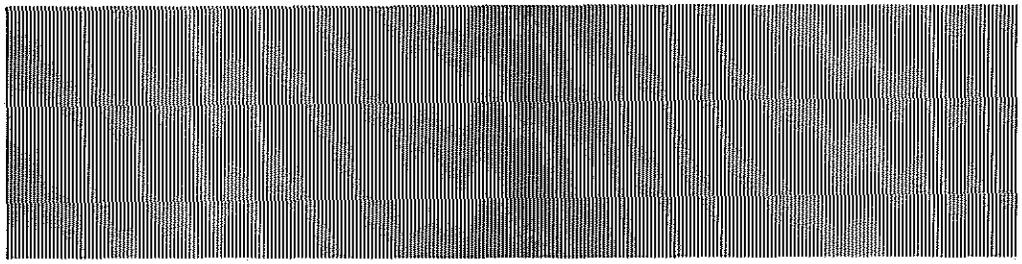


# MICRO WAVE NEWS



Vol. IX No. 1

A Report on Non-Ionizing Radiation

January/February 1989

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## NCI Set To Begin Childhood Cancer-EMF Study

### Role of NCI Scientists Questioned

The National Cancer Institute's (NCI) study of the possible association between childhood leukemia and electromagnetic fields (EMFs) is scheduled to begin in the fall. The four-year study, which will be part of a larger effort to understand the causes of childhood leukemia, will assess residential exposures from power lines and appliances.

In December, NCI announced that requests for proposals (RFPs) would be issued by the end of the month. They were not available by February 1, however, but an NCI spokeswoman said that they would be released very soon (see box on p.15 for a description of the study). The estimated cost of the EMF study is \$2.5 million. NCI anticipates that awards will be made by September 30, 1989.

The announcement comes as a storm is brewing over possible ethics violations by NCI staff members who have testified on behalf of utilities that there is no evidence of adverse biological effects from exposure to power frequency EMFs. Questions have also been raised as to whether such testimony might prejudice the NCI study.

"I think we have a very open mind going into this study," Dr. Martha Linet told *Microwave News*. Linet, the co-director of the NCI study along with Dr. John Boice, added that she had been unaware of her colleagues' testimony.

Last year, Drs. Stuart Aaronson, Lucius Sinks and Margaret Tucker, all

*(continued on p.15)*

## Vernon Down's Syndrome Study Is Abandoned; Critics Voice Outrage

The New Jersey Department of Health (NJDOH) has dropped its study of the incidence of Down's Syndrome and other birth defects among babies born in Vernon Township, NJ, primarily because of the lack of evidence of a continuing problem and the "apparent impossibility" of estimating past microwave exposures.

Many observers contest both of these arguments. A leader of the citizens' group, Citizens Against the Towers (CAT), which first prompted the study, said that NJDOH's action "borders on criminal neglect. It's one big cover-up." CAT has long maintained that the large number of uplink antennas at three satellite complexes in the town may be in some way responsible for the health problems in the community.

*(continued on p.14)*

## Epidemiology Roundup

### Support for Radio Operator Cancer Risk

Dr. Samuel Milham, Jr., has uncovered new evidence to support his epidemiological study which found that amateur radio operators had a significant excess mortality rate due to acute myeloid leukemia, multiple myeloma and certain types of malignant lymphoma. The original study, published last year, was based on data compiled by the Federal Communications Commission (FCC) (see *MWN*, N/D87).

Using radio operator license class as a "crude measure of duration of licensing," Milham found that members of the FCC's novice class did not show the increase in cancer mortality observed in the other, more experienced classes. Novices, who are limited as to transmitter power and restricted to certain transmission frequencies, may not have "been exposed long enough to fulfill a cancer latency period" or may have been less exposed to "whatever carcinogenic agents may be operating," Milham explained in a letter to the *American Journal of Epidemiology*. The novice class, in a sense, "provides an internal control group," he said.

The new analysis "adds a lot of credibility to the other findings and fits exactly with what you would expect in an occupational cohort in terms of latency parameters," Milham told *Microwave News*.

Milham proposed that it should now be possible to study the effect of license duration on mortality and to determine the interval between initial licensing and development of disease by tracking "individual license holders through successive [FCC] registration files."

Milham's letter was published in the November 1988 issue of the *American Journal of Epidemiology* (128, pp.1175-1176); the original study appeared in the journal's January 1988 issue (127, pp.50-54). Milham's first report of a link between radio operators and cancer based on an analysis of mortality records of members of the American Radio Relay League was published as "Silent Keys" in the league's monthly magazine *QST* (see *The Lancet*, April 6, 1985, and *MWN*, My85).

Also, in a letter to the editor which appeared in the following issue of the journal (December 1988), Dr. Thomas

Kurt, a Dallas, TX, researcher, pointed out that the onset of AIDS, as well as the nationwide increase in non-Hodgkin's lymphoma over the past 40 years, may have contributed to Milham's original findings. Milham, using data from his new study on license class, discounted these assertions.

### Leukemia in Sweden

Male Swedish electrical line workers had nearly double the expected incidence of chronic lymphocytic leukemia (CLL), according to a study by a group of U.S. and Swedish researchers led by Dr. Martha Linet of the National Cancer Institute in Bethesda, MD. This finding was statistically significant.

The U.S.-Swedish team also reported that electrical line workers did not show a significantly increased incidence of other types of leukemia, including acute non-lymphocytic leukemia (ANLL), and that, "No excess [ANLL] was seen in other occupational groups potentially exposed to electromagnetic fields" (EMFs).

When asked about the significance of the line worker-CLL association, Linet told *Microwave News* that, "It's one finding, one study. It needs to be followed up with more research."

A previous Swedish epidemiological study had identified a non-significant increase in total leukemia—though not in any subtype—among power linemen (see *MWN*, M/J86). Linet and coworkers suggested that, since the risk of CLL is highest among older people, the previous study by Dr. S. Tornqvist and associates may have missed this finding because, unlike Linet, Tornqvist did not include males over 64 years old.

Using the Swedish Cancer-Environment Registry, which links national cancer data from 1961 through 1979 with employment information, the researchers observed a number of new leukemia-occupation associations, including chronic myelogenous leukemia among brewery workers and motor mechanics and CLL among cloth and pattern cutters. The registry does not contain data on employment duration or on specific exposures, such as radiation, benzene or other potential carcinogens.

Linet's study appeared in the *American Journal of Industrial Medicine*, 14, pp.319-330, 1988.

### Parental Occupational Exposures

A case-control study of children with central nervous system (CNS) tumors showed no consistent association with parental occupational exposures to EMFs. Dr. Philip Nasca and coworkers at the New York State Department of Health pointed out that their study does not rule out a link between EMF exposures and tumors of the peripheral nerves.

The study did reveal an increased risk of cancer among the children of fathers with jobs associated with exposures to ion-

**MICROWAVE NEWS** is published bimonthly • ISSN 0275-6595 • PO Box 1799, Grand Central Station, New York, NY 10163 • (212) 517-2800 • Editor and Publisher: Louis Slesin, Ph.D.; Associate Editors: Jennifer Goren, Sarah Verdone; Contributing Editor: Mark A. Pinsky; Copy Editors: Jim Feldman, Ann Hornaday • Subscriptions: \$250.00 per year (\$285.00 Canada & Foreign, U.S. funds only); single copies: \$50.00 • Copyright © 1989 by Louis Slesin • Reproduction in any form is forbidden without written permission. • We invite contributions to *From the Field*, our column featuring news and opinions from the non-ionizing radiation community. Letters from readers are also welcome.

izing radiation. (This association was apparent when exposure was based on industrial codes, but not on occupational titles.)

The researchers investigated 338 children under the age of 15 diagnosed with CNS tumors between 1968 and 1977 in New York state. The study appeared in the December 1988 issue of the *American Journal of Epidemiology* (128, pp.1256-1265).

### **Emphasize Science, Not Statistics**

The public is being unduly alarmed by epidemiological studies that are scientifically flawed, an epidemiologist at the Yale University School of Medicine charged in the December 2, 1988 issue of *Science*. Dr. Alvan Feinstein based his view on studies which implicated a "common entity of daily life"—not infectious diseases; some of these studies passed peer review and received wide publicity only to be discredited later.

Using as examples three recent studies linking reserpine (a medication for hypertension) with breast cancer, coffee with pancreatic cancer and alcohol with breast cancer, Feinstein argued that the epidemiologists overlooked fundamental scientific standards. Since their publication, the reserpine and coffee risk studies have both been refuted.

Feinstein recommended that, in the future, epidemiologists should place more emphasis on the scientific quality of the evidence, and less on the statistical methods of analysis and adjustment.

## **OTA on EMPRESS II: More EMI Testing Is Needed**

The U.S. Navy's electromagnetic pulse (EMP) simulator, EMPRESS II, presents "no significant health effects" threat to humans and wildlife on land or to marine life when operating in the Atlantic Ocean, 15 miles off the coast of North Carolina, according to a new analysis by the Congressional Office of Technology Assessment (OTA). The report does recommend additional testing to gauge EMPRESS II's threat of electromagnetic interference (EMI) to avionics.

The OTA's Dr. Anthony Fainberg, the author of *The Potential Biological and Electronic Effects of EMPRESS II*, does recommend that it would be "imprudent" to have Navy personnel aboard the ships exposed to 50 kV/m electromagnetic fields (EMFs), given the uncertainties in knowledge and "particularly since simple shielding could reduce the field strengths to far lower values." He notes that the rate of cancer among Boeing workers exposed to EMP, though not "definitive," might be "a cause for concern and an indication for further study." Since the OTA report was issued, Dr. Sam Milham, Jr., has called for a national EMP health study (see *MWN*, N/D88).

Fainberg highlights research needs related to EMI. He points out that the Navy has neither examined the effect of EMPRESS II on flight electronics nor determined the EMF

## **U.S. Army To Prepare EMP EIS**

On January 11, the U.S. Army announced that it will prepare an environmental impact statement (EIS) on its EMP simulators at its Woodbridge, VA, facility. The EIS will cover health and environmental effects, as well as EMI to medical, aviation and marine electronics. Public meetings were held on January 30 and 31.

The Army has targeted the completion of the EIS for September 1989, according to Dave Davison of the U.S. Army Laboratory Command's Public Affairs Office.

The EMP testers at Woodbridge have been shut down since April 1988, as part of a settlement of a lawsuit which sought EISs for most military EMP facilities (see *MWN*, M/J88). For more information, contact: Marian Singleton, Army Laboratory Command, Attn: AMSLC-PA, 2800 Powder Mill Rd., Adelphi, MD 20783.

levels at the boundary of the 6,000-foot-high exclusion zone. "Both of these issues should be resolved by appropriate testing," he recommends, calling the present uncertain situation "somewhat disturbing." Marine traffic will be excluded from approaching within two miles of EMPRESS II.

Of special concern, according to Fainberg, is EMI to "fly-by-wire" aircraft—those, such as the Boeing 757 and 767 and the Airbus 320, which are controlled electronically instead of mechanically. He notes that the Boeing 767 is designed to withstand peak EMFs of only 100 or 1,000 V/m, depending on frequency. Fainberg advises that, "It would be vital to assure that no unhardened 'fly-by-wire' aircraft come within the 100 V/m range, which might be as far as 25 nautical miles away. Over the site, the 100 V/m altitude might be around 60,000 feet, beyond the limit of commercial aircraft."

Fainberg notes that the U.S. Army's Harry Diamond Labs is considering operating a similar EMP tester (VEMPS II) at its Woodbridge facility in Virginia, 15 miles from Washington's National Airport and only a little further from Andrews Air Force Base and Dulles International Airport. "Given the presence of [VEMPS II] near three large airports in the Washington, DC, metropolitan area, a solid understanding of EMP on commercial aircraft seems vital," he warns.

While "EMPRESS II levels appeared to cause no damage to tested marine electronics at levels equivalent to those at the edge of the two-mile exclusion zone," Fainberg adds that, "Momentary upsets of depth-finding equipment were noted," and that, "Within the zone, a LORAN-C receiver suffered upsets that could be difficult to detect." The LORAN-C was affected by levels above 4.3 kV/m. Fainberg advises that an examination of the susceptibility of "a wider variety of equipment than has already been tested" is needed.

The OTA report was requested by Congressman Walter B. Jones (D-NC), the chairman of the House Committee on Merchant Marine and Fisheries. Jones's district includes Curri-

## HIGHLIGHTS

tuck County, which borders on EMPRESS II's ocean site. Jones sought this independent OTA review to calm fears and concerns among his constituents.

Edmund Welch, chief counsel to the committee, told *Microwave News* that no follow-up was planned by the committee, but that Congressman Jones "will continue to monitor" EMPRESS II activities.

EMPRESS II, an acronym for the second Electromagnetic Pulse Radiation Environment Simulator for Ships, has been at the center of a controversy for many years (see *MWN*, O84, N84, J/F87 and M/J88). The Navy had originally planned to use the simulator in the Chesapeake Bay but finally selected the Atlantic Ocean site when faced with intense opposition from elected officials in Maryland and Virginia.

Among Fainberg's other findings are:

- "There appears to be a lack of hard data to justify the [U.S. Air Force's 100 kV/m personnel] standard."
- Residents of Corolla, NC, the closest land-based population, are exposed to 80 V/m from EMPRESS II, according to Navy measurements.
- "Tests on birds show that homing is still accomplished after exposure to EMP, although some disorientation may occur," and "It is unlikely that the effect of EMP on migration is greater than the effect of natural lightning."
- Exposure to test EMPs—not simply computer simulations or sub-scale modeling—is "necessary" to verify the hardness of ship electronics.

For more information, contact: Dr. Anthony Fainberg, International Security and Commerce Program, OTA, U.S. Congress, 600 Pennsylvania Ave., SE, Washington, DC 20510, (202) 228-6429.

## Picking the Right RF Meter

Power densities measured with broadband radiofrequency (RF) meters can be incorrect by as much as a factor of 50, according to tests by Ed Mantiply of the U.S. Environmental Protection Agency's (EPA) Office of Radiation Programs.

Mantiply recommends the use of specific types of meters for different types of sources. For single FM stations, any meter designed for this frequency range (88-108 MHz) will yield "good results." In areas where there are multiple FM and/or TV stations, a meter with a thermocouple (e.g., a General Microwave Raham 3 or a Narda 8621/8631 probe) or a square-law diode-based instrument (e.g., a General Microwave Raham 4A or a Narda 8652/8662 probe) should be used. If an electric field is to be measured in the presence of significant AM broadcast fields, a meter which is immune to RF potential sensitivity (e.g., Instruments for Industry EFS-1) is desirable.

In a paper presented at the *10th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, held in New Orleans, LA, last November, Mantiply outlined the types of problems which can lead to spurious readings: RF potential sensitivity, non-sinusoidal and out-of-

## Professor Saul Rosenthal 1918-1989

After a period of declining health, Dr. Saul Rosenthal suffered a cerebral hemorrhage and died on January 15.

An associate professor of electrical engineering at Polytechnic University in Brooklyn, NY, Rosenthal was a leading member of the bioelectromagnetics community. From 1968 to 1988, he was the chairman of what is now called the American National Standards Committee C95 on Non-Ionizing Radiation Hazards—and he played a key role in shepherding the 1982 ANSI standard through its lengthy approval process. Rosenthal was one of the original board members of the Bioelectromagnetics Society (BEMS) and was an active participant in the IEEE and URSI.

Much of Rosenthal's research was on the biological effects of microwaves and millimeter waves—specifically, on the potential damage of microwaves to the eye and on the attempted replication of Soviet cellular studies on low-level millimeter waves.

Rosenthal was an early and enthusiastic supporter of *Microwave News*. When the newsletter was still in the planning stages, he encouraged us to go forward and, during the crucial first years of publication, he was always ready and willing to help. Saul Rosenthal was most generous to us, and we will miss him.

band responses, zero instability and non-isotropy.

RF potential sensitivity can come into play at frequencies below 10 MHz when the meter responds to the RF potential difference between the probe and the meter instead of to the electric field in the vicinity of the probe. And non-sinusoidal fields can lead to measurements which are 1-2 dB too high.

If an RF meter is used in the presence of fields outside its specified frequency range, "unpredictable" responses may result. For instance, Mantiply indicates that some meters will be influenced by 60 Hz electric fields. Zero stability can also be tricky because the zero point may only drift when the field is applied—otherwise, it appears to be stable.

For more information, contact: Ed Mantiply, Office of Radiation Programs, EPA, PO Box 98517, Las Vegas, NV 89193, (702) 798-2476.

## Canada Adopts New Computer EMI Standards

On February 1, new rules governing electromagnetic emissions from computers went into effect in Canada. The regulations parallel—and were in fact prompted by—those already adopted in the U.S. by the Federal Communications Commission (FCC).

"There are a few minor differences between the two sets

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The New York Power Authority (NYPA) went on an early December field trip to Sandpoint and East Williston, both in NY, to take magnetic field measurements next to an underground 345 kV line—similar to a proposed 25-mile power line to run under Long Island Sound. The fields measured directly above the buried line in Sandpoint were less than 1 mG; in contrast, measurements taken under a nearby overhead distribution line showed levels of 2.5 mG. Officials from East Williston, one of the towns opposing the new line, accompanied NYPA on what it described as a “demonstration.” In May 1988, the state PSC approved the route, which, according to a NYPA spokesman, now only needs a permit from the U.S. Army Corps of Engineers before construction can begin. Meanwhile, a group of Westchester residents who are protesting the line are disappointed over NY Governor Mario Cuomo’s last-minute veto of a bill which would have required NY utilities to consider siting power lines along state highways rather than along local streets—including those in their own neighborhood (see *MWN*, M/J88). Undaunted, the group is now pressing state legislators to re-introduce the bill in the new session.

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*Electrical World* offered some advice in its November issue concerning “What Utilities Can Do About the EMF Threat.” First, the magazine noted that, “Scant evidence exists to prove” claims that EMFs contribute to cancer and other health effects: “The outlook for utilities planning critical new transmission projects is not bright at this time for, as in acid rain and greenhouse issues, perception seems to be more powerful than reality. In other words, whether or not EMFs are harmful is irrelevant. What is relevant is the fear that they are harmful.” Then it endorsed the approach taken by the New York Power Authority in the Marcy-South lawsuit—lining up experts who conclude that EMFs do not cause cancer and showing that land next to power lines has not been devalued.

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In January, the Sandpiper Shores Elementary School in suburban Boca Raton, FL, opened on schedule, despite a last-minute class action suit filed against the Palm Beach County school board (see *MWN*, S/O88). Three of the children’s parents are seeking a permanent injunction against the opening of the school, which is located within 230 feet of five power lines. At a preliminary courtroom hearing on December 13, Dr. Andrew Marino testified that opening the school would “constitute a human research experiment on the children.” A different view was offered by Dr. Morton Miller, testifying for the school board: There is no scientific evidence that EMFs cause any deleterious biological effects, he said, even though he did recommend further research. A trial date has been set for May 8. Phyllis Adler, president of Citizens Endorsing a Safer Environment (CEASE), a parents group which continues to oppose the school’s opening, told *Micro-*

*wave News* that most CEASE members are not sending their children to the school, and that others are sending their children for the remainder of the semester only and will make other arrangements for the next school year if the court does not take action. Some of the parents believe that the school board relied on misleading and biased information from scientists on utility payrolls in making its decision to open the school. At an October 26 informational hearing, experts told the school board that the magnetic field levels surrounding the school are within “safe” limits. But Adler claims that the experts—Drs. Philip Cole, Paul Leaverton, Samuel Milham, Jr., and Harrison Mehn—were supplied with an outdated maximum field measurement of 1.4 mG; the highest levels measured were closer to 2.8 mG (45 feet from the school). In addition, the lines are only being used at 48% capacity, she said.

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In the October/November issue of the *EPRI Journal*, James Hall looks at ways to improve power lines to meet a number of objectives, including reducing EMFs. Using the ENVIRO software, developed at EPRI’s High-Voltage Transmission Research Center in Lenox, MA, Hall compared the electric and magnetic fields from a standard double-circuit 230 kV line and from a compact six-phase 230 kV line. The electric fields were roughly the same in each case, but the magnetic fields associated with the six-phase line were approximately half of those from the double-circuit line.

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Central Maine Power Co.’s (CMP) plans to purchase 300 MW of electricity from Hydro-Québec for \$4 billion over the next 29 years have been put on hold. On January 9, the Maine Public Utilities Commission (PUC) voted 2-1 to deny CMP permission to build a power line composed of two segments—42 miles at 345 kV AC and 92 miles at 450 kV DC—across western Maine. According to the PUC, the utility did not show that the proposed contract was the “least cost energy plan,” and failed to adequately assess in-state production and conservation. The decision was not based on health or environmental concerns—the power line would have required cutting down 2,000 acres of trees and would have crossed the Appalachian Trail. Pamela Prodan, a member of No Thank Q Hydro-Québec, a citizens group opposing the project, told *Microwave News*, “In this particular case, the PUC wasn’t ready to look at the economic impacts of health effects.”

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On April 4, Dr. Bill Feero of Electric Research & Management will chair a panel on power line EMFs at the *11th IEEE/PES Transmission & Distribution Conference and Exposition* in New Orleans, LA. Among the panelists will be Robert Black and James Mitsche, both of EPRI, Dr. Lee Rosen of W/L Associates and James Vick of Gulf Power Co. The T&D expo is the largest meeting of its kind—the last one, held in 1986, attracted more than 10,000 participants.

## Sheppard to Seattle City Light: Consider Epidemiological Data

"It is now reasonable to consider epidemiological evidence in making public policy" on power lines, Dr. Asher Sheppard advises in a report to Seattle City Light (SCL), a Washington state utility. Sheppard adds, however, that, "It would be wrong to treat the evidence as if a cause and effect relation had been proven" and that, "It will not be possible to confirm or rule out an association between 60 Hz fields and cancer for some time."

When asked by *Microwave News* whether he would recommend a magnetic field exposure limit based on the Wertheimer-Leeper and Savitz epidemiological studies, Sheppard replied that, "I can't recommend a number that would serve as a 'standard' for magnetic field exposures but what I do recommend is that on the basis of the epidemiological data, milliGauss (mG) fields may influence cancer incidence."

Sheppard did suggest that in planning new power lines, SCL should take a close look at the routing to see who is at risk and what the economic impact may be. Then the utility should let the ratepayers decide the preferred course of action. Sheppard, who is on the research staff at the Veterans Administration Hospital in Loma Linda, CA, prepared his report as a consultant to SCL.

Laurie Geissinger of SCL's Environmental Affairs Division told *Microwave News* that, "The Sheppard report will indeed influence the way SCL presents any new proposals for

facility upgrades, including power lines." Like Sheppard, Geissinger shied away from a specific magnetic field standard: "The next logical step is not trying to impose specific standards when we don't know if we are purchasing any increased benefits with respect to public health. Instead, we are getting ready to make changes in design that may be warranted in the future." She added that the utility is now also investigating whether there are areas of high exposure.

In a critique of Sheppard's report, Dr. Robert Becker, a consultant based in Lowville, NY, argues that the evidence of harmful effects is "sufficiently compelling to require that any new transmission line be constructed in such a fashion as not to expose any residence or school building...to any 60 Hz magnetic field in excess of 3 [mG]." However, he does add that, "I do not advocate that this standard be immediately placed on all existing facilities" because "such an action would result in the failure of our electric power system with unacceptable risks to the general population."

In his comments, Becker dismisses as "patent nonsense" the NY Public Service Commission's decision—following the release of the NY Power Lines Project final report—to set a field strength limit of 100 mG at the edge of 345 kV rights-of-way (see *MWN*, M/A88 and N/D88). Becker prepared his comments at the request of Citizens Against Overhead Power Lines (CAOPL), a Seattle citizens group organized to fight a

### SCL Policy Statement on EMFs and Human Health

Seattle City Light (SCL) is committed to providing safe, reliable and environmentally sound electric service for its customers and a safe work environment for its employees. The Utility adheres to the Washington State Standards for Electrical Construction Code and Electrical Workers Safety Rules (WAC Chapter 296-44 and 45) and complies with other applicable regulations governing installation of electrical facilities. Additionally, the Utility is committed to public involvement in determining where electrical facilities should be located.

The utility is aware of the ongoing research effort to identify the biological effects of power frequency (50-60 Hertz) electric and magnetic fields (EMFs) and to determine if such effects have any implications for human health. Research on EMFs covers a wide range of subjects, such as studies concerning reproduction, cancer and behavior. Studies of humans include both workers and people without work-related exposure.

Exposure of people to electric and magnetic fields from electrical transmission, distribution, and appliances may or may not be found to affect health. At this time, whether such fields can produce or promote change that impairs or otherwise compromises health is a matter of great scientific uncertainty. However, the fact that some studies even suggest a link between electric and magnetic fields and health requires assertive steps by the utility industry and government agencies to answer questions pertaining to possible health effects. SCL acknowledges the scientific uncertainty and public concern about possible health effects. Any po-

tential risk to health is viewed as a serious concern by the utility. SCL's policy on this topic will be used to guide decision-making of the utility that involves consideration of electric and magnetic field effects.

#### Statement of Policy

It is the policy of SCL to share its knowledge of the available information on the biological and possible health effects of electric and magnetic fields in open internal and public communications about research and regulatory developments, and to ready the utility for operational changes that could be warranted in the future. This will be accomplished by establishing an interdisciplinary work group with responsibility for:

- Monitoring research and regulatory developments
- Registering concerns about possible health effects and responding in a coordinated manner to requests for information on electric and magnetic fields from the public and SCL employees
- Initiating the conveyance of information to enhance understanding of electric and magnetic field effects as dictated by milestones in the research and/or heightened sensitivity of the public and employees
- Identifying and proposing means by which SCL may work with other electric utilities to advance and support research in this field
- Making recommendations concerning changes to design standards and/or system operating practices that may be warranted.

230 kV line first proposed by SCL in 1984.

In his report, Sheppard proposes that SCL expand its 1986 final Environmental Impact Statement (EIS) on the 230 kV Highline power line project to include magnetic—as well as electric—field concerns. SCL's Geissinger said that the Highline project has been "shelved" for at least three to five years.

Among Sheppard's other recommendations are that SCL prepare a supplemental EIS with an emphasis on risk assessment, taking into account recent epidemiological studies; set up an EMF task force; evaluate potential risks associated with power lines and substations; assess existing facilities to estimate potential health hazards; and consider delaying new power line projects until more information has come in.

CAOPL calls for the creation of an oversight group made up of experts not affiliated with utilities, to be independently funded and administered by a public health agency. In the meantime, CAOPL wants SCL to "stop all construction of proposed...lines and substations" and to take "accurate 24-hour measurements of existing 'hot spots' of chronic exposure levels."

SCL recently adopted a policy statement on human health and electric and magnetic fields (see p.7) and will soon finalize a work plan for the next few years.

*Update on the Scientific Literature Concerning Health Effects of 60-Hz Electric and Magnetic Fields of Power Transmission and Distribution Facilities*, which was released in September 1988, was prepared at the order of Seattle City Council Resolution 27741. The report is available from: Laurie Geissinger, Seattle City Light, 1015 Third Ave., Seattle, WA 98104, (206) 684-3462.

## FROM THE FIELD

*On March 27-31, the Maryland Public Service Commission will hold hearings on the health effects associated with exposure to extremely low frequency (ELF) electromagnetic fields (EMFs). The hearings are the latest stage in the Potomac Electric Power Company's (PEPCO) 12-year struggle to build the 10-mile 500 kV Brighton-High Ridge power line—the only unbuilt piece of a 243-mile loop around Washington, DC (see MWN, M1A88 and S1O88). The following is excerpted from expert testimony filed by some of the parties and intervenors in the case.*

### For PEPCO

*Dr. Edwin Carstensen, Professor of Electrical Engineering and Biophysics, University of Rochester, NY.*

**Q.** What is the scientific consensus on the effects of transmission line EMFs on health and safety?

**A.** Over the past decade, there have been in excess of 15 reviews of this subject by consensus groups throughout the world. These scientific and governmental bodies have identified three potentially adverse effects from exposure to transmission line fields—shock from contact with conducting objects, the related effects on productivity in honeybees, and inhibition in a limited subset of implanted cardiac pacemakers. The National Electrical Safety Code contains a 5 mA standard to address the potential for adverse shock effects. That standard appears to have been 100% effective in eliminating shock-related accidents. As I noted before, the effect on honeybees can be

## NAS-NRC ELF Workshop

The National Academy of Sciences-National Research Council (NAS-NRC) will host a one-day workshop on extremely low frequency (ELF) fields in Washington, DC, on March 14. The purpose of the workshop is to see how this field of study has developed over the last few years and to determine whether the NAS-NRC should devote more attention to it, according to Dr. Ray Cooper of the NAS-NRC's Board on Radiation Effects Research.

An ad hoc panel, chaired by Dr. Richard Setlow of Brookhaven National Lab, has been assembled to review the ELF data. The panel will hear from six experts: Drs. Martin Blank of Columbia University; Craig Byus of the University of California, Riverside; David Carpenter of the NY State Department of Health; Russell Reiter of the University of Texas Health Science Center; David Savitz of the University of North Carolina, Chapel Hill; and Tom Tenforde of Battelle.

The NAS-NRC held similar workshops in 1983 and 1985 (see *MWN*, D83 and N/D85). In a report, *Non-Thermal Effects of Non-Ionizing Radiation*, issued following the 1985 meeting, the NAS-NRC panel concluded that, "Abundant fragmentary evidence has been presented in support of possible biological effects from non-ionizing radiation, at both transmission line and microwave frequencies. These effects often appear to be unaccompanied by macroscopic thermal changes" (see *MWN*, M/J86).

"Things have changed quite a lot since the earlier workshop," Cooper told *Microwave News*, "but I am not sure that there is enough information to say anything definitive [about ELF mechanisms]." Academy members and federal officials have been invited to the workshop. Those wishing to attend should contact Cooper directly at the NAS-NRC, 2101 Constitution Ave., NW, Washington, DC 20418, (202) 334-2743.

eliminated by shielding the hives. With respect to pacemaker inhibition, the consensus is that this is a manufacturing defect and that the solution to the problem lies with the manufacturer.

*Dr. Mark Israel, Chief of the Molecular Genetics Section of the Pediatric Branch, Division of Cancer Treatment, National Cancer Institute (NCI), Bethesda, MD.*

**Q.** Based upon your experience and research as a pediatric oncologist and cancer researcher, is there any scientific evidence that would lead you to believe that exposure to power frequency EMFs causes, promotes, or otherwise leads to the development of cancer?

**A.** No.

**Q.** In your opinion, is there any scientific basis to believe that exposure to the EMFs from the Brighton-High Ridge 500 kV transmission line would cause, promote, or otherwise lead to the develop-

ment of cancer?

A. No.

Q. Dr. Israel, let us assume that the magnetic field levels at the edge of the right-of-way [ROW] for the Brighton-High Ridge line would be as high as 200 mG. Based upon that assumption, is there any scientific evidence that would lead you to believe that exposure to magnetic fields from the Brighton-High Ridge line would cause, promote, or otherwise lead to the development of cancer?

A. No.

*Dr. Margaret Tucker, Chief of the Family Studies Section of the Environmental Epidemiology Branch, NCI, Bethesda, MD.*

Q. What do you conclude based upon your review of the occupational and residential epidemiological studies of EMFs?

A. I find no consistent pattern of risk of cancer in children or adults, no indication of a dose/response relationship, and in certain studies, an inadequate assessment of the impact of probable confounders.

Q. In your opinion, do the occupational and residential studies fail to show a consistent pattern of risk because the research has not advanced far enough?

A. No. The epidemiology research is fairly far advanced. For example, at the same stage in the cigarette/cancer research, one could make a conclusion about the relationship between cigarettes and cancer, because there was a consistent pattern of risk within and across the studies.

Q. What is your opinion on the risk of cancer from exposure to EMFs?

A. The research in epidemiology in this area has yielded no persuasive scientific evidence of an increased risk of cancer in children or adults from exposure to power frequency EMFs.

Q. Dr. Tucker, let us assume that the magnetic field levels at the edge of the ROW for the Brighton-High Ridge line would be as high as 200 mG. Based upon that assumption, is there any scientific evidence that would lead you to believe that exposure to magnetic fields from the Brighton-High Ridge line would increase the risk of cancer in children or adults?

A. No.

#### **For Maryland People's Counsel**

*Dr. Charles Polk, Professor of Electrical Engineering, University of Rhode Island, Kingston, RI.*

Q. Were you aware of the work of Wertheimer and Leeper before the results of the Savitz study were published and what was your opinion concerning their findings?

A. Yes, they are discussed in...the *Handbook of Biological Effects of Electromagnetic Fields*, which I edited. In 1984 or 1985 I was very skeptical concerning the validity of their findings, primarily because I did not believe at that time that the "wire configuration code," which they used, was really a valid measure of long-term magnetic field exposure. I also discounted the results, because the classification of residences into wire codes was not done "blind"; that is, the classifier was aware of whether or not the particular residence corresponded to a cancer case.

Q. Have you changed your opinion concerning the Wertheimer-Leeper studies?

A. Yes, because the much more elaborate study by Savitz and co-workers gave results very similar to the earlier findings. Also, measurements over 24-hour periods by Kaune and coworkers (*Bioelectromagnetics*, 8, p.315, 1987) in 43 homes indicated that the Wertheimer-Leeper wire codes predicted reasonably, although imperfectly, average magnetic field levels. Finally, I concur now with the suggestion by Savitz that the Wertheimer-Leeper wire codes may be a better indication of long-term, historical magnetic field exposure

of former residents of a home (who died of cancer) than current short-time (hour or less) field measurements which are affected by such variables as recent home wiring changes or purchase of new appliances.

Q. What do you believe are the implications of the New York power lines study and of the laboratory investigations which you described for the construction of the proposed 500 kV transmission line in Maryland?

A. While it is probably impossible to wait several years for the availability of further research results, I believe that caution is in order. Since the Savitz and Wertheimer-Leeper and Tomenius studies suggest a possible association of cancer with long-term exposure to magnetic fields above 2.5 or 3.0 mG, it is clearly desirable to reduce the magnetic fields from the line as much as possible in areas where dwellings are located.

#### **For Howard County, Maryland**

*Dr. Jerry Phillips, Cancer Therapy and Research Foundation, San Antonio, TX.*

Q. Do the results of your studies provide any explanation of a manner in which EMF exposure might be associated with an increased incidence of cancer or other illness or disease?

A. Yes. Cancer is a disease that appears to develop in stages. The first stage, known as initiation, is irreversible and involves at least one heritable change in the structure of the cell's genetic information, its DNA. The second stage, known as promotion, involves a series of reversible changes during which this initiated cell that was produced undergoes continued growth and further change that ultimately results in the production of a cell that is recognizable as a cancer cell. During the final stage, which is known as progression and is irreversible, certain more cancerous variants become dominant and have selective growth advances and survival advances over other cells in the tumor. Therefore during this phase of progression, one sees the emergence of increasingly diverse cancer cells with enhanced survival and growth characteristics. In lay terms, this stage of progression has been defined as that stage during which tumors go from bad to worse. Within this framework then, one can see a relationship between the work performed in my laboratory and those events that are characteristic of the stage of progression in tumor development. As stated above, human cancer cells exposed to EMFs demonstrated an increased capacity to grow, as well as an increased resistance to destruction by natural killer cells, which are cells that are part of the body's normal defense system. These cells, then, after exposure to EMFs, have demonstrated enhanced properties of growth and survival. It would appear that EMF exposure has taken a bad situation and made it worse....

Q. Dr. Phillips, do you have an opinion, based upon your individual research and your review of studies conducted by other scientists and physicians, whether there are biological or adverse health-related effects from exposure to EMFs?

A. Yes, I do.

Q. What is your opinion?

A. It is incontrovertible that exposure of biological systems to EMFs produces changes in those systems. Furthermore, it is my opinion that it is probable that the observed changes in biological structure and function are related to adverse effects on human health and development. I have stated in the past that I believe there is indeed a problem associated with human exposure to EMFs and that the only way to properly define the nature and magnitude of that problem is through continued research. Until we can define whether or not there is a problem, in what areas a problem exists and how big that problem might be, I believe it is imperative to minimize exposure of the general public as much as possible.

## FROM THE FIELD

### For Maryland Department of Natural Resources

Dr. William Bailey, Vice President, Environmental Research Information, Inc., New York, NY.

**Q.** Is there any evidence that there may be a health hazard associated with the EMFs generated by transmission lines?

**A.** Several epidemiological studies have reported that some types of electric utility wiring configurations (primarily relating to the number and thickness of distribution lines and their distance from residences) are found more frequently outside the residences of cancer cases than outside the residences of individuals without cancer.... This has led to the hypothesis that this association reflects a low but increased risk of cancer from exposure to power line magnetic fields. If the hypothesis were true, then possibly all sources of magnetic fields, including household wiring and electrical appliances, would be associated with increased risk, as well as transmission lines.

**Q.** Do these studies prove that power lines cause cancer?

**A.** No. These studies are open to other interpretations and none has proved that the reported associations are causal. In addition, a larger number of other similar epidemiological studies have not observed any such association. An important consideration that also argues against a causal relationship is the fact that such associations (between wiring configurations and cancer) are not confirmed in those studies in which exposure to magnetic fields in the residence was determined by actual measurement.

**Q.** What about epidemiological studies of workers in "electrical" occupations?

**A.** There have been about 30 epidemiological studies which have looked for associations between job titles in "electrical" occupations and cause of death. These descriptive studies do not include measurement-based estimates of exposure to EMFs or to known or suspected chemical carcinogens that are widely prevalent in "electrical" occupations. Therefore, it is difficult to determine what field exposure might have contributed to mortality, independent of other factors. Without such information, these studies are of little help in documenting health risks. The studies also are not consistent in their findings....

**Q.** Have laboratory studies of animals or cells isolated from animals and humans, exposed to EMFs produced findings that would indicate that these fields cause cancer?

**A.** The evidence clearly weighs against this possibility.... Neither has the behavior of normal or cancerous cells been shown to be affected by field exposures in ways that would characterize fields as having tumor-promoting properties.

**Q.** Is the evidence which suggests there might possibly be a health hazard from EMFs adequate to cause changes in public policies regarding the routing of transmission lines?

**A.** Not on the basis of the evidence that is now available.... The results of currently available epidemiological and laboratory research on EMFs together do not support the conclusion that the operation of a 500 kV transmission line would produce cancer or other health hazards in adjacent populations.

Thomas Magette, Manager, Nuclear Programs for the Maryland Power Plant and Environmental Review (MPPER) Division, Department of Natural Resources.

**Q.** What are MPPER Division's conclusions?

**A.** Based upon our evaluation of the existing research, we do not believe that the operation of the 500 kV Brighton-High Ridge transmission line will result in any adverse health effects.

**Q.** Would you then say that there is no risk of a health effect from the operation of this line?

**A.** If there is any risk of a health effect, it is extremely low, and is

easily outweighed by the benefits of the electrical transmission system, including the Brighton-High Ridge line.

J. Patrick Reilly, Johns Hopkins University Applied Physics Laboratory, Laurel, MD.

**Q.** What are the calculated maximum field levels within the ROW for the existing 230 kV lines?

**A.** The maximum field level for the existing four-circuit 230 kV lines is calculated as 95 mG under conditions described by PEPCO as "normal loading." Under "heavy loading" conditions, the calculated maximum level is 125 mG....

**Q.** What are the calculated maximum field levels within the ROW with the addition of the 500 kV line?

**A.** The calculated fields depend on which configuration is being considered. For configuration A, the maximum field level within the ROW is 77.3 mG under conditions described by PEPCO as "normal loading" and 101.0 [mG] under conditions described as "heavy loading." For configuration B, the maximum field level is 83.8 mG for "normal loading" and 118.4 mG for "heavy loading."

**Q.** Could you please explain how these fields could be lower following the addition of the 500 kV circuit?

**A.** The addition of an additional transmission line alongside existing lines can cause the total field to either increase or decrease at specific locations. The total field level is affected by several factors, among them the specific line designs, the current loads, and the interaction of the fields from each transmission line....

**Q.** What exactly do you mean by interaction of the fields?

**A.** Each wire in the transmission line circuit will produce its own magnetic field. The magnetic field at a distant point will be due to the combined effects of all the wires, but these effects are not necessarily additive in a simple sense because of the differing electrical phases. As a general rule, the fields from separate sources can combine in either a mutually reinforcing or canceling way, depending on the phases of the separate sources. The magnetic field components from the individual wires of a single transmission lines circuit will partially cancel one another at most locations distant from the lines. The efficiency of this mutual cancellation will depend on the geometric arrangement of the wires. As a rule of thumb, the cancellation becomes more efficient as the wires comprising a simple transmission line circuit are moved closer together, and also as the measurement point is moved more distant from the lines. If there is more than one transmission circuit in a ROW, the combination may be one of addition or cancellation depending on the relative phases of the wires in the different circuits and the location of the measurement point.

**Q.** What are the calculated field levels distant from the ROW?

**A.** ...the calculated fields are below a level of 0.5 mG somewhere between 400 and 1,000 feet from the centerline of the ROW. The precise distance depends on which configuration is being considered, the current load that is assumed, and the degree of electrical imbalance.

**Q.** What is the significance of a level of 0.5 mG?

**A.** 0.5 mG is a typical level found in many residences that are not located near high voltage transmission lines. Actual ambient residential levels depend upon a host of factors and could be higher or lower than that value.

**Q.** Is it possible that the magnetic fields might actually be greater than the ones you have calculated?

**A.** Yes, it is.

**Q.** What factors could cause the magnetic fields to be greater than the calculated levels?

**A.** Two major factors could result in magnetic field levels that are substantially greater than the calculated levels. One is higher current levels, the other is electrical imbalance.

# UPDATES

## BIOLOGICAL EFFECTS

**PMF-Rat Study Shows Some Effects...**PMFs had some adverse effects on pregnant rats and their offspring, but the Canadian researchers who ran the study generally discounted the significance of the effects. Dr. Maria Stuchly of Health and Welfare Canada in Ottawa, Ontario, first presented the results at the power line contractors' review in Kansas City, MO, in November 1987 (see *MWN*, N/D87). Female rats were exposed to PMFs at intensities of 5.7, 23 or 66  $\mu$ T seven hours per day starting two weeks prior to impregnation and lasting throughout pregnancy. The fetuses exposed to 66  $\mu$ T PMFs had a highly significant ( $P < 0.001$ ) increase in minor skeletal anomalies. One type of skeletal variation was also elevated in the 23  $\mu$ T group. Stuchly and coworkers discounted these findings as "common 'noise' that appears in every teratological evaluation." The team also found statistically significant decreases in red and white blood cell counts among the rats exposed to 66  $\mu$ T, as well as a small but significant change in one blood chemistry index among those exposed to 23  $\mu$ T. Stuchly called this latter finding "incidental," but noted that the changes observed at 66  $\mu$ T "could represent a toxic response to the magnetic field." These hematological findings were not reported in 1987. The results appear in *Teratology*, 38, pp.461-466, 1988.

## COMPATIBILITY & INTERFERENCE

**"ENR" Changes Hands...**The *Electromagnetic News Report (ENR)* has a new owner. The bimonthly newsletter, started 17 years ago by Robert Goldblum of R&B Enterprises, has been sold to Michael Howard, the president of Liberty Labs, Inc., which until now has been best known for its engineers' log books. In a telephone interview from his office in Cedar Rapids, IA, Howard told *Microwave News* that he plans to continue the current format, but will add new features and columns. For instance, in the first issue edited by Howard (January 1989), William Kimmel of Kimmel Gerke Associates Ltd., an EMI consulting firm based in St. Paul, MN, inaugurates an "EMC Notebook." Howard will also send his subscribers special bulletins—*ENR Express*—to highlight news that cannot wait until the newsletter's next issue. "We intend to provide up-to-date information to the EMC community," he said. When asked to compare *ENR* to both Don White's bimonthly *EMC Technology* and Dash, Straus & Goodhue's

Louis Slesin, the editor of *Microwave News*, takes a look at the implications of the demise of EPA's non-ionizing radiation program and its decision not to issue federal exposure rules in "The Danger of Ignoring Non-Ionizing Radiation," which appears in the January 1989 issue of *Technology Review*, an MIT publication. Subscribers can get a complimentary copy by sending a self-addressed stamped envelope to: *Microwave News*, PO Box 1799, Grand Central Station, New York, NY 10163.

quarterly *Compliance Engineering*. Howard said that while *EMC Technology* is directed to the design engineer and *Compliance Engineering* emphasizes regulations and standards, "ENR will provide general news to the EMC community." *ENR* has a circulation of approximately 500, with a readership of 2,100, according to Howard. Subscriptions are \$53.00/year in the U.S. and Canada and \$68.00/year elsewhere. For more information, contact: Michael Howard, Liberty Labs, Inc., 4920 Johnson Ave., NW, Cedar Rapids, IA 52405, (319) 390-3646 or (800) 728-7081.

**TEMPEST Industry Hurting...**In our last issue, we noted that Frost & Sullivan, Inc. (F&S), was predicting a slower rate of growth for the TEMPEST products market. More recently, the January 23 *Washington Post* reported that the industry is struggling through hard times—and may therefore be in worse shape than was suggested by F&S. The *Post* quoted representatives from Washington, DC, area TEMPEST firms: "The industry in general is having a bad year," said John Innocenti of Atlantic Research Corp., who predicted "some tough times ahead" for the smaller companies. David Lucien, president of Tempest Technologies, Inc., said that "TEMPEST is leveling off" and that future growth will be more like 9 percent a year compared to the 30-40 percent levels of the past. The turnabout was blamed on a combination of a slowdown in the computer industry and a government spending freeze on data processing equipment.

## EMP

**FCC Petitioned Once More...**Two Washington, DC, area residents are again trying to convince the FCC to open a notice of inquiry (NOI) on how best to protect civilian communications against an EMP. On November 28, Nickolaus Leggett and Donald Schellhardt filed a new petition asking the commission to reconsider its position that the NOI is unnecessary because other efforts are in progress—the basis for the FCC's refusal to act favorably on similar petitions in 1986 and in 1987 (see *MWN*, S/O86, J/F87 and M/J87). Leggett, a "technology analyst," and Schellhardt, an attorney, argue that, contrary to the commission's expectations, EMP protection standards are not expected from the National Security Telecommunications Advisory Committee (NSTAC) or from the American National Standards Institute (ANSI) in the foreseeable future. They cite a letter from the president of ANSI, stating that EMP standards are "not a priority" and that, "We have no idea when to expect their development."

## GOVERNMENT

**EPA Meets EEPA...**The Board of Directors of the Electromagnetic Energy Policy Alliance (EEPA) met with Richard Guimond and Dave Janes, both of EPA's Office of Radiation Programs (ORP), in early December to try to convince them to change their minds and issue federal RF/MW radiation limits. The EPA staffers held their ground. Guimond, the head of

## UPDATES

the ORP, explained, as he has in the past (see *MWN*, S/O88 and N/D88), that non-ionizing radiation is not a high priority at EPA or in Congress and that the agency had decided to tackle more important issues, according to Richard Ekfelt, EEPA's executive director. Ekfelt said that, as far as EEPA is concerned, the costs of *not* implementing the guidance are greater than the costs of doing so. In a telephone interview with *Microwave News*, Guimond explained that issuing the RF/MW guidance would not be enough in itself and that the agency would also have to implement it. He said that the agency would have to spend a million dollars and assign five members of the ORP staff during the current fiscal year to complete the rules and then would have to earmark the same resources for each of the next few years to educate industry and the public. When asked at the end of January if his prognosis for the guidance had changed, Guimond replied, "I don't see it in the cards at this time." EEPA has not given up the fight and is waiting for the new EPA Administrator, William Reilly, to take office to see if he is more responsive to its interests. Whatever Reilly's outlook may be, Guimond said that he expects to be staying on as the head of the ORP. Meanwhile, Ekfelt said that EEPA will continue to look for a receptive ear in Congress.

**FCC and FM Boosters...** The FCC has added FM booster stations to its list of facilities that require environmental analyses of RF/MW radiation levels before permits can be issued or renewed. The final action comes a year after the commission first proposed applying its rules governing the preparation of environmental impact statements to FM boosters, which are used to reach listeners who otherwise could not receive FM signals due to terrain obstructions (see *MWN*, J/F88). The FCC had originally exempted FM boosters because of their low-power transmission (see *MWN*, A85 and M/A87). The FCC changed its mind after the boosters were allowed to operate at powers of up to 20 kW. For more information, contact: Dr. Robert Cleveland, Office of Engineering and Technology, FCC, 1919 M St., NW, Washington, DC 20554, (202) 653-8169.

### MEDICAL APPLICATIONS

**FDA Faults Magnetron...** The FDA withdrew its approval of the Magnetron hyperthermia unit last fall, according to a front-page story in the November 25 *Los Angeles Times*. The agency ordered that patients should no longer be treated with the unit, which was developed by Dr. Kristian Storm, formerly at UCLA and now at the University of Wisconsin, and which is manufactured by Henry Medical Electronics, Inc., in Los Angeles. The unit heats the body using 13.56 MHz radiation (see *MWN*, My81). The *Times* cited an October 6 letter from the FDA's Office of Device Evaluation which claims that researchers using the Magnetron unit at nine medical centers have failed to prove its efficacy and safety. The *Times* also reported that the FDA was worried about the Magnetron's potential for significant leakage, thereby exposing

medical personnel to undesirable levels of radiation. Until his resignation in December 1987, Storm was the chairman of the ANSI subcommittee charged with revising the 1982 ANSI RF/MW safety standard (see *MWN*, M/A88).

### MEETINGS

**Electrical Potpourri...** EPRI is sponsoring seminars on various aspects of power line design and analysis in Palo Alto, CA, during the first five days of May. One day each will be devoted to radio noise, lightning and EMF calculations; two days are reserved for power line EMC with railroads and pipelines. You can register for each topic separately or for all four together. For more information, including costs, contact: Valerie Kakaio, EPRI, PO Box 10412, Palo Alto, CA 94303, (415) 855-2798.

**MW Susceptors and Migration...** There will be a special session on microwave susceptors at *MW Foods '89*, to be held at the Drake Hotel in Chicago, IL, on March 15. Among the topics to be covered are susceptor safety, package migration, food product/package interaction, consumer safety, fires and hot spots. Jerome Heckman of Keller & Heckman, a Washington, DC, law firm, will chair the panel discussion; joining him will be Robert Schiffmann, a consultant based in New York City, and Dr. Lester Borodinsky of the FDA, among others. For more information, contact: The Packaging Group, PO Box 345, Milltown, NJ 08850, (201) 636-0885.

**Bioelectricity Meeting Canceled...** The *2nd Meeting of the International Society for Bioelectricity*, scheduled for March 10-12 in Denton, TX, has been canceled. According to Dr. Andrew Marino, the president of the society, the move was prompted by a lack of "quality abstracts."

### MILITARY SYSTEMS

**Nunn Seeks PAVE PAWS Evaluation...** On January 4, Senator Sam Nunn (D-GA), chairman of the Senate Armed Services Committee, asked the USAF for an "official evaluation of the potential hazards of the PAVE PAWS radar emissions to aircraft flight safety and the long-term adequacy of the current operational procedures" at Robins AFB, GA. Nunn also requested a report on how the phased array radar can perform its space tracking mission with minimal risk to aircraft operations. "We may need to have an independent assessment," Nunn warned. In a January 27 letter to Nunn, USAF Brigadier General Burton Moore said that the USAF has "convened a General Officer Group to review the potential safety problems and make recommendations by June 1989." Over the past year, the Robins PAVE PAWS radar has been at the center of an EMI controversy over whether electro-explosive devices (EEDs) aboard aircraft flying through the radar's main beam are in danger of detonating (see *MWN*, J/A88). The USAF considered relocating the radar at a cost of \$37.7 million because of this risk—but later rejected the proposal. In the meantime, a number of safety precautions for air traffic

have been instituted at the base and plans to upgrade the radar's power have been scrapped (see *MWN*, N/D88). These precautions include shutting down a portion of the radar whenever fighter planes carrying EEDs land at the base runway, according to the January 7 *Macon Telegraph and News*. Also on January 27, the director of the USAF Space Command office of public affairs wrote to the editor of the *Macon Telegraph and News* explaining that the original EED EMI hazard assessment was based on the average power of the radar but that a later review had indicated that "peak power was, in fact, a more accurate parameter to use."

**...USAF Pays for Change of Channel...** Georgia public TV station WDCO, whose signal interferes with the PAVE PAWS radar at Robins, is being reimbursed by the USAF for switching its broadcast frequency, according to the December 10 *Macon Telegraph and News*. Since 1986, when the phased array radar became operational, the USAF has regularly detected minor, low-level EMI caused by WDCO's transmitter located about 20 miles away. After WDCO asked the FCC for permission to upgrade its power output from 300,000 to 5 million watts, the USAF became concerned that the EMI would now compromise the PAVE PAWS mission to monitor sea-launched nuclear missiles and orbiting satellites and offered to pay for the change in frequency.

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### OCCUPATIONAL HEALTH

**Workers To Get NIER Policy...** Bath Iron Works (BIW) and the Occupational Health and Safety Administration (OSHA) have reached a settlement regarding BIW's numerous violations—including lax radar testing—at its Portland, ME, shipyard. In 1986, BIW workers claimed that they had been exposed to a U.S. Navy ship's radar and were experiencing health problems ranging from severe headaches and facial burns to raised blood pressure and fever (see *MWN*, J/A86). As part of its agreement with OSHA, BIW will completely restructure and implement a non-ionizing radiation policy and will introduce a "state-of-the-art" safety and health program at all of its plants by April 1, 1989. The company will also pay \$650,000 in fines—much less than the record \$4.2 million penalty originally proposed in 1987 (see *MWN*, N/D87). One unique part of the settlement calls for BIW to provide "substantial and meaningful financial" support for an "Occupational Health and Training Resource Center," to be located in Auburn, ME, for the benefit of all workers in the state.

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### STANDARDS

**Canada: Power Line EMI...** An amendment has been proposed to the Canadian Standards Association's RFI Regulations (standard C108.3.1) to expand protection from high-voltage power lines. The proposal provides for the transfer of responsibility for the investigation and resolution of complaints of power line-induced EMI from the Department of Communications to utilities. It also stipulates minimum performance standards for newly-constructed and modified

power lines and for methods of measurement. The amendment was spurred by increasing numbers of power line EMI complaints; rising from 10,949 in 1980 to 16,560 in 1984. The amendment appears in the August 20 issue of *The Canada Gazette, Part 1*, pp.3361-3374. A copy is available from: JoAnne Overman, Office of Standards Code & Information, Admin. Bldg., Rm. A629, NIST, Gaithersburg, MD 20899, (301) 975-4037. Ask for TBT/Notif. 88.188.

**New and Reaffirmed ANSI Standards...** ANSI has published two new standards, *Recommended Practice for the Measurement of RF Emission from ISM Equipment Installed on User's Premises*, ANSI/IEEE 139-1988 (\$45.00) and *EMC Limits—Recommended Practice*, ANSI C63.12-1987 (\$49.50). ANSI has also reaffirmed *RF Radiation Hazard Warning Symbol*, ANSI C95.2-1982 (R1988) (\$15.00) (see *MWN*, O81). Copies of all three standards are available (prepaid) from: Sales Department, ANSI, 1430 Broadway, New York, NY 10018. Shipping and handling are extra.

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### VDTs

**Newsroom Miscarriage Cluster...** Since September 1987, there have been 14 miscarriages among women working at the *USA Today* headquarters in Arlington, VA. The first report of the cluster appeared on the front page of the December 9 *Washington Post*, prompting other newspapers to pick up the story. Although the cause of the cluster has not been identified, employees speculated that VDT use or poor indoor air quality may have played a role. All of the women who miscarried used VDTs and worked in newsrooms that have been under heavy construction for nearly a year, according to the *Post*. About 100 women work in the division. In a December 13 follow-up item, the *Post* reported that air sampling tests failed to reveal any toxic contaminants in the building. NIEHS epidemiologist Dr. Allen Wilcox recommended further investigation of the cluster and told the *Post* that "...it sounds like an unusual number." (See also *MWN*, N/D88).

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### ETC...

**BEMSNET Off the Air...** Just before the new year, ONR's electronic mail network for the bioelectromagnetics community suddenly went off the air, leaving messages in limbo and severely curtailing communications among researchers. The system's carrier, DIALCOM, pulled the plug because of "contract complications" with ONR and GSA, according to ONR's Dr. Michael Marron. Apparently, DIALCOM had not been paid for months. As we go to press, negotiations are underway to find a new carrier.

**What Is This Product?...** A recent Macy's catalogue offers a product, "Finally Free," which removes "hair permanently without shaving, wax or cream. Low frequency radio waves travel to the hair root." Next to the listing is a picture of a woman using it to remove eyebrow hair. The price is \$100.

Two members of NJDOH's own scientific advisory panel, set up to monitor the study, expressed surprise and dissatisfaction at the decision to abandon years of work. "It is my belief that the failure to complete the study is a breach of faith with the community, with those who agreed to serve as cases and controls, and with the scientific panel members," Dr. William Morton, an epidemiologist at the Oregon Health Sciences University in Portland, told the NJDOH in an October 26, 1988 letter. Morton added that the "decision to terminate the study before completion of data collection or analysis may have been political and/or economic, but it was not scientific and did not have the approval of the panel."

Similarly, Dr. Maureen Hatch, an epidemiologist at Columbia University in New York City, told the NJDOH that she was more than disappointed by the decision to abandon the study and, in an October 27 letter to the NJDOH, she threatened to resign from the panel.

In a telephone interview, Dr. Leah Ziskin, assistant commissioner of NJDOH's Division of Community Health Services, who is in charge of the study, said, "I respect [the panel members'] opinions, but from a public policy point of view, I feel that the department was justified in its decision."

Other panel members, including Chairman Dr. Nicholas Wright of the Robert Wood Johnson Medical School in Piscataway, NJ, and Ron Petersen, manager of non-ionizing radiation protection at AT&T Bell Labs in Murray Hill, NJ, supported NJDOH's decision.

Dr. Daniel Whartenberg of the Department of Environmental and Community Medicine at the Robert Wood Johnson Medical School, who reviewed the NJDOH report, told *Microwave News* that, "I think that what they did with the data they had was reasonable, but I would not go so far as to say that the problem is gone. I would like to continue surveillance."

The report promises to "continue to monitor the health of babies born to residents of Vernon" through the state Birth Defects Registry. In an interview, Dr. Mark Fulcomer, who wrote the report, said that, "The community deserves to have the work continued." For his part, Whartenberg favors a more detailed effort—a prospective epidemiological study.

The controversy surrounding the study is essentially a repeat of the 1984 dispute that arose when the NJDOH first tried to dismiss local fears of a birth defects problem in Vernon (see *MWN*, S84 and My85). The NJDOH was later forced to admit that its numbers were wrong—that there was a greater than expected incidence of chromosomal abnormalities among Vernon babies. The following year, the Centers for Disease Control confirmed the cluster and recommended that the NJDOH conduct the case-control study which it is now abandoning (see *MWN*, N/D85).

### **Three or Four Cases in 1987**

In its December 1988 report, the NJDOH states that, "There is no continuation of the earlier increased rate of Down's Syndrome in babies born to residents of Vernon Township." Others, including Morton and CAT, disagree,

arguing that the cluster continues to grow.

The critical year is 1987, when there were at least three cases—four cases, according to CAT—of babies born with chromosomal defects in Vernon. According to Morton's notes from the May 1988 panel meeting, the NJDOH said that there were two abnormal babies born in the first half of 1987: one case of Down's Syndrome and one case of translocation, another type of genetic abnormality. In addition, the amended minutes of the meeting acknowledged a further case of Down's Syndrome later in 1987. (The NJDOH report does not include a year-by-year breakdown of abnormal births.)

CAT's Elise Kreindler stated that there were three cases of babies born with chromosomal abnormalities in January 1987 alone. The third was a case of Trisomy 13, which is rarer than Down's and which is usually fatal. In addition, the case of gene translocation was extremely unusual—"A country-wide search failed to turn up a similar case," Kreindler said in a telephone interview from her new home in Florida. According to her records, at least two of the mothers were under 30 years of age when their babies were born with defects.

Including NJDOH's Down's Syndrome case from the second part of the year, Kreindler's total for 1987 rises to four.

On the average, there are fewer than 200 live births per year among women under the age of 31 in Vernon, according to NJDOH's statistics, and the expected rate of Down's Syndrome for this age group is approximately one per 1,000 live births. (Two other more serious abnormalities, Trisomies 13 and 18, together have an expected rate of only one in approximately 10,000 live births among women under 30.) Thus, the expected annual incidence of Down's and other serious genetic defects among young women in Vernon is approximately 0.2 cases per year.

"Clearly, if you look at the 1987 data, the cluster is continuing," said Dr. Robert Becker, a consultant to CAT based in Lowville, NY. In fact, Becker argued this very point in a letter to *Microwave News*: These new cases may "represent the beginning of a second peak in incidence" (see *MWN*, M/A88). Morton agrees, pointing out that such periodicity is consistent with reports of other epidemics.

When asked about the 1987 abnormal births, NJDOH's Fulcomer said that he did not want "to discuss the numbers," but added that three or four cases in a year would not be remarkable. Similarly, NJDOH's Ziskin did not respond to repeated requests for comment on the 1987 cases.

In the minutes of the May 1988 panel meeting, the NJDOH, while acknowledging two of the January 1987 cases, noted that it would not include its third recognized case in the study because it fell after the June 1987 cutoff date and the department chose not to "change the study period."

There is also a dispute about whether the NJDOH made a concerted effort to ascertain all of the cases of abnormal births. "The NJDOH did not try hard enough," Kreindler told *Microwave News*. "It's just plain criminal that they can know of this problem, but not do anything for seven years."

One longtime observer decried the way clusters have been

investigated. Dr. David Lilienfeld, an epidemiologist at New York City's Mount Sinai Hospital, told *Microwave News*: "The mishandling of the Vernon and other clusters in which the public is convinced that there is a health problem—whether there is one or not—leads to such suspicion and distrust in the public's mind that the agency is no longer able to fulfill its mandate. It's a major tragedy."

### **Microwave Radiation Levels**

In 1987, the NJDOH asked the National Bureau of Standards (NBS) to evaluate two proposals to measure microwave radiation exposures in Vernon—one from Richard Tell, a consultant based in Las Vegas, NV, and one from Dr. Bill Guy of the University of Washington in Seattle. The NBS replied that the proposed methods would yield power density calculations with large uncertainties (on the order of 10-30 dB) and, thus, the "value of the proposed study [was] questionable."

But some members of NJDOH's advisory panel disagreed. In her comments to the NJDOH, Hatch argued that this conclusion seemed "well beyond the expertise of NBS." She strongly criticized the state for basing its decision to "jettison" the study on the NBS report without giving the panel the opportunity to meet with the NBS and review its findings.

In an October 28 letter to the NJDOH, Petersen pointed out that the accuracy of microwave measurements depends on the amount of money available, but that, "The cost of doing a useful assessment would far outweigh the benefit." He later stated that he was "satisfied with the state's conclusion that you cannot do an accurate assessment at a reasonable cost."

### **NCI EMF Study Questioned** (continued from p.1)

of whom work at NCI, testified on behalf of the New York Power Authority (NYPA) in the \$66.5 million Marcy-South power line lawsuit. In prepared statements, each discounted any cancer threat from EMFs (see *MWN*, J/A88 and S/O88). For instance, Sinks wrote that, "After consideration of genetics, hematology, immunology and epidemiology taken as a whole, it is my opinion that there is no causal relationship between exposure to power frequency EMFs and childhood cancer."

For their contributions, Aaronson was paid \$70,250.98, Sinks \$41,083.42 and Tucker more than \$12,978.04 (see *MWN*, N/D88.).

Similarly, NCI's Dr. Mark Israel is testifying on behalf of the Potomac Electric Power Co. (PEPCO) in an ongoing health effects hearing (see p.8).

Some of these NCI staffers are participating in a number of different proceedings across the country. For example, in 1988, Tucker gave evidence on behalf of the Mississippi Power Co., the Public Service Co. of Colorado, the Arizona Public Service Co. and PEPCO (see p.9).

The above-mentioned fees appear to be in violation of NCI rules. According to the National Institutes of Health's (NIH) rules on outside income, "Total compensation from consulting with profit-making organizations, including in-

## **The NCI EMF Study**

The primary objective of the \$2.5 million NCI study is to examine the association between specific subtypes of acute lymphocytic leukemia (ALL) among children and EMF exposure from power lines and residential appliances. Dr. John Boice of NCI's Radiation Epidemiology Division and Dr. Martha Linet of NCI's Epidemiology and Statistics Program are directing the study.

They will assess lifetime residential EMF exposure through visits to all current and previous residences of the ALL cases and of the matched controls in six mid-Western and mid-Atlantic states and through measurements taken at approximately 8,000 residences and 1,500 schools throughout the country. (The RFP asks for development of standardized protocols for obtaining and coding field measurements.)

NCI is also seeking proposals for an organization to act as the coordinating center for the study.

The EMF study is piggybacked onto a \$2.35 million five-year study by the U.S. Children's Cancer Study Group of risk factors for childhood leukemia, which began in September 1988. The study, which also is being funded by the NCI, is headed by Dr. Leslie Robison of the University of Minnesota in Minneapolis.

For more information on the *Etiology of Childhood Leukemia: Measurement of Low Frequency Electromagnetic Fields*, RFP No. NCI-CP95608-21, and on the *Etiology of Childhood Leukemia: Coordinating Center*, RFP No. NCI-CP95610-21, contact: Barbara Shadrack, Cancer Etiology Contracts Section, NCI, Executive Plaza South, Rm. 620, Bethesda, MD 20892, (301) 496-8611.

dustry and law firms, and from testimony in private litigation, is limited to \$25,000 per year, with no more than \$12,500 from any individual company or law firm." (These rules were revised on September 1, 1988.)

In a December 29 letter to NIH Director Dr. James Wyngaarden, Dr. Ross Adey of the Veterans Administration Hospital in Loma Linda, CA, wrote that he and others "are deeply concerned that the RFP from NCI...comes from a source already committed by public statements of its senior scientists to an *a priori* position unequivocally denying the existence of a health problem." Adey raised the question of "excess" compensation and warned that, "At issue...is the safeguarding of an independent, objective and unbiased source of scientific expertise essential for framing wise public policies on highly technical issues that directly impact the public welfare."

Adey also sent copies of his letter to NIH to California Democratic Congressmen George Brown and George Miller.

As of January 25, the NCI had begun looking into Adey's allegations. An NCI spokeswoman told *Microwave News* that the investigation would take at least six weeks and that NCI scientists would not be available for comment.

# CONFERENCES

## New Listings

March 7-8: **American National Standards Institute (ANSI) Annual Public Conference on "The Future of the Voluntary Standards System: Challenges and Opportunities in the Post-Reagan Era,"** Grand Hyatt, Washington, DC. Contact: Development Department, ANSI, 1430 Broadway, New York, NY 10018, (212) 354-3300.

March 14-15: **MW Foods '89,** Drake Hotel, Chicago, IL. Contact: The Packaging Group Registrar, PO Box 345, Milltown, NJ 08850, (201) 636-0885.

April 10-14: **2nd International Conference on Frequency Control and Synthesis,** University of Leicester, U.K. Contact: Conference Secretariat, Institution of Electronic and Radio Engineers, Savoy Hill House, Savoy Hill, London WC2R 0JD, U.K., (01) 240-1871, ext. 246.

May 1-5: **Electrical Potpourri,** Electrical Power Research Institute (EPRI) Conference Center, Palo Alto, CA. Contact: Valerie Kakaio, EPRI, PO Box 10412, Palo Alto, CA 94303, (415) 855-2798.

May 8-12: **10th International Conference on Electricity Distribution,** Brighton Centre, Brighton, U.K. Contact: CIRED 1989 Organizing Committee, Conference Services, Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, U.K., (01) 240-1871, ext. 222.

May 21-25: **Annual National Conference on Radiation Control,** Hilton Hotel, Baton Rouge, LA. Contact: Conference of Radiation Control Program Directors, 71 Fountain Place, Frankfort, KY 40601, (502) 227-4543.

June 18-22: **35th Annual International Education Seminar of the International Right-of-Way Association (IRWA),** Dearborn, MI. Contact: IRWA, 9920 La Cienega Blvd., #515, Inglewood, CA 90301, (213) 649-5323.

June 20-23: **4th National Environmental Health Conference,** San Antonio, TX. Contact: Centers for Disease Control, Atlanta, GA 30333, (404) 488-4700 or 488-4682.

August 21-23: **24th Microwave Power Symposium,** Westin Hotel, Stamford, CT. Contact: International Microwave Power Institute, 13542 Union Village Circle, Clifton, VA 22024, (703) 830-5588.

September 4-8: **19th European Microwave Conference,** Wembley Conference Centre, London, U.K. Contact: Microwave Exhibitions and Publishers Ltd., 90 Calverley Rd., Tunbridge Wells, Kent TN1 2UN, U.K., (08) 924-4027.

October 5-8: **National Convention of the Society of Broadcast Engineers (SBE),** Kansas City, MO. Contact: SBE, PO Box 16861, St. Louis, MO 63105.

October 20-21: **A Delicate Balance: Technics, Culture and Consequences,** California State University, Los Angeles, CA. A conference sponsored by the L.A. chapter of the IEEE's Society on the Social Implications of Technology. Contact: Dr. Nik Warren, Otis/Parsons Art Institute, 134 Hart Ave., Santa Monica, CA 90405, (213) 392-6595.

October 29-November 2: **Conference on Electrical Insulation and Dielectric Phenomena,** Xerox Conference Center, Leesburg, VA. Contact: Prof. Marshall Pace, Dept. of Electrical & Computer Engineering, University of Tennessee, Knoxville, TN 37996, (615) 974-5419.

November 28-December 1: **34th Annual Conference on Magnetism and Magnetic Materials,** Sheraton Boston Hotel, Boston, MA. Contact: Dr. John Scott, American Institute of Physics, 335 E. 45th St., New York, NY 10017.

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