MICRO WAVE NEWS

Vol. XVI No. 4 A Report on Non-Ionizing Radiation July/August 1996

INSIDE...

EMF NEWS pp.2-7

Power Line Talk: ABC's Stossel Looks into the Moonlight • Priest in Philippines Arrested • Stevens in Cancer Research • DOE-Fetzer Workshop • Sagan's EMF Book • More for Altoonian

NAS-NRC Report Due in Early September

Plaintiffs' Lawyers Must Pay for SCE's Experts Table of Expert Witnesses and Fees

Two Swedish Studies Show Excess Cancer Risk for Railway Workers

NIOSH Railway Research Sidetracked

French and Canadian Transient Data on Hold

Commentary: The Keys to EMF Epi Studies

HIGHLIGHTS pp.8-14

BEMS Takes a Stand on Biological Effects Text of Two BEMS Statements

Cellular Phone Notes: CTIA/WTR Financial Dispute (Continued) • WTR Pacemaker Session Postponed • Oklahoma Center's Medical Devices EMC Meeting • Helicopter Association on Tower Siting • SARs & Aneurysm Clips

Motorola Quiet on Adey Animal Results

WTR Cell Phone–Brain Cancer Epi Study

Norwegian Navy: RF/MW & Birth Defects?

Cell Phones: How To Certify Compliance?

WHO Launches $3 Million EMF Project

FROM THE FIELD pp.14-16

Clippings from All Over

Dr. Kenneth Foster Letter on WTR v. NYPLP

Flashback: 5, 10, 15 Years Ago

UPDATES pp.15-19

Battelle Breast Cancer Studies • Iridium and Radio Astronomy • Electric Blankets Free of Brain Cancer Link • OrthoLogic Under Fire • Hearing Aid EMI Standards • Police Radar Suit Dismissed • People in the News • Meetings: COST on Mechanisms, Bioeffects in Japan, Magnetotherapy Congress in U.K., Vermont Law School on Wireless Policy

CLASSIFIEDS pp.17-20

Both Electric and Magnetic Fields Seen as Critical to Cancer Risk

Ontario Hydro Worker Study Links Combined Exposures to Excess Leukemia

Workers exposed to high levels of magnetic *and* electric fields had leukemia rates that were up to 11 times greater than expected, according to researchers at the University of Toronto in Canada. This result indicates that electric field exposures may play a crucial role in the link between cancer and power frequency electromagnetic fields (EMFs). The leukemia risks found by the Toronto team are some of the highest reported in a major epidemiological study.

"Up until now, people have tended to pursue the notion that any cancer effects were likely to be from magnetic fields," said Dr. Anthony Miller,

See Commentary on Exposure Assessment, p.7

lead author of the Toronto paper, published in the July 15 issue of the *American Journal of Epidemiology (144,* pp.150-160, 1996). "However, this study suggests that electric fields are potentially critical to cancer risk."

Dr. David Agnew, a senior safety scientist at Ontario Hydro in Toronto and a member of Miller's team, agreed that the findings are "important." He predicted that they will prompt "future research to explore this further."

The Ontario Hydro results have put electric fields back in the limelight.

(continued on p.5)

FCC RF/MW Rules Favor NCRP Limits; Cell Phones To Be Tested for Safety

The Federal Communications Commission (FCC) has adopted final health and safety regulations for exposures to radiofrequency and microwave (RF/MW) radiation. The new rules are based in large part on those recommended by the National Council on Radiation Protection and Measurements (NCRP) in 1986, although the FCC adopted some provisions from the 1992 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) guidelines.

"We believe that the exposure criteria we are adopting will protect workers and the general public from potentially harmful RF emissions due to FCC-regulated transmitters," stated the FCC in its August 1 *Report and Order.* In favoring the NCRP limits, the FCC sided with the Environmental Protection Agency and against the communications and electronics industries, which had mounted a massive lobbying campaign in favor of the ANSI/IEEE standard (see *MWN,* M/J94 and M/A96).

The FCC will now require that all new cellular and personal communi-

(continued on p.13)

EMF NEWS

« Power Line Talk »

Are power line EMFs as harmless as moonlight? Last June's PBS television program ***Frontline*** (see *MWN,* J/A95) made this comparison, and this argument is becoming common among those seeking to downplay the EMF issue. The *Frontline* narration, which was written by **Jon Palfreman**, who also produced the show, stated that, "Physicists have calculated a person standing under a power line at night would get some 10,000 times more electromagnetic energy from moonlight than from the power line." The figure recently resurfaced in an interview for an ABC-TV special on scientific controversies hosted by **John Stossel** and scheduled to air this fall. **Marc Dorian**, the ABC program's producer, did not know the origin of the moonlight argument, but said it was a standard point in the EMF debate. When *Microwave News* asked Dr. **Robert Adair** of the Yale University Department of Physics in New Haven, CT, one of the physicists in the *Frontline* piece, about it, he replied that it was new to him. Later, after doing the math, he called back and said, "The calculation is in the ballpark." Dr. **Charles Polk** of the University of Rhode Island in Kingston, a coeditor of CRC Press' *Handbook of Biological Effects of Electromagnetic Fields,* agreed that the calculation may be accurate, but he was nevertheless harshly critical: "It is a propaganda argument and it's totally irrelevant—it has nothing to do with the possibility or impossibility of biological effects." Palfreman's assistant credited the statement to Dr. **Peter Valberg**, a utility consultant with the Gradient Corp. in Cambridge, MA. Valberg said in an interview that some of the points that led him to this calculation came from a 1994 report he wrote for **EPRI** on possible EMF mechanisms of interaction (see *MWN,* J/F96). When Stossel posed the moonlight question on June 28 to **Joan Tukey** of the **California Alliance for Utility Safety and Education** (CAUSE), a citizens group based in San Diego, she asked **Michael Silva** of Enertech Consultants in Campbell, CA, to join the discussion. Tukey told *Microwave News* that when Silva—who was also scheduled to appear on the show—approached the cameras, Stossel ordered them turned off. "I tried to explain to Stossel the problems with that argument," Silva said. Tukey, who had grown increasingly frustrated by the tone and direction of Stossel's questions, walked away from the interview. In a July 1 letter to ABC News Executive Producer Victor Neufeld, Tukey pointed out that, prior to the interview, readings of up to 85 mG were measured in a power line corridor in a residential neighborhood. Stossel himself is no stranger to controversy, having been called by consumer advocate **Ralph Nader** "the most dishonest journalist" he ever met. Stossel's 1994 ABC special, "Are We Scaring Ourselves to Death?" prominently featured Dr. **John Graham**, director of the Harvard Center for Risk Analysis in Boston, which established an EMF risk assessment program that is being funded by industry groups including EPRI (see *MWN,* J/A94). Stossel has also been referred to as "the darling of conservative and industry groups" by the *Washington Post* and has received as much as $22,000 per lecture. He claims to be giving proceeds from his speaking engagements to charity since an ABC policy took effect in 1994 barring correspondents from accepting money from corporations and trade associations. But while Stossel gave about $135,000 from 1994 lectures to charity, he pocketed some $25,000, according to the April 17, 1996, *Corporate Crime Reporter,* a Washington-based newsletter.

«« »»

"They treated me like a pig," **Father Shay Cullen** said of the Philippine police who arrested him on June 13 in Olongapo. The 53-year-old priest told the ***Philippine Daily Inquirer*** that he and a colleague, Lowell Maglaqui, were brutally beaten before being arrested without warrants for protesting the routing of high-voltage power lines near a home for destitute children (see *MWN,* M/J96). In a press release issued on July 3, Cullen said police forced their way onto the platform he had built atop a 40-foot pylon, where he had been staging his protest since April. The priest noted that the police then closed its curtains and began beating him up. He also claimed that his radio, cellular phone and camera were confiscated and not returned. Cullen's statement on the incident also alleged that an officer approached Alex Hermoso, a bystander who was taking photographs of the arrest, and ordered him at gunpoint to hand over his radio and camera. Police Chief Nicasio Radovan denied the charges, reported the *Daily Inquirer* on June 15, and claimed that his officers had patiently tried to convince the priest to climb down from the pylon for his own safety. Radovan said that he was following the orders of the town's mayor, Katherine Gordon, to remove the priest from the pylon. Cullen told *Microwave News* that these events show "the cost of protest in the Philippines." But he vowed that, "We will continue on with court actions and public awareness raising."

«« »»

The melatonin hypothesis got a big boost when ***Cancer Research*** featured Dr. **Richard Stevens** on the cover of its July 15th issue. Below a photograph of Stevens, the prestigious journal featured a flow diagram that outlines how light-at-night and/or EMFs from electric power could lead to low levels of melatonin, which in turn could lead to increased breast cancer risks. Dr. **Sidney Weinhouse**, the cover editor of *Cancer Research,* commented that the "direct evidence" for Stevens's hypothesis, first proposed in 1987 (see *MWN,* J/F87), "is sparse but provocative." Weinhouse, a member of the National Academy of Sciences since 1979 and formerly the editor of the jour-

MICROWAVE NEWS is published bimonthly. • ISSN 0275-6595 • PO Box 1799, Grand Central Station, New York, NY 10163 • (212) 517-2800; Fax: (212) 734-0316; E-mail: <mwn@pobox.com> • Editor and Publisher: Louis Slesin, PhD; Senior Editor: Peter Hogness; Associate Editor: Christopher Doherty; Assistant Editor: Georgina Keenan; Copy Editors: Jim Feldman, Roy Thomas Jr.; Production Coordinator: Joe Mungioli; Circulation Assistant: Diana Cooper • Subscriptions: $285.00 per year ($315.00 Canada & Foreign, U.S. funds only); Single copies: $50.00 •

nal, added that the "body of evidence is sufficient to bind electric power over for trial, but not nearly adequate to render a verdict." The hypothesis' next big test will come next spring, when Stevens and Dr. Scott Davis of the Fred Hutchinson Cancer Research Center in Seattle announce the results of their major epidemiological study, which tests Stevens's theory (see *MWN,* N/D91). "I'm delighted," Stevens told us from his office at the Battelle Pacific Northwest Labs in Richland, WA. "*Cancer Research* is one of the most respected journals in the cancer research community and this is a real honor." He added that he is pleased with the recognition, not only for himself but also for the field of bioelectromagnetics: "This is a mainstream and highly visible recognition of the EMF research effort."

«« »»

The **DOE** and the **Fetzer Institute** are sponsoring a small by-invitation-only workshop on ***Self-Organized Biodynamics and Control by Chemical and Electromagnetic Stimuli,*** which will be held at the institute in Kalamazoo, MI, August 10-14. Those who do not attend will have a chance to cover some of the same ground in San Antonio on Sunday, November 17. The Texas meeting—***The Emerging Science of Nonlinear Dynamics and Self-Organized Systems: Can It Help Explain Reported EMF Bioeffects?***—is scheduled for the afternoon before the start of DOE's annual EMF research review. For more information on the DOE review, contact: Dr. William Wisecup, W/L Associates, 7519 Ridge Rd., Frederick, MD 21702, (301) 663-1915, Fax: (301) 371-8955. Special room rates at the St. Anthony Hotel in San Antonio are available for those who reserve by October 13.

«« »»

Dr. **Leonard Sagan**, who led EPRI's EMF program for many years before his retirement, has published ***Electric and Magnetic Fields: Invisible Risks?*** The 214-page paperback was issued in June by Gordon and Breach, which is based in Amsterdam, The Netherlands. In a foreword, Dr. **Donald Kennedy**, the former head of the FDA and the president emeritus of Stanford University, urges readers not to "accept at face value either the apocalyptic visions presented in the media, or the bland reassurances they receive from self-appointed experts." The book is available in the U.S. for $19.95 from: International Publishers Distributor, Attn: Marketing, c/o PO Box 200029, Riverfront Plaza Station, Newark, NJ 07102.

«« »»

The first damage award in an EMF personal injury case just got bigger. **John Altoonian** and his wife had won a jury verdict of $762,524 against **Atlantic Electric**, most of it for emotional distress (see *MWN,* M/J96). But in the official final judgment on June 25, New Jersey Superior Court Judge Charles Previti added interest charges of $174,873, as well as $8,870 that the utility had already agreed to pay for trespass, bringing the total amount to $946,267. The award is under appeal.

NAS-NRC EMF Report Watch

This time, the National Academy of Sciences - National Research Council (NAS-NRC) sounds quite certain. Its report on EMF health effects is now due out in early September—most likely the week of September 9.

"It's in post-review editing," said Dr. John Zimbrick, the director at NRC's Board on Radiation Effects Research in Washington. He noted that all the scientific reviews have been completed. The board will soon start working with the news office to schedule a press conference.

Cancer Plaintiffs' Lawyers Must Pay for Utility's Experts

The law firm representing plaintiffs in a major EMF–cancer suit has been ordered to pay all expert witness fees—past and future—for the defendants, which include Southern California Edison Co. (SCE). A higher court put the case on hold on June 20, so that it could consider an appeal of the unusual sanction.

The lawsuit, *Younkin v. SCE,* was brought by employees of an Orange County real estate firm who developed cancer while working in an office located over a set of SCE transformers (see *MWN,* J/A94, M/J95 and J/F96).

Superior Court Judge Dennis Choate imposed the penalty when an expert witness for the utility refused to testify after receiving a letter of complaint from the plaintiffs' lawyers. At a February 1 hearing, Choate emphasized that dissuading a witness "is a crime in this state," and angrily compared the case to another, in which a gang member had drawn his finger across his throat while staring at a witness in the courtroom. "This is a dumb move," said Choate, according to hearing transcripts. "Felony dumb move. Misdemeanor dumb move. This should be reported to the state bar....I don't know whether I am obligated to refer it to the district attorney."

"It's a pretty strong sanction," commented SCE lawyer Joel Lamp, of O'Connor, Cohn, Dillon & Barr in San Francisco. "I've never seen it imposed before. The judge actually thought it was more serious than we did—he was very upset." Lamp said that this penalty was all the more striking because SCE had not requested it.

"It's just a disaster," said Annee Della Donna of the Santa Ana, CA, firm of Wylie Aitken. She contended that the ruling had created a conflict of interest that made it impossible to represent the plaintiffs fairly. Della Donna stated that her firm had already spent over $100,000 in costs—a figure that does not include any payment for the attorneys' time.

"Every decision concerning this action is now an ethical struggle between counsel's interest in reducing expert costs and their duty of undivided loyalty owed to the clients," Della Donna argued in court papers filed on March 28. If the sanctions ruling is not overturned, she told *Microwave News,* her firm will be required by state bar association rules to withdraw from the case. "Then the clients will be left to represent them-

Expert Witnesses and Fees in Office Cancer Suit

Listed below are selected expert witnesses in Johsz v. Koll, *an EMF–cancer lawsuit brought by a group of office workers against the Grubb & Ellis real estate firm, building owner Koll Co. and Southern California Edison Co. (see below). Witness lists have not yet been submitted in a related case,* Younkin v. SCE, *but attorneys for both sides say that they expect to retain the same experts on EMFs.*

For ***Plaintiffs:***		
John Bobis, PE	Engineering consultant, Rancho Cordova, CA	$1,100 first hour; $275 each additional hour
Dr. Wayne Lancaster	Economics consultant, Fullerton, CA	$360 first hour; $180 each additional hour
Dr. Abraham Liboff	Oakland University Physics Department, Rochester, MI	$2,000/day
Dr. Samuel Milham Jr.	Epidemiology consultant, Olympia, WA	$350/hour testimony; $100/hour standby
Gerard Moulin	Expert Technical Consultants, Thousand Oaks, CA	$275/hour
Dr. David Ozonoff	Boston University School of Public Health, MA	$3,200/day
For ***Defendants:***		
Dr. Hoda Anton-Culver	College of Medicine, University of California, Irvine	$150/hour
Dr. Patricia Buffler	University of California School of Public Health, Berkeley	$400/hour
Dr. Philip Cole	University of Alabama School of Public Health, Birmingham	$400/hour
Bill Eisinger, PE	Power Engineers Inc., Hailey, ID	$175/hour
Dr. Edward Gelmann	Lombardi Cancer Research Center, Washington, DC	$300/hour
Dr. Victor Levin	Anderson Cancer Research Center, University of Texas, Houston	$600/hour
Dr. Judith Luce	Oncology Services, San Francisco General Hospital, CA	$350/hour
Dr. Saul Allen Rosenberg	Oncology Division, Stanford University Medical Center, Stanford, CA	$400/hour
Dr. Jack Sahl	Southern California Edison, Rosemead, CA	(defendant's employee)
Michael Silva, PE	ENERTECH Consultants, Campbell, CA	$185/hour
Dr. Peter Valberg	Gradient Corp., Cambridge, MA	$180/hour

selves," she said, "and the case will go down in flames."

The expert witness involved is Dr. Hoda Anton-Culver, an epidemiologist at the University of California, Irvine, and the head of the Orange County Cancer Registry. She had been retained by SCE in *Younkin* and a related lawsuit, *Johsz v. Koll,* which grew out of the same cluster of cancer cases. The two actions involve different groups of workers but the same defendants—the Rosemead, CA-based utility, the real estate firm and the building owner. Both cases also involve the same attorneys on each side and substantially the same list of expert witnesses (see table above).

By coincidence, a plaintiff in *Johsz* named Mary Ann Stewart has a sister who is part of an unrelated breast cancer study being conducted by Anton-Culver. As part of that study, Anton-Culver asked Mary Ann Stewart to come to her office to be interviewed and provide a blood sample. Stewart did so on December 10.

When Della Donna learned what had happened, she accused Anton-Culver of improper conduct. "My feeling was that Dr. Anton-Culver had disqualified herself and would have to withdraw," she explained, noting that Anton-Culver had obtained "confidential medical information" without revealing that she was working for SCE. Della Donna said that the lawsuit was discussed during the office visit, and since Anton-Culver had read the plaintiffs' depositions, she "would have had to have her nose buried in the ground not to know that it was the same case."

Della Donna then wrote a letter to all defense attorneys demanding the return of the blood sample, insisting that Anton-Culver withdraw from the case and threatening legal action if she tried to take the stand. Della Donna also sent copies to Anton-Culver and her dean at UC Irvine. Soon afterwards, Anton-Culver informed SCE's attorneys that she would not testify.

SCE complained to Judge Choate about Della Donna's contact with its witness and asked that he dismiss the case. Choate rejected this request but ordered that a report which Anton-Culver had prepared for SCE be entered into evidence, even though she would not testify in support of it. He announced that he would tell the jury that her absence was the fault of the plaintiffs. And he ordered the plaintiffs' law firm to pay for all the defendants' expert witnesses as compensation for what he called "the kill shot inflicted upon witness Anton-Culver."

At the February hearing, Choate scolded Della Donna for taking action independent of the court: "Why didn't you...say, 'Judge, we have a problem here'?...Why don't you go through the route you are supposed to go through? Why do you have direct contact with the witness to the point where the witness has refused to testify?" The appeal of Choate's ruling will be heard by a three-judge panel on January 21, 1997.

Meanwhile, Della Donna filed a brief appealing the dismissal in the *Johsz* case on June 24. That case had been thrown out on December 8 of last year, in a dispute over admissible evidence and proof of causation (see *MWN,* M/J95 and J/F96).

In another major California EMF suit, the state's Supreme Court heard oral arguments on June 6 in the *Covalt* property-devaluation case (see *MWN,* N/D95). A decision is expected by the end of the summer. In May of 1995 an appeals court ruled that the state's public utilities commission had exclusive jurisdiction over all EMF issues, and that the *Covalt* case therefore did not belong in court.

New Support for Railway Exposure–Leukemia Link

Two new studies of Swedish railway workers provide further support for a link between EMF exposure and excess cancer risk. Building on Dr. Birgitta Floderus's 1993 study of railway workers, Dr. Lars Alfredsson's new research found a significantly higher rate of lymphocytic leukemia among these workers. Similarly, Dr. Ingrid Nordenson's study of railway employees detected a significantly higher incidence of chromosome breaks among the workers.

The study of engine drivers and conductors by a team from the Karolinska Institute in Stockholm led by Dr. Alfredsson showed that the incidence of chronic and acute lymphocytic leukemias was more than double that for the average Swedish male—a statistically significant finding. Published last May in *Cancer Causes and Control (7,* pp.377-381, 1996), the report described the data as uncertain, because of the small number of cases involved. There were ten cases of lymphocytic leukemia—eight chronic and two acute—observed in the railway workers from 1976 to 1990. Alfredsson said that it should be kept in mind that the 230 percent increase in lymphocytic leukemia among the workers corresponds to "about four extra cases...in a cohort of more than 9,000 engine drivers and conductors over a period of up to 14 years." He also pointed out that there was no increase in brain tumors observed in the cohort.

The study by Nordenson and her coauthors showed that engine drivers had a significant increase in chromosome breaks, which, the team argued, are associated with future cancer risk. It was conducted by the National Institute for Working Life (NIWL) in Umeå and presented at the Bioelectromagnetics Society annual meeting in June. The 18 drivers comprising the cohort were compared to a control group of seven dispatchers and 16 office workers.

The high and fluctuating EMF levels the drivers were exposed to occasionally reached into a range of 20 mG to 400 mG, with peak values at times exceeding 1300 mG. The mean value of occupational exposure for the control group was 2 mG.

While the study showed that the level of chromosomal aberrations overall was not significantly high, a significant number were found when only chromosome breaks were examined. In contrast to the 1.3% of drivers' cells with chromosomal breaks, the controls had only 0.3%.

Alfredsson's study agrees with the findings of Birgitta Floderus's epidemiological study of railway employees *(Cancer Causes and Control, 5,* pp.189-194, 1994), which showed cancer increases in workers exposed to EMFs. Alfredsson's study overlaps Floderus's, in that data from about 50% of the subjects, compiled between 1976 and 1990 and included in the new study, were initially used in the analysis of railway workers by Floderus, who is with the NIWL in Solna (see p.7 and *MWN,* S/O92, M/J94 and S/O95). Indeed, Alfredsson relates that both studies indicate that "this disease has persisted over time."

As early as 1985, the same team led by Nordenson was finding similar effects in substation workers (see *MWN,* J/F 85). This previous study showed that spark discharge pulses elicited chromosome breaks.

NIOSH Seeks Better Data for Railroad Worker Health Study

The National Institute for Occupational Safety and Health (NIOSH) will not embark on a study of railroad track workers because existing employee records are insufficiently detailed to gauge EMF exposures. The institute may, however, study railroad conductors—whose numbers are larger and whose exposure levels, NIOSH believes, may be higher.

In its *Electromagnetic Fields and Rail Maintenance Workers: Final Report of an Exposure Survey and Feasibility Investigation,* NIOSH found that employee records are not complete enough to estimate track workers' exposure levels. The feasibility study, which was released earlier this year, came in response to requests from Senator John Kerry (D-MA) and three congressmen—Frank Pallone Jr. (D-NJ), Robert Andrews (D-NJ) and Robert Borski (D-PA). In his March 6, 1993, letter to NIOSH, Pallone called the study "necessary," and stressed the "compelling need to further investigate this matter." His letter was prompted by a Pennsylvania railroad union's concerns over the health of its members.

Average exposures of rail maintenance workers are believed to be "slightly higher than the exposures of workers in other industries," according to NIOSH. These workers had higher exposures when a train was nearby. For example, average exposures rose from 12 mG to 80 mG as a train approached. Peak levels ranged from 34 mG to 185 mG when the train was passing the measurement location.

"We hope to take further measurements to learn if conductors have higher exposures than rail maintenance workers," said NIOSH's Dr. Thurman Wenzl in Cincinnati. "If so, rail passengers may also have elevated exposures on trains powered by overhead lines."

Dr. Birgitta Floderus has found that engine drivers had a threefold increased risk of chronic lymphocytic leukemia (see story on left), while Dr. Tore Tynes of the Cancer Registry of Norway in Oslo found no elevated leukemia risk among track workers.

Ontario Hydro Worker Study *(continued from p.1)*

They were the principal focus of attention in the 1970s and early 1980s, but in the mid-1980s researchers shifted their attention to magnetic fields. Earlier this year, a U.K. group suggested that electric fields could explain EMF–cancer risks through the concentration of radon by-products (see *MWN,* M/A96 and M/J96).

"There is no question after seeing Miller's study that I would be willing to put more effort into studying electric field exposures," Dr. David Savitz said in an interview from his office at the University of North Carolina, Chapel Hill. Savitz's 1995 report for the Electric Power Research Institute (EPRI) linked electric utility workers' EMF exposures to brain cancer (see *MWN,* J/F95).

Electric fields are now on EPRI's research agenda. "Further studies are needed to examine the relationship between occupational exposure to electric fields and leukemia," Dr. Leeka Kheifets, manager of EPRI's EMF research program in Palo Alto, CA, told *Microwave News.* "EPRI is exploring the availability of other survey measurement data to evaluate the relationship between magnetic fields and electric fields in occupa-

tional environments," she said.

One of the notable features of the Miller study is its detailed exposure assessment (see "Commentary," p.7). EMF exposures were estimated not only with job titles but also with where employees did their work.

Miller's team showed striking increases in leukemia risk for cumulative exposures to high electric and magnetic fields. Indeed, the adjusted risk ratio for all leukemia was 1.6 (nonsignificant) when the analysis was limited to magnetic field exposures only. But when electric fields were included as well, the risk ratio rose to 11.2, a significant result.

In the published paper, Miller's team concluded that the data point to "associations for all leukemia and its subtypes with increasing electric field exposure," especially when electric and magnetic fields were considered together.

Those exposed to the highest levels of both electric and magnetic fields were primarily power line maintenance workers and those who do jobs that put them close to electricity-generating equipment and high-voltage transformers.

The Ontario Hydro project is part of a three-utility study that also included Hydro-Québec and Electricité de France (EDF). While much of the magnetic field data for all three utilities was published in 1994 (see *MWN,* M/A94), the electric field analysis released in July is new. Although all three utilities recorded electric field data, the analysis for the other two utilities, as well as that for the three utilities combined, dealt only with magnetic fields.

The University of Toronto researchers asserted that their exposure estimates are more accurate than those used in past research or in the Hydro-Québec and EDF components of the three-utility study. In their paper, they wrote that, "There may have been greater opportunity for misclassification of exposure in the other two utilities than in Ontario Hydro."

Dr. Gilles Thériault of McGill University in Montreal, who led the Hydro-Québec study, confirmed that information on job location is critical. "I agree that exposure can vary more with location than with job title," he said. "We came across this in our study, too."

Over 30,000 present and former Ontario Hydro male employees were included in the study. Among these there were 50 cases of leukemia, 35 of brain cancer and 58 of malignant melanoma. Miller found elevated risks for both leukemia and skin cancer but not for brain tumors. With respect to brain cancer, he allowed that, "We may have failed to see a significant ...[statistical] association because of low power."

There was "a suggestion of a dose–response relation" for leukemia and melanoma, but the test for a trend did not produce a significant result, the Ontario team noted.

At the highest level of exposure to both magnetic and electric fields, the odds ratio jumped from 3.51 to 11.2 when the researchers included the interaction of the effects of the two types of fields. When asked which estimate was more indicative of the actual cancer risk, Miller replied, "The correct way to think about it is the 11.2, because what you're actually looking at is the combined effects."

Ontario Hydro is now investigating the reliability of the electric field exposure data. Ruth Greey, EMF issue manager at Ontario Hydro, told *Microwave News* that the next step will be to examine the relationship between the electric fields measured by the Positron monitor and the ambient electric field strengths in the workplace.

In addition, work is under way to see whether cumulative EMF exposures (that is, μT-years and V/m-years) are the best ways to gauge cancer risks. "We're looking at different metrics, including intermittent, peak and average exposures," Greey noted.

For his part, Miller would like to see the extent to which electric field exposures play a role in the residential environment. Two studies involving childhood leukemia, which are also using the Positron personal exposure meter, are due out next year. Miller is leading one of these and Dr. Richard Gallagher of the Cancer Control Agency of British Columbia is the principal investigator for the second study, which is being sponsored by BC Hydro.

"What worries me is that so much of the experimental cellular work that has been done has screened out electric fields," Miller said.

Canadian unions are expressing concern about the new findings—in contrast to American labor groups, which have generally been indifferent to EMF health risks. "It's alarming. This is cause for immediate employer and government action to protect workers," John Murphy of the Power Workers' Union told Ontario's *Windsor Star* (July 11) after the publication of the Miller study.

Savitz noted that the results of the Ontario Hydro study were released too late to be included in the NAS-NRC report due out in September (see p.3).

Transient Analysis Still on Hold

Work on the EMF transient data collected by the Canadian and French utilities is still at an impasse. "Pulsed [EMF] exposure has so far not been evaluated with [the] Ontario Hydro data," Dr. Anthony Miller and coworkers reported in their July 15 paper.

Ontario Hydro's Ruth Greey said that there is as yet no commitment to go forward with the transient analysis. "It's not scheduled now," she told *Microwave News*. She echoed others' concerns over what the Positron meter is actually measuring.

For his part, Miller wants to move forward. "Just give us the data and we'll analyze it," he said in an interview. He explained that whatever the sources of the transients may be, the data may reveal new information about EMF and/or RF health effects.

In November 1994, Dr. Gilles Thériault's group at McGill University reported an up-to-tenfold increased risk of lung cancer among Hydro-Québec and Electricité de France workers exposed to high-frequency transients (see *MWN,* N/D94). Thériault also reported a "very clear" exposure–response relationship.

In his paper, Miller noted a "suggestion of association"—a nonsignificant 80-90% increase—between lung cancer and high exposures to combined 60 Hz electric and magnetic fields.

As soon as the McGill paper was published, Hydro-Québec, which owns the data set, barred further study by Thériault (see *MWN,* N/D94). The stalemate continues. "I still believe that the pulsed magnetic fields are an important issue and that someone should follow it up," Thériault told *Microwave News* in July. "People may be suffering from something that could be brought under control."

Commentary

The Three Keys to EMF Epidemiological Studies: Exposure Assessment, Exposure Assessment, Exposure Assessment

The Ontario Hydro study (see p.1) puts a spotlight on the key issue for future epidemiological work: Are we measuring the relevant EMF exposures? Dr. Anthony Miller's results point to the importance of electric fields and show how sloppy exposure assessment can mask significant risks.

"When people say they've done a study that looked at magnetic fields and there's nothing there, I can't agree," Miller told *Microwave News*. "What our study says is, 'Well, you should have looked at electric fields, too.'" The Ontario Hydro study reveals that workers exposed to the highest levels of *combined* electric and magnetic fields had leukemia rates that were 11 times greater than expected.

"Miller's results support the notion that induced electric currents can affect human health, whatever their origins," commented Dr. Paul Héroux of McGill University, noting that both electric and magnetic fields can induce current flows in the human body.

Why have electric fields been ignored? Héroux offered an explanation: "These new results point to the troubling conclusion that the focus on magnetic fields may have resulted from political improvisation rather than thoughtful science." Héroux designed the Positron dosimeter used by Ontario Hydro, the only one that easily logs both electric and magnetic fields.

Miller also once again shows how job titles alone are at best vague measures of EMF exposures. "When you're assigning exposures retrospectively, you've got to be very careful not to rely only on job titles," he stressed. At least part of the solution lies in adding information on job location.

Miller makes this point elegantly in his paper with respect to high magnetic—but not electric—field exposures and leukemia risks. The odds ratio was 1.56 when he coupled job titles with job locations. In contrast, when only job titles were used, the risk fell to 0.97.

This is not the first time that researchers have documented how job titles can lead to erroneous results. For example, Dr. Birgitta Floderus of the National Institute for Working Life (NIWL) in Solna, Sweden, found that her study of EMF-exposed railway workers (see p.5) contradicted a similar report by Dr. Siv Törnqvist, also of the NIWL, completed the year before. While Floderus found excess cancers among railway workers, Törnqvist had not.

In 1994, the two researchers, working together, discovered that the types of work done by railway employees had changed between 1961 and 1979. In the early years, there were two engine drivers on each train. Later, there was only one. The displaced drivers either retired or were transferred to low-exposure jobs—but they retained their job title. On paper, they were still engine drivers.

Floderus and Törnqvist's joint assessment indicated higher chronic lymphocytic leukemia risks among drivers from 1961-69, but not from 1970-79. They concluded, "[T]his structural change of the industry...could dilute a potential effect."[1]

Later the same year, a team led by Dr. Patrick Breysse of Johns Hopkins University's public health school in Baltimore made a similar point regarding telephone linemen. Detailed measurements indicated that in the "lineworker" category, those with the "cable splicer" job title had distinctly higher EMF exposures, with average peaks of 99.2 mG, compared to 29.1 mG for "non-lineworkers." Central office technicians, categorized as linemen as well, also had elevated exposures, but other linemen had exposures similar to those in the non-lineworker job category.

Using job titles alone, Breysse's team had initially lumped workers with low- and high-exposure jobs together under the rubric of linemen. He found that the exposures of telephone lineworkers, thought to be higher than those of other workers, were often similar to those of non-lineworkers.

The Johns Hopkins group concluded further analyses should focus on cable splicers, and the use of vague job titles such as telephone lineworkers and non-lineworkers was "not appropriate."[2]

Importantly, the team had previously shown that it was the cable splicers and, to a lesser extent, the central office technicians who had elevated rates of leukemia.[3]

The elevated leukemia risk observed in the Ontario Hydro study may still be imprecise because of the difficulties associated with measuring electric fields—they are easily perturbed by body movements and by the location of the dosimeter. "Small electric field sensors worn on the body are not that reliable," said Michael Silva of Enertech Consultants in Campbell, CA. Ontario Hydro's Dr. David Agnew agreed: "As people move about, they move their arms and bend over. All these things influence the electric field measurement that you get on the monitor."

But Miller's study is still a wake-up call. The EMF–cancer risk may not necessarily be small for those who are exposed to relatively high electric and magnetic fields, which are still much lower than the exposures allowed by most health standards. If anything, the risks could be larger than the 11-fold increases reported by Miller.

In an interview, Dr. Gilles Thériault of McGill—who led the Hydro-Québec study—repeated one of the most basic lessons of epidemiology: "If there is an actual real association, then the more precise the estimate of exposure, the greater chance we have of seeing the real risk."

1. Birgitta Floderus, Siv Törnqvist and Carin Stenlund, "Incidence of Selected Cancers in Swedish Railway Workers, 1961-79," *Cancer Causes and Control, 5,* pp.189-194, March 1994. See *MWN,* M/J94.
2. Patrick Breysse et al., "60 Hertz Magnetic Field Exposure Assessment for an Investigation of Leukemia in Telephone Lineworkers," *American Journal of Industrial Medicine, 26,* pp.681-691, November 1994. See *MWN,* N/D94.
3. See *MWN,* N/D89 and J/A91.

Bioelectromagnetics Society Takes Stronger Stand on EMF Bioeffects After Members Criticize First Statement

The Bioelectromagnetics Society (BEMS) has issued a strongly worded statement in defense of research on EMF bioeffects. In a June 24 letter sent to all members of Congress, top BEMS officials point to public concern about links between EMFs and leukemia, breast cancer and Alzheimer's disease. They warn that "public statements by those...lacking in the requisite multidisciplinary expertise" might lead to cutbacks in research before these issues are resolved (see box at right).

Two months earlier, BEMS had staked out a much weaker public position in the controversy over EMF bioeffects and human health (see box at right). The society's board of directors adopted a statement on April 9 that was criticized by many members as too cautious. Criticisms were aired in public at BEMS' annual meeting June 9-14 in Victoria, Canada, as the board grappled with the research funding issue.

On the eve of the Victoria conference, Shirley Linde, chair of the National EMF Advisory Committee (NEMFAC), warned the BEMS board that funding for EMF bioeffects research was in serious danger. Linde attributed this to recent media coverage of the EMF issue, particularly the reporting on the statement by the American Physical Society (APS) and public television's *Frontline* show, both of which suggested that there are better ways to spend research money (see *MWN,* M/J95 and J/A95, respectively).

"I had members of Congress telling me that they had heard there are no biological effects, so why continue EMF research?" Linde told *Microwave News*. "I was getting statements from various funding sources that EMF scientists were either charlatans or prostitutes. Someone needed to provide a more balanced view." Linde is associated with a Los Angeles citizens group concerned about EMF risks.

The BEMS letter to Congress points out that EMFs can affect hormone levels, the immune system and the growth rate of cancer cells. It warns that if research is cut back while new communications and electronic technologies are being introduced, "international standards may be imposed before adequate scientific knowledge is available," adding that, "Failure to continue this research could ultimately result in extensive costs to the energy and communications industries, both in litigation and product development."

Both House and Senate appropriations committees later passed budgets that preserve most funding for EMF bioeffects research for fiscal year 1997, which begins on October 1, 1996.

The letter was signed by the newly installed president of BEMS, Dr. Richard Luben of the University of California, Riverside; his predecessor, Dr. Kjell Hansson Mild of the National Institute for Working Life in Umeå, Sweden; and the society's president-elect, Dr. Martin Blank of Columbia University in New York City. Luben succeeded Mild at the meeting in Victoria, and Blank will take over at next summer's conference.

Luben told *Microwave News* that the society is now working on a new public statement, which he hopes will be ready by the fall. "We were asked by the membership to make it more forceful," he explained. "The presidents' letter was a way of clarifying our position in the time between the previous and future statements."

The original statement was discussed by the BEMS board of directors for a few months before its adoption in April. It noted that concern about power line EMFs and cancer has been raised by epidemiological studies since 1979, and that "strong criticism" of these studies was "due primarily to [the] variability of results as well as the incomplete nature of laboratory data to support the specific cancer findings." It advocated further research to determine "whether adverse effects are (1) real and significant, (2) real but of minor importance or (3) nonexistent."

Even before the June meeting, some BEMS members were criticizing this statement as "extraordinarily weak" and "pretty bland." Board member Dr. Indira Nair of Carnegie Mellon University in Pittsburgh, who had worked on drafts that she considered weak, asked, "Why are we behaving like lawyers?"

In an outcry at BEMS' annual membership meeting on June 12, speakers described the board's statement as "very disappointing" and "less than inspiring" and insisted that it "should have been stronger." Several members argued that while there might be no consensus within BEMS on EMFs and cancer, it was important that the society challenge the idea that EMF bioeffects are either nonexistent or unimportant. Some called for "a strong rebuttal" to the APS statement. Mild closed the debate by saying that the board would discuss the issue when it met two days later. It then decided on the June 24 letter.

In an interview in May, Mild had noted that the society "includes respectable scientists with a wide variety of opinions" on EMF health risks. "The current body of evidence can reasonably be used to support...different tentative conclusions," he added, "depending upon one's assumptions and personal feelings on how to handle risk calculations in the absence of data." Board member Dr. Paul Gailey of Oak Ridge National Lab in Oak Ridge, TN, gave a similar assessment and said that the April statement had been "an effort to represent the diversity of views within BEMS."

Both Gailey and board member Janie Blanchard of Bechtel Corp. in San Francisco described the board's April statement as a response to the APS. But Dr. James Lin of the University of Illinois, Chicago, who helped to draft it, told *Microwave News,* "It was not intended to refute or confront any other statements, including the APS one." Luben offered that, "It was not necessarily a direct response to the APS statement, but that was part of the stimulus for it."

At the same time, Lin made a point of stating that, "Despite the recent arguments by some physicists that such effects are not possible and thus the health issue does not exist, the biological and epidemiological evidence continues to mount and the public concern does not decrease."

"It is necessary to clearly separate the official [APS] statement from all the other things that accompanied it," emphasized Mild, citing the background report written by Dr. David Hafemeister of California Polytechnic State University in San

Bioelectromagnetics Society: Two Statements

BEMS Board of Directors on EMF Issue

The following statement was unanimously adopted by the BEMS board of directors on April 9, 1996. The board is now working on a new statement (see opposite page).

The Bioelectromagnetics Society [BEMS] is a scientific society which was established in 1979 to promote the study of the interaction of electromagnetic energy with biological systems. The board of directors of [BEMS] is issuing this statement because we believe it is our responsibility to inform interested parties of the fundamental scientific issues that form the basis for public concern about possible health risks from exposure to electric and magnetic fields.

The health questions associated with exposure of individuals to extremely low frequency (ELF) electric and magnetic fields have been driven largely by cancer epidemiological studies. The first such study was reported in 1979 and a number of studies have appeared since with variable results. Strong criticism of these epidemiological studies has been due primarily to this variability of results as well as the incomplete nature of laboratory data to support the specific cancer findings. Additional difficulties in the evaluation of the epidemiological data are that the apparent increases in cancer are relatively low, and that there is at present no proven mechanistic explanation to support the epidemiological findings. The answers to these exposure and health questions can only be clarified through a well-coordinated and funded research program.

Both public concern and the potential cost of engineering mitigation are considerable. A large portion of the population of industrialized nations is exposed and thus potentially at risk. However, it is yet to be determined whether there is cause for concern or what the appropriate mitigation, if any, should be. Whether adverse effects are (1) real and significant, (2) real but of minor importance or (3) nonexistent must be determined by current and future research to allay public fears and to provide to industry a basis for appropriate response or action.

There have been many occasions in the history of science when distinguished scholars have argued that an observed phenomenon must be invalid on the basis of current understanding. A great deal is yet to be discovered about the interaction of EMFs with biological systems. These discoveries will only come through careful, competent investigation. It is imperative that good science be sponsored and conducted to answer these important health questions. These questions will continue to be important in public debate and continuation of good scientific research will significantly help to clarify these issues.

BEMS Presidents on EMF Bioeffects Research

The following letter was sent to all members of the U.S. Congress on June 24, 1996.

Public concern continues to grow about possible connections between exposure to electric and magnetic fields and such diseases as childhood leukemia, breast cancer and Alzheimer's disease. At the same time, daily exposure of the public to electric and magnetic fields is increasing rapidly due to new electronic and communications technology, more use of electric power and new medical applications of electric and magnetic fields. As leaders of the largest international scientific society studying biological effects of electric and magnetic fields, we are concerned about a potential decline in research in this area, due in part to public statements by those who we believe are lacking in the requisite multidisciplinary expertise.

The biological processes involved in human diseases are complex and multifaceted. Moreover, electric and magnetic fields, unlike many other environmental agents, are not characterized by a single quantity but involve many different factors. Proper approaches to such complex scientific questions can be achieved only by a multidisciplinary collaboration of biologists, physicians, engineers and biophysicists. A wealth of published, peer-reviewed scientific evidence indicates that exposure to different combinations of electric and magnetic fields consistently affects biological systems in the living body as well as in laboratories, including:

- Altering the function of nerve cells.
- Changing the density and healing rate of bone.
- Disturbing the balance of important hormones.
- Changing the growth rate and drug sensitivity of cancer cells.
- Modifying the immune system's ability to fight disease.
- Altering the heart rate.

There is a potential for benefits from these fields, as well as the possibility of adverse public health consequences. Understanding their biological effects may allow us to increase the benefits as well as mitigate the possible hazards. But these processes cannot be well understood without further research.

Major strides have been made in the past 20 years of research in this area. The program has only recently expanded to a critical mass of interdisciplinary and multi-laboratory effort that, in our opinion, must be continued. In this still emerging area of scientific research, controversy about reported results is a natural and healthy part of the scientific process. Such controversy should not be the basis for discarding programs of research before the important questions are answered conclusively.

We believe it is essential that research in this area be continued. Without U.S. government funding, the remaining available sources of funds are too limited, too focused by discipline and may in some cases carry questions of bias. The governments of other industrialized countries such as Sweden, Japan, Germany and Norway are presently spending significant amounts of money to further research in this area. But without U.S. leadership, the task of determining the potential health risks and benefits involved in the distribution and use of electric and magnetic energy will be difficult to complete.

We are also concerned that international standards may be imposed before adequate scientific knowledge is available. Failure to continue this research could ultimately result in extensive costs to the energy and communications industries, both in litigation and product development. Public concern can be reduced only when the issues and questions are resolved by careful research.

We ask that you take these views into account when making decisions regarding the future of research into the effects of electric and magnetic fields. The undersigned will be happy to confer with you in detail or provide any further information you may need in order to make an informed decision.

Sincerely yours,

Kjell Hansson Mild, PhD
President 1995-1996

Richard Luben, PhD
President 1996-1997

Martin Blank, PhD
President-Elect 1997-1998

Luis Obispo, the Internet news bulletin put out by APS information director Dr. Robert Park, who works in the Washington office of the APS, and other comments by individual APS members. Hafemeister's report was released along with the APS statement but was not endorsed by the APS Council (see *MWN,* M/J95), while the opinions in Park's bulletin are explicitly his own and not those of the APS (see also *MWN,* S/O 95).

"It is those [other] statements that sometimes make or imply the accusation that all of the positive low-field results in bioelectromagnetics are violations of physical law, artifacts or pseudoscience," Mild explained. "Most of the people making these statements have never done work in bioelectromagnetics, nor even in biophysics."

Linde voiced the same opinion, noting that funding officials "were coupling the statements of Hafemeister, Park and the APS Council as if they were the same thing." She said that while "the APS statement itself didn't say that much, the Hafemeister report was full of innuendos, half-truths and distortions."

Unlike the APS statement, which received widespread coverage, both BEMS statements have so far been completely ignored by the press.

« *Cellular Phone Notes* »

On June 5, the **CTIA** announced that it had approved a $6.7 million budget for its research organization, **WTR**, in its current fiscal year (which began on June 1). The press release stressed that this amount would keep the CTIA on schedule with its five-year, $25 million commitment for health research. But it will apparently take more than a press release to settle the CTIA/WTR financial dispute (see *MWN,* M/J96). WTR spokesperson **Michael Volpe** said in an interview that WTR has received only $2.4 million of this money, which "did not go much beyond enabling us to pay off our back debts." According to Volpe, WTR has spent $1.7 million on pacemaker research and $600,000 on litigation, a total of $2.3 million, "which the CTIA has stated will not have to come out of our research budget." CTIA President **Thomas Wheeler** confirmed that only $2.4 million was paid in June. The rest will be provided "on a quarterly schedule jointly agreed to by the CTIA and WTR," he wrote in response to questions from *Microwave News*. "It's perfectly true that WTR has legal bills and expenses on the pacemaker work," said CTIA spokesperson **Tim Ayers**. "But they haven't billed us for that yet." When the bill is received, he added, "That'll be paid right away." Volpe would not comment further, noting only that, "The money determines the amount of work that WTR does."

«« »»

A **WTR** meeting on electromagnetic interference (**EMI**) from cellular phones to **cardiac pacemakers** has been postponed from July 16 to September 30. A WTR statement attributed the postponement to a need for "greater input from federal regulatory agencies and the pacemaker and cellular phone industries." WTR's Michael Volpe explained that researchers at the FDA, the Mayo Clinic in Rochester, MN, and the Mt. Sinai Medical Center in Miami Beach, FL, had "asked for more time so that they could complete some of their studies." WTR plans to issue a final report on its pacemaker research at the symposium (see *MWN,* M/J96). The meeting will take place in Washington. Contact: Mary Supley at (202) 833-2800, or look up WTR's Web site at <http://www. WTRLLC.com>.

«« »»

Interference with pacemakers will also be discussed on September 11 at a forum sponsored by the University of Oklahoma's **Center for the Study of Wireless Electromagnetic Compatibility** (EMC), which was established in 1994 by a number of telecom companies (*MWN,* J/A94). The session will address not only pacemakers but also medical devices in hospital settings and hearing aids. The meeting will be held in Washington, and the featured luncheon speaker will be **CTIA** President **Thomas Wheeler**. The next day the center will host a workshop at the offices of the CTIA on how to develop hospital EMI policies. The center has just issued Part I of a report titled *EMI Management in the Hospital Environment*. "The issue was brought to public attention by cell phone use," said Dr. **Ravi Ravindran**, the center's director, "but less than 5% of all medical equipment failures are due to cellular phones." Walkie-talkies used by emergency personnel, security guards, police and firefighters are a bigger problem because they use higher power levels, Ravindran said in an interview. "Electrostatic discharge is a bigger problem, too," he added. "Some hospitals are reacting by banning the use of cell phones and thinking the problem has been solved—when it has not. It takes a lot of work to develop more specific policies." The recommendations in Part I include: restricting the use of wireless devices in critical-care areas with a high concentration of medical instruments; establishing areas where wireless phones and walkie-talkies *can* be used; installing microcells within the hospital to make possible more widespread use of low-power wireless devices; and encouraging hospital staff to report all incidents of EMI to the FDA at (800) FDA-1088. Part II of the report, due out in the fall, will focus on how to develop a hospital EMI policy. The center will also provide computer software that can help make these decisions. To request the report, send a fax to (405) 325-2556, or e-mail to <shawkins@mailhost.ecn.uoknor.edu>. For more information on the Washington sessions, call Ravindran at (405) 325-2429.

«« »»

Another group has joined the fray over cellular tower siting regulations. The **Helicopter Association International** (HAI) wants legislation to give the Federal Aviation Administration and local zoning boards "uncompromised authority" in cellular tower siting cases. The industry group, based in Alexandria, VA, contends that the telecom act will facilitate the spread of cellular towers, posing a serious risk to helicopter safety. "What

Bulletin from BEMS

Motorola Keeps a Low Profile on Adey Animal Study Showing Tumor-Inhibiting Effect of Cellular Phone Radiation

Dr. Ross Adey's paper was arguably the most important presentation at the annual meeting of the Bioelectromagnetics Society (BEMS), held in Victoria, Canada, June 9-14. A press release was prepared, edited and reedited. A room was reserved for a press conference, which was canceled at the last minute.

It soon became apparent that Motorola in fact wanted to *avoid* publicity for this, its own major study, which showed that at least one type of cellular phone radiation does not promote brain cancer in lab animals.

With all the scare stories in the media about cellular phones and brain tumors, some were surprised that Motorola was not shouting the news from every hilltop.

Yes, Motorola was pleased with Adey's results, but there was a rub. The five-year animal study suggested that 836 MHz radiation, designed to mimic signals from a digital cellular phone, could in fact inhibit brain tumor development in rats (see *MWN,* M/J96). That is, there might be some kind of protective effect at work. And if so, the long-awaited paradigm shift could be at hand: Low-level RF/MW radiation could no longer be treated as biologically neutral.

A desire to downplay the results was apparent when Adey showed his slides. He said that rats given a cancer-inducing drug and exposed to the digital cellular phone signals had only four brain tumors, as compared to nine such tumors among the rats that were only given the cancer drug. The difference was suggestive but not statistically significant.

But the data in Adey's abstract, published before the meeting and distributed to attendees on registration, showed four additional tumors among the unexposed rats. When these are included in the statistical analysis, the difference between the two groups becomes 4 to 13—which *is* significant.

In his talk, Adey explained that the four other tumors were in the rats' spinal cords. And he stressed that "one can legitimately include spinal cords" in the comparison between the two groups of rats—as he had done in the abstract. After all, all the tumors arose from the same cell type (glial), and dosimetric analysis by Dr. Niels Kuster of the ETH in Zurich, Switzerland, had shown that the rats' spinal cords were exposed to the cellular phone radiation.

The apparent protective effect was also observed when no cancer drug was administered. In this case, too, Adey saw fewer tumors among radiation-exposed rats compared to controls.

Adey avoided the phrase "protective effect," explaining that the Food and Drug Administration (FDA) had warned that it would fall into "the snake oil category." The FDA had suggested "tumor-inhibiting" as preferable, Adey said.

But even this made the Motorola lawyers nervous. (One of them was at the BEMS meeting to keep a watchful eye on the presentation.) There were even rumors that the lawyers did not want Adey to mention the possibility that the radiation could have enhanced DNA repair. But if so, Adey did not play along. He speculated on various mechanisms that could explain the decrease in brain tumors.

In the end, however, Motorola's efforts at spin control won the day. The company issued no press release, and Adey's VA hospital in Loma Linda, CA, had only a three-paragraph statement. Only one small newspaper, *The Press Enterprise* in Riverside, CA, ran a story on the results—probably because Dr. Craig Byus, one of Adey's collaborators, is at the University of California, Riverside. And, other than a story in the trade newspaper *RCR* and a short item on CNN's financial network (and an article in the last issue of *Microwave News),* there was no further coverage of the results.

The significance of the Motorola study was not lost on those at the BEMS meeting. As Dr. Abraham Liboff of Oakland University in Rochester, MI, told the audience after Adey's presentation, such low-level effects fly in the face of the conventional wisdom that only thermal effects are relevant to public health. "This makes me absolutely sure that there could be a coupling between fields and tumor development," he said.

we're trying to prevent is the proliferation, without proper oversight, of dangerous obstacles to low-level flight....We can minimize this new and ominous threat to aviation and public safety if we can get the Congress to act quickly and responsibly," HAI President Frank Jensen Jr. said in a statement.

«« »»

Add another medical device to the list of items cellular phone users should be wary of: **aneurysm clips**, which are implanted in the brain to reinforce blood vessels. In a paper presented at the June Bioelectromagnetics Society meeting in Victoria, Canada, a group led by Dr. **Niels Kuster** of the **Swiss Federal Institute of Technology** (ETH) in Zurich reported that metallic implants can enhance the absorption of RF energy by a factor of four, when averaged over one gram of tissue. But, they warned, over smaller volumes, the energy absorbed can be enhanced by "a factor of several hundred." They cautioned that metallic eyeglasses and jewelry can, in certain cases, also cause significant enhancements. An aneurysm clip is probably the most common type of metallic implant in the head. **Janine Morris** of **FDA's Center for Devices and Radiological Health** in Rockville, MD, estimated that 15,000-18,000 clips are put in place each year in the U.S. She said that it is hard to say how many Americans have aneurysm clips because of the lack of long-term records and the fact that some people have had more than one clip implanted. "Until the health implications of strong, locally concentrated fields inside the human body are known, I would advise those with such implants against extensive use of mobile phones," Kuster told *Microwave News.*

New Cell Phone–Brain Cancer Epidemiology Study by WTR

Wireless Technology Research (WTR), the cellular telephone industry's research organization, announced on June 28 that it would fund a $419,000 case–control study of cell phone use and brain cancer risk. Results from the study, which will be conducted by the American Health Foundation (AHF) in New York City, are expected in about two years.

"We should be able to answer the question of whether short-term use of cellular telephones is related to the incidence of brain tumors," said AHF's Joshua Muscat, the project's director. Five hundred brain cancer patients and 500 controls will be interviewed at participating hospitals. The research design was developed in an AHF pilot study, funded by a $75,000 grant from the National Cancer Institute (NCI).

Last May initial results were released from an ongoing WTR-sponsored epidemiological study, a survey of 256,000 cellular phone customers being conducted by Drs. Kenneth Rothman and Nancy Dreyer and others at Epidemiology Resources Inc. (ERI) in Newton Lower Falls, MA (see *MWN,* M/J96). The ERI team found no increase in overall mortality from short-term use of hand-held cellular phones. The ERI and AHF studies have different designs and are each intended to shed light on the issue from a different angle. "Theirs is a population-based cohort study, while ours is a hospital-based case study," Muscat noted, "so the two should complement each other nicely."

Work on the ERI study was suspended in the spring due to an interruption in funding and privacy issues raised by the passage of the new telecom law. Dreyer, president of ERI, said that ERI is still waiting for its WTR money to be restored.

"We are trying to prioritize and balance WTR's research funding needs based on the amount of money we have received and which has been promised by the CTIA," said WTR spokesperson Michael Volpe. He said ERI should get more money once funding issues with the Cellular Telecommunications Industry Association (CTIA) and privacy questions are resolved.

Volpe stressed that sufficient funds are definitely available for the AHF study. "I checked with the lawyers and the bank before I sent out the press release," he told *Microwave News.* "This was ready to go for a couple of months—we were just waiting for an infusion of money into our escrow account."

Last year, an NCI research team pointed out that "the introduction and widespread use of cellular telephones are very recent phenomena," and that this limits what can now be learned from epidemiological research on cellular phones and brain cancer risk (see *MWN,* M/A96 and M/J96; also S/O95). Volpe argued that, "WTR would be remiss in its public health responsibility if it didn't study this issue." He explained that, "Since we don't know what kinds of cancer mechanisms might be involved here, it makes good scientific sense to look at brain cancer, no matter what the latency period."

"The etiology of brain tumors remains largely unknown," said Muscat, "and we know little about the possible health effects of EMFs. So we don't know enough to conclude that it's too early for epidemiological studies." He added that potential long-term effects will need to be studied in the future.

Norwegians Study Possible RF/MW Link to Birth Defects

Norway's defense department has begun a study of a potential link between RF/MW radiation and birth defects among children of 30,000 naval officers over the last 30 years. Onboard radio transmitters, radar and electronic equipment are all under investigation, navy Captain Stig Morten Karlsen in Oslo told *Microwave News.*

The study was spurred by a chance discovery in which two officers from the motor torpedo vessel *Kvikk* met at a clinic in Bergen and found that they each had a child with clubfoot, according to the Swedish newspaper *Svenska Dagbladet* (July 4). The two men brought this to the attention of the Norwegian navy, which then ordered an investigation. Soon, three more officers from the *Kvikk* were found to have children born with clubfoot. To date, 82 cases of birth defects, including clubfoot, heart and central nervous system defects, brain dysfunction and hydrocephalus, have been identified among children of navy personnel.

"We are working from the hypothesis that electromagnetic radiation is responsible," Jan Helge Halleråker, a naval captain and chief medical officer, told *Svenska Dagbladet.* Interestingly, the study has received very little attention in the Norwegian press.

When the cluster was reported at a recent NATO meeting in Brussels, Belgium, a decision was made to use radio transmitters at half-power on all ships, *Svenska Dagbladet* reported. After the investigation began, the Norwegian navy took RF/MW radiation measurements on the ships and marked potential "danger" areas for the crews to avoid, Karlsen said.

The data analysis is under way but is not expected to be completed until 1998. The research is being coordinated with a larger RF/MW study, which includes other NATO countries.

In spite of the discovery of the *Kvikk* cluster, Karlsen remains cautious about linking it to RF/MW radiation: "So far, no one in Norway or anywhere else in the world can say that this has anything to do with birth defects."

The incident is similar to one reported 25 years ago in the United States. In 1971, Dr. Peter Peacock, then chairman of the Department of Public Health and Epidemiology at the University of Alabama, Tuscaloosa, identified 17 cases of clubfoot among helicopter pilots' children born between July 1969 and November 1970 at the Lyster Army Hospital in Fort Rucker, AL.

In a report for the Environmental Protection Agency, Peacock noted that one of Fort Rucker's "unique characteristics" is the prevalence of radar—46 installations within 30 miles of the base. He theorized that helicopter pilots would have relatively high RF/MW exposures, because they fly at low altitudes, where radar radiation is greatest, for long periods of time. In addition to clubfoot, Peacock turned up defects in the infants' hearts, genitals and circulatory and respiratory systems.

Peacock repeatedly sought to follow up this work, but each time he was denied access to military records and documents by the Army Medical R&D Command. "The Army closed down on us—they refused to give us access to their records," Peacock said in an interview in July. Peacock, now retired, speculated,

"My guess is that the Army was afraid of the possibility of someone suing them if a link was found." His travails were reported in detail in Paul Brodeur's 1977 book, *The Zapping of America.*

Some are optimistic that the Norwegian study will not meet the same fate as Peacock's effort. "Norway is a small and 'open' country, where these kinds of facts are hard to cover up," according to Leif Södergren of the Association for the Electrically- and VDT-Injured in Göteborg, Sweden.

FCC Adopts RF/MW Rules *(continued from p.1)*

cations services (PCS) hand-held telephones be tested to assure that users are not exposed to a specific absorption rate (SAR) over 1.6 W/Kg. Compliance may be shown with laboratory measurements or by computer modeling. The FCC followed the recommendation of the Food and Drug Administration and rejected an exclusion clause for low-power devices—allowed under the ANSI/IEEE standard.

"We are not routinely going to require SAR data for phones already on the market," Dr. Robert Cleveland, who led the FCC's effort to write the new rules, told *Microwave News.* "However, if we have reason to believe that any of these phones are not in compliance, we may ask for more information from the manufacturers."

In other major provisions of the new RF/MW rules, the FCC:

• Denied requests to extend federal preemption of state and local RF/MW health regulations for personal wireless services to all communications facilities—for instance, radio and television towers. Preemption of state and local RF/MW rules for cellular and PCS towers was mandated by the Telecommunications Act of 1996 (see *MWN,* M/J95 and M/A96).

• Acted "out of an abundance of caution" to require routine evaluation of cellular and PCS antennas if they are mounted lower than 10 meters above the ground and have a total power output over 1 kW.

• Generally endorsed the distinction between "occupational" and "general population" exposures used by the NCRP instead of the "controlled"/"uncontrolled" dichotomy cited by ANSI/IEEE.

• Set limits of 1 mW/cm^2 for public exposures and 5 mW/cm^2 for occupational exposures above 1500 MHz (which are up to ten times more stringent than those recommended by ANSI/IEEE) for continuous exposures.

• Rejected special consideration of modulation effects as "premature."

Although all four sitting members of the FCC approved the new rules, Commissioners Rachelle Chong and James Quello issued a separate statement, noting that their decision "does not in any way diminish our support for the ANSI standard-making process or the latest 1992 ANSI standard."

The new FCC RF/MW rules, which take effect on August 6, were issued as *Microwave News* went to press. Further coverage will appear in our next issue. All 108 pages of the FCC rules are available on the Internet in the Office of Engineering and Technology section of the FCC's World Wide Web site at <http://www.fcc.gov>.

Cell Phone RF Tests Required—But Who and How To Do Them?

All cellular phone manufacturers must now certify that their products comply with the FCC's new RF/MW rules (see p.1). What the commission does not specify, however, is how to demonstrate compliance.

The two main methods of RF exposure assessment—both allowed by the FCC—are computer modeling and direct measurement. "The results of numerical techniques differ sometimes from experimental results," noted Ron Petersen of Lucent Technologies in Murray Hill, NJ. Until this spring, the Cellular Telecommunications Industry Association (CTIA) was funding a research program designed to resolve these discrepancies. But after the CTIA cut off funding for this work, its research group, WTR, canceled all related contracts (see *MWN,* M/J96).

Two days before the FCC decision was announced, the CTIA took the position that it is not important which technique is used. CTIA President Thomas Wheeler refused to be interviewed, but gave this written response to questions from *Microwave News:* "There are multiple exposure-measurement techniques which have been developed. The important fact is that all phones must meet the [new] standards."

Another unresolved question about certification is who will do it. CTIA spokesperson Tim Ayers had predicted that if the FCC allowed manufacturers to do it themselves—as it now has—then the CTIA would not conduct industry-wide RF testing. "If self-certification is an option, then it's probably not worth it for us to get into it," Ayers said, adding, "We'll only do the testing ourselves if there's a market for it."

This represents a shift for the CTIA, which had told the FDA in 1994 that it planned to add RF exposure testing to its existing equipment certification program. In 1995, the CTIA asked Aprel Labs of Nepean, Canada, to get ready to perform these tests—but on January 26, 1996, the CTIA abruptly put the project on hold.

"It was a 'go' one day and a 'no go' the next," Aprel President Kathy MacLean told *Microwave News.* MacLean said that she had sent her staff to a training course at Motorola to learn how to use the robot measurement system developed by Dr. Niels Kuster of the ETH in Zurich, Switzerland. MacLean contended that reliance on mathematical calculations is "not acceptable when it comes to handsets."

An observer, who asked not to be identified, offered this explanation of the CTIA's changing plans: "The CTIA viewed RF certification as a revenue source. But it underestimated how strongly manufacturers felt about handling this themselves."

Petersen said that Lucent is now planning to fund research by Dr. Kenneth Foster that was halted when WTR cut off his funds in April (see p.10, p.15 and *MWN,* M/J96). WTR will not be involved, and, Foster told *Microwave News,* that he prefers it this way. Petersen maintained that Lucent is still interested in helping WTR to raise industry money for dosimetry research. "But we haven't got a commitment from other manufacturers yet, and we feel we have to get this work moving."

WHO Launches $3 Million Project on EMF and RF/MW Health Effects

The World Health Organization (WHO) has embarked on a five-year, $3.3 million project to examine the status, and plan the future, of EMF health effects research. The decision was announced shortly after a May 30-31 preparatory meeting at WHO headquarters in Geneva, Switzerland, which was attended by representatives from 23 countries, including Mary Beth Jacobs of the U.S. Food and Drug Administration (FDA).

The study, which will cover research on both extremely low frequency (0-300 Hz) and radiofrequency and microwave (300 Hz-300 GHz) radiation, will be led by Dr. Michael Repacholi, on leave from the Royal Adelaide Hospital in Adelaide, Australia.

"For the first time, we will have an international focus to clarify the science of EMFs," Repacholi told *Microwave News*. The project will involve a number of steps—for example, meeting to gain an overview of the science, identify gaps in knowledge, prioritize needs, produce generic research protocols and encourage support for future studies, Repacholi said.

The WHO has scheduled a seminar, titled *Biological Effects on Nonthermal Pulsed and Amplitude-Modulated RF Electromagnetic Fields and Related Health Risks,* for November 20-22 in Munich, Germany. Speakers will include Drs. Martin Blank, Kenneth Foster, Konstantin Hossman, Kenneth Rothman and Thomas Tenforde.

Financial support for the project has been pledged by Australia, Ireland, Sweden and the U.K., with Austria and Germany funding specific activities. Repacholi noted that the U.S. has yet to give money, but he is still optimistic that the FDA and the FCC will contribute. France has not decided whether it will support the project.

For more information, contact: Repacholi, Office of Global and Integrated Environmental Health, WHO, 1211 Geneva 27, Switzerland, (41+22) 791-3427, Fax: (41+22) 791-4123, E-mail:<repacholim@who.ch>. The WHO can now be reached on the World Wide Web at: <http://www.who.ch>, but Repacholi is planning a separate home page for the EMF project.

FROM THE FIELD

Clippings from All Over

"Alexander Graham Bell didn't have to go before a zoning board and describe a telephone pole or put on the kind of show we're being forced to.... It's an incredible impediment—an incredibly unnecessary impediment."

—Priscilla Triolo, attorney for Bell Atlantic–Nynex, on community opposition to a proposed cellular phone tower in Wyckoff, NJ, quoted by John Keller in "Bad Reception: With Cellular Towers Sprouting All Over, Towns Begin To Rebel," *Wall Street Journal,* p.1, July 2, 1996

Yesterday I saw a man standing bareheaded in the midday sunshine while using a mobile phone and smoking a cigarette. Would anyone care to estimate his life expectancy?

—Tom Baldwin, in a letter, "Risk Assessment," to *The Times* (U.K.), July 2, 1996

The question about radiotelephones' impact on human health remains unanswered. Practically all groups insist on continuing experiments to determine the causative connection between use of radiotelephones and changes in human health. We think that the research will cost less than curing "fried" brain and compensating thousands of people.

—Aleksey Savin, "Could a Cellular Phone Be a Cause of Brain Cancer?" *Izvestia* (Moscow, Russia), p.9, June 19, 1996

[I]f Iridium goes ahead as planned, it will be piracy in the radio spectrum, it will make a mockery of the [International Telecommunication Union] and its radio regulations, and it will be a disaster for radio astronomy.

—John Ponsonby, Onsala Space Observatory, Onsala, Sweden, in a letter, "Motorola Versus Radio Astronomy," to *Nature* (U.K.), p.550, June 13, 1996 (see p.15)

Until clarifying results are obtained, governments must make a decision as to which, if any, regulations or policies are warranted. Formal risk assessments, as some call for, are difficult to interpret in light of the imprecise and sometimes contradictory study results. In my view, in light of the positive data, limited action is called for. Whether the underlying risk factor for the observed childhood leukemias is magnetic field exposures or not, the evidence shows that these cancers are indeed correlated with high wire codings and thus possibly with the presence of magnetic fields. Therefore, where we can reduce exposures at low cost and low inconvenience, we may substantially reduce future disease. Even if the association proves spurious, this strategy of limited, low-cost action will not have had a large impact on society.

—Dr. Daniel Wartenberg, Environmental and Occupational Health Sciences Institute in Piscataway, NJ, "EMFs: Cutting Through the Controversy," *Public Health Reports,* p.216, May/June 1996. Wartenberg is a member of the NAS-NRC EMF committee.

...EMF personal injury litigation is likely to continue for many years to come. An esteemed scientist once explained that public health issues do not die a sudden death, but rather die from years of neglect. We cannot and should not expect one study or several studies to put an end to either the EMF health debate or EMF litigation. Nor is the "neglect stage" anywhere in sight. We should instead expect a protracted battle over EMFs. The science of EMFs is a critical weapon for both sides in most, if not all, aspects of this battle.

—Mark Warnquist, Russell Yates and Chad Neuens, lawyers at LeBoeuf, Lamb, Greene & MacRae in Denver, CO, "The Role of Science in EMF Litigation," *IEEE Engineering in Medicine and Biology,* p.69, July/August 1996

Don't count on melatonin to make you live longer, improve your sex life, cure cancer or lower your cholesterol. There is little scientific basis for sensational claims for melatonin's health benefits reported recently in the popular press. These claims are based on anecdotal reports ("I tried it and it worked"), animal research—some of it flawed—and pure speculation.

—From "Melatonin—1996: Frequently Asked Questions," a brochure published by the *Society for Light Treatment and Biological Rhythms,* based in Wheat Ridge, CO, July 15, 1996

Letter to the Editor

WTR v. NYPLP

June 27, 1996

To the Editor:

The well-publicized problems with Wireless Technology Research Inc. (WTR)—which is leading an industry-sponsored research program on health effects of cellular phones—raise the question as to whether there might be another model for such an effort. Indeed there is: the New York State Power Lines Project (NYPLP).

This five-year program was established in February 1980 with $5 million in research funds from the settlement of a lawsuit against a proposed 765 kV power line. It funded 16 research projects, including two major epidemiology studies (the studies by Dr. Richard Stevens and by Dr. David Savitz), a long-term animal study, a human study, primate studies, a variety of *in vitro* studies and important studies on dosimetry. A series of lengthy final reports was published in 1987. In addition, I counted nearly two dozen papers in peer-reviewed journals citing funding from this source. By and large, the quality of these studies was very high.

How could the project accomplish so much with fewer resources than those promised to WTR (even taking inflation into account)? It had much less infrastructure. The project was administered by Dr. David Carpenter, a talented scientist-administrator, with the help of an advisory committee of eight scientists. No doubt, New York state provided considerable in-kind administrative support. In contrast, WTR has a large infrastructure to support. Carpenter also had a guaranteed source of funds, which WTR apparently lacks.

But there are also differences in scientific philosophy as well. Carpenter came from a background of research science (he was briefly my boss at the Armed Forces Radiobiology Institute, and before that he was at the National Institutes of Health). Dr. George Carlo, the head of WTR, came from a background in regulatory science. Regulatory science differs from research science in the strict bureaucratic controls it imposes on research (such as the insistence on Good Laboratory Practices), which naturally drive up costs and reduce flexibility. The NYPLP enforced scientific quality by carefully selecting projects to fund, scheduling occasional site visits and providing engineering support to investigators.

The ultimate success of WTR can only be judged according to its goals—what information it is supposed to produce, at what level of reliability and for whose use. But in terms of the amount of high-quality research it supports on an issue that the public views as important, the NYPLP will certainly come out ahead by a large margin. The public, I suspect, would judge the NYPLP to be far more effective, and I suspect that the industry sponsors of WTR would also.

Kenneth R. Foster, PhD
Department of Bioengineering, University of Pennsylvania
220 S. 33rd St., Philadelphia, PA 19104-6392
E-mail: <kfoster@eniac.seas.upenn.edu>

Dr. Foster's research contract with WTR was abruptly canceled in April (see p.13 and MWN, *M/J96). For more on the NYPLP, see* MWN, *F81, Ap82, J/A87, N/D88 and M/A90.*

UPDATES

BREAST CANCER

Battelle Visits Löscher's Lab... In late July, Dr. Larry Anderson of the Battelle Pacific Northwest Labs in Richland, WA, began a set of six-month studies to examine the combined effects of magnetic fields and the carcinogen DMBA on the incidence of breast cancer in rats. Animals were treated with a single 10 mg dose of DMBA and are being continuously exposed to fields of 50 Hz at 1 G, or 60 Hz at either 1 or 10 G. In a set of three-month studies, which Anderson plans to start in August, the animals will be exposed under the same conditions but will be given four 5 mg doses of DMBA. The three-month study at 50 Hz will be an exact replication of the work of Dr. Wolfgang Löscher and colleagues at the School of Veterinary Medicine in Hannover, Germany, who found that EMFs can promote the action of DMBA, increasing the risk of breast cancer in rats (see *MWN,* J/A93, J/F95, M/A95, J/A95 and M/A 96). In preparation for these experiments, Anderson's colleagues, Drs. James Morris and Richard Stevens, visited Löscher's lab to ensure that the conditions at Battelle would be as similar as possible to those in Germany. Stevens told *Microwave News* that his intent had been to record the strain of rats, the DMBA doses and the magnetic field exposures. He noted that he was impressed by what he had seen in Hannover. "Löscher has done these experiments very carefully and very well," Stevens said. Meanwhile, Löscher and Dr. Meike Mevissen are completing the data analysis of a replication of their 1 G, 50 Hz study with funds from the U.S. Department of Energy. In an article published in the May 1996 issue of *Carcinogenesis (17,* pp. 903-910), Löscher and Mevissen concluded that rats exposed to 500 mG had a higher incidence of breast cancer than did rats exposed to 100 mG, but a lower incidence than those exposed to 1 G, providing evidence for a dose–response relationship.

CELLULAR PHONE INTERFERENCE

Astronomers Wrangle with Iridium... Motorola's Iridium satellites are based on a flawed design that will cause unacceptable interference with neighboring parts of the radio spectrum, according to a letter in the June 13 issue of *Nature*. Dr. John Ponsonby of the Onsala Space Observatory in Onsala, Sweden, warns that the resulting interference with radio astronomy will violate the rules of the International Telecommunication Union (ITU), which allocates frequency use on a global basis. Ponsonby explains that the problem stems from Iridium's use of high-efficiency power amplifiers together with composite signals, which combine several transmissions destined for different subscribers. He states that, "This inevitably leads to 'intermodulation distortion'—spurious frequency components

are generated both inside and outside the band occupied by the intended signals." Ponsonby concedes that an output filter on each amplifier could remove the "out-of-band" signals. But he notes that since each Iridium satellite uses many individual amplifiers, this would probably add too much weight to be practical. How much out-of-band interference will there be? Since it depends on the level of phone traffic, Ponsonby calls it "hard to estimate," but contends, "Typically, it might be 1,000 times above the level acceptable [for radio astronomy], and it therefore would amount to total jamming of the band." On April 18, *Nature* reported that Europe's Committee on Radio Astronomy Frequencies (CRAF) had asked Motorola to limit the number of Iridium users on the system at times of peak traffic in order to minimize this type of interference. "But such a solution is clearly not compatible with a commercial aim of maximizing revenue," wrote correspondent Alison Abbott. In a 1994 agreement with the U.S. National Radio Astronomy Observatory (NRAO), Motorola promised at least four hours of zero interference per day—during times of least phone use. "We have coordinated with radio astronomy sites in the U.S. and have every intention of coordinating with radio astronomers worldwide," John Windolph, Iridium's director of marketing and corporate communications, said in a telephone interview from the company's headquarters in Washington. He explained that Iridium will pay for a beacon at each radio astronomy site: "When the subscriber's phone detects the beacon, it ratchets up to a higher part of the spectrum so it won't interfere." How will this change Iridium's downlink—the satellite-to-earth transmissions that are the focus of Ponsonby's critique? "If you take the handset out of the equation, you don't have a problem," Windolph asserted. "The satellite transmission alone doesn't cause the interference. It's the interaction between satellite and handset transmissions, which are in the same bandwidth, that causes a potential problem." However, NRAO spokesperson Dave Finley, in Socorro, NM, maintained that, "It is expected that intermodulation products of the Iridium downlink will appear within the radio astronomy band during times of high satellite usage." Finley told *Microwave News* that the NRAO will be "working with Motorola on tests to measure the interfering emission levels" when the Iridium system enters its test phase. (See p.14 and *MWN,* J/A95.)

ELECTRIC BLANKETS

Mothers' Use Not Linked to Childhood Cancer...A recent study of exposures to electric blankets and water bed heaters *in utero* and after birth suggests that they do not promote brain tumors in children. A team led by Dr. Susan Preston-Martin of UCLA's medical school investigated 540 children under the age of 19 living on the West Coast of the United States who were diagnosed with cancer between 1984 and 1991. The report, published in the *American Journal of Epidemiology (AJE, 143,* pp.1116-1122, June 1, 1996), indicates that the risk of brain cancer did not depend on the trimester of the pregnancy in which the exposure occurred. Similarly, there was no rise in the rate of brain cancer among children directly exposed to water bed heaters or electric blankets—compared to the 801 children in the control group. These results stand in contrast to the findings of the first study of this kind: Six years ago, Dr. David Savitz of the University of North Carolina, Chapel Hill, reported *(AJE, 131,* pp.763-773, May 1990) that children exposed *in utero* to electric blanket EMFs had a two-and-a-half times greater than expected risk of developing brain tumors (see *MWN,* M/J90). "Their study provides credible evidence against an association," Savitz told *Microwave News,* "just as ours provided some evidence in support."

MEDICAL DEVICES

OrthoLogic Under Scrutiny... On May 31, the FDA issued OrthoLogic Corp. a "warning letter" threatening regulatory ac-

"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

• A former radar repairman wins a $200,000 out-of-court settlement from General Electric Co. and Western Electric Co. after he charged that his deafness, bleeding eyes and systemic hemorrhaging were due to 14 years of RF/MW radiation exposure from a Nike Hercules radar.

• A NIOSH RF/MW criteria document is delayed by the Reagan administration's proposal to move the institute from Washington to Atlanta.

Years 10 Ago

• Shipbuilders at the Bath Iron Works in Portland, ME, report facial burns, headaches, irritated eyes, nausea and exhaustion after spending a rainy March morning working near a U.S. Navy ship with its radar accidentally turned on.

• The EPA proposes four options for public RF/MW exposures: maximum SARs of 0.04, 0.08 or 0.4 W/Kg, or setting no limit at all.

• Human tumor cells exposed to power-frequency EMFs proliferate more easily and are more immune to attack, according to Dr. Jerry Phillips of the Cancer Therapy and Research Foundation in San Antonio, TX.

Years 5 Ago

• An animal study by Drs. Jack McLean and Maria Stuchly of Health and Welfare Canada in Ottawa and a cell-culture study by Dr. Chris Cain of the VA Hospital in Loma Linda, CA, independently show that ELF magnetic fields can act in concert with the carcinogen TPA to promote cancer development.

• The U.S. Congress, the General Accounting Office and the FDA investigate scores of fatalities that occurred after apnea monitors—devices that detect respiratory failure—did not respond due to EMI.

• Telephone line workers have higher mortality rates from leukemia than other telephone company employees, according to Dr. Genevieve Matanoski and colleagues at Johns Hopkins University in Baltimore.

tion if the company did not retract "misleading" information about its Model 1000 Bone Growth Stimulator, which uses magnetic fields to increase the synthesis of growth factor IGF-II. In the letter, Lillian Gill, director of the Office of Compliance at FDA's Center for Devices and Radiological Health in Rockville, MD, questioned the company's claims that the device has a 78% success rate with an average treatment time of 4.1 months and that it was approved by the FDA for areas other than the arms and legs. Dr. Allan Weinstein, CEO of OrthoLogic, did not make the letter public, telling the *Wall Street Journal* that he did not believe it would have a "material adverse effect" on the company. Nevertheless, he later admitted to the *Journal* that while the letter was still under wraps, he sold 50,000 shares of OrthoLogic, claiming to have done so in the interest of "portfolio diversification." When the warning letter was leaked to the press in mid-June, the price of OrthoLogic shares tumbled—falling from $23.75 to $14.88 over a two-day period (all prices are adjusted to reflect a two-for-one stock split in late June). The shares, which had risen from $2.50 to $26.75 in the last year (see *MWN,* M/J96), leveled off at about $8-$9 at the end of July. Meanwhile, Weinstein has been replaced as president and chief operating officer by George Oram Jr.—who was previously with OrthoLogic's competitor, EBI Medical Systems Inc. in Parsippany, NJ. Weinstein remains with the company as chairman and CEO. OrthoLogic now faces lawsuits from disgruntled shareholders who charge that Weinstein and other company officials sold their shares to avoid losses totaling over $2 million.

MEETINGS

Coghill Congresses... The *1st World Magnetotherapy Congress,* which was held at the headquarters of the Royal Society of Medicine in London, U.K., May 7-8, attracted 60 delegates from 12 countries. The event, which included 16 papers on the use of magnetic fields to aid the body's healing processes, was sponsored by Coghill Research Labs in Gwent, U.K. Dr. Martin Blank of Columbia University's medical school in New York City, the president-elect of BEMS, chaired the meeting. He praised Roger Coghill for having "brought together a lot of new and not-so-new ideas." Coghill is already planning his next conference: the *1st World Congress on Bioelectromagnetics in Nature,* to be held in London, May 8-9, 1997. For more information, or to order the proceedings of the Magnetotherapy Congress ($60.00), contact: Coghill Research Labs, Lower Race, Gwent, Wales NP4 5UH, U.K., (44+1495) 763-389, Fax: (44+1495) 769-882, E-mail: <100771.1170@compuserve.com>.

Bioeffects Symposia... As the *25th General Assembly of the International Union of Radio Science* (URSI), to be held in Lille, France, draws near, presentations from a 1993 symposium in Fukuoka, Japan, which was held after the 24th assembly in Kyoto, have been published. The 243-page volume, titled *Biological Effects of Magnetic and Electromagnetic Fields,* was edited by Dr. Shoogo Ueno of the University of Tokyo and is comprised of 16 papers. Several Japanese authors are featured, including Drs. Ueno and Masakazu Iwasaka on "Magnetic Nerve Stimulation and Effects of Magnetic Fields on Biolog-

ical, Physical and Chemical Processes" and Drs. Masamichi Kato and Tsukasa Shigemitsu on "Effects of Exposure to a 50 Hz Magnetic Field on Melatonin in Rats." To order a copy, contact Plenum Publishing Corp. at (800) 221-9369, or send $79.50 to Plenum, 233 Spring St., New York, NY 10013.

Workshop on Interaction Mechanisms...COST 244 on Biomedical Effects of EMFs—part of the European Cooperation in the Field of Scientific and Technical Research—is organizing a workshop on *Delineation of Differences in the Mode of Energy Coupling and Mechanisms of Interaction at ELF and RF,* to be held in Zagreb, Croatia, October 5-6. Also on the agenda is a roundtable discussion comparing various measurement standards. The official language of the workshop will be English, and there will be no registration fee. For more information, contact: Dr. Dina Simunic, Faculty of Electrical Engineering and Computing, University of Zagreb, Unska 3, HR-10000 Zagreb, Croatia, (385+1) 6129-789, Fax: (385+1) 6129-606, E-mail: <dina.simunic@fer.hr>; or look up <http://pubwww.srce.hr/cost244/zgwork> on the World Wide Web.

Lawyers Unplugged... The Environmental Law Center at Vermont Law School is holding a conference, *Unplugged: Health and Policy Implications of the Wireless Revolution,* at the Killington Ski Resort, November 15-16. Among those speaking will be Dr. Stanislaw Szmigielski and attorney Anthony Roisman. For more information, contact: Clare Kelsey, Public Interest Law Cooperative, PO Box 1, Strafford, VT 05072, (802) 765-4409, Fax: (802) 765-4509, E-mail: <cckelsey@sover.net>.

PEOPLE

After turning 65, writer **Paul Brodeur** has retired from *The New Yorker.* His three books on EMFs, *The Zapping of America* (1977), *Currents of Death* (1989) and *The Great Power Line Cover-Up* (1993), were all excerpted in the pages of the magazine prior to their publication. A novelist before he began to write about EMFs, Brodeur was on the staff of *The New Yorker* for 38 years. He is now finishing a memoir, which is slated for publication next year....Dr. **Martin Blank** of Columbia University's medical school in New York City is the new president-elect of the Bioelectromagnetics Society. Blank won a three-way election, beating out Dr. **Q. Balzano** of Motorola and Dr. **John Osepchuk**, who recently retired from Raytheon Co. Blank takes over from Dr. **Richard Luben**, the current president, next June....**Thomas Maney**, a former chairman of the board of directors of the EMR Alliance, died on June 5 of a heart attack at the age of 72. Maney, who lived in Fort Walton Beach, FL, was vice president of the Florida Undergrounders Inc. Most recently, he was the author of "Benefits of Urban Underground Power Delivery," which appeared in the spring 1996 issue of *IEEE Technology and Society Magazine*....**Gary Taubes**, a contributor to *Science* and *Discover* magazines, is making news, rather than just writing about it. Taubes has long been a skeptic and critic of EMF health effects, most notably in "Fields of Fear," which appeared in the November 1994 issue of *The Atlantic*. But the spotlight now shining on him has nothing to do with EMFs—rather the controversy cen-

ters on a profile of Dr. **Stanley Prusiner** written by Taubes a decade ago. Prusiner, a neurologist, has spearheaded the prion hypothesis—that there exist infectious proteins. When first proposed, the theory was regarded as heresy, but it is now mainstream science. Some still maintain that the prion hypothesis is the "cold fusion" of infectious diseases, according to a detailed special report in the July 12 issue of *Science*. But Prusiner, the world's leading prion scientist, refused to be interviewed by *Science*. The reason, according to several of his colleagues, is that Prusiner has never gotten over a decade-old profile by Taubes, in *Discover,* "The Name of the Game Is Fame, But Is It Science?" *Science* correspondent Rosie Mestel explained that, "Taubes reported in his story that Prusiner's forceful personality and a flair for public relations, rather than the scientific merit of his work, was behind the growing prominence of the hypothesis." Prusiner won the Lasker Award two years ago and is said to be on the short list for a Nobel Prize.

POLICE RADAR

Another Lawsuit Voluntarily Dismissed... On May 29, a federal court in South Carolina agreed to the dismissal of a lawsuit against Kustom Signals Inc., a manufacturer of police radar equipment—a dismissal requested by the plaintiffs. The suit had been brought on behalf of the wife and child of Danny Farr, who had worked for the South Carolina Highway Patrol and died of testicular cancer in May 1995. Attorney John Kassel of Suggs & Kelly in Columbia, SC, asked that the suit be dismissed without prejudice, meaning that it could be refiled at a later date. Judge Joseph Anderson granted the request, but with certain conditions. Before Farr's family could refile such a suit in the future, they would have to pay Kustom for its court costs to date, plus an additional $2,000 for what the judge called "a partial attorney's fee." Kustom attorney Mark Oium, of O'Connor, Cohn, Dillon & Barr in San Francisco, said that he knows of no personal injury lawsuits now pending against Kustom or any other police radar makers. "I think the bloom is off the radar litigation rose," he commented in a telephone interview. "There doesn't seem to be a lot of enthusiasm out there for filing these lawsuits." Kassel did not return phone calls requesting comment. In January he told *Microwave News* that "these are tough cases," noting that there is a lack of research on the health effects of radar.

STANDARDS

Hearing Aid EMI...IEEE committee C63.19 is preparing two standards addressing compatibility between hearing aids and wireless technology. One of these, *Method of Measurement for Hearing Aid Compatibility with Wireless Communications,* is a protocol for making measurements, while the other, *Limits for Hearing Aid Compatibility with Wireless Communications,* is a set of guidelines to prevent interference. The committee had an organizational meeting in late June in Minneapolis and will convene again in August in Santa Clara, CA, according to one of its cochairs, Dr. Stephen Berger of Siemens Rolm Communications in Austin, TX. Berger told *Microwave News* that he expects the standards to be finished by fall 1998.

CLASSIFIEDS