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INSIDE...

Office Building Cancer Clusters: Are EMFs Responsible?

Three office building cancer clusters—one in Washington, DC, and two in California—continue to defy explanation. Electromagnetic fields (EMFs) have been raised repeatedly as a possible cause and have been measured in each building, but they have not been linked to the cancers.

Health officials and scientists have provided few answers. Two of the investigations ended with the admission that no cause could be identified. And most of the details of the third cluster are being kept under wraps. The workers in these buildings are frustrated. With more than a dozen studies pointing to a link between EMFs and brain tumors (see *MWN*, M/A90), they are pushing for more thorough studies. Here is what is known so far.

Ford House Office Building, Washington, DC

Twelve cases of cancer among 500 employees at the Ford House Office Building (FHOB) in Washington remain unexplained following an investigation by the National Institute for Occupational Safety and Health (NIOSH). The agency did not determine whether the rate of cancer in the FHOB was unusual.

NIOSH concluded that the cancers—which include five brain tumor cases—were not related to "the physical environment" of the building and noted that even though some studies suggest an association between brain cancer and EMFs, "the body of evidence is inconclusive." The NIOSH Health Hazard Evaluation (HHE), released in September 1992, states that "exposures to [extremely low

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EMF Mitigation: Cost-Effective in New Buildings, Costly in Existing Offices

A ground-breaking effort by the World Bank demonstrates that mitigating EMFs is inexpensive if tackled while a new building is being designed. The news is not as good for those who seek to reduce EMFs in existing offices, however. It can be done, but magnetic field shielding is expensive.

In the design and construction of its new headquarters in Washington, the World Bank has embraced "prudent avoidance." Working with the project's architects and engineers, Richard Barry, a consultant who is spearheading the bank's mitigation efforts, has identified a number of cost-effective steps for cutting exposures. Barry found, for example, that EMF reductions can be achieved in the way offices are laid out—by putting the areas where workers spend most of their time farthest from the electrical service equipment and the office machines that generate the strongest fields. "There was very little cost associated with this," Barry said.

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« Power Line Talk »

In case their position is not clear, the authors of the recent White House EMF report "consider it necessary" to let everyone know that the new Swedish studies "are not sufficiently compelling" to alter their conclusion that EMF risks are "weak and biologically implausible" (see *MWN*, N/D92). In a letter published in the April 2 issue of *Science* magazine, the authors, an 11-member panel assembled by Oak Ridge Associated Universities for the Committee on Interagency Radiation Research and Policy Coordination (**CIRRPC**), point to inconsistencies between the results of **Maria Feychting** and Dr. **Anders Ahlbom** and those of Dr. Lennart Tomenius, also of Sweden, as well as between the findings of Feychting–Ahlbom and Dr. **Birgitta Floderus**. The letter no doubt represents the views of the two epidemiologists on the CIRRPC panel: Dr. **Leon Gordis** of Johns Hopkins University's School of Hygiene and Public Health in Baltimore and Dr. **Dimitrios Trichopoulos** of the Harvard School of Public Health in Boston. Trichopoulos, who has been a consultant to Crowell & Moring's Utility Health Sciences Group (see *MWN*, J/F91), previously criticized the new Swedish studies in an article by *Science* reporter Richard Stone, which appeared on December 11 (see p.6). Also in the April 2 *Science*, Ahlbom and Feychting respond to the CIRRPC panel. Addressing Trichopoulos's comment, quoted by Stone, that they had not observed an association between present-day measurements and cancer risk, they point out that the "measured fields refer to a 20-minute period, in some cases as many as 26 years after diagnosis." The two Swedish epidemiologists stress their belief that "EMF calculations are better predictors of past fields than the actual measurements." Ahlbom and Feychting, who are based at the Karolinska Institute in Stockholm, say that of the nine childhood cancer–EMF studies that they are aware of, three should be discounted: Tomenius's effort is undermined by problems in assessing exposures; Dr. John Fulton's 1980 study in Rhode Island has problems due to bias in the way the controls were selected; and the recent U.K. study by Dr. A. Meyers and coworkers has too few exposed subjects (see *MWN*, J/F91). In the remaining six, "a fairly clear consistency across studies" is apparent, they say, with all relative risk estimates in the range of 1.5 to 3.0 and only two falling short of statistical significance. "It would indeed be appealing if all available evidence—from residential and occupational studies, from children and adults and from studies on different types of cancer—fit together in an intelligible pattern, but this does not appear to be the case," they write. "However, in our view, the evidence on leukemia in children is actually fairly consistent, and inconsistent results from studies of other types of cancer or on adults should not detract from this."

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Dr. **Ahlbom** and **Feychting**'s epidemiological study of childhood cancer and power line EMFs has been accepted for publication by the *American Journal of Epidemiology*, Ahlbom told *Microwave News* (see *MWN*, S/O92 and N/D92). The journal anticipates that it will appear this summer—the precise date had not been set at press time. Meanwhile, Dr. **Floderus** and coworkers have submitted a paper on their occupational EMF exposure study—there's no word yet on where or when it will be published.

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Two large epidemiological studies, by Dr. **Gilles Thériault** and by Dr. **David Savitz**, which should be released later this year, promise to gain widespread attention. The results of these major occupational studies are being held tightly. Both researchers plan to publish them in a journal with no prior public announcements. "I hope there will be no leaks," Thériault told *Microwave News* from his office at McGill University in Montreal, Canada. In early March, he gave a draft of his analysis to epidemiologists at Electricité de France, Hydro-Québec and Ontario Hydro—his sponsors—whose workers are participating in the study. The utility officials all signed confidentiality agreements before seeing the results, Thériault said. Their comments are due by mid-April, at which time Thériault will begin preparing his final manuscript. He predicted that his paper will be published this summer. Neither Thériault nor Savitz would say where they would like their papers to appear, though Savitz said that he was leaning towards a weekly journal for its "speed of publication"—to allow less time for the results to trickle out. Savitz, who is at the University of North Carolina, Chapel Hill, told *Microwave News* that he hopes to have his paper ready by the end of the year. Savitz said that even he does not yet know his own findings: "Until the data are integrated, I have no idea what they will show." EPRI is sponsoring the Savitz study, and its scientific advisers, Drs. **A.A. Afifi** of the University of California, Los Angeles, **Patricia Buffler** of the University of California, Berkeley, and **James Quackenboss**, who recently joined the Environmental Protection Agency in Las Vegas, NV, will be the first to see his paper. Savitz said that he will give them a draft for comment before he submits it for publication.

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Contrary to popular expectations, ***Zuidema v. San Diego Gas & Electric*** may not be EMF litigation's "watershed case," **Tom Watson** of the Washington law firm of Crowell & Moring told a gathering of utility managers at *Transmission & Distribution*

DOE–EPRI Meeting in Savannah, GA

The annual review of EMF bioeffects research, sponsored by the DOE and EPRI, is set for October 31-November 4 in Savannah, GA. The meeting, which is open to the public, will be held at the Radisson Plaza Hotel; call (912) 233-7722 for room reservations.

For those wishing to present papers, abstracts are due in early September; a call for abstracts will be mailed in June. For more information, contact: W/L Associates, 120 West Church St., Frederick, MD 21701, (301) 663-1915.

Commentary

Waiting for the National EMF Research Program

The national EMF research and communications program (NERP) is in trouble. The first deadlines specified by law have all been missed and there is little hope that the DOE and NIEHS will meet those that are fast approaching. No money has yet been appropriated for the five-year, $65 million program—none is expected before next fall. And now there are rumblings that the program may fall victim to the deficit-cutting ax.

All this comes at a time when a consensus is growing that a much larger research effort will be needed to resolve key questions about EMF health risks.

At an April 1 hearing before the House subcommittee on energy and power, Dr. Raymond Neutra of the California Department of Health Services and Dr. Thomas Tenforde of the Battelle Pacific Northwest Lab both urged Rep. Philip Sharp (D-IN), the chairman of the subcommittee, to ensure that Congress makes good on its promises to support the NERP.

"It's a tremendously good investment," Neutra said, comparing the $32.5 million that the federal government plans to spend on EMF research—an amount to be matched by industry —with the hundreds of billions of dollars in economic impacts on the national economy if the public demands premature action. Tenforde went further, "strongly" recommending that Congress invest more than the $12 million a year earmarked for the NERP in the energy bill passed last October. The bill also allocates $1 million a year for risk communications.

A few weeks earlier, at the annual meeting of the American Association for the Advancement of Science, held in Boston, Dr. Granger Morgan of Carnegie Mellon University in Pittsburgh called for at least $20 million a year for EMF health studies.

In February, three senior congressmen wrote to Secretary of Energy Hazel O'Leary to "make clear" that they are seeking $18 million for EMF research in fiscal year 1994 (FY94), which begins next October 1: $12 million for the NERP as well as $6 million to continue DOE's own long-running effort. Rep. George Brown (D-CA), the chairman of the Science, Space and Technology Committee, Rep. Henry Waxman (D-CA), the chairman of the health and environment subcommittee, and Rep. Sharp wrote that they want an "*expanded and accelerated* research program" (their emphasis). They may be disappointed.

What no one mentioned at Sharp's hearing is that the NERP will not be funded until FY94—a year after the energy bill was signed into law. Whether you blame the change of administrations, an ambivalent Congress or lackadaisical federal agencies, the longer it takes to unravel the mysteries of EMF effects, the harder it will be for electric utilities to site new power lines and substations. Just ask Consumers Power Co., in Jackson, MI, which, on March 1, announced that it was abandoning plans to build a 60-mile, 345 kV line in the face of intense public opposition.

As we go to press, the President has requested only $10 million in his proposed FY94 budget—$6 million for the NERP (to be matched by industry) and $4 million for the ongoing DOE program. It will be interesting to see if anyone in Congress will push for more than $16 million when confronted with budget cuts in many popular programs.

When Sharp asked the panelists testifying before his subcommittee how long would it take to reduce some of the uncertainties associated with EMF health risks, Neutra and Tenforde, as well as Dr. Keith Florig of Resources for the Future and DOE's Dr. Robert San Martin, replied that the odds of resolving much in the next three to five years are at best fifty-fifty. Only NIEHS Director Dr. Kenneth Olden anticipated some useful scientific results in the near term.

The imperative that prompted the NERP has not changed: We need answers—sooner, not later.

magazine's *1993 EMF Conference* on March 23 in Arlington, VA. As the first personal injury suit to go to trial, it's an "important case," he said. "If the plaintiffs win, there will be more EMF cases, but it's California and a lot of strange things happen there." Watson argued that the round of litigation *after* Zuidema will be more telling as to whether "the floodgates are to open." Watson also noted that litigation stemming from occupational EMF exposures is "an area of rising interest." Ted and Michelle Zuidema are alleging that their daughter developed kidney cancer from *in utero* exposure to EMFs from nearby power lines (see *MWN*, J/A91 and N/D92). The trial opened in San Diego on April 5. **John Ward** of the Baltimore firm of Quinn, Ward & Kershaw, who represents plaintiffs in EMF cases, offered the utility audience some advice: "I suggest to you as a public interest lawyer to stop demanding more studies before taking action." He warned that property damage litigation will "dwarf" personal injury cases and that the number of disputes between insurance companies and utilities is growing. It will not take "untold billions of dollars to attack this problem," Ward predicted, "and taking action will dramatically decrease the number of lawsuits."

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The **Ohio Power Siting Board** has approved a rule that requires utilities to identify schools and hospitals near proposed transmission lines and to review alternative ways of constructing the lines to reduce EMFs. Until "scientific findings are more conclusive, prudence dictates that electric facilities should be designed and sited using methods which address EMF issues," said Craig Glazer, chairman of both the siting board and the Public Utilities Commission of Ohio. The March 22 order also requires utilities

to look at the possible health effects of EMFs and to estimate levels of magnetic fields beneath proposed transmission lines. Other states have taken similar action. Last fall, Colorado formally adopted a policy of prudent avoidance (see *MWN*, J/F93) and Wisconsin—going further than either Ohio or Colorado—has ordered utilities to use the "best available control technology" to mitigate EMFs from transmission and distribution systems (see *MWN*, J/F92).

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Dr. **Keith Florig**, a fellow at Resources for the Future in Washington, has urged Congress to sponsor more research on the possible link between EMFs and breast cancer. In his testimony before the House subcommittee on energy and power on April 1, Florig cited the NCI study under way at the Fred Hutchinson Cancer Research Center in Seattle (see *MWN*, J/F92 and M/J92), but he added, "Given the high stakes of the breast cancer question, it would seem to deserve much more scrutiny from the federal government than this one study will be able to provide." At the same hearing, chaired by Rep. **Philip Sharp** (D-IN), Dr. **Thomas Tenforde** of the Battelle Pacific Northwest Lab in Richland, WA, took aim at the physicists who argue that most sources of power frequency EMFs cannot cause any ill effects. These physicists are looking at individual cells, while a "more realistic model of living tissues is that of a large collection of cells communicating with each other," Tenforde said. "From this perspective, the claims made in several recent publications that signals produced in tissue by environmental 60 Hz fields are too weak to overcome background noise and exert biological effects are unwarranted," he concluded.

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In our last issue we quoted from a letter Dr. **Raymond Neutra** of the California Department of Health Services sent *The New Yorker* as well as from an op-ed article he wrote with Dr. **John Peters** of the University of Southern California in Los Angeles, both criticizing **Paul Brodeur**'s December 7 article on the cancer cluster at the Slater School in Fresno, CA. Here's what happened next: On January 8, two *New Yorker* editors wrote back to Neutra that, "We stand by Paul Brodeur's reporting." They emphasized that, "[A]t no point in your letter do you claim that Brodeur misquoted you or misrepresented your work." They also pointed out that, "Brodeur has presented a history of events at Slater school based on reports written by you and your colleagues, on the recollections and notes of others involved in those events and on recordings of meetings." And on February 15, Brodeur sent a letter to Peters taking issue with the op-ed article: "Kindly note that at no time have I ever advocated the 'immediate rerouting of high power transmission lines away from thousands of American schools,' nor have I ever suggested that cancer clusters should 'drive environmental policy.' What I have recommended is that cancer clusters in schools 'should occasion in-depth investigations,' and that, 'While these studies are in progress, interim preventive measures should be undertaken to reduce the magnetic field exposure of children in hundreds of schools and day-care centers across the nation which have been built perilously close to high voltage and high current power lines.' " Brodeur went on: "I note with interest that the joint op-ed piece you have written with Neutra calls for 'well-designed' studies, but omits any reference to the recent Swedish studies conducted by Ahlbom and Feychting, and by Floderus and her colleagues....[O]ne must question the public health wisdom of your apparent readiness to wait for the completion of studies yet to be funded or begun (studies that will probably take several years to complete once they have begun) before recommending preventive measures to reduce the exposure of school children to power line magnetic field levels that have been associated with the development of childhood cancer."

Congress, States Seek To Limit Power Line EMFs at Schools

A bill that would forbid the siting of new schools and day-care centers on property where EMFs exceed 2 mG was introduced on March 25 by Rep. George Miller (D-CA). The congressional move comes on the heels of two state actions: All New York electric utilities have agreed to survey EMFs at schools next to power lines, while in Oregon, a bill has been introduced that would require utilities to ensure that schoolchildren are not exposed to power line EMFs in excess of 2 mG.

Miller, the chairman of the Committee on Natural Resources, said that his bill would require "prudent steps to protect our children's health until such time as the federal government and scientists determine that [EMFs] created by transmission lines are not a threat." He explained that the legislation, known as the Children's Electromagnetic Field Risk Reduction Act of 1993 (H.R. 1494), was proposed in response to a growing body of scientific evidence that shows "a possible dose–response relationship between human exposure to EMFs from electric transmission lines and development of cancer, particularly childhood cancer." The bill has been referred to the House Committee on Education and Labor.

At New York State Attorney General Robert Abrams's request, seven electric utilities will follow in the footsteps of the Niagara Mohawk Power Corp., based in Syracuse, which, in 1991, initiated a survey of power lines on or adjacent to school property (see *MWN*, N/D92). "The school survey is a valuable start in providing utility companies, government and the public with meaningful information," Abrams wrote in a February 26 letter to the utilities. Niagara Mohawk will release the results of its measurements by April 15, according to Jack Toennies, the company's director of environmental licensing and planning. Niagara Mohawk has already agreed to reduce EMFs at the Voorheesville School, near Albany, which is within 100 feet of two power lines. One of the lines will be removed and the other will be reconfigured.

And on March 12, Oregon Rep. Lisa Naito introduced HB 3608, a bill that would require public electric utilities to "inventory the magnetic fields around [their] power lines or [sub]stations that are located within 500 feet of any public school building or grounds and...take appropriate corrective action to prevent human exposure to magnetic fields [above 2 mG]." Recent articles and studies suggesting a link between power line EMFs and cancer promped Naito to introduce the bill, according to Kristen Funk-Tracy, her legislative assistant.

The debate over power line EMFs and schools is not a new one. Several years ago, a school district in Houston forced Houston Lighting & Power to remove a high voltage transmission line from school property at a cost of $8.6 million (see *MWN*, N/D85 and J/A88). In 1988, California adopted guidelines requiring a minimum distance between schools and power line rights-of-way (see *MWN*, M/J88).

No Excess Occupational Cancer Risk, California Utility Says

Researchers at Southern California Edison (SCE) in Rosemead and at the University of California, Los Angeles, have failed to find a consistent association between on-the-job EMF exposures and mortality from leukemia, brain cancer or lymphoma.

The study, which SCE describes as "the most comprehensive and best designed" to date, investigated 36,221 company employees who worked for at least one year between 1960 and 1988. "This result substantially weakens the argument for EMFs being a significant cause of cancer in the Edison work environment," SCE announced, but the utility added that, "The lack of an association does not 'prove' that EMFs [are] not a cause of cancer."

Jack Sahl, a senior research scientist at SCE, told *Microwave News* that his study is "a substantial advancement in exposure assessment" over past efforts. He explained that the workers were a homogeneous population, that he had access to the workers' full occupational histories and that he took detailed measurements with EMDEX meters.

In interviews with *Microwave News*, other epidemiologists gave Sahl's effort mixed reviews. "It's a carefully done study," said Dr. Raymond Neutra of the California Department of Health Services in Emeryville. And Dr. David Savitz of the University of North Carolina, Chapel Hill, said that the exposure assessment was "a reasonable try" and that there was "no obvious fatal flaw." On the other hand, Dr. Nancy Wertheimer of Boulder, CO, took issue with the way the exposures were estimated. "All the exposure assessments seem to be dependent on how long a subject worked for SCE and we are not told if the cases and controls worked for comparable amounts of time," she said. Wertheimer added that she would have liked for Sahl to have presented age-specific relative risks.

Dr. Sam Milham of Olympia, WA, commented that, "It is curious that having gone to the time, trouble and expense of doing a cohort mortality study with excellent follow-up, they did not publish SMRs," referring to standard mortality ratios, which compare age-adjusted cancer rates in the study population with those in the population at large.

Milham raised the possibility that the SCE workers did indeed have some elevated cancer risks and that some of Sahl's control population may have been exposed to EMFs. "By my preliminary calculations, Sahl's data show an increased frequency of leukemias, brain cancer and lymphomas over the expected numbers," he said.

When asked about whether young workers had a greater cancer risk, Sahl replied that, "We don't see an effect based on age in our analysis." With respect to why he omitted SMRs, Sahl said that he did not understand the criticism: "The method we used is the method of choice."

The trouble with trying to estimate EMF exposures is that no one knows what aspect of the magnetic field is biologically relevant. Are the short-term EMDEX measurements used by Sahl's team better than job titles? A similar question has arisen in residential studies: Why are wire codes better than spot measurements? "The crucial issue is whether the careful and reasonable attempts to characterize the long-term exposures of the workers really get us closer to the truth or whether the more traditional, usual job title is better," Neutra said. Or as Savitz put it, "They are different stabs in the dark."

See Jack Sahl, Michael Kelsh and Sander Greenland, "Cohort and Nested Case–Control Studies of Hematopoietic Cancers and Brain Cancer Among Electric Utility Workers," *Epidemiology, 4*, pp.104-114, 1993. Sahl said that a second paper, with more details on the worker exposures, has been accepted for publication in *Bioelectromagnetics.*

Dutch Study Finds No Increased Cancer Mortality Among Adults

A group of epidemiologists at the University of Limburg in Maastricht, The Netherlands, has found no increased mortality among adults living near high voltage transmission lines or a substation.

The Dutch team identified 192 men and women who died after living at least five years within 100 meters of two 150 kV lines or a substation and compared them to 239 controls who had lived more than 100 meters away. The magnetic fields in the area near the EMF sources ranged from 1 to 11 mG, while the control group was exposed to 0.2 to 1.5 mG.

There was no difference in the cancer rates among the two groups—except for an excess of Hodgkin's lymphoma among the exposed women. The researchers conclude that the "study does not support previously reported associations of exposure to [EMFs] with leukemia, brain cancer and breast cancer." They warn, however, that, due to the small number of cases, their study has limited statistical power.

See Gerrit Schreiber et al., "Cancer Mortality and Residence near Electricity Transmission Equipment: A Retrospective Cohort Study," *International Journal of Epidemiology, 22*, pp.9-15, 1993.

Industry Consultants on the Feychting–Ahlbom Epidemiological Study*

[The F&A] study is in several ways the most complex investigation yet done on the relationship of residential exposure to [EMFs] and cancer. Despite the complexity of the study and an impressive attention to detail, it does, however, have a crucial limitation: it is very small with respect to children. With regard to leukemia in children, the study reports some association with an indirect measure of magnetic field exposure, but this association is not present when actual spot measurements of magnetic fields are used and is not present at all among children living in apartment houses. In general, inconsistencies in the findings ([e.g.] the association between magnetic fields and leukemia comes almost entirely from the period 1975-1985 and is almost absent in 1960-1974) preclude making a cause–effect inference. The results with regard to leukemia among adults are suggestive, but only that, of an association between magnetic fields and chronic myeloid leukemia, but provide no foundation for accepting a cause–effect relationship. The study provides evidence against a link between power frequency field exposure and cancer of the brain or central nervous system both in children and adults. Indeed, these associations tend to be inverse and suggest that all of the results must be interpreted with great caution.

—Dr. Philip Cole, Chairman, Dept. of Epidemiology, School of Public Health, University of Alabama, Birmingham, for Cap Rock Electric Cooperative Inc. and Southwestern Public Service Co., before the Texas PUC†, December 30, 1992

A major strength of the Swedish residential study is that the researchers estimated exposure as *historical* calculated fields. In previous residential epidemiology studies, past exposure to electric and/or magnetic fields was estimated at the time of the study....The major limitation of the Swedish study in children is the small number of cases....While the results support the association of childhood leukemia with calculated fields from power lines, there are inconsistencies in the findings. The association comes from cancer cases diagnosed during the period 1975-1985 and is almost absent in 1960-1974; the association is present for single family residences but does not appear for apartment dwellers. Other limitations within the study include the fact that cases were included regardless of how briefly they lived near the power line, and known potential risk factors for childhood leukemia were not evaluated, such as exposure to prenatal X-rays or certain preexisting medical conditions.

—Dr. Linda Erdreich, Bailey Research Associates, New York, NY, for Northeast Utilities, Hartford, CT, November 5, 1992

Even taken at face value, the results for childhood leukemia showed some inconsistencies. For example, there was no evidence of association for residents of apartments, but only for those in single family dwellings. In Stockholm, a lower apparent leukemia risk was reported for children in homes with higher calculated magnetic fields than for children in homes in intermediate categories....Overall, the results for children indicate no increased cancer risk; the risks of brain tumors appear unrelated to exposure, and the results for leukemia are internally inconsistent and suggest the need for further investigation of the few cases which account for the apparent associations in some analyses. Overall, the results for adults indicate no association of leukemia as a whole and varied patterns of risk estimates for specific leukemia types, with only one of 249 statistical tests being nominally significant. For adult brain cancer, there appears to be no significant association, with most estimates of risk being negative, including the only one which is nominally significant. The suggestions in some portions of the report that there may be an increased risk of a particular type of cancer in children or adults should be balanced against the inconsistencies of the results, the limited number of statistically significant results even when taken at face value, and the decreased risks suggested for other types of cancer.

—Dr. Darwin Labarthe, Dept. of Epidemiology, School of Public Health, University of Texas, Houston, for Metropolitan Edison Co., Pennsylvania Electric Co., Jersey Central Power & Light Co. and Duquesne Light Co., before the Pennsylvania PUC†, December 14, 1992

When actual measurements of the electric and magnetic fields have been used, there have been no reports of an increased risk of childhood cancers (e.g., Savitz et al., 1988; London et al., 1991; [F&A], 1992).

—Dr. Lucius Sinks, Director, Cancer Center, Middlesex Hospital, Middletown, CT, for Gulf States Utilities, before the Texas PUC†, November 1992

It is my view that both of the Swedish studies, especially the residential study by [F&A], appear to have been well-conducted within the limitations necessarily imposed...in this kind of research....Unfortunately, despite this effort the size of both studies is still quite small....When we compare the results of the studies, either one to another or to the existing body of research, we see that there are numerous inconsistencies....For adult brain cancers, the occupational study reports some increased odds ratios...while the authors of the residential study note that their data on adult brain cancers are erratic and do not lead to a conclusion of an association....For adult leukemias, the inconsistencies are even more striking....For childhood cancers the residential study found no increased risk for measured magnetic fields. This is consistent with the results of previous studies....[I]n the residential study the research period covered such a long timeframe (25 years) that important improvements in diagnosis of cancers took place during the period covered by the study. ...[P]ossible error can be introduced into the study by combining data that were collected under fundamentally different assumptions at various times during the past....When evaluated in the context of the large existing body of research results, the Swedish studies have not appreciably changed the overall conclusion....EMF exposure has not been demonstrated to cause cancer in humans.

—Dr. Jan Stolwijk, Dept. of Epidemiology and Public Health, Yale University School of Medicine, New Haven, CT, letter to the Electricity Supply Association of Australia, Melbourne, October 29, 1992

...Dimitrios Trichopoulos, chair of the epidemiology department at the Harvard School of Public Health...points out that Ahlbom failed to come up with a correlation between present day EMFs and cancer risk. He also claims that Ahlbom's findings diverge from previous Swedish studies and notes that some of Ahlbom's calculated cancer risks aren't statistically significant, because of the small number of cases of childhood leukemia. Trichopoulos concludes that the scientific community needs better designed epidemiological studies.

—Richard Stone, "Polarized Debate: EMFs and Cancer,"* Science, *p.1725, December 11, 1992 (see also p.2)

*Maria Feychting and Anders Ahlbom (F&A), *Magnetic Fields and Cancer in People Residing near Swedish High Voltage Power Lines*, Stockholm, Sweden: Karolinska Institute, 1992; to appear in the *American Journal of Epidemiology* (see p.2 and *MWN*, S/O92 and N/D92). † PUC=Public Utilities Commission.

Epidemiology Roundup

Acute Leukemia Linked to EMF Exposure

French researchers have confirmed and extended their previous report that linked occupational EMF exposures with leukemia (see *MWN*, M/A91). Their case–control study of 185 workers over 30 years old and 513 controls found up to a fivefold increase in acute myelogenous leukemia (AML) among those exposed to EMFs.

Dr. Sylvia Richardson of INSERM in Villejuif found a non-significant increase for all acute leukemias among workers exposed to all types of EMFs, but the odds ratio rose to 3.9, a statistically significant result, when exposures from arc welding were excluded. The researchers advise caution on interpreting the results because of the unclear role of arc welding and because "there was no association with level or length of exposure."

Nevertheless, after citing the many previous studies that link EMFs to leukemia, the French team writes that "the hypothesis of EMF being leukemogenic has reached consistency." The researchers conclude that, "Our study adds credence to the hypothesis that pesticides and EMFs are leukemogenic agents, together with benzene." See S. Richardson, "Occupational Risk Factors for Acute Leukemia: A Case–Control Study," *International Journal of Epidemiology, 21,* pp.1063-1073, 1992.

Leukemia Among Telephone Linemen

Dr. Genevieve Matanoski and coworkers at the Johns Hopkins University (JHU) School of Hygiene and Public Health in Baltimore have published the final report on their study of leukemia among telephone linemen. In the summer of 1991, Matanoski announced that her team had found higher rates of leukemia among certain linemen and for certain measures of exposures.

In a report to EPRI, which sponsored the study, the JHU group concludes: "It does not seem prudent to assume that [EMF] exposure has no risk."

In earlier presentations, Matanoski has reported that workers exposed at an early age are more vulnerable to EMF risks (see *MWN*, J/A91 and J/A92), but she does not cite these results in her EPRI report. Matanoski could not be reached for comment.

Copies of *Leukemia in Telephone Linemen* (TR-101813), December 1992, are available for $200 each from: EPRI Distribution Center, 207 Coggins Dr., Pleasant Hill, CA 94523, (510) 934-4212. There is no charge for EPRI members, government agencies or not-for-profit groups.

The JHU results will also be published in the March 15 issue of the *American Journal of Epidemiology,* which is behind schedule and will appear in late April.

NHL Among Swedish Power Workers

A team of American and Swedish researchers has found that engineers and technicians in the electric power industry have close to five times the expected rate of non-Hodgkin's lymphoma (NHL), a statistically significant increase. Using the Swedish cancer registry, Dr. Martha Linet of the U.S. National Cancer Institute and coworkers also found excesses of NHL among office workers, bank employees and shoemakers, among others.

With respect to power plant workers, Linet's team notes that, "As well as possible exposures to [EMFs], the Swedish workers may have had contact with various solvents, other chemicals and nonchemical exposures." See "Non-Hodgkin's Lymphoma and Occupation in Sweden: A Registry-Based Analysis," *British Journal of Industrial Medicine, 50,* pp.79-84, 1993.

EPRI Workshop on Future Studies

In February 1991, EPRI held a by-invitation-only workshop on *Future Epidemiologic Studies of Health Effects of Electric and Magnetic Fields* in Carmel, CA. Some 21 months later, Dr. Patricia Buffler, who organized the workshop, has published a report outlining the recommendations of the 70 attendees, together with the conclusions of four working groups—on residential and occupational cancer studies, on reproductive outcomes and on methodological issues.

Overall, the researchers put the highest priority on studies: (1) to "explore the relationship between 'very high current configuration' homes and childhood cancer risks"; (2) to "explore the relationship between wire configuration codes and characteristics of magnetic fields other than time-weighted average field intensity"; (3) to "survey presumably highly exposed industries or occupations to identify cohorts for occupational studies, giving special attention to exposures of female workers"; and (4) to "improve exposure assessment in ongoing and future residential studies to address questions raised by [the] Los Angeles and Denver childhood cancer studies."

Drs. John Peters and Stephanie London of the University of Southern California (USC) in Los Angeles first announced the results of their epidemiological study at the Carmel workshop, and their presentation is included in an appendix (see *MWN*, M/A91 and S/O91).

Another appendix lists the key findings of the more than 100 epidemiological studies published through 1990. And a third lists the names and addresses of the attendees.

Future Epidemiologic Studies of Health Effects of Electric and Magnetic Fields (TR-101175), September 1992, is available for $200 from the EPRI Distribution Center. See ordering information at left.

Updates from Wertheimer-Leeper, Vena & Peters

• Dr. Nancy Wertheimer and Ed Leeper, both of Boulder, CO, have commented on two recent papers on electric blankets and cancer in order to "alert researchers to some of the pitfalls possible in assessing only one of the multiple sources of [EMF] exposure to which all subjects are exposed." One of the papers, by Dr. John Vena and coworkers at the State University of New York, Buffalo, addressed the risk of breast cancer (see *MWN*, S/O91), and the other, by Dr. Rene Verreault and coworkers at the Fred Hutchinson Cancer Research Center in Seattle, investigated testicular cancer (see *MWN*, M/J90). Vena responded to

Wertheimer and Leeper, but Verreault did not. The exchange appears in the *American Journal of Epidemiology, 137,* pp.252-257, January 15, 1993.

• USC's Drs. John Peters and Stephanie London have issued a correction to one of the tables in their paper on EMFs and childhood leukemia (see above). The correction appears in the *American Journal of Epidemiology, 137,* p.381, February 1, 1993.

EPA Tests Gaussmeters

In a new report, the Environmental Protection Agency (EPA) offers a large amount of data on the performance of 15 hand-held, single-axis magnetic field meters but does not draw any conclusions about which meters are the most reliable or which offer the best value for the money.

"This report presents just the facts," Edwin Mantiply of EPA's Office of Radiation and Indoor Air in Montgomery, AL, told *Microwave News.* The report was completed a year and a half ago but its release was delayed by concerns within the agency over liability. Some EPA managers had wanted to delete the names of the meter manufacturers. The project was initiated in mid-1990 (see *MWN,* J/A90).

The EPA evaluated meters made by the Dindima Group, Electric Field Measurements (EFM), Electromagnetics Design, ExpanTest, Holaday Industries, Integrity Research, Macintyre Electronic Design, Magnetic Sciences International, Magnetic Technology, Monitor Industries, Safe Computing, Sydkraft, Walker Scientific and Widerange Instruments. Meters by F.W. Bell and Teslatronics, and an additional meter from Holaday Industries, were not included because EPA did not receive two of each model in time; raw data for these meters are available from Mantiply.

The number of gaussmeters on the market has risen dramatically over the last few years—25 companies are currently selling over 60 different models.

The EPA tested meters for accuracy over a range of field strengths, for sensitivity to an increase in field intensity and for the likelihood of interference from other electromagnetic signals. There was a large variation in performance.

For instance, a Widerange Instruments meter gave readings which were, on average, approximately 36% in error. Widerange Instruments has subsequently taken its meters off the market, in part due to their poor performance in the EPA report, according to Widerange's president, George Work.

Mantiply said that the report, which cost less than $50,000, was prepared by Science Applications International Corp. of McLean, VA, under an EPA contract with Sanford Cohen & Associates, also of McLean.

Laboratory Testing of Commercially Available Power Frequency Magnetic Field Survey Meters (EPA Report No.400R-92-010) was released at the end of 1992, though it is dated June 1992. A limited number of copies are available free from: EPA, Office of Radiation and Indoor Air, 1504 Avenue A, Montgomery, AL 36115, (205) 270-3400. For a list of gaussmeters now being sold in the U.S., send $1.00 and a self-addressed, stamped business envelope to: *Microwave News,* PO Box 1799, Grand Central Station, New York, NY 10163. (For an earlier review of gaussmeters, see *MWN,* M/A91.)

National EMF Advisory Committee

The Department of Energy (DOE) and the Department of Health and Human Services (DHHS) have selected their candidates for the National EMF Advisory Committee. The committee, mandated by the energy bill enacted last October, will help mold the new five-year, $65 million EMF research and communication program.

On March 31, letters of invitation were sent to: Dr. Peter Bingham,* North American Philips Corp., Briarcliff Manor, NY; John Coughlin,* Wisconsin Public Service Commission, Madison, WI; Margaret Seminario, AFL-CIO, Washington, DC; Shirley Linde, Citizens for Safer EMF, Los Angeles, CA; Kate Brown Maracas,* Salt River Project, Phoenix, AZ; Dr. James Melius, New York State Department of Health, Albany, NY; Dr. Thomas Rozell, National Academy of Sciences, Washington, DC; Robert Schell, Maine Bureau of Health, Augusta, ME; Dr. Louis Slesin,* *Microwave News,* New York, NY; Dr. Paul Zweiacker,* Texas Utility Services, Dallas, TX. (The asterisks indicate those selected by the DOE; the others were picked by the DHHS.)

Formal announcement of the committee members is expected after the candidates have agreed to serve, according to DOE's Dr. Robert San Martin. Members of a companion EMF interagency committee have not yet been named. Under the law, the two committees should have been set up by December 24, 1992 (see *MWN,* N/D92 and J/F93).

Office Building Cancer Clusters *(continued from p.1)*

frequency] fields in the FHOB are typical of modern office environments."

Robert Reischauer, the director of the Congressional Budget Office (CBO), asked for an investigation in a January 1992 letter, noting "the unusual number of brain tumors and cancers suffered by individuals working in the building." The FHOB houses the CBO, a computer services center and congressional staff offices.

NIOSH's Gene Moss, an industrial hygienist, found that readings in the CBO's fourth-floor offices reached a maximum of 6.80 mG and averaged 1.82 mG. EMFs in the hallways did not exceed 1.50 mG. Magnetic fields in a computer room on the sixth floor ranged from 0.4 to 66 mG. Electrical equipment is located directly above the entrance to the computer room, according to the HHE.

But Moss's survey did not answer one question Reischauer raised when he requested the study: Had the people with cancer worked "close to any equipment that might have generated strong electromagnetic fields?" The details of the EMF survey are sketchy, and few employees are reassured. "The investigation

was not handled in a professional manner," said an FHOB employee who has followed the investigation. "No good came out of the report," he added. The employee asked that his name not be used.

Moss told *Microwave News* that he tried to take measurements where he believed people worked and called the survey "the best attempt he could make," given his work load.

In its report, NIOSH said that the HHE was not supposed to be a detailed study: "The limited number of measurements taken was not intended to represent an in-depth evaluation of the radiation fields at the site, but rather to approximate workplace exposure levels found on the days of measurement." The report (HHE 92-156-2256) was coauthored by Moss and Dr. Allison Tepper, an epidemiologist at NIOSH.

Santa Clara County Office Building, San Jose, CA

The California Department of Health Services (DHS) in Berkeley could not find the cause of eight cases of cancer of the central nervous system among employees in an office building in San Jose. "We have not been able to come up with any other plausible explanation except for chance," Dr. Raymond Neutra, acting chief of the DHS's Environmental Health Investigations Branch in Emeryville, told *Microwave News*.

The DHS determined that there was a fourfold cancer excess in the west wing of the Santa Clara County office building, where approximately 1,800 people had worked between 1962 and mid-1991. The agency counted seven cases of primary brain tumors and one cancer of the spinal cord among three women and five men who had been employed there as planners, lawyers and clerks.

The DHS report—like NIOSH's study of the FHOB—states that environmental factors could not account for the tumors. "No existing or recorded physical or chemical agent could be identified as the likely cause" for the cancer excess, according to the 65-page study, released in April 1992.

Much of the DHS investigation addressed EMFs from two 115 kV power lines located "several blocks away" from the building. Indeed, the report presents 25 pages of EMF measurements taken at one-foot intervals up to 700 feet from the power lines, where magnetic fields measured less than 0.35 mG. The DHS concluded that the lines had "no demonstrable influence" on the west wing.

Indoors, the DHS took readings in the centers of offices and determined that "all areas and rooms in the west wing measured less than 0.5 mG." In addition, five employees were given EMDEX meters to measure exposures over a 24-hour period. This survey revealed average workplace EMFs of 1.19 mG, while maximum on-the-job exposures ranged between 14 and 40 mG. Dr. Gerri Lee, an epidemiologist at the DHS, said in an interview that the peak readings corresponded to brief exposures to appliances like copy machines.

But representatives of the Service Employees International Union (SEIU), who had originally requested the DHS investigation, say that they are not satisfied. "We wanted more people wearing the meters for more time, and we wanted mapping for potential hot spots," SEIU representative Beth Shafran, who is based in San Jose, said in a telephone interview.

Neutra said that the agency had made no attempt to take readings where the people with brain tumors had worked. He said that estimating past exposures was virtually impossible, in part because sections of the west wing had been remodeled and rewired over the years. "We did this investigation under incredible resource restraints," Neutra said. "The purpose was to assess the safety of the building in general with the resources we had." Neutra added that he does not think it is useful to look at individual cancer clusters. He said that he would prefer a "large, well-designed" investigation, noting that he has asked the California Public Utilities Commission to fund such a study.

Meanwhile, NIOSH has agreed to SEIU's request for an additional study of EMFs in the west wing, according to Dr. Allison Tepper, who studied the FHOB cancer cluster. Tepper said that NIOSH had denied an earlier request by the union, but "this time decided it was reasonable to provide employees with more information."

Pacific Bell, Garden Grove, CA

Between 1984 and 1991, 13 out of 89 Pacific Bell clerical employees who had worked in the basement of a building in

Widow of Office Worker with Brain Tumor Files Suit

The widow of a California office worker who died of a brain tumor is suing the city of San Jose, claiming that microwave radiation from a city owned and operated transmitter was responsible. Michael Popolizio was a district attorney who worked in the west wing of a Santa Clara County office building (see story at left) from 1976 to 1988 and who died of brain cancer in 1991 at the age of 45. The claim was filed in state superior court on March 20, 1992, by Flora Chu of the San Jose firm of Hawes & Chu.

Although the claim points to radiation from a microwave transmitter located next to the building in which Popolizio worked, Chu told *Microwave News* that she is considering amending the suit to include exposure to EMFs from the building's electrical equipment.

Chu criticized the DHS survey of EMFs in the Santa Clara building. "The report was not done completely," she said. "They needed to look more carefully at where people spent their time." Chu noted that two of the eight people with cancer in the west wing had worked next to each other, calling this a "significant piece of information that did not come out" in the DHS report. "If we can discover the historical information, we may be able to prove or disprove our theories," Chu said, explaining that she is taking her own measurements in the building to assess her client's EMF exposure.

Garden Grove, CA, were diagnosed with various forms of cancer. None of the consultants or researchers hired by Pacific Bell to study the basement office could find an environmental cause for the cluster.

At least three reports investigating the cluster were prepared for Pacific Bell, but the telephone company refused to release them. Spokeswoman Linda Bonniksen, based in Los Angeles, would only provide the company's press statements, which were issued between August 1991 and April 1992. The following information is based on those press releases:

- The total number of cancer cases in the Garden Grove basement office exceeds the expected number in the general population, but when the cluster is separated by type of malignancy, the varieties, taken individually, do not occur at high rates, according to Dr. Hoda Anton-Culver of the University of California, Irvine. Anton-Culver declined to release her report, referring queries to Pacific Bell.
- The highest EMF measurement taken in the basement area was 186 mG, according to Dave Rainer, formerly of Bellcore, the research arm of Pacific Bell and the other regional Bell companies. Using Rainer's data, Pacific Bell concluded that EMFs in the basement office are "well within acceptable industry guidelines"—referring to those adopted by the International Radiation Protection Association (IRPA) and the American Conference of Government Industrial Hygienists (ACGIH), which allow EMF exposures of up to 5,000 and 10,000 mG, respectively. Rainer, who is now director of the environmental health and safety center at North Carolina State University in Raleigh, declined to be interviewed. Rainer took measurements in Garden Grove as part of Bellcore's national study of telephone company workers and EMFs, which Bellcore has refused to release (see *MWN*, M/J92).
- As part of Rainer's survey of the basement office, Garden Grove employees, like their counterparts in Santa Clara, wore EMDEX meters to gauge EMF exposures. Average on-the-job EMFs ranged from 0.8 to 7.22 mG, according to Pacific Bell.
- No further environmental or epidemiological studies are needed at Garden Grove, according to Dr. Howard Frumkin of the School of Public Health at Emory University in Atlanta. Frumkin—who was recommended to Pacific Bell by the DHS—based his opinion on the reports by Anton-Culver and Rainer, and on other environmental surveys. Frumkin also declined to release his report.

Although Pacific Bell did not reveal the employees' maximum EMF exposures, Bellcore's survey of the Garden Grove office, obtained by *Microwave News*, indicates that peak levels recorded on the EMDEX meters ranged between 4.0 and 77.5 mG. These readings are a result of "very brief" exposures, the report states, but their source "has not been clearly defined." The 186 mG spot measurement was taken one foot from a circuit breaker in a power room next to the basement office.

"I have reservations about the way Bellcore's study was done," said John Theriault, who is with the Communications Workers of America. He said that he would have preferred the EMF survey to have been done by an independent consultant.

Theriault, a Pacific Bell communications technician who works in Costa Mesa, noted that electromechanical switching gear at Garden Grove had been replaced with digital equipment a few years before Bellcore's EMF measurements were taken. Theriault said that the measurements might not accurately reflect past exposures of the basement employees, who worked a floor below the room that housed the old equipment. He pointed to a 1989 Johns Hopkins University study, which found that male telephone workers exposed to complex EMFs from mechanical switching gear had elevated rates of leukemia, breast cancer, lymphoma and prostate cancer (see *MWN*, N/D89).

Dr. Michael Yost, an industrial hygienist formerly with the University of California, Berkeley, who was a consultant to the DHS, said that the agency had been aware of the cancer cluster at Garden Grove but had decided not to pursue it. "The DHS has no resources," he said, "and Garden Grove was a low priority—several things were competing for [DHS's] attention." Yost is now at the University of Washington, Seattle.

Building EMF Mitigation *(continued from p.1)*

Since employees have to live with the results, you want to get it right, he said. "You only get this opportunity once every 30 or 40 years."

The most expensive measure taken in the World Bank project was putting the main electrical switching equipment in the fifth subbasement. This is commonly placed where the electrical service comes in from the street, exposing adjacent areas to strong magnetic fields. "This is your biggest emitter," Barry explained, noting that magnetic fields nearby "can easily be in the hundreds of milligauss."

Placing this equipment on the building's lowest level, which is used primarily for parking, was "a fairness issue," said Dr. Keith Florig of Resources for the Future in Washington, who was also a consultant on the project. Any other alternative would have forced some employees to work in very strong magnetic fields—a situation that was considered undesirable, Florig said.

In existing buildings, demand is growing for substantial reductions of magnetic fields. "We are seeing a huge number of requests for shielding," explained Larry Maltin, president of Amuneal Manufacturing Corp. in Philadelphia. "I believe the recent Swedish studies and the press coverage they have received have sensitized the public," he added. Maltin's firm specializes in the preparation and installation of μ-metal alloys and low-carbon steel for EMF mitigation. For many years, the company's main activity was protecting electronic equipment from magnetic field interference, but, in response to customers' health concerns, area shielding is now Amuneal's fastest growing business.

"Generally, the first indication that there are elevated magnetic fields is interference on VDTs," Maltin told *Microwave News*. Reducing fields to less than 10 mG throughout an office is adequate to eliminate the interference problem—and results in average fields that are lower than 10 mG. A limit of 5 mG can double or triple the cost, and further reduction, to 1-2 mG, is a "fundamentally different" undertaking, according to Maltin, since the common contents of an office—lighting, copiers, fax machines, VDTs, electrical cords—generate fields above this level.

A job that involved reducing magnetic fields to 10 mG or less for two large offices directly above a building's electrical

(continued on p.12)

EMFs at New York City's Best Addresses

From Wall Street to Park Avenue, tenants and landlords of some of New York City's prime commercial properties are finding high EMFs—often in excess of 1,000 mG—in their buildings. In most cases, the problem is due to electrical equipment, such as wiring and transformers (see *MWN*, M/J91). Some companies have taken measures to put the space to new use or to shield it; others have moved out and are pursuing legal action. Here is a sampling.

Marine Midland Bank

After discovering high magnetic fields in its second-floor offices at 250 Park Avenue, Marine Midland Bank signed an agreement with its landlord to shield the space—at a cost of $1 million, according to a knowledgeable source, who asked to remain anonymous. The bank had originally filed a suit against the landlord, Vista Properties Corp., but dropped it when Vista agreed to take remedial action. Floor-level magnetic fields of up to 300 mG were generated by power cables or the switching gear below the second floor, according to a report by HealthWaves Inc.—which is no longer in business—obtained by *Microwave News*. A subsidiary of Marine Midland's parent company, Hong Kong Shanghai Bank, now occupies the space. Richard Menaker of the New York City law firm of Menaker & Herrmann, who represented Marine Midland, declined to comment.

The Chrysler Building

Magnetic fields of more than 2,000 mG in its offices on the 31st floor of the landmark Chrysler Building have prompted the Klockner Chemical Co. to move out. It is preparing to file suit against its landlord, according to Klockner's attorney, Kenneth Everett of Becker, Glynn, Melamed & Muffly in New York. Klockner's claim will follow an earlier suit by Darby & Darby—a law firm that sublets to Klockner—against the chemical company for not paying rent and against Cooke Properties Inc., the owner of the building, for "uninhabitable premises" due to high EMFs, according to Darby's lawyer at the Manhattan firm of Wormser, Kiely, Galef & Jacobs. Fred Helene of Wallingford, CT, measured magnetic fields of 2,050 mG on the 31st floor, and Consolidated Edison Co., the local utility, later recorded levels as high as 2,700 mG. The EMFs were generated by electrical equipment located on the 30th floor, directly below Klockner's offices, Everett said.

Children's Television Workshop

The Children's Television Workshop (CTW), best known for *Sesame Street*, paid $60,000 to reconfigure its second-floor offices to reduce worker exposures to EMFs, according to Ellen Morgenstern, CTW's director of media relations. CTW moved its employees out of the space for several months until the changes could be made. Morgenstern said that EMF readings in its offices, which are across the street from the Lincoln Center for the Performing Arts, are now "no higher than in any of CTW's offices on other floors." She could not specify the field levels, either before or after the alterations, referring questions to Milford Managing Corp., which runs the building. A company representative said he knew nothing about the issue.

American Express Tower

Jitter on computer screens provided employees in the American Express office tower in the World Financial Center with their first clue that they were working in strong magnetic fields. A survey by American Power Technologies Inc. of Lake Success, NY, later showed that the fields near the affected computers were as high as 90 mG. In other parts of the lobby-level offices, EMFs reached a maximum of 105 mG; just outside, in the lobby, they were 168 mG. (All of the measurements were taken at three feet above the floor.) "We believe it is evident that the problems...are being caused by magnetic fields produced by the electric service equipment (principally the low voltage collector bus and switchboards) located in the service level below the area," according to the report, obtained by *Microwave News*. The office was later shielded "as a preventive measure," said American Express spokeswoman Susan Miller, who declined to provide further details.

Gateway Plaza, Battery Park City

A subsidiary of Watermark Associates found EMFs of nearly 2,000 mG in the offices it rents in Gateway Plaza, a high-rise residential building in Battery Park City in lower Manhattan. As a result, in October 1992, it filed a suit in New York State Supreme Court to break its lease with Hudson Towers Co.—a subsidiary of the LeFrak Organization, which owns Gateway Plaza—claiming that the space was unsafe. Watermark declined to comment on the matter, but *Microwave News* has learned that an out-of-court settlement is being negotiated. EMFs in the ground floor offices ranged between 850 and 1,980 mG, according to a report by Jen-Mar Electric Co. of Brooklyn, NY. Four Con Edison transformers below the offices are believed to be responsible.

Columbia University School of Public Health

Administrators at the Columbia University School of Public Health rearranged a suite of basement offices after discovering high EMFs from nearby electrical equipment. A survey ordered by Dr. Edward Christman, director of environmental health and safety, found magnetic fields of 100-180 mG along a wall separating the offices from the equipment. EMFs at a VDT workstation next to the wall reached 58 mG. (The user of this VDT was relocated.) The fields in the room next door, near a switch panel, were 800-2,000 mG. The offices are occupied by the school's Center for Population and Family Planning. In a July 21, 1992, letter, Christman wrote that "there should be no concern for adverse health effects" since the levels are well below the standards limiting occupational exposure to EMFs, referring to guidelines set by the International Radiation Protection Association, the American Conference of Governmental Industrial Hygienists and the U.K.'s National Radiological Protection Board. But he noted that the decision to reconfigure the space was "prudent since it will eliminate VDT interference problems and the associated eye strain." The office space with the strongest EMFs is now being used for filing cabinets.

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(continued from p.10)

switching equipment cost roughly $280,000—a price tag that is "not unusual," according to Maltin. Another site—the ground-floor offices in Gateway Plaza in lower Manhattan (see p.11)—presented a more difficult situation. This space is directly above transformer vaults, and surveys indicated that magnetic fields in some areas approached 2,000 mG. Amuneal engineers estimated that shielding for this area, which is roughly 1,100 square feet, would cost more than $500,000.

Cost estimates from Consolidated Edison Co. in New York City are similar. "The fact is, we can reduce magnetic fields 20-fold, 30-fold, 50-fold, but at a price and only in a given area," explained Dr. Daniel Mark, a senior Con Ed engineer. The utility has worked with Amuneal on several demonstration projects designed to assess the effectiveness of various types of shielding.

Con Ed does not presently shield its equipment in response to customer requests, spokesman Martin Gitten said, because it is impossible to know what a safe magnetic field exposure is. But Mark explained that, since New York State has adopted a 200 mG magnetic field limit for power line rights-of-way (see *MWN, S/O90*), utility officials want to know "what we can do" to reduce magnetic fields from other electric power facilities.

In one Con Ed project, completed in 1990, a 460 volt distribution vault was shielded with μ-metal on the walls and ceiling, yielding a 25 to 1 reduction of the magnetic field at a cost of $200,000. In another, engineers put a fence lined with μ-metal around a 30-foot by 15-foot capacitor bank that is part of an outdoor substation. The magnetic field measured about 1,000 mG outside the fence before the shielding was in place, and 20-25 mG after, Mark said. The cost of this effort, completed in 1991, was $180,000. The utility is currently experimenting with shielding methods at one of its power plants.

"It would be impossible to shield all Con Ed installations for magnetic fields," Mark said, adding that he is far from convinced it is necessary. "I can't imagine New York City covered with tons and tons of μ-metal," he said.

The World Bank evaluates emissions when purchasing new office equipment, Barry told *Microwave News*. While low emission VDTs are fairly easy to find, Barry explained, levels vary widely among different types of copy machines, computer printers and even desktop lamps. EMFs can be cut sharply simply by choosing these products carefully, he said.

Mitigation Resources

Norman Beddows of EPA's regional office in Boston has prepared a ten-page guide, *Extremely Low Frequency (ELF) Magnetic Fields in Offices, and Mitigation.* Copies are available from Amuneal Manufacturing Corp., 4737 Darrah St., Philadelphia, PA 19124, (215) 535-3000.... Amuneal's Larry Maltin will give a tutorial on shielding DC and AC EMFs on June 16 at the Bioelectromagnetics Society's annual meeting in Los Angeles. Call W/L Associates for details: (301) 663-1915.

The World Bank team also adopted the following mitigation measures for its new headquarters:

- Electrical transformers for each floor are being placed near elevator lobbies so that storage closets, corridors and common areas that are only used intermittently form a buffer between this EMF source and employee areas. Magnetic fields reach 100 mG or more right next to this equipment, according to Barry, but drop off to negligible levels about 12 feet away.
- Electronic ballasts rather than magnetic ballasts are being used for fluorescent lights, and two banks of lights are being run on each ballast, cutting the number of sources in half; ballasts are also being positioned back to back, to promote field cancellation. "This is a real win-win situation," Barry pointed out, since the design improves energy efficiency and costs less to install.
- Desks are being positioned away from the fan coil units that are used for ventilation in window offices. These emit relatively high fields—stronger than those of most office equipment—but the levels drop off quickly with distance, Barry said.

The first phase of the World Bank headquarters will be completed this year, after which Barry plans a thorough survey of magnetic field levels to evaluate the effectiveness of the mitigation efforts. The entire complex, covering one city block, is scheduled to be finished in 1996.

FROM THE FIELD

PG&E Mitigates Existing Transmission Line EMFs

To the Editor:

Recently, I was called in to measure magnetic fields for CAT Software, a company in Palo Alto, CA, which is 50 feet from the transmission lines supplying all of Palo Alto. The company's original complaint was the flickering of their VDT screens. My measurements showed 10.5 mG in the offices closest to the lines and 4.5 mG in those furthest away.

Soon afterward a meeting was held, attended by Pacific Gas & Electric (PG&E) engineers, a city engineer, the landlord, company representatives and myself. Though PG&E representatives wanted to focus only on the flickering of the VDTs—suggesting ways to reduce the symptoms—company representatives were aware of the health research and wanted the fields reduced.

I suggested reverse phasing the lines in accordance with EPRI research. The PG&E engineer, Tomm Marshall, agreed to look into the feasibility of this mitigation strategy. Within a week he had ordered the reverse phasing. I remeasured the magnetic fields on the same day of the week and at the same time of day as my first measurements and found a 76% reduction at the front (2.5 mG, down from 10.5 mG) and a 73% reduction at the rear (1.2 mG, down from 4.5 mG). The VDTs no longer flickered. According to Tomm Marshall, the reverse phasing was accomplished during the day, with no disruption of service, and was considered a minor task.

Considering the number of residences, businesses and recreation areas that have similar problems, all utilities might want to adopt similar mitigation measures as standard procedure.

Sincerely,
Karl Riley
ELF Magnetic Surveys
475 Gate Five Rd., Suite 216
Sausalito, CA 94965

HIGHLIGHTS

$1.6 Million Award for Worker Fired After Radar Accident

Richard Eldridge, one of six civilian employees who were exposed to strong radar radiation in a 1983 accident at Clear Air Force Station near Fairbanks, AK, has won a jury award of $1.6 million for being wrongfully dismissed by his employer, Felec Services Inc., after he sought expert medical treatment for his injuries. Eldridge's was the only wrongful termination case filed, but he and three others also have personal injury claims pending.

Felec, a subsidiary of ITT, has asked Judge Russel Holland, who oversaw the case in U.S. District Court in Anchorage, AK, to either throw out the jury's February 17 decision—a move known as granting judgment as a matter of law—or grant a new trial. "The jury got sidetracked," said Marcus Clapp, an attorney in the Fairbanks offices of Hughes, Thorsness, Gantz, Powell and Brundin, who represents Felec. The jury was instructed to find for Eldridge only if it was shown that Felec's motivation was "to prevent him from exercising his right to see a physician of his own choosing, or to retaliate against Mr. Eldridge for pursuing his workers' compensation rights." But Clapp maintains that the plaintiff's case did not demonstrate anything about Felec's motives, focusing instead on Eldridge's employment contract.

Richard Friedman, Eldridge's attorney, dismisses these views. He told *Microwave News* that Eldridge "really pushed to see doctors who knew something about radiation injuries." The case he presented showed that this was why he was fired, said Friedman, who is with the firm of Friedman, Rubin & White in Anchorage.

Eldridge, a welder, was servicing a powerful tracking radar—part of the Air Force's Ballistic Missile Early Warning System—when it was accidentally turned on by another worker (see *MWN*, N83). He and five other workers were 80 feet above the ground on the superstructure that houses the radar when they began to feel warm and realized the radar was in operation.

Eldridge was a vocal critic of Felec's and the Air Force's handling of his injuries. Immediately after the accident, the six workers were examined by the company's nurse, who found that they had elevated body temperatures, high blood pressure and some burns. Eldridge and the others complained of vision loss, partial hearing loss, nausea and other symptoms. The next day, they were sent to a hospital in Fairbanks, but doctors there had no experience with radar radiation injuries, according to Eldridge. For a full week, the workers were told that the radiation badges they wore to detect ionizing radiation would also document their exposures to non-ionizing radiation from the radar. Nine days after the accident, the workers were informed that they would be sent to the School of Aerospace Medicine at Brooks Air Force Base in Texas to see doctors who were familiar with radiofrequency and microwave radiation, but that trip was delayed several more weeks. Eldridge decided to seek his own medical experts and went from Brooks to see doctors in New York and Massachusetts.

Eldridge recently told *Microwave News* that he still suffers from short-term memory loss. "I have to write everything down," he said.

The jury awarded Eldridge $630,000 for lost wages and pension benefits. Felec will also have to pay interest and attorneys' fees, bringing the total to more than $1.6 million. Felec's motion to overturn the jury award should be heard sometime in April, according to Clapp, and if it is denied, an appeal is still possible.

Meanwhile, the personal injury claims brought by Eldridge and the three other workers are the subject of a complex and drawn-out legal battle. Along with Felec, the defendants are RCA Corp. (now owned by General Electric Co.), which manufactured the radar and operated it for many years, and the Air Force (see *MWN*, S/O85). These claims have been consolidated before Judge Holland. Currently, the court is considering a motion from the defendants to dismiss the claims, pursuant to a provision of the Federal Tort Claims Act that precludes certain types of actions against the government.

The defendants "have made every possible attempt to delay and impede discovery in this case," said Tulsa, OK, attorney Jon Running, who represents all the plaintiffs except Eldridge. Clapp, whose firm is also handling Felec's defense in these cases, admitted that the legal complexities being raised in this case are "bizarre." He said that any trial is probably several years away.

The circumstances of the accident are subject to controversy. The Air Force, in a report based on a reconstruction of the events at Clear, stated that the maximum exposure for any of the workers was 105 mW/cm^2 and estimated that Eldridge was exposed to radiation levels of 12-19 mW/cm^2 for seven or eight minutes. The workers, however, maintain that the exposures were as high as 135 mW/cm^2 and lasted up to seventeen minutes (see *MWN*, D83 and J/F84). A subsequent investigation by the General Accounting Office found that the accident was due to "basic problems" in Felec's operational and safety practices (see *MWN*, N/D85).

EMS Technicians Question Safety of Their Two-Way Radios

New York City's Emergency Medical Service (EMS) technicians are concerned that their walkie-talkies may be affecting their health. Female EMS employees are reporting menstrual irregularities and abnormal pap smear tests, according to the EMS Women's Coalition, an employee group. They worry that the Motorola STX and Sabre radios they use may be responsible, and some are refusing to carry them, Anne Collazo, head of the Women's Coalition, told *Microwave News*.

As many as 100 of the city's 680 female EMS employees may be affected, according to the March 22 New York *Daily News*. Collazo, however, declined to estimate how many women have health complaints, explaining that her group has just begun a survey of all EMS personnel to try to determine the scope of the problem. "Since all this hit the papers," Collazo said, "a lot more women are coming forward."

Motorola is defending its radios. When used properly, they

are held "well away from the head," Motorola pointed out. "There is no credible evidence to suggest that the weak signals from these radios could penetrate the skull and reach the pituitary gland at levels that could cause any adverse effects," the company said in a statement prepared in response to press reports. An EMS spokeswoman, Lynn Schulman, concurred, suggesting that job stress or nighttime work could be responsible for the women's health problems.

Female EMS workers reject this reasoning. They point out that the first reports of gynecological problems surfaced in mid-1989, just after EMS replaced its older radios, which operated at around 400 MHz, with the new 800 MHz Motorola equipment. Soon thereafter, 15 out of about 40 women who worked in the Bellevue Hospital EMS unit in Manhattan began complaining of menstrual irregularities, according to Collazo. The women suspected the new radios, so the union that represents EMS technicians, Local 2507 of District Council 37, had radiation measurements taken by Professor Leo Birenbaum of Polytechnic University in Brooklyn, NY. At 10 cm from the antenna, the new radios produced power densities of approximately 2 mW/cm^2, according to Birenbaum's report. The union also suggested that video display terminals (VDTs), installed in EMS vehicles at about the same time, might be responsible for the menstrual problems.

The health concerns reemerged after the controversy over cellular telephone radiation erupted earlier this year (see *MWN, J/F93*). The EMS radios operate at 800-900 MHz with a 3-watt maximum input power—the precise frequencies are programmed when the system is set up. This is the same range used by cellular phones, but the radios are more powerful than 0.6-watt handheld cellular phones.

In 1989, the environmental epidemiology unit of the New York City Department of Health (DOH) agreed to investigate the workers' complaints and interviewed 34 women from the Bellevue unit. The study was never completed, however. The agency will now revisit the issue, according to Steven Matthews, a DOH spokesman. "We'll look at any factors that seem to present themselves as opportunities for study," Matthews said, but he added that he could not yet say whether the DOH would consider emissions from either the radios or the VDTs.

Navy To Cancel EMPRESS II

The Navy's controversial seagoing electromagnetic pulse (EMP) simulator, known as EMPRESS II, will not be funded in fiscal year 1994, due to reductions in the military budget, Navy officials report. "This is one of the areas that we could not afford to keep funding, given other priorities," said Captain William Mahew of the Naval Sea Systems Command in Crystal City, VA. "It's not likely to be reactivated," he added.

There will be one more set of tests this summer, at a site in the Atlantic Ocean off the coast of North Carolina, where EMPRESS II has been operating since the summer of 1988 (see *MWN*, J/A88). Fiscal year 1993 runs through September 30.

Several years ago, the Navy said it needed to run as many as ten testing cycles per year. Because weather conditions only allowed use of the Atlantic site during the summer, the Navy proposed a second site in the Gulf of Mexico, off the coast of Alabama and Mississippi, for use in the winter (see *MWN*, J/A89). Communities along the Gulf Coast vehemently opposed the Navy's plans, which were dropped in March 1992 (see *MWN*, J/F92 and M/J92). At the time, the Navy reported that it was scaling back the EMPRESS II program due to budgetary constraints. The North Carolina site itself was selected after the Navy abandoned its planned site on Chesapeake Bay. The Navy faced strong opposition in Maryland and Virginia to use of the Chesapeake site (see *MWN*, J/F87 and M/A87).

Mahew told *Microwave News* that the Navy's other EMP testing programs will not be affected by the decision to curtail EMPRESS II. The older EMPRESS I facility is still in use at the Patuxent River Naval Air Station, MD, he noted.

EMPRESS II—the acronym stands for EMP Radiation Environment Simulator for Ships—was designed to test the ability of electronic systems on Navy vessels to withstand the EMP of a nuclear blast. Mahew told *Microwave News* that the program has been useful for understanding the "whole-ship influence" of EMP. The Navy has learned that the effort required to harden ships so they are not disabled by EMP is "reasonably manageable, at reasonable cost," Mahew said.

VDT Research Center Weighs EMF–Breast Cancer Studies

Researchers are seeking funds from the Center for VDT and Health Research to investigate the possible link between EMFs and breast cancer. And the center, located at the Johns Hopkins University (JHU) School of Hygiene and Public Health in Baltimore, seems receptive, having asked for detailed proposals for breast cancer studies from two well-known EMF experts, according to its director, Dr. Ronald Gray.

Dr. Genevieve Matanoski, also of JHU's public health school, is seeking support for a pilot study to investigate whether women who use video display terminals (VDTs) have an elevated rate of breast cancer. Matanoski and coworkers were the first to identify a link between male breast cancer and EMFs when, in 1989, they reported a breast cancer cluster among young New York Telephone Co. workers (see *MWN, N/D89* and *M/A91*).

Dr. Robert Liburdy of the Lawrence Berkeley Laboratory in Berkeley, CA, who has shown that power frequency EMFs can block the body's defenses against the growth of breast cancer cells (see *MWN*, J/A92), is applying for a grant to extend his work to the sawtooth waveforms emitted by VDTs.

The center is also considering a third study, by Dr. Michele Marcus, an epidemiologist at Emory University in Atlanta, who is in the midst of a major prospective study of pregnancy loss among office workers (see *MWN*, J/A89). Marcus wants a grant to measure her subjects' EMF exposures over a 24-hour period.

The center received these three applications, among others, before its advisory board had outlined a research program. On March 5, a formal written request for proposals was issued.

In addition to Matanoski's 1989 report, three subsequent studies—by Dr. Paul Demers of the Fred Hutchinson Cancer Research Center in Seattle (see *MWN*, J/A90 and S/O91), by Drs. Tore Tynes and Aage Anderson of the Cancer Registry of Norway in Oslo (see *MWN*, J/F91) and by Dr. Dana Loomis of the University of North Carolina, Chapel Hill (see *MWN*, J/A92) —found an excess of breast cancer among men exposed to EMFs at work.

In January 1991, a panel of epidemiologists at a National Institute for Occupational Safety and Health (NIOSH) workshop recommended further research on EMFs and female breast cancer (see *MWN*, J/F91). Last year, a team of researchers from the Hutchinson center and from the Battelle Pacific Northwest Lab in Richland, WA, began investigating whether power line EMFs are a risk factor for female breast cancer (see p.4 and *MWN*, N/D91 and M/J92).

Gray told *Microwave News* that the center does not have a particular interest in breast cancer, and that it is "just a coincidence" that two of the three proposals being considered by the center address it. As many as ten projects a year will receive grants—up to $50,000 apiece—for pilot studies or for add-ons to existing studies.

If the Liburdy, Marcus and Matanoski studies are approved, funding would probably begin in May or June, Gray said. Meanwhile, preliminary plans for a summer workshop on VDT EMF exposure assessment are being reviewed, according to Patrick Breysse, associate director of the center.

The VDT Health Research Foundation (HRF), which established the research center last fall (see *MWN*, M/A92 and S/O92), is still being supported only by Apple Computer Inc., Compaq Computer Corp. and IBM Corp.; no other companies have stepped forward since the HRF was announced last March, according to Philip Shellhaas, executive director of the foundation and director of public policy programs for IBM. The HRF's budget remains at $2.25 million over three years.

UPDATES

CELLULAR COMMUNICATIONS

Radiation Protection Devices... Products designed to reduce users' exposures to emissions from hand-held cellular telephones are being rushed to market after the recent outburst of health concerns (see *MWN*, J/F93). Dynaspek Inc. of Westmont, IL, and Ixcel Innovations Inc. of Bellingham, WA, have both introduced curved shields that cover one side of the phone antenna. Quantum Laboratories in Renton, WA, has begun selling Cellguard, which consists of a sleeve that slips over the phone's antenna and a separate part that covers the earpiece. Press reports indicate that additional products may not be far behind. So far, however, there is little support for the claim that these devices provide a practical way for users to protect themselves. Only Dynaspek has provided independent test results to support the claim that its shield reduces exposures. These show that radiation measuring 1.45 mW/cm^2 two inches from a Motorola Ultra Classic phone in operation was cut to 0.038 mW/cm^2 on the side of the phone nearest the operator with Dynaspek's Cell Shield installed. But Elite Electronic Engineering of Downers Grove, IL, which performed the tests, also found that the shield may reduce the efficiency of the phone's signal. The cellular industry has sharp criticism for all the new products, arguing that anything that interferes with the signals the phones transmit could actually make radiation exposures worse. The output power of cellular phones is controlled by the base station, and hand-held phones seldom operate at full power (0.6 watts), according to Bob Ratliffe, a spokesman for McCaw Cellular Communications Inc. in Kirkland, WA. "The shields may cause the phone to increase its power and operate at full power output all the time," Ratliffe said. "One needs to be extremely careful to make sure they don't do more harm than good," he added.

COMPATIBILITY & INTERFERENCE

Electronic Devices Aboard Planes... It's déjà vu all over again. Momentum is building for restrictions on the use of portable electronic devices on commercial aircraft, following a flurry of press reports about potentially catastrophic effects of EMI on aircraft communication and navigation systems (see, for example, *Time*, February 22). Concerns over EMI were raised ten years ago, prompting a five-year study by the Radio Technical Commission for Aeronautics (RTCA) (see *MWN*, S83 and O83). In its final report, the RTCA concluded that the probability of interference is "small," but to play it safe, it recommended that the use of laptop computers, FM radio receivers and other portable electronics be prohibited during takeoffs and landings and that the use of cellular phones and remote-control devices be banned altogether (see *MWN*, N/D88). Now, the FAA has prepared a "Proposed Advisory Circular," which is intended to provide "information and guidance" to help determine whether portable electronic devices will interfere with airplane communication or navigation systems. The circular does not change the underlying rules, which leave the decision on what is allowed to the airlines —not surprisingly, policies vary from company to company— but it does state that all airlines, "for reasons of potentially hazardous interference to critical aircraft systems," must prohibit the use of cellular phones while a plane is airborne and that airlines should, at a minimum, prohibit operation of portable electronic devices "when their use could interfere with the ability of the flight crew to give necessary instructions in the event of an emergency." The FAA circular explains that cellular phones may be used once a plane has landed and is taxiing to the terminal, but not after it has left the gate on departure. In response to the FAA advisory, the Cellular Telecommunications Industry

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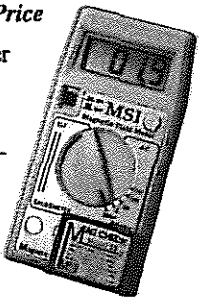

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Association endorsed the existing rules and advised against any tighter restrictions. Anthony Broderick, associate FAA administrator for regulation and certification, told the *Washington Post* (February 12) that the advisory was intended primarily to remind airlines about the cellular phone procedures and should not be understood as an indication that the FAA thinks other devices may be dangerous. The International Air Transport Association (IATA) in Montreal, Canada, recommended to its members on April 8 that "passengers should not be allowed to use transportable electronic devices during the takeoff and landing phases of flight," essentially following the RTCA's 1988 advice. Many members have put this restriction in place, according to IATA.

MEETINGS

Russian Proceedings...A five-volume collection of papers presented at the *11th International Conference on Microwave Ferrites*—held in Alushta on the Crimean peninsula, October 16-20, 1992—is now available. Many of the papers are on gyromagnetic electronics and electrodynamics, but a number address biological effects. Three of the volumes are in Russian and two are in English—each is approximately 200 pages long. The few papers that are both on biology and in English are in volume 4. Each volume costs $7.00 (U.S.), which includes postage. Orders must be prepaid by sending funds in U.S. dollars to: Inkombank, Account No.005070859, Moscow, Russia; specify "Moscow Power Engineering Institute, XI–ICMF." Orders will be processed when a copy of the receipt of the payment is received. Send orders to: Dr. L.K. Mikhaylovsky, Moscow Power Engineering Institute, Krasnokazarmennaya, 14, 105835 Moscow, E-250, Russia, (7+95) 362-7534, fax: (7+95) 361-1620.

POLICE RADAR

Second Trial in May...A case in California may be the next police radar–cancer claim to go before a jury. Judge William Orrick has set a trial date of May 3 in U.S. District Court in San Francisco for the lawsuit brought by Officer William McGuigan of the Belmont, CA, Police Department. McGuigan used traffic radar manufactured by Kustom Signals Inc. of Lenexa, KS, the defendant, from 1984 until mid-1991, when he had a malignant tumor removed from his left thigh and began to suspect that there was a link between the use of the radar and his cancer, according to court papers. The case must first survive a motion by the defendants for dismissal, however. This is scheduled to be heard on April 29. The first police radar claim to go to trial—brought by Officer Eric Bendure against Kustom—was rejected by a jury in February (see *MWN*, J/F93)....Meanwhile, Kustom has dropped the lawsuit it filed in Connecticut last August challenging the state's ban on hand-held radar guns (see *MWN*, S/O92). Kustom's dismissal notice was filed quietly last fall, according to a story by Don Michak in the March 25 *Journal Inquirer*, which is published in Manchester, CT. William Ruppert, Kustom's president, confirmed that the suit has been withdrawn, but neither he nor Lawrence Connelli of the Hartford, CT, firm of Reg-

nier, Taylor, Curran and Eddy, who represents Kustom, would comment further.

RESOURCES

CMU Publications... Over the years, Carnegie Mellon University's (CMU) Drs. Keith Florig, Granger Morgan and Indira Nair have written extensively on EMFs. (They are best known for proposing the policy of prudent avoidance.) Now they have assembled 28 of their publications in one volume, which includes their influential 1989 report for the Office of Technology Assessment (see *MWN*, J/A89), as well as their 1985 and 1990 articles for *IEEE Spectrum*. Papers from some hard-to-get journals and proceedings are included, as are Morgan's and Nair's separate reviews of Paul Brodeur's book, *Currents of Death*. In a number of cases, only the abstracts of articles are reprinted, however. Copies of *Selected Writings on Power-Frequency Fields* are available for $16.00 each, plus shipping, from: Department of Engineering and Public Policy, CMU, Pittsburgh, PA 15213, (412) 268-2670....In addition, CMU's newest EMF booklet, *What Can We Conclude from Measurements of Power Frequency Fields?*, is now available. The booklet is a companion to *Measuring Power Frequency Fields*, which was released last year (see *MWN*, S/O92). These two booklets are being sold as a set for $5.50 (prepaid). Multiple-copy discounts are available. Order from the above address and mark your envelope "Attn: EMF Brochure." Telephone orders are not being accepted.

STANDARDS

FCC Seeks To Adopt 1992 RF/MW Limits... On March 11, the FCC announced a proposal to adopt the new ANSI RF/MW exposure standard. When the FCC first set RF/MW rules in 1985, the agency based them on the ANSI C95.1-1982 guidelines (see *MWN*, Ap85, M/A87 and J/A88). Now that the IEEE has updated the 1982 limits and ANSI has accepted them (see *MWN*, N/D91 and N/D92, respectively), the FCC plans to follow suit. If the commission adopts the 1992 ANSI limits, it would, among other changes, dictate a tougher stand on the automatic exclusion of many low-power devices such as cellular phones and mobile radios. The FCC is inviting public comments on its proposal, the full text of which was released on April 8; they are due by August 13, with reply comments due by September 13. The FCC is specifically seeking opinions on a number of issues, such as the definitions of "controlled" and "uncontrolled" environments, the exclusion of hand-held devices and the discontinuity in the induced current limits within the FM broadcast band (see *MWN*, J/F93). Also on April 8, FCC Commissioner Ervin Duggan released a statement that was clearly in response to the recent flap over cellular phone health risks (see *MWN*, J/F93). "Press scares and media hype are poor substitutes for the careful processes of science and government," he said. "The FCC and other government agencies, as well as the cellular phone industry, will work energetically to resolve questions

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REQUEST FOR PROPOSALS

The Center for VDT and Health Research at the Johns Hopkins University, School of Hygiene and Public Health, invites investigators to submit proposals for research on the health effects of VDT use. The Center has particular interest in supporting innovative studies of the following issues:

a) Methodologies for the measurement of electromagnetic field (EMF) exposures associated with VDTs, and the contribution of VDTs to total field exposures;
b) The association between VDT use and reproductive health problems or risks of neoplasia;
c) The measurement of physical stresses/forces associated with VDT use and the effects on cumulative trauma disorders (CTDs);
d) The moderating influence of psychosocial stress on b) and c) above;
e) The biological effects of EMFs at the cellular or subcellular level.

The Center primarily provides support for pilot studies or for additions to existing studies. The average award is approximately $50,000 per year for direct costs, and indirect costs should not exceed 15%. Funds can be awarded for up to three years, subject to annual review.

Investigators are invited to submit a two page pre-proposal to Dr. Ronald H. Gray, Room 4028, Johns Hopkins University, School of Hygiene and Public Health, 615 North Wolfe Street, Baltimore, MD 21205, (Fax 410-955-0792). Instructions for preparations of pre-proposals can be obtained on request. Pre-proposals should be received by Friday, June 11, 1993. After review by the Center's Scientific Advisory Board in July, selected investigators will be asked to submit full proposals by September, for final review and funding.

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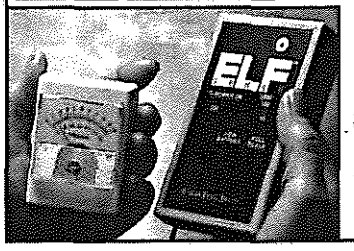

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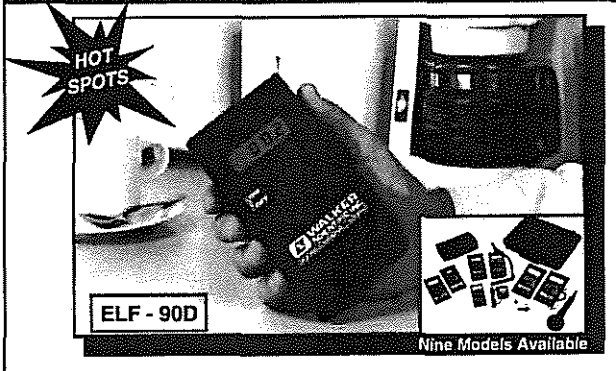

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about the safety of all RF devices. Meanwhile, it is important to keep such safety questions in perspective: *Any* new technology presents risks and uncertainties, which must be weighed intelligently against the obvious benefits that new technology brings. Modern life challenges us to balance those risks with courage and calm analysis, and to avoid hysteria." For more information, contact: Dr. Robert Cleveland, Office of Engineering and Technology, FCC, 1919 M St., NW, Washington, DC 20554, (202) 653-8169.

ETC...

Broadcast v. Radar Radiation... Dr. Bill Guy, formerly of the University of Washington, Seattle, who was one of the expert witnesses for the defense in the Bendure police radar lawsuit (see *MWN*, J/F93), offers the following comments on public concerns over police radar radiation: "It is ironic that the broadcast industry continuously exposes the North American population to tens of megawatts of electromagnetic radiation at frequencies in the bands of maximum absorption by the human body—and with modulated signals, which often are reported to cause biological effects. It is ironic because TV programs like CBS's *60 Minutes* will fill the ether with its megawatt radiations in questioning the safety of an unmodulated 50 milliwatt continuous wave police radar that operates at a frequency at which the energy is absorbed mostly in the skin. The public is indeed misinformed when police radars can be banned...." See Arthur Guy, "Electromagnetic Fields and Health: Some Thoughts About the Past and Future," *Bioelectromagnetics, 13,* pp.601-604, 1992.

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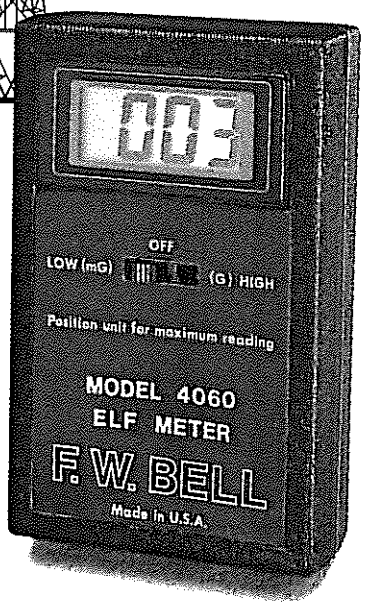

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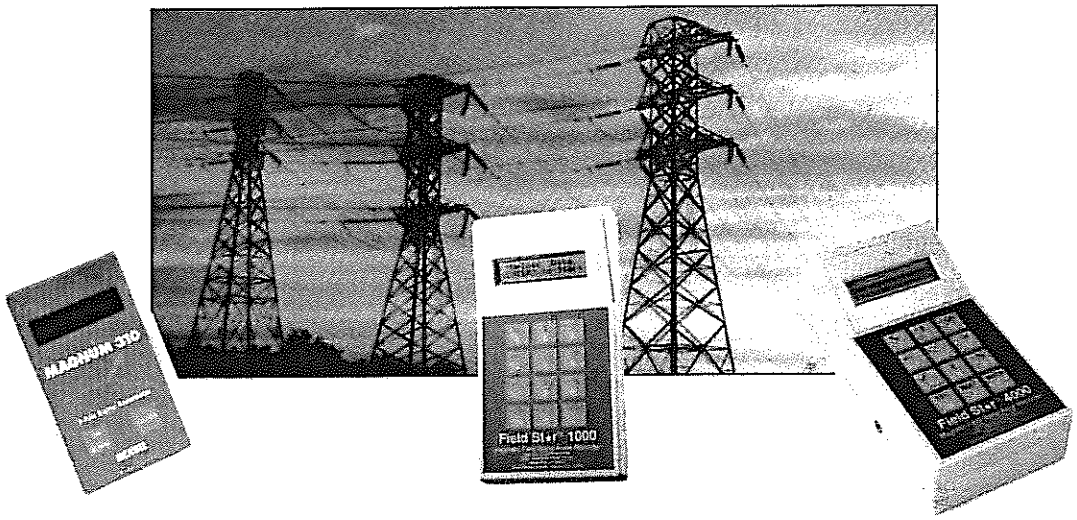

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Other features of the Magnum 310 include: a 2x16 alpha-numeric readout with two display modes—resultant only or resultant-with-vector-components, a resolution of .04 mG, a durable membrane keypad, auto shut off to save battery power, and a low battery indicator.

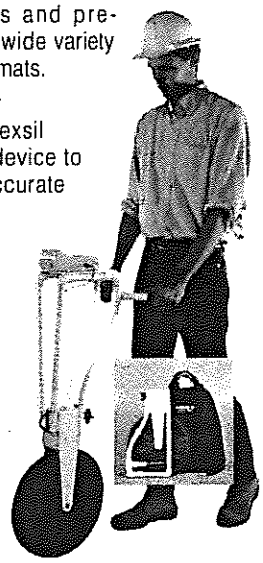
Field Star™ 1000 & Field Star™ 4000

Both Dexsil's Field Star 1000 and Field Star 4000 are full function data loggers for AC magnetic fields. The Field Star 1000 has a full scale range of 1000 mG with a resolution of .04 mG and the Field Star 4000 has a full scale range of 4000 mG for higher current environments.

Each device has three orthogonal sensing coils to measure the vector field components. Both devices can be used as either survey instruments or data loggers to record data as a function of time, distance or position. In the survey mode, the resultant and vector components can be displayed in real time and can be used to locate magnetic field sources. The time-data sampling mode allows the user to store field readings at intervals of seconds or minutes for exposure measurements or dosimetry. With the use of the mapping wheel, straight line profiles or complete 2-D maps of field strength can be made. Event markers and turns can easily be entered from the keypad.

Software provided with each unit allows the user to upload data easily to any PC compatible computer for data analysis and presentation in a wide variety of graphics formats.

Whatever your application, Dexsil has the right device to provide the accurate information you need.



For more information contact Dexsil.

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