schedule is that opportunity for public comment will be delayed. This is due to the fact that, based on the reviews by the SAB and CIRRPC, the current draft document will be revised as necessary and a *Federal Register* notice will then be published requesting public comment. The final version of the document will be developed after public comment....

NCI

Dr. Richard Adamson, acting deputy director: ...Over the past decade, there have been an increasing number of reports suggesting that low frequency EMFs might be associated with cancer in humans. Overall, the observations are inconclusive and do not demonstrate a causal connection....

Occupational studies of electrical workers have suggested associations with certain cancers, particularly leukemia and brain tumors. However, these studies are difficult to interpret because electrical workers are often exposed to chemicals, solvents and other potential carcinogens....Epidemiologic studies of residential EMFs and cancer have also been inconsistent....Further, despite the great increase in

energy consumption and exposure to low frequency EMFs that has occurred in our country over the past 40 years, there has been no corresponding increase in the incidence of childhood leukemia or other childhood cancers during this same time period.

...[I]n September 1989, the NCI initiated a four-year study of childhood leukemia and EMFs in collaboration with the Children's Cancer Study Group (CCSG). The CCSG is a multicenter network of pediatric oncologists, epidemiologists and other cancer researchers from 38 institutions and affiliated hospitals across the U.S. The EMF study is part of a larger investigation evaluating the risk of childhood leukemia associated with a number of factors, including prenatal x-rays, indoor radon, childhood and pregnancy-related diseases, pregnancy-related drug use and smoking, parental occupations, household chemical exposures and family histories of cancer....

The EMF evaluation will involve approximately 600 children who developed acute lymphocytic leukemia under the age of 15, and 600 matched controls residing in six states....The study has several methodologic advantages which should clarify the potential hazard associated with EMFs. Foremost, the study includes a very strong measurement component....Second, the study will focus on recently diagnosed cases of leukemia....

Results are still preliminary but indicate that an excellent predictor of personal magnetic field exposure can be obtained from measurements of magnetic fields in the bedroom for 24 hours, coupled with spot measurements made in the family room and kitchen....

In a letter dated March 9, 1990 from EPA, the NCI was requested to review the draft [EMF–cancer report]. NCI staff members...provided written comments that were sent to EPA on April 17, 1990. All NCI reviewers agreed that the human epidemiologic data to date did not support the sweeping conclusions made in the EPA report. In our judgment the conclusions presented were not scientifically sound and were unnecessarily alarming.

Recently, staff members at the NCI reviewed the revised EPA draft report dated October 1990. A number of concerns were raised as to the accuracy of statements found in the body of the report, but most importantly the executive summary remained scientifically unbalanced and we believe it should be substantially rewritten. The available evidence is, in our view, far too weak and contradictory to support the overall message that epidemiologic studies "involving electrical power frequency exposures show a consistent pattern of response which suggests a causal link."...There appeared to be a tendency throughout the report to dismiss negative or inconclusive findings rather than weighing these inconsistencies in the overall interpretation. These problems were then carried over to the executive summary. The childhood cancer studies, in particular, are far from "strong" when all the available data are considered.

It could be made more clear in the document that no statistically significant associations of cancer with EMF measurements have been found. The few "statistically significant associations" reported in epidemiologic surveys are with indirect indicators of EMFs, such as wire code configurations and job titles. Neither job classifications nor diagrams of nearby external power lines are known to correlate well with EMF exposures in the workplace or home, and job classifications may be indicators of exposures other than to EMFs....

[Some EPA] statements rest upon the implicit assumption that the carcinogenicity of EMFs has been demonstrated, which it has not. Missing throughout is a clear statement that we cannot conclude at this time whether EMFs pose a cancer hazard....

In summary, it is not clear today whether exposure to low intensity and low frequency EMFs pose a cancer risk. Previous studies have been inconclusive and inconsistent. There are no laboratory investigations linking EMF exposures to cellular transformation or animal carcinogenesis....[W]e found that [EPA's] conclusions were not balanced, were open to misinterpretation and, as such, were unnecessarily alarming to the American public....

OSTP

Eugene Wong, associate director for physical sciences and engineering: The issue of low level EMFs and their possible effects on health is not new to OSTP....Over a year ago—in October 1989—CIRRPC received a request from the DOL to investigate the scientific validity of possible associations between exposure to EMFs and the development of certain forms of cancer. Last summer, Dr. James Wyngaarden, OSTP's former associate director for life sciences, and Dr. Bromley specifically asked CIRRPC to review the status of research in this field and recommend appropriate additional studies to clarify outstanding questions....

Last summer the administrator of EPA, William Reilly, asked Dr. Bromley if it would be possible for FCCSET to independently review [EMFs and cancer], in addition to the review that would normally be conducted by EPA's SAB....

Dr. Bromley passed on Mr. Reilly's request to Dr. Alvin Young, director of the Office of Agricultural Biotechnology at the Department of Agriculture, who is chairman of CIRRPC....

Shortly before EPA's draft report was scheduled to be released to the SAB for review, EPA was asked to brief Dr. Bromley and OSTP on the contents of the report. On November 26, 1990, Dr. Erich Bretthauer, the assistant administrator of EPA, and two of his staff members, Drs. William Farland and Robert McGaughy, who were heavily involved in the preparation of the report, briefed Dr. Bromley, myself and several other members of OSTP's staff.

Much of the briefing concerned the body of the report, which, in general, is a workmanlike summary of various studies of the health effects of exposure to EMFs. However, the members of OSTP at the briefing expressed concerns that the report's executive summary contained conclusions that did not accurately reflect the content of the report. For example, the executive summary states that "[a] large number of human studies are available in which the relationships between human cancer incidence or mortality and exposure to EMFs have been investigated." In fact, the report cites only about a dozen such studies involving electrical power sources and a few more involving RF sources. Some of the studies involved very few cases, and some are assessed by the report itself to be seriously flawed in methodology. Further, many of the studies did not involve a measurement of exposure to EMFs but proximity to potential sources of such fields. Indeed, one study found that "risk tended to increase with increasing distance" from such a source.

This puzzling finding illustrates the state of uncertainty left by the existing studies, a state that is accurately portrayed in the report but not in the executive summary....

At the briefing, the OSTP staff members made no demand that EPA take any particular course of action with its report. We expressed our views and left it to EPA to decide what to do.

However, about two weeks after the briefing—but before the report had been sent to the SAB and therefore released to the public—several press reports appeared implying that OSTP was in some way delaying release of the report. This implication is patently false....

Throughout this process, the objective of OSTP has been to ensure that scientific facts are presented accurately to the public. When there is general uncertainty and disagreement within the scientific community as to the meaning and implications of research findings—as is the case with the health effects of EMFs—premature and unwarranted conclusions are inappropriate. Reports should be factual, and their executive summaries should refrain from editorializing. To do otherwise is to risk unnecessary and unwarranted public concern. I might add that the senior members of EPA are in total agreement with us on these points....

shop's keynote speaker on EMF epidemiological studies, said that such a study is a "fairly high priority."

"It is important to design very good follow-up studies on male and female breast cancer," said Dr. Patricia Buffler, director of the Southwest Center for Occupational Health and Safety at the University of Texas Health Science Center in Houston. Buffler, who is chairing another major workshop on the future direction of EMF epidemiological studies, added, "I'll make sure this issue is addressed at the workshop." The invitation-only meeting, *Future Epidemiologic Studies of Health Effects of EMF*, sponsored by the Electric Power Research Institute (EPRI), was held in Carmel, CA, February 5-8 (see *MWN*, N/D90).

The new emphasis on female breast cancer was prompted by the publication of a Norwegian study which was the third to link male breast cancer to occupational EMF exposures (see story at right). The Norwegian researchers are already planning a study of female breast cancer among telephone workers. In November 1989, Matanoski and coworkers identified a cluster of male breast cancer among young New York telephone workers (see *MWN*, N/D89). Last June, Paul Demers and Dr. David Thomas, both at the Fred Hutchinson Cancer Research Center in Seattle, WA, reported that telephone linemen, electricians and electric power workers developed male breast cancer at six times the expected rate (see *MWN*, J/A90). In a telephone interview, Thomas noted that the new finding "confirms the results of the other two studies and cannot be dismissed."

Dr. Richard Stevens of Battelle Pacific Northwest Lab in Richland, WA, has long espoused a theory on breast cancer and EMFs and/or "light-at-night" (see *MWN*, J/F87), but to date has been unable to secure funding for a study. "Stevens's hypothesis should now be tested," Dr. Michel Coleman of the International Agency for Research on Cancer in Lyon, France, said in Cincinnati.

In an unusual show of agreement, researchers from academia, industry and government all called for further studies—among them were Dr. David Savitz of the University of North Carolina in Chapel Hill, Dr. John Peters of the University of Southern California in Los Angeles, Dr. Leeka Kheifets of EPRI, Dr. Linda Erdreich of Environmental Research, Inc. in New York City and NIOSH's Dr. Teresa Schnorr and David Brown.

Many of the epidemiologists cited the evidence of EMF-induced changes in melatonin production as a rationale for pursuing the female breast cancer link (see *MWN*, J/A90). "Enough is known about the biology of melatonin in animals and humans to make the link plausible," Coleman said. And Savitz noted that the melatonin work "leads to epidemiological predictions—probably the only testable hypothesis in this field."

A number of the researchers cautioned that EMF-female breast cancer studies will not be easy. "It may be hard to do," warned Matanoski. And Milham noted, "I don't think a high proportion of female breast cancer could be related to EMFs, but if the same mechanism is operating in women as in men, you should be able to detect it in women."

Dr. Russel Reiter of the University of Texas Health Science Center in San Antonio pointed out that there are a number of different types of female breast cancer and a variety of risk factors to be considered in designing a study: "If you think melatonin is related, it would be better to look at younger women—15 to 35 years old."

Matanoski also suggested that if there is an EMF-neuroendocrine effect, the incidence of prostatic cancer among EMF-exposed men should also be investigated.

Breast cancer is the most common type of cancer among American women, according to the American Cancer Society, and the rate is on the rise (see p.2).

Male Norwegian EMF Workers Have Excess Breast Cancer

Norwegian men exposed to ELF EMFs on the job developed breast cancer at twice the expected rate—a statistically significant increase. The new report, published in *The Lancet*, is the third in the past year to detail an increased risk of male breast cancer—an extremely rare disease—among EMF-exposed workers (see p.1).

"The results indicate an association," wrote Drs. Tore Tynes and Aage Andersen of the Cancer Registry of Norway in Oslo, but they warned that, "the numbers are small and the results should be interpreted with caution."

Tynes told *Microwave News* that he and Andersen plan to study female telephone workers exposed to EMFs from switching equipment.

In interviews, Johns Hopkins University's Dr. Genevieve Matanoski said, "Now we have three studies. I think it's fascinating," and Battelle's Dr. Richard Stevens called the new study "extremely provocative."

Using data from their registry—considered to be one of the most comprehensive in the world—Tynes and Andersen found that electrical transport workers, including railway engine drivers and tram drivers, had a statistically significant fourfold increase of male breast cancer. The incidence among electricians was more than twice that expected, though not statistically significant. There was a significant doubling of male breast cancer risk for all the groups combined.

The researchers noted that although the subgroups they used supported the EMF–breast cancer link, "the job titles selected may not be the best for an evaluation of cancer risk to workers exposed to ELF fields....Our results seem to support the justification of further studies on the association between breast cancer and occupational exposure to ELF fields."

Tynes and Andersen looked at cancer data on all Norwegian residents between the years 1960 and 1985, focusing on the distribution of breast cancer cases among electrical workers according to occupational status at the 1960 and 1970 censuses. For that 25-year period, they observed 12 cases of male breast cancer among 37,953 workers (824,321 person years) where 5.8 were expected. Their letter appeared in the December 22/29, 1990 issue of *The Lancet*.

UPDATES

BIOLOGICAL EFFECTS

New Hypothesis for Henhouse Results...EPA's Dr. Carl Blackman has come up with a new idea to explain the variation in results obtained by the six labs that participated in the Henhouse Project. The project sought to replicate the findings of Dr. Jocelyne Leal of the Ramón y Cajal Hospital in Madrid, Spain, showing that weak PMFs can damage developing chick embryos (see *MWN*, M/A88 and S/O90). Of the six labs, five found that a 1 μT PMF caused an increase in abnormal embryos—though only two had statistical significance. The pooled results were significant at the p=0.001 level. As previously reported, one of the six labs used a different strain of eggs, indicating a genetic component to the effect (see *MWN*, J/F90). In a letter published in the November/December 1990 issue of the *Bioelectromagnetics Society Newsletter*, Blackman points to a trend of declining statistical significance of the PMF effect in the five remaining labs with decreasing levels of the earth's DC magnetic field. "From this data, it is possible to hypothesize that the mean total DC flux density must be higher than 35 μT for a field-induced effect to be observed" for experiments using the Henhouse protocol. As early as 1986, Leal herself stressed the importance of the DC magnetic field in understanding PMF effects (see *MWN*, J/F87). Blackman urges his fellow researchers to "include a test of the potential influence of the static magnetic field on the pulsed field induced effects" in future studies.

INTERNATIONAL

Dutch RF/MW Standard... The Netherlands Environmental Health Inspectorate recently published a guideline for exposure to RF radiation from stationary emitters. The guideline is based on the International Radiation Protection Association's (IRPA) RF/MW guidelines, which were revised in 1988 (see *MWN*, Mr84 and J/F88). Dr. Branko Bosnjakovic of the Dutch Ministry of Housing, Planning and Environment told *Microwave News* that the new guideline will be used by regional authorities charged with licensing TV and radio transmitters and radar facilities. Bosnjakovic is a member of IRPA's International Non-Ionizing Radiation Committee. For a copy of *Richtlijn voor Radiofrequente Straling bij Zendinrichtingen* (#90-01), available only in Dutch, contact: Ministry of Housing, Planning and Environment, Centrale Directie Voorlichting en Externe Betrekkingen, Van Alkemadelaan 85, 2597 AC's-Gravenhage, The Netherlands, (31+70) 317 41 74.

MEDICAL APPLICATIONS

NASA Resets Biological Clocks... Bright lights aren't just for treatment of seasonal affective disorder (SAD). Some NASA astronauts who work on night-shift operations are using high-intensity light to alter their circadian rhythms before space launches. According to the January 14 issue of *Aviation Week and Space Technology*, astronauts on a recent space shuttle mission were able to reset their biological clocks by using bright lights for only four days before launch. In the past, astronauts adjusted their rhythms by going to sleep earlier and earlier over a six-week period.

MEETINGS

MRI Bioeffects... The New York Academy of Sciences (NYAS) will hold a meeting on the *Biological Effects and Safety Aspects of Nuclear Magnetic Resonance Imaging and Spectroscopy*, May 15-17, 1991, at the Hyatt Regency in Bethesda, MD. Among the presenters will be Dr. Frank Shellock of the Cedars–Sinai Medical Center in Los Angeles, CA, and Sweden's Dr. Bertil Persson of the University of Lund. Contact: NYAS at (212) 838-0230.

Medical Microwaves in Yugoslavia... Belgrade will be the site of *Microwaves in Medicine '91*, April 8-11. The meeting will address medical applications, radiation risks and safety standards. Dr. Stanislaw Szmigielski of the Center for Radiobiology and Radiation Safety in Warsaw, Poland, has been invited to present a lecture on EMFs and cancer. Contact: Prof. Z. Djordjevic, Institute of MW Techniques and Electronics, Bulevar Lenjina 165b, PO Box 220, 11070 Belgrade, Yugoslavia, (38+11) 135-420.

STANDARDS

European RFI Standard... The European Committee for Electrotechnical Standardization has asked for comments on a draft standard, *Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical (ISM) Radiofrequency Equipment* (EN 55 011 prAB). Copies are available for $8.00 each from: International Sales Dept., ANSI, 1430 Broadway, New York, NY 10018.

Power Line Effects... The IEEE has issued a call for comments on its proposed new standard, *Definitions of Terms Relating to Corona and Field Effects of Overhead Power Lines* (BSR/IEEE 539), a revision of a 1979 standard (ANSI/IEEE 539). All comments are due by Febuary 26, 1991. For a copy of the standard, send $30.60 to: Michelle Phillips, IEEE, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855. Comments should be sent to Linda Dame at the same address.

TECHNOLOGY

Maglev and EMFs... Understanding the effects of magnetic levitation systems is rapidly becoming a priority in Washington, DC. EPA has been required by the Clean Air Act Amendments of 1990, passed last fall, to report to Congress by May 15, 1991 on the "health and environmental aspects of maglev technology." The agency is also looking into EMFs from maglev trains for the Federal Railroad Administration (see *MWN*, S/O90). And the National Research Council's (NRC) Transportation Research Board is considering EMF effects as part of an ongoing project on *High-Speed Surface Transportation in the United States*. The NRC's Walter Diewald, the project officer, told *Microwave News* that although EMFs will only be a small part of the study, the committee assembled by the board will probably use the EPA EMF-cancer report to provide "some guidance." The committee is studying potential commercial applications of high-speed transportation technology, including magnetic levitation.

CLASSIFIEDS

Magnetic Sciences International

announces:

Two new magnetic field meters

developed for professional users and utility companies:

The **MSI-25:**

• reads directly in milligauss at 60 and 180 Hz for measuring in environments where harmonics are appreciable. Calibration accuracy: ±3% at 60 Hz, ±5% at 180 Hz.

The **MSI 20-25:**

• offers the frequency responses of our rising-response and flat sensors, switch-selectable. A difference in reading=harmonics. For brochure call 415 486-1024 or write: **MSI,** 2425B Channing Way, Suite 489, Berkeley CA 94704

Safe VDTs with 0.0 milliGauss (magnetic radiation) as well as 0.0 Volts/meter (electric radiation) at 60 Hz and at VLF frequencies. Used by U.S. Congress, U.S. EPA, NY State & Yale Medical School. Magnetic radiation milliGauss meters to measure power lines, VDTs, TVs. Call George Lechter at (800) 222-3003 or (617) 444-7778, or write for literature to Safe Computing, Inc., 33 William St., Needham, MA 02194. The Safe Monitor has been featured on CNN, NBC and CBS.

VDT NEWS

The computer health and safety newsletter

$87.00/year from:

PO Box 1799, Grand Central Station,
New York, NY 10163, (212) 517-2802.

EMF Papers

A clipping service on non-ionizing radiation

Microwave News now offers *EMF Papers.* For only $100 per month you will receive a packet twice a month containing the most recent literature on electromagnetic fields, keeping you up-to-date on all the news in the news. It's the perfect complement to your subscription to *Microwave News.*

Subscribe today, or send $25 for a sample packet.
To order, call: (212) 517-2800.

Microwave News
Bound Editions

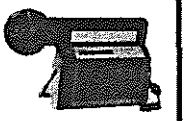
•The first five years of *Microwave News* (1981-1985) are now available as a bound volume for $450.00.

•A second volume (1986-1990) will be available soon, also for $450.00.

For more information, contact:
Louis Slesin at (212) 517-2800.

ELF MAGNETIC FIELD METER

MFG. by COMBINOVA AB, SWEDEN



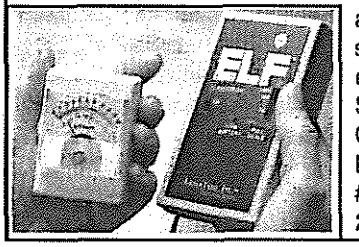
- Meets Swedish requirements for accuracy.
- Locates sources 5 to 2000 Hz.
- Accurate, rugged, portable
- Programmable, stores 4000 measurements.

ERGONOMICS, INC.

P.O. BOX 964 • SOUTHAMPTON, PA 18966 • (215) 357-5124 / FAX (215) 364-7582

Magnetic field meter for extremely low frequencies

ELF SENSE™



ELF magnetic fields are under study as a possible health hazard. **ELF Sense™**, our two-component system, allows you to seek maximum field direction while easily reading its analog meter. Make accurate measurements close to sources such as electric blankets and VDTs. Standard 9v battery included. Checks, MO, COD $295.00 ExpanTest, Inc.™, 232 St. John St., #316M, Portland, ME 04102. 207-871-0224.

Order *Microwave News*

[ ] 1-year subscription (6 bimonthly issues) for $250.00 ($285.00 Canada & Foreign).

[ ] 6-month trial (3 bimonthly issues) for $130.00 ($150.00 Canada & Foreign).

[ ] ____ back issues, 1981-1990, $95.00 per year ($100.00 Canada & Foreign).

[U.S. Funds Please]

Order from: *Microwave News,* PO Box 1799, Grand Central Station, New York, NY 10163, (212) 517-2800.

Name_____
Institution_____
Address_____
City_____
State_____ Zip_____

MICRO WAVE NEWS

Vol. XII No. 1 A Report on Non-Ionizing Radiation January/February 1992

INSIDE...

EMF NEWS pp.2-8

Power Line Talk:
Utilities' Outlook on Moving Facilities • JASON and DOE • Whatcom County Revisited • EPRI Workshop on Transients • Another Showdown Over Florida ROW Limits? • Newsletter Proliferation • Rhode Island Task Force Report • Marketing "Radiation Free Bedding" • NERP News • Illinois Town Takes on Commonwealth Edison

DOE Seeks $7.5 Million for 1993 Research

Brain Tumor Victims Sue Northeast Utilities

Rep. Brown Confident on $70 Million Program

Wisconsin Mandates Low EMF T&D Systems

Florida School Suit Settled

Mitigation Roundup:
Washington State Task Force Report
Power Line Patent to Ashley
New Papers

Ambiguous Cancer Link on Cape Cod

U.K.'s IEE Reports on Biological Effects

HIGHLIGHTS pp.8-12

Seattle and King County Issue RF Rules

SCC-28 Response to Seattle's Concerns

NY Police Union's Radar–Cancer Survey

SAB Completes Work on Cancer Study

No MRI–Reproductive Risk Found

EMPRESS II Gulf of Mexico Site Opposed

EC Worker NIER Guidelines Proposed

FROM THE FIELD pp.12-13

Interview with Rep. George Brown

UPDATES pp.14-15

California PUC Cellular Investigation • Wolpe Hearing Transcript Available • People in the News • "T&D" Magazine's EMF Conference • Maine Law Restricts Light at Night • Harkin and the Microwave Democrats • Tesla at the Top of the Charts

CONFERENCES p.15

Additions to 1992 Conference Calendar

CLASSIFIEDS pp.15-16

Possible Radar Link in Florida Hodgkin's Disease Cluster

A cluster of Hodgkin's disease cases has been identified in an ocean-front neighborhood in Florida adjacent to an air traffic control radar on Patrick Air Force Base (AFB).

A recent Florida Department of Health and Rehabilitative Services (DHRS) study included the cases of eight people diagnosed with Hodgkin's, a lymphatic cancer, between 1967 and 1983 in South Patrick Shores, which is about 20 miles south of Cape Canaveral. Seven of the eight lived within 400 yards of the radar, which is used by both the Federal Aviation Administration (FAA) and the U.S. Air Force; the eighth lived just slightly farther away from the radar.

Additional cases have been identified in the area—bringing the total to almost twice the number in the DHRS study. A local newspaper reporter, Jim Ash, has found 15 cases, including two men who work at Patrick AFB. DHRS researchers did not include the base in their study area.

Initially, community concern focused on toxic chemicals. Articles Ash wrote in July for *Florida Today*, a paper based near Melbourne, examined whether pesticides and other chemical wastes from a closed military dump had contaminated residents' drinking water. The possibility that toxic pollution caused this cluster has largely been dismissed, however.

In the DHRS study released in September, state epidemiologist Dr. Richard Hopkins of Tallahassee wrote that the cause of the cluster "is unknown." He concluded that the "most likely explanation...remains an infectious agent, circulating in the community in the mid-sixties through the late seventies."

(continued on p.10)

Bioelectromagnetics in Europe: A New Era of Collaboration

Bioelectromagnetic research is flourishing as Europe moves toward economic unity. In a new climate of collaboration, initiatives are being shaped to coordinate research, to set common exposure standards and to establish a European research laboratory.

At the close of the *First Congress of the European Bioelectromagnetics Association* (EBEA), held in Brussels, Belgium, January 23-25, EBEA President Dr. Jocelyne Leal predicted that the links being forged among researchers would usher in a new era of cooperation. "Our meeting was a success, not only because we had 160 participants and good papers, but also because it will open the way for productive collaboration in the future," she told *Microwave News*. The EBEA now has 367 members from 35 countries.

Some of the emerging research arrangements are informal. Others are

(continued on p.11)

« Power Line Talk »

A new trend is developing among utilities facing opposition to power lines and substations because of EMF health concerns: power companies are agreeing to move controversial facilities as long as others foot the bill. In Canada, **BC Hydro** recently indicated that it is willing to bury two kilometers of a 230 kV power line in Vancouver, if the $20 million tab is paid by the city or by a private group. In a July 10, 1991 letter to the Vancouver City Council, Thom Thompson, BC Hydro's manager of government and public affairs, stated that, "BC Hydro would not oppose [a move to bury the lines] made by another party," provided that the company is not required to fund the project. Members of the activist group **Citizens Against Transmission Towers** have pointed to possible EMF health effects in calling for the move. Readings taken by the utility show peak fields of about 12 mG on the right-of-way (ROW), and levels of about 5 mG on immediately adjacent property, according to Dr. Kelly Gibney, BC Hydro's EMF project manager. "We don't feel that the evidence shows that this line presents a health risk," Gibney told *Microwave News*....The **Sacramento (CA) Municipal Utility District** (SMUD) has agreed to move several controversial substations *if* an acceptable alternative site is available and *if* the opponents of the original site pay for the move, according to a policy statement issued in December. Residents near three SMUD substations have cited EMF concerns as a principal objection to the sites. Developers of land in the area are interested in sponsoring the relocations but no definite plans have emerged, Mike Deis, an SMUD spokesman, told *Microwave News*. SMUD's EMF specialist, Ron Scott, said in a telephone interview that he wouldn't be surprised if the policy becomes a standard way of dealing with EMF concerns: "If it's not costing the utility any money and everyone agrees, then I don't see why not."

«« »»

One of the recommendations that came out of DOE's November 20-21 EMF workshop was to hold **JASON**-type meetings to help set research goals. JASON refers to a team of scientists who consult primarily with the DOD on defense issues. Wasting no time, the DOE contacted the MITRE Corp. in McLean, VA, which runs the JASON Program Office (JPO), and an EMF seminar was held on January 24 for the "JASONs" in La Jolla, CA. They heard presentations by Drs. **Ross Adey** of the VA Hospital in Loma Linda, CA, **Ted Litovitz** of Catholic University in Washington, DC, and **Duncan Thomas** of the University of Southern California in Los Angeles. Robert Henderson, the director of the JPO, did not return calls for comment.

«« »»

A planned upgrade of transmission facilities in northern Washington State will comply with a law aimed at reducing public exposure to EMFs by confining new power lines above 115 kV to industrially zoned areas, according to officials of **Puget Power and Light Co.** and the **Bonneville Power Authority** (BPA). Voters in Whatcom County, WA approved the restrictions by a nearly two-to-one margin in a November 1990 referendum (see *MWN*, N/D90). The upgrade involves rebuilding facilities to increase the capacity of lines on existing Puget Power and BPA ROWs and adding a new 115 kV line. "Reliability in the area and power transfer are still the two key issues here," Ray Trzynka, a Puget Power spokesman, told *Microwave News*. **Neighbors Opposed to Power Encroachment** (NOPE), the citizens group which initiated the referendum, will probably not challenge the new project. "Officially, we're still exploring all the ramifications, but, to some extent, we're pleased," NOPE's Clare Fogelsong said in a telephone interview. "The new plan is much more in keeping with the utility plan for the county, much less damaging to the environment and the community," he added. However, Fogelsong indicated that NOPE supports conservation measures to reduce the need for such projects entirely: "We're still concerned...it seems that the industry would much rather pursue old paths than embark on new ones," he said.

«« »»

EPRI has invited 10-15 experts to a workshop on ***Magnetic Field Transients*** to be held in Palo Alto, CA on February 19. The purpose of the meeting is to learn more about the transient environment, its biologically significant parameters and methods for characterizing exposures in future studies, according to Thanh Dovan of **Enertech Consultants** in Campbell, CA, which is organizing the workshop for EPRI. Enertech is in the process of developing equipment to measure EMF transients, under an EPRI contract.

«« »»

In **Florida**, after a short truce, **Hillsborough County** and the state Department of Environmental Regulation (DER) seem to be headed for another showdown over DER's power line EMF limits. The limits—150-200 mG at the edge of a ROW, depending on the voltage of the line—were immediately challenged in court by the county when they were adopted in 1989 (see *MWN*, M/A89). In March 1991, county officials agreed to withdraw the lawsuit in exchange for what they believed was a promise from the DER to reconsider the limits during a rules review that will begin with a February 20 meeting in Tallahassee (see *MWN*, M/J91). The DER says it never made such a commitment, however. DER's Buck Oven told *Microwave News* that revising the limits was "never our intention" and "would not be considered during the review." Nancy Fleming, the chairwoman of **Concerned Citizens for Power Line Safety**, which is based in Tampa, said that the DER is reneging on a deal: "They promised to take a very serious look at the limits, and that is why we dropped the suit. In my mind, this is the worst form of government," she told *Microwave News*. Fleming also said that she intends to go before the Hillsborough County Board of Commissioners and ask that the suit be refiled. Michael Skelton of

DOE Seeks 50% Increase in 1993 EMF Research Budget

The DOE has requested $7.5 million for EMF research in fiscal year 1993 (FY93), a 50% increase over FY92, according to Marvin Gunn, a senior DOE official who is overseeing the EMF effort.

Before Congress named the DOE as lead agency for EMF research, department officials had planned on a $5 million budget (see *MWN*, N/D91). The request was increased late last year because, "We recognized the relative importance of the topic," Gunn told *Microwave News*. The DOE had considered asking for as much as $15 million for FY93 before settling on half that amount, according to sources close to the agency. FY93 begins on October 1, 1992.

The DOE submitted its request to Congress at the end of January as part of the President's budget. In the explanation accompanying the budget, the DOE stated that public concern about EMFs "is limiting the siting and capacity of transmission and distribution systems...."

Gunn said that the DOE EMF program is moving forward. "We expect that by the end of June we should have a pretty comprehensive plan," he said.

de la Parte & Gilbert, the Tampa law firm representing the county, confirmed that if the limits are not revised, the county will "seriously consider" refiling the suit. Oven defended the current limits, stating in a telephone interview that, "The scientific evidence does not exist to warrant a change."

«« »»

In response to growing concern about EMF health effects, a number of electric utility organizations are now publishing EMF newsletters. The newest player is Central Maine Power Co.—the utility's Center for Energy Information recently began offering its in-house, biweekly, ***EMF Keeptrack***, to the public. "We were creating a fairly large EMF resource and the demand was there," the center's director, Alan King, told *Microwave News*. In early 1991, the Edison Electric Institute began publishing the biweekly ***EMF News***. Though the newsletters are available by subscription only, EPRI offers its ***EMF Research Review***, published three times per year, for free.

«« »»

In **Rhode Island**, Governor Bruce Sundlun's **EMF task force** could not reach a consensus on the proposed three-year ban on new power lines above 115 kV, which was considered by the state legislature last year (see *MWN*, J/F91, M/J91 and J/A91). A bill setting forth the moratorium will be reintroduced in the 1992 legislative session, according to Rep. Steve Hernandez, the sponsor of last year's bill. The task force's interim report, dated December 1991, recommends that the governor adopt and distribute to the public an EMF health policy statement, and create an ongoing commission to track EMF developments.

The task force has also commissioned an $82,000 study of the cost-effectiveness of power line EMF mitigation techniques. The research—paid for by state utilities—is being conducted by a Jackson, MI firm, Commonwealth Associates, and is due to be completed this spring. "It is by far the most far-reaching aspect of the task force's work," Scott Wolf, an aide to the governor and the chairman of the task force, said of the study. The task force will wait for the results of the project before issuing final recommendations, Wolf said in a telephone interview.

«« »»

Recent data linking electric blanket users to high EMF exposure and adverse health effects is sending many people in search of an old-fashioned down quilt, and at least one company is glad the public is finally waking up. Cuddledown, a Portland, ME mail order distributor of natural fiber quilts, blankets and other textiles, has placed a **"Radiation Free Bedding"** badge on its catalogue to indicate that its products do not emit EMFs. The badge features a nuclear "mushroom cloud" with a red line drawn through it.

«« »»

The **National EMF Research Program** (NERP) has selected **Energetics Inc.** of Columbia, MD to provide staff support through February 1993 and has named **Wendell Holland**, a member of the Pennsylvania Public Utility Commission, to its steering committee. He replaces **Michael Wilson** of Florida, who resigned. The committee, which is developing a formal response to the EMF research legislation introduced by Rep. **George Brown** (D-CA), plans to hold its next meeting March 24-25 in Washington, DC.

«« »»

The city of **Wheaton, IL** has taken on **Commonwealth Edison Co.** with an ordinance to block the upgrade of a power line. On January 20, the city council amended Wheaton's zoning rules for residential areas so that new or upgraded substations with a capacity of greater than 34 kV will require special use permits. The city's action was spurred by the utility's plans to upgrade a power line in the area from 34 kV to 138 kV, according to Wheaton resident John Bengel, who led the drive for the zoning change. The line, which runs along a greenway called the Illinois Prairie Path, feeds a substation in Wheaton that would have to be upgraded at the same time. "The city has chosen not to address power lines directly," since they are under the jurisdiction of the Illinois Commerce Commission, Bengel told *Microwave News*. A spokesman for Commonwealth Edison, Michael Kelly, said the utility is working with DuPage County, where Wheaton is located, to get land on a forest preserve for a new substation. But he would not rule out a legal challenge to the zoning rules. Bengel said Wheaton was the first municipality in Illinois to pass legislation concerning power line EMFs, adding that, "Other, neighboring communities are very interested in what we are doing." The nearby city of **Aurora** considered—but failed to enact—an ordinance that sought to limit power line EMFs.

Two Brain Tumor Victims Sue Connecticut Utility

Two residents of Meadow Street in Guilford, CT have sued Northeast Utilities and its affiliate, Connecticut Light and Power Co., claiming that their brain tumors were caused by electromagnetic fields (EMFs) from power lines and from a nearby substation. Melissa Bullock, a 19-year-old with a malignant brain tumor, filed her claim on December 19. Jack Walston, who lived next door to Bullock, filed a similar suit on January 14.

Bullock has lived on Meadow Street since 1979; Walston lived on the same block for most of the time between 1947 and 1983. In 1990 Paul Brodeur, a staff writer at *The New Yorker*, argued that EMFs were the probable cause of four brain tumors—including Bullock's and Walston's—and other health problems among residents of the one-block street, making it a focal point in the power line controversy (see *MWN*, S/O90, N/D90 and M/A91).

In their complaints, filed in state Superior Court in New Haven, CT, the plaintiffs charge that the utility knew—or should have known—of potential EMF health effects, and failed to use "every effort possible" to warn and protect the public against the danger, as is required by law.

Both suits ask for unspecified monetary compensation for physical injury and emotional distress, as well as for a court order forcing the utility to "cease and desist the emission of dangerous levels of [EMFs]" from their electrical equipment and to disclose any information on EMF health risks to the public. Bullock's parents are also requesting compensation for the loss of value of their house, which they put on the market in December 1991.

"We expect to vigorously defend ourselves against the contentions of the lawsuits. We are preparing for a long, hard court battle," Emmanuel Forde, a spokesman for Northeast Utilities, told *Microwave News*. Forde added that the cases could "stretch out for years."

Michael Koskoff of Koskoff, Koskoff & Bieder in Bridgeport, CT, and John Ward of Quinn, Ward and Kershaw in Baltimore, MD, are the lead attorneys representing both Bullock and Walston.

Michael Withey of Schroeter, Goldmark & Bender in Seattle, WA is acting as a legal consultant to the plaintiffs. Withey's and Ward's law firms are founding members of the Electromagnetic Radiation Case Evaluation Team (see *MWN*, M/A91). Also assisting the plaintiffs' lawyers are attorneys from the Washington, DC-based Trial Lawyers for Public Justice. Last year, Withey filed suit on behalf of a San Diego, CA couple who allege that their daughter's kidney cancer was caused by power line EMFs (see *MWN*, J/A91).

"The tragedy of Melissa's cancer is the result of decades of neglect by the power companies. Melissa deserves compensation, and the public is entitled to know the risks of electromagnetic radiation," Koskoff said. Her case is an opportunity to set a strong precedent which could pave the way for other victims of EMF injuries, he told *Microwave News*. Ward agreed: "The remedy we're seeking would also involve protecting other people from this hazard."

In 1989 Bullock was diagnosed as having an astrocytoma, a malignant brain tumor. Walston was first diagnosed as having a meningioma, a nonmalignant tumor, in 1979.

Koskoff expects the utility to try to invalidate Walston's claim using the state's strict laws limiting suits to two years from the time an injury is discovered and to three years from the time of exposure. "Because a victim can't very well sue for an injury that he doesn't know he has, there is some question about the constitutionality of these statutes," he said.

Brodeur described the history of the Bullock and Walston families in a July 9, 1990 *New Yorker* piece titled "Calamity on Meadow Street." He filed a follow-up in the November 19, 1990 issue. The articles were a continuation of his "Annals of Radiation" series; the original three parts were published in his book, *Currents of Death*.

"[B]efore the physicians and the scientists feel free to acknowledge that substations and high current power lines constitute a serious public health hazard, it will undoubtedly be necessary to identify some additional Meadow Streets," Brodeur wrote in the July article. He then went on to blame EMFs for high cancer rates in neighborhoods in North Carolina and California.

In an interview with *Microwave News*, Brodeur reaffirmed this view: "Meadow Streets exist from one end of the United States to the other and I will show this to be true in future articles for *The New Yorker*."

Northeast Utilities officials disputed many of Brodeur's claims in a series of letters to *The New Yorker*. They also argued that he failed to ask them about his charges.

Rep. Brown Sees Quick Approval of $70 Million EMF Program

Rep. George Brown (D-CA), sponsor of the principal EMF research legislation in Congress, is confident it will pass this year. "My anticipation is that we'll have this bill enacted," he told *Microwave News*.

His measure, H.R.3953, budgets $60 million for research and $10 million for public information over ten years—and calls for as much as half of the research funding to come from nonfederal sources (see *MWN*, N/D91).

In an extensive telephone interview, Brown commented on the actions of White House Science Advisor Dr. Allan Bromley, the ongoing role of the Environmental Protection Agency and his own vision of the federal EMF research effort. Excerpts from the interview appear on pp.12-13.

The chairman of the House Committee on Science, Space and Technology, Brown has tentatively scheduled a hearing on the legislation for March 10.

Wisconsin Mandates Low EMF T&D Systems

The Wisconsin Public Service Commission (PSC) has ordered state utilities to use the "best available control technology" to reduce EMF emissions from new and upgraded transmission lines. The PSC, which issued the ruling at its January 16 meeting, also directed the utilities to report on the availability of low EMF distribution line systems and to use such systems as soon as possible.

"The commissioners feel that minimization is the way to go," Dan Dasho, a PSC aide, told *Microwave News*. The PSC did not set specific exposure limits or guidelines, however.

The question of EMF health effects is unresolved, the PSC stressed. Commissioner John Coughlin said that the PSC "cannot conclude that there is a sufficient demonstration of scientific peer-reviewed findings to conclude that there is a causal relationship between EMFs and adverse human health effects." He cautioned, however, that controversy over EMF effects "could have a considerable societal impact." Coughlin is also chairman of the steering committee of the National EMF Research Program.

The commission rejected a proposal for a three-year moratorium on new transmission lines of at least 60 kV, which was requested by a citizens group, Promoting Options for Wise Energy Regulation (POWER). "The moratorium...could well be contrary to their stated goal," Coughlin said. If utilities were prohibited from building new lines, they would have to increase the current on existing transmission lines to meet the demand for power, he explained, adding that this would generate stronger magnetic fields and increase the exposure of nearby residents. A bill pending in the Wisconsin legislature also calls for a three-year moratorium (see *MWN*, N/D91).

The PSC ruling was based on two sets of hearings held last October: five days of technical hearings in Madison and public hearings in Eau Claire, Stevens Point, Green Bay and Madison. Among the 14 witnesses at the technical hearings were Dr. Abe Liboff of Oakland University in Rochester, MI, Dr. John Moulder of the Medical College of Wisconsin in Milwaukee, Dr. David Savitz of the University of North Carolina, Chapel Hill and Dr. Michael Silva of Enertech Consultants in Campbell, CA.

The PSC ruling, which is scheduled to be issued as a formal order in late February, stipulates that:

- Utilities planning transmission lines must consider the number of people exposed to EMFs as well as the intensity and duration of exposures. This information must be included in siting proposals to the PSC. The commission will "take a hard look at the alternatives" to siting a line near residential areas, PSC Chairwoman Cheryl Parrino said, according to the January 17 *Wisconsin State Journal*.
- Utility and PSC staffers will work together to set up a uniform protocol for measuring EMFs on request. They will also develop a system for managing the data.
- Utilities must include EMFs in the demand-side planning already required by the PSC. Dasho said that the commission will use the EMF issue to press for greater conservation efforts.
- The best available control technology requirement for transmission lines may be modified on a case-by-case basis, particularly to ensure that worker safety and a reliable power supply are not put at risk.
- Utilities that lack the capability to use low EMF technology are not excluded; they must develop it.

The PSC also urged the state's utilities to support further EMF research programs, in addition to those at the Electric Power Research Institute (EPRI), according to Dasho. This was done due to a "perception" that EPRI's research is tainted by a pro-utility bias, he said. "No one on the commission has a problem with the research, but every time you bring up EPRI research, the public dismisses it." The utilities will prepare a report on possible alternatives to EPRI.

The final PSC order, including compliance deadlines, will be available from: Jackie Reynolds, Secretary to the Commission, Hill Farms State Office Building, PO Box 7854, Madison, WI 53707, (608) 266-8097.

Children Allowed Transfers in Florida School Settlement

Parents who have been battling school officials over EMFs at the Sandpiper Shores Elementary School in suburban Boca Raton, FL have won the right to transfer their children to other Palm Beach County schools. In their settlement of a three-year-old lawsuit, the parents and the county school board agreed that a request for a transfer must be accompanied by a note from a physician—simply indicating that the doctor was consulted on EMF health concerns. Midyear transfers have been requested for 32 students, according to Sharon Rausch, a plaintiff in the suit; transfers can also be requested next fall, she pointed out.

The class action suit, which was filed before the school opened, "is effectively over now," said Lawrence Marraffino, attorney for the parents. When the school was under construction, a number of parents became concerned about high voltage power lines nearby and sought an injunction to keep the school closed (see *MWN*, S/O88 and J/F89). It opened on schedule, but the court ordered that areas with the highest magnetic field measurements not be used (see *MWN*, M/J89 and J/A89).

The court also required EMF measurements: during the 1989-90 school year, teachers sported EMDEX gaussmeters. The levels recorded averaged under 2 mG, but some parents were not reassured (see *MWN*, M/J90). Marraffino told *Microwave News* recently, "We're going to keep checking on the levels," especially in the summer, when power consumption is at its peak due to the use of air conditioners.

Mitigation Roundup

Washington State Task Force Report

A Washington State task force charged with recommending research priorities and legislative options for reducing power line EMFs has called for a "systematic assessment of the proximity of Washington State residents and structures to power lines and other sources of EMF."

Among the other types of study the panel suggests are: a comparison of field measurements with computer projections of distribution system EMFs; a comparison of the performance of underground and overhead transmission lines; and an examination of the feasibility of reducing EMFs through energy conservation and load management.

Established by the legislature in March 1990, the Electric Transmission Research Needs Task Force concluded in its final report that, "It would be shortsighted not to research and refine techniques to reduce public exposure to power frequency fields, given the lead time to implement solutions...."

The panel also found that:

• For 230 kV transmission lines, burial provided the best EMF mitigation. An underground cable in fluid-filled steel pipe had a magnetic field of 0.2 mG and an electric field of less than 0.1 kV/m, at 40 feet from the center line. These levels compared with 29.7 mG and 1.9 kV/m from the commonly used horizontal design, 6.7 mG and 0.9 kV/m from a multiphase, six-conductor system and 4.8 mG and 0.6 kV/m from a double circuit/split-phase design.

• For distribution systems, increasing voltages or using a double circuit design was the most effective means of reducing magnetic fields. A flat, horizontal 12.5 kV overhead line yielded 7.7 mG. Doubling the voltage cut the magnetic field to 3.1 mG, but increased the electric field slightly, to 0.04 kV/m. A double circuit, split-phase overhead design produced 2.5 mG and 0.04 kV/m.

The 88-page report, *Electric and Magnetic Field Reduction: Research Needs*, is available at no charge from: Washington State Department of Health, Office of Epidemiology, PO Box 47813, Olympia, WA 98504, (206) 753-5935.

Six-Phase Power Distribution Patent

A Florida engineer, Dr. Robert Ashley, has received a patent for a six-phase power distribution system designed to reduce EMFs and improve power line efficiency. According to computer calculations, field cancellation from Ashley's arrangement of six conductors can reduce magnetic fields to a level that is one-fifth of that generated by existing three-phase systems.

By doubling the number of conductors, the current in each is reduced, which in turn cuts line losses. "This is a significant reduction in distribution system losses, which could pay for the additional wire in some ten years," Ashley told *Microwave News*.

Patent number 5,070,441, approved December 3, 1991, outlines ways of connecting six-phase distribution lines to existing three-phase transmission lines at the substation and to standard single-phase and three-phase loads at the service drop. Ashley has additional related patents pending.

Ashley described his distribution system as an "economically attractive alternative method of resolving [a] political problem." He said that he does not believe power line EMFs are a health risk but does see demand for low EMF distribution systems. "I would like to be a millionaire," he said, with an eye on possible royalties.

New Papers

• Three papers presented at the *1992 Winter Meeting of the IEEE Power Engineering Society*, January 26-30 in New York City, review the potential for magnetic field mitigation using six- or twelve-phase high voltage transmission lines—known as high phase order (HPO) systems. In "Magnetic Field Reduction Using High Phase Order Lines" (92 WM 284-0 PWRD), Steinar Dale of Oak Ridge National Laboratory in Oak Ridge, TN, Kenneth Klein of Energetics Inc. in Columbia, MD and James Stewart of Power Technologies Inc. in Schenectady, NY report results from work at an HPO test facility in Malta, NY. The researchers conclude that, "It is possible to develop [HPO] alternatives to three-phase lines with comparable power-handling capacity, significantly smaller size, and the same or reduced ground level fields." Stewart told *Microwave News* that this paper is the last in a series based on work at the Malta facility. He said work on HPO transmission systems will now be focused on a demonstration project in the Binghamton, NY area. In the next few months, a 1.5-mile, six-phase line will go into service as part of New York State Electric and Gas Corp.'s transmission system. Stewart said the Binghamton line should provide practical knowledge about system protection and integration of HPO lines into existing power grids. For more on this project, see R.V. Rebbapragada et al., "Selection and Application of Relay Protection for Six-Phase Demonstration Project" (92 WM 199-0 PWRD) and "Design Modification and Layout of Utility Substations for Six-Phase Transmission" (92 WM 226-1 PWRD). The papers are available for $3.50 each for IEEE members and $6.50 each for nonmembers, plus $4.00 postage and handling, from: Single Publication Sales Department, IEEE Service Center, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (908) 981-0060.

• James Burke of Power Technologies Inc. reviews the pros and cons of a number of mitigation ideas in "Controlling Magnetic Fields in the Distribution System" in the December 1991 *Transmission and Distribution*. He addresses grounded versus ungrounded, and single-phase versus three-phase, distribution systems, in addition to underground cables, higher primary voltages and line compaction. Burke concludes that, "The mitigation of magnetic fields can be achieved, but at a high cost and with a potential reduction in system reliability."

Power Line & Substation Cancer Links Studied on Cape Cod

A long-awaited environmental epidemiological study of elevated cancer rates in five Cape Cod, MA towns implicates high voltage power lines and substations. The link to electromagnetic fields (EMFs) was only a small part of the three-year, $500,000 study, however.

"The results suggest that EMFs may be biologically active. There is a need for continued investigation," Dr. Ann Aschengrau of the Boston University (BU) School of Public Health, the lead investigator, told *Microwave News*. The study was sponsored by the Massachusetts Department of Public Health (see *MWN*, M/J88).

Among the other findings were increased cancer risks for people exposed to aerially sprayed pesticides, airborne pollutants from airport runways and military facilities and contaminated drinking water. Aschengrau and her coinvestigator, Dr. David Ozonoff, also of BU, looked at the possible influence of the PAVE PAWS radar at the Massachusetts Military Reservation, formerly the Otis Air Force Base, but the findings were inconclusive.

"Our results suggest that there is some association with environmental factors, although our study was unable to estimate its magnitude," Aschengrau said, but she cautioned that environmental exposures "explained only a small part of the elevated rates of cancer on the Upper Cape." She added that, "It's clear that there was a tremendous amount of pollution on the Upper Cape....We're saying that there was ample reason to be concerned, but we couldn't find a link to most of the cancers we studied."

Aschengrau and Ozonoff found that people who lived within 500 feet of a 115 kV transmission line had an adjusted relative risk (RR) of 1.57 of developing lung cancer; the risk rose to 1.8 for those living within 300 feet. They also found increased rates of bladder cancer (RR=2.57) among those living within 500 feet of the line. For all cancers combined, the relative risk was 1.37. None of these findings was statistically significant.

For those living within 500 feet of a substation, the relative risk for lung cancer was 2.78, which bordered on statistical significance. The researchers also observed a nonsignificant elevated rate (RR=1.69) of female breast cancer. (There were no cases of male breast cancer on the Cape, according to Ozonoff.) Within 250 feet of a substation, the relative risk for all cancers combined was 2.84.

Ozonoff noted that the lung cancer finding showed up twice, which, he said, was "kind of suspicious." He explained that the cases near substations were not the same ones as those near power lines. In November 1989, Dr. Genevieve Matanoski of the Johns Hopkins University School of Public Health reported higher rates of lung cancer and other types of cancer among EMF-exposed telephone cable splicers (see *MWN*, N/D89).

The BU researchers did not find elevated rates of brain tumors or leukemia near power lines and substations, but did observe a statistically significant increased risk (RR=3.98) of brain tumors among people living within 1.9 miles of runways at military installations and a moderately elevated, nonsignificant risk (RR=1.50) for those within 1.9 miles of the Barnstable Municipal Airport. When asked if radar might be a contributing factor, Aschengrau said that the idea was "intriguing" but that the municipal airport results were confounded by the population's exposure to Barnstable's contaminated water supply: "If I had to bet on anything, I'd say maybe it was the water."

With regard to the phased array radar, the team stated, "While no association was seen for PAVE PAWS, the available exposure data were inadequate. We strongly recommend that systematic power density measurements be taken throughout the area scanned by PAVE PAWS so that useful exposure data will be available for future analyses of its potential health impact."

Environmental exposures were estimated by geographic proximity and length of residence. A limited number of magnetic field measurements were taken in front of some residences; power line wire codes were not used to assess exposures.

The researchers investigated 1,042 cases of cancer diagnosed among residents of Barnstable, Bourne, Falmouth, Mashpee and Sandwich between 1983 and 1986 and matched them with 1,285 controls. The study focused on lung, breast, colon/rectum, bladder, kidney, pancreatic, brain and liver cancers and leukemia.

U.K. Biological Effects Review

A report issued by the U.K.'s Institution of Electrical Engineers (IEE) concludes that, "At present there is no widely accepted experiment which can demonstrate any biological effect of low-level electromagnetic fields [EMFs]." The report endorses guidelines based only on thermal effects and induced currents.

"Sensationalist" reports in the media are to blame for the recent upsurge in public awareness of potential EMF health effects, according to the review panel, chaired by Dr. A.T. Barker of the Sheffield Health Authority, that wrote the July 1991 report. Other panelists are: Dr. R.A. Cartwright of the University of Leeds, Dr. O.C. Jones of the National Physical Laboratory, Dr. C.L. Lopez-Cacicedo of National Power, Dr. J.C. Male of the National Grid Research and Development Centre and Professor P.A. Payne of the University of Manchester.

The reviewers endorse the guidelines issued by the National Radiological Protection Board (NRPB), which state that there are "insufficient biological and epidemiological data to make a health risk assessment or even to determine whether there is a potential hazard" with regard to athermal EMF effects (see *MWN*, J/A89). The NRPB guidelines are based on "reference levels" for thermal effects issued by the International Radiation Protection Association (see *MWN*, M/A87 and J/F88).

Epidemiological studies "do not provide a firm link with electric or magnetic field exposures and may be observing some other occupational factor," according to the IEE report. However, the panelists conclude that a number of epidemiological studies scheduled to be completed in the next three years should "add significantly to our knowledge of the effects of human

exposure to low frequency fields."

"Laboratory studies have yet to prove reproducible for low-level fields and none of the hypothetical mechanisms proposed in the literature can be regarded as proven by experiment," according to the reviewers. Ion cyclotron resonance research is cited as "the most promising area" for discovering EMF–health effects mechanisms.

The Possible Biological Effects of Low-Frequency Electromagnetic Fields is available for £5.00 from: IEE, Savoy Pl., London WC2R OBL, U.K., (44+071) 240-1871.

HIGHLIGHTS

Seattle and King County Set RF Exposure Limit at 200 μW/cm²

Motivated by concern that broadcast facilities could present a health risk, Seattle and King County, WA (where Seattle is located) have adopted identical limits for public exposures to radiofrequency and microwave (RF/MW) radiation. The new standards, which are modified versions of those recommended by the National Council on Radiation Protection and Measurements (NCRP), limit exposures to 200 μW/cm² in the 30-300 MHz range (see *MWN*, M/J86).

The standards cover the frequency range from 100 kHz to 300 GHz. The limit rises to 20 mW/cm² at 3 MHz and to 1 mW/cm² above 1.5 GHz—tracing out the now common well shape that appears in both the NCRP and the American National Standards Institute (ANSI) guidelines.

"It is an important first step," City Councilwoman Sue Donaldson, who pushed for the new standards, told *Microwave News*. She pointed out, however, that the available data are "not adequate" to ensure that the 200 μW/cm² level is safe. Clifford Marks of the city's Office of Long Range Planning (OLRP) agreed: "Though the intention is to lower the risk, no one can guarantee that the limits are safe." The city council will continue to review health effects literature and could revise the standards at any time.

The King County Council adopted the limits on July 8, 1991, and the Seattle City Council followed by unanimously approving the standards on January 27, 1992. The joint Seattle/King County Health Department is in charge of enforcing the limits.

City and county officials had been working to develop the new standards for several years. Originally, Seattle's OLRP had proposed a 100 μW/cm² limit, but it was opposed by the mayor and the National Association of Broadcasters (see *MWN*, J/A88, J/A89 and S/O89). The recommendation was later revised upward to 200 μW/cm². "If there were ever a legal challenge to the limit, the mayor thought we would have a much easier time defending a 200 μW/cm² standard because this is more in line with what other bodies are recommending and adopting," Marks explained in a telephone interview.

In March 1991, Donaldson convened an advisory committee of representatives from both local citizens groups and the

SCC-28's Response to Seattle

Last fall, Seattle City Councilwoman Sue Donaldson wrote to Dr. Tom Budinger of the Lawrence Berkeley Laboratory in Berkeley, CA, the chairman of the IEEE's Standards Coordinating Committee 28 (SCC-28), which has revised the 1982 ANSI RF/MW safety limits, expressing concern over the adequacy of the draft standard (see MWN, *S/O91). Excerpted below is Budinger's November 15, 1991 reply. (For more on the new ANSI standard, see* MWN, *N/D91.)*

...The basis for the guidelines for [RF/MW] frequencies is the known reversible changes in behavior of subhuman primates in repeatable experiments with an absorbed power of 4 W/Kg. Based on these data, the committee took a prudent approach of a factor of 10 to arrive at a maximum whole-body averaged specific absorbed power of 0.4 W/Kg for controlled environments and 0.08 W/Kg for uncontrolled environments. The standards are based on a further assumption that the individual would be in a worst-case situation: the incident electric field is uniform over the extent of the human body, is parallel to the human body, the person is standing barefoot and in contact with a wet, highly conductive ground. After consulting with Dr. [Om] Gandhi, I am satisfied that to the present knowledge of RF dosimetry, the specific absorbed power is only a small fraction of the above-quoted values if all the worst-case conditions do not occur in a particular electric and magnetic field exposure situation. Thus, if we computed from the information given in the revised standards that an individual might receive 0.4 W/Kg averaged over the whole body and that individual was wearing shoes or standing above dry ground, the actual specific absorbed power would be very much less than the expected 0.4 W/Kg. In short, the [specific absorption rates] encountered in real life are likely to be as much as two orders of magnitude lower than the 1 to 4 W/Kg [range which is cited as dangerous and possibly lethal] in your letter.

With regard to literature since 1986 on lethal effects and non-thermal effects, I would like to emphasize two perspectives. First, data reported in the reviewed literature are not being ignored. Some experiments are under keen scrutiny at this very moment as Subcommittee 4 is still charged with the task of revising the revised standard. Experiments involving animals in healthy and normal environments wherein the data are not confounded by hypoxic conditions or parasite infestation are specifically garnered from the literature for close scrutiny. Experiments show some effects in animals which have been in an unnatural state either through their environmental conditions or the presence of some pathology. Secondly, I have also learned through many years of experimental work that data from cell systems cannot be extrapolated to the integrated biological systems.

With regard to the 7 watts exclusion (less for higher frequencies), we sought a prudent level below the whole-body allowed power of 28 watts (0.4 W/Kg x 70 Kg) and a desire to keep a local SAR below 8 W/Kg....

broadcast industry to review the scientific data—the group recommended the 200 μW/cm² limit. "I think everyone just needed to sit down and talk to get things moving," Donaldson said.

The limit was a "compromise," according to Tom Buchanon, who served on the advisory committee and is a member of the Central Area Neighborhood Association in Seattle. Though some residents would have preferred a lower limit, the new policy "is the start of something that is very important for people in dense urban areas...it signals a consciousness of the possible RF health risks and an awareness that broadcast emissions need to be taken into account," Buchanon said.

Industry officials had argued against a 100 μW/cm² limit, and they are generally pleased with the new standards. "The radiation issue was one of the prime concerns when drafting the policy....There is always a group that says 'not in my back yard,' but, in general, I think that the citizens decided that this policy was the best that they could hope for," KING Broadcasting's Ken Hermanson, who also served on the advisory committee, said in a telephone interview.

Jim Hatfield a Seattle-based RF consultant who has followed the health effects issue closely, told *Microwave News* that, "Actual ambient fields do not approach the levels of the standard," adding that, "We can't say what is safe or unsafe, but we can put it in context."

Nevertheless, some still feel that the 200 μW/cm² limit is too lenient. "It protects us against getting singed, but not against cancer and other chronic effects," Joanne Lenox of the Cougar Mountain Residents Association, a group formed to oppose a cluster of broadcast towers in King County, said in a telephone interview (see *MWN*, J/F86). In the past, county residents have also voiced concern over a number of satellite communications towers located on Vashon Island (see *MWN*, M/A86 and M/J86).

NY Police Union Surveying Members on Cancer and Radar

The union representing New York state troopers has launched a survey of police officers to examine a possible link between police radar and cancer. The Police Benevolent Association of the New York State Troopers (PBA/NYS) mailed a one-page questionnaire to 6,000 members last November. It was sent to active and retired officers but not to the families of deceased officers, said Trooper Maureen Tuffey, a PBA/NYS spokeswoman.

Although the questionnaire was developed informally and was not originally intended for scientific analysis, Drs. John Violanti of the Rochester Institute of Technology (RIT) and John Vena of the State University of New York at Buffalo, who have collaborated on previous epidemiological studies, will review the data.

A former New York state trooper, Violanti first learned of the PBA/NYS health survey when he received a questionnaire in the mail. He told *Microwave News* that he had regularly used police radar devices during 23 years as a police officer. A preliminary analysis should be completed by this spring, Violanti said.

SAB Completes Review of EPA Cancer Report

On January 31, the Environmental Protection Agency's (EPA) Science Advisory Board (SAB) forwarded its review of the agency's EMF–cancer report to Administrator William Reilly. As expected, the SAB is seeking a complete rewrite of the report to correct "serious deficiencies." The final SAB recommendations are very similar to those circulated last summer (see *MWN*, J/A91).

The SAB is continuing to work on EPA's EMF research strategy. The SAB Executive Committee has asked its EMF subcommittee to rework its report on this document.

A limited number of copies of the SAB review are available at no cost from: Lori Gross, SAB (A-101), EPA, 401 M St., SW, Washington, DC 20460, (202) 260-4126.

In 1986, a team led by Vena and Violanti conducted a study of 2,376 police officers in Buffalo, NY. It reported that officers who worked 20-29 years had 3.64 times as many brain cancer deaths as expected based on the observed rates among U.S. males, 1950-1979; officers who worked 10-19 years had 3.75 times the expected colon cancer rate and 4.0 times the expected blood cancer rate. In "Mortality of a Municipal Worker Cohort: III. Police Officers," *American Journal of Industrial Medicine, 10*, pp.383-397, 1986, the team suggested exposure to police radar signals and radio transmissions as possible causes. See also, Violanti et al., "Disease Risk and Mortality Among Police Officers: New Evidence and Contributing Factors," *Journal of Police Science and Administration, 14*, pp.17-23, 1986.

Tuffey said that the data the PBA/NYS is collecting will also be sent to the Food and Drug Administration, which is gathering anecdotal reports of cancer linked to police radar (see *MWN*, S/O91).

In response to a PBA/NYS request, the New York state police stopped using hand-held radar guns in November. The state police used about a dozen of these units to calibrate speedometers in its own vehicles, according to Maj. Douglas Ostrander of the NYS police. The department's standard radar units use dashboard-mounted antennas. Late last year, the Connecticut state police stopped using hand-held radars due to concern about the alleged cancer hazard (see *MWN*, N/D91).

Drs. Robert Davis and Samuel Milham of the Washington State Department of Health in Olympia are reviewing the health records of some 1,000 police officers in the state and expect to complete the study this year (see *MWN*, M/A91).

No Increased Reproductive Risks Among MRI Workers

Pregnant women did not experience higher rates of reproductive problems, such as miscarriages and premature deliveries, when they worked as magnetic resonance imaging (MRI) technicians than when they were employed in other jobs,

according to the preliminary results of a new study.

"These results, while tentative...suggest that there is not a substantial increase in these common adverse reproductive outcomes," concluded Drs. Emanuel Kanal of the Pittsburgh (PA) NMR Institute, Frank Shellock of the Cedars-Sinai Medical Center in Los Angeles, CA, David Savitz of the University of North Carolina, Chapel Hill and Joseph Gillen of the University of Pittsburgh.

In terms of static field exposures, "the data are reassuring," Kanal told *Microwave News*. But he emphasized that, "The study does not provide us with any data on the safety—or lack thereof—of time-varying field exposures, since only the extreme minority of operators would have been exposed to these components."

The team sent questionnaires addressing menstrual, reproductive and work histories and potential confounders—such as smoking, age and alcohol consumption—to female MRI technicians and nurses at more than 90% of the clinical MRI facilities in the U.S. More than 1,900 women responded with information on 1,448 pregnancies.

Pregnancies that occurred while the respondents were MRI operators were compared with those that occurred when the women were otherwise employed or not working. The researchers observed a nonsignificant relative risk of 1.3 for miscarriages during MRI work; there were no increases in fertility problems or in pre-term deliveries. They noted, however, that the results are "tentative given the unknown response rate, self-reporting information and the potential for heightened health concerns among MRI operators."

In a telephone interview, Savitz noted, "The study does suggest that all women who were working [either at MRI centers or elsewhere] at the time of pregnancy showed more reproductive risks than those who were not working at all."

Kanal presented the findings at the *77th Annual Meeting of the Radiological Society of North America* in Chicago on December 4, 1991. Kanal and Shellock are members of the Society for Magnetic Resonance Imaging's safety committee.

In a related area, the International Non-Ionizing Radiation Committee of the International Radiation Protection Association provides guidance for the protection of patients undergoing an MRI scan in the December 1991 issue of *Health Physics* (61, pp.923-928).

Gulf Coast Site for EMPRESS II Draws Community Opposition

The Navy has again encountered opposition to the EMPRESS II barge—this time while seeking a site for the electromagnetic pulse (EMP) simulator in the Gulf of Mexico, off the Mississippi and Alabama coasts.

Previously forced to abandon plans to deploy the facility on Chesapeake Bay, the Navy has operated EMPRESS II—the acronym stands for EMP Radiation Environment Simulator for Ships—off the coast of North Carolina since 1988. But, due to local weather conditions, the Navy can only use that location during the summer. It has been pursuing the Gulf Coast site for use the rest of the year (see *MWN*, J/A88 and J/A89).

Through most of its environmental review process, the Navy encountered little opposition to the winter site, which is about 25 nautical miles offshore. But controversy flared in December after a series of articles on risks associated with EMP, written by Glynn Wilson, appeared in the *Islander*, a semiweekly newspaper in Gulf Shores, AL.

A January 7 meeting in Gulf Shores, the largest town on this stretch of beaches and tourist resorts, drew 400 to 500 people. "From [the Navy's] presentation, more opposition grew," said Roger Riggs, a local attorney who has been leading the opposition to EMPRESS II. In the final environmental impact statement (EIS), released last October, the Navy wrote that, "There is scientific evidence to assure us that EMP has no effect on humans." But Riggs disagreed: "They do not discuss the broad range of material that's out there," he told *Microwave News*. The EIS is available from: Lt. Commander Joseph Osborne, Naval Sea Systems Command (PMS-423), Department of the Navy, Washington, DC 20362-5101, (703) 602-3348.

Florida Radar–Cancer Link (continued from p.1)

In a telephone interview, Hopkins conceded that many researchers have tried—and failed—to find a viral cause for Hodgkin's, but he added that recent studies of retroviruses, following the discovery of the AIDS virus, have rekindled interest in this possibility.

Dr. Samuel Milham Jr., an epidemiologist with the Washington State Department of Health in Olympia, questioned Hopkins's conclusion. "Viruses account for only a small portion of all cancers. I don't see how the radar can be dismissed out of hand," Milham told *Microwave News*.

The radar facility, which is maintained by the FAA, is an FPS/66A—a long-range radar that operates on 1265 MHz and 1365 MHz. A height-finding radar that operated on 2710 MHz was decommissioned in 1989.

Radar is well known in the area as a persistent source of radiofrequency interference (RFI). Complaints from people who live in the South Patrick Shores subdivision and from the Air Force Technical Applications Center (AFTAC), a high-security computer facility on the base, have prompted repeated investigations that implicated the radar facility. Military contractors have taken RF measurements on at least three occasions since 1987. The FPS/66A's emissions are readily identifiable because bursts of RFI occur every 12 seconds, corresponding to the time it takes to complete a 360° sweep of the horizon.

In an apartment about 1,000 yards away from the radar—more than twice as far from the facility as the homes of most of those in the cluster—engineers found a peak field strength of 195 V/m (~10 mW/cm^2) and an average strength of 0.42 V/m

(~0.05 μW/cm²) at 1345 MHz. Measurements made near Highway A1A, which runs next to the radar installation, showed average field strengths of 0.2 μW/cm² at 1265 MHz, 2.5 μW/cm² at 1345 MHz and 132 μW/cm² at 2710 MHz.

Hopkins reported that 2.2 Hodgkin's cases would be expected in the study area for 1967-1990. He found that the actual occurrence of the disease was 2.7-3.6 times the expected rate. The precision of that ratio depends on assumptions about latency period—the interval between exposure to the presumed cause of the illness and onset of symptoms—which determine who is included in the study population. Hopkins counted the eight cases based on where people lived four to nine years before diagnosis.

Hopkins said he is following up on the possible radar link and has requested information on the power output and direction of the radar. He downplayed the possibility that exposure to toxic chemicals played a role in this cancer cluster.

The elevated risk of Hodgkin's appears to have passed. "If anything, there has been a deficit of Hodgkin's in the area" in recent years, Hopkins said. He is looking for something that could account for the drop-off in Hodgkin's cases. Any change in the strength or direction of the emissions in the mid-seventies "would certainly pique my interest," he said.

Though all but one of the eight people in the DHRS study lived in one corner of the South Patrick Shores subdivision, within a few blocks of the radar, Hopkins said there is "no hard evidence" that Hodgkin's is caused by exposure to non-ionizing radiation. He said, however, "It certainly is true that if you stand in that neighborhood...and look north, what dominates your view is that radar dome."

On January 7, following publication of a special report in *Florida Today* on the possibility of a link between the cancer cluster and the radar, the FAA said it planned to replace the radar facility at Patrick AFB by the end of 1994. An FAA spokeswoman, Kathleen Bergen, told *Microwave News* that the radar will be replaced as part of a multibillion-dollar upgrade of air traffic control facilities nationwide, which was being planned as far back as 1981. "Our decision to put in a new facility has nothing to do with any alleged cancer cluster," she said.

In a January 8 editorial, *Florida Today* praised the FAA's decision to shut down the radar, but added that, "the clouds of suspicion and fear that hang over the Patrick radar and similar installations will remain until adequate research is conducted to resolve the health issue conclusively."

European Bioelectromagnetics *(continued from p.1)*

being organized under the auspices of the European Community's Directorate-General for Science, Research and Development. For instance, Dr. Bertil Persson of the Lund University Hospital in Lund, Sweden, is working with scientists from five labs in Belgium, France, Italy and Sweden to set up a project on the *Biomedical, Biological and Health Effects of Modulated Radiofrequency (RF) Radiation.* A second research project, on power frequency electromagnetic fields (EMFs), is in the planning stages.

At the same time, a proposal has been developed by COST—which stands for European Cooperation in the Field of Scientific and Technical Research—to coordinate bioeffects research with an aim toward setting a common European standard for exposures to non-ionizing radiation, from DC to visible light. At an October workshop in Rome, Italy, 28 participants from nine countries adopted a memorandum of understanding for this project (COST 20B) on the biomedical effects of EMFs. If approved by COST officials next April and if at least four of the 23 COST member countries* then agree to participate, a four-year effort will be launched to "stimulate" work on unresolved health problems.

Professor Zlatko Koren of the University of Zagreb in Croatia, who is leading the COST initiative (see *MWN*, J/A91), told *Microwave News* that he expects at least 15 countries to sign up for the project. He said that it would be sponsored by the participating countries.

Plans are also under way for establishing a European Bioelectromagnetics Center (EBC) to provide, according to Leal, "the best physical and biological conditions to perform collaborative scientific experiments, in vivo and in vitro" for all types of non-ionizing radiation. The board of directors of the EBEA is assembling a committee to canvass scientists from across Europe on the best way to set up the center. Koren anticipates coordination between the COST project and the EBC.

*These include the 12 members of the European Community, as well as Austria, Czechoslovakia, Finland, Hungary, Iceland, Norway, Poland, Sweden, Switzerland, Turkey and Yugoslavia.

EBEA Research Papers

The EBEA conference offered a rich assortment of research results from across Europe. These included:

- New evidence that microwave radiation can increase the permeability of the blood–brain barrier—Drs. Leif Salford and Bertil Persson of the Lund University Hospital;
- Indications that a 20 Hz, 20 G magnetic field can alter the morphology and mitochondrial activity of human breast cancer cells—Dr. Sabine Johann of the Institute of Experimental Surgery at the Technical University of Munich, Germany;
- Indications of an increase in chromosomal breaks among

MICROWAVE NEWS is published bimonthly • ISSN 0275-6595 • PO Box 1799, Grand Central Station, New York, NY 10163 • (212) 517-2800; FAX (212) 734-0316 • Editor and Publisher: Louis Slesin, PhD; Managing Editor: Robert Dieterich; Associate Editor: Barton Biggs; Assistant Editor: Andrew Goffe; Contributing Editors: Jennifer Goren, Mark A. Pinsky; Copy Editors: Jim Feldman, Peter Pullman; Circulation Director: Barbara Gerson • *Subscriptions: $285.00 per year ($315.00 Canada & Foreign, U.S. funds only); single copies: $50.00* • Copyright © 1992 by Louis Slesin • Reproduction in any form is forbidden without written permission.

cable splicers employed at a high voltage test lab, especially those who smoke—Dr. Arnt Vistnes of the University of Oslo, Norway;

• The first observation of changes in the movement of calcium in *individual* cells exposed to a 50 Hz magnetic field—Ewa Lindström and a team from the University of Umeå, Sweden and the National Institute of Occupational Health in Umeå;

• Further analysis of the data generated by the Henhouse Project (see *MWN*, M/A88) demonstrating even more conclusively that pulsed magnetic fields can have profound effects on the developing chick embryo—Dr. Jocelyne Leal of the Ramón y Cajal Hospital in Madrid, Spain;

• Epidemiological and accident reports showing that airport workers who are exposed to radar radiation have higher rates of chromosomal aberrations and other health problems—Drs. Jasminka Goldoni and Vera Garaj-Vrhovac of the Institute of Medical Research and Occupational Health at the University of Zagreb;

• Experimental data indicating that intermittent exposure to 45 Hz, 1.26 mT magnetic fields can have effects on the EEGs of human volunteers—Russian-Finnish team led by Dr. Eugene Lyskov of the Institute of the Human Brain in St. Petersburg, Russia.

In addition, Finnish researchers presented new epidemiological evidence that magnetic fields from video display terminals (VDTs) can result in greater risk of miscarriages. (Detailed reports on this work and on the Croatian radar results will appear in our next issue.)

The next EBEA meeting will be held in 1994; Leal announced that she had already received offers to host the meeting from both western and eastern Europe. In the meantime, the EBEA is planning a workshop on *Interaction Mechanisms of EMFs with Biological Systems*, which will be held in Puschino, Russia in October. The EBEA is also one of the organizers of next June's *World Congress for Electricity and Magnetism in Biology and Medicine*, to be held in Orlando, FL.

The *Transactions* of the conference, including abstracts of the papers and posters presented at the meeting, are available from: Dr. Marcel Rooze, Laboratory of Embryology and Human Anatomy, Medical School, Free University of Brussels, 1000 Brussels, Belgium, (32+2) 536-6376. The price was unavailable at press time. A selection of these papers will be published in a special issue of *Bioelectrochemistry and Bioenergetics*.

EC Panel Proposes Guidelines for Worker NIER Exposures

A working group of the Commission of the European Communities has issued proposed guidelines for occupational exposures to non-ionizing electromagnetic radiation (NIER).

The recommendations closely follow those of the NIER committee of the International Radiation Protection Association. They include guidelines for static and extremely low frequency electromagnetic fields and radiofrequency, microwave, infrared, visible and ultraviolet radiation.

The proposal appears in *Physica Medica* (7, pp.77-89, April-June 1991)—the official journal of the Italian Association of Biomedical Physics. For more information, contact: Dr. Martino Grandolfo, Physics Laboratory, Superior Institute of Health, Viale Regina Elena 299, 00161 Rome, Italy.

FROM THE FIELD

Interview: Congressman George Brown

As chairman of the House Committee on Science, Space & Technology, Rep. George Brown (D-CA) has played a leading role in setting federal electromagnetic field (EMF) research funding. In 1990, at his initiative, Congress gave the Environmental Protection Agency (EPA) $750,000; in 1991 his legislation led to a $1.94 million EPA EMF research budget. Late in 1991, Brown and Rep. James Scheuer (D-NY) introduced H.R.3953, the National Electromagnetic Fields Research and Public Information Dissemination Act. The bill would provide $70 million over ten years—$60 million for research and $10 million for public information—to be paid for jointly with federal and private funds (see MWN, *N/D91).* Microwave News *spoke with Brown by telephone in mid-January.*

Microwave News: Some people were surprised that in your legislation you named the Department of Energy (DOE) rather than EPA as the lead agency.

Brown: We made that decision in an effort to cooperate with the [Bush] administration.

MWN: Did you have a specific request from the administration?

Brown: The DOE had met with us and we were presented with a *fait accompli*.

MWN: Do you still foresee a large role for EPA in this?

Brown: Yes, we feel that EPA will have a role. There are going to be many agencies that will all be part of this and they will be equals with the DOE in providing coordination.

MWN: In the statement of introduction for your legislation, you expressed dismay with the way the DOE was designated the lead agency.

Brown: Right. I would have preferred EPA myself....We're not sure yet it will be carried out properly [by the DOE] at this point.

MWN: Can you explain that a little more?

Brown: Well, we're going to try to keep it within the purview of the people most concerned with health and the environment.

MWN: Your legislation puts the lead authority in DOE's Office of Health and Environment rather than the Office of Conservation and Renewable Resources (OCRR). Is that out of concern—as some DOE officials have expressed—that there is at least the appearance of a conflict of interest in OCRR because it is charged with promoting the electric power industry?

Brown: That's one of the concerns....Frankly, our main concern is with having an effective operation over at [DOE]. We have struggled with bureaucratic controversies for many, many years, and there isn't any good way to resolve them. What we hope to do is to establish some system and to provide considerable oversight.

MWN: You also expressed concern that the DOE was designated lead agency in appropriations report language.

Brown: We feel very strongly about that.
MWN: Do you intend to try to pursue how that happened in this particular case? I know you have a broader concern with that as chairman of an authorization committee.
Brown: We are actively pursuing ways to get the Appropriations Committee to stop making policy....We will seek to eliminate [the appropriations language] and replace it with authorization language....[W]e haven't passed an energy authorizations bill in God knows how long....
MWN: You had talked about the need for more Congressional oversight. Do you see Congress becoming more involved in federal EMF research?
Brown: Yes, I think so. Obviously, I have difficulty speaking for other committees....In our case, we have engaged in the most vigorous oversight program this committee has ever had.... We intend to continue that, and we intend to reassert our authorizing legislation as promptly as possible. But we intend to do that by working with the other committees which have some claim to overlapping jurisdiction. We're not trying to carve out the issue to ourselves...or to fight with the other committees.
MWN: Your bill calls for $60 million over ten years for research, or about $6 million a year. What would you like to see accomplished?
Brown: Well, within ten years we ought to be able to get a fairly definitive understanding of whether there are adverse biological effects at any particular level of EMF. I suspect that as with most situations, conditions hold in which there could be adverse health effects and we need to find that out in various circumstances. I see no reason why we can't achieve that kind of information within ten years.
MWN: Your bill uses a public–private funding mechanism.
Brown: Various industry groups have suggested that they feel that this is what we need to get a vigorous program that would still have the confidence of the public.
MWN: Do you feel that's a reasonable way to go?
Brown: Absolutely. The way the legislation sets the program up, the public agencies are in control but there are strong advisory committee and private industry connections in the process.
MWN: Do you see a role, as others do, for groups such as the National EMF Research Program (NERP) or the Health Effects Institute (HEI)?
Brown: It could easily be, because there is ample room for any other nonpublic organization...to be involved here in one way or another.
MWN: Would you be comfortable with some of the $60 million being given to the NERP or HEI?
Brown: I would have no problems with it. The bill provides mechanisms in which we can ascertain whether there are conflicts of interest or other things of that sort.
MWN: Could some of the federal funds go to the Electric Power Research Institute (EPRI) for, say, mitigation research?
Brown: I wouldn't object. I would assume that that kind of research would be done. In terms of funding, EPRI and some of the other private groups are proposing to contribute to the federal effort. So I'm not sure which way the money would go.
MWN: You are chair of a committee that is going to play a major role—as you say, you are not the only committee—
Brown: No, we're not the only committee...and we intend to cooperate with the [House Energy and] Commerce Committee.
MWN: Where do you rank this issue among other issues before your committee?
Brown: I do not rate it all that high. It certainly does not rate as high as the public interest in toxic waste or in radioactive hazards, or some things like that. I rate it down around the third or fourth tier of public concern, but one that may be rapidly increasing. And this is what we have to try to anticipate. Some of the members of Congress are under very strong pressure from constituency groups to do something about it. We don't want this to get out of hand, and the Congress to be accused of mostly reacting.
MWN: What kind of information program do you intend to fund with your legislation?
Brown: We're not in a PR game here. What we want to do is to set up mechanisms by which there is adequate transmission of research results and analytic findings and policy implications to key people in the public and [to] public interest groups that have a concern about this issue.
MWN: What are your bill's prospects in this session?
Brown: Well, this type of bill is not one that should cause us too many headaches....It has industry support; it has strong support among the members of Congress who are involved with this issue, which is not necessarily all that large a number. But I know of no organized opposition to it, so that means we ought to be able to move ahead. And the arguments about it will be over the sort of details that you raised: Who's going to carry it out? Who spends the money? And so on....[T]he money is already flowing under slightly different conditions....My anticipation is that we'll have this bill enacted this year.
MWN: Is it your hope that you will be able to get enough response from your hearing in March to develop some sort of consensus for your legislation?
Brown: Yes. Out of that hearing—I think not one hearing, we can always have a couple of short ones—I think we'll be able to go ahead with the markup of the bill and get it moving.
MWN: Are you planning to seek a Senate sponsor?
Brown: We'll get a Senate sponsor.
MWN: Let me jump to another issue, White House involvement in this issue. What's your knowledge of, or your dealings with, the administration on this?
Brown: I've spoken to the White House Science Advisor, Dr. [Allan] Bromley. He is the one who took upon himself the responsibility to make sure that the EPA report was not too flamboyant or likely to excite unnecessary public reaction [see *MWN*, M/A90 and N/D90].
MWN: Was Bromley's role appropriate?
Brown: Well, I was worried about it at the time, because I don't like to have the White House interfering with the peer-review process within the agencies, and I thought that was going along all right. I talked to Bromley about it, and he assured me that it was not his intention to interfere with the legitimate review process, but that he did have a broader concern. I think he acted quite properly....
MWN: Do you hear about EMFs when you're back in your district?
Brown: Yes....There are strong interests in southern California. There has been one program at the University of California—sort of in the nature of a public education program on the hazards of EMF—and some of the best research on EMF is being done at the Veterans Hospital [in Loma Linda] in my district.
MWN: Do you foresee a situation in which utilities are routinely going to have trouble siting power lines?
Brown: They already are, but for other reasons. There's a host of reasons—aesthetic, environmental, what have you, that cause power lines to have trouble. And I expect that will continue....On the other hand, the utilities are being much more perceptive when it comes to siting. I think that, on balance, they'll be able to do all right.
MWN: What's it going to take to get the federal government moving forward on this issue?
Brown: The federal government, at a low level, through the DOE, has been working on this for years. This is just what I would describe as a reasonable next-step expansion of an ongoing program, and [there's] nothing dramatic or startling about it in my opinion....We need to be more perceptive and anticipatory in a number of areas, and this is setting a good example for it.

UPDATES

CELLULAR COMMUNICATIONS

California Investigation... The potential health effects of cellular handsets will not be considered during the cellular phase of the California PUC's investigation into EMF hazards (see *MWN*, N/D91). "The [FCC] has preempted state authority to regulate these handsets," Administrative Law Judge Meg Gottstein wrote in a January 29 ruling. Gottstein, who is presiding over the investigation, also decided that cellular compatibility with hearing aids is beyond the scope of the investigation. The PUC will instead focus on transmissions from cellular broadcast facilities. In the same ruling, Gottstein created a panel responsible for organizing an informational workshop intended to narrow the scope of the probe and reduce the need for formal hearings. The panel will be chaired by a representative from the commission's Advisory and Compliance Division and will include Diana Brooks of the Division of Ratepayer Advocates (DRA), Dr. Raymond Neutra of the state Department of Health Services (DHS), John Scully of the Cellular Carriers Association of California and Sun Yung Kim of Citizens Concerned with Telecommunications EMF (CCTE). Gottstein's ruling followed a December 13 PUC workshop during which interested parties discussed the structure of the investigation. According to a report from the meeting, the cellular industry said it wants the proceeding "to be conducted as expeditiously as possible. Industry is concerned about the message sent when the [PUC] has an open investigation into the safety of its facilities." However, the DRA and the DHS maintained "that this phase of the proceeding should not be rushed." The DRA said it is also "concerned that the cellular industry has more extensive resources than other parties in this proceeding," and members of CCTE argued that they should be reimbursed for work in the investigation, according to the report. Dr. Neutra voiced similar concerns in a November 25 letter to Gottstein: "Neither the [DHS] nor the community groups have the resources to assemble the experts who have concerns about [RF] exposures, so the hearings would tend to be one-sided." Neutra also advised Gottstein to include cellular handsets in the investigation: "I would urge you to consider them since the exposure of those who use them is dominated by this source," rather than transmission towers.

LEGISLATION

Maine Restricts Light at Night... The state of Maine has enacted a law to curtail light pollution. The ordinance, which went into effect January 1, restricts new outdoor fixtures of more than 1800 lumens that are paid for by the state—including streetlights. New fixtures are to be "full cutoff luminaires," which allow no direct light above the fixture. For roadway lighting, the strength of the lighting is limited to the minimum required by the federal Department of Transportation, and safety alternatives such as reflectors or lowered speed limits must be used wherever possible. Rep. Jason Wentworth of Arundel, sponsor of the legislation, said engineers often recommend much stronger outdoor lighting than is needed for safety.

MEETINGS

EMF Conference... The power industry magazine *Transmission and Distribution (T&D)* is sponsoring its second "EMF conference and debate," March 9-10, 1992, at the Crystal Gateway Marriott Hotel, Arlington, VA. Speakers at the meeting, *EMF: How Dangerous?* will include: Dr. Robert Adair of Yale University; Dr. David Carpenter of the State University of New York, Albany; John Coughlin, chair of the steering committee of the National EMF Research Program and a member of the Wisconsin PSC; Rep. Peter Kostmayer (D-PA); and Dr. Stanley Sussman of EPRI. The registration fee is $450.00. Contact: *T&D*, EMF Conference, 5072 West Chester Pike, Box 556, Edgemont, PA 19028, (215) 359-1241.

PEOPLE

Dr. **Bill Kaune** has left Enertech Consultants and has returned to Richland, WA, where he used to work at Battelle Northwest Labs, to set up EM Factors, a consulting and research firm. Among the EMF services he is offering are: exposure assessments, dosimetry, instrumentation and mitigation....**Dinah McElfresh** has taken over from **Dick Ekfelt** as the executive director of the Electromagnetic Energy Policy Alliance....Dr. **Sam Milham** of the Washington State Department of Health has been awarded a Lifetime Achievement Award by Governor Booth Gardner for his epidemiological studies....**Ed Mantiply** of EPA's Office of Radiation Programs has moved his operation from Las Vegas, NV to the National Air and Radiation Environmental Lab in Montgomery, AL. Mantiply will continue to work on both high and low frequency issues....**Paul Gailey** has joined the Oak Ridge National Lab in Oak Ridge, TN to head the EMF program which supports the DOE. He replaces **Ben McConnell**....FDA's **Howard Bassen** and the University of Utah's Dr. **Carl Durney** have been elected fellows of the IEEE....Dr. **Sol Michaelson** of the University of Rochester, NY died of cancer on January 7.

RESOURCES

Michigan Hearing Transcript... The transcript of the August 6, 1991 congressional hearing on power line EMFs is now available. Rep. Howard Wolpe (D-MI) held the hearing in his home district to help resolve a conflict between Consumers Power Co. (CPC) of Jackson, MI and Michigan Residents Against Giant Electric (RAGE), a citizens group (see *MWN*, S/O 91). After the hearing Wolpe wrote to CPC urging the company to suspend construction of a 115-mile, 345 kV line. CPC rejected the suggestion, but later agreed to have the state's PSC settle the dispute in binding arbitration. Wolpe is chairman of the subcommittee on investigations and oversight of the House Committee on Science, Space and Technology. A limited number of copies of the 480-page transcript, *EMF and High-Voltage Power Lines: A Case Study in Michigan*, are available for $14.00 each from: U.S. Government Printing Office, Superintendent of Documents, Congressional Sales Office, Washington, DC 20402, (202) 783-3238. Refer to Stock No.552-070-11402-5.

ETC...

Harkin Half Cooked..."I'm not a microwave Democrat." That's the catchy slogan Senator Tom Harkin (D-IA) was reported to be using as he made the rounds in New Hampshire. His point, according to the January 17 *New York Times*, was that others in the Democratic presidential primary were like leftovers heated up in a microwave oven: hot on the outside but cold on the inside, like the hard-hearted Republicans who have held the White House for more than a decade. Harkin appears to have his facts backwards: microwaves actually cook from the inside out.

Tesla Hits the Top Ten... Is the American public more interested in gauss than in Glasnost? Encyclopedia Britannica's Instant Research Service has found, after receiving 162,000 requests for information last year, that more people asked about Nikola Tesla, the inventor of AC current, than about either Mikhail Gorbachev or Boris Yeltsin. Tesla ranked as the tenth most popular individual for the year, just one notch below Al Capone and a mere three below Jesus.

The Johns Hopkins University
School of Hygiene & Public Health
Department of Environmental Health Sciences

5th Summer Institute in Environmental Health Studies
May 18-29, 1992

Physical Agents in Environmental Health Sciences
Course Director: Dr. Zory R. Glaser

Fundamentals of non-ionizing electromagnetic radiation, pressure variations, temperature effects, vibration and ergonomic considerations. Contact: Dr. J. Corn, The Johns Hopkins School of Hygiene & Public Health, Rm 6001, 615 N. Wolfe St., Baltimore, MD 21205 (410) 955-2609

EFFECTS OF IONIZING AND NON-IONIZING RADIATION ON BIOLOGICAL SYSTEMS: Hazards, Standards, Protection and Risk Assessment

Short Course: March 30–April 2, 1992
Washington, D.C.

Instructors: Alexandra C. Miller, Ph.D. and Zory R. Glaser, Ph.D., M.P.H.

Info: "Chip" Blouin, Continuing Education Program, School of Engineering & Applied Science, The George Washington University, Washington, DC 20052, (202) 944-8527.

VDT NEWS

The computer health and safety newsletter

[ ] 1-year subscription (6 bimonthly issues) for $87.00 ($97.00 Canada & Foreign).

[ ] Back Issues, 1984-1991, $45.00 per year ($50.00 Canada & Foreign).

Order from: *VDT News*, PO Box 1799, Grand Central Station, New York, NY 10163, (212) 517-2802.

1992 Conferences: New Listings

March 23-24: **2nd Nordic Meeting on the Bioeffects of EMFs,** Aalborg, Denmark. Contact: Povl Raskmark, Institute for Electronic Systems, Aalborg University Center, Fredrik Bajers vej 7A, DK-9220 Aalborg Øst, Denmark, (45) 98 15 85 22.

April 7-8: **Nonthermal Health Hazards of ELF EMFs: Principles of Biological Action and Exposure Evaluation,** Holiday Inn Motel, Silver Spring, MD. Contact: Dr. Marjorie Lundquist, Industrial Hygiene Institute, PO Box 11831, Milwaukee, WI 53211, (414) 372-7753.

April 22-24: **EMC/ESD International 1992,** Sheraton Tech Center, Denver, CO. Contact: Dawn Keith, EMC/ESD International, 6300 South Syracuse Way, Suite 650, Englewood, CO 80111, (800) 525-9154.

April 30-May 1: **Measurement of Power System Magnetic Fields,** Lenox, MA. Contact: Hazel Mazza, Electric Power Research Institute, High-Voltage Transmission Research Center, East New Lenox Rd., PO Box 796, Lenox, MA 01240, (413) 494-4358.

May 18-19: **4th Annual EEI/EMF Conference,** Ritz-Carlton Pentagon City, Arlington, VA. Contact: Gayle Harreld, EEI, 701 Pennsylvania Ave., NW, Washington, DC 20004, (202) 508-5654.

June 8-12: **High-Voltage Transmission Line Design,** Lenox, MA. Contact: Hazel Mazza, see April 30 above.

August 24-27: **22nd European Microwave Conference,** Helsinki University of Technology, Espoo, Finland. Contact: Microwave Exhibitions and Publishers, 90 Calverley Rd., Tunbridge Wells, Kent TN1 2UN, U.K., (44+892) 54 40 27.

September 21-24: **17th Annual Conference of the Australian Radiation Protection Society** (ARPS), Sheraton Hotel, Darwin, Australia. Contact: Dr. Jiri Kvasnicka, ARPS-NT, PO Box 4405, Darwin NT 0801, Australia, (61+89) 89 66 07.

November 17-18: **Electrosafe 1992,** Jean Monnet Building, Luxembourg. Contact: Conference Services, Institution of Electrical Engineers (IEE), Savoy Pl., London WC2R OBL, U.K., (44+71) 240-1871, ext.222.

December 1-4: **37th Annual Conference on Magnetism & Magnetic Materials,** Westin Galleria Hotel, Houston, TX. Contact: John Nyenhius, Purdue University, School of Electrical Engineering, West Lafayette, IN 47907, (317) 494-3524.

For more listings of 1992 conferences, see *MWN*, N/D91.

Microwave News

[ ] 1-year subscription (6 bimonthly issues) for $285.00 ($315.00 Canada & Foreign).

[ ] 6-month trial (3 bimonthly issues) for $150.00 ($170.00 Canada & Foreign).

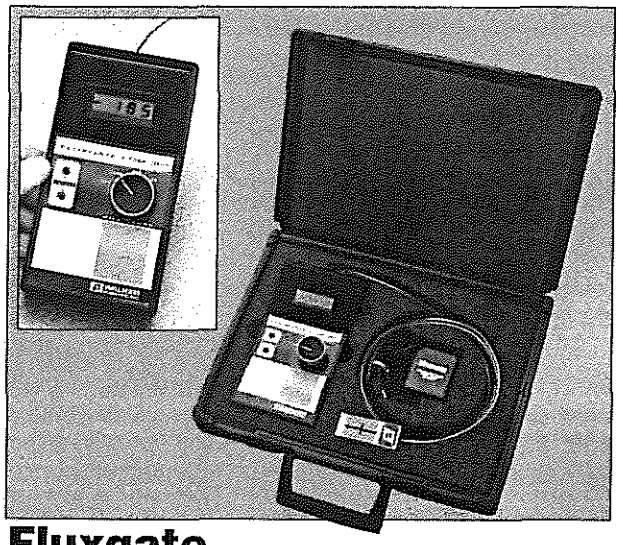
[ ] Back Issues, 1981-1991, $95.00 per year ($100.00 Canada & Foreign).

[U.S. Funds Please]

Order from: *Microwave News*, PO Box 1799, Grand Central Station, New York, NY 10163, (212) 517-2800.

Name _____
Institution _____
Address _____
City _____
State _____ Zip _____

CLASSIFIEDS



Fluxgate Magnetometer

GENERAL:
The first low-cost portable hand-held fluxgate magnetometer with laboratory accuracy. For magnetic measurement from 1 gamma (0.01 milligauss) to 2 gauss with an absolute accuracy of ± 0.5% traceable to NIST (previously NBS). Analog output DC to 100 Hz.

TYPICAL APPLICATIONS:
Earth's field vector measurements, air shipment inspection, mapping and recording field perturbations, etc.

WALKER SCIENTIFIC INC.

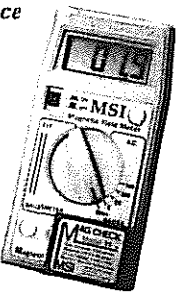
Rockdale Street
Worcester, MA 01606 U.S.A.
Telephone: (508) 852-3674 / 853-3232
Toll Free: 1-800-962-4638
Telex: 9102508517 / FAX (508) 856-9931
Code Name: "WALKER SCI"

---

msi ELF Magnetic Field Meters

Professional Accuracy at an Affordable Price

MSI-25 for reliable measurements of power frequency fields including harmonics and non-sinusoidal waves. $169.95+p&h.
MSI-20/25 for frequency information on harmonics. Displays wave forms on oscilloscope; outputs to data logger. $189.95+p&h.



For ordering or for information write or call
Magnetic Sciences International
2425B Channing Way, Suite 489
Berkeley, CA 94704 (510) 208-5080

Don't spend a fortune to get accurate EMF measurements

The ELF Alert™ series of milligauss meters permit accurate, low-cost measurement of ELF/power frequency magnetic fields.



- Digital LCD display with resolution to 0.1mG
- Accurate to 1% at 60/50 Hz
- Lightweight, pocket size, self-contained unit facilitates quick, easy measurements
- Low cost...models start at $99.95

TESLATRONICS

ONE PROGRESS BLVD. #25 • ALACHUA, FL 3261• (904) 462-2010

EMF Papers

A clipping service on non-ionizing radiation

Microwave News now offers *EMF Papers*. Twice a month, you can receive press clippings and other bulletins with the latest news on electromagnetic fields. Only $100.00/month.

Subscribe today, or send $25.00 for a sample packet.
To order, call: (212) 517-2800.

Monitor Industries' new line of residential magnetic field mitigation products (plumbing current blocking, active field cancellation) is available to qualified measurement contractors wishing to expand their field mitigation capabilities. Technical (engineering) expertise and/or construction trades experience are desirable.

(303) 442-3773 *Monitor Industries*

EMF SURVEY METERS

For Measuring

RF, Microwave, VLF and ELF Fields

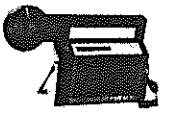
25 years of excellence

HOLADAY INDUSTRIES, INC.

14825 Martin Drive
Eden Prairie, MN 55344
ph. (612)934-4920

ELF MAGNETIC FIELD METER

MFG. by COMBINOVA AB, SWEDEN



- Meets Swedish requirements for accuracy.
- Locates sources 5 to 2000 Hz.
- Accurate, rugged, portable
- Programmable, stores 4000 measurements.

Ergonomics Inc.

P.O. BOX 964 • SOUTHAMPTON, PA 18966 • (215) 357-5124 / FAX (215) 364-7582

MICRO WAVE NEWS

Vol. XIII No. 1 | A Report on Non-Ionizing Radiation | January/February 1993

INSIDE...

EMF NEWS pp.2-5

Power Line Talk:
- Media Coverage of EMFs at All-Time High
- Neutra and Riley Respond to Brodeur
- Savitz and Tenforde Challenge CIRRPC Report
- PA PUC Hearings Resume

Cancer Excess at Aluminum Plant

NERP Off to a Slow Start

EPA To Transfer Research Funds to NIEHS

Colorado Adopts Prudent Avoidance

CDC Report on Long Island Breast Cancer

NIH Director on EMFs and Breast Cancer

HIGHLIGHTS pp.5-6

Jury Rejects Police Radar–Cancer Claim

EPA and California PUC Plan

Spring RF/MW Radiation Meetings

NEW BOOKS pp.6-7

Brief Reviews

SPECIAL REPORT pp.8-12

Cellular Phone Safety:
- Timeline: How the Story Unfolded
- Motorola's Three Key Studies
- U.K. Research Shrouded in Secrecy
- What They Are Saying
- Exemptions for Hand-Held Devices Challenged in Europe

FROM THE FIELD p.13

Report from Chinese Bioelectromagnetics Conference

Savitz on Cancer and Electricity Trends

UPDATES pp.13-14

Appeal of ANSI/IEEE RF/MW Standard Rebuffed • Guy Study Published • Police Radar Exposure Survey

CLASSIFIEDS pp.14-16

Research Promised as Cellular Phone Industry Faces Safety Questions

The cellular telephone industry and the federal government are promising new studies to determine whether exposure to microwave radiation from hand-held cellular phones is harmful. The Cellular Telecommunications Industry Association (CTIA) announced that it will fund a research effort "to re-validate...existing studies, which have found that the radiowaves from cellular phones are safe." McCaw Cellular Communications Inc. will sponsor its own studies, and the National Cancer Institute (NCI) will investigate cellular phones as part of a major epidemiological study of brain tumors.

These moves come after cellular phone safety suddenly captured the media spotlight—and battered cellular industry stocks. The publicity stemmed from news reports about the lawsuit filed in Florida last April by David Reynard, who alleges that the brain tumor that killed his wife Susan was caused or promoted by radiation from her cellular phone (see *MWN*, M/J92). But the safety debate took on a life of its own (see timeline, p.8).

CNN's *Moneyline* program gave the lawsuit its first broad exposure with a piece on January 12, and CNN's *Larry King Live* followed with an appearance by Reynard on January 21. The story was fueled by the coincidental announcement that two high-profile business executives had developed brain

(continued on p.8)

Commentary

Cellular Phones: Why the Health Risk Can't Be Dismissed

In recent weeks, the cellular phone industry has repeatedly argued that thousands of studies over the last 40 years have proved that hand-held cellular phones are safe. The claim is insupportable.

Thousands of papers have indeed been published, but they do not answer the critical question: Are there health effects from long-term, low-level exposures? Most of the thousands of experiments have used short-term, high-level exposures—addressing thermal insults that are irrelevant to cellular phones.

The hollowness of the industry mantra became clear during Motorola's January 25th press conference when, on questioning, the company was unable to come up with three studies that support its position.

Essentially no studies have been done at cellular phone frequencies (800-900 MHz). But there is a growing body of work which indicates that various types of radiofrequency and microwave (RF/MW) radia-

(continued on p.11)

EMF NEWS

« Power Line Talk »

If anyone began 1993 unaware of EMFs, odds are they know about the issue now. The American public has been bombarded with news about EMFs over the last few months. In an unprecedented development, two prime-time news shows featured EMFs during the same time slot. CBS's ***Street Stories*** and CNN's ***Larry King Live*** call-in interview show both addressed power line health risks on January 28. In early February, ***Good Morning America*** featured a three-part series, "EMF: A Shock to the System." There is more to come: ***Prime Time Live*** will air its EMF report in March and the Fox network also plans to cover the topic. A number of local television stations, including two in New York City, have or will run their own special investigations. The 33 million readers of ***USA Weekend***, Gannett's Sunday magazine supplement, were greeted with a January 3rd cover story titled, "Is My Electric Blanket Killing Me?" Richard Harris updated his 1991 EMF series on **National Public Radio** on February 2. And, of course, there was the extraordinary amount of coverage of cellular phone radiation (see p.1). Even if you always skip the news, you still got a dose of EMFs—from Jay Leno's monologue on ***The Tonight Show*** to the hit show ***Civil Wars*** to one of the TV movies on **Amy Fisher**, the Lolita of the 90s. On *Civil Wars*, a former utility attorney who claims he was fired for refusing to suppress reports on the power line–cancer link, has a nervous breakdown. At one point, in stream of consciousness, he free-associates: "Power lines, magnetic fields, schools, children, death...." One could not even escape to the movies. In *The Distinguished Gentleman*, **Eddie Murphy** plays a corrupt congressman who changes his ways after one of his constituents comes to his office with her daughter, who has a brain tumor—which is blamed on a power line next to her school. Murphy's character soon learns about an EPA report on EMFs and cancer that is being suppressed by the White House. This is the second Disney movie to focus on EMF risks: last year, the studio released *Honey, I Blew Up the Kid* (see *MWN*, J/A92).

«« »»

Dr. **Raymond Neutra**, sharply criticized by **Paul Brodeur** in a December 7 article in *The New Yorker*, is fighting back. On December 14 he sent a letter to the magazine in which he disputes Brodeur's facts and accuses him of "simplified and slanted" reporting to "arouse passion" in his readers to promote a policy he endorses. "In pursuing his crusade Paul Brodeur has distorted the truth," Neutra charges. In his article, "The Cancer at Slater School," Brodeur wrote that Neutra, acting chief of the environmental health investigations branch of the California Department of Health Services in Berkeley, had failed to investigate properly a cancer cluster at the Fresno school, while at the same time taking steps to reduce EMF levels in his own office. Neutra says that Brodeur never spoke to him about the article: "He does not contact the scientists he attacks to verify 'quotations' or facts." Neutra calls the *New Yorker* piece biased, and says that Brodeur attempts to silence the people he does not agree with. As of early February, the magazine had not published the letter, but Neutra is circulating the rebuttal himself. He has also prepared, with Dr. **John Peters** of the University of Southern California in Los Angeles, an op-ed article that faults the press for using bad science to sell stories. Neutra and Peters claim that the media use isolated cancer clusters at schools near power lines "to push for the immediate rerouting of high power transmission lines away from thousands of American schools." They say that there could be a hundred cancer clusters at schools near power lines in the U.S. by chance alone. Neutra has brought others to his defense, including Dr. **Herbert Needleman** of the University of Pittsburgh, who is known for his work on lead poisoning. In a December 21 letter to Brodeur, Needleman says that he is troubled by Brodeur's negative portrayal of Neutra and that "a first-rate scientist and human being has suffered because of it." **Karl Riley** of ELF Magnetic Surveys in Sausalito, CA also takes Brodeur to task for the "slur" on Riley's reputation. In his piece, Brodeur said that, "Riley gave the impression that by fixing magnetic-field hot spots created by interior wiring he could reduce background magnetic fields...." In a December 24 letter to Brodeur, Riley—who took EMF measurements and implemented mitigation techniques at the Slater school—denies making such a claim. He says that Brodeur "falsely described" his work.

«« »»

Dr. **David Savitz** of the University of North Carolina, Chapel Hill, has sharp words for the panel of scientists that wrote the **CIRRPC report** on EMFs, which was released by the White House in November (see *MWN*, N/D92). "In its impatience to find an irrefutable body of research to demonstrate and explain health hazards from electric and magnetic fields," Savitz writes in the January issue of *Environmental Science and Technology*, "the panel appears to accept nothing less than instant, comprehensive evidence...." He adds: "The report consistently sidesteps discussion of the evidence that does exist by focusing on the aspects that are missing. Confronted with a series of epidemiologic studies linking childhood cancer to wiring configuration codes...the report dismisses the evidence because cancer rates have not risen in parallel with electric power consumption." (He offers a detailed rebuttal of the cancer trends argument, which is excerpted on p.13.) Savitz's views appear as part of a special report, which includes a similar commentary by Dr. **Thomas Tenforde** of the Battelle Pacific Northwest Lab in Richland, WA, the complete executive summary of the CIRRPC report and an editorial by CIRRPC Chairman Dr. **Alvin Young**. Tenforde's criticisms are as strenuous as Savitz's. He writes that the panel concluded "quite correctly in my view, that the evidence for biological and human health effects of ELF fields is very limited." But he objects to the idea that this makes

further research a low priority: "Given the tremendous public interest in this subject, ignoring the existence of a possible problem will not make it disappear." After outlining a number of specific omissions and flaws, Tenforde concludes that the report "is seriously deficient in both content and logic, and should not be regarded as a definitive statement on the possible relationship between exposure to ELF fields and cancer risk."

«« »»

Technical hearings in Pennsylvania's largest power line case resumed in January after being delayed for two months by PUC Administrative Law Judge Robert Meehan. Opponents of a 268-mile, 500 kV transmission line proposed by **General Public Utilities Corp.** (GPU) of Parsippany, NJ and **Duquesne Light Co.** (DQE) of Pittsburgh had asked for more time to prepare their case, and Meehan agreed. EMF expert witnesses called by the utilities are now facing cross-examination. The case has attracted more than 9,000 letters—mostly from those protesting the line—and involves nearly 700 active parties, according to PUC spokesman John Frazier. Dr. **Samuel Milham Jr.**, formerly of the Washington State Department of Health, has been retained as an expert witness by the PUC trial staff, which functions as the prosecutorial arm of the commission, representing the public interest, Frazier said. Witnesses for GPU-DQE will include **Michael Silva** of Enertech in Campbell, CA and Dr. **Edward Gelmann** of Georgetown University Medical School in Washington. The power line is currently scheduled to begin operating in January 1997, one year later than originally planned (see *MWN*, J/A92).

Cancer Excess at Aluminum Plant in Washington State

Workers at a Washington State aluminum plant died from leukemia and lymphoma at five times the expected rate, according to a report by Dr. Howard Rockette and researchers at the University of Pittsburgh, released on December 18. The team identified eight men at the Kaiser Aluminum plant in Tacoma who died of these diseases between 1964 and 1989—only 1.6 cases were expected.

Rockette told *Microwave News* that he had considered polycyclic aromatic hydrocarbons (PAHs)—known carcinogens—and electromagnetic fields (EMFs), but he could not conclude that either had caused the excess cancer. "There is a statistically significant number of excess lymphoma/leukemia deaths in the Tacoma work force, and other than having worked at the Tacoma plant, no other 'common thread' appears to exist," his report states. Levels of PAHs and EMFs at the Tacoma plant were similar to those at other aluminum plants, Rockette said.

"We looked at the length of time workers spent in the 'potrooms,'" where they were exposed to high EMFs, Rockette said. Even though he could not draw a connection between the excess cancer and working in the potrooms, he noted that the small size of the study population could have obscured a possible association. Rockette reviewed the histories of 830 Kaiser-Tacoma workers and found that five of the 579 who had worked in potrooms had died from leukemia or lymphoma.

Previous studies have shown that potroom workers are exposed to toxic chemicals and to strong EMFs induced by direct currents used in the aluminum reduction process. DC magnetic fields in potrooms as high as 100 G have been recorded (see *MWN*, J/A90 and N/D91). Rockette said that he did not measure EMFs in the potrooms at the Tacoma plant, and that he only had information on the current loads.

Drs. Samuel Milham Jr. and Robert Davis—both formerly with the Washington State Department of Health in Olympia—had previously documented abnormal immune systems among aluminum workers at the same Tacoma plant (see *MWN*, J/A 90). "If I had to pick one work environment to pursue the EMF–cancer connection, it would be aluminum reduction plants," Milham told *Microwave News*. He drew a parallel between the impaired immune systems he and Davis observed in the Tacoma workers and those found among the rats exposed in Dr. Bill Guy's long-term exposure study (see p.13 and *MWN*, J/A84 and Mr85). Milham pointed out that midway through Guy's study, the rats were found to have abnormal B- and T-cell counts as compared to controls.

In 1979, Rockette did a study of 22,000 aluminum industry workers in the U.S. He said that he is planning to update the study and that he will investigate the possible role of EMFs.

NERP Start-Up Lags as Existing Programs Continue

The first deadlines specified in the legislation that established the National EMF Research Program (NERP) have been missed, and officials now say that the new program is not expected to affect existing federal research efforts before next fall.

Dr. Gary Boorman, chief of the chemical carcinogenesis branch at the National Institute of Environmental Health Sciences (NIEHS), and Robert Brewer, director of the Department of Energy's (DOE) utility systems division, said that both of their agencies intend to avoid disruption of ongoing research. Boorman added that, "It is difficult to anticipate any major changes" before October 1, when the next fiscal year begins.

Until recently, DOE officials were unsure whether the agency's own research program would continue or be incorporated in the NERP. The DOE has now begun distributing money—which was appropriated before the NERP was enacted—to researchers who are part of the agency's ongoing program, Brewer said. With that decision made, funding for NERP organizational activities could require a supplemental congressional appropriation.

Still unclear is the long-term fate of DOE's health research.

Brewer said he did not know whether President Clinton will request separate funding to continue it. Boorman explained that federal agencies can independently fund their own efforts and that NIEHS will pay for its $8.2 million animal study out of its own budget, not that of the NERP (see *MWN*, S/O92).

Boorman and Brewer are coordinating the shift of primary research authority from the DOE to NIEHS, as required by the NERP (see *MWN*, N/D92), and both described the relationship as working well.

Boorman told *Microwave News* that he expects the NERP will make substantial changes in the direction of federal health research. The advisory and interagency committees that will guide the program "will be stacking everything up and measuring it," he said. The two committees are not yet established, however. Despite a formal deadline of December 24, no members had been appointed as we went to press in early February.

Brewer said that the Bush administration had identified potential advisory committee members and was ready to extend invitations, but he said he does not know whether the Clinton team now plans to reconsider these choices. Members of the nine-member interagency committee will be nominated by federal agency heads and appointed by presidential directive—a process that has been slowed by the transition, according to Brewer.

NIEHS and the DOE also failed to meet the December 24 deadline for preparation of a program outline for the NERP. The research plan the DOE began developing in late 1991 lays the necessary groundwork, but federal officials do not yet know when the final plan will be completed.

Officials from both NIEHS and the DOE have met with representatives of the electric utility and computer industries to begin raising matching funds required to pay for the NERP. "I don't foresee any major problems" with nonfederal funding, Brewer said.

EPA Plans To Transfer EMF Research Funds to NIEHS

The Environmental Protection Agency (EPA) plans to give to the National Institute of Environmental Health Sciences (NIEHS) the $1.875 million that Congress appropriated for EMF research in EPA's 1992 budget. Actual transfer of the funds, which were carried over into the current fiscal year, is still being arranged, according to David Kleffman of EPA's Office of Research and Development, but the shift seems likely. "It looks like it's going to happen," agreed Dr. Richard Griesemer, deputy director of NIEHS.

Kleffman emphasized that the transfer is appropriate because NIEHS is the lead agency for health effects research under the National EMF Research Program enacted last fall as part of the energy bill (see p.3). In addition, he said, NIEHS has a mechanism in place for distributing research grants. Kleffman noted that current research goals at NIEHS—concerning exposure parameters and possible biological mechanisms—are similar to EPA's: "Their priority areas match our priority areas."

EPA's own research has been on hold since 1991, when the agency used two-thirds of its $750,000 EMF research budget to commission a national research agenda from the Health Effects Institute (HEI) in Cambridge, MA. That plan, which was originally scheduled for release in the fall of 1991, is still not complete. Kleffman said he has a "draft final" version of the report, which still must be approved by HEI's board of directors.

HEI, which had been considered a candidate for the 1992 EPA research funds, must now work with NIEHS, Kleffman said. "We do not believe we will be supporting research in this area down the line," he said. Griesemer noted that, "NIEHS has had a nice relationship with HEI" in a collaborative air pollution research program and on other projects. NIEHS has talked to HEI directly about the possibility of performing EMF research, he said.

Colorado Joins Wisconsin and Adopts Prudent Avoidance

After years of deliberations, the Colorado Public Utilities Commission (PUC) has formally adopted prudent avoidance. Electric utilities are now required to consider the health effects of power line EMFs when planning new transmission lines.

In January 1992, the Wisconsin Public Service Commission ordered utilities to use the "best available control technology" to reduce EMFs from transmission and distribution systems (see *MWN*, J/F92).

The PUC's decision was prompted by a lawsuit involving Denver-based Public Service Company's request to upgrade a power line in Douglas County from 115 to 230 kV. In 1989, the PUC announced that it would consider prudent avoidance in connection with this power line; the case remains unsettled, however (see *MWN*, N/D89, M/A91 and M/J92).

Utilities "shall include the concept of prudent avoidance with respect to the planning, siting, construction and operation of transmission facilities," according to the new PUC rule, published on November 10. The commission defines prudent avoidance as the "striking of a reasonable balance between the potential health effects of exposure to magnetic fields and the cost and impacts of mitigation of such exposure...." It goes on to identify steps utilities can take to reduce exposures, such as using low EMF designs and siting power lines away from schools and hospitals. The PUC also said that it will decide by 1995 whether the public would benefit by extending the ruling to cover distribution lines.

The actual effect of the PUC's ruling is being debated. "Prudent avoidance is a great idea, but it depends on how it's applied," said Douglas County attorney Mark Hannen. The new rule requires utilities to demonstrate that they have taken prudent avoidance into account; whether mitigation strategies are adopted is another question.

"No one knows exactly what [the new rule] means," said Stephen Denman of the Denver firm of Sherman & Howard, who represented the county in its case against Public Service.