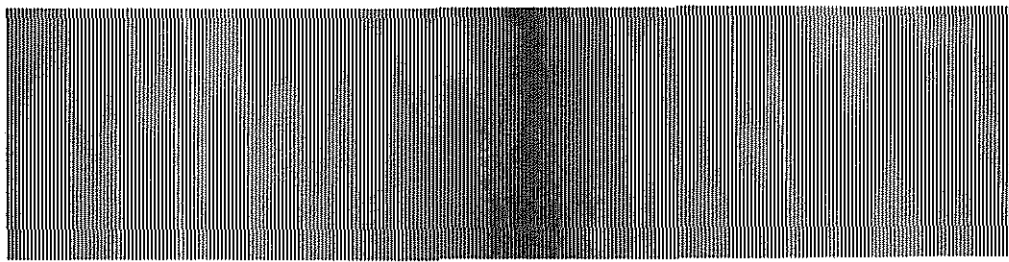


# MICRO WAVE NEWS



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## Research Promised as Cellular Phone Industry Faces Safety Questions

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

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

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

(continued on p.8)

### Commentary

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

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

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

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

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

(continued on p.11)

## « Power Line Talk »

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

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Dr. Raymond Neutra, sharply criticized by Paul Brodeur in a December 7 article in *The New Yorker*, is fighting back. On December 14 he sent a letter to the magazine in which he disputes Brodeur's facts and accuses him of "simplified and slanted" reporting to "arouse passion" in his readers to promote a policy he endorses. "In pursuing his crusade Paul Brodeur has distorted the truth," Neutra charges. In his article, "The Cancer at Slater School," Brodeur wrote that Neutra, acting chief of the environmental health investigations branch of the California Department of Health Services in Berkeley, had failed to investigate properly a cancer cluster at the Fresno school, while at the same time taking steps to reduce EMF levels in his own office. Neutra says that Brodeur never spoke to him about the article: "He does not contact the scientists he attacks to verify 'quotations' or facts." Neutra calls the *New Yorker* piece biased, and says that

Brodeur attempts to silence the people he does not agree with. As of early February, the magazine had not published the letter, but Neutra is circulating the rebuttal himself. He has also prepared, with Dr. John Peters of the University of Southern California in Los Angeles, an op-ed article that faults the press for using bad science to sell stories. Neutra and Peters claim that the media use isolated cancer clusters at schools near power lines "to push for the immediate rerouting of high power transmission lines away from thousands of American schools." They say that there could be a hundred cancer clusters at schools near power lines in the U.S. by chance alone. Neutra has brought others to his defense, including Dr. Herbert Needleman of the University of Pittsburgh, who is known for his work on lead poisoning. In a December 21 letter to Brodeur, Needleman says that he is troubled by Brodeur's negative portrayal of Neutra and that "a first-rate scientist and human being has suffered because of it." Karl Riley of ELF Magnetic Surveys in Sausalito, CA also takes Brodeur to task for the "slur" on Riley's reputation. In his piece, Brodeur said that, "Riley gave the impression that by fixing magnetic-field hot spots created by interior wiring he could reduce background magnetic fields...." In a December 24 letter to Brodeur, Riley—who took EMF measurements and implemented mitigation techniques at the Slater school—denies making such a claim. He says that Brodeur "falsely described" his work.

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

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

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Technical hearings in Pennsylvania's largest power line case resumed in January after being delayed for two months by PUC Administrative Law Judge Robert Meehan. Opponents of a 268-mile, 500 kV transmission line proposed by General Public Utilities Corp. (GPU) of Parsippany, NJ and Duquesne

Light Co. (DQE) of Pittsburgh had asked for more time to prepare their case, and Meehan agreed. EMF expert witnesses called by the utilities are now facing cross-examination. The case has attracted more than 9,000 letters—mostly from those protesting the line—and involves nearly 700 active parties, according to PUC spokesman John Frazier. Dr. Samuel Milham Jr., formerly of the Washington State Department of Health, has been retained as an expert witness by the PUC trial staff, which functions as the prosecutorial arm of the commission, representing the public interest, Frazier said. Witnesses for GPU-DQE will include Michael Silva of Enertech in Campbell, CA and Dr. Edward Gelmann of Georgetown University Medical School in Washington. The power line is currently scheduled to begin operating in January 1997, one year later than originally planned (see *MWN*, J/A92).

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## Cancer Excess at Aluminum Plant in Washington State

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

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

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

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

Drs. Samuel Milham Jr. and Robert Davis—both formerly with the Washington State Department of Health in Olympia—had previously documented abnormal immune systems among

aluminum workers at the same Tacoma plant (see *MWN*, J/A90). "If I had to pick one work environment to pursue the EMF-cancer connection, it would be aluminum reduction plants," Milham told *Microwave News*. He drew a parallel between the impaired immune systems he and Davis observed in the Tacoma workers and those found among the rats exposed in Dr. Bill Guy's long-term exposure study (see p. 13 and *MWN*, J/A84 and Mr85). Milham pointed out that midway through Guy's study, the rats were found to have abnormal B- and T-cell counts as compared to controls.

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

## NERP Start-Up Lags as Existing Programs Continue

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

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

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

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

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

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

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

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

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

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

### **EPA Plans To Transfer EMF Research Funds to NIEHS**

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

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

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

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

### **Colorado Joins Wisconsin and Adopts Prudent Avoidance**

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

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

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

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

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

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

"There are a number of vague provisions subject to different interpretations by different parties, and it could result in a fair amount of litigation." The utility says the new rule won't be a hardship. "We've been abiding by the policy [informally] for several years," company spokesman Mark Stutz said.

In the latest decision in the Douglas County case, the district court blocked the planned upgrade on October 21. Both the utility and the PUC have appealed the decision, which has gone back and forth between upper and lower courts. A hearing date has not been set.

In Texas, prudent avoidance has been the de facto PUC philosophy since 1976, according to a March 1992 report on EMFs, but it is unclear what the policy means. (For more on states and prudent avoidance, see *MWN*, M/J92.)

## **Known Risk Factors Explain NY Breast Cancer Excess, CDC Says**

The excess of breast cancer in Long Island's Nassau County can be explained by known risk factors, according to the federal Centers for Disease Control and Prevention (CDC) in Atlanta, and the agency plans no further action on the issue, states a CDC report released on December 17.

Known risks such as a history of benign breast disease and being Jewish—the county has a comparatively large Jewish population—account for the elevated rate, the study states. Between 1983 and 1987, the incidence of breast cancer in white women in Nassau County was 17% above the state average. Environmental factors including air and water pollution, pesticides and EMFs have no known role in inducing or promoting the disease, the report states.

Dr. James Melius, director of the New York State Department of Health's (DOH) division of occupational health and environmental epidemiology, said that the DOH was satisfied with the CDC report. "Based on the present knowledge, we cannot find anything unique on Long Island to account for the high rate of breast cancer—but that doesn't mean that environ-

## **HIGHLIGHTS**

### **Jury Rejects Officer's Claim That Radar Gun Caused Cancer**

A federal jury in San Francisco has rejected Police Officer Eric Bendure's claim that use of a traffic radar gun caused his non-Hodgkin's lymphoma (NHL). Attorneys for Bendure and for the defendant—Kustom Signals Inc. of Lenexa, KS—described the decision as a setback for other police officers pursuing similar claims.

The jury's decision apparently turned on whether Bendure had used the hand-held radar long enough for it to have caused his cancer, according to Bob Boatman, one of Bendure's at-

### **NIH Director on EMFs and Breast Cancer**

Dr. Bernadine Healy, director of the National Institutes of Health (NIH), said that exposures to power line EMFs may have contributed to the high incidence of breast cancer among women on Long Island, but that there is not enough evidence to make a definitive association, according to a report by Don Michak in the January 27 *Journal Inquirer*, a newspaper based in Manchester, CT.

When asked for confirmation by *Microwave News*, an NIH spokeswoman denied that Healy linked breast cancer and EMFs. She did confirm that Healy said that the association between EMFs and breast cancer "keeps coming up," that it shouldn't be ignored and that Healy favors more government research on the issue. Michak's article was published during a seminar on women's health held in Hartford.

mental or other unknown risk factors aren't contributing," he said, adding that the report goes along with what the DOH has been saying: that demographics and personal risk factors could account for the excess breast cancer in Nassau County.

But some people say the numbers don't add up. "The report missed the boat on the unknown risk factors," said Sen. Alfonse D'Amato (R-NY), who argues that unidentified environmental hazards account for as much as 75% of Nassau's problem. Others also believe that CDC's study fell short. "We're terribly disappointed that the panel focused on the well-worn channels of early detection and known risk factors rather than bringing new thinking to the problem," said Barbara Balaban, director of the Breast Cancer Hotline & Support Program at the Adelphi University School of Social Work in Garden City, NY.

The DOH is currently completing a brief study that compares breast cancer rates in Long Island communities that are near power lines with those that are farther away, Melius said. The report is set to be released at the end of February.

torneys. Dr. Saul Rosenberg of Stanford University Medical Center, a leading authority on NHL, testified for the defense that the latency period—the time between exposure to a carcinogen and manifestation of the cancer—is five to ten years for NHL. Roughly three and one-half years passed between Bendure's first use of the radar and his diagnosis. "That was our Achilles' heel," said Boatman, who is with the Phoenix firm of Gallagher & Kennedy. "I think the jurors gave Rosenberg undue weight," said Bendure's cocounsel, John Sweeney of John E. Sweeney & Associates in Agoura Hills, CA, adding that Rosenberg "has no background in electromagnetic radiation."

The defendant claims a more broad-based victory, however. "The scientific evidence does not support any connection be-

## HIGHLIGHTS

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tween cancer and exposure to microwave radiation," said Dexter Louie of the San Francisco firm of O'Connor, Cohn, Dillon & Bahr. Rosenberg was an "especially effective" witness, Louie admitted. "I agree that [the latency period] was one weak point in their case, but that focus overlooks the other evidence," he said.

In addition to Rosenberg, Kustom called Dr. Roswell Boutwell of the McArdle Laboratory for Cancer Research in Madison, WI, Dr. Linda Erdreich of Bailey Research Associates in New York City, Dr. Bill Guy, who is retired from the University of Washington, Seattle, and Dr. Kristian Storm III of the Comprehensive Cancer Center at the University of Wisconsin, Madison. These witnesses argued that microwave radiation from police radar guns is too weak to cause injury.

Bendure's attorneys said they were surprised by the defeat. Even after the jury's decision, they maintained that they had succeeded on several key points during the trial. "I think on the issue of whether microwave radiation is a health hazard, we were right, and I think we demonstrated that to the jury," Boatman said. Boutwell and Guy "fell apart on the stand," he added. The plaintiffs called Prof. Leo Birenbaum of Polytechnic University in New York City and Dr. Andrew Marino of LSU Medical Center in Shreveport, LA. They had also planned to use Dr. Samuel Milham Jr., formerly of the Washington State Department of Health, but they decided his testimony was not needed.

Bendure's attorneys suggested that the outcome might have been different if they had been allowed to discuss other, similar cases of cancer that have been reported among police officers who used traffic radar (see *MWN*, M/A92). Judge Stanley Weigel, who presided in federal court for the Northern District of California, ruled that this information was inadmissible.

"This jury's decision is going to give other plaintiffs' attorneys pause," Boatman admitted. Altogether the case cost Boatman's firm several hundred thousand dollars. "We took an awfully hard hit on this financially," Boatman said.

Dexter Louie said the Bendure decision will not change significantly the way the defendants approach the other suits that are pending. "We will be as aggressive in defending the next case as we were in this one," he said. MPH Industries Inc. of Owensboro, KY had been named as a defendant in the Bendure case but was dropped prior to the trial because most of Bendure's radar exposure was from Kustom units.

At least five other police radar-cancer cases are still being pursued, and several of these are ready to go to trial. The claim brought by Officer David Berndt, who is retired from the Grand Rapids, MI police department, may go before a jury as early as July, according to his attorneys (see *MWN*, M/A92 and N/D92). And that of Officer Steven Cottini of the Concord, CA police department has a trial date in March (see *MWN*, S/O91 and M/J92). Sweeney, who also represents Cottini, said that the trial may be delayed because of a scheduling conflict.

Attorney Michael Cassity of Cassity, Kelly and Wallace in Mt. Orab, OH said he is continuing with the case of Officer Wayne Vessels, who was diagnosed with skin cancer in 1977 and who died in mid-December (see *MWN*, M/J92). Vessels's suit has been withdrawn and will be refiled as a wrongful death

case, Cassity said. There also are cases pending in Connecticut and Wisconsin (see *MWN*, S/O91).

As we went to press in early February, *Microwave News* learned that Eric Bendure died on February 8. He was 34 years old.

## EPA and California PUC Plan RF/MW Meetings This Spring

The Environmental Protection Agency (EPA) will hold a conference on the potential health effects of radiofrequency and microwave (RF/MW) radiation on April 26 and 27. Approximately 50 speakers will cover findings from cellular, animal and human studies. One of EPA's main objectives is to address the need for possible future actions to control exposures to RF radiation, including setting federal safety standards.

The conference—first announced by Margo Oge, director of EPA's Office of Radiation Programs, at an August 10, 1992 Senate hearing on police radar—is being organized in response to a recommendation by EPA's Science Advisory Board that the agency resume developing RF/MW exposure guidelines (see *MWN*, S/O92). EPA began work on RF/MW guidelines in the late 1970s but abandoned its efforts in 1988 (see *MWN*, S/O88).

EPA will use the information collected at the conference to update its data base with research completed since the publication of its report, *Biological Effects of Radiofrequency Radiation*, in 1984 (see *MWN*, J/F84 and D84).

The conference, which is open to the public, will be held at the Holiday Inn in Bethesda, MD. For more information, contact: James Laurenson, ICF Inc., 9300 Lee Highway, Fairfax, VA 22031, (703) 218-2565.

The California Public Utilities Commission (PUC) will also sponsor an RF/MW workshop before June 30, as part of its ongoing inquiry into the health risks of power frequency EMFs and cellular tower radiation. The workshop is intended to help narrow the focus of the PUC's investigation and reduce the need for formal hearings (see *MWN*, N/D91 and J/F92).

For more information on the PUC workshop, contact: George Hersh, PUC, 505 Van Ness Ave., San Francisco, CA 94102, (415) 703-1540.

## NEW BOOKS

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Milton J. Allen et al., eds., *Charge and Field Effects in Biosystems—3*, Boston: Birkhäuser, 1992, 502 pp., \$75.00. Thirty-nine papers—reprinted in their original manuscript form—that were presented at an international symposium held in July 1991 at Virginia Commonwealth University. Includes many contributions from scientists working in republics that used to be part of the Soviet Union.

Michele Bertomen, *Transmission Towers on the Long Island Expressway: A Study of the Language of Form*, New York: Princeton Architectural Press, 1991, 72 pp., \$9.95. At a time when many communities are rejecting communications towers, here is a well-illustrated book that sings their praises, comparing them to the cathedrals and aqueducts of earlier times. Unfortunately, much of the writing is in architect'speak and will be undecipherable to the uninitiated.

Carl Brighton and Solomon Pollack, eds., *Electromagnetics in Medicine and Biology*, San Francisco: San Francisco Press Inc., 1991, 365 pp., \$37.50. A collection of 54 papers—including 13 reviews—that were presented in 1990 on the occasion of the tenth anniversary of the Biological Repair and Growth Society (BRAGS). The editors, leaders of BRAGS, write that they “believe that electromagnetism in biology and medicine has gone beyond the mere description of fascinating and perhaps amusing phenomena. The ability of electromagnetic fields to turn on intracellular messengers, to enhance ion flux into a cell, to stimulate specific growth factors and to bring about significant transcriptional changes in cells all point to an enormous potential for electromagnetism in clinical medicine.” The papers are evenly divided between basic science and clinical applications, with most of the BRAGS membership represented among the authors.

Roger Coghill, *Electrohealing: The Medicine of the Future*, London, U.K.: Thorsons (an imprint of HarperCollins), 1992, 176 pp., \$14.00 (paperback). An eclectic overview of electromedicine by the U.K.’s leading EMF activist. Coghill, who is based in Wales, covers a wide array of potential therapies, from magnetic fields to negative ions to UV radiation.

Michael Fumento, *Science Under Siege: Balancing Technology and the Environment*, New York: William Morrow and Co., 1993, 448 pp., \$27.50. This is a “plea for rational public policy” on environmental problems, using power line and VDT EMFs, along with Alar, dioxin, Agent Orange and food irradiation, as case studies. The chapter on EMFs is mostly an attack on Paul Brodeur and his articles in *The New Yorker*. Fumento’s review of the epidemiological literature is spotty at best. Fumento endorses the University of Rochester (NY) view that EMFs present little, if any, public health concern: “The \$5 million it could cost to bury a small stretch of power line that will quite possibly save zero lives could be spent to vaccinate every child in the area around that stretch of power line with every vaccination he or she could possibly need.” The chapter on VDTs also assails Brodeur as well as Louis Slesin, editor of *VDT News* and *Microwave News*. Here again, Fumento’s understanding of the health risks is limited and much of his information is already out of date. Fumento argues that the nation’s health problems stem from too much smoking and drinking and from bad diets, not from environmental insults.

Mary Kerney Levenstein, *Everyday Cancer Risks and How To Avoid Them*, Garden City Park, NY: Avery Publishing Group, 1992, 318 pp., \$11.95. Covers everything from food additives to hazardous waste dumps to AIDS. The chapter on “Radiation in the Home” addresses EMFs, citing the writings of Becker, Brodeur, Leeper, Milham and Wertheimer, and offers a number of suggestions on limiting exposures to EMFs and RF/MW radiation.

Bengt Nordén and Claes Ramel, eds., *Interaction Mechanisms of Low-Level Electromagnetic Fields in Living Systems*, New York: Oxford University Press, 1992, 295 pp., \$85.00. A collection of 17 papers presented at a May 1989 workshop organized by the Swedish Academy of Sciences. Today, three and one-half years later, some of the papers have been overtaken by new developments—for instance, “Magnetic Fields and Cancer: More Information Is Still Needed,” by Ahlbom, Yang and Feychting is clearly out of date. Portions of the reviews by Adey, Blackman, Hamnerius, Liboff, Liburdy and Schwan have already appeared in somewhat different form elsewhere. The most useful contributions are those from Swedish labs, notably those on the permeability of the blood-brain barrier and diatom mobility. Interestingly, a consensus statement on low-level effects, issued by Nordén and Ramel after the conference, is not included—perhaps because it troubled a number of the participants (see *MWN*, N/D89 and J/F90).

J. Patrick Reilly, *Electrical Stimulation and Electropathology*, New York: Cambridge University Press, 1992, 504 pp., \$74.95. With the assistance of a number of colleagues, Reilly has written what will no doubt become the standard text on the effects of short-term electrical exposures, both intended and accidental. Reilly’s audience is the biomedical scientist and the engineer concerned with electrical safety. The chapter on “Standards and Protective Measures” is by Walter Skuggevig of Underwriters Laboratories. Reilly, a member of the staff at the Johns Hopkins University Applied Physics Lab in Laurel, MD, does not address the health effects of chronic low levels of EMFs.

Nancy J. Simon, *Biological Effects of Static Magnetic Fields: A Review*, Boulder, CO: International Cryogenic Materials Commission Inc., 1992, 284 pp., \$50.00 in the U.S., \$55.00 in Canada and \$65.00 elsewhere (paperback). Simon, a physicist at the National Institute of Standards and Technology in Boulder, provides the most thorough examination anywhere available of the literature on static fields. When experimental results conflict, Simon, who also has training in molecular and cellular biology, offers possible reasons for the discrepancies. For example, in 1984 a German team announced that a magnetic field of 0.4 T could cause detectable increases in body temperature, but an attempted replication by Dr. Tom Tenforde failed (see *MWN*, J/A84 and S/O85). At the end of the volume, which includes more than 600 references, Simon lists 11 “significant static field effects that have not yet been confirmed or refuted” and concludes that, “Any of these effects, if confirmed, could seriously affect site considerations for and occupational practices in future large-scale systems with superconductors and cryogenic conductors. More research is urgently needed to address these problems.”

Ellen Sugarman, *Warning: The Electricity Around You May Be Hazardous to Your Health*, New York: Simon & Schuster, 1992, 238 pp., \$11.00 (paperback). In attempting to give an overview of the debate about potential health hazards, Sugarman has written a text littered with errors—even basic definitions cannot be trusted. In one of her more extraordinary lapses, Sugarman writes that the Kaiser VDT-miscarriage study was “designed to assess the effects on pregnancy outcomes of statewide melatonin spraying” to combat fruit flies. The pesticide was malathion. Sugarman’s point of view is that the industry is covering up the health risks. Despite its shortcomings, this book is likely to sell briskly because there aren’t any other primers to satisfy consumer demand for EMF information.

Louise B. Young, *Power Over People*, New York: Oxford University Press, 1992, 247 pp., \$10.95 (paperback). A new edition of the first book to warn against the dangers of power line EMFs, originally published in 1973. Young has added an introduction and an epilogue as well as some updated references. She chronicles the battle of citizens against a large utility over the siting of a high voltage power line. Twenty years ago, Young wrote that when the public has the facts, “Then people will triumph over power.”

#### Forthcoming

David O. Carpenter and Sinerik Ayrapetyan, eds., *Biologic Effects of Electric and Magnetic Fields*, San Diego: Academic Press, 1993. A two-volume work: The first is on “sources and mechanisms” and the second is on “beneficial and harmful effects.” Among the contributors are: Drs. Anders Ahlbom, Dean Astumian, Andrew Bassett, A. Chia-brera, Robert Cleveland, Don Deno, Joseph Elder, Reba Goodman, Ann Henderson, Martin Kavaliers, Richard Luben, Granger Morgan, K.-P. Ossenkopp, Russel Reiter, Kurt Salzinger, Richard Stevens, Gilles Thériault, James Weaver and Bary Wilson, as well as a number of researchers from Armenia, Russia and Ukraine.

tumors. Once cellular industry stocks fell, the day after the Larry King broadcast, no one passed up the story. Over the next two weeks, the controversy was covered by the evening news programs on CBS and NBC, by ABC's *20/20* and by numerous radio and television talk shows. Every major newspaper ran at least one item—the *Wall Street Journal* featured a half-dozen stories, *USA Today* even more. *BusinessWeek*, *Newsweek*, *Time* and *U.S. News & World Report* all carried the story. An industry poll conducted shortly after Reynard appeared on *Larry King Live* found that half of all Americans knew of his lawsuit, according to a February 9 story in the *Washington Post*.

The industry unveiled its research plan in the midst of this public relations crisis. CTIA President Thomas Wheeler told a Washington press conference on January 29 that a "blue-ribbon panel" of federal agency representatives would be asked to oversee the research. He would not say definitively how much money the industry would provide—only that it would be "well into seven figures," that is, more than \$1 million.

Separately, McCaw Cellular committed \$130,000 for re-

search by Dr. Om Gandhi of the University of Utah, Salt Lake City, to estimate how much radiation is absorbed by the human head from the antenna of a hand-held cellular phone. The first results will be available in about six months, according to Robert Ratliffe, a spokesman for McCaw, which is based in Kirkland, WA. The company has also agreed to exchange any customer's hand-held phone for a car phone at no charge. McCaw, which operates under the Cellular One name, is the largest cellular service provider in the U.S. and a major reseller of cellular phones.

The recent publicity has focused on hand-held units, which have antennas on the tops of the handsets, within a few inches of the user's brain and eyes. Hand-held phones account for about 60% of current cellular phone sales and about 30% of the 10 million cellular phones now in use. No one has yet suggested that car phones, for which antennas are mounted on the exterior of vehicles, present a health risk.

The NCI brain tumor study is still in the planning stages, but data collection should begin this year, said Dr. Richard Adamson, director of NCI's division of cancer etiology in Bethesda, MD.

## The Cellular Phone Safety Debate: A Timeline

*The controversy over the safety of cellular phone radiation reached a huge audience in late January and early February. It cropped up in newspapers and on the evening news around the U.S. (and worldwide). It was discussed in radio and television business reports and in testimony before a congressional subcommittee. It even made it into Jay Leno's opening monologue on The Tonight Show. Here is how the story unfolded:*

- **April 8, 1992.** David Reynard files his lawsuit in Circuit Court for Pinellas County, FL, naming NEC America Inc. and a unit of GTE Corp. as defendants (see *MWN*, M/J92). Press coverage is limited to local papers.
- **January 3, 1993.** Nancy McVicar publishes a story about the lawsuit in the Fort Lauderdale, FL *Sun-Sentinel*. Her story appears in other Knight-Ridder newspapers.
- **January 12.** CNN's *Moneyline* program airs a special report on the Reynard lawsuit.
- **January 19.** Reginald Lewis, chief executive of TLC Beatrice International Holdings, dies from a brain tumor.
- **January 20.** Tenneco announces that its CEO, Michael Walsh, has been diagnosed with a brain tumor. (There is no indication that either Lewis or Walsh used a hand-held cellular phone, but news of their illnesses heightens interest in the cellular story.)
- **January 21.** Reynard appears on CNN's *Larry King Live* to discuss possible health risks from cellular phones.
- **January 22.** Prudential Securities recommends selling holdings of cellular industry shares, predicting "a spate of newspaper articles dealing with this topic over the next few weeks." Cellular industry stocks fall.
- **January 25.** Motorola calls a telephone press conference to answer questions about the safety of its products. More than 75 journalists call in, leading to dozens of print, television and radio stories.
- **January 26.** Rep. Edward Markey (D-MA) writes to FCC's Thomas Stanley, asking about the current RF/MW radiation safety standard and seeking information about any research the FCC has done on cellular phone radiation.

- **January 27.** Markey asks the General Accounting Office to investigate cellular phone safety and the history of federal regulatory efforts.
- **January 28.** McCaw Cellular Communications says it will fund additional research and allow customers to trade hand-held phones for car phones.
- **January 29.** CTIA President Thomas Wheeler announces plans for an industry research initiative, describing cellular phones as "a great made-in-America success story."
- **January 29.** Josephthal, Lyon & Ross, a securities firm, changes its evaluation of Motorola from "buy" to "hold," and downgrades Pacific Telesis, which has plans to spin off its cellular operations later this year, to "sell." Cellular stocks are battered. Motorola loses \$4.875 to close at \$51.00 a share with a trading volume of more than 13 million shares, making it the most active stock on the New York Stock Exchange. McCaw loses \$3.375 to close at \$32.50 a share and is the most active issue in the over-the-counter market. Just eight days earlier, Motorola was trading above \$60 a share and McCaw was above \$38 a share.
- **January 29.** The FCC answers Markey's letter, explaining that it "is not the expert agency" for evaluating the health effects of RF/MW radiation. Markey calls the FCC response an indication of "the lack of concrete data evaluating the potential health hazards...."
- **January 29.** The ABC news magazine *20/20* airs a segment on cellular phone safety.
- **February 1.** *BusinessWeek*, *Newsweek* and *Time* (all dated February 8) appear with stories about cellular phone safety.
- **February 1.** Attorneys in Chicago file a breach-of-warranty class action lawsuit against Motorola and Mitsubishi Electronic Corp., alleging that the defendants are "only now commissioning studies on how cellular phones affect users' exposure to radiowaves, studies which may take years to complete."
- **February 2.** Markey's subcommittee on telecommunications and finance holds a briefing on Capitol Hill, with testimony by Dr. Stephen Cleary and officials from EPA, FCC, FDA, NCI and Motorola.
- **February 4.** The FDA releases its advisory on cellular phones.



Adamson described NCI's research plans at a February 2 congressional briefing organized by Rep. Edward Markey (D-MA), the chairman of the telecommunications and finance subcommittee of the House Energy and Commerce Committee. Markey has also requested that the General Accounting Office, an arm of Congress, prepare "a comprehensive overview of the state of scientific knowledge" about the potential health risks posed by cellular phone radiation.

The briefing brought together some key players in the safety debate. "I do believe that there is a potential relationship between exposure to fields of this type and cancer promotion," Dr. Stephen Cleary of Virginia Commonwealth University in Richmond told the overflow crowd. Cleary has shown that brain tumor cells exposed to radiofrequency and microwave (RF/MW) radiation proliferate at an abnormally high rate (see *MWN*, M/A90). In his experiments, the abnormal growth continued for five days after exposure. Such findings "suggest the possibility of cumulative effects," according to his 1990 paper. Cleary did not investigate cellular phone frequencies (800-900 MHz); he studied 27 MHz, used by RF heat sealers and other industrial equipment, and 2450 MHz, used by microwave ovens. Radiation at cellular frequencies would cause similar effects, he predicted.

Another witness at the briefing, Dr. Mays Swicord of the Food and Drug Administration's (FDA) Center for Devices and Radiological Health in Rockville, MD, said that there is no proof of a link between cellular phone radiation and cancer. But he suggested that one can limit use of hand-held cellular phones—an idea repeated in a "Talk Paper" issued by the FDA two days later. "We simply don't have enough information at this point to rule out the possibility of a risk," the FDA advisory stated.

Thomas Stanley, chief engineer of the Federal Communications Commission (FCC), emphasized that the commission "is not the expert agency for evaluating the biological effects of [RF/MW] radiation on human health and safety." He explained that the FCC has adopted the 1982 American National Standards Institute (ANSI) RF/MW guidelines and that, "Cellular telephones, including hand-held units, have been exempted

## **U.K. Research on Hand-Held Phones Shrouded in Secrecy**

Research on RF/MW radiation from cellular phones and related devices is also being pursued in the U.K., but specific details are hard to come by.

What is known is that the National Radiological Protection Board (NRPB) in Didcot, England, is managing a project for the Department of Trade and Industry (DTI), a government agency, to develop computer models to characterize the EMFs induced in the human head by hand-held devices. This much was learned from an NRPB spokeswoman, who also said that the research was being carried out at three English universities—Bradford, Surrey and King's College, London. She then referred us to DTI for additional details.

Further inquiries by *Microwave News* were rebuffed: Dr. Camelia Gabriel of King's College declined to comment, forwarding our request to DTI. In a September 8, 1992 letter to *Microwave News*, DTI's Graham Worsley wrote that the project is titled "Interaction of the Body with Radio Emissions from Hand-Held Transceivers," adding that, "The project is not directly concerned with research into health risks from mobile telephones." He said that DTI was preparing more information for public release and would make it available "when it is finalized." That was the last word received from Worsley or from DTI.

from routine examination...based on calculations and measurement data indicating that they would not cause exposures that would violate the ANSI guidelines."

Markey, Stanley, Swicord, and David Kleffman of the Environmental Protection Agency's (EPA) Office of Research and Development all used the briefing to call for additional research. Kleffman noted that cellular phone safety will be raised at an upcoming EPA workshop on RF/MW radiation and health (see p.6).

Industry representatives remained unequivocal as they responded to questions about cellular phone safety. Dr. Quirino Balzano, a vice president of the land mobile products sector of Motorola Inc., which has its headquarters in Schaumburg, IL, said at the briefing that the "thorough and objective scientific process" that went into creation of the current RF/MW safety guidelines, ANSI/IEEE C95.1-1992 (see p.14), allows the industry to state with certainty that cellular phones are safe. And, during a January 25 press teleconference, Edward Staiano, president of Motorola's general systems sector, said that, "Our confidence in the safety of our products is rooted in scientific fact." Staiano referred to "more than 40 years of research" and "more than 10,000 studies" demonstrating the safety of hand-held phones.

Even after the congressional briefing, the industry campaigned to put the best face on events. CTIA's Wheeler issued a statement claiming that, "Diverse scientific viewpoints were assembled [at the briefing] in an open forum with cross-examination. The verdict was overwhelming—cellular telephones do not cause cancer."

### **Motorola's Three Key Studies**

*After its press conference on January 25, Motorola released the following three references in response to a request for studies which show that cellular phones are safe:*

W.R. Adey, S.M. Bawin and A.F. Lawrence, "Effects of Weak Amplitude-Modulated Microwave Fields on Calcium Efflux from Awake Cat Cerebral Cortex," *Bioelectromagnetics*, 3, pp.295-302, 1982.

C.V. Byus, R.L. Lundak, R. Fletcher and W.R. Adey, "Alterations in Protein Kinase Activity Following Exposure of Cultured Human Lymphocytes to Modulated Microwave Fields," *Bioelectromagnetics*, 5, pp.341-352, 1984.

C.V. Byus, K. Kartun, S. Pieper and W.R. Adey, "Increased Ornithine Decarboxylase Activity in Cultured Cells Exposed to Low Energy Modulated Microwave Fields and Phorbol Ester Tumor Promoters," *Cancer Research*, 48, pp.4222-4226, 1988.

## What They Are Saying

If there are health-related effects of fields at these levels of incident energy, they fall in the category of athermal effects. Heating is not the basis of any observed tissue interactions. Rather, for microwave fields in the GHz range, they may arise in resonant effects at the carrier frequency on vibrational and rotational behavior of molecules or portions of molecules.

Future cellular and [personal communications system] products will use RF signals which vary in instantaneous power at ELF frequencies. Where RF/MW fields are pulse- or amplitude-modulated at ELF frequencies, their range of bioeffects may be enhanced by orders of magnitude over effects of a [continuous wave] field of the same intensity and carrier frequency.

...In a regulatory perspective, the pioneering developments by Motorola of cellular phone systems operating at presumably athermal exposure levels would set aside recent ANSI/IEEE Committee 28 guidelines that have preempted consideration of athermal bio-effects by the continuing use of inherently thermal models of tissue interactions.

—*Dr. Ross Adey, VA Medical Center, Loma Linda, CA, Memo to Motorola's Dr. Q. Balzano, January 24, 1993, Released by Motorola Inc., January 25, 1993*

First, let me assure you that all of our products are safe. By a substantial margin, they meet all national and international safety standards on user exposure to radiofrequency energy.

...Our confidence in the safety of our products is rooted in scientific fact. For more than 40 years, we at Motorola and other scientists around the world have been researching the biological effects of RF energy. None of this scientific inquiry has demonstrated the existence of health risks from the use of cellular telephones.

—*Dr. Edward Staiano, President, General Systems Sector, Motorola Inc., Press Teleconference, January 25, 1993*

I tried to get this issue out to the public a couple of years ago, after realizing that this may have been a problem. And it didn't appear that the news media was willing to listen to what was being said. They asked me, was there a lawsuit involved, and at that time there was not. And my only response to that was, "I guess we'll just have to wait till enough white-collar CEO workers die off from this, and somebody'll pay attention to it."

—*David Reynard, Interview on NBC's Today show, January 26, 1993*

We do not see any obvious way for the cellular industry to refute these charges short of new tests that will take time. There are already two high-level executives stricken with brain cancer for the media to focus on and speculate about. In the meantime, we look for a barrage of bad publicity and the following events to occur:

- Further reports of consumer reaction and sales declines for both phones and cellular usage.
- The government will want to get involved. We cannot rule out the possibility of publicity-seeking congressmen holding highly publicized hearings.
- Liability lawyers will be anxious to cash in on this latest potential source of business, especially with some large well-heeled corporations like Motorola and AT&T involved.

—*Lawrence Borgman, Josephthal, Lyon & Ross Inc., Market Advisory, January 29, 1993*

It is apparent that the various federal agencies responsible for the health and safety of the public in this area need to coordinate efforts so that the FCC can adequately address these issues when

it licenses wireless telephone services for the general public.

—*Rep. Edward Markey (D-MA), Chairman, Subcommittee on Telecommunications and Finance, Press Statement, January 29, 1993*

Despite the many research studies showing that cellular is safe, it has become necessary to reassure those whose doubts have been raised by this scare. It is time for truth and good science to replace emotional videotape and unsupported allegations.

Therefore, the cellular telecommunications industry is today announcing that it will fund research to re-validate the findings of the existing studies, which have found that the radiowaves from cellular phones are safe. We recognize that some may find industry-sponsored research is suspect. Therefore, we are asking the federal government to appoint a blue-ribbon panel to review the methodology and findings of this research.

—*Thomas E. Wheeler, President, Cellular Telecommunications Industry Association, Washington Press Conference, January 29, 1993*

The current standard [ANSI/IEEE C95.1-1992, see p.14] emerged after we carefully and deliberately winnowed down thousands of pieces of research to 321 studies....[T]his exhaustive process established a threshold, below which there was no scientific evidence of adverse health effects.

—*Dr. Quirino Balzano, Vice President, Land Mobile Products Sector, Motorola Inc., Congressional Briefing, February 2, 1993*

The Commission is not the expert agency for evaluating the biological effects of radiofrequency radiation on human health and safety....Cellular telephones, including hand-held units, have been exempted from routine examinations under the Commission's [National Environmental Policy Act] requirements based on calculations and measurement data indicating that they would not cause exposures that would violate the ANSI guidelines.

—*Thomas Stanley, Chief Engineer, Federal Communications Commission, Congressional Briefing, February 2, 1993*

How much evidence is there that hand-held cellular phones might be harmful? Briefly, there is not enough evidence to know for sure, either way....A few studies suggest that these levels can accelerate the development of cancer in laboratory animals, but there is much uncertainty among scientists about whether these results apply to the use of cellular phones....Nonetheless, we cannot dismiss these studies as irrelevant to cellular phone users....

In the absence of conclusive information about any possible risk, what should people do? It is not necessary that people stop using their hand-held cellular phones. If there is a risk from these devices—and at this point we don't know if there is—it is probably small. But if people are concerned about avoiding even potential risks, there are simple steps they can take to do so. For example, since time is a key factor in how much exposure a person receives, those who spend long periods of time on their hand-held cellular phones could consider holding lengthy conversations on conventional phones and reserving the hand-held cellular models for shorter conversations or for situations when conventional phones are not available.

—*Food and Drug Administration Talk Paper, Update on Cellular Phones, February 4, 1993*

## Exemptions for Hand-Held Devices Challenged in Europe

Outside the U.S., officials are beginning to force cellular phone companies to show compliance with RF/MW radiation exposure limits. In December 1991, Germany's Radiation Protection Commission announced that hand-held communications devices would no longer be exempted from health standards and that henceforth all companies would have to provide experimental evidence that their products comply with German exposure limits. The move came after an April 1991 hearing at which manufacturers of mobile communications equipment and service providers, along with research scientists, reached a consensus that measurement data were necessary to assure safety.

The International Commission on Non-Ionizing Radiation Protection has also drafted a position statement that would reject exclusion clauses for low power devices (see *MWN*, M/J92).

In the U.S., the FCC exempts hand-held cellular phones in accordance with the 7-watt exclusion clause in the 1982 ANSI standard and is expected to maintain an exemption in light of the narrower exclusion specified in the 1991 IEEE standard, which was recently adopted by ANSI to replace the 1982 guidelines (see p.14).

The decision by the German commission was based in part on the work of Dr. Niels Kuster, a research fellow at the Swiss Federal Institute of Technology, known as ETH, in Zürich. Over the last four years, Kuster has been developing computer models to simulate the absorption of RF/MW radiation from nearby transmitters—especially from hand-

held or body-mounted antennas.

Working with Dr. Quirino Balzano of Motorola Inc. in Plantation, FL, Kuster has shown that the 7-watt exclusion is incompatible with the 1982 ANSI standard's exposure limits (see *MWN*, N/D90). In an interview with *Microwave News*, Kuster said that, "The exemption in the 1991 standard is not totally satisfying because some devices, which fall within this exemption, may still exceed the basic safety limits."

Kuster is presently developing an automated test site for standardized compliance testing of hand-held transmitters for specific SAR limits under a contract from the German and Swiss Ministries of Post and Telecommunications, as well as German Telekom and Mannesmann Mobilfunk GmbH, both providers of cellular communications services. The test site and a well-defined testing procedure should be completed by the end of July, Kuster said.

Kuster's research findings are presented in his doctoral dissertation, submitted in 1992, which also provides an introduction to current and planned mobile communications systems and an overview of current safety standards. Copies of Kuster's dissertation, *Dosimetric Assessment of EM Sources near Biological Bodies by Computer Simulations* (DISS. ETH No.9697) are available for \$25.00 each from: Dr. Niels Kuster, ETH, CH-8092, Zürich, Switzerland. See also, N. Kuster, "Multiple Multipole Method Applied to an Exposure Safety Study," *Applied Computational Electromagnetics Society Journal*, 7, pp.43-60, Winter 1992.

### Commentary on Cellular Phone Health Risks (continued from p.1)

tion can contribute to the development of cancer. Laboratory, animal and human studies all point to a possible problem.

The most compelling evidence comes from Dr. Stephen Cleary's lab at Virginia Commonwealth University in Richmond: In a paper published in 1990, Cleary showed that unmodulated 27 MHz and 2450 MHz radiation can accelerate the proliferation of human brain tumor cells. Indeed, five days after a single two-hour exposure—designed to ensure that no heating occurred—the tumor cells were still growing abnormally (see *MWN*, M/A90). Obviously, Cleary's experiment must be repeated using microwaves that mimic cellular phone signals—and the sooner the better.

Only one long-term RF/MW exposure study has ever been completed and it supports a cancer risk. The five-year, \$5 million study by Dr. Bill Guy at the University of Washington, Seattle, showed that small doses of radar-like microwave radiation caused a significant excess of cancer in rats (see p.13 and *MWN*, J/A84 and Mr85). Even though Guy has consistently downplayed his own results—and the U.S. Air Force, Guy's sponsor, has refused to acknowledge the possible cancer link—

the Environmental Protection Agency (EPA) found that "the University of Washington study can be said to have demonstrated the carcinogenic action of this type of pulsed RF radiation" (see *MWN*, J/A90).

A smaller study, by Dr. Stanislaw Szmigielski of the Center for Radiobiology and Radiation Safety in Warsaw, Poland, found that RF/MW radiation can act as a tumor promoter in mice (see *MWN*, My81).

Other animal experiments indicate that tiny amounts of RF/MW radiation can increase the permeability of the blood-brain barrier (BBB), a membrane that controls which chemicals can migrate into brain tissue. Just last summer, Drs. Leif Salford and Bertil Persson of the University of Lund in Sweden reported leakage through the BBB of rats at specific absorption rates (SARs) as low as 0.01 W/Kg (see *MWN*, J/A92). By comparison, the 1992 ANSI/IEEE safety standard allows the head to be exposed continuously to over 100 times that level of radiation: up to 1.6 W/Kg for the general public and up to 8 W/Kg for workers, who are assumed to be aware of the risks. Even though RF/MW-induced BBB leakage was first reported by U.S. re-

searchers in 1977, and even though it provides a possible mechanism for affecting brain biochemistry, no one here has seriously pursued this line of research.

With respect to human studies, Szmigielski has twice reported that Polish military personnel exposed to RF/MW radiation have significantly more cancer than their unexposed counterparts (see *MWN*, Mr85, J/F87, J/A89 and S/O90). And Dr. Samuel Milham Jr., an epidemiologist formerly with the Washington State Department of Health, has reported that amateur radio operators, who are exposed to various sources of non-ionizing radiation, have higher-than-expected rates of cancer (see *MWN*, My85 and N/D87). Milham found an excess of acute myeloid leukemia as well as an excess of brain tumors.

Indeed, over the last decade, more than a dozen epidemiological studies have shown that people exposed to EMFs of one kind or another have higher rates of brain tumors—up to 10-13 times the expected rates (see *MWN*, M/A90).

Moving beyond the cancer connection, a series of studies carried out at the Johns Hopkins University Applied Physics Lab in Laurel, MD by Henry Kues and coworkers indicate that RF/MW radiation can have profound effects on the eye, especially in combination with commonly used glaucoma drugs (see *MWN*, J/A83, S/O86, J/A87, J/A88 and S/O91). In a recently published paper (*Bioelectromagnetics*, 13, pp.379-393, 1992), Kues's group states that glaucoma patients using timolol therapy can suffer ocular changes at an SAR as low as 0.26 W/Kg—a level that is also well below current safety standards.

All these studies, taken together, illustrate how ludicrous the cellular industry's position is. Three years ago, in its now famous report on EMFs and cancer, EPA scientists concluded that RF/MW radiation should be classified as a "possible human carcinogen" (see *MWN*, M/J90).

The Cellular Telecommunications Industry Association's (CTIA) attempts at denial and spin control are not unexpected—this must be how its executives see their role. For example, after the Food and Drug Administration (FDA) issued a "Talk Paper" that refused to rule out a possible cancer link, CTIA sent out a press release announcing that it was "pleased by FDA's conclusion that 'there is no proof at this point that cellular phones are harmful.'"

What is surprising, however, is the misleading and inconsistent picture of the scientific data presented by Motorola. A few hours after being asked which specific studies show that cellular phones are safe, the company distributed a list of three papers by Dr. Ross Adey of the VA Hospital in Loma Linda, CA and coworkers (see box, p.9). These papers show that, under certain conditions, unmodulated RF/MW radiation has no effects—but they also show that the radiation, when modulated, can induce biological changes.

Industry lobbyists have long argued that Adey's work has no bearing on health, so it is ironic to see Motorola now trying to use this research to its own advantage. But, at the same time, by implication, this evidence shows that modulated cellular signals may not be safe. Therefore, adding irony to irony, Motorola

is questioning the viability of the next generation of its cellular technology, which will use modulated radiation.

Motorola, and many other companies, will soon introduce digital systems with greater capacity, efficiency and security. Motorola is betting billions of dollars on its Iridium project, a system of 66 low-Earth orbit (LEO) satellites that will allow customers to use hand-held phones anywhere on the planet. The Iridium signals will be modulated—remarkably—at 50 Hz, the European power frequency. Picking a frequency that has been implicated in dozens of cancer studies was certainly strange. As one scientist quipped, "It's hard to think of a worse choice."

To its credit, Motorola is sponsoring studies in Adey's lab to investigate the safety of its new digital technology. That work is years away from completion, but Motorola is already misusing it. At its press conference, while Motorola executives were scurrying behind the scenes to come up with the three Adey studies described above, they cited Adey's ongoing work for the company as indicating that the current analog cellular system is safe. Given that the company puts a premium on the distinction between the effects of modulated and unmodulated radiation, it should not be using results on the digital (modulated) radiation to show that the analog (unmodulated) radiation is safe. At the same time, it is worth asking: Why is Motorola willing to undermine the viability of its Iridium system?

Motorola has yet to say how powerful its Iridium phones will be, but they will probably have to be stronger than the 0.6 W cellular units now in use because the Iridium satellites will be orbiting at an altitude of 420 miles. In contrast, cellular phone signals need only travel about 10 miles. Motorola clearly understands the health risks associated with sending cellular signals long distances. In an interview with *Barron's* (February 10, 1992), a Motorola executive said the company had picked the LEO system instead of a geostationary system with satellites parked 22,000 miles overhead because, to send messages that far, the hand-held phones would cause "fried brains."

The wireless revolution envisioned by communications and computer companies will be held hostage until the public is satisfied that the technology is free of unreasonable risks. It will take years and a lot more money than CTIA, McCaw and Motorola have yet committed to settle the health questions. Their first priority is to regain the public trust and the only way to do so is to stop the double-talk.

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# FROM THE FIELD

## Chinese Conference

*Dr. Y. Fen of the Microwave Institute at Zhejiang Medical University sent Microwave News this report:*

The 4th Chinese Scientific Conference on Bioelectromagnetics was held at Xian Electronic Scientific-Technical University, Xian, China, on October 26-29, 1992. More than 40 experts attended the meeting, which was sponsored by the Chinese Society of Biomedical Engineering and the Chinese Biophysics Society. At the conference, there were five invited papers (reviews) presented in plenary session, such as "ELF Magnetic Fields and Cancer," "Mechanisms of EMF Interaction with Living Systems," "The Future of Bioelectronics," etc. and 62 papers presented in four sessions dealing with: "Biological Effects of ELF EMFs" (8 papers); "EMFs in Living Systems and How To Measure Them, and Dosimetry for Bioelectromagnetism" (7 papers); "Biological Effects of RF EMFs, Static Electricity and Magnetic Fields" (18 papers); and "Mechanisms of Biological Effects and Medical Applications of EMFs" (29 papers). Prizes were awarded to some young researchers for the papers they presented. A new Bioelectromagnetics Commission of the Chinese Society of Biomedical Engineering was established, with Dr. H. Chiang as director and Drs. J. X. Li and C. Q. Wang as deputy directors. To enhance international cooperation, academic exchanges between countries and/or areas will be one of the main tasks of the new commission. A booklet of the meeting abstracts (in Chinese) has been published. A few booklets are available from Dr. Zhong Qi Niu, Engineering Department of Electromagnetic Fields, Xian Electronic Scientific-Technical University, Xian 710071, People's Republic of China. The next conference will probably be held in Chengdu City, Sichuan Province, China.

Sincerely,  
Dr. Y. Fen

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## David Savitz on Cancer Trends

*Below are comments by Dr. David Savitz of the University of North Carolina, Chapel Hill, on cancer rates and electricity consumption (see MWN, J1F91, J1A91, M1J92 and J1A92), excerpted from the January issue of Environmental Science & Technology as part of a discussion of the recent CIRRPC report (see p.2 and MWN, N1D92).*

A specific theme [in the CIRRPC report] for both cancer and adverse reproductive outcomes is that whatever the research might suggest, [EMFs] could not adversely affect health because the rise in electric power use over time has not produced epidemics of cancer, birth defects or miscarriage. In fact, the two observations are true but unrelated.

In order to produce parallel trends in exposure and disease, as is readily observed for smoking and lung cancer, for example, the secular trend data would require: (1) markedly rising exposures, (2) accurate data on the rate of the disease over time, (3) an absence of major concomitant changes in other risk factors for the disease and (4) strong association between exposure and disease.

In regard to [EMFs], all are absent. The most critical problem is that the rising use of electric power has probably not been accompanied by any increase in exposure. In moving from a pre-industrial to industrial society, exposure surely increased, but that was over a time period that is not amenable to study given the absence of accurate health records. In the past 40 years it seems unlikely that exposures have risen. One bit of empirical evidence comes from Rhode Island [Fulton et al., 1980], where homes occupied in the 1960s tended to have higher exposures than those occupied in the 1970s, presumably

reflecting the movement from central cities to the suburbs, with larger yards and greater distances from homes to power lines. This demographic shift was widespread throughout the United States.

In-home wiring practices also changed over that period from a pattern that generated large magnetic fields by spatial separation of the phases to a method in which the phases are closer in space and largely cancel one another. Increasing the voltage of power lines over time leads to lower currents, compensating in part for the greater use of electricity. Ultimately, we cannot assess how the population exposure has changed from the 1950s to the 1990s, but there is good reason to believe that it does not parallel the striking increase in electricity consumption during that interval. The report invokes lack of secular trends in childhood cancer to counter results of case-control studies, as though the calendar time in which children lived were a superior exposure marker to characteristics of individual children's residences.

The health events of interest, cancer and reproductive outcomes, are not available over long enough periods to address the pre-electrical era for which a contrast in exposure can be made. Only during the past 20 years or so have reliable registries for cancer incidence and birth defects become available, with mortality data for cancer markedly influenced by improvements in survival (particularly for childhood cancers) during that period. Thus, the era in which reliable health data are available does not coincide with the period in which exposures were likely to have changed dramatically.

Finally, although temporal trends in exposure and disease can be informative, the marked changes in other relevant factors over the same period might spuriously create or mask an association with the agent of interest. Changes in dietary habits, control of infectious diseases and improvements in medical technology for diagnosing and classifying disease would likely obliterate any change related to an exposure that has a moderate or small relation to disease. Thus, distinguishing between the presence of a moderate effect of [EMFs] on health and no effect cannot possibly be done on the basis of secular trends. One might speculate on how the reviewers would (and should) react to an assertion that the rise in brain cancer in the elderly in the past 20 years is attributable to increased use of electric power.

## UPDATES

### GUY STUDY

**A Paper Is Published...** More than eight years after the results were first presented at a conference, Dr. Bill Guy and coworkers have published a paper on their five-year, \$5 million, long-term, low-level microwave exposure study (see MWN, J/A84, Mr85 and N/D86). The report is part of a collection, published in *Bioelectromagnetics*, that was prepared for an October 1991 symposium held in Guy's honor when he retired from the University of Washington, Seattle. Until now, Guy's findings were only available in a set of nine volumes published by the U.S. Air Force. Dr. C.-K. Chou, who moved from Guy's lab to the City of Hope National Medical Center in Duarte, CA, is the lead author of the paper and the guest editor of the collection. With respect to the contentious issue of cancer, Guy's team concludes that, "The findings of an excess of primary malignancies in exposed animals is provocative. However, when this single finding is considered in light of the other parameters, it is conjectural whether the statistical difference reflects a true biological influence." See C.-K. Chou et al., "Long-Term, Low-Level Microwave Irradiation of Rats," *Bioelectromagnetics*, 13, pp.469-496, 1992.

**POLICE RADAR**

**Exposure Levels...**From measurements of 5,000 radar devices over the last ten years, Dr. David Fisher of Michigan State University in East Lansing concludes that, "When the device is being operated properly, the microwave exposure levels encountered by radar operators are less than  $50 \mu\text{W}/\text{cm}^2$ , i.e., less than 1% of the maximum exposure level of the current safety standards." Approximately 95% of the units tested were fixed-mounted antennas and 5% were hand-held units. Fisher points out that police officers may be exposed to more than 1% of the aperture power density—which can range from  $0.1 \text{ mW}/\text{cm}^2$  to  $6.4 \text{ mW}/\text{cm}^2$ , at X-band (8-12 GHz) and K-band (18-27 GHz) frequencies—when "the antenna is pointed at a metal object sufficiently close to the antenna [i.e., within 12 ft] and oriented so that the [EMFs] reflect directly back toward the radar operator." Fisher notes that those who place the hand-held devices in their laps will also be exposed to more than 1% of the aperture power density, though it will be reduced because of impedance mismatch. See "Microwave Exposure Levels Encountered by Police Traffic Radar Operators," *IEEE Transactions on Electromagnetic Compatibility*, 35, pp.36-45, February 1993. For more on Fisher's work, see *MWN*, N/D91 and J/A92; and for reports on other surveys, see *MWN*, M/A91 and M/A92.

**STANDARDS**

**Approval of RF/MW Standard Upheld...**ANSI's Board of Standards Review has rejected an appeal from the broadcast industry that asked for the reversal of the panel's earlier decision approving ANSI/IEEE C95.1-1992, the revised RF/MW radiation exposure guidelines. The main objection, first raised by Hammett & Edison Inc. (H&E), a San Francisco consulting firm (see *MWN*, M/J92 and N/D92), is to the standard's 100 MHz cutoff point for limiting induced body currents, which falls in the middle of the commercial FM radio band. The appeal was supported by ABC, CBS, Westinghouse Broadcasting Co. and the National Association of Broadcasters (NAB), among others. "A proper consensus was never reached due to a lack of balance on SC-4," Michael Chiarulli, manager of telecommunications engineering for ABC, told the board at a February 4 hearing in New York City. The issue of balance on SC-4, the IEEE subcommittee that drafted the standard, has been raised before, with objections focusing on the panel's large military contingent and its limited biological and medical expertise (see *MWN*, S/O89, J/A90 and N/D92). But Chiarulli argued a different point—that his industry was not properly represented. After all, he pointed out, "Broadcasters have the greatest potential for exposing the public to high levels of RF radiation." Ron Peterson of AT&T Bell Laboratories in Murray Hill, NJ, who is secretary of SC-4, countered that, "Broadcasters were well represented by Ralph Justus [who was then with the NAB] and Jules Cohen [a consultant based in Washington]." He also argued that below 100 MHz, the electric field from broadcast facilities can induce currents in excess of the limits in the new guidelines: "That's where the 100 MHz cutoff came from."

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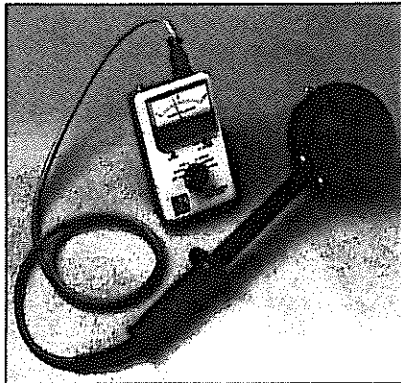
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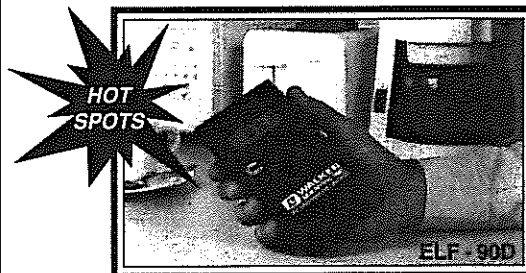


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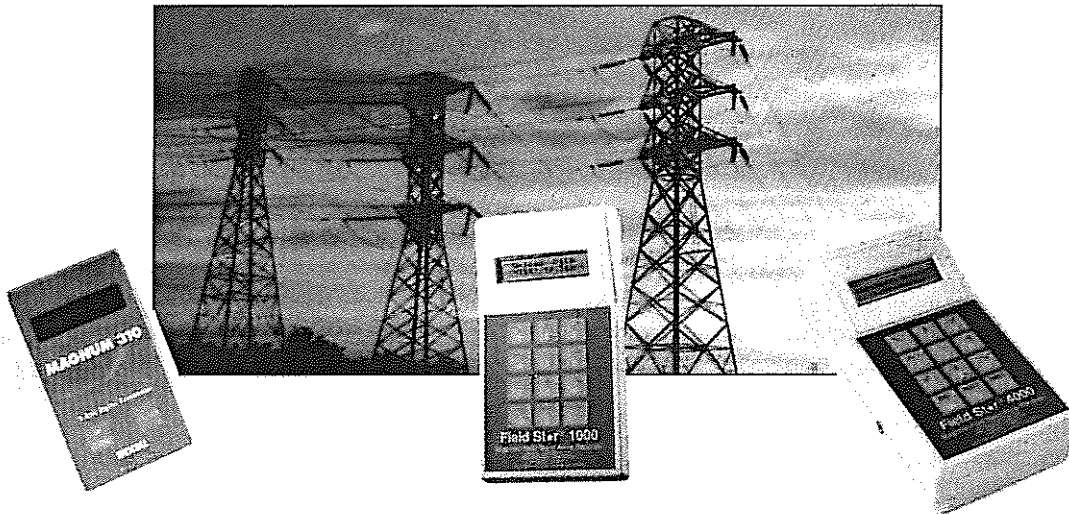
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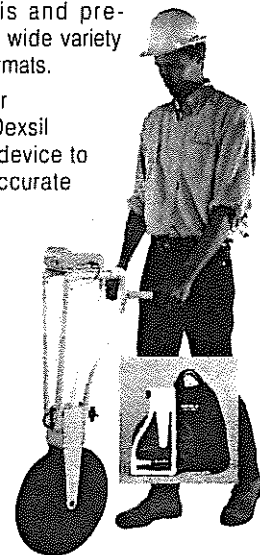
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