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EPA Shelves EMF–Cancer Report

But Link Called Stronger Than in 1990

The Environmental Protection Agency (EPA) has indefinitely delayed the release of its already long-awaited report assessing the cancer risk of electromagnetic fields (EMFs).

"The report will not come out in the foreseeable future," said Dr. Robert McGaughy of EPA's Office of Health and Environmental Assessment (OHEA) in Washington. McGaughy attributed part of the delay to "budgetary uncertainties" at the agency. McGaughy has been working on the report for some eight years.

EPA's cancer assessment is said to be in essential agreement with the conclusions of another report, prepared for the National Council on Radiation Protection and Measurements (NCRP), which calls for strong action to curtail exposure of the U.S. population (see pp.2-3 and *MWN,* J/A95), according to a source who has read both reports.

"The EPA and NCRP reports are heading in the same direction," said the source, who asked that his name not be revealed, referring to the evidence of an EMF–cancer link.

The first draft of the EPA report, released in 1990, prompted international headlines when word got out that McGaughy and his staff had concluded that EMFs were a "probable human carcinogen" (see *MWN,* M/J90). Agency officials overruled this assessment, but they still allowed that EMFs were a "possible, but not proven, cause of cancer in humans" (see *MWN,* N/D90).

An EPA Science Advisory Board (SAB) review panel, convened in 1991, sharply criticized the report as unsupported by the evidence and sent it back to the EPA to be rewritten (see *MWN,* M/J91, J/A91 and J/F92).

In an interview, McGaughy said that there are now more data supporting an EMF–cancer link than there were five to six years ago when the first draft

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EPRI Finds "Small but Significant" Occupational Brain Tumor Risk

Based on a combined analysis of 29 occupational studies, the Electric Power Research Institute (EPRI) has reported that there is a "small but significant" increase in the risk of brain cancer among workers exposed to EMFs. Biases in the studies were judged "unlikely" to be responsible for the overall increase in risk. EPRI found that some broad evidence does support an EMF–cancer connection, a significant conclusion for the industry-funded group.

But the meta-analysis did not indicate a clear dose–response relationship between EMF exposures and the incidence of brain tumors, and the EPRI team felt that adequate exposure information was often lacking. Thus, the paper cautioned, "It is not possible to conclude that EMF[s] [are] causally

(continued on p.8)

« Power Line Talk »

In a December 1995 report, **Australia's Senate Economics References Committee** advocated prudent avoidance in the design of the proposed 250-mile, 330 kV **Eastlink** high-voltage power line: "[T]he fear of detrimental health effects, whether real or imaginary, is in itself having an impact on the lives of some individuals affected by the Eastlink proposal ....[A]s a minimum policy or until evidence suggests otherwise, the concept of 'prudent avoidance' should continue to be practiced by government and power authorities." The document acknowledged the lack of consensus on what prudent avoidance means, defining it as "siting the line as far as possible from houses, outbuildings and other farm facilities." The report was based, in part, on a series of hearings at which Drs. **Mark Israel**, **Richard Luben** and **Michael Repacholi** testified (see pp.15-16). The committee also reviewed the earlier Gibbs and Peach reports, both of which advised a similarly cautious strategy (see *MWN,* M/J91). The Eastlink power line results from a December 1993 agreement between Queensland and New South Wales to connect their power grids. After the Senate committee took up the Eastlink proposal last March, it received more than 1,300 public comments—most of them in opposition. Its report is only a recommendation to the Queensland and New South Wales state governments, which will make the final decision. This could turn on a soon-to-be-released environmental impact statement, as well as on state and local elections. Eastlink is not the first EMF controversy to break out in the Australian Senate. In November 1994, for example, Senator Robert Bell of North Hobart, Tasmania, presented his colleagues with a report titled *(Non-Ionizing) Electromagnetic Fields and Human Health: Are Current Standards Safe?* by **Don Maisch** of EMFacts in Hobart. Maisch questioned the reliability of exposure standards, particularly the 1 G limit for the general public recommended by the International Commission on Non-Ionizing Radiation Protection (**ICNIRP**). Maisch's report came under fire last year, when the **Electricity Supply Association of Australia** Ltd., a utility group supporting Eastlink, released critical evaluations by two experts: Dr. **Jan Stolwijk** of the Yale University School of Medicine in New Haven, CT, and a member of ICNIRP, and Dr. **Michael Baker** of the University of Toronto, Canada. Stolwijk contended that Maisch "made many serious mistakes, misstatements and omissions in his discussion of the scientific publications.... [such that] the report as a whole has little credibility or usefulness as a scientific document" (see box on p.3). Baker maintained that "the results of the hundreds of laboratory studies involving cells, tissues and animals exposed to power frequency EMF do not provide a scientific basis to conclude that exposure to these fields cause or contribute to the development of cancer in humans." In August 1995, Maisch responded with an updated report, *Fields of Conflict,* in which he argued that "earlier studies, when combined with recent research, clearly show that there is a significant health risk from overexposure to this kind of radiation." More recently, Maisch submitted a commentary to the Senate committee investigating Eastlink, in which he conceded that Stolwijk "did have some very valid criticisms," but considered it "incredible" that Stolwijk would claim that there is no scientific evidence supporting an EMF–cancer link. For a copy of the Eastlink report, contact: Secretary, Senate Economics References Committee, Parliament House, Canberra, ACT 2600, Australia, Fax: (61+6) 277-5719.

EPRI's Sussman and Kheifets Move Up

Dr. Stanley Sussman has become the director of EPRI's Environment Group, a newly created position. "I'll be sharing responsibility for planning and management with Dr. Stephen Peck, vice president for the Environment Group," Sussman told *Microwave News.*

Sussman had been manager of EPRI's EMF health effects research since 1991. Dr. Leeka Kheifets, who has taken over this position, will report directly to Peck. "I intend to stay on top of developments related to EMFs," Sussman said. "Clearly I won't be as involved as I have been, but I'll make time to keep abreast of things."

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San Diego Gas & Electric Co. (SDG&E) and **Southern California Edison** Co. (SCE), two utilities involved in EMF lawsuits, are worried that the public might get the wrong impression from the **National Council on Radiation Protection and Measurements** (NCRP) draft report on EMF health risks (see *MWN,* J/A95). "The recent public controversy of a purported leak of a NCRP-SC-89-3 draft report undermines the trust that the public has in the scientific community," wrote **Angela Dawson**, SDG&E's EMF project manager and Dr. **Jack Sahl**, SCE's manager of health research and evaluation, in an October 6 letter to NCRP's president, Dr. Charles Meinhold. They argued that important policy decisions "may be influenced by a draft report that does not represent the views of the NCRP," and that the integrity of the council and its report had been compromised. The 2 mG limit proposed by the draft appears to be a major concern: Such a standard "has enormous implications for decision-making regarding public health and the cost of society's infrastructure." Dawson and Sahl concluded that, "It is imperative that the NCRP act now to discipline and clarify its process, before utilities and regulators react to opinion of uncertain status and credibility."

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Since the conclusions and recommendations of the **NCRP** report were leaked last summer, many have sought a copy of the complete 800-page report. But few have succeeded. While the whole report is still unobtainable, the appendix on epidemiology—a cornerstone of the EMF–cancer debate—is available, although in a condensed form. Dr. **Richard Stevens**, the author of the appendix, requested and received permission from the NCRP to reprint a version of it in the just-published

Two NAS-NRC Committee Members—Two Views of EMF Health Risks

The next major EMF health report is due to be issued in late April by the National Academy of Sciences-National Research Council (NAS-NRC) (see MWN, *S/O91, M/J93, M/A95 and S/O95). Since last year's leak of the National Council on Radiation Protection and Measurements (NCRP) draft report (see* MWN, *J/A95), the NAS-NRC has carefully guarded its findings.*

Recent documents from Australia, however, provide some indication of the positions of two members of the NAS-NRC study committee, Drs. Richard Luben and Jan Stolwijk.

Luben, of the University of California, Riverside, and the president-elect of the Bioelectromagnetics Society, testified before the Australian Senate Economics References Committee on November 8 (see pp.15-16).

In an April 21, 1995, review of an Australian report by Don Maisch (see p.2), Stolwijk, of the Yale University School of Medicine in New Haven, CT, argued against any EMF–cancer risk. Stolwijk's commentary was presented on behalf of the Electricity Supply Association of Australia Ltd. (ESAA). He is a member of the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP limit for general public exposures is 1 G (see MWN, *M/J89).*

"My feeling, based on what I see in my laboratory, is that 1 G is a level of exposure that I would be uncomfortable with."

"We simply do not have enough information to say that EMF exposures of 10 mG-1 G, even for short times, are safe. It may be that they are safe, and we will all be relieved to find that this is so. On the other hand, the unproven but suggestive status of laboratory and animal science argues that we should not necessarily expose humans to elevated levels until we know more."

—Dr. Richard Luben

"Based on the entire body of this epidemiologic research, I find no scientific basis to conclude that EMF causes or contributes to cancer in either children or adults. I also find no scientific basis to conclude that there would be any demonstrable benefit to public health as a result of power frequency magnetic field standards at field levels below those specified in the existing ICNIRP guidelines."

—Dr. Jan Stolwijk

second edition of CRC Press' ***Handbook of Biological Effects of Electromagnetic Fields***. Stevens, an epidemiologist at the Battelle Pacific Northwest Labs in Richland, WA, concludes his chapter this way: "In spite of continued questions about the biological rationale and plausibility of EMFs harming human health, the suggestive epidemiologic data cannot and should not be dismissed. Even effects which initially seem implausible in the laboratory may prove to be causative, as illustrated by the early difficulties in confirming carcinogenic effects of benzene and inhaled arsenic, known human carcinogens. In the case of EMFs, the possibilities are of more than theoretical interest since the exposures are virtually ubiquitous in industrial societies...."

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The **California EMF Program** has awarded a contract to examine policy issues on possible EMF health effects in public schools and day-care centers (see *MWN,* M/A95). "We hope to offer decision-makers practical guidance to maintain public trust and reach closure," stated **EcoAnalysis** Inc. of Ojai, CA, in its winning proposal. EcoAnalysis will lead a team of consultants who have joined together and are calling themselves the **EMF Resources Group**. They include: Drs. Brock Bernstein and Michael Kelsh of EcoAnalysis; Dr. Edward Faeder of SRF Environmental and Health Management Inc. in Diamond Bar, CA; Laurie Geissinger of Paradigm Planning and Research in Vashon, WA; Dr. William Kaune of EM Factors in Richland, WA; Dr. Antonio Sastre of A.S. Consulting and Research Inc. in Suffern, NY; and Dr. Asher Sheppard of Asher Sheppard Consulting in Redlands, CA. The $695,000 award has angered some members of the Stakeholders Advisory Committee (SAC)—a group that counsels on program decisions—who believe that ties between the utility industry and several of the consultants present a conflict of interest. **Ellen Stern Harris**, executive director of the Fund for the Environment in Beverly Hills, CA, voiced displeasure with EcoAnalysis in particular, noting its strong association with SCE. In addition, Faeder formerly worked at SCE. "Unfortunately, to us, this award engenders a genuine sense of betrayal," Harris told Dr. **Raymond Neutra**, chief of the California EMF Program, based in Emeryville. The complaints have led Neutra to allocate $10,000 to help those SAC members who feel they lack the necessary resources and expertise to detect bias in the course of the project. Proposed changes in the general selection of future research contractors, however, were rejected at a January 18 meeting of the SAC, according to Dr. **Vincent Delpizzo**, the program's research director. He added that proposals will be evaluated with the help of peer reviewers, including SAC nominees, "only on the basis of technical merit and [will] require the winning team members to reveal information that would help others to assess potential conflict of interest or bias." The California EMF Program has awarded a second contract for a study on EMF exposures in schools to a team led by Dr. Luciano Zaffanella and Chris Hooper, both of **Enertech Consultants** in Campbell, CA. While the policy analysis and school exposure studies are not expected to be completed until 1999, the results from a project on design guidelines for building and remodeling schools, led by Brooks Cavin, an architecture professor at California Polytechnic State University, Pomona, will be released later this year. The EcoAnalysis proposal is available for $15.00 from Copy Central, 5801 Christie Ave., Emeryville, CA 94608.

California Utility Wins Dismissal of Office Cancer Lawsuit

A California judge has thrown out a lawsuit brought against Southern California Edison Co. (SCE) by a group of office workers with cancer. The suit, *Johsz v. Koll,* stems from a cluster of 11 cancer cases in a real estate office located directly over a set of SCE transformers. On January 4, the plaintiffs' attorney, Annee Della Donna of the Santa Ana firm of Wylie Aitken, moved for a new trial and a hearing was scheduled for January 30.

In granting summary judgment for SCE on December 8, Superior Court Judge Warren Siegel wrote that he was doing so "because plaintiff cannot show causation." Specifically, Siegel objected that Della Donna's expert witnesses on causation—Dr. Samuel Milham Jr., an epidemiology consultant based in Olympia, WA, and Dr. David Ozonoff of the Boston University School of Public Health—would not be able to present sufficient evidence.

"They have come to an opinion that there's a causal connection between EMFs and certain types of cancer," said Judge Siegel, according to transcripts of a December 5 hearing. "But they haven't, personally, examined any of these people....It's got to be based on personal observation. Where is the personal observation from these experts?" Unless they examined the patients themselves, he contended, they are not qualified to present an expert medical opinion. In his written ruling, the judge retreated from this a bit, but still objected that Milham's and Ozonoff's pretrial declarations:

> do not say EMFs caused plaintiffs' cancers—only that there is a causal association; that based on statistics it 'may' be a cause. Statistics may lend credence to an opinion that EMFs caused plaintiffs' cancers, but there is no expert opinion that it did in this case.

"A physical examination of the patient is not the role of an epidemiologist," Della Donna told *Microwave News* after Siegel had entered his decision. "I think the judge just didn't get it." At the hearing, Della Donna assured Siegel that Milham and Ozonoff had examined "stacks and stacks" of plaintiffs' medical records, but this did not satisfy him.

Oncologists treating the plaintiffs were also on Della Donna's expert witness list, but their pretrial declarations did not discuss causation. And at the hearing, SCE's attorney, Joel Lamp of O'Connor, Cohn, Dillon & Barr in San Francisco, objected that at least one of the oncologists' depositions stated that he had no opinion as to the cause of the cancers. Lamp dismissed Ozonoff as "some public health guy from Boston," not "a treating physician," and therefore not competent to testify as a medical expert.

Judge Siegel's ruling "surprised us all," said Gary Kwasniewski of the law firm of Sedgwick, Detert, Moran & Arnold in Los Angeles, a lawyer for Koll Co., a building management firm that was also named as a defendant in the case. "Being defense lawyers in Southern California, we don't expect judges to rule on causation, because they're too timid," Kwasniewski told *Microwave News*. "But he did." Kwasniewski supported the ruling, arguing that the testimony planned by Milham and Ozonoff was deficient: "None of these expert witnesses had the courage to say directly that EMFs caused the plaintiffs' cancer—with good reason. And the judge picked up on that."

Lamp offered a similar view, contending that Milham and Ozonoff were "hedging" in their pretrial declarations: "I thought they were beating around the bush," he said in an interview. "They never really said what they did to familiarize themselves with these peoples' conditions."

One reason lawyers were surprised by Siegel's decision is that it was not based on the arguments advanced in SCE's briefs. Ironically, the judge rejected the central point raised by the utility but ruled in their favor anyway.

SCE had indeed contended that the plaintiffs could not prove causation—but not because their experts were unfamiliar with the individual patients. An SCE brief had even stated that the important issue was not "testimony that EMFs caused plaintiffs' specific cancers." Instead, the utility said, the key point was "the threshold issue of whether EMFs cause cancer generally." SCE sought to demonstrate that there is a scientific consensus against the idea, and that Milham's and Ozonoff's views stand outside that consensus (see story at right). But Judge Siegel did not accept this argument, and when he ruled in SCE's favor it was for his own reasons.

Johsz v. Koll was filed in March of 1994 (see *MWN,* J/A 94). The plaintiffs, Michael Johsz, James Nichols and Mary Ann Stewart, had been diagnosed with brain cancer, lymphoma and breast cancer, respectively, in 1993. They are among 11 people with cancer who had worked in a real estate office on top of a set of electrical transformers, switching gear and 12 kV distribution circuits.

SCE has measured EMF levels as high as 150 mG in some spots in the office, and a study for the building owner found readings of up to 32 mG four feet above the floor in a work area that was used heavily by the plaintiffs.

In addition to Koll Co., the building owner, the defendants include SCE and the real estate firm, Grubb & Ellis. The trial had been scheduled to begin on January 8.

A related case, *Younkin v. SCE,* involving two other Grubb & Ellis employees who have cancer, was filed later and does not yet have a trial date (see *MWN,* M/J95). According to Della Donna's office, the *Younkin* case—in which a different judge is presiding—is unaffected by the *Johsz* dismissal.

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In the Courtroom, Utilities Claim "Scientific Consensus" That EMFs Do Not Cause Cancer—But Judges Are Unmoved

In two recent lawsuits, utilities have tried to prove the existence of a scientific consensus that EMFs cannot increase the risk of developing cancer. So far they have failed to win judicial support for this view.

In the *Johsz* cancer case in California, this argument was rejected by the presiding judge, though SCE later won the case on other grounds (see story at left). In the *Jordan* lymphoma lawsuit, the "scientific consensus" claim helped Georgia Power Co. and Oglethorpe Power Co. win an initial jury verdict in their favor. But a higher court ruled that claiming a "scientific consensus" was a form of hearsay, and ordered a new trial.

In *Johsz,* SCE sought to prove that "the general consensus of the relevant scientific community is that EMFs do *not* cause cancer" (their emphasis). The utility contended that support for an EMF–cancer link by Drs. Samuel Milham and David Ozonoff, expert witnesses for Johsz, represented a view that was overwhelmingly opposed by their colleagues. "Every single one of the 27 independent reviews conducted to date on the health effects of EMFs...has concluded that the scientific evidence does not show that EMFs cause or promote cancer," stated an SCE brief, citing a sworn statement by Dr. Philip Cole of the School of Public Health at the University of Alabama, Birmingham.

When *Microwave News* asked Cole whether he believed there was a scientific consensus on the health risks of EMFs, Cole said he would not comment.

"The epidemiological evidence on EMFs is stronger and considerably more abundant than it was when asbestos was accepted as a carcinogen in 1949," said Ozonoff, chair of the Department of Environmental Health at Boston University's School of Public Health, in an interview. He acknowledged that EMF health effects are controversial among scientists. "But the reasons for the lack of consensus don't have to do with scientific factors," he contended, citing instead the high social and economic stakes involved.

On the EMF–cancer connection, Ozonoff argued, "The only thing that stands in the way of general acceptance—which is not the same thing as consensus—is for someone to demonstrate a plausible biological mechanism, because everything else is there. And this is not a requirement for the standard methods of epidemiology. In fact, we still don't have a biological mechanism for asbestos."

SCE lawyer Joel Lamp expressed a different view, saying that "it may not be completely unanimous, but the vast majority of the scientific community" does not believe in an EMF–cancer connection. Lamp feels that recent findings have increased support for this view: "I think the three recent occupational cohort studies* are convincing more and more people in the scientific community that EMFs do not cause cancer."

Johsz's attorney, Annee Della Donna, countered: "If you pull out SCE's Sahl study, I think there's pretty strong evidence that EMFs cause cancer." In fact, she maintained, "if you take out the utility-influenced studies and experts, there is a consensus that EMFs do cause cancer....The reviews that SCE calls 'independent' are not independent of the utility companies."†

At a hearing on December 5, the judge rejected the idea that there is a scientific consensus about EMF effects: "On the general question of whether EMFs can cause cancer, I would deny summary judgment, because there certainly appears to be a legitimate issue of fact." He added that, "The two experts, Milham and Ozonoff, certainly have set forth their expertise and [it] certainly appears that they are recognized experts in their field."

Although SCE did not win judicial endorsement of its scientific consensus argument, it won the case—and thus fared better than Georgia Power and Oglethorpe Power in the *Jordan* lawsuit.‡ Those two utilities had a 1994 jury verdict in their favor overturned on November 30 (see *MWN,* N/D95), precisely because they had presented testimony that there was a scientific consensus.

A Georgia appeals court panel found that the lower court "committed reversible error in admitting this 'consensus' testimony," because "an expert witness may not act as a surrogate for a non-testifying expert." The unanimous decision cited a previous Georgia ruling that a trial court must reach its decisions "based on the evidence available to it rather than by simply calculating the consensus in the scientific community," and another stating that "a witness' opinion must be his own and he cannot act as a mere conduit for the opinions of others."

Oglethorpe Power and Georgia Power have petitioned the Georgia Supreme Court to hear an appeal of the reversal of judgment. The attorney for Larry and Nancy Jordan, Bruce DeBoskey of Silver & DeBoskey in Denver, told *Microwave News* he expects the court to rule soon on whether to consider the matter.

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* Dr. Jack Sahl, an SCE employee, and coworkers found no connection between EMF exposures and cancer (see *MWN,* M/A93 and J/A93). Drs. David Savitz and Dana Loomis of the University of North Carolina School of Public Health, Chapel Hill, found a link to brain cancer (see *MWN,* J/F95), and the study by Dr. Gilles Thériault of McGill University in Montreal, Canada, found significant associations between EMFs and both leukemia and lung cancer (see *MWN,* M/A94 and N/D94).

† Della Donna also contended that the existence of a consensus is not the issue in deciding whether scientific testimony will be allowed in court: "Different opinions can both be admissible, as long as they're both based on a generally accepted methodology." Lamp disagreed, arguing, "If there's a split in the scientific community, then you can't bring a suit on that issue in California."

‡ The *Jordan* suit, filed in July 1991, charged that Nancy Jordan's non-Hodgkin's lymphoma was due to EMFs from power lines on an easement next to the Jordans' property. She had lived on the property since 1983, developing breast cancer in 1985 and lymphoma in 1989 (see *MWN,* M/J94 and M/J95).

Pooled Swedish and Danish Data: Greater Childhood Cancer Risks

A combined analysis of the data from two well-publicized Scandinavian epidemiological studies gives new support for the childhood cancer–EMF link, especially for leukemia. The meta-analysis of the Swedish and Danish results, which were both first reported in 1992, indicates a statistically significant fivefold increase in childhood leukemia for exposures of 5 mG or higher. The risk of leukemia, lymphoma and brain tumors together was four times the expected rate for such exposures.

The paper, which appears in the November 1995 issue of the *European Journal of Cancer (31A,* pp.2035-2039), also presents previously unpublished data from both studies. Neither the Swedish team—Drs. Anders Ahlbom and Maria Feychting of the Karolinska Institute in Stockholm (see *MWN,* S/O92)—nor the Danish team, led by Dr. Jørgen Olsen of the Danish Cancer Society in Copenhagen (see *MWN,* N/D92), had analyzed those cases with exposures of 5 mG or higher.

When they did so, the Swedish and Danish researchers found "stronger effects for higher levels of exposure." They are cautious about drawing conclusions about "the shape of any dose–response pattern," however, because even when the two data sets are combined, the number of cases is still small. But, they argue that, "A focus on highly exposed subjects in future studies is warranted," and note that, "Choosing lower cutoff points for the exposure might lead to false negative conclusions."

For exposures of at least 2 mG, the combined analysis shows twice the risk of childhood leukemia as that from exposures below 1 mG. A similar increase was observed for lymphoma, though it was statistically less reliable. No increased risk of brain tumors was identified at 2 mG, but a nonsignificant doubling was found above 5 mG. For the three types of cancer combined, the meta-analysis yields a nonsignificant twofold increase above 2 mG.

The researchers also looked at the impact of cumulative exposures—measured in μT-years or mG-years—but they found that this "did not add much to the understanding of the association between magnetic fields and cancer."

Overall, the scientists are cautious about interpreting their results since "there is no known mechanism by which the magnetic field interacts with biological systems and knowledge is also limited concerning the relevant exposure measure and disease outcomes." They add that exposure to EMFs from high-voltage power lines still appears to have a small impact on public health—only one extra case of childhood leukemia per year in Sweden and Denmark is attributable to 220 kV and 400 kV power lines.

Two years ago, the researchers published similar findings linking EMFs to childhood leukemia based on data from these two studies, along with those from a Finnish study (see *MWN,* N/D93). Unlike the Swedish and Danish case–control studies, the Finnish effort was a cohort study (see *MWN,* S/O93). Because of the similarity of the designs of the Swedish and Danish studies, the researchers argue that they were able to "obtain more stable relative risk estimates" and analyze higher levels of exposure.

Next: Meta-Analysis with Data from Eight European Countries

Having completed their meta-analysis of the Swedish and Danish studies linking power lines to childhood leukemia, Drs. Anders Ahlbom and Maria Feychting will now extend it to include data sets from six additional European countries.

The European Community has awarded Ahlbom and Feychting a three-year contract to fund their new project. The study, which will use data from Denmark, Finland, France, Germany, Italy, Norway, Sweden and the U.K., is due to begin this year.

The Swedes will test three alternative hypotheses proposed to explain the observed association between power lines and leukemia: 1) it is coincidental; 2) it is real, but not due to magnetic fields; and 3) it is due to confounding by pesticides, air pollution and/or other factors.

By combining these data sets, Ahlbom and Feychting hope enough cases of exposure to high magnetic fields will be available to investigate possible causes. In addition, because exposure conditions vary from country to country, they believe they will be able to test different hypotheses.

EMF Concerns Grow in the U.K.

Lawsuits alleging childhood leukemia due to EMFs are proceeding in the U.K. In contrast to such lawsuits in the U.S., these cases are likely to be combined and decided together.

"In Britain, the courts are unlikely to consider this issue seriously more than once, so the individual cases will probably go forward together to get one central judgment," said Martyn Day of Leigh, Day & Co. in London, the plaintiffs' lead attorney. Day will be paid by the government. He added that he does not expect the matter to be decided for some time.

Day has been working on a number of childhood leukemia cases for the past several years. He first won legal aid in 1993 to represent the Studholme family, who claim that EMFs from a nearby power station and their home's electrical wiring caused their son's fatal leukemia (see *MWN,* J/A93 and S/O93). In response to objections from the National Grid Co. and from the local electricity company, Norweb, the Legal Aid Board rescinded funding. Day appealed the decision in early 1995 and the money was recently restored. Day is now preparing to bring three test cases to trial—the Studholme case and two other childhood leukemia cases involving families living close to power lines. (For more on Day's cases, see *MWN,* M/A94.)

Day considers his funding victory important because, after extensive arguments from both sides, the board deemed the case to have merit. Legal aid is awarded to those who can demonstrate both their financial need and that their claims are supportable. "Since that time we had quite a few other cases come forward, which means that we will probably end up with half a dozen good childhood leukemia cases going to trial at the same time," Day told *Microwave News.*

All of this will not happen quickly, which Day believes to be to his advantage: "It may well take two or three years be-

fore the case finally comes to trial, which means that we will be incorporating the U.S., British and Canadian studies that should be out in the next couple of years."

Day has extensive litigation experience in cases involving tobacco, nuclear power and water pollution. In a profile in the November 22 *Financial Times,* he was described as bringing "fear to British boardrooms by pioneering American-style aggressive litigation." But unlike his U.S. counterparts, according to the *Financial Times,* Day finances all of his cases with state-provided legal aid, and he cannot receive any of the compensation won by his clients.

While the EMF issue has developed considerably more slowly in the U.K. than in the U.S., the British are now becoming increasingly aware of the debate over the potential health effects of EMFs. According to recent news stories:

• Major lenders are denying mortgages for homes near power lines, reported the December 2 London *Times.* Some surveyors will not even estimate the value of houses under power lines, according to the September 25 *Daily Mail* and other papers.

• In northern England, the National Grid faces a "well-organized protest campaign" against a planned 35-mile-long power line, stated the December 31 *Sunday Telegraph.* "Eighty-six of the 121 farmers whose land would be crossed have so far refused to grant wayleaves or permanent easements, despite compensation offers of £20,000 per pylon," the paper noted. "It's not like Yorkshire farmers to refuse that sort of money without good reason," said John Greenway, a local member of Parliament. (£20,000 is approximately $30,000 U.S.)

• Citizens are fighting other utility company bids to build new power lines or are asking for hefty compensation. In Surrey, south of London, "The Grid had offered a not inconsiderable £6,000 to [a] farmer for the wayleave. He rejected it as too little," the December 10 *Sunday Times* said. "If pylons and power lines were found to be a health hazard, it could prove expensive for the Grid," the paper added.

• Parents are asking for an inquiry into eight cases of leukemia among children and adults living near the Euston-Scotland rail lines, according to the December 3 *Sunday Express.* "Campaigners blame electromagnetic fields, believed to cause cancer, from 25,000-volt overhead power lines."

EPA Shelves Revised EMF–Cancer Report *(continued from p.1)*

became public. McGaughy cautioned that he could not predict what the report, if and when completed, would finally conclude, but stated, "I personally think that the evidence is stronger today."

Dr. Doreen Hill, a senior scientist at Energetics, a consulting firm in Columbia, MD, and the author of the epidemiology chapter of the EPA report, agreed with McGaughy that the evidence for a cancer risk has increased. "All the Scandinavian studies were published after 1990," she said, referring to both childhood and occupational cancer studies. Before joining Energetics in 1992, Hill worked at the EPA. She is continuing to work on the document.

An earlier draft of the EPA report, obtained by *Microwave News* in 1994, concluded that the EMF–cancer link "is a real association that cannot be explained by improper epidemiologic methodology" (see *MWN,* S/O94).

Since then, the report has undergone a number of reviews, the most recent being three by epidemiologists: Dr. Scott Davis of the Fred Hutchinson Cancer Research Center in Seattle, Dr. Linda Erdreich of Bailey Research Associates in New York City and Dr. Leeka Kheifets of the Electric Power Research Institute in Palo Alto, CA. Both McGaughy and Hill told *Microwave News* that the three "fundamentally agreed," as McGaughy put it, with the EPA position.

The revised report had been scheduled for another review—this time by other federal agencies—during the winter of 1995-96. Then, once updated, the report would have been made publicly available. After a 90-day comment period, the cancer assessment was to be reviewed by EPA's SAB.

Dr. Genevieve Matanoski, the chair of the original SAB review panel and now the chair of the SAB's Executive Committee, said that she was disappointed that the SAB would not be asked to review the cancer document. "The EMF issue is not going to go away and the EPA should say something. The EPA must make some kind of statement, even if it can't decide, because this is the agency that the public looks to for advice," she told *Microwave News.* Matanoski is at the Johns Hopkins University public health school in Baltimore.

McGaughy concurred: "It's a little disappointing for me personally. I definitely want to get it out one way or another, as does Bill Farland." Farland, the director of EPA's OHEA, declined to be interviewed.

In an October 25 internal memorandum, EPA officials disclosed that the agency would "suspend" the planned review by the SAB at least until after September 1996. This memo attributed the delay to the planned release of two other reviews—by the NCRP and by the NAS-NRC (see p.3)—and to "uncertainties about the agency's 1996 operating budget."

"One of the original purposes for preparing the EPA document was to provide an interim analysis of available information for EPA use," according to the memo. "Release of the NAS and NCRP [reports] will supersede the need for an interim EPA report," it continued.

McGaughy also attributed the delay to a recent Senate report, which advised that, "The committee believes the EPA should not engage in EMF activities" (see *MWN,* S/O95). Some observers think this language refers to all EMF work, while others see it as meaning only that the EPA should leave the ongoing RAPID EMF research program to the National Institute of Environmental Health Sciences and the Department of Energy.

The EPA has also been under pressure to abandon the cancer report by the National Electrical Manufacturers Association (NEMA) in Washington. Douglas Bannerman, NEMA's environmental consultant, has said that, "We should not have individual agencies popping up and giving their own risk assessments" (see *MWN,* M/A95). Bannerman told *Microwave News* that he would have no objection if the cancer report were to be released through the RAPID program.

associated with the observed excess of brain cancer."

Dr. Leeka Kheifets, the new head of EPRI's EMF research program (see p.2), and her colleagues explained in the paper that there are three possible interpretations of "the body of epidemiologic evidence": (1) There is no connection between occupational EMF exposures and cancer; (2) There is a small effect across a broad population; (3) There is a strong effect on a small number of people. They concluded:

> We believe that this meta-analysis provides some evidence against the hypothesis of no association between occupational exposure to EMF[s] and the risk of cancer, provides some evidence to support the hypothesis of a small pervasive effect, and provides no clues that could help to identify a circumstance...[supporting] the third hypothesis.

Meta-analysis is a statistical technique for combining the results of several studies, taking differences in survey size and design into account. "Studies assessed to be of better quality produced lower risk estimates," reported Kheifets and coworkers. On the other hand, "when specific brain cancer subtypes were examined, i.e., gliomas, the risk increased." They also examined possible biases in the different studies, and determined that when the results were pooled the effects of these biases tended to cancel one another out.

When results were combined from the six studies that reported risks by exposure level, an exposure–response pattern did in fact emerge. But only three of the six had based their exposure categories on measured field levels, and when these three were examined alone, "no clear exposure–response pattern was present."

Their paper also noted that:

> Although there are clear differences in the levels of exposures among specific jobs, higher exposures did not correspond to higher risks. This is probably because imprecision in the exposure assessment has undoubtedly led to a large exposure misclassification, which most likely would underestimate the risk.

The findings appeared in the December issue of the *Journal of Occupational and Environmental Medicine,* in the paper by Kheifets, Dr. Abdelmonem Afifi of the School of Public Health at the University of California, Los Angeles (UCLA), Dr. Patricia Buffler of UC Berkeley and Zhong Zhang of the UCLA School of Public Health. Both Afifi and Buffler have served on EPRI's Scientific Advisory Board on EMFs.

"They found about a 20% increase in the risk for brain cancer for so-called electrical occupations," Dr. Stanley Sussman, director of EPRI's Environment Group, said in an interview. But Sussman underlined the lack of a clear dose–response relationship, explaining, "While not conclusive, that argues that EMFs may not actually be the cause of the observed increase in risk. That's perhaps just as important a conclusion." Sussman is the former head of EPRI's EMF research effort (see p.2).

Asked whether there were any policy implications from the meta-analysis, Sussman replied, "In general, we don't comment on policy applications. We are a research organization. Our job is to do high-quality research and analysis, and it's for others to...come to whatever conclusions are appropriate."

The *Washington Post* ran a story on Kheifets's paper on December 22 headlined "Electrical Workers at Greater Risk for Brain Cancer, Study Says." But Madalyn Cafruny of the American Public Power Association in Washington had a different assessment, telling *Microwave News,* "It was another confusing study with confusing results."

Richard Loughery, EMF issues manager at the Washington-based Edison Electric Institute, said in an interview, "I don't think it was that conclusive. It's just another piece we need to add to the body of evidence. Even though they found an association, it's still fairly low." As to whether the meta-analysis might prompt consideration of "prudent avoidance" of EMF exposures in the workplace, Loughery said, "The results aren't strong enough to warrant that kind of response."

The conclusions of the meta-analysis, submitted for publication on March 6, 1995, represent a major shift for Buffler, the dean of UC Berkeley's School of Public Health. For example, when Buffler was interviewed on EMFs for the November 1994 *UC Berkeley Wellness Letter,* she said:

> Early research did raise legitimate concerns about the health effects of [EMFs]. Since then, most studies have found no association, but there are occasional chance findings—blips—that keep the issue on the table.

The vast majority of the studies examined in the EPRI meta-analysis showed a positive association between EMFs and brain cancer.

Buffler appeared in the June 1995 *Frontline* television report on EMFs, in a segment discussing three recent large occupational studies (see *MWN,* J/A95 and footnote on p.5). The program introduced Buffler as one of "many epidemiologists" who think that inconsistency among the three studies and their low risk ratios "raise serious questions as to whether there is in fact a real risk, or whether all the studies are picking up is statistical noise."

In the past, Buffler has also criticized the concept of prudent avoidance—the idea that, since EMFs may pose a health hazard, it is worth taking low-cost measures to reduce exposure: "Such advice would be in conflict with the scientific evidence, since we don't know that there is anything there to avoid" (see *MWN,* J/F95).

When asked by *Microwave News* whether she stood by such previous remarks, Buffler declined to comment.

Kheifets also declined to be interviewed, but responded to questions about the study in writing and through EPRI spokesperson Barbara Klein. On the future direction of EPRI's research in this area, Kheifets told *Microwave News,* "I believe we currently do not have strong leads to initiate new major occupational EMF studies." But she wrote that there is more that can be done to understand the existing body of evidence, noting that, "Dr. Savitz continues to analyze and add information to his database to clarify his findings." Kheifets also wrote that she would lead an effort "to investigate the reasons for the differences in risk estimates between the three recent utility worker studies." A potential obstacle to this work is the fact that Hydro-Québec has blocked researchers' access to the data from Thériault's occupational study (see *MWN,* N/D94). According to Klein, Kheifets "is still working with the Canadian utilities to finalize their participation in the project."

Recent Reports from the Electric Power Research Institute (EPRI)

L. Anderson, L. Sasser and J. Morris, ***Large Granular Lymphocytic (LGL) Leukemia in Rats Exposed to 60 Hz Magnetic Fields: Preliminary Studies and Protocol*** (TR-104577), December 1994, 74 pp. Price: $200.00. Concludes that LGL leukemia in rats serves as an accurate model for evaluating the progression of the disease. The researchers, all of Battelle Pacific Northwest Labs in Richland, WA, developed a protocol to test the effects of intermittent 60 Hz EMFs on late-stage cancer in rats with LGL leukemia.

Robert S. Banks Associates, ***Proceedings: Health Implications of EMF Neural Effects Workshop*** (TR-104327), August 1994, 54 pp. Price: $200.00. The proceedings of EPRI's May 17-21, 1992, workshop in Asilomar, CA. The participants—all experts in neurobiology or EMF health effects—split up into groups to evaluate the neurological effects of EMFs on cells and molecules, tissues and organs, the whole organism and populations. Each group offered recommendations for future research. Several speakers also reviewed current knowledge on the subject.

T.D. Bracken et al., ***The EMDEX Project: Residential Study, Vol.1: Summary, Vol.2: Project Description and Results*** and ***Vol.3: Appendices*** (TR-104325-V1-3), December 1994, 64 pp., 256 pp. and 228 pp., respectively. Price (for the set): $200.00. Documents EPRI's 26-month geographic survey of wire-code configurations and EMF measurements in 396 residences, led by Dr. Dan Bracken, a consultant in Portland, OR. High EMF levels were found in houses with very-high-current wire-code configurations. However, the distribution of EMF measurements overlapped considerably among different wire-code categories, making these configurations poor indicators of EMFs. The decade in which each home was constructed was the only variable that could be linked to wire codes.

EPRI, ***Electric and Magnetic Fields Research Abstracts: 1994 Annual Report*** (TR-105863), October 1995, 88 pp. Price: $200.00. Contains 44 abstracts of ongoing EPRI-sponsored studies. Topics include: epidemiological and laboratory studies; exposure assessment; magnetic field mitigation; and risk management.

EPRI, ***The 1995 Research, Development, and Delivery Plan*** (CI-104571), March 1995, 126 pp. Price: $60.00. This guide describes the institute's new structure, summarizes the 1995 funding plan and outlines EPRI's research program for 1996. ***Highlights '95*** (BR-103740-R1) is a free six-page overview of EPRI's 1995 program and funding allocations.

J. Ferguson and K. King, ***Magnetic Field Management for Overhead Transmission Lines: Potential Options for Low Field Designs*** (TR-104413), September 1995, 137 pp. Price: $200.00. Provides utility engineers with background information on the magnetic field levels associated with specific transmission line designs. Techniques for reducing magnetic field levels from 115-500 kV lines are described and evaluated. Ferguson is with Sverdrup Corp. in Haslet, TX, and King is with GE in Lenox, MA.

C. Graham, M. Cook and H. Cohen, ***Investigation of the Effects of Magnetic Field Exposure on Human Melatonin*** (TR-104278), August 1994, 92 pp. Price: $25.00. Dr. Charles Graham and coworkers at the Midwest Research Institute in Kansas City, MO, ran the first nighttime double-blind investigation of melatonin levels in men exposed to 60 Hz fields of 10 mG and 200 mG. Overall, no significant differences were found in their melatonin levels. However, there was some evidence that EMF exposure at night might suppress melatonin in men who already have low levels of the hormone. Those exposed to the fields made more errors on a perception test than did those exposed to sham fields. (In a follow-up study, presented at last November's DOE meeting in Palm Springs, CA, Graham reported that he was unable to repeat this finding.)

G. Johnson, J. Guttman and L. Zaffanella, ***Survey Measurements and Experimental Studies of Residential Transient Magnetic Fields*** (TR-104532), December 1994, 208 pp. Price: $200.00. A pilot study evaluating the transients in 21 Northern California homes. The researchers, of Enertech Consultants in Campbell, CA, and the High Voltage Transmission Research Center in Lenox, MA, found that hundreds to thousands of transient currents occurred in each home on a given day. Homes with the Wertheimer-Leeper very-high-current configuration experienced more transients from outside sources than did homes with other wire-code configurations (see *MWN,* S/O95).

P. Keng et al., ***Electric and Magnetic Fields and Tumor Progression*** (TR-104799), December 1994, 40 pp. Price: $200.00. A University of Rochester, NY, study of the bioeffects of 60 Hz EMFs on melatonin in rats and on human colon cancer cells. The study did not confirm earlier reports that EMFs suppress nighttime levels of melatonin in rats and promote the ability of cancer cells to form colonies.

J. Peters et al., ***Exposure to Residential Electric and Magnetic Fields and Risk of Childhood Leukemia*** (TR-104528), June 1995, 108 pp. Price: $200.00. This study evaluated alternative explanations for the link between childhood leukemia and specific wire-code configurations observed in Peters's epidemiological study (see *MWN,* J/F91, M/A91 and S/O91). The researchers, of the University of Southern California in Los Angeles, found a weak, but statistically significant, link between leukemia and wire-code configurations for 232 children living in Los Angeles. They interviewed the parents, took EMF spot measurements inside and outside homes and made 24- and 72-hour measurements in the children's sleeping areas. Leukemia risk was not linked to measured fields. The team created a model with which they could more accurately predict the field levels than by using wire codes, but this model was not linked to leukemia risk, either. Finally, the researchers found no bias in the data due to dietary factors, traffic density or socioeconomic status. "We conclude that the association between leukemia risk and wire codes is not due to confounding by non-EMF-related factors or to selection bias and may reflect a causal effect of [EMFs]," they reported.

R. Rankin and T.D. Bracken, ***Association of Wire-Code Configuration with Long-Term Average 60 Hz Magnetic Fields and Exposure, Vol.1: Summary*** and ***Vol.2: Appendices*** (TR-104656-V1-2), December 1994, 68 pp. and 292 pp., respectively. Price (for both): $200.00. A progress report on a planned study of the association between cancer and wire codes in more than 200 geographically diverse U.S. households. A sampling plan, a method of selecting residents and measurement procedures are included. Over the two-year data collection period, EMFs will be measured inside and outside the houses to determine if the configuration of utility lines is tied to EMF exposure.

P. Valberg, ***Biology and Electric and Magnetic Fields: Biophysical Mechanisms of Interaction*** (TR-104800), December 1994, 50 pp. Price: $200.00. Dr. Valberg, of Gradient Corp. in Cambridge, MA, evaluated biophysical processes that have been suggested to explain EMF health effects. "None of the mechanisms reviewed was found to be free of significant problems," he concluded.

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Motorola Backs Replication of Study on Brain Tumor Cells

Motorola's radiofrequency and microwave (RF/MW) radiation bioeffects research program will examine whether RF/MW radiation accelerates the growth of human brain tumor cells. The cellular phone company has signed a contract with Dr. Shirley Motzkin, a professor of biology at Polytechnic University in Brooklyn, NY, under which she will try to repeat the findings of Dr. Stephen Cleary of Virginia Commonwealth University (VCU) in Richmond.

In 1990, Cleary published a now well-known study showing that human brain tumor cells continued to grow abnormally even five days after a two-hour exposure to microwaves (see *MWN,* M/A90). Cleary saw effects at specific absorption rates (SARs) as low as 5 W/Kg.

"We are going to replicate Cleary's work showing the proliferation of glioma cells at 27 MHz and 2450 MHz," Motzkin told *Microwave News*. She said that exposures will begin soon.

Motzkin has been an active member of the microwave bioeffects research community at Polytechnic for many years, previously collaborating with Leo Birenbaum and the late Saul Rosenthal. Their work focused on the effects of millimeter waves on bacteria and membranes. More recently, Motzkin researched the impact of microwaves on excitable tissue—for instance, neuromuscular systems—for the U.S. Air Force.

Cleary's work received a great deal of attention when concern over the possible link between cellular phones and brain tumors hit the newspapers in early 1993. The Cellular Telecommunications Industry Association (CTIA) has challenged the relevance of Cleary's findings because he had used a different frequency, intensity and modulation than those associated with cellular phones. A March 1994 briefing package from the CTIA included the following question and answer:

> *Q*. Have any studies shown—directly or indirectly—that cellular phones could be harmful?
> *A*. No. The work of Dr. Stephen Cleary at the Medical College of Virginia [VCU] has been cited by some as a basis for suspicion. Dr. Cleary found cancer proliferation in cells exposed to radiowaves in petri dishes. However, those experiments were conducted at a different frequency and at power levels well in excess of those used by cellular phones. No such effects have been observed in experiments performed at frequencies and power levels typical of cellular telephones....

In fact, Cleary's work has yet to be repeated at cellular phone frequencies or at lower power levels. Although Cleary has met with representatives of CTIA's Wireless Technology Research (WTR), including its chair, Dr. George Carlo, a number of times over the last few years, WTR, which is based in Washington, has declined to support work in Cleary's laboratory.

"Carlo told me that WTR could not determine where our research would fit into his program," Cleary told *Microwave News*.

In an interview, Dr. Mays Swicord, Motorola's director of biological research, said, "Cleary's work is an issue that has come to the public's attention and needs to be addressed."

In addition to sponsoring Motzkin's replication effort, Motorola is also sponsoring tumor cell proliferation studies in Dr. Ross Adey's lab at the VA Hospital in Loma Linda, CA. At the Bioelectromagnetics Society's annual meeting last June in Boston, Dr. Robert Stagg, a member of Adey's research group, reported that he could not see any RF/MW-induced proliferation in rat glioma cells. Stagg used 836 MHz radiation—in the cellular phone frequency band—at SARs of 0.21-21 mW/Kg, levels considerably lower than that used by Cleary and hundreds of times less than that associated with a typical cellular phone.

"This was not a replication of Cleary's work, but an exploration in the same area," Stagg noted in an interview. He said that his results have been submitted for publication.

Other New Motorola Studies

In addition to sponsoring brain tumor proliferation studies, Motorola has expanded its RF/MW research program to include two other projects (see also *MWN,* J/A95):

• An animal cancer study of exposures to the Iridium signal, Motorola's global satellite communications system. The principal investigator is Dr. Michael Dauphinée of the Goodwin Institute for Cancer Research in Plantation, FL.

• A study of the possible effects of the GSM digital signal on the hormone levels of humans. Dr. René de Seze of the Centre Hospitalier Universitaire in Nimes, France, is leading this effort.

Motorola expects both studies to be completed in 1996.

WTR Plans To Use Comet Assay for Study on Blood Cells

Now that WTR, CTIA's research arm, has accepted the comet assay as an effective method for measuring DNA damage in RF/MW studies (see *MWN,* N/D95), it has begun to decide how to make use of this tool.

Representatives of WTR met with researchers from three different labs in Miami on December 13 to plan a set of coordinated studies using the technique—also known as the single cell gel (SCG) assay. "They met to determine the direction of WTR's research in the SCG area," said WTR spokesperson Mike Volpe.

Present at the Miami meeting were Drs. Henry Lai and N.P. Singh of the University of Washington, Seattle; Dr. Ray Tice of Integrated Laboratory Systems in Research Triangle Park, NC; and Dr. Luc Verschaeve of VITO, the Flemish Technological Research Institute, in Brussels, Belgium. Among those attending for WTR were its attorney James Baller of Baller Hammett in Washington; WTR member Dr. Bill Guy; Dr. Graham Hook of CanTox in Mississauga, Canada; and Dr. Don McRee, WTR's director of extramural research.

"We want to see whether exposures at certain wavelengths affect DNA in human cells exposed *in vitro,"* Tice said in an interview. "We met to get some agreement on what protocol we're going to use." He explained that the three teams would expose human lymphocytes (white blood cells) to continuous-

wave 837 MHz microwaves. In addition to the comet assay, researchers will also use the micronucleus assay, an alternative method of assessing genotoxicity. All experiments will be conducted at one central exposure facility, the site for which has not yet been selected.

Some observers have criticized the use of a single exposure system as expensive and unproductive (see *MWN,* S/O95), but Tice thinks it is the logical choice: "There are some technical difficulties in carting the biology to a different lab, but that may well be less than the technical difficulties involved in setting up different exposure facilities. The biology is only as good as the dosimetry."

"It is a little inconvenient," Lai told *Microwave News,* "but there is no better way to do it since it is difficult to set up exactly the same exposure system in different labs." But he raised a potential problem with the plan: "With a central facility, people will question whether it is a truly independent replication, even though three different labs run the same experiment." Lai suggested that one alternative might be "to circulate the exposure system among the labs involved."

Singh, who together with Lai has done *in vivo* studies of the effects of RF/MW exposure on DNA in the brains of rats (see *MWN,* N/D94), described the choice of human lymphocytes as "a good starting point," but noted that "the lymphocyte system is far away from brain cells, which are the main target of investigation for cellular phone studies."

Volpe described Dr. Ian Munro, director of CanTox, as the WTR member with principal responsibility for bioeffects research. But Munro and other CanTox officials would not discuss the planned experiments. Volpe himself declined to comment on when the exposure facility would be chosen, when the experiments might begin or even which researchers had attended the Miami meeting. "WTR policy," he said, "is not to comment on things that are still being negotiated."

"The agreements haven't been signed yet," noted Tice, explaining that the final budgets depend on both the location of the central exposure facility and specifics of the experimental protocol. Both Tice and Lai said that before the actual experiments begin, researchers from all three labs will have to do some test runs to ensure that equipment and procedures are

« Cellular Phone Notes »

Scientists engaged in **Motorola**-sponsored studies of RF/MW bioeffects met with company officials January 28-30 in Plantation, FL, to discuss the status of their work. Attending were research teams from the ten projects that Motorola has announced so far (see p.10 and *MWN,* J/A95), plus Dr. **Quirino Balzano**, a corporate vice president, Dr. **Asher Sheppard**, a Motorola consultant based in Redlands, CA, Dr. **Mays Swicord**, director of Motorola's biological research, and other executives. "We discussed how to make sure that we use the best methods to achieve scientifically valid results," Balzano told *Microwave News.*

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WTR sees no reason to keep cellular antennas away from schools—in contrast to the **California Public Utility Commission's** (CPUC) November 1995 recommendation to avoid such locations (see *MWN,* N/D95). A recent WTR report states that, "There is no reason to exclude schools and similar areas as potential base station sites. Base stations have been successfully located on school properties with the support of the school and community." It also quotes one expert as saying that exposure from towers is "almost a non-issue" in terms of safety standards. The report, titled *Federal Focus National Symposium on Wireless Transmission Base Station Facilities: A Tutorial,* summarizes the findings of a meeting sponsored by WTR and organized by **Federal Focus** Inc., a nonprofit group that arranges conferences on policy issues. The participants at the October 28, 1994, meeting held at the University of Pennsylvania, Philadelphia, are not named in the report, but included government officials, RF consultants and land use and bioeffects experts. "We never give their names," Dr. **Jim Tozzi**, chairman of the Washington-based Federal Focus, said in an interview. He explained that the group does not want to imply that the conclusions are the official positions of the government representatives who were in attendance. Those at the meeting concluded that negative health consequences of athermal exposure to RF/MW radiation are believed only by "a minority of scientists" and that most of the studies that claimed to have shown such results "have nothing to do with health effects." Concerns about EMI affecting medical devices, the report states, are "expected to arise, if at all, only when a base station is mounted on the hospital roof." (The CPUC also advised against putting the antennas near hospitals.) While the conference participants acknowledged that RF/MW radiation can interfere with medical devices—noting that many hospitals have restricted cellular phone use—they dismissed the towers as a threat, since they "do not appear to pose any significant problems to powered wheel chairs or electronic medical devices."

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Call it **Motorola** style. "We have created...a new wearable product category we believe consumers will embrace enthusiastically," the giant company proudly announced in early January. Motorola's new StarTAC phone weighs as little as three ounces and is roughly the size of a pager. It's "the world's smallest and lightest cellular phone available today," the company said. But Motorola isn't just targeting business executives who want a convenient means of staying in touch. The company hopes the new phone will become an essential item for those who always want to look their best: "When folded, the StarTAC phone is so small and light it can be worn fashionably as an accessory." The phone complies with all relevant health standards, according to Motorola spokesperson Norman Sandler.

working properly. The researchers hope to compare notes on this at the Environmental Mutagen Society meeting in Victoria, Canada, in late March, according to Tice.

Volpe confirmed that WTR's *in vivo* research will begin only after WTR had completed development of an *in vivo* exposure system. "We'll be making an announcement on that in due time," he said.

Shortwave Transmitter Disturbs Sleep of Swiss Villagers

Families living near a Swiss shortwave transmitter have a higher rate of neurological complaints than those residing farther away, according to a recent report. Sleep disturbances were found to be directly associated with the strength of the transmitter, and there was a suggestion that children in a local school had more trouble learning than those in other areas.

"There is no immediate danger to the population living in the surroundings of the transmitter, and there is no reason for urgent protection measures," concluded the researchers, led by Dr. Theodor Abelin of the Department of Social and Preventative Medicine at the University of Bern in Switzerland. "On the other hand, it was clearly demonstrated that the transmitter is associated with a marked deterioration of the sleep quality of the most exposed group of persons," they added.

Since the 1970s, residents near the Schwarzenburg shortwave transmitter, 20 km (12.4 miles) south of Bern, have reported health complaints. In the early 1990s, the Swiss government commissioned a survey in which 215 people in the area kept a diary of how they felt for an average of 25 days. Those living close to the station had more subjective health complaints—problems sleeping, headaches, tiredness, irritability, lower-back ache and limb pain—than those living over 4 km away (see *MWN,* N/D93).

Follow-up studies were then conducted to identify the causes of the ailments. Based on new diaries kept by 102 villagers, a statistically significant improvement in sleep quality was observed one day after the transmitter was shut down. However, Abelin's team found no plausible mechanism to explain this. Melatonin levels in humans and in cows were not associated with radiation levels.

No excess risk of chronic illnesses, such as diabetes or cancer, was found among the population, nor was high blood pressure linked to exposure levels. But the researchers cautioned that the population in the area is too small to rule out a slight increase in risk for some chronic ailments.

The team found that fewer schoolchildren in the area were promoted from primary to secondary schools, as compared to children in a control school. However, they could not eliminate the possibility that socioeconomic differences were responsible for this discrepancy.

They concluded that a major international study would be required to investigate further any health risks associated with shortwave transmitters. The report, *Study on Health Effects of the Shortwave Transmitter Station of Schwarzenburg, Bern, Switzerland* (No.55, August 1995), was published by the Swiss Federal Office of Energy.

Three 6.1-21.8 MHz antennas with powers of 150 kW operate simultaneously at the shortwave complex. The villagers who lived within 900 meters of the station were exposed to an average of 1.4 $\mu W/cm^2$, with a minimum and maximum of 21 nW/cm^2 and 164 $\mu W/cm^2$, respectively. Those living more than 900 meters from, but within 1.5 km of, the antennas were exposed to 54 nW/cm^2 (4.9-300 nW/cm^2), and those who lived more than 4 km away were exposed to 0.54 nW/cm^2 (0.4-0.8 nW/cm^2).

The EMF levels at the measurement sites did not exceed the limits recommended by the ICNIRP. Nevertheless, the researchers suggested that, "In view of the observation of a relationship between the transmitter and sleep quality by this study, the question arises as to whether the present guidelines for acceptable magnetic field strengths should not be adapted."

Police Radar Lawsuits Face Dim Future After Dismissals

Four more lawsuits seeking to link cancer to the use of police radar have been dismissed, in Illinois, Mississippi, Ohio and Texas. Three of the dismissals were requested by plaintiffs' lawyers, who are increasingly pessimistic about winning this type of litigation.

"It appeared to us that the state of scientific knowledge was just not developed to the point where you can legally show causation," explained Larry Spencer of the firm of King & Spencer in Jackson, MS. Spencer represented Hilda Wheeler, the widow of a Mississippi highway patrol officer who died of a brain tumor in 1992. On December 4, Spencer asked the U.S. District Court in Jackson to dismiss the lawsuit.

Kustom Signals, a leading police radar manufacturer and a defendant in all four cases, noted in a statement that it has now won 22 victories, made no settlements and paid nothing in damages (see also *MWN,* J/F93 and S/O93). "We have always stood behind the safety and integrity of our products," affirmed company president John Kusek.

"The general trend in police radar cases is pessimistic for the plaintiffs," Kustom's attorney, Mark Oium of O'Connor, Cohn, Dillon & Barr in San Francisco, told *Microwave News.* "And it costs a lot to mount these cases. Once the plaintiffs see how much they have to spend and how thin their evidence is, they generally drop the suit."

Is police radar litigation coming to a close? "I don't see how anyone could conclude otherwise, given all of the dismissals," Spencer said in an interview. "I don't know any attorneys who are still willing to take on this kind of case—which is unfortunate, because I believe that one day causation will be sufficiently established. And I think that will turn out to be a very horrible set of facts for all these police officers, comparable to thalidomide."

Other plaintiffs' attorneys were reluctant to even talk about their cases. Michael Cassity of Mt. Orab, OH, attorney for the widow of Ohio State Patrol Officer Wayne Vessels Jr., in *Vessels v. Kustom,* did not respond to repeated phone calls. On January 11 in Cincinnati, U.S. District Court Judge Arthur Spiegel granted Cassity's request for a dismissal of the case. Wayne

Suit Says WTR's Epidemiological Study Is Illegal "Human Testing"

The cellular phone industry is conducting human testing on the health effects of mobile phones "without the knowledge and consent" of those being studied, according to a class action lawsuit filed in Chicago on October 26. Named as defendants are Ameritech Mobile Communications; the Cellular Telecommunications Industry Association (CTIA), including Ron Nessen, vice president for public affairs and communications, and Thomas Wheeler, president; Epidemiology Resources Inc.; Motorola; and Wireless Technology Research (WTR), including Dr. George Carlo, chair.

The case was filed in Cook County Circuit Court on behalf of Jerald Busse and other cellular phone users by Ben Barnow of the Chicago firm of Barnow & Hefty. Busse purchased a hand-held Motorola phone in December 1993, with transmission service from Ameritech. Barnow said in an interview that on January 26 a federal judge rejected a defense petition to take the matter out of the hands of the Illinois courts.

"Industry researchers have acknowledged that they cannot say for certain" that cellular phones pose no health hazards, the suit charges. In fact, it continues, the defendants "have engaged some 3,000,000 users...in a research study to determine the detrimental effects of electromagnetic radiation from cellular portable telephones." This has allegedly been done by compiling a database of "personal information," which users had provided only for billing purposes.

In the complaint, Barnow contends that:

> these defendants, along with other industry members, have put the means of the test...into the consumers' hands without informing them of the lack of proven safety of the cellular portable telephones, and have failed to advise the consumers that they would be part of a test to see if they get health maladies such as brain tumors.

"I would love to be able to respond, but since it's under litigation I'll have to go with the proverbial 'no comment,'" said Dr. Nancy Dreyer, president and CEO of Epidemiology Resources, in an interview. Epidemiology Resources has a contract with WTR, the research arm of the CTIA, to conduct large-scale studies of the health of cellular phone users (see *MWN,* J/F94 and S/O95). Ameritech and the CTIA also declined to comment.

"WTR believes that this attack on science and the scientific community is baseless, irresponsible, and counterproductive," declared a statement from WTR attorney James Baller of Baller Hammett in Washington. "The public wants and needs prompt answers to its questions about the health effects of cellular telephones. If allowed to succeed, this wasteful lawsuit would at best delay the search for truth, possibly for years....A slow or weakened scientific process would benefit only those who would prefer to appeal to the emotions of juries without being encumbered by objective scientific facts."

Motorola is "not directly involved in the epi studies," company spokesperson Norman Sandler told *Microwave News,* but "our position is that we've done the responsible thing by supporting research." Sandler added that, "We believe that this research will confirm that there is a sound scientific basis for confidence in the safety of these products."

Vessels died of basal and squamous cell carcinoma in December 1992 (see *MWN,* J/F95).

Also refusing to return calls requesting comment was John Tavormina of the Houston law firm of Helm, Pletcher, Bowen & Saunders. Tavormina was the plaintiff's lawyer in *Giraldo v. Kustom,* which was withdrawn from state District Court in Harris County, TX, on December 15. The suit was filed in June 1994 by a Houston police officer who had developed testicular cancer. Oium noted that the withdrawal came in the wake of similar action by famed attorney Joe Jamail in a major EMF–childhood cancer case in Harris County, which has historically been considered a favorable jurisdiction for plaintiffs (see *MWN,* S/O95). Oium said that, "We had some speculation" that both withdrawals were due to a recent Texas Supreme Court ruling "that pretty much adopted the federal *Daubert* rule in the state of Texas," imposing stricter standards for the introduction of scientific evidence.

The one case that was not voluntarily dismissed, *Blesy v. Kustom,* involves a different set of legal issues and will be appealed. This class action suit aims to force radar manufacturers to establish a medical monitoring fund, and the plaintiffs' attorneys feel that they will prevail in the end. "We recognized at the beginning that we had an uphill battle, and we're continuing with the case," said Norman Rifkind of Biegel, Schy, Lasky, Rifkind, Goldberg & Fertik in Chicago. The suit was dismissed from Cook County Circuit Court on November 14.

Although the six officers specifically named as plaintiffs in *Blesy* all suffer from cancer, the suit does not seek to prove that police radar was the cause. In 1994, Rifkind explained that the officers had decided to sue for medical monitoring rather than personal injury damages because "no one so far has been able to make these allegations stick" (see *MWN,* M/J94 and M/A95). But it was precisely the failure to prove an actual injury that Judge Margaret McBride cited when she threw the case out of court:

> While it is conceivable under certain circumstances [that] an Illinois court would recognize a heightened risk of contracting a disease as a present injury, this court does not believe a sufficient risk exists in the case at hand....Cases allowing medical monitoring damages usually involve long-term exposure to highly toxic substances where the risk of contracting serious illness is great....The requirement of a present injury is a traditionally sound method of disallowing what could be called speculative claims.

According to a hearing transcript, McBride expressed concern that if the complaint was allowed to go forward, the courts "would be inundated with complaints by literally hundreds of thousands of individuals who could claim that their expo-

sure to electromagnetic radiation was significant." She said this could include "motorists who periodically pass police units using radar guns, passengers on airplanes and consumers of various other household appliances—and these are just some examples."

Oium said that Kustom now faces only one active lawsuit besides *Blesy,* and that he knows of none against other police radar manufacturers. The remaining case was filed by the widow and young child of Danny Farr, a former South Carolina highway patrol officer who died of testicular cancer in May 1995.

"I think these are tough cases," said the Farr family's lawyer, John Kassel of Suggs & Kelly in Columbia, SC. "There are many issues of proof that the plaintiffs confront," he conceded. "But that doesn't mean there's not a problem." Kassel argued that many scientists are concerned about "the injuries caused by these radar guns," and that there is a need for more research on the subject.

Last June, a report from the National Institute for Occupational Safety and Health recommended that all hand-held radar units be equipped with a "dead-man switch." This feature shuts off the device when it is not gripped in the user's hand, in order to avoid unnecessary exposure (see *MWN,* J/A95 and S/O95). But in an interview with *Microwave News* in January, Kustom's Kusek stated that the company still makes radar guns without the dead-man switch, and that models lacking this safety feature sell better by a margin of more than nine to one. "They're more popular with police officers because it does get uncomfortable holding that switch down when you're monitoring a lot of traffic," Kusek explained. But he noted that Kustom makes the option of the dead-man switch available at no extra charge because of the concerns that have been raised.

FROM THE FIELD

Clippings from All Over

The weakness and inconsistent nature of the epidemiological data, combined with the continued dearth of coherent and reproducible findings from experimental laboratory research, leave one uncertain and rather doubtful that any real biologic link exists between EMF exposure and carcinogenicity. In the meantime, while considerable research funding is being devoted to the study of potential links, very real economic effects are being felt. Public concern has led to costly litigation, to delays or changes in the installation and operation of electrical transmission equipment and to a tendency for property values to decrease at locations adjoining high-voltage transmission lines. Should our research investment not lead to reproducible and cohesive results, the scientific community will need to reach some consensus about the likelihood and possible extent of risk. While it may continue to be impossible to prove either the presence or absence of risk, perhaps it can be feasible to assign likely risk boundaries upon which practical guidance for community consensus can be reached.

—Dr. Clark Heath of the American Cancer Society, "Electromagnetic Field Exposure and Cancer: A Review of Epidemiological Evidence," *CA – A Cancer Journal for Clinicians, 46,* pp.42-43, January/February 1996

The search for extraterrestrials scored a major breakthrough last year. A new system built by the SETI Institute in Mountain View, California, picked up regular signals that provided indisputable proof of intelligent life. The researchers, who were using the 64-meter radio telescope at Parkes Observatory in Australia, found a distinctive radio signal at 2.3 to 2.4 GHz every evening around dinnertime. However, the team found that signals were not coming from ET but from the microwave oven downstairs. They have since put a note on the microwave, asking people not to use it while they are carrying out observations at this frequency.

—Jeff Hecht, "Take Me to Your Microwave," *New Scientist* (U.K.), p.6, January 20, 1996

George Carlo, in support of his motion, submitted an extensive affidavit which recites his educational background, work history, residency, the history of HES and details his and HES' involvement with the cellular telephone industry. Without going through the facts of the affidavit, Dr. Carlo, who has a PhD in epidemiology and is also a lawyer, and HES could be characterized as having a non-adversarial relationship with the cellular telephone industry....It appears from both the affidavit and George Carlo's deposition transcript that to date most of the time and effort expended by HES in relation to cellular telephones has involved a review of the existing research and the formulation of a $15-25 million five-year research program. The stated purpose of this research is to determine whether cellular telephones pose a public health threat and if they do what is the appropriate response. Very little actual research has yet to take place.

—Judge Paddy McNamara, in an order dismissing Dr. George Carlo and the Health and Environmental Sciences Group Ltd. (HES) as defendants in *Debbra Wright v. Motorola Inc.,* Circuit Court of Cook County, IL, January 26, 1996 (see *MWN,* M/A95)

[A] 2 mG ambient exposure limit "would really shut down some technologies," such as electric trains. "There are limits to what one can consider for the sake of safety without going back to the Dark Ages."

—Dr. Thomas Tenforde, vice president of the NCRP and chief scientist of the Health Division of Battelle Pacific Northwest Labs, quoted in "Battling EMF Reports," *Environmental Health Perspectives, 104,* p.16, January 1996

No official tests of high-powered microwave weapons' effects on humans are on record, although that doesn't preclude the possibility that tests have been performed. (It took decades before the public heard about LSD tests by the CIA in the 1970s and radiation experiments by the Pentagon during the 1950s.) Major Tom Schultz at the public affairs office of the Assistant Secretary of Defense says he cannot answer questions about high-powered microwave weapons because research on them is classified. "We're probably quite far from a good understanding of the health effects of microwave technologies used as weapons," says [Federation of American Scientists' Steve] Aftergood. "I am not aware of any dedicated human-subject research in this area, and the continuing development of these technologies makes me nervous, because at some point they will have to be tested against human subjects. And given the background of Cold War human experimentation, I am concerned about how these tests will be conducted. At a minimum, the testing protocols need to be subjected to public review."

—Peter Cassidy, "Guess Who's the Enemy," *The Progressive,* pp.22-23, January 1996

In Australia, Mark Israel, Richard Luben and Michael Repacholi Testify on EMF Health Risks

Reprinted below are excerpts from testimony presented at an Australian Senate Economics References Committee hearing, held November 7-8, 1995, regarding the proposed Eastlink high-voltage power line (see p.2). The experts included Dr. Mark Israel of the University of California, San Francisco, Dr. Richard Luben of the University of California, Riverside, and Dr. Michael Repacholi, the chief scientist at the Royal Adelaide Hospital in Adelaide, Australia. Luben is the president-elect of the Bioelectromagnetics Society, and Repacholi is the chairman of the International Commission on Non-Ionizing Radiation Protection. (For more of Luben's comments, see p.3.)

Dr. Mark Israel

...Overall, the childhood cancer studies that have been talked about so much during the past two days show no consistent association between childhood cancer and any number of measures of EMF exposure....

A number of other studies have examined adult exposure to EMF[s] at residences and in the workplace, but none of these studies have provided a consistent, strong, plausible body of data to suggest that there are adverse health effects associated with power line frequency EMFs. I think it is really worthwhile reiterating yet again that this interpretation is shared by virtually all of the expert review panels which have examined the epidemiologic literature in this area. I am reminded of one that has been a watershed for me, and that is the one by Sir Richard Doll of Oxford University—one of the world's most experienced and respected epidemiologists....

[T]here is a huge body of literature—I mean numbered in hundreds of studies—that directly tests the issue of whether EMF[s are] likely to be important for the development of cancer. This research includes laboratory studies, biochemical research and animal studies, and it provides me, as a cancer researcher, with absolutely no cause for concern that EMFs, of the type that we are discussing, can and will cause cancer. In fact, I find the literature reassuring that this is not one of the reasons that I would worry about cancer causation or adverse health effects....

What I want to say to you is that, based on my personal education, my experience, my training as a cancer researcher, as a medical doctor, as a pediatric oncologist and based on the available molecular, cellular and animal experiments, I find no scientific basis for concluding that power frequency electromagnetic fields induce or promote cancer or any other adverse health effect. Using the accepted scientific criteria that I and the scientists with whom I associate apply to carcinogenesis, I cannot find support for the notion that power frequency [EMFs] can lead to the development of cancer.

Q: [Y]ou will not be afraid to put your house in close proximity to power lines.

It would not be a consideration. I do not like my children going in restaurants where people are smoking. There are lots of things that I do not do in order to avoid known carcinogens and problems.

Q: Power lines are not one of them?

This is not an issue for me.

Q: ...I find it interesting that as a scientist you are prepared to make absolute statements, where none of the other scientists who have appeared before us—

I am unique amongst the scientists that I think you have had. I am a physician. In the afternoon I take care of patients, in the morning I go to the lab. I do not have the luxury of keeping an open mind about everything in life. I am not against further research. My problem is that in the United States, when people come and ask me this question, they have a pool of money and they are going to put that pool of money into one kind or another of cancer research—and I have to make a value judgment; what do I think is most important. I do not put any more of that money into EMF research. My judgment is it is enough already. If there are unlimited resources I think it is fine but I do not have the luxury in my life.

Q: ...I am interested that ESAA [Electricity Supply Association of Australia Ltd.] have invited you to come to make this presentation....

I do not know these people at ESAA; I had never met them before yesterday. I do not think they knew my opinion when they invited me. They asked me to review the literature and formulate an opinion....I came here to be an advocate for children and research cancer for children. I came here to try to see that the focus on what causes childhood cancer is correctly directed, that the resources that are available for cancer research are correctly directed.

Q: Have you appeared for power companies in the United States as a witness?

Not in the last couple of years. I did several years ago, off and on. I think I have done it perhaps fewer than five or six times—maybe 10 times. I do not know, but not very often. I would say maybe 10 times in 10 years....

I do not think it matters whether [the epidemiologic data are] measured fields, closeness to power lines or anything else. If you look at the body of data in its totality, as these review panels have, you will see that it lacks the consistency, it lacks the strength, it lacks the dose–response, it lacks all of these criteria that we routinely look for in order to come to some conclusion as to whether or not cancer is associated with one variable or another.

Dr. Richard Luben

...I am...a member of Subcommittee 89.3 of the NCRP, which is the committee that produced the document that has at least partially been leaked to the press and has been discussed widely....[W]hat was leaked [from the NCRP report] is in fact the executive summary that was agreed to by the entire committee, and there is no question in my mind that the report is finished—at least at this stage. It does not constitute a working document and most certainly does not constitute a non-report....

We can say that living close to power lines is likely to be associated with an increase in childhood leukemia and possibly other cancers. We cannot at this point say that the measured EMF is the causative agent, but we have enough evidence to say that it is a possible causative agent. It seems to me that, in the absence of a better scientific understanding of the mechanisms and the linkages that are involved in these statistical epidemiological associations, prudence is a wise course to take....

[O]ur review of [the EPA's document on EMFs] found that the conclusion that EMF exposure was a possible potential carcinogen was a valid scientific conclusion....

The correlation between power lines and leukemia is statistically supportable. There are possible mechanisms based on both animal and laboratory results that suggest cancer-causing or cancer-promoting activities of electromagnetic fields. Combining the statistical association and the laboratory data, with which I am most familiar because I work with it every day, leads me to feel that there is some reason for caution.

Five years ago, when I took home a magnetic field meter to measure the magnetic fields in my household, I found that my four-year-old son's bed was in a region of the house where there was about a 4 mG exposure rate. I found that in the other corner of his bedroom the magnetic field was only 0.25 mG. I did not think that there was such a big decision to make; I simply moved his bed to the corner of the room that had [a smaller] field. If you were to ask me whether I would sell my house if there were a power line next to it, I do not know what the answer would be. But you can take wise and prudent measures to decrease the exposure of people, particularly children, to magnetic fields....

Q: Dr. Luben, it is important to us to try to establish your expertise and where you are coming from so that we can assess it.... I presume that in Australia you represent yourself.

That is correct.

Q: You were invited to come?

I was invited by Ian Macmillan as a result of his association with Victoria Powerline Action. I made it clear when this subject was raised that I was not a proponent of any particular causation mechanism. I most certainly was not going to tell anyone that I think that magnetic fields cause cancer because I do not see the scientific evidence for that. The other thing is that, unlike some witnesses, I am most certainly not being paid any fee or honorarium, nor have I ever been paid any fee or honorarium for providing my scientific opinion on these matters.

Q: Your fare [to Australia] was paid by Mr. Macmillan's group?

That is correct....We have data that indicate that magnetic fields will enhance the responsiveness of cells in culture to tumor promoters such as the phorbol ester class of compounds. We also have data that has just been published in the *Journal of Biological Chemistry* that shows that a 1 G magnetic field will activate a receptor in human B-lymphocytes which is associated with the growth of those cells and turning them into leukemias.

This is very important data because of the fact that most of the studies that have been done with leukemia cells and EMFs have been done using the wrong type of leukemia cells....

[B]ut our data are consistent with the idea that magnetic fields at levels much higher than are found in households can promote the neoplastic character of these cells....

My feeling, based on what I see in my laboratory, is that 1 G is a level of exposure that I would be uncomfortable with....

We still do not have a well-agreed-on biophysical mechanism that would allow us to biophysically describe the interaction of these magnetic fields with molecules in the cell membrane. There are several theories and some of these theories do have laboratory data that suggests that they are valid approaches. Nevertheless, there have been literally hundreds of peer-reviewed publications in the last decade demonstrating magnetic field effects, particularly at the level of 100 mG to 1 G and above, on cells in culture. So, in my opinion, it is no longer open to question whether these kinds of cellular effects can happen, but it is still an interesting and approachable question of what the biophysical mechanism is.

Dr. Michael Repacholi

...There have been millions and millions of dollars spent on occupational epidemiology, trying to identify if [electrical workers] are in fact at a higher risk. The most recent studies have also shown a confusing array of results: Some have shown increased leukemia, some have shown increased brain tumors but not leukemia and some have shown nothing at all. Here we have a group receiving exposures which are significantly higher than the general public and yet we are still getting an array of confusing results....

It has been the work of my commission to assess the literature on a continuing basis because we publish international guidelines on exposure limits that we, on the basis of the science, consider that people can be exposed to safely, based on the evidence that we have....To date, right to this day, there are no data that indicate that there should be a change to the current international guidelines on exposure limits to the 50-60 Hz fields. Perhaps I should leave it there and face the firing squad.

Q: ...Would you have any apprehension or fear for yourself or your family if you had a house in close proximity to a high-voltage power line?

From a health viewpoint—

Q: Only from a health viewpoint, yes.

I would have no problems in living—

Q: I am not talking about the aesthetics or the environment.

I hate the look of them. But, from a health viewpoint, we are actually exposed probably to higher levels of fields from various devices that we use in the home, unless you live in very close proximity to a high-voltage transmission line. And, usually, the easements in Australia are such that the levels are down to a few mG....You are exposed to much higher levels if you use an electric shaver or hair dryer....

Q: ...Do you think that research has been going on for a long enough period of time now for a scientist or you to say either that there is no health risk with high-voltage power lines or that the evidence that you have at this stage would suggest that there is none? Has the research been going long enough for that?...

My answer is that there has not been enough research....While the literature at this stage does not establish that there is an adverse health effect at the levels that we are normally exposed to, I still believe there are gaps in knowledge that we would like to have filled to substantiate our health risk assessments. We will never know everything, but we usually like to have a bulk of evidence that will say we are convinced that all this evidence is consistent; it is all pointing in the same direction and it has been well conducted. You cannot prove something does not happen.

Q: ...[I]s it fair to say that, although there are some gaps in the research, on balance you still do not think that those gaps are enough to say that there is a health risk? If you yourself wanted to live in proximity to a power line, would you think the evidence is against it rather than for it?

I believe that the evidence is against it, certainly, and—based on health—I would not worry about living under power lines. Having said that, I realize that it is still a new field, and there is more evidence needed. But you cannot wait for another 50 years to progress; you have to go on what you can establish. As a person involved in the development of guidelines, I know that you can only work on what is established and then make recommendations based on that, because then your criteria for establishing those limits are firm and able to be addressed in science and stand up to the rationale that is provided. People are concerned, and I empathize with those concerns. They are worried. They have children who are getting leukemia, but we have a normal incidence of leukemia which is occurring in the population anyway....

Let me say a few words on the NCRP report. It is a report of some committee members. It has not received any scientific peer review, which means that, in science, it does not exist....

Unfortunately the media is there to sell a story. They are not there to convey factual information. It is just part of our system....

This is a nonevent—the NCRP report—but in the media's mind it has become an event because some committee members have wanted to put this information out for whatever purpose. In science it cannot be justified in any way. I would strongly recommend that the committee ignore that report because it is a nothing report.

ELECTROMAGNETIC INTERFERENCE

Compromise Sought on Hearing Aids... The *Hearing Aid Compatibility and Access to Digital Wireless Telecommunications Summit,* held January 3-4 in Washington, addressed ways to resolve cellular phone interference with hearing aids. The conference was organized by a steering committee that included cellular industry groups, hearing aid manufacturers and organizations of the hearing-impaired. CTIA's Tim Ayers, who attended the summit, explained that it resulted from an October 2 meeting between FCC Chair Reed Hundt and wireless industry representatives: "Hundt said, 'I want this problem taken care of,' and said that everyone should work together on it." Three working groups will issue short- and long-term recommendations in March. Still unresolved is the disagreement over two different standards for digital cellular systems, TDMA (including GSM) and CDMA (see *MWN,* M/J95). "There's some interference with all technologies," explained Brenda Battat of Self Help for Hard of Hearing People (SHHH), "but there's *much, much* less with CDMA." Frederick Graefe of the Wireless Communications Council (WCC), a pro-CDMA trade group, charged that "the GSMers want to delay any resolution until after they have all their technology deployed. Once the GSM industry spends $10 billion, nobody's going to tell them they have to dismantle it." Graefe claimed that FCC's Hundt called the October 2 meeting in response to a petition filed last June by HEAR-IT NOW, a coalition that includes both SHHH and the WCC. However, Ayers, who described the CTIA as "technology-neutral," emphasized that when Hundt spoke at the summit, "He said very specifically, 'I am not going to delay a rollout of [digital] technology.'" Battat noted that although SHHH would prefer to see the FCC make hearing aid compatibility mandatory for the wireless industry, Hundt had made clear that this would be "a very last resort." But, she said, "We're committed to making this process work."

GROUND CURRENTS

Research Plan Proposed...A Minnesota scientific advisory committee has proposed a five-year research plan on the possible role of ground currents—other than conventional stray voltage—in dairy cow health problems. The committee was established in 1994 by the state Public Utilities Commission (PUC), under orders from the state legislature, in response to concerns of farmers that such currents could be responsible for odd behavior, health ailments and a decreased milk supply in dairy cows. The research program—estimated to cost over two million dollars—would include surveys of farmers, development of measurement protocols and field and laboratory studies on how dairy cows respond to specific types of EMFs. In a January progress report, the committee noted that the available information does not show any clear relationship between the effects and ground currents. Instead, it suggested, the ailments may often be caused by nearby stray voltage sources, such as water lines or metal stalls, rather than by primary distribution lines or nonelectrical sources (e.g., bacteria or viruses). The committee, chaired by Dr. Roger Staehle of the University of Minnesota, Minneapolis, includes Drs. Larry Anderson of Battelle Pacific Northwest Labs in Richland, WA, Abe Liboff

of Oakland University in Rochester, MI, and Charles Polk of the University of Rhode Island, Kingston. The Wisconsin PUC is currently planning to join forces with the Minnesota PUC in a related investigation of the roles of stray voltage, ground currents and EMFs in reduced milk production, according to the January 12 *Wisconsin State Journal*. Stray voltage has received substantial media attention in the Midwest, and several farmers have won million-dollar awards for damages (*MWN,* N/D90 and J/F95).

MEETINGS

Gordon Research Conference... This year's biennial Gordon conference on bioelectrochemistry is titled *Molecular and Cellular Biophysics of the Alteration of Biochemical Reactions and Transport by Electric and Magnetic Fields*. It will be held July 21-26 at Salve Regina University in Newport, RI. "We will focus on how environmental fields and fields used for medical applications—for instance, drug delivery—alter the reaction rate or transport of ions and molecules," Dr. James Weaver of MIT said in an interview. "After all, such questions are at the heart of the conceptual controversy over the effects of EMFs." Weaver is the meeting's chairman, and Paul Gailey of Oak Ridge National Lab in Oak Ridge, TN, is the vice chair. On the agenda are: biophysical mechanisms of electric and magnetic field reception; electrically driven transport across biological barriers; and molecular and biophysical events in membrane proteins. More information can be obtained automatically by return e-mail from grc_info@geldrop.mit.edu. Or Weaver, Room 20A-128, MIT, Cambridge, MA 02139, Fax: (617) 253-2514.

PATENTS

EMF Neutralizing Apparatus... Last September 19, Dr. Ted Litovitz of the Catholic University of America in Washington was granted Patent No.5,450,859 for a method that he claims reduces EMF health risks. Litovitz explains that he has found that superimposing electromagnetic "noise" upon ambient EMFs of up to 50 kV/m and/or 50 G can inhibit the biological effects of the fields. The patent states that the technology is designed "to confuse the biologic cell so that it can no longer respond to the usual fields found in the home and workplace." In this way, Litovitz contends, a fluctuating field can be used as a protective device. Dr. Abdallah Mishrick, CEO of New York City-based EMX Corp., which owns an exclusive worldwide license for the patent, calls Litovitz's invention "a safe and economical answer to EMF health hazards." EMX has already marketed a computer keyboard that neutralizes EMFs from VDTs (see *MWN,* J/A93 and J/F94), and is planning other products. These include a hair dryer, a converter plug for electric blankets and a home protection system. The company is seeking a separate patent for a device that mitigates health risks from cellular phones. "One of the best demonstrations that weak fields can cause biological effects is the fact that those effects can be eliminated," Litovitz told *Microwave News*.

PEOPLE

Dr. **Gary Boorman**, the chief of the Pathology Branch at NIEHS in Research Triangle Park, NC, has taken over as the agency's

leader on the RAPID EMF research program. **Dan Vandermeer**, who recently retired from NIEHS, had hoped to continue managing the RAPID effort (see *MWN,* N/D95), but NIEHS Director Dr. **Ken Olden** has decided that the job should go to Boorman. Boorman said that he is not yet sure whether he will be the cochair of the interagency committee....**Tom Watson** has left Crowell & Moring to open up a new firm with partners **Curt Renner** and **Paul Lumnitzer**. Watson & Renner has assumed Crowell & Moring's EMF practice. "It was an amicable separation," Watson said in an interview. "I've always dreamed of starting up my own firm." Watson did not move very far. His offices are still at 1001 Pennsylvania Ave. in Washington, but he is now on the 4th floor instead of the 11th....**John Wilson** of Con Edison in New York City has been promoted and is now the acting manager of communications and training within the Department of Environmental Affairs. Wilson was formerly EMF issue manager. **Paul Carbone** has assumed the responsibility for EMFs at the utility....Two leaders of the EMF citizens movement have died. **Edward Ronald Kinney** was a vice-president and frequent spokesman for the Seattle-based Citizens Against Overhead Power Lines (CAOPL), one of the first and most active advocacy groups in the U.S. **Claire Alston** of the Coalition to Reduce Electropollution has died of a brain tumor in British Columbia, Canada. She was the editor of the group's newsletter, *The Current*.

RF WEAPONS

Disabling People and Electronics... The military continues to explore development of RF weapons for the conflicts of the future. For instance, the *First Directed Energy Warfare (DEW) Conference,* held last year at the Mitre Corp. in McLean, VA, featured Dr. David Erwin of the Armstrong Lab at Brooks AFB, San Antonio, TX, on "DEW RF Effects" and Dr. Jose Pina of the CIA on "Ground Combat Applications of RF." Other topics included "Personnel Vulnerability" and "DEW Biological Effects." The June meeting was organized by the Association of Old Crows, whose members are specialists in electronic warfare. Conference participants had to have security clearances of "Secret" or higher, as has been the case at similar meetings in the past (see *MWN,* J/F87 and N/D93). Public discussion of RF/MW weapons has focused on disrupting technology. But a recent article in the *Airpower Journal* revealed "for the first time that the military is developing high-powered microwave weapons for use against human beings," reports Peter Cassidy in the January 1996 *Progressive* (see p.14). RF/MW and EMF-based weapons are also being studied for civilian law enforcement. Oak Ridge National Laboratory (ORNL) in Oak Ridge, TN, will soon complete a literature review for the National Institute of Justice on the feasibility of "thermal guns," which could heat the body to 105 to 107°F and incapacitate the target; "seizure guns," which "would use EM energy to induce epileptic-like seizures"; and "magnetophosphene guns," which would cause the target to "see stars." The institute's Ray Downs in Washington cautioned that the report may not be made public. ORNL's Dr. Clay Easterly has said that some effects not associated with heating could be useful in developing nonlethal weapons (see *MWN,* N/D93).

CLASSIFIEDS