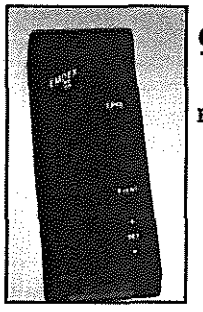
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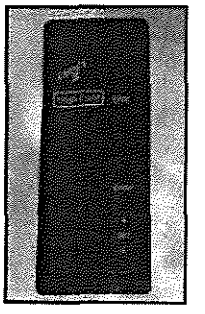
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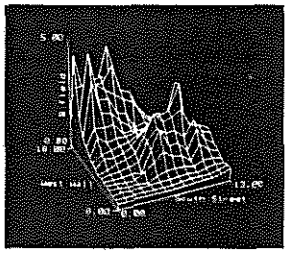
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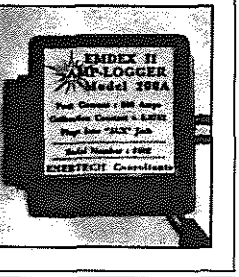


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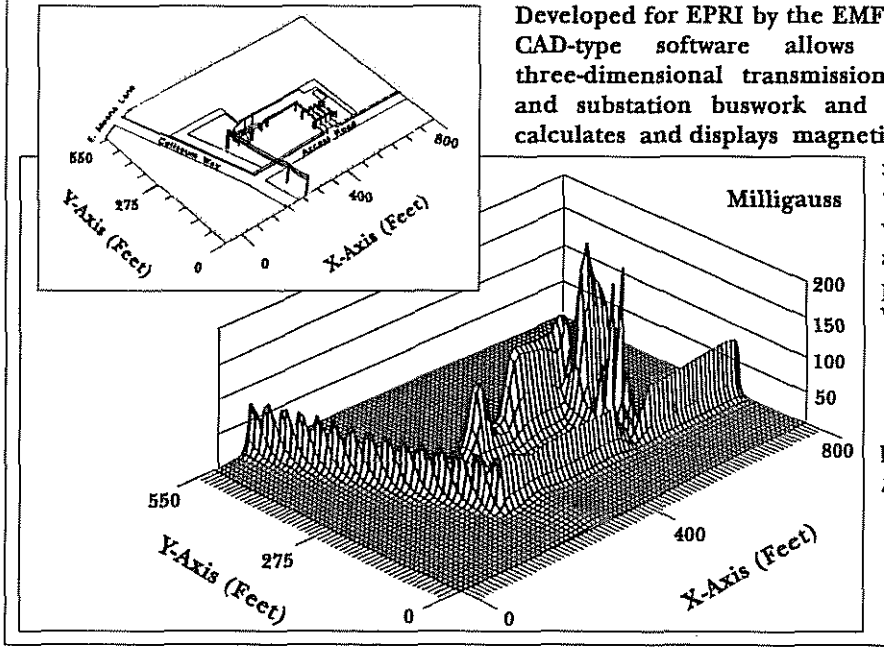
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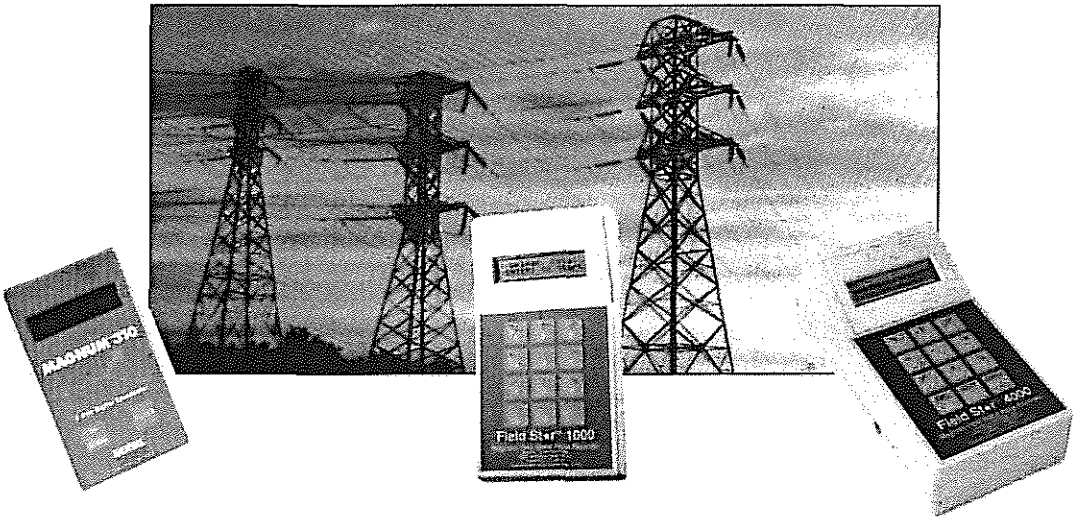
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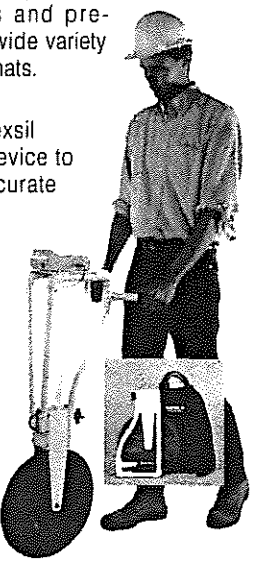
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MICRO WAVE NEWS

Vol. XIV No. 3 A Report on Non-Ionizing Radiation May/June 1994

INSIDE...

EMF NEWS pp.2-10

Power Line Talk:
(Mis)interpreting Feychting–Ahlbom • Yale Physicists Just Say No • Australian Childhood Cancer Study Shelved • Loomis's Breast Cancer Paper Out • Cunningham of NYPA Resigns • New Books • Press on Property Values

EPA Establishes EMF Hotline

Sweden Backs Away from Exposure Limits

DOE Review: El Paso in November

Blackman and Blanchard Offer New Parametric Resonance Model

Swedish Trade Unions Demand Safeguards

New EPRI Reports, Resource Papers and Brochures

Florida Judge Refuses To Dismiss Leukemia Lawsuit

The Pitfalls of Using Job Titles To Assess Exposures

HIGHLIGHTS pp.10-15

HAARP Ionospheric 'Heater' Under Attack in Alaska

Police Officers Seek Funding for Health Tests from Traffic Radar Companies

VDT–Cancer Claim Dismissed

Mobile Telephones Alter Sleep Patterns

Comments on FCC's Proposed Adoption of ANSI/IEEE C95.1 RF/MW Radiation Limits

FROM THE FIELD p.16

Clippings from All Over

UPDATES pp.17-19

NIOSH Report on Brain Cancer Cluster at St. Louis Post-Dispatch • High-Power Microwave Research at European Meeting • Salmonella Survives Uneven Microwave Heating • EMF and VDT Protection Guides from ILO and INIRC • EEPA Makeover

CLASSIFIEDS pp.17-20

Utilities Win Three in a Row: Two Cancer Claims, Property Case

Three key power line electromagnetic field (EMF) lawsuits were decided in favor of electrical utilities in recent weeks, dealing a blow to plaintiffs who claim that EMFs are harmful.

"In my opinion, the plaintiffs' bar should look long and hard before bringing another one of these cases," said Robert Pennington, an attorney for Georgia Power Co. in the case brought by Nancy Jordan, who alleged that her non-Hodgkin's lymphoma (NHL) was caused by power lines belonging to Georgia Power and to a second defendant, Oglethorpe Power Co. On May 11, a jury in Douglasville, GA, rejected Jordan's claim. Pennington did not predict that these cases will now vanish, however: "I'm sure there will be more cases." Pennington is with the Atlanta firm of Troutman Sanders.

Bruce DeBoskey, one of Jordan's attorneys, also said there will be more cases, and he added that ultimately the plaintiffs will succeed. "It's only a matter of time," he told *Microwave News*. "I feel we really moved the ball forward dramatically with this case." Calling the jury's decision "disappointing but not discouraging," he said, "I think we can win these cases and will win these cases." The jury would have decided in favor of the plaintiffs, he asserted, had the suit involved childhood leukemia.

The Jordan trial marks the second time an EMF–cancer claim has failed. A year ago, Ted and Michelle Zuidema's allegations that EMFs from San Diego Gas & Electric Co. (SDG&E) power lines caused their daughter to develop a rare kidney cancer also were rejected by a jury (see *MWN,* M/J93).

Shortly before the decision in *Jordan v. Georgia Power,* another cancer

(continued on p.7)

New Clues on Leukemia and Breast Cancer Risks Among Railway Workers

A series of Scandinavian occupational studies indicates that railway workers aboard electrified trains face an elevated risk of leukemia and breast cancer, while track or station workers do not appear to have an increased risk of cancer.

In a new analysis of previously published data, Swedish researchers led by Dr. Birgitta Floderus found that engine drivers had a significant threefold increased risk of chronic lymphocytic leukemia (CLL) compared with other workers. These results, which appear in the March 1994 issue of *Cancer Causes and Control,* agree with those in Floderus's well-publicized case–control study, announced in 1992 and published in 1993, which showed a similar risk of CLL for those in jobs with the highest EMF exposures (see *MWN,* S/O92 and S/O93). While Floderus did not cite specific occupations in her 1992-93 study, she noted that railway workers had extremely

(continued on p.9)

EMF NEWS

« Power Line Talk »

One of the key features that distinguishes **Maria Feychting** and Dr. **Anders Ahlbom**'s study of childhood cancer and EMFs from previous epidemiological efforts is that they estimated past magnetic field exposures from historical loads on power lines (see *MWN,* S/O92). Nevertheless, many observers maintain that there really was not much new about the Swedish team's methodology. For instance, in his overview of the EMF problem at the April 6-7 meeting of the National Council on Radiation Protection and Measurements, Dr. **Thomas Tenforde** of the Battelle Pacific Northwest Labs in Richland, WA, characterized the Feychting–Ahlbom study as one that investigated risks as a function of distance from a power line—and noted that they had failed to find a link with recently measured fields. He did not mention their calculation of historical fields. In a letter that will appear in the July 1 *American Journal of Epidemiology (AJE),* Dr. **Richard Stevens**, also of the Battelle Labs, raises the issue directly, questioning whether the calculated field means anything more than simply the distance to a power line: "The calculated historical field is a function of distance to the line, load on the line at the time of diagnosis and configuration of the line. Do load and configuration contribute much, or is the calculated field really just distance?" Feychting and Ahlbom respond that a further analysis of their data shows that distance explains only 62% of the variation in calculated magnetic fields—approximately the level that Stevens said would persuade him that the Swedish results "add new support for an association between magnetic field exposure...and the risk of leukemia in children." Stevens told *Microwave News* that he is now convinced that there is more to the Swedish study's estimate of risk than just distance to the power line. Before the Feychting–Ahlbom study, wire codes or spot measurements, or a combination of the two, were used to estimate past magnetic field exposures. In several studies, including Dr. **David Savitz**'s 1988 study, childhood leukemia showed a stronger association with wire codes than with spot measurements. This has been widely used as an argument against any causal relationship between EMFs and leukemia. In another letter to *AJE,* which appeared in the April 15 issue, Savitz, of the University of North Carolina School of Public Health, Chapel Hill, takes on a number of "reviewers of [the EMF] literature [who] persist in erroneously attributing a different pattern of association [between wire codes and measured fields] to a failure of the gold standard (measured fields) to show stronger relations with childhood leukemia than a proxy (wire codes)." After all, gaussmeters only take a "relatively brief sample in time during the wrong historical period," writes Savitz. Who are these reviewers? Savitz cites Dr. Richard Doll and others at the U.K. National Radiological Protection Board, Drs. James Jauchem and James Merritt of the U.S. Air Force, the late Dr. Sol Michaelson of the University of Rochester (NY), Dr. Leonard Sagan of EPRI and Harvard University's Dr. Dimitrios Trichopoulos and his colleagues on the CIRRPC panel.

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"It is my opinion that the dangers to human health from low-level ELF fields have been exaggerated beyond reason. I base this conclusion on considerations ranging from the underlying physics to the inconsistent epidemiological data and lack of concrete biological results. It is appalling that close to a billion dollars has already been spent on this problem. I by no means conclude that no further research should be conducted on biological interactions with ELF fields; however, nothing in the available data suggests the need for any sort of crash program. There are far more urgent things to support in the present national concern over the economy, and unwarranted hysteria could end up trivializing concern over legitimate dangers to health such as cigarette smoking and the AIDS epidemic." These are the words of Dr. **William Bennett Jr.**, a physicist at **Yale University** in New Haven, CT, in an article on "Cancer and Power Lines," which was published in the April issue of *Physics Today.* At about the same time, Bennett's colleague in the Yale physics department, Dr. **Robert Adair**, offered a similar view in a press release announcing the publication of his new paper in the April *Proceedings of the National Academy of Sciences (91,* pp.2925-2929): "I think the fear of power lines springs from the human need to find an explanation for everything bad that happens. Cancer and leukemia happen for many reasons that we do not now understand. But power lines are not among the possible reasons." Adair limits his new analysis to the action of ELF fields on biological magnetite, while Bennett presents a more general argument against weak field interactions. Both are well-known critics of those who express concern over low-level EMF health threats. Bennett was a member of the CIRRPC White House panel, which dismissed EMF health risks (see *MWN,* N/D92) and is the author of a new book, *Health and Low-Frequency Electromagnetic Fields,* published by the Yale University Press. Adair has written and spoken widely to convince people not to be concerned about EMFs.

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An **Australian epidemiological study** of EMFs and childhood cancer, sponsored by the Electricity Commission of New South Wales, has been shelved (see *MWN,* J/A91). The scientific committee that was planning the study has been disbanded. Dr. **Michael Repacholi** of the Royal Adelaide Hospital, who was coordinating the $1.2 million study at the Australian Radiation Laboratory in Yallambie, explained that the study would not go forward because of "our inability from

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present evidence to define our concept of 'dose.'" Repacholi also pointed to methodological problems associated with minimizing bias in the selection of controls, which would have forced the development of a surrogate similar to wire codes. "This was seen as unsatisfactory, since we could not improve on the Scandinavian studies," he said. Others at the lab regret the decision not to move forward. They see the loss of an opportunity to test the wire code hypothesis in a country outside the U.S. Repacholi said that he too is "disappointed," but that he understands "the sponsors' reluctance to produce another epi study that will be put in the pile and not contribute significantly to our knowledge." Repacholi, who has been in Geneva, Switzerland, consulting with the World Health Organization on the development of a non-ionizing radiation program, will be returning to the Royal Adelaide Hospital in July.

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The first study to link EMF exposures with **breast cancer in women** will appear in the June 15 issue of the ***Journal of the National Cancer Institute*** (see *MWN,* N/D93). Dr. Dana Loomis, Dr. David Savitz and Cande Ananth's paper, "Breast Cancer Mortality Among Female Electrical Workers in the United States," will also be featured in the news section of the journal. Meanwhile, Loomis said that he is still seeking funds to pay for EMF exposure assessments for a group of women who are the subjects in an ongoing study of breast cancer.

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James Cunningham, head of the public affairs department at the **New York Power Authority** (NYPA), resigned in April amid questions about his department's expenses. A new chief executive, S. David Freeman, took over the NYPA earlier this year after newspaper reports about lavish executive perks and other management problems prompted NYPA's chairman to resign. "The NYPA is in the midst of a reorganization," Cunningham told *Microwave News.* "I felt it was time for a change." Cunningham denied a report in *New York Newsday* (April 20) that his position was going to be downgraded or eliminated. The newspaper criticized the department's spending practices and reported that Cunningham's staff had run up large bills for meals, travel and consultants. The paper also stated that Cunningham himself had "quietly repaid" several hundred dollars in personal expenses. Cunningham defended his expenses, however, telling the newspaper that many of his trips were made to promote utility industry EMF research. Indeed, Cunningham lobbied hard for passage of the national EMF research program. As early as 1990, Cunningham, testifying before Congress, argued that utilities should commit money to a government research program to avoid a "perceived bias" in the utility industry's own research (see *MWN,* M/A90 and J/A90).

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In the coming weeks, two new collections of papers by a veritable who's who of the EMF research community will be published. ***Biological Effects of Electric and Magnetic Fields*** is a two-volume set edited by Drs. **David Carpenter**, the dean of the School of Public Health at the State University of New York, Albany, and **Sinerik Ayrapetyan** of the Armenian Academy of Sciences in Yerevan. The first volume addresses "Sources and Mechanisms," and the second is on "Clinical Applications and Therapeutic Effects." Published by Academic Press in San Diego, each volume runs more than 350 pages and costs $99.00. To order, call (800) 321-5068, or fax (800) 336-7377. Dr. **Allan Frey**, a consultant based in Potomac, MD, edited the second collection, ***On the Nature of Electromagnetic Field Interactions with Biological Systems,*** which will be published by CRC Press in Boca Raton, FL. The 184-page volume costs $89.95 ($108.00 outside the U.S.). To order, call (800) 272-7737, or fax (800) 374-3401. And later this year or in early 1995, CRC Press will release the second edition of the ***CRC Handbook of Biological Effects of Electromagnetic Fields,*** edited by Dr. **Charles Polk** of the University of Rhode Island, Kingston, and Dr. **Elliot Postow** of the NIH in Bethesda, MD.

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The effect of power lines on **property values** is clearly a hot topic of late—probably due to the *McCartin* trial (see p.8). An April 30 ***Washington Post*** item focused on one new home purchase that fell apart when the buyer found that large Virginia Power Co. transmission lines ran within 300 feet of the property. And a story in some editions of the April 26 ***Los Angeles Times*** quoted real estate agents, appraisers and utility officials: "Right now, we don't have hard market data showing that buyers pay less for property near a power line," Mike Poizner of the Los Angeles Department of Water and Power told the paper. Utility publications have also tackled the topic. The May/June issue of the Edison Electric Institute's (EEI) ***Electric Perspectives*** ran a long piece with a detailed discussion of two reports, which were commissioned by EEI and published in 1992, on how power lines affect public attitudes.

Call 800-EMF

The full number is (800) EMF-2383. That's the new, toll-free hot line established in mid-May by EPA as part of its return to non-ionizing electromagnetic radiation (NIER) issues (see *MWN,* M/A94). Hot line operators provide "down the middle, straightforward information on what we do know and what we don't know" about hazards from ELF and RF radiation, according to Dennis O'Connor of EPA's Office of Radiation and Indoor Air (ORIA) in Washington. The hot line was clearly needed, O'Connor explains, "to relieve our office and the regional offices of the incredible burden of answering EMF questions all the time."

O'Connor notes that the hot line already receives about ten calls per day: "And that's without the number being advertised at all." ORIA had previously estimated that EPA fields thousands of calls per year on NIER hazards (see *MWN,* J/A93), but O'Connor says that the actual volume has never been monitored carefully. The hot line, which is being operated by an outside contractor, is open from 9 am to 5 pm, eastern time.

Swedish EMF Limits Unlikely; Analysis of Options Continues

Sweden is now unlikely to set exposure limits for power frequency magnetic fields, government officials report. Taken together with a new government booklet that downplays possible EMF health risks, this development marks a retreat from the position Sweden took in 1992, after the completion of two major epidemiological studies of EMFs and cancer.

The National Electrical Safety Board (NESB), which is responsible for developing EMF rules, continues to work on an analysis of the costs associated with various regulatory options, according to Jaak Noü, the board's technical director. This effort has suffered substantial delays, and no final decisions will be made until it is completed. Specific, firm guidelines rather than numerical limits are the "probable result," Noü told *Microwave News*.

The NESB has warned previously that new day-care centers, schools and playgrounds should not be built where magnetic fields exceed 2-3 mG. The agency stands behind these guidelines and could go still further—perhaps by proposing regulations for children's facilities, according to Noü.

Research results in the coming years could affect government policy, Noü said. If future findings show a link between EMFs and breast cancer, for example, "Then we will have to consider limits again." For now, however, while "a lot of studies point to a relationship between magnetic fields and cancer," substantial uncertainty remains.

The informational booklet, released in May by the NESB and three other agencies, states that uncertainties in current scientific knowledge leave "no basis for establishing limits." It was primarily written by the NESB, Noü said, with assistance from the National Board of Health and Welfare, the National Board of Housing, Building and Planning and the Swedish Radiation Protection Institute. "It represents the positions of all four agencies together," Noü said.

Dr. Lars-Erik Paulsson of the Radiation Protection Institute in Stockholm concurred that the booklet reflects a "consensus" of the four agencies. He added, however, that the only formal government policy is a January 1993 statement from the institute. When the costs are "reasonable," according to this document, steps should be taken to reduce magnetic field exposure (see *MWN,* M/J93). "My personal view is that an exposure limit is hard to implement as long as we don't know what physical quantity we should limit," Paulsson said.

Vattenfall, the state power company, took a cue from the new EMF booklet and predicted in a May 19 press release that "no limit values are likely to emerge in the foreseeable future in Sweden." In a telephone interview, Vattenfall's Rolf Lindgren added that the NESB faces pressure from other agencies to avoid limits.

In September 1992, prompted by the results of the residential EMF exposure study by Maria Feychting and Dr. Anders Ahlbom and of the occupational study by Dr. Birgitta Floderus and coworkers, the Swedish government announced that it would begin drafting regulations for new construction near power lines and for all new electrical facilities (see *MWN,* S/O92). At the time, Noü said that the regulations would take six months to complete.

After more than a year had passed, the NESB released an interim report and said that its analysis of the costs associated with 2, 5 and 10 mG limits, along with any proposed rules, would not be ready until this spring (see *MWN,* J/F94). The NESB's Henric Nilsson now expects the final report and proposals will not be completed until the end of 1994, at the earliest. Problems with a computer analysis designed to examine the locations of existing electrical facilities are a primary cause of the delays, he said.

In 1992, the National Board for Industrial and Technical Development's electrical safety department—the predecessor to the NESB—announced that it would "act on the assumption of a link between EMFs and cancer, particularly childhood cancer." "That has changed a bit," Nilsson conceded. "The other agencies don't want to go that far yet," he explained.

The 16-page booklet, which was written as a series of questions and answers, stresses the uncertainties around possible EMF health effects. It notes, for example, that: "The majority of investigations have not shown any increased risk for adults. But this needs more study before one knows for sure."

The booklet makes no mention of specific EMF levels that might be considered unsafe, avoiding language that is worded as strongly as the NESB's earlier recommendations. It cautions that new homes, schools and day-care centers should not be sited close to existing electrical equipment "that gives rise to significant magnetic fields." But it qualifies this advice by adding, "if alternative locations are available."

The thrust of the comments on childhood cancer is that only a small number of children are potentially affected:

> The normal annual risk for childhood leukemia is four cases per 100,000—or about 70 cases in Sweden every year. Seven of ten children survive. Certain study results suggest that the risk is almost doubled for children who live near power lines....This would therefore mean that two children in Sweden get leukemia every year due to magnetic fields from power lines.

In an interview with *Microwave News* following the release of his and Feychting's study in 1992, Ahlbom made a similar point, estimating that two leukemia cases occur each year among children living near power lines in Sweden and that one of those could be attributed to EMF exposure, based on his findings (see *MWN,* N/D92).

DOE–EPRI Meeting in El Paso, TX

The annual review of EMF bioeffects research, sponsored by the DOE and EPRI, is set for November 6-10 in El Paso, TX. The meeting, which is open to the public, will be held at the Camino Real Paso del Norte Hotel; call (800) 769-4300 or (915) 534-3099 for reservations.

For those wishing to present papers, abstracts are due September 10; a call for abstracts will be available in June. For more information, contact: W/L Associates, 120 West Church St., Suite 4, Frederick, MD 21701, (301) 663-1915.

The booklet concludes that, since "the cost of eliminating these possible [childhood leukemia] cases is very large," money would be better spent elsewhere — on reducing the cancer risk from radon, for example, or on cutting the number of traffic accidents. *Magnetfält och Eventuella Halsorisker Utifrån Vad Vi Vet i Maj 1994 (Magnetic Fields and Possible Health Risks Based on What We Know as of May 1994)* is available from: NESB, PO Box 1371, S-11193 Stockholm, Sweden, (46+8) 453-9700. There is no charge for single copies. An English translation of the text is also available.

Blackman–Blanchard Offer Ion Parametric Resonance Model

First there was Liboff–McLeod ion cyclotron resonance, then Lednev's parametric resonance, and now Dr. Carl Blackman and Janie Blanchard are proposing an ion parametric resonance model to explain how EMFs cause biological effects.

Blanchard and Blackman's model seeks to show how certain specific combinations of static and time-varying magnetic fields can affect biologically important ions. And, although they cannot readily explain how such changes are translated into observable responses, they have experimental data from Blackman's lab at the Environmental Protection Agency's Health Effects Research Lab in Research Triangle Park, NC, which show that the mix of AC and DC magnetic fields dictated by the model distinctly affects neurite outgrowth from PC-12 cells, a well-established line of nervous system cells.

"Our model predicts a unique, nonlinear response," Blanchard told *Microwave News* from her office at Bechtel Corp. in San Francisco, "and we are excited about the remarkable consistency we found when we tested it in Carl's lab."

In two companion papers which will take up more than 40 pages of the next issue of *Bioelectromagnetics (15,* pp.217-238 and pp.239-260, 1994), Blanchard and Blackman spell out, complete with thorough mathematical details, the theoretical underpinnings of their model and then show how it was successfully applied to the PC-12 cells. In one particular case, the model explains 94% of the variation in response of the cells to a 45 Hz signal over a range of different strengths of static and time-varying fields.

A number of close observers are impressed. "It is a sheer tour de force to have successfully fitted this complicated set of data," Dr. Abe Liboff of Oakland University in Rochester, MI, said in an interview. And Dr. Charles Polk of the University of Rhode Island, Kingston, commented that it is "important and interesting work." Over the last ten years, Liboff and Blackman have championed the idea that the Earth's magnetic field is a key variable for understanding EMF bioeffects (see *MWN,* S84, N84, J/F87 and M/A92).

In a third, forthcoming paper, Blanchard and Blackman speculate more freely on how magnetic fields can cause subtle shifts in the conformation of proteins and enzymes. "It is possible that a critical ion may be bound in a protein cavity that shields it from collisions with other...molecules and precludes the hydration of that ion." After all, they write, "Changes in protein function or enzyme activity [are] presumably a function of various minor structural or conformational states assumed by the protein, represented by changes in energy levels of the reaction sites." Their paper, "A Model of Magnetic Field Effects with Confirming Data from a Cell Culture Preparation," is a chapter in *On the Nature of Electromagnetic Field Interactions with Biological Systems,* soon to be published by CRC Press (see p.3).

"Overall, this is another indication that the Earth's static magnetic field may play a role," Polk said. But he added that, "I am surprised that they got such good agreement." Polk also said that he would like to see if the model is as successful when applied to a different experimental system.

"This is the first time that there is a detailed theory and an extensive test of that theory," Blackman said. "It is essential that it be independently replicated."

Swedish Trade Union Group Demands EMF Safeguards

A special working group on "Electric and Magnetic Fields" of the Swedish Trade Union Confederation—representing blue-collar workers—issued the following list of demands as part of an informational booklet, Cancer and Magnetic Fields at the Workplace. *Citing epidemiological studies that show links between EMFs and cancer, the union writes that, "The fact that it is not yet regarded as proved that a link exists must not prevent the trade unions from trying to protect our members' health." The booklet is available from the confederation, Barnhusgatan 18, S-10553 Stockholm, Sweden.*

- That the principle of caution be applied as regards exposure to magnetic fields;
- That all unnecessary exposure be avoided;
- That new places of work be designed and equipped in such a way that the exposure to magnetic fields is minimized;
- That the manufacturers of electrical equipment aim to minimize the magnetic fields;
- That manufacturers give details of the levels of magnetic fields in connection with the sale of such equipment;
- That no employee be exposed to an average exposure exceeding 2 mG per working day;
- That temporary high exposures be minimized as far as possible;
- That the employer maps out the existing levels of magnetic fields and, when necessary, draws up plans of action in accordance with the internal control regulations;
- That the staff in question be informed and trained;
- That practical measures to reduce exposure be taken without further delay, such as indication of areas with high exposure, reduction of magnetic fields, transfer of work sites and changed work organization;
- That the distribution of responsibilities between the different authorities be clarified;
- That Swedish laws and ordinances reflect a viewpoint corresponding to the principle of caution mentioned above;
- That stray currents be eliminated by the introduction of five wire systems;
- That the National Board of Occupational Safety and Health, pending the draft for a hygienic limit, issues a regulation in accordance with the views above;
- That the research on electric and magnetic fields be continued and intensified.

New from the Electric Power Research Institute (EPRI)

Reports

B. Clairmont, ***Handbook of Shielding Principles for Power System Magnetic Fields, Vol.1: Introduction and Application, and Vol.2: Methods and Measurements*** (TR-103630-V1–2), April 1994, 312 pp. and 516 pp., respectively. Price: $200.00 each. A compilation of available data on low-frequency magnetic field shielding. Volume one includes a basic introduction to the principles of active and passive shielding. Volume two introduces more complex numerical techniques to determine the efficacy of high-conductivity or high-permeability shielding materials. The roles of harmonics and transients are also discussed. Volume one includes a detailed glossary as well as contacts for shielding materials and services.

R. Goodman and A. Henderson, ***The Effects of Electric and Magnetic Fields on Transcription in Cultured Human Cells*** (TR-102860), December 1993, 76 pp. Price: $200.00. A summary of Drs. Reba Goodman and Ann Henderson's experimental studies, showing that human cell lines exposed to EMFs respond by increasing the messenger RNA transcripts of certain genes, including the c-*myc* oncogene. Goodman, who is at Columbia University, and Henderson, who is at Hunter College, both in New York City, observed the greatest increase using a 45 Hz sine wave with a magnetic field of 57 mG (rms) and an electric field of 10 ∝V/m. The response became apparent in less than ten minutes. They were not able to determine whether it was the electric field, the magnetic field or some combination that was responsible. The report includes extensive experimental details of their setup. (See also, *MWN,* S/O85, N/D86 and M/A87.) (Goodman and Henderson recently identified a specific region of the c-*myc* promoter that responds to EMFs; see *MWN,* M/A94.)

R. Kavet, ***Proceedings: EPRI Cancer Workshop II on Laboratory Research*** (TR-101749), September 1993, 84 pp. Price: $200.00. A review of research sponsored by EPRI between July 1988 and September 1991, when the workshop was held in Washington. Topics include the mouse skin tumor model, C3H/10T 1/2 cells, the nude mouse model, pineal research and recommendations for new research projects. Kavet is an EPRI project manager.

J. Kirschvink et al., ***Magnetite-Based Magnetoreceptors in Animals: Structural, Behavioral, and Biophysical Studies*** (TR-102008), September 1993, 58 pp. Price: $200.00. Dr. Joseph Kirschvink of the California Institute of Technology in Pasadena and coworkers were unable to pinpoint the location of magnetite in salmon and honeybees, but succeeded in training bees to respond to a 22 G magnetic field at frequencies from 1 to 60 Hz. Kirschvink previously identified magnetite in human brain tissue (see *MWN,* M/J92). Based on biophysical modeling of how magnetite might interact with magnetic fields at the cellular level, this research team concludes that the magnetic fields "produced by electrical appliances are well within the range for potential effects," but, due to the small amount of magnetite in human tissue, ELF EMFs below 50 mG are unlikely to have effects.

J. McCann, F. Dietrich and A. Martin, ***A Critical Review of the Genotoxic Potential of Electric and Magnetic Fields*** (TR-102115), December 1993, 76 pp. Price: $200.00. Although the authors conclude that "the overwhelming preponderance of evidence" does not suggest that static or ELF EMFs damage DNA, they consider a number of exceptions among their review of 55 published studies. Based on these exceptions, they single out two categories of exposure that merit further investigation: simultaneous exposure to EMFs and chemical mutagens or ionizing radiation; and very high electric fields associated with "spark discharge, transient electrical shocks and corona." In an appendix, the authors include a less exhaustive survey of 37 studies on the genotoxicity of RF/MW radiation exposure. Of the 15 studies that reported positive results, the authors discount the results of 12 because of possible thermal effects. (This same team published a review article with the same title in *Mutation Research, 297,* pp.61-95, 1993.)

R. Patterson and F. Dietrich, ***Small Animal Electric and Magnetic Field Exposure Systems*** (TR-103194), October 1993, 120 pp. Price: $200.00. A technical report describing 60 Hz experimental exposure systems.

D. Robertson and F. Dietrich, ***Pilot Study of Magnetic Fields in Electric Vehicles*** (TR-103275), January 1994, 149 pp. Price: $200.00. EMF measurements on two vehicles—the Conceptor Electric G-Van and the Chrysler/EPRI Phase II TEVan—using protocols similar to those used for electric mass transit systems (see *MWN,* J/A93). The maximum 5 Hz-3 kHz magnetic fields ranged from 1.8 to 50.8 mG inside the vehicles. The means at various interior locations ranged from 1.4 to 9.9 mG. The researchers, both with Electric Research and Management Inc., write that the "combination of variable DC and AC current within the wiring and load devices on board the [vehicles] created a very complex magnetic environment."

Resource Papers

Electric and Magnetic Field Fundamentals (BR-103745), March 1994, 28 pp. Price: $5.00. A primer that covers the physics of electricity and magnetism as well as basic considerations in designing studies on EMF health effects.

Meta-Analysis: Introduction to Its Use in Epidemiology (BR-103744), March 1994, 24 pp. Price: $5.00. Concentrates on how to pool the results of several epidemiological studies to increase overall statistical power. Outlines the process of designing and carrying out a meta-analysis and reviews possible drawbacks.

Occupational EMF Exposure Assessment (BR-103743), February 1994, 24 pp. Price: $5.00. A survey of the methods used to estimate on-the-job exposures, from job titles to personal dosimetry. Touches on the thorny issue of what characteristic of EMF exposures should be measured—transients, intermittency, geomagnetic resonances, time spent above a certain threshold or "something else entirely."

Brochures

EMF Laboratory Studies (BR-103714), May 1994. Price: Free for first copy, $3.00 for additional copies. A brochure describing a selection of EPRI-sponsored research projects on the role of EMFs as cancer promoters and on basic cellular processes.

EMF Research (BR-102833), 1993. Price: Free for first copy, $2.00 for additional copies. Companion brochure to *EMF Laboratory Studies. EMF Research* describes EPRI's ongoing projects and the rationales behind them.

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claim—this one in the Washington State workers' compensation system—was defeated when an administrative law judge found that the evidence was insufficient to support the charge that on-the-job EMF exposure was a cause of the leukemia that killed Seattle utility worker Robert Pilisuk.

And, in May, a property value case in San Clemente, CA, again involving SDG&E, was dismissed following a month-long jury trial.

"This is a trend," said SDG&E legal counsel Greg Barnes. EMF cases "simply don't make sense" to jurors, he added. The contention that EMFs cause health problems "is a losing proposition," he told *Microwave News*.

But Michael Withey, who represents the San Clemente property owners and Pilisuk's widow—and represented the Zuidemas—said that any rumors of the demise of this litigation "have been greatly exaggerated." He said he will appeal both cases.

Jury Rejects Evidence for Lymphoma Link

Pointing out that the claim of an EMF–cancer link has now been rejected in "a string of cases," Oglethorpe Power's attorney, James Orr, argued that the jury's decision in *Jordan* "is consistent with the opinion of the overwhelming majority of the scientific community."

Orr, who is with the firm of Sutherland, Asbill & Brennan in Atlanta, also pointed out that this case was decided on the issue of causation—whether EMFs actually caused Nancy Jordan's lymphoma. In *Zuidema v. SDG&E,* the jury was instructed to consider first whether SDG&E had a duty—as of 1987, when the Zuidemas' child was exposed to EMFs *in utero*—to warn customers about possible health risks. Only if the jurors had found for the plaintiffs on that issue would they have considered the specific cause of the girl's cancer. The process was reversed in *Jordan,* with the jury being instructed to consider the cause of Jordan's cancer and to rule on whether the utility was negligent only if they found for the plaintiffs on the first question.

To decide in favor of Jordan, the jurors had to find that a preponderance of the evidence supported the existence of a causal link between EMFs and her cancer, according to DeBoskey. "I think they basically felt that the adult lymphoma evidence was not as compelling as the childhood leukemia evidence," he admitted. DeBoskey, of the Denver firm of Silver & DeBoskey, interviewed half of the jurors following the trial. He said the forewoman told him that if the trial had concerned childhood leukemia the jury would have had a plaintiff's verdict in 15 minutes. DeBoskey said he likely will appeal. Jordan was also represented by Robert Shields of Doffermyre, Shields, Canfield & Knowles in Atlanta.

Jurors' comments reported in newspapers immediately after the trial support DeBoskey's account. The forewoman, Sara McKoy, told the Associated Press that scientific studies "show there is something there, but we weren't convinced it caused this case." Another juror said that the utilities "may have won this battle, but the war is not over. None of us like the decision. But the law was the law, and our hands were tied. I fully believe that EMFs cause cancer."

Asked about these comments, Orr noted that the jury's decision was unanimous, adding, "We think it was a strong verdict." Pennington argued that, "The plaintiffs failed to present any credible scientific evidence that there was a causal link between EMFs and Nancy Jordan's cancer." He said that he had not talked to any jurors but that the decision "was not close at all."

Jordan learned she had NHL in 1989, and her doctors have said the cancer is progressing. The home she lived in with her family from 1983 until after she was diagnosed with cancer is less than 50 feet from power transmission and distribution lines operated by the two utility defendants (see *MWN,* S/O 93). Magnetic fields in the house range from 4 to 30 mG, according to DeBoskey.

The witnesses called during the trial included a number of experts who had testified before—some quite frequently—and a few who had never appeared. The defendants retained Dr. Saul Rosenberg of Stanford University Medical Center in Palo Alto, CA, a leading expert on NHL. He was a key defense witness in the police radar–cancer claim brought by Officer Eric Bendure, which was rejected by a jury in early 1993 (see *MWN,* J/F93). They also called: Dr. Philip Cole of the University of Alabama, Birmingham, an epidemiologist who has done extensive work for utility clients; Dr. Richard Bland, a local radiation oncologist who had done no work on EMF issues until he was hired by the defendants to review the literature; and Fred Dietrich, an engineer with Electric Research and Management Inc. in Pittsburgh, who provided estimates of Jordan's power line EMF exposure.

Dr. David Carpenter of the School of Public Health at the

Florida Judge Refuses To Dismiss Leukemia Lawsuit

A judge in Miami has denied a motion by Florida Power & Light Co. (FP&L) to dismiss the lawsuit brought by Leonard Glazer of Coral Gables, who alleges that EMFs from the utility's power lines caused him and his late wife to develop leukemia.

In her May 19 decision, Circuit Court Judge Maria Korvick rejected FP&L's argument that the court lacked jurisdiction because the state's Department of Environmental Protection (DEP) is responsible for regulating EMF exposure. But she did direct the plaintiffs and defendants jointly to request that the DEP prepare "an opinion and/or an update on the issues raised in the complaint." This will be used as additional evidence, said Howard Talenfeld, a Ft. Lauderdale lawyer, who is Glazer's cocounsel. "It will be like having another witness in the case," he told *Microwave News*. In 1989, Florida set the first power line magnetic field limits in the U.S. (see *MWN,* M/A89).

Stacey Shaw, a spokeswoman for FP&L, which is based in Palm Beach, said that the utility has asked the judge to reconsider issues other than jurisdiction that were raised in its motion for dismissal, including arguments that the plaintiffs' claims are barred by the statute of limitations. "We felt that the court primarily addressed the jurisdictional issue," Shaw said.

FP&L is represented by Alvin Davis of the Miami firm of Steel, Hector & Davis and by Carlos Alvarez of Hopping, Boyd, Green & Sams in Tallahassee. In addition to Talenfeld, Glazer is represented by Lawrence Marrafino of Boca Raton. The case was filed in January (see *MWN,* J/F94).

State University of New York, Albany, testified for the plaintiffs. This is the first time Carpenter, who led the New York State Power Lines Project, has been used as an expert in a trial. Dr. David Ozonoff of Boston University also appeared, and testimony from the late Dr. Peter Wright of the Poly Clinic in Seattle was presented on videotape. Both Ozonoff and Wright testified for the plaintiffs in *Zuidema*.

Causal Link Not 'Probable' in Widow's Claim

A judge in Washington State found no "probable" link between on-the-job exposure to EMFs and Robert Pilisuk's leukemia. Judge Linda Williams of the Board of Industrial Insurance Appeals affirmed an earlier decision denying Mimi Handlin Pilisuk her husband's pension. In her 40-page decision, entered April 14, the judge acknowledged a "possibility" of a connection, however, and wrote that the theory of an EMF–leukemia link is "plausible."

"The surviving spouse must show that the claimant's employment probably, as opposed to possibly, caused his leukemia," Williams wrote. "While the theory that EMF promotes or copromotes leukemia is plausible, it is not probable." (She also noted that even if one accepts that EMF exposure promoted Pilisuk's cancer, it still would not be considered "a proximate cause" of his disease and would not be compensable; for an excerpt of her decision, see p.16.)

Pilisuk died five years ago of complications from acute lymphocytic leukemia. He was 44 years old and had worked for Seattle City Light for seven years (see *MWN,* M/A91, M/J92 and J/F94). His average daily exposure to 60 Hz magnetic fields at work was 12.6 mG, but occasionally he was exposed to fields as high as 150 mG, according to Williams's decision.

"Judge Williams drew a very, very important distinction between 'possible' and 'probable.' That's what these cases are all about," said Mark Warnquist of LeBoeuf, Lamb, Greene & MacRae in Denver, who, with city attorneys, represented the utility. "This case is one of the first that squarely addresses the distinction, but it's not inconsistent with many previous cases."

As an apprentice and as an electrician-constructor, Pilisuk's exposure to high levels of EMFs was in fact a condition of his employment, Williams wrote. However, although epidemiological studies show an association between electrical occupations and leukemia, there are several reasons why this association alone does not prove that Pilisuk's leukemia "was proximately and naturally caused by his exposure"—a legal burden for a decision in the plaintiff's favor. The association is "extremely weak," she noted, adding that laboratory studies have not scientifically proved that it is indeed a result of EMF exposure, and that EMFs are not involved in the initiation of leukemia.

"The preponderance of the evidence suggests that EMF is neither an initiator nor a promoter of leukemia....Although there were many studies which showed that EMF caused cancerous cell proliferation, none of these studies involved leukemia cells," she stated. Therefore, "Applying these results to reach a conclusion that Mr. Pilisuk's [leukemia] was caused by EMF exposure is too speculative."

Withey told *Microwave News* that he will continue to pursue Pilisuk's claim. He has asked the three-person Board of Industrial Insurance Appeals to review the decision, though this board is unlikely to reject Williams's proposed order. If the board upholds the decision, Withey said, he will seek a trial in state Superior Court: "I'm confident that we will be successful before a jury." Pilisuk is represented by Withey and Sydney Royer, both of Schroeter, Goldmark & Bender in Seattle. Dr. Richard Piccioni, another Seattle lawyer who has worked on Pilisuk's case, said that the new Canadian–French epidemiological study led by Dr. Gilles Thériault "would no doubt have strengthened the case" (see *MWN,* M/A94).

Pilisuk's claim was initially rejected by the Department of Labor and Industry in March 1992 (see *MWN,* M/J92 and J/F94).

Property Owners' Claim Against SDG&E Rejected

On May 16, a Superior Court judge in Fullerton, CA, dismissed a case involving three couples who alleged that the value of their homes in San Clemente fell sharply due to EMFs from a power line built and operated by SDG&E. Judge James Ross based his opinion on the findings of an advisory jury, which rejected the homeowners' contention that their property had been "taken or damaged" without just compensation.

Plaintiffs' lawyers have tried to "promote the notion that power lines are unhealthy," SDG&E's Greg Barnes said, "and then turn around and collect money based on the fear they have created." This idea "is lunatic," he argued.

Withey, who represents Mark and Cheryl McCartin and two other couples with homes near the line, called the trial "frustrating," but he also maintained that the case is far from over. "There are solid grounds for an appeal, and we will appeal," he said. This case and other similar actions have already had an impact on how utilities site new power lines, he added: "I don't think any utility would do today what SDG&E did to the McCartins and their neighbors in 1990."

The McCartins' claim concerned a 1990 upgrade of power lines in an existing right-of-way near dozens of luxury homes. SDG&E added a new 12 kV circuit to two existing 12 kV lines. According to the plaintiffs' court papers, the utility's own calculations showed that magnetic field levels near the line "had significantly increased" as a result of the changes. Initially 24 plaintiffs were part of the lawsuit, but most dropped out prior to the trial after finding out that their properties were not directly affected by EMFs from the power line upgrade.

Magnetic fields exceed 4 mG in significant portions of the remaining plaintiffs' homes, according to court papers, effectively ruining the value of the properties as sites for single-family residences. Withey told *Microwave News* that the need for a setback near power lines is well established, noting as an example an ordinance adopted in Irvine, CA, which limits new residential construction near a Southern California Edison power line. He also argued that real estate developers have avoided property where fields exceed 1-2 mG.

The plaintiffs wanted SDG&E to move the line or buy their homes, said Barnes, adding that this all-or-nothing approach was clearly "overreaching." He said the utility had tried to settle the suit before going to trial by offering to rephase

the lines. Since the plaintiffs rejected this and lost the case, they can now be held responsible for the legal expenses the utility incurred after making the offer. "This could easily reach six figures," he said.

The plaintiffs maintained that, regardless of whether EMFs are a proven health risk, current controversy lowers property values, but this reasoning was rejected by the judge. He found that the plaintiffs had to present evidence to the jury showing that EMFs are indeed a health hazard. His ruling runs contrary to a recent decision by New York State's highest court, which found that public perceptions of EMF risks could form the basis for property value claims (see *MWN,* N/D93), and this will be a primary issue for the appeal, according to Withey. Restrictions the judge placed on the testimony of expert witnesses, limiting their comments to their own work and personal conclusions, will also be challenged, he said.

The Pitfalls of Using Job Titles To Assess EMF Exposures

The reanalysis of Siv Törnqvist's data (see p.1) illustrates how the use of job titles to assess EMF exposures can lead to misclassifications that could mask a cancer risk.

In 1992, when Dr. Birgitta Floderus completed her major case–control epidemiological study of EMF-exposed workers (see *MWN,* S/O92), she noted that her results did not agree with those of Törnqvist's 1991 cohort study. Unlike Törnqvist, Floderus found indications of a larger-than-expected number of railway workers with cancer.

Working together, Floderus and Törnqvist learned that work practices had changed over the 1960-1980 study period, resulting in only one railway engine driver per train, instead of two. With the elimination of double-manning, many workers were transferred "from highly exposed to less exposed jobs and to early retirement," while keeping the same job titles they had prior to the changes. The researchers concluded that, "[T]his structural change of the industry...could dilute a potential effect."

Floderus and Törnqvist found support for their hypothesis when, on dividing the study period into two parts—1961-69 and 1970-79—they observed higher CLL risks among engine drivers in the first, but not the second, decade.

They cautioned, however, that an alternative explanation is possible. EMFs may do their damage "within a comparatively short time and...people exposed for several decades may be more or less resistant." In addition, if, as Floderus and others have reported, younger workers are more susceptible, they may become less and less represented in the cohort as they age over time.

Nonetheless, in an interview with *Microwave News,* Floderus said she believes that, "The inconsistencies among studies are, to a large extent, explained by the enormous difficulties in making accurate exposure assessments."

Floderus's team presents "pretty good circumstantial evidence that exposures changed over time," Dr. David Savitz of the University of North Carolina School of Public Health, Chapel Hill, told *Microwave News*. The results are a "reminder of how fallible inferences [based] on job titles can be."

Dr. Anders Ahlbom of the Karolinska Institute in Stockholm, who was a coauthor on the 1991 Törnqvist paper, called the new analysis "very interesting," adding that the results now support "the hypothesis of an association between magnetic fields and cancer."

Railway Worker Cancer Risks *(continued from p.1)*

high exposures, and that these workers, although very few in number, seemed to be overly represented among the cases.

In addition, the new analysis by Floderus and her fellow researchers at the National Institute of Occupational Health (NIOH) in Solna found an eightfold increase in male breast cancer among engine drivers and a fivefold increase for drivers and conductors combined. The number of cases was small, however, with only two cases among the drivers and one among the conductors. They also observed three times more pituitary gland tumors than expected among drivers and conductors combined. The researchers noted that, taken together, these results lend support to "the hypothesis of EMF acting on hormonal-dependent organs."

In a December 1990 letter to the *Lancet,* Dr. Tore Tynes reported a higher-than-expected incidence of male breast cancer among railway engine and tram drivers (see *MWN,* J/F 91). The nearly fourfold excess was also based on a small number of cases. The Floderus study is the fifth to show an association between occupational EMF exposure and male breast cancer (see also, *MWN,* N/D89, J/A90, M/A91 and J/A92).

But in a new study published in the April 1, 1994, *American Journal of Epidemiology,* Tynes, who is with the Cancer Registry of Norway in Oslo, and his coworkers found no association between leukemia or brain tumors and railway employees who worked in stations or maintained tracks or electrical lines—that is, those who did not work on board trains. Tynes did not include engine drivers in the study.

The variation in risks between the two types of railway workers may be explained by differences in EMF exposures in their work environments. According to Fred Dietrich, those on trains are exposed to magnetic fields all the time. In contrast, track workers are only exposed to magnetic fields when a train is running nearby, though they are exposed continuously to electric fields. Dietrich, who is with Electric Research and Management Inc. in Pittsburgh, told *Microwave News* that, "The track workers are exposed to the same peak fields as the engine drivers, but because they are exposed to the magnetic fields for shorter periods, their time-averaged exposures are lower." Dietrich cautioned that he has surveyed the EMFs associated with electrified rail systems in a number of European countries, as well as in the U.S., but not those in Scandinavia (see *MWN,* J/A93).

Tynes told *Microwave News* that the distinction between railway employees aboard trains and those on the ground is more complicated because the former may be shift workers.

In addition, he noted that in populated areas where many trains are running, track workers may also be continuously exposed to magnetic fields.

The new NIOH paper is a reanalysis of a 1991 study by Siv Törnqvist and colleagues, which did not find an elevated leukemia or brain tumor risk among railway workers. When Floderus and Törnqvist, working together, divided the 19-year follow-up period of the original study in two, they found cancer risks that had not been apparent before (see p.9). The original study and the new analysis both relied on job titles reported by Swedish men between the ages of 20 and 64 in the 1960 census. No further exposure assessment or job analysis was done.

Floderus and Törnqvist observed a nonsignificant association between railway work and brain tumors for younger workers. They found that workers under 40 had a two-and-a-half-times higher risk, while workers under 30 had a twelvefold increased risk, though this was based on only two cases among conductors.

The absence of EMF–cancer risks in Tynes's 1994 study is seemingly at odds with the results of a study he completed in 1992, in which he found a significant doubling of the risk of brain tumors among railway track walkers who had worked for at least ten years. Tynes said that the "unexplained excess risk may be related to one or several unknown factors." In his paper, Tynes suggested three possible risk factors: creosote, solvents and herbicides.

In addition to the Nordic studies, a Swiss study also found an increased cancer risk among railway workers. Researchers led by Dr. M. Balli-Antunes found a significant 60-70% increased risk for cancers of the blood and lymph among engine drivers (see *MWN,* S/O90). Railways in Norway, Sweden and Switzerland operate at 16.6 Hz.

M. Balli-Antunes, D. Pfluger and C. Minder, "The Mortality from Malignancies of Haematopoietic and Lymphatic Systems (MHLS) Among Railway Engine Drivers," *Environmetrics, 1,* pp.121-130, 1990.

Birgitta Floderus et al., "Occupational Exposure to Electromagnetic Fields in Relation to Leukemia and Brain Tumors: A Case–Control Study in Sweden," *Cancer Causes and Control, 4,* pp.465-476, September 1993.

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.

Siv Törnqvist, Bengt Knave, Anders Ahlbom and Tomas Persson, "Incidence of Leukemia and Brain Tumors in Some 'Electrical Occupations,'" *British Journal of Industrial Medicine, 48,* pp.597-603, 1991.

Tore Tynes and Aage Andersen, "Electromagnetic Fields and Male Breast Cancer," *Lancet, 336,* p.1596, December 22/29, 1990.

Tore Tynes, Aage Andersen and Frøydis Langmark, "Incidence of Cancer in Norwegian Workers Potentially Exposed to Electromagnetic Fields," *American Journal of Epidemiology, 136,* pp.81-88, July 1, 1992.

Tore Tynes, Henrik Jynge and Arnt Inge Vistnes, "Leukemia and Brain Tumors in Norwegian Railway Workers, A Nested Case–Control Study," *American Journal of Epidemiology, 139,* pp.645-653, April 1, 1994.

HIGHLIGHTS

U.S. Military Plans Powerful RF 'Heater' for Ionospheric Studies

Plans to modify the ionosphere with powerful radiofrequency (RF) radiation are attracting attention, as a prototype transmitter nears completion in Alaska. Opponents are raising concerns over whether the transmitter and a full-scale facility planned for the same location could interfere with communications and whether they might pose danger to people and to wildlife. The opponents are also challenging the premise that it is useful or wise to meddle intentionally with the Earth's upper atmosphere.

The demonstration project is the first phase of the U.S. military's High Frequency Active Auroral Research Program, known as HAARP. Construction of the $26 million prototype began last fall at a remote site in southeastern Alaska. It will consist of a phased array antenna covering four acres and transmitters with a combined power of up to 320 kW.

The full-scale "ionospheric research instrument" (IRI) called for in HAARP plans would be more than ten times this size. If built, it would have total transmitter power of 3,600 kW and an effective radiated power of 1.7 GW—or 1.7 billion watts—making it three times as powerful as any similar facility, according to John Heckscher of the Air Force's Phillips Laboratory at Hanscom Air Force Base, MA. The IRI is designed to operate at various frequencies from 2.8 MHz to 10 MHz.

HAARP will be used for "studying fundamental physical principles" of the Earth's ionosphere, according to a fact sheet prepared by Phillips Laboratory and the Navy's Office of Naval Research, which together manage the program. The possible applications for this research are subject to considerable debate, however.

A 1990 military report on HAARP describes ways that "ionospheric heaters," as these facilities are called, might be used to modulate atmospheric currents in order to communicate with submerged submarines. This process "in effect, produces a virtual antenna in the ionosphere" for generating ELF and VLF signals. The Navy currently uses the Project ELF transmitters in Michigan and Wisconsin for its submarine communications; these have been the subject of considerable controversy themselves (see *MWN,* Mr84 and J/F90). Other potential applications outlined in the 1990 report include methods to disrupt or enhance surveillance and communications systems and to disable missiles and satellites.

"When you are talking about billions of watts," explained Clare Zickuhr, an Anchorage resident and the leader of a group called No HAARP, "you begin thinking, what can it do to people?" Zickuhr told *Microwave News* that his loose-knit organization has more than 150 members. Many of the local opponents are radio operators who are worried over potential interference, he said. The group is seeking support from environmental organizations and is emphasizing the possible

risk HAARP poses to migratory birds.

Zickuhr admitted, however, that his main interest in trying to stop HAARP stems from worry over possible damage to the atmosphere. "They don't know what it will do," he explained. The project sponsors want to "kick the atmosphere real hard and watch what happens," he said.

Fears about damage to the atmosphere are "unfounded," according to Heckscher. "It's not unreasonable to expect that something three times more powerful than anything that's previously been built might have unforeseen effects," Heckscher said in a telephone interview. "But that's why we do environmental impact statements [EIS]."

HAARP has completed a full environmental review. The final EIS, dated July 1993, concludes that while HAARP transmissions would be "of sufficient intensity to cause measurable changes in the ionosphere's electron density, temperature and structure," these would be insignificant "when compared to changes induced by naturally occurring processes." Heckscher pointed out that similar ionospheric heaters have been operating for years. Facilities in Tromso, Norway, and in the former Soviet Union operate with an effective radiated power of 1 GW, he said. Less powerful U.S. facilities are located in Arecibo, Puerto Rico, and near Fairbanks, AK.

Atmospheric heaters have created controversy before, however. In 1988, when Dr. Bernard Eastlund, an engineer in Spring, TX, patented a device that is similar to, but more powerful than, the HAARP IRI, some criticized the technology as a "serious threat to the atmosphere" (see *MWN,* M/J88). At the time Eastlund said this technology could be used to create "total disruption" of radio communications around the world. Eastlund is a former employee of Arco Power Technologies Inc. in Los Angeles, which is the prime contractor for the HAARP demonstration project.

Eastlund recently told *Microwave News* that the technology also has potential as a "Star Wars" weapon for destroying satellites and ballistic missiles. In an unclassified report that is based on secret research for the Defense Advanced Research Projects Agency, Eastlund describes a "full, global shield" of accelerated electrons created with RF transmitters. The HAARP project "obviously looks a lot like the first step toward this," Eastlund said. He noted, however, that the applications he has described would require a significantly more powerful device with a much larger antenna—perhaps 20 square kilometers—than even the full-scale HAARP IRI.

Heckscher denied that HAARP is "based on anything that Eastlund has patented." He also pointed out that it would take "thousands of times" more power to create the effects he has described.

Whether the full-scale HAARP IRI actually will be built remains to be seen. Money for completion of the demonstration project is in place, Heckscher said, but the larger facility would require additional funding from Congress. The prototype is scheduled to begin operation this fall. Construction of the larger transmitter facility is scheduled to run from the summer of 1995 to the end of 1997. HAARP has been designed so that the transmitters, antenna structures and support facilities installed for the demonstration project would become part of the full-scale IRI.

Police Radar Class Action Suit Seeks Medical Monitoring

Attorneys representing a group of police officers with cancer have filed a class action lawsuit asking for the manufacturers of police radar equipment to fund regular health assessments for anyone who has used their products. Attorney Norman Rifkind, who is representing the officers, told *Microwave News* that he hopes to establish a fund, "either by a settlement or a judgment," to pay for medical monitoring and for new research into the possible link between police radar use and cancer.

This marks a change of course for police officers who claim their cancers are related to traffic radar. At least 19 individual claims have tried to show a causal link between radar use and the development of cancer, but none of these has been successful (see *MWN,* S/O93). Only one case, brought by a California police officer, Eric Bendure, went to trial, and it was rejected by a jury in January 1993 (see *MWN,* J/F93). Attorneys for the radar manufacturers now say that none of these personal injury cases is active.

The plaintiffs' attorneys in the new class action decided against filing personal injury claims, explained Rifkind, who is with the Chicago firm of Biegel, Schy, Lasky, Rifkind, Goldberg & Fertik. "We were sufficiently concerned that no one so far has been able to make these allegations stick." He declined to estimate the size of the class or how much money he might seek. Kustom Signals Inc., MPH Industries Inc. and Decatur Electronics Inc., among others, are named as defendants. Six police officers from around the country are named as plaintiffs "on behalf of all others similarly situated." All six have cancer, Rifkind said, but he declined to identify what types of cancer.

Attorneys for the defendants have filed motions to dismiss the lawsuit and to deny certification of the class. They predict that the plaintiffs will not be successful if they cannot show a link between police radar use and an officer's cancer. "What they are saying is, 'I don't want to carry the burden of proof because I can't,'" argued Mark Oium of the San Francisco firm of O'Connor, Cohn, Dillon & Barr, who represents Kustom. He predicted that the class action will be no more successful than the individual claims.

Among the questions that must be resolved in this litigation, according to the plaintiffs' complaint, is whether "the class suffer[s] a significantly increased risk of contracting or developing a serious illness or injury as a result of their exposure." The defendants argue that this claim has no legal basis. "You cannot sue for an increased risk of something," said Oium. "Most states do not allow it. Certainly Illinois does not allow it." To receive damages, Oium told *Microwave News,* actual harm or injury must be demonstrated, and a "causal link" to an event or exposure must be shown.

One previous related case, brought by Robert Strom, who alleged that exposure to a Boeing Co. electromagnetic pulse (EMP) simulator caused his leukemia, resulted in the establishment of a fund for medical monitoring (see *MWN,* S/O90). Oium noted, however, that this case was settled out of court

and set no legal precedent. Oium said that the new case is more like *Verb et al. v. Motorola et al.,* a class action lawsuit which alleged that cellular telephone manufacturers had failed to warn users that the devices were not safe. This case was rejected by an Illinois judge last year (see *MWN,* J/A93).

VDT–Cancer Claim Dismissed; Zaret Testimony Rejected

In one of the first tests of the *Daubert* rule for admissible evidence, an appeals court has dismissed a case brought by two former KLM reservations clerks, who claimed that radiation from video display terminals (VDTs) made by Raytheon caused their cervical cancer.

The April 21 ruling by the U.S. Court of Appeals for the Seventh Circuit in Chicago affirmed a lower court's November 12, 1992, decision of summary judgment for Raytheon Co. and Raytheon Service Corp. A panel of three judges wrote that the evidence from the plaintiffs' only expert witness, Dr. Milton Zaret, lacked the "rigor and objective support" needed under the rule set last year by the U.S. Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals.*

In *Daubert,* the court concluded that evidence does not have to be generally accepted by the scientific community to be admissible, but it must be relevant and reliable. Further, the decision leaves it up to the court to assess "whether the reasoning or methodology underlying the testimony is scientifically valid...."

The plaintiffs, Carol Sampson and the estate of Cyndee Hayes, who died in 1980 of cervical cancer, sued Raytheon for product liability, negligence and wrongful death. Sampson had abnormal cervical cell growth and cataracts, according to court papers. Both Hayes and Sampson worked as ticketing agents for the Dutch airline in Chicago. Hayes began working for KLM in 1977, two years before being diagnosed with cervical cancer. Sampson worked in the same office from April 1979 to December 1980. She began seeing Zaret, an ophthalmologist based in Scarsdale, NY, in February 1981. In 1984, he prepared a report which concluded that she suffered from cataracts induced by exposure to radiant energy from VDTs.

In supporting the lower court decision, the judges wrote that Zaret contradicted himself about acceptable levels of radiation, saying on the one hand that "there was no known level at which radiant energy is either safe or harmful," and, on the other, that "the level of acceptable radiant energy is somewhere below 0.1-10 nW/cm^2."

Zaret also did not support his key premise that the source of the radiation was the workplace, according to the decision. He acknowledged that other sources, such as televisions, radar and commercial radio broadcasts, can be harmful.

Finally, the court found "equally important...the lack of trustworthy evidence in the record regarding the level of radiation to which the plaintiffs were exposed in the course of their employment with KLM." Zaret simultaneously relied on the findings of Eli Port of Radiation Safety Services Inc. in Evanston, IL, who tested radiation levels at KLM's office, and rebutted the reliability of Port's report.

"Each of these gaps in Dr. Zaret's chain of reasoning leads us to conclude that his opinion lacks the rigor and objective support required to distinguish admissible scientific opinion from inadmissible speculation," stated the decision.

In an interview with *Microwave News,* Zaret, now based in Rye Brook, NY, stood by his original findings, saying that harmful radiation was emitted by the VDTs. He said the equipment used by Port to survey the emissions was not sensitive enough to capture the nature and extent of the women's exposures and that Port did not understand the subtleties of the measurement task.

The VDTs emitted very short bursts of intense energy, Zaret said, adding that Port's "finding that there was a *spurious* response—*intermittent off-scale readings*—indicated that further study was required."

Hand-Held Cellular Telephones Affect Sleep Patterns

Exposure to microwave radiation emitted by the digital signals from hand-held telephones shortens the duration of rapid eye movement (REM) sleep, reduces the time it takes to fall asleep and changes brain waves during REM, according to researchers at the University of Mainz, Germany.

Drs. Klaus Mann and Joachim Röschke also found that nighttime microwave exposure does not affect a person's alertness the next morning. These results will be presented by Mann on June 6 at the *8th Annual Meeting of the Associated Professional Sleep Societies* in Boston.

With a grant from German Telekom, Mann and Röschke studied the effects of pulsed microwaves on 12 men, ages 21 to 34. For eight hours during one night of the three-night experiment, a digital mobile radio telephone was positioned 40 cm from the top of each subject's head. The subjects did not know on which night the phone was activated. The telephone emitted 900 MHz radiation with a peak power of 8 W, a pulse repetition rate of 217 Hz and a pulse width of 580 ∝s. The signal corresponds to that used in the European TDMA (time division multiple access) cellular phone system, known as GSM.

The observed reduction in REM was statistically significant. Also, sleep onset latency was shortened from 12.25 to 9.50 minutes, and "a qualitative alteration of the EEG signal during REM periods" was detected. None of the subjects, however, reported any side effects, although they did say they felt calmer the day following the exposure.

"REM sleep plays a special physiological role for information processing in the brain, especially concerning consolidation of new experiences," the researchers said. "Thus, the effects observed possibly could be associated with alterations of memory and learning functions."

Mann and Röschke told *Microwave News* that they have also studied the effects of pulsed microwaves on people who are awake, and are planning to study the effects on the production of nighttime melatonin.

The appeals court decided not to publish its decision, an action which prevents attorneys from citing it in other cases. "That's unfortunate," said Raytheon's attorney, John Burke Jr. of Burke & Associates in Chicago. "I receive calls about this every day from attorneys around the country handling EMF and other cases....I suspect the court didn't publish it because it doesn't want to publish a lot of different interpretations of *Daubert*."

Sampson and Hayes were represented by William Harte and Erik Gruber of the Chicago firm of William Harte Ltd. Harte said he will not appeal the case to the U.S. Supreme Court.

Industry Urges FCC Adoption of ANSI/IEEE C95.1-1992

Communications companies, among others, are urging the Federal Communications Commission (FCC) to adopt the revised American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) radiofrequency and microwave (RF/MW) standard, known as ANSI/IEEE C95.1-1992. Last year, the FCC proposed using the ANSI/IEEE standard to evaluate RF/MW radiation hazards to satisfy its responsibilities under the National Environmental Policy Act (see MWN, *M/A93). The comments excerpted below were filed in response to the FCC's proposal.*

Many of the industry comments stand in contrast to those filed by the Environmental Protection Agency (EPA), which was sharply critical of the ANSI/IEEE standard, calling it seriously flawed (see MWN, *J/F94). The National Institute for Occupational Safety and Health (NIOSH) has also raised objections to the ANSI/IEEE guidelines for basing exposure levels solely on body heating (see below).*

The Food and Drug Administration's Center for Devices and Radiological Health recommended adoption of the standard (see MWN, *J/F94).*

A number of companies asked the FCC to preempt local RF/MW regulations that are inconsistent with the ANSI/IEEE standard. But Dr. Robert Cleveland of FCC's Office of Engineering and Technology, who is writing the new rules, told Microwave News *the federal preemption issue would most likely have to be addressed in a separate rulemaking because the commission had not raised it in last year's proposal. In 1986, the National Association of Broadcasters petitioned the FCC to preempt state and local RF/MW rules (see* MWN, *M/J86); the commission denied the request four years later.*

Over 100 sets of comments and reply comments were filed with the FCC before their respective January 25 and April 25 deadlines. Cleveland said that the earliest the commission would reach a decision on whether to issue final rules or to seek additional public comments would probably be by the end of the calendar year. He pointed out that the original FCC rules governing RF/MW radiation exposures took the better part of a decade to complete and that the current proposal is "much more complex" (see MWN, *Ap85).*

...There is ample basis for concluding that the proposed 1992 ANSI/IEEE standard is arbitrarily delineated, and is not the proper basis for evaluating communications facilities. The commission should terminate this proceeding without action....There is in the ANSI/IEEE 1992 standard no stated justification for the standard for the "uncontrolled" environment, or for the decision to utilize a safety factor of 50....—***American Radio Relay League Inc.,*** January 25.

AT&T supports the proposal to adopt the 1992 ANSI/IEEE standard....Because the evidence shows that radiation from common carrier microwave stations, cellular base stations and vehicle-mounted cellular terminals does not exceed the new limits, commission action regarding such equipment should remain categorically excluded from environmental processing. On the other hand, because emissions from some Part 15 devices and hand-held terminals of various kinds may exceed the new limits, categorical exclusion of these types of equipment would not be appropriate....—***American Telephone and Telegraph Co.*** (AT&T), January 25.

...The widespread consumer use of personal computers, and the expected development of PCS [personal communications systems], underscore the importance of ensuring that data and voice PCS devices do not pose any health risk to users. To this end, Apple has worked within IEEE and the industry on the development of the 1992 ANSI standard, and believes that the adoption of this standard, as proposed by the commission, is in the public interest....—***Apple Computer Inc.,*** January 25.

...We urge the commission to adopt the ANSI/IEEE's dichotomy between controlled and uncontrolled environments in applying the new higher standard of protection, rather than applying a distinction based merely on whether a particular area may ever be "accessible" to the public....ANSI/IEEE concluded that exposure to the levels of RF radiation permitted by the controlled standard should be "safe for all." The more stringent, uncontrolled standard is therefore prophylactic in nature, providing an extra margin of safety in those areas where prolonged exposure of members of the general public to RF radiation is likely to occur. While such an extra measure of protection is, in our view, appropriate, it clearly goes beyond what has been shown to be necessary for the protection of human health; therefore, we believe it should be applied with due regard for its likely practical impact on broadcasters....[B]y recognizing that the mere transient passage of members of the general public through an area exposed to an RF field need not invariably result in application of the higher standard, the ANSI/IEEE controlled/uncontrolled dichotomy reasonably takes the practical needs of broadcasters into account....[We] urge the commission to specify clear, technically reliable and economically reasonable procedures for determining compliance with the new standards. Consistent with past practice, the FCC should allow broadcasters to assess compliance through the use of established calculation methods. In this regard, [we] are particularly concerned about demonstrating compliance with the new standards for induced and contact currents....Finally, in adopting the new RF radiation standards, the commission should ensure that federal policies are not undermined by inconsistent state or local regulation. Prompted by unsubstantiated fears, several states and municipalities have already prevented commission licensees from fully deploying their systems and services in the manner contemplated by their FCC licenses....—***CBS Inc., Capital Cities/ABC Inc., Greater Media Inc., Tribune Broadcasting Co. and Westinghouse Broadcasting Co.,*** January 25.

...CTIA supports the commission's proposal because the newly adopted 1992 ANSI/IEEE standards are sound and scientifically based and provide the basis for the safe use of the vast array of radio products that increasingly are becoming commonplace....CTIA believes that SAR compliance can best be accomplished by incorporating it as a requirement of the commission's radio type acceptance process. This should not be burdensome to manufacturers, since measuring a unit's SAR is a parameter which manufacturers must

measure as part of the unit's design and development cycle, and is in essence simply another characteristic of the radio. CTIA recommends that the commission require only that the type acceptance applicant indicate affirmatively that the SAR was measured in accordance with approved procedures, and that the unit meets the commission's requirement. It is not necessary or appropriate to require manufacturers to submit detailed data relative to this measurement since if a unit meets the applicable standard, it meets all applicable health and safety requirements....—***Cellular Telecommunications Industry Association (CTIA),*** January 25.

...Another difference [compared to ANSI/IEEE] noted is that NCRP [National Council on Radiation Protection and Measurements] requires use of the general population criterion even for the workplace if the exposure is to carrier frequencies modulated at a depth of 50% or greater at frequencies between 3 and 100 Hz. This is a requirement that has no practical application. Broadcast transmitters are not modulated at these frequencies at a depth of 50% or greater except for very short intervals. Consequently, the circumstances do not arise that would trigger the requirement to use the stricter standard in a controlled environment....—***Jules Cohen & Associates,*** January 25.

...EEPA believes that the large and diverse membership of the IEEE committee reflects a more accurate consensus of the scientific community compared with smaller panels of selected experts such as Scientific Committee 53 of the [NCRP] and (IRPA/INIRC)....In adopting a revised RF radiation regulatory scheme, EEPA urges the commission to adopt a rational interpretation of the "controlled" and "uncontrolled" environment provisions of the revised ANSI/IEEE standard and to incorporate reasonable and practical approaches to the regulation of human exposure to "contact" and "induced" currents....—***Electromagnetic Energy Policy Alliance*** (EEPA), now the Electromagnetic Energy Association (see p.19), January 25.

...The FAA objects to the establishment of two standards for the management of exposure to RF radiation and will continue to use the more conservative "uncontrolled environment" criteria for all areas within FAA's responsibility. FAA will make no distinction between "controlled" and "uncontrolled" environments in the application of permissible exposure limits for [RF] protection.—***Federal Aviation Administration*** (FAA), August 20, 1993.

...Ford supports [the] adoption [of the ANSI/IEEE] standard.... Nevertheless, before the agency can require compliance with the new policies, licensees and other entities that will be obliged to meet the new standard must know with particularity how to comply with the rules. This, in turn, will require clarification from the commission on two issues of particular concern to the automotive industry. First, as the IEEE itself acknowledges, further clarification is needed on techniques for measuring electric and magnetic fields within 20 cm of any object. Measurements degrade when probes are placed near antennas or reradiating structures, and the inside of an automobile has many such areas....Under the standard as drafted, the sole method for determining compliance with the guidelines for areas within 20 cm is through calculation of [SARs]. However, as the IEEE and ANSI stress, measuring SARs is "a challenging task."...Until the commission adopts standards for measurement technology and compliance methodology, it would be virtually impossible to demonstrate compliance with the new guidelines....—***Ford Motor Co.,*** January 25.

...The power limit prescribed in ANSI/IEEE C95.1-1992 under exclusions for the uncontrolled environment is certainly quite conservative for the present-day cellular telephones operating at 820-850 MHz.—***Dr. Om Gandhi, University of Utah,*** October 22, 1993.

...GTE believes that its wireless operations, as well as the industry more generally, have been and continue to be in compliance with the newly proposed RF guidelines. However, due to recent "press scares and media hype," consumers have become confused regarding the safety of exposure to RF radiation caused by wireless services. Agency action to formally adopt the new guidelines will foster public understanding by providing an official record regarding the substantial margin of safety as well as providing assurances for consumers of wireless technologies....—***GTE Service Corp.,*** January 25.

...Unjustified state and municipal restrictions could have particularly severe consequences in the area of mobile services. The FCC's farsighted efforts to encourage the development of cellular, PCS and other mobile services could be derailed by state regulations more onerous than scientific data warrants, inflamed by "press scares and media hype." Accordingly, GTE recommends that the commission promptly issue a further notice of proposed rulemaking to examine such inconsistent policies, with a view toward preempting those that interfere with the development of "a rapid, efficient, nationwide and worldwide wire and radio communications service...."—***GTE Service Corp.,*** reply comments, April 25.

...The 1992 ANSI/IEEE guidelines contain new recommendations regarding the maximum permissible exposure from induced and contact RF currents. This is an important topic that was not addressed in the former ANSI guidelines. However, I believe that a) there is bias favoring one type of instrument; b) limiting current measurements to the point of entry on the human body is not appropriate; c) the upper frequency limit for current measurements is not appropriate; and d) there is a relevant conflict of interest in the leadership of IEEE [SCC] 28....—***Dr. Mark Hagmann, Florida International University,*** January 10.

...[A]doption is recommended with four important conditions: 1) The commission should preempt, albeit on a limited basis, the promulgation by nonfederal agencies of RF standards that are more restrictive. 2) The commission should specify threshold distances for all classes and services of stations, beyond which no consideration of RF radiation effects need be made, but within which account must be taken of every such station. 3) The commission should standardize the measurement device interface and the minimum observer effective height for induced body current measurements. 4) The commission should hold in abeyance any requirement for measuring induced or contact body currents above 30 MHz until such time as reliable measurement devices are commercially available....—***Hammett & Edison Inc.,*** January 21.

...It should be recognized that there exists no credible evidence of harm to human beings resulting from exposure at levels specified in ANSI C95.1-1982....The ANSI/IEEE standard must be considered a "living document" because it is continuously under review....—***IEEE Committee on Man and Radiation*** (COMAR), undated.

...Any interpretation of the guideline that equates controlled environment with occupational exposure and uncontrolled environment with general population exposure is a distortion of the standard and should be avoided....[W]hen an excluded device meets the requirement of the controlled environment for the user/controller, who can be expected to be aware that the device emits an RF signal, the device also *ipso facto* satisfies the uncontrolled specification for the neighboring/adjacent nonuser....—***IEEE Standards Coordinating Committee (SCC) 28,*** undated.

...Apart from the fact that it is unknown whether certain subgroups of the population may be more at risk than others, it is our view that use of the "occupational" and "general population" designations provides even less certainty than use of "controlled" and "uncon-

trolled" environments. For example, under the uncontrolled category, ANSI/IEEE-1992 includes office workers in an industry that employs [RF] radiation as an important element of its business. Indeed, the definition of the uncontrolled environment specifies that the exposure may be in a workplace as well as in living quarters.... Virtually all hand-held communications devices operate in the range of 0.1 to 5 watts, which is well within the ANSI/IEEE low power exclusion limit for the controlled environment. An imposed restriction of the power of such devices, which members of the general population use by choice, could result in diminished communications range and increased risk to the general public, especially following criminal activities, accidents or natural disasters. As do the NCRP guidelines, the ANSI/IEEE-1992 guidelines also recognize the need for those who knowingly choose to operate hand-held radio transceivers to be classified as belonging to the controlled environment. It is important to note that both the NCRP and ANSI/IEEE guidelines would classify the use of a cellular telephone to be governed by the guidelines of the upper tier. Like the hand-held transceivers, the cellular telephone has become important to the safety and well-being of the public in emergency situations and many people buy them only for that purpose....The EPA comments to the FCC assert many times that the ANSI/IEEE-1992 guidelines ignore athermal biological effects and are based only on harmful thermal effects. However, it is clearly stated in the standards document that in the literature review that preceded the establishment of the guidelines, no preconceived assumptions were made concerning mechanisms, thermal or athermal....—***IEEE SCC28,*** reply comments, April 21.

...The commission should carefully balance the burden of preparing extensive unnecessary compliance showings against the remote possibility that facilities will actually exceed the standard. The record shows that such balancing strongly supports retaining the categorical exclusion for paging and cellular base stations and microwave relay stations. These facilities operate at low power levels and are subject to a number of engineering and practical constraints that severely limit the possibility of exceeding the ANSI/IEEE safety standard....The results of a recent study by Dr. Om Gandhi, a leading researcher in this field, demonstrate typical cellular hand-held phones in use today radiate at levels far below the requirements of the ANSI/IEEE standard. These results should reassure the public and the FCC that cellular hand-held phones are safe....McCaw requests the commission to initiate further proceedings in this docket to preempt state and local oversight over RF exposure from cellular facilities....—***McCaw Cellular Communications Inc.,*** January 25.

...The exposure limits applicable to the "uncontrolled environment" should be applied to users of cellular telephones, as well as to any members of the general public who may be near radio transmitters. Other similar services, such as a future [PCS], should likewise be included in the uncontrolled category. Those users included within the FCC Part 90 Private Land Mobile Radio Services, however, with the exception of certain [specialized mobile radio] users, should be governed by the limits applicable to the "controlled environment." The ANSI low-power exclusion provisions should be adopted by the commission. It may be necessary in some cases, such as for cellular telephones, to routinely measure the [SAR] because the 2.5 cm spacing requirement for application of this exclusion is not met. However, this exclusion will be applicable to other radio types, such as those used in the private land mobile radio services....—***Motorola Inc.,*** January 25.

...[I]n revising its rules, NAB urges the FCC to adopt implementation procedures and to interpret the revised standard...in a fashion that will minimize burdens on broadcasters (and other regulatees) yet still adhere to the standard's provisions....[W]e urge the FCC to continue the "three-prong" approach whereby stations generally will be able to avoid making actual measurements to assess and certify compliance. Instead, the majority of broadcasters should be able to determine their compliance through the use of charts and graphs....In adopting a revised RF radiation regulatory scheme, NAB urges the commission to adopt a rational interpretation of the "controlled" and "uncontrolled" environment provisions of the revised ANSI/IEEE standard and to incorporate reasonable and practical approaches to the regulation of human exposure to "contact" and "induced" currents....Also, and due to the difficulties—caused by the intervention of nonfederal authorities—that many broadcasters and other FCC regulatees are having in siting and employing FCC-authorized facilities, we believe that now is the time for the commission to confront squarely the need to adopt a lawful and effective policy of federal preemption. Absent such a policy, the frustration now experienced by many existing communications companies will be eclipsed by the effects of nonfederal opposition to the introduction of new communications technologies such as high definition television and the [PCS]. Indeed, the very implementation of such new technologies may be threatened unless the commission takes near-term action....—***National Association of Broadcasters*** (NAB), January 25.

...NIOSH is concerned about the lack of participation by experts with a public health perspective in the IEEE RF standards-setting process. For example, epidemiology studies were categorically rejected as not useful in the process of setting the ANSI/IEEE C95.1-1992 limits. This lack of public health perspective creates a weakness in the ANSI/IEEE C95.1-1992 standard that should be acknowledged by the FCC in adopting these guidelines for regulating occupational and environmental exposures to RF radiation....The provision of a two-tier standard based on "controlled" versus "uncontrolled" environments is problematic. The designation of controlled versus uncontrolled depends, in part, on the worker's knowledge of both the exposure level and the related health effects. It is extremely difficult to assess the level of a worker's "knowledge" and it is especially so when the standard does not provide any guidance on training programs or worker notification procedures. Therefore, the conservative public health approach would be to adopt only the more restrictive "uncontrolled environment" limits for all exposed workers and the general public. The exposure levels that would be set by the standard are based on only one dominant mechanism—adverse health effects caused by body heating. Nonthermal biological health effects have been reported in some studies and research continues in this area....The standard should note that other health effects may be associated with RF exposure and that exposure should be minimized to the extent possible. In general, the standard provides minimal guidance on control measures, appropriate medical surveillance, training, or hazard communication....—***National Institute for Occupational Safety and Health*** (NIOSH), January 11.

...With respect to the discussion on "controlled" vs. "uncontrolled" environment, Raytheon concurs with the standard as written which is based [on] the concept of "control" and not "type of population." Raytheon believes that the new standard is correct in rejecting the thesis that "certain subgroups of the population are more at risk than others" since that thesis has no basis in the scientific studies.... Raytheon believes that the FCC should continue its "categorical exclusions," particularly for applications such as marine radar which are unlikely to expose users at or above the guidelines of the new standard....Raytheon believe[s] the proposal to use more conservative guidelines in the presence of "modulation" should be rejected. There was no scientific rationale for this practice in the referenced NCRP guidelines authored in 1986 by a small group....—***Raytheon Co.,*** November 5, 1993.

Clippings from All Over

Fairly high fields are not terribly unusual. You get them on elevators, on subway trains; anything that has electrical machinery has electromagnetic fields associated with it. Using a hair dryer for three minutes, you could get as much EMF exposure as you would get... living in a house near a high power line.

—Dr. Imre Gyuk, program manager for electromagnetic research at the DOE, quoted in *Shape,* the magazine of "Mind and Body Fitness for Women," p.44, June 1994

It's interesting that at least in occupational studies, we seem to be showing a trend toward negative results—that is, that no significant problem is being proven.

—Robert McCourt, EMF issues manager for Public Service Electric & Gas (PSE&G), on the Thériault study, quoted in *PSE&G News* (NJ), an internal newsletter, April 15, 1994

An analysis combining the results of the three recently published Nordic studies taken together supported the link between magnetic fields and childhood leukemia. The emphasis should no longer be on blaming exposure misclassification for having decreased the observed relative risks but on further serious attempts to comprehend the effects of magnetic fields on human health.

—Dr. Pia Verkasalo of the Finnish Department of Public Health et al., reply to a letter from Alasdair Philips of the Scientists for Global Responsibility, U.K., *British Medical Journal, 308,* p.1163, April 30, 1994

Taken together, the occupational and residential studies done to date suggest that exposure to stronger-than-average magnetic fields may slightly increase the risk of developing some types of leukemia. The evidence for an association with other types of cancer is far less clear.

—"Electromagnetic Fields," *Consumer Reports,* p.356, May 1994

Many [home] buyers have begun predicating their purchase decisions on the results of EMF surveys conducted by independent engineers, environmental consultants and representatives of local utility companies. In the past year, for example, four local consultants provided more than 200 EMF surveys, while the Washington area's electric utilities—Pepco, Virginia Power and Northern Virginia Electric Cooperative—conducted nearly 1,100 EMF readings.

—"Magnetic Fields Are No Dreams to Some Buyers," *Washington Post,* p.E16, April 30, 1994

Our position is that we should stay with the protections against known hazards unless we receive conclusive proof [that EMFs pose a hazard as well].

—Jim Dushaw of the International Brotherhood of Electrical Workers, quoted in *EMF News,* a publication of the Edison Electric Institute, p.4, April 18, 1994

While the theory that EMF promotes or copromotes leukemia is plausible, it is not probable. Even if one assumes that EMF is capable of acting as a promoter, it is impossible to conclude that the exposure naturally and proximately caused Mr. Pilisuk's leukemia. Although Dr. [Peter] Wright believed that the claimant's initiated cells would not have progressed into leukemia "but for" his exposure to EMF, the doctor also admitted that a promoter alone could not cause cancer. According to the model set forth by Dr. Wright, the genetic damage caused in the initiation phase is essential to the development of cancer. While Ms. Pilisuk is not required to show that the exposure was the *sole* cause of her spouse's occupational disease, she must still show that EMF is *a* proximate cause of the claimant's leukemia.

—Linda Williams, industrial appeals judge, Board of Industrial Insurance Appeals, Washington State, *In re: Robert Pilisuk,* p.38, April 14, 1994

The first thing consumers should do when they look at numbers is ask themselves if they seem right. Persi Diaconis, a professor of mathematics at Harvard University, had this reaction when he heard about a study suggesting an association between electric razors and leukemia: "Aw, come on." It does not take a scientist to decide that some research makes sense and some does not.

—"If It Doesn't Make Sense, It Probably Isn't Sense," *Wall Street Journal,* p.B7, May 17, 1994

Federal case law [as in New York State] also supports the argument that the statute of limitations would not run in an electromagnetic field case until the full property value loss occurred.

—"Power Lines of Litigation," *New York Law Journal,* p.S12, March 14, 1994

In conclusion, the present knowledge from experimental and epidemiological research gives some support to the hypothesis that increased use of electrical power may increase breast cancer risk....If the increased risk of female breast cancer is due to some aspects of electric power use, it could have a large impact due to the prevalence of the exposure and the magnitude of the disease.

—Dr. Tore Tynes of the Cancer Registry of Norway, "Electromagnetic Fields and Male Breast Cancer," *Biomedicine & Pharmacotherapy, 47,* p.426, 1993

The Earth's magnetic field could have influenced the outcome of reactions that led to life, so that one form of essential molecules was favored over the other.

—Dr. Philip Kocienski of the University of Southampton, U.K., quoted in *Science, 264,* p.908, May 13, 1994

And most [of] the evidence has shown that questions have been raised, that there is at best a weak and inconsistent association with some forms of leukemia and EMFs. Association, that's all that has been shown. These are simply some of the associations that have been connected with lymphoma. We are not suggesting that hair dye causes non-Hodgkin's lymphoma. We are not suggesting that being a schoolteacher causes non-Hodgkin's lymphoma, nor the fact that one is a health insurance clerk or a bank cashier. These are simply associations which have been developed over the years by scientists. And if you'll look at the odds ratios here, you'll see some of them, messenger, just a messenger in the food business has got a 4.3 risk ratio. Health insurance clerk, 3.2...risk ratio, high consumption of milk, 3.4. Compare those with the associations on EMFs and leukemia and you'll see that the EMF leukemia risk is lower. If you compare it with those studies on non-Hodgkin's lymphoma, you'll find that those studies really come up to about 1.0 or null. At best, as I say, questions have been raised which the plaintiffs want this jury in this courtroom to resolve, whereas the best minds in the scientific world haven't been able to do so. This is a challenge that's been thrown at you, and I submit it is an unfair challenge.

—Robert Pennington of Troutman Sanders, closing argument for Georgia Power in *Jordan v. Georgia Power Co.,* May 9, 1994

CANCER CLUSTER

Newsroom EMF Assessment... After a brief investigation, NIOSH has concluded that a cluster of brain tumor cases at the editorial offices of the *St. Louis Post-Dispatch* is "unlikely" to be related to the newspaper's physical environment. NIOSH measured EMFs in the paper's fifth-floor newsroom, finding magnetic fields of 3.23-9.79 mG in the middle of the room. Gene Moss, a NIOSH industrial hygienist who coordinated the measurements, told *Microwave News* that these fields were "obviously" due to a cable running through the middle of the newsroom. In other parts of the room, the fields were lower—0.88-1.90 mG. In its final report, NIOSH noted that these levels were "relatively low" but added that the "exposure of building occupants could be reduced." Bill Allen, a *Post-Dispatch* science writer, performed a preliminary EMF survey in the newsroom last year, finding levels as high as 80 mG near the floor in some places. After NIOSH released its findings, Allen told *Microwave News* that he still hopes "the company will do something to reduce the fields, as a measure of prudent avoidance." Similarly, Dave Eisen, the Newspaper Guild's research and information director in Silver Spring, MD, urged that "steps be taken to eliminate" the source of the EMFs. In a telephone interview, Michael Hammett, the director of industrial relations at the *Post-Dispatch,* said that NIOSH had given the paper a "clean bill of health" and that he did not plan to do anything further. NIOSH noted in its report that the newspaper's management had indicated that older VDTs were being replaced by newer, low-emission terminals and called this effort "appropriate." At least seven people, all of whom had worked in the newsroom, have been diagnosed with cancer (see *MWN,* S/O93). Contrary to initial reports, however, NIOSH found in a review of medical records that not all the cases were primary astrocytomas. The NIOSH report did not indicate whether the number of cancer cases identified at the paper was larger than would normally be expected. Dr. Bruce Bernard, the NIOSH epidemiologist who wrote the report, told *Microwave News* that there were not enough cases to do such an analysis. Copies of *Health Hazard Evaluation Report, HETA 93-0969-2389, St. Louis Post-Dispatch, St. Louis, Missouri,* February 1994, are available from: NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226, or National Technical Information Service, 5285 Port Royal, Springfield, VA 22161, (800) 553-6847. In 1992, NIOSH performed an investigation of a brain cancer cluster at the Ford House Office Building in Washington and the possible link to building EMF exposure, publishing a report with very similar conclusions (see *MWN,* M/A93).

MEETINGS

Euro Electromagnetics... The *International Symposium on Electromagnetic Environments and Consequences,* to be held in Bordeaux, France, May 30-June 4, will feature a number of papers on high-power microwaves (HPMs). A special plenary session on "EMP and HPMs in Russia" will have presentations by three members of the Russian Academy of Sciences, including Dr. G.A. Mesyats, a vice president of the academy. At another session on HPM sources, Dr. A.B. Prishche-

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penko of the Russian Institute for Central Scientific Research will speak on the role of RF weapons on the battlefield of the future (see also, *MWN,* N/D93). Dr. Ted Litovitz of Catholic University in Washington will give a plenary lecture on "Do Weak EMFs Cause Bioeffects? Why Is There Such Skepticism? What Are the Possible Answers?" and Dr. Bernard Veyret of the University of Bordeaux is organizing a number of talks on bioeffects by researchers from India, Israel, Japan, Poland, Russia, Switzerland and Taiwan. For more information, contact: Délégation Générale pour l'Armement, Direction des Recherches, Etudes et Techniques, Centre d'Etudes de Gramat, 46500 Gramat, France, (33) 65105432, Fax: (33) 65105433.

OCCUPATIONAL HEALTH

ELF and VDT EMF Booklets... The International Labor Organization (ILO) has published two EMF exposure protection guides, prepared by the International Radiation Protection Association's International Non-Ionizing Radiation Committee (INIRC). The first, *Protection of Workers from Power Frequency Electric and Magnetic Fields: A Practical Guide* (1994, 81 pp., $16.00), a thorough and technical discussion of how electric and magnetic fields can affect humans, is intended for utility workers. Topics range from the ability of strong ELF magnetic fields to cause magnetophosphenes (the perception of flickering lights) to the potentially lethal shocks that can occur in strong electric fields. The possibility of an elevated risk of cancer from long-term magnetic field exposure is covered in a few pages, and there are no recommendations about avoiding low-level fields. According to the booklet, increased risks of leukemia and brain tumors due to EMF exposure "have been considered," but studies are inconsistent. "The current state of knowledge does not permit an estimate of the risk...." Though the booklet was published this year, the 1992 Swedish epidemiological studies (see *MWN,* S/O92) and other, more recent efforts are not included. Specific numerical values for EMF exposure are taken from the guidelines the INIRC completed in 1989 (see *MWN,* M/J89 and J/F90). These were reaffirmed in 1993 by the successor to the INIRC, the International Committee on Non-Ionizing Radiation Protection, which was created in 1992 (see *MWN,* J/A92 and M/J93). The working group that wrote the booklet included Drs. Jürgen Bernhardt and Martino Grandolfo (cochairs), Annette Duchêne and Jan Stolwijk. The second booklet, *Visual Display Units: Radiation Protection Guidance* (1994, 53 pp., $12.00), is a shorter report for those who use VDTs. It was written by a working group that included Drs. Bengt Knave (chair), Ulf Bergqvist, Michael Repacholi, Jan Stolwijk and Maria Stuchly. Health research regarding possible adverse effects on pregnancy, skin and the eyes is discussed, along with other topics such as musculoskeletal disorders. On pregnancy, the group states: "Experimental studies, while showing a diverse outcome, have as a whole failed to demonstrate an effect on reproductive processes in magnetic field situations resembling those around [VDTs]." Both booklets are available from: ILO Publications Center, 49 Sheridan Ave., Albany, NY 12210, (518) 436-9686; all orders must be prepaid,

including postage and handling charges of $3.00 for the first booklet, 50¢ for each additional booklet.

OVENS

***Salmonella* Survives Uneven Heating...**A group of Alaskans who used microwave ovens to reheat roast pork that they had brought home from a community picnic became ill with salmonellosis, while those who used conventional ovens did not, according to a study in the May 1 *American Journal of Epidemiology (139,* pp.903-909, 1994). Most people who ate the meat without reheating it also fell ill. Dr. Bradford Gessner of the CDC in Atlanta and Dr. Michael Beller of the Alaska Department of Health and Social Services in Anchorage identified the pork as the source of the illness with both case–control and cohort studies. Although they could not determine how the meat had first become contaminated, they concluded that the *Salmonella* had proliferated because the meat was underdone when first cooked and had been left unrefrigerated for at least 17 hours during preparation and shipping from a Seattle restaurant. Gessner and Beller speculate that conventional ovens have a "protective effect" because they heat food more evenly than microwave ovens. Meat cooked in a microwave oven may be underheated in places, particularly on the surface, allowing bacteria to survive, they note. Others have warned about the risks from incomplete cooking in the past (see *MWN,* Jun81, Ap82, S/O88, M/A89 and M/J90). Gessner and Beller recommend that health officials "consider the role of microwave ovens when investigating outbreaks of salmonellosis or other illness caused by enteric pathogens." The FDA recommends that when using a microwave oven meat should be cooked to an internal temperature 25˚F higher than when using a conventional oven. The Department of Agriculture (USDA) has often referred to the tendency of microwave ovens to leave cold spots in food. The USDA offers advice on how to use a microwave oven safely on its meat and poultry hot line: (800) 535-4555.

TRADE ASSOCIATIONS

EEPA Drops the P... In May, the Electromagnetic Energy Policy Alliance changed its name to the Electromagnetic Energy Association (EEA) and announced a "new organizational focus." In addition to the lobbying efforts it has undertaken since its founding in 1984 (see *MWN,* Mr84), EEA now intends to develop safety standards for non-ionizing electromagnetic radiation emissions from products such as cellular telephones and VDTs. The organization has applied to the American National Standards Institute (ANSI) for accreditation, according to Dinah McElfresh, EEA's executive director. EEA also plans to begin "an extensive public education effort in support of EMF safety." The new activities "are a response to a barrage of negative publicity in 1992 and 1993," McElfresh told *Microwave News,* citing the controversy over cellular phone safety in particular. "We have seen the effect the opposition can have when supported by the media," she said. EEA's current chair is Jesse Russell of AT&T Bell Labs. Other companies represented on its board include: Apple Computer, General Electric, GTE, Motorola and Raytheon.

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MICRO WAVE NEWS

Vol. XV No. 3 A Report on Non-Ionizing Radiation May/June 1995

INSIDE...

EMF NEWS pp.2-6

Power Line Talk:
Gene Expression Dispute in "Nature" • EMFs Are Hot at Harvard • "Frontline" on "Currents of Fear" • Appeal Filed in Jordan Case • Insurance Worries • Shielding Firm Spun Off from NoRad

New Jersey Considers 50% Cut in EMFs

Physicists Dismiss EMF–Cancer Link

American Physical Society's Statement

California's Top Court To Hear Covalt Appeal

Three Workers' Compensation Claims:
AT&T Wins Nebraska Brain Tumor Case
Pilisuk Leukemia Suit Rejected
Kaiser Wins Round on Lymphoma

HIGHLIGHTS pp.7-15

Cellular Phone Notes:
OTA Report on Wireless Infrastructure • "Washington Post" View of Research • Boonton Abuzz on Tower Siting • SAG Becomes WTR • A Call in Time

WTR Blacklists "Microwave News"

U.S. Cell Phones Cause Pacemaker EMI

Pacemakers and Security Systems

Appeal in Brain Tumor–Cellular Phone Suit

CTIA-WTR's $1.5 Million Dosimetry Study

Industry Seeks Faster Tower Siting

CTIA Petition Seeking Federal Preemption of Tower Siting Rules: Pros and Cons

Charge of NCRP Committee 89-4

EPA To Issue Draft RF/MW Guidelines

FROM THE FIELD p.11

Clippings from All Over

UPDATES pp.16-18

Confusion Spares Project ELF • Melatonin Roundup • Cell Phone–Hearing Aid EMI • Finnish RF/MW Meeting • HAARP Ignored No More • No EMF Reproductive Risks Seen • CMU Booklet • International EMR Alliance

CLASSIFIEDS pp.16-20

RF/MW-Exposed Soldiers Have More Leukemia and Lymphoma

Polish military personnel exposed to radiofrequency and microwave (RF/MW) radiation had significantly higher rates of leukemia and lymphoma than those who were not exposed, according to a new study by Dr. Stanislaw Szmigielski of the Center for Radiobiology and Radiation Safety and the Military Institute of Hygiene and Epidemiology, both in Warsaw. The risk of developing these cancers was more than eight times the expected rate for younger soldiers.

"These new results support our previous findings of a cancer link," Szmigielski told *Microwave News*. The epidemiological study, the most detailed ever of an RF/MW-exposed population, spanned a 15-year period, surveying an average of 127,800 soldiers a year, of whom, on average, 3,720 were exposed to RF/MW radiation. The exposed personnel's overall risk of all types of cancer was about double that of the controls. For leukemia and lymphoma, the risk rose to more than six times the expected rate for all age groups and to over eight times for those servicemen between the ages of 20 and 49. All of these risks are statistically significant (see table on p.14).

Szmigielski, a professor of pathology at the center's Department of Biological Effects of Non-Ionizing Radiations and a former member of the editorial board of *Bioelectromagnetics,* reported elevated rates of most lymphoma and leukemia subtypes, both acute and chronic. All of these risk estimates were based on a very small number of cases, however. Szmigielski identified a total of 25 cases of leukemia and lymphoma among the exposed soldiers—one to three cases per year—and 133 cases among the controls.

(continued on p.14)

Conflict Over NCRP Review of Modulated RF/MW Radiation

A newly chartered committee of the National Council on Radiation Protection and Measurements (NCRP) addressing health standards for modulated RF/MW radiation is already causing controversy. At issue is the committee's mission and makeup.

NCRP Committee 89-4 was established earlier this year to consider how to include modulation—for instance, the pulsed signal of a digital cellular phone—in setting RF/MW safety standards. The Environmental Protection Agency (EPA), which requested this two-year NCRP study and which is supporting it under a $150,000 agreement, is concerned that the committee has deviated from its original charge to define the structure of modulation-based standards, and is instead planning to recommend new limits.

"We do not anticipate the committee focusing on possible health impacts of pulse modulation," Dennis O'Connor of EPA's Office of Radiation and Indoor Air (ORIA) told *Microwave News,* explaining that the primary focus

(continued on p.14)

EMF NEWS

« Power Line Talk »

Dr. **Jeffrey Saffer** and **Adam Lacy-Hulbert** have published letters in *Nature,* one of the world's leading science journals, describing their inability to replicate the HL-60 **gene expression** experiments of Drs. **Reba Goodman** and **Ann Henderson** (see *MWN,* J/A94 and J/F95). Writing in the May 4 issue, Saffer and Sarah Thurston, both of the Battelle Pacific Northwest Labs in Richland, WA, argued that Goodman and Henderson's experiments lacked "essential controls." They framed their comments as a follow-up to another recent letter in *Nature,* which concluded that the results of all *in vitro* EMF experiments are suspect because of possible contamination by ferromagnetic particles (see *MWN,* M/A95). Saffer and Thurston reported that their "extensive series of experiments," which failed to show an EMF effect, led them to "question the entire notion that changes in gene expression can be induced by magnetic fields." They concluded with the following statement: "Thus it is not necessary to invoke magnetite as an explanation for these effects, which in fact may not exist." Asked by *Microwave News* whether they were referring to gene expression or to all magnetic field effects, Saffer replied: "I do not believe that there has been a single demonstration of an *in vitro* effect that *proves* weak magnetic fields are capable of affecting cellular processes" (his emphasis). In a response submitted to *Nature,* Goodman, of Columbia University, and Henderson, of Hunter College, both in New York City, stated, in part, that they continue to have "confidence" in their data and questioned whether Saffer and Lacy-Hulbert faithfully followed their experimental protocols. Goodman told *Microwave News* that she had asked the editors of *Nature* to publish her and Henderson's reply in the same issue as the Saffer and Lacy-Hulbert letters, but that *Nature* had refused. Goodman stressed that over the last year she had repeated her experiments with all the suggested controls and continued to see changes in gene expression, albeit at rates that were smaller than originally reported—an average 40-45% increase in c-*myc* transcript levels after a 20-minute exposure to a 67 mG, 60 Hz magnetic field, down from a two-to-fourfold increase. These new results have been accepted for publication in *Bioelectromagnetics,* she said. *Nature* ran Saffer's and Lacy-Hulbert's letters under the headline, "Cancer Risk and Electromagnetic Fields," which probably explains why newspapers—for instance, the May 4 *Seattle Post-Intelligencer*—announced that Saffer and Lacy-Hulbert had found no evidence of a power line–cancer link.

«« »»

In June, the Public Broadcasting System's investigative reporting series ***Frontline*** will look at EMF health risks in a program titled "Currents of Fear." Among those who have been interviewed for possible inclusion in the program are Dr. Gary Boorman, Paul Brodeur, Dr. Patricia Buffler, Dr. David Carpenter, Dr. Jeffrey Saffer and Dr. David Savitz, as well as several physicists and grass-roots activists. "We're taking a really hard look at the science, at what people's concerns are based on," said *Frontline'*s Michelle Nicholason. "It's certainly not a scathing critique, but it's a hard analysis." Nicholason also said that, "There have been a lot of human interest stories already, and we wanted this to be something different." While the BBC in Britain has done two hour-long programs on the EMF issue, this will be the first examination of this length to appear on U.S. television. The program has a June 13 national air date.

«« »»

EMFs are hot at Harvard. About a year ago, the Center for Risk Analysis at the School of Public Health set up the **Harvard Advisory Committee on EMF and Human Health** with the help of the Electric Power Research Institute (EPRI) and the Edison Electric Institute (EEI) (see *MWN,* J/A94). In February, Dr. **David Savitz** of the University of North Carolina, Chapel Hill, went to Boston to debate the possible EMF–cancer link with Dr. **Dimitrios Trichopoulos**, the chairman of the school's department of epidemiology. Savitz spoke in favor of a policy of prudent avoidance, while Trichopoulos voiced his well-known skepticism about any health risks at all, according to a report in the Spring issue of the *Harvard Public Health Review.* The quarterly's editors see the link as "inconclusive," offering the conclusion that, "Taken as a group, the studies amount to a scientific Rorschach test in which the pattern that emerges depends on who is looking." Indeed, that appears to be true for the members of the EMF advisory committee. A special issue of the center's newsletter, *Risk in Perspective*—"Workers, EMFs and Cancer" (see also p.11)—illustrates the divergence of views among members of the committee, most of whom work in the field. Asked their level of confidence (on a scale of 0-100) that EMFs cause leukemia, the opinions ranged from a low of 10 to a high of 75. For brain and breast cancers, the spreads were even greater: 5-75 and 3-85, respectively. Later this summer, the Harvard School of Public Health will be teaming up with Boston Edison, Con Edison, EEI, EPRI and Northeast Utilities, among others, to present a three-day course on *EMF Health Research: State of the Science* and a one-day symposium on *EMF Bioeffects: Linking Biophysics with Biology.* The course costs $695, but the symposium is free. The directors for both events are Drs. Joseph Brain of Harvard, EPRI's Robert Kavet and Peter Valberg of the Gradient Corp in Cambridge, MA.

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Attorneys for the Jordan family filed their brief in the Georgia Court of Appeals in Atlanta on May 15. Last May, a jury rejected **Nancy and Larry Jordan**'s claim that EMFs from **Georgia Power** Co. and **Oglethorpe Power** Co. power lines were responsible for Nancy Jordan's lymphoma (see *MWN,* M/J94 and J/A94). Bruce DeBoskey of Silver & DeBoskey in Denver, one of the Jordans' attorneys, said it took almost a year to file the brief because "we were waiting for a copy of the trial transcript, which runs 15 volumes." Todd Terrell, a spokesperson for Georgia Power, said that the utility is ready to file its brief on June 5. Oral arguments are scheduled for June 7. "We could have a decision by the end of the year," DeBoskey predicted.

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The **insurance industry** is growing increasingly concerned about what would happen if a plaintiff won an EMF personal injury lawsuit. The resulting claims could far outweigh "the financial capability of the insurance industry," according to Dieter Kohl, underwriting manager of Frankona Ruckversicherungs in Munich, Germany. Kohl, whose comments were reported in the April 11 *Journal of Commerce,* spoke at the biennial conference of the London (U.K.) Insurance and Reinsurance Market Association. The potential impact was also a topic in San Francisco at the annual conference of the New York City-based Risk and Insurance Management Society: "I would suggest that EMF may well be the next asbestos," said David Brickell, director of Risk Control Services for Willis Corroon Corp. of Arizona in Phoenix, in remarks reported in the May 8 *National Underwriter.* Brickell provided the San Francisco meeting with copies of *EMF Litigation: Overview and Trends* by attorney **Mark Warnquist** of the Denver office of LeBoeuf, Lamb, Greene & MacRae. In the report, Warnquist, who recently defended Seattle City Light in the Pilisuk case (see p.6), pointed out that EMF litigation has been around for two decades, but that until recently lawsuits were both few and sporadic. "The situation has changed substantially in the 1990s," he advised, adding that hundreds of scientific studies and increased awareness have made EMFs "a high profile" litigation issue. Just how high profile remains to be seen. David Katz, the *National Underwriter*'s assistant managing editor, said that EMF liability is "definitely on the agenda" but added, "It's not clear that it's up to the level of asbestos." Still, from a utility perspective, fully 96% of risk managers rate EMFs as their top concern, according to the *1995 U.S. Risk Management Survey,* conducted by **Alexander & Alexander**, the New York City-based insurance advisers. And Warnquist notes that electric utilities alone have been involved in more than 400 EMF cases and an increasing number of plaintiffs' lawyers with backgrounds in asbestos are now entering the EMF litigation arena. "We should...expect a protracted battle over EMF," he wrote, but "if we remain vigilant in defending EMF claims, we should continue to be successful."

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NJ Advisory Group Again Seeks 50% Cut in EMFs from New Lines

A New Jersey advisory committee has issued another draft of proposed rules calling for a 50% reduction in the magnetic fields from new or modified lines of 100 kV or more. Lines of 26 kV or higher would be studied for possible future regulation. The Advisory Committee on Non-Ionizing Radiation (ACNIR), an offshoot of the state Commission on Radiation Protection, released a similar draft in October 1993 (see *MWN,* N/D93).

Dr. Daniel Wartenberg of the Environmental and Occupational Health Sciences Institute in Piscataway, NJ, ACNIR's chair, said that the committee had spent the past year and a half gathering more data to strengthen the draft proposal—but only with partial success. "The utilities haven't given us a full breakdown of the economic costs of line construction," Wartenberg told *Microwave News.* "But we have learned enough to estimate that a 50% reduction in magnetic fields can be achieved with a 50% increase in construction costs, which amounts to less than 1% of the total cost of operating that power line over its lifetime."

The rationale behind the draft proposal is that power line EMFs should be "as low as reasonably achievable," better known as "ALARA." The ALARA strategy was advocated in New Jersey as early as 1990 by Wartenberg's predecessor, Dr. Fred Sterzer (see *MWN,* J/A90). The current proposal notes that the "inconsistent results" of health studies "preclude their use for the development of scientifically defensible exposure limits."

The draft proposal was announced in the May 1 *New Jersey Register.* After ACNIR considers the public comments, which are due by July 15, a revised draft will be submitted to the commission, which will decide whether or not to make it a formal proposal. Wartenberg expects the entire process to take at least another year. For more information or for a copy of the proposal, contact Wartenberg at (908) 445-0197, Fax: (908) 445-0784.

Michael Hiles has left **NoRad** Corp., the company he had led since 1985, to start **Field Management Services** Corp. (FMS), an EMF measurement, mitigation and consulting company. NoRad, in Carson, CA, markets glare and static screens for computer monitors, electric and magnetic field meters and ELF ProTech, a device that can redirect magnetic fields away from a computer user. Michelle Hartzell, who had been in charge of NoRad's corporate communications, has become the new president and CEO. Hiles will be working with two EMF consultants, Jon Munderloh and Kenneth Griffing, who had also been at NoRad, as well as with Per Forsgren, the former director of R&D at Stockholm Energi in Sweden. FMS has its headquarters in Los Angeles, with offices in Charlotte, NC, and Stockholm.

There Is No EMF Problem, Says the American Physical Society

The American Physical Society (APS) has declared that science has not substantiated "conjectures relating cancer to power line fields." In a short statement, approved by APS' governing body on April 22, the group declared that there is "no consistent, significant link" between electromagnetic fields (EMFs) and cancer and that "no plausible biophysical mechanisms for the systematic initiation or promotion of cancer...have been identified." Indeed, "the preponderance of the epidemiological and biophysical/biological research findings have failed to substantiate those studies which have reported specific adverse health effects," the statement stressed.

The APS, which has 43,000 members, further contends that mitigation costs are not commensurate with any risk that might exist. (For the full text, see box below.)

"We've been tracking the issue for about seven years," Dr. Robert Park, APS' director of information and a professor of physics at the University of Maryland, College Park, told *Microwave News*. "During that time, I think most physicists were skeptical that there could be a connection between...power line fields and cancer for a variety of reasons." Laboratory research and bigger and better epidemiological studies failed to allay public fears, Park explained, and so the APS panel on public affairs finally decided to look at the issue more closely.

The APS statement was based on an 18-page review, *Power Line Fields and Public Health,* prepared by Dr. David Hafemeister of California Polytechnic State University in San Luis Obispo. In his report, based on reviews of EMF health effects, research papers and interviews, Hafemeister concluded that "spending considerable funding to mitigate ELF [extremely low frequency EMFs] under the guidance of 'prudent avoidance' would make sense if the ELF risk were documented and some measure of cost-effectiveness could be determined. This is not the case...."

Park said that Hafemeister, who is the head of the 19-member APS public affairs panel, had volunteered for the review about a year ago: "Someone had to do it and we are all grateful that he did." Other APS members helped, Park added, but he would not identify them. Hafemeister, who served as a U.S. Senate committee aide from 1990 to 1993, has worked on nuclear proliferation issues. He did not return telephone requests for an interview.

APS' governing council approved the position statement by a vote of 29-1 (17 members were absent). The single negative vote was cast by Dr. Albert Wattenberg, professor emeritus of physics at the University of Illinois, Urbana, who felt that the statement was not strong enough. "The cancer rate should have increased many thousandfold if you could get it from ordinary power lines," Wattenberg told *Microwave News*.

Other council members include Dr. Allan Bromley of Yale University in New Haven, CT, who was President Bush's science adviser and who will become APS president in 1997, and Dr. Steven Koonin of CalTech in Pasadena, CA, who prepared an EMF report on behalf of the JASONs, a high-level advisory group on defense issues (see *MWN,* S/O93).

New York Times science writer William Broad, who once compared concerns over EMFs to claims about space aliens, publicized the APS statement in the May 14 *Times* in an article headlined "Cancer Fear Is Unfounded, Physicists Say" and subtitled "Power Line Concern Is Called Needless." It was widely syndicated and reprinted in the U.S. and abroad.

On May 20, the *Times* ran a response from Dr. Daniel Wartenberg of the Environmental and Occupational Health Sciences

APS Statement on EMFs

Reprinted below is the text of the Washington-based American Physical Society's statement on Power Line Fields and Public Health. *It is based on an 18-page report prepared by Dr. David Hafemeister, which is available on the Internet at the following address: http://www.calpoly.edu/~dhafemei. Hafemeister's detailed resume is also available at this address.*

Physicists are frequently asked to comment on the potential dangers of cancer from [EMFs] that emanate from common power lines and electrical appliances. While recognizing that the connection between power line fields and cancer is an area of continuing study by research workers in many disciplines in the United States and abroad, we believe that it is possible to make several observations based on the scientific evidence at this time. We also believe that, in the interest of making the best use of the finite resources available for environmental research and mitigation, it is important for professional organizations to comment on this issue.

The scientific literature and the reports of reviews by other panels show no consistent, significant link between cancer and power line fields. This literature includes epidemiological studies, research on biological systems, and analyses of theoretical interaction mechanisms. No plausible biophysical mechanisms for the systematic initiation or promotion of cancer by these power line fields have been identified. Furthermore, the preponderance of the epidemiological and biophysical/biological research findings have failed to substantiate those studies which have reported specific adverse health effects from exposure to such fields. While it is impossible to prove that no deleterious health effects occur from exposure to any environmental factor, it is necessary to demonstrate a consistent, significant, and causal relationship before one can conclude that such effects do occur. From this standpoint, the conjectures relating cancer to power line fields have not been scientifically substantiated.

These unsubstantiated claims, however, have generated fears of power lines in some communities, leading to expensive mitigation efforts, and, in some cases, to lengthy and divisive court proceedings. The costs of mitigation and litigation relating to the power line–cancer connection have risen into the billions of dollars and threaten to go much higher. The diversion of these resources to eliminate a threat which has no persuasive scientific basis is disturbing to us. More serious environmental problems are neglected for lack of funding and public attention, and the burden of cost placed on the American public is incommensurate with the risk, if any.

Institute in Piscataway, NJ. Wartenberg, a member of the National Academy of Sciences' committee reviewing EMF health risks, argued that APS' logic "flies in the face of conventional science" because "in nine of 11 epidemiology studies of children, those with leukemia lived closer to 'high exposure' power lines more often than those without leukemia" and "in the four most recent and most sophisticated occupational epidemiology studies, workers in three of the four studies showed elevated leukemia and brain cancer rates."

Physicists have long been skeptical of an EMF–cancer link. A year ago, Dr. Robert Adair, a physicist at Yale University, suggested that "the fear of power lines springs from the human need to find an explanation for everything bad that happens" (see *MWN,* M/J94). And Bromley has written that the growing public concern about EMFs is unjustified by available research (see *MWN,* S/O94). Bromley was accused in 1990 of trying to suppress a report from the Environmental Protection Agency that suggested a possible link between EMFs and some types of cancer (see *MWN,* M/J90 and N/D90).

California Supreme Court To Hear Appeal in Covalt Case

The California Supreme Court has agreed to review the dismissal of *Covalt v. San Diego Gas & Electric* (SDG&E). The Court of Appeal in Santa Ana had ruled that this EMF claim did not belong in court because it fell under the jurisdiction of the California Public Utilities Commission (CPUC). The lower court's decision has already had a major impact on other EMF lawsuits, and some observers have predicted that if it is sustained, it will end all EMF litigation in California.

On May 11, four of the seven members of the Supreme Court agreed to hear an appeal in *Covalt*. The Covalt family's lawyer, Michael Withey of the Seattle firm of Schroeter, Goldmark & Bender, said in an interview that the Supreme Court would probably hear the case this fall, and hand down a decision in 1996.

Covalt v. SDG&E is a property-devaluation suit, and one of the many controversies about the Court of Appeal ruling is whether it establishes CPUC jurisdiction over personal injury cases. A March 30 decision in Orange County Superior Court held that it does not. Southern California Edison Co. (SCE) failed to convince Judge Phillip Cox that *Covalt* required dismissal of *Muir v. SCE,* in which Douglas Muir asserts that three 4 kV power lines outside his bedroom window led to his non-Hodgkin's lymphoma (see *MWN,* M/A95).

In *Ford v. Pacific Gas & Electric* (PG&E), however, the decision went the other way. PG&E lawyer Roger Rizzo of Sedgwick, Detert, Moran & Arnold in San Francisco said in an interview that the judge had accepted his argument that the case fell under the jurisdiction of the CPUC and threw the suit out of court on May 22. *Ford* involves a telephone line worker who died of brain cancer (see *MWN,* M/A95).

That same day, SCE petitioned the state Supreme Court to address the personal injury issue directly by considering another case, *Younkin v. SCE,* along with *Covalt*. "We would hope," explained SCE house counsel John Tinker, "that if they thought *Covalt* was important enough to review, they would want to consider the whole issue and not just a part of it." The Younkin case involves a cancer cluster in a real estate agency a floor above some SCE transformers (see *MWN,* J/A94).

"I think that they should decide both issues, and I think that they will," said Annee Della Donna of the firm of Wylie Aitken in Santa Ana, who represents the plaintiffs in both the Muir and Younkin cases. "Since the issue is a jurisdictional one, it's so primary that it's got to get resolved soon." Tinker said that he would like to see all EMF suits put on hold until the Supreme Court decides these test cases.

The *Covalt* ruling was a major factor in the dismissal of the long-running Slater School case, *Hurd et al. v. PG&E,* according to plaintiffs' attorney Joseph Davis of Davis & Winston in Los Angeles. Davis said that the decision was not due to *Covalt* alone, but also to a PG&E threat to hold his clients responsible for the utility's court costs if the lawsuit failed. Plaintiffs agreed to an April 7 dismissal of all charges.

"They couldn't take the fear that they'd be hit with over $100,000 in costs," Davis told *Microwave News,* saying that this had a "chilling effect" on his clients. He expressed hope that *Covalt* would be overturned on appeal but said his clients could not afford the risk, imposed by the state's "loser pays" litigation rule. The case involved 33 teachers, staff, students and neighbors of the Slater School, over half of whom had contracted cancer (see *MWN,* N/D92 and J/F94).

Employers Win in Three EMF Workers' Compensation Claims

Employers have won victories in three major workers' compensation cases that sought to link cancer with occupational exposure to EMFs. Two of the decisions appear to be final.

AT&T Wins Nebraska Brain Tumor Case

Claims alleging that the fatal brain tumors of two Nebraska workers were caused by EMF exposures were dismissed on April 12. The widows of Donald Moran and Sam Toscano attributed their husbands' deaths in 1991 to environmental conditions at the Omaha production facility of AT&T Network Systems. Both men worked in the plant's Building 30.

Since 1989, eight other workers in Building 30 have died of brain cancer, according to Mike O'Brien of Cannon, Goodman, O'Brien & Grant in Omaha, who represented Velma Moran and Erlene Toscano. O'Brien said that compensation claims were filed in five of these cases, and that he has been handling all of them. Author Paul Brodeur drew public attention to the deaths in his February 8 testimony before the Nebraska state legislature (see *MWN,* M/A95).

Moran had done electroplating in Building 30 since 1961, while Toscano had worked there as an electrician since 1959. O'Brien had argued that they were exposed to high levels of EMFs, and also to radiofrequency and microwave (RF/MW) and some ionizing radiation.

Dr. Elaine Panitz of Princeton, NJ, a consultant in occupational and environmental medicine, appeared as an expert witness for the plaintiffs. She testified that the brain cancer

mortality rate in Building 30 was 11 times higher than expected. But Workers' Compensation Court Judge Paul LeClair largely discounted her testimony, commenting in his decision that, "Dr. Panitz is not an epidemiologist."

Expert witnesses for AT&T included Dr. Philip Cole of the University of Alabama, Birmingham, on EMFs, Dr. Don Justesen of the VA Medical Center in Kansas City, MO, and Dr. Carl Sutton of Milwaukee's Medical College of Wisconsin on RF/MW radiation and Dr. Richard Monson of the Harvard School of Public Health in Boston on ionizing radiation.

Panitz cited Drs. David Savitz and Dana Loomis's recent study, which found a statistically significant relationship between EMF exposure and brain tumors. But Cole argued that the Savitz-Loomis study "cannot be interpreted as anything other than negative or, at most, weakly positive" for a link between EMFs and brain cancer (see p.11).

"The various studies received in evidence, at best, *suggest* a possible causal relationship," ruled Judge LeClair (his emphasis). "An award of compensation cannot be based on speculation and conjecture." He wrote that the plaintiffs had not shown "by a preponderance of the evidence" that on-the-job exposures had caused the workers' cancers.

"The scientific facts in the case clearly established that there was no link between the illnesses of our two former employees and their jobs at the plant," said John Heindel, an AT&T executive, in a statement to plant employees. AT&T's attorney, Paul Prentiss of the Omaha firm of Timmermier, Gross & Burns, told *Microwave News* that the brain cancer rate in Building 30 was no higher than is found in the general population.

Prentiss and O'Brien each said that the deadline for appeal of the Moran and Toscano cases had passed. Prentiss said the other five cases would be withdrawn because both sides have agreed on a settlement. "I've got the checks right here on my desk," he added. "We're just working on getting the plaintiffs' signatures and processing the papers." O'Brien said, "All I can say is that we've made certain agreements, that we have resolved to resolve the case."

Velma Moran said in an interview that she had expressed her desire for an appeal, and that she had not yet signed any papers agreeing to a settlement. O'Brien responded that all of his clients had agreed, before the deadline, to seek a settlement with AT&T.

Neither attorney would comment on their agreement. However, *Microwave News* has learned that AT&T had offered the seven plaintiffs a settlement of $500,000, but in March reduced this to $140,000. After Judge LeClair's decision, AT&T cut its offer to $55,000 for all seven together, most of which would go towards expert witness fees and legal expenses.

Pilisuk Leukemia Suit Rejected

On May 4, a jury in Seattle voted 10-2 against a suit involving Robert Pilisuk, a Seattle City Light employee with acute lymphocytic leukemia (ALL) who died in 1989. The jury found that the Washington Board of Industrial Insurance Appeals acted properly last year in rejecting a pension claim by his widow, Mimi Handlin Pilisuk. Her lawyer, Michael Withey of the Seattle firm of Schroeter, Goldmark & Bender, told *Microwave News* that he would not appeal.

Last September, the appeals board had supported (2-1) the April 1994 opinion of Industrial Appeals Judge Linda Williams, who had written, "While the theory that EMF promotes or co-promotes leukemia is plausible, it is not probable."

The verdict of the King County Superior Court jury was the fourth defeat in a row for the Pilisuk claim (see *MWN,* M/A91, M/J92, J/F94 and S/O94). No new evidence was allowed, as the jury could only consider whether the appeals board acted properly given the evidence before it. Attorneys for both sides hired actors to read from hearing transcripts. "It helped keep the jury awake," said Seattle Assistant City Attorney Betty Ngan. She said that Williams had allowed both sides to present scientific evidence in extensive detail.

"Unfortunately, the jury felt that the issue of biological plausibility had been established only as possible, not probable," said Withey, "though they did seem impressed by the epidemiological studies."

Pilisuk was employed by Seattle City Light as a cable splicer/electrician from 1982 until his death from pneumonia brought on by his ALL. Withey presented evidence that Pilisuk's average EMF exposure on the job was 12.6 mG.

Kaiser Wins Round in Brewer Lymphoma Case

The first ruling in the U.S. to find that EMFs cause cancer has been reversed. Like the original ruling, however, the significance of the decision is mostly procedural. A full hearing on the merits of the case—a workers' compensation claim against Kaiser Aluminum & Chemical Corp. in Washington state—will probably come within six months, according to the plaintiff's lawyer, Lance Palmer.

The case was filed by James Brewer, who worked in the "potroom" at Kaiser's aluminum smelting plant in Tacoma from 1969 until 1986. Brewer was diagnosed with non-Hodgkin's lymphoma in November 1991.

The state accepted Brewer's claim on June 29, 1994, based only on the evidence submitted by his attorney (see *MWN,* J/A94). The claim had been filed almost a year and a half earlier, and Kaiser had twice failed to respond to queries from the Department of Labor and Industries.

The acceptance of the claim attracted considerable attention, and the department was quick to downplay its significance. "We're not making a scientific judgment on the linkage of EMF and cancer," Director Mark Brown said last year. "Under law, workers are entitled to sure and speedy relief. I'm not sure we've made the right decision here on the 'sure' side of the equation." Kaiser asked that the ruling be reversed, and the department granted its request on February 23, 1995.

Palmer, of the Seattle firm of Levinson, Friedman, Vhugen, Duggan & Bland, said that he was "disappointed but not surprised" by the reversal. He said that the department gave no explanation of the reasons for its reversal, and that he is taking the case to the Board of Industrial Insurance Appeals.

Seven of Brewer's coworkers in the potroom developed cancer and died. Studies of the plant's workers have found elevated rates of lymphoma and leukemia, as well as immune system abnormalities (see *MWN,* J/A90 and J/F93).

HIGHLIGHTS

« Cellular Phone Notes »

At a time when a number of federal officials are expressing frustration at the slow pace of CTIA's health research program, the congressional **Office of Technology Assessment** (OTA) in Washington has given CTIA's Wireless Technology Research group (previously known as the SAG) a vote of confidence. In a draft of a forthcoming report on ***Wireless Technologies and the National Information Infrastructure***, OTA analysts hold that, "The SAG and its research process appear to meet the criteria for unbiased and open scientific research," and that, "Questions have been raised about the potential bias of [research sponsored by the cellular telephone industry], but these concerns appear to have been adequately addressed." The OTA allows that, "There is currently not enough scientific information available to finally determine one way or another whether there are long-term adverse health effects of wireless communications devices, or what they might be." But it advises, nonetheless, that, "Although research is still sparse, at present there appears to be little cause for concern that hand-held cellular telephones cause adverse health effects, such as cancer." The OTA offers little to support this position, except that, "Cellular telephones...put out little power and skin proves to be a fairly effective shield for much of the radiation a typical cellular phone puts out." On hearing this, one federal staffer could not contain his amazement. "Where did they get that?" asked the official, who requested anonymity. "It is not scientifically credible." (See, for instance, *MWN,* J/F94 and J/F95.) The OTA also tries to put to rest the possibility of a brain tumor risk by citing a 1993 letter from Dr. Kristian Storm of the University of Wisconsin, Madison, who argued that the rate of brain cancer "has not changed significantly over the last decade." Storm's view—which he also detailed in an affidavit on behalf of NEC in the Reynard brain tumor case and which Judge Ralph Nimmons Jr. cited in his order dismissing the suit (see p.10)—is at odds with statistics published earlier this year by the National Cancer Institute (NCI). Writing in the February 1, 1995, issue of the *Journal of the NCI,* Dr. Susan Devesa and her NCI coworkers report that the incidence rate of brain cancer has shown a "sizable" increase. When asked about this apparent conflict, Todd LaPorte, an OTA analyst who is working on the report with David Wye, the project director, said that he was unaware of the NCI data. LaPorte stressed that health impacts are not the main thrust of the report and that the April 4 draft obtained by *Microwave News* did not have the "benefits of reviewer comments." Interestingly, the OTA was remarkably prescient about the outcome of the Reynard case. Six weeks *before* Judge Nimmons handed down his decision, the OTA announced that the case had been dismissed "for lack of evidence." LaPorte predicted that the final report would be published at the end of June.

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In his coverage of the dismissal of the **Reynard** brain tumor case (see p.10) on May 20, the ***Washington Post***'s John Schwartz makes the following statement towards the top of the story: "But researchers who have studied possible connections between cancer and exposure to radiowaves of the frequencies used by cellular telephones have found no statistical correlation between the two." The statement is unattributed.

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A group of **Boonton, NJ**, residents may have prevailed, at least temporarily, against the siting of nine cellular telephone antennas in their community, but, in the process, they took a drubbing from the local press. The anti-antenna residents objected to **Bell Atlantic Mobile**'s (BAM) application to build the towers on a nearby apartment building, in spite of tests done by the company, which, according to BAM spokesperson Robin Nicol, showed that the microwave exposures would be far below the New Jersey standard. The standard is based on the 1982 ANSI guidelines (see *MWN,* Ap84 and J/F94). The tests also showed no measurable radiation levels at a distance of 75 feet, Nicol said. After eight months of hearings, the zoning board rejected BAM's application by a vote of 4-2, with the majority arguing that the public anxiety was disruptive, according to the Morristown, NJ, *Daily Record*. Four days after the vote, on May 1, the *Daily Record* ran an edito-

WTR Blacklists Microwave News

Wireless Technology Research (WTR), CTIA's research group, has blacklisted *Microwave News*. Mike Volpe, WTR's spokesperson, said that he will no longer provide this newsletter with press releases, reports or any other documents.

Volpe explained that he made the move after Dr. Louis Slesin, *Microwave News'* editor and publisher, refused to provide WTR with advance copies of the newsletter. In addition, Volpe complained that other issues of the publication had arrived late. He said he suspected that this was the result of political bias.

"If you guys play ball with us and send us the information in an expedited manner, then I'll send you documents," Volpe told *Microwave News*. "Until that's resolved, I'm not going to send them to you." Volpe professed indifference to the outcome, saying, "More people read the *Wall Street Journal* and the *New York Times* than *Microwave News,* so if we skip you guys it's no skin off my back."

WTR Chairman Dr. George Carlo did not respond when asked whether he agreed with Volpe's actions.

"In 15 years of publication, we have never had a request to provide advance copies and we are not going to start now," Slesin said. He added that all subscribers' copies are sent out at the same time by a mailing house and that, "The suspicion that the mailing house has been asked to delay the copies of a particular subscriber is false, petty and ridiculous."

"The real question is this," said Slesin. "What is a research organization doing with an enemies list?"

rial, "Victory for Voodoo," that declared, "Witch doctors have taken over Boonton," and asked, "Is New Jersey next?" The editorial described the anti-antenna group as "ignorant agitators" and suggested that "...the episode reflects a deeper modern problem—a problem not far removed from the puzzle of the Oklahoma bombing; what can we do to counteract the sort of sweeping public superstitions that frighten people into thinking radio antennas kill you and the federal government is a Soviet/UN conspiracy?" It did not take long for some Boonton residents to respond. In a letter published on May 5, Marlene Middleton asked that the editors apologize for their attempt "to exploit the horrific [Oklahoma] tragedy to make some bizarre, confusing and irrelevant point." She pointed out that the people of Boonton have become "highly educated in the field of cellular radiation" after listening to hours of testimony on both sides of the issue. "I suggest you take the time to read the transcripts and educate yourself," Middleton wrote. Another resident, Bonnie Lobb, suggested in a May 10 letter that BAM build its antennas on top of the *Daily Record* building. "I seem to recall that there aren't any churches, residences or schools anywhere near you! See if your employees will appreciate it." (The editors had already stated in response to an earlier letter that the paper would be glad to lease its roof for cellular antennas.) The war of words is not likely to stop soon. Nicol told *Microwave News* that the company plans to appeal the board's vote.

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CTIA's research arm has changed its name again. First known as the Scientific Advisory Group (SAG) on Cellular Phone Safety and then as the SAG on Wireless Technology (see *MWN,* J/F95), it is now the **Wireless Technology Research (WTR) Limited Liability Co.** WTR's Dr. George Carlo said that the latest change is a result of a recommendation from the General Accounting Office in its report on cellular phone health research (see *MWN,* N/D94). The new name also reflects a change in legal status, and comes a month after Carlo was sued by Debbra Wright for conspiring to deceive the public about the health risks posed by cellular phones (see *MWN,* M/A95).

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A cellular phone was a lifesaver—at least for a short time—according to a May 18 *Associated Press* report. On May 15, minutes before **Darrell Gene Devier**, a Georgia man convicted of rape and murder, was scheduled to be executed, a storm left the state prison near Jackson without power and telephone service. Unable to be contacted in the event that Devier had been granted a reprieve, Georgia Attorney General **Michael Bowers** left the prison with his cellular phone and drove until he received a clear dial tone. And when he did, he got word from the U.S. Supreme Court that the death sentence had been stayed. (A state corrections official told reporters that the execution would have been delayed as long as the prison was out of contact with the outside world.) The suspension did not last long, however, as later that week the Supreme Court lifted the stay and Devier was executed.

U.S. Cellular Phones Found To Cause Pacemaker Interference

Separate studies at Mt. Sinai Medical Center in Miami Beach, FL, and at the Mayo Clinic in Rochester, MN, have found that American digital cellular phones can cause implanted cardiac pacemakers to change their pulse rate or stop functioning altogether. In all cases, the pacemakers returned to normal operation once the cellular phones were removed.

The Food and Drug Administration (FDA) said that the new studies agree with results to date from its own ongoing research. Last year similar types of electromagnetic interference (EMI) were reported by Swiss and Italian researchers (see *MWN,* J/A94).

The research group of the Cellular Telecommunications Industry Association (CTIA), Wireless Technology Research (WTR; see above), released a statement that such studies had "generated valid questions about wireless technology" and announced that it was about to proceed with a larger-scale investigation.

"When [the European studies] first came out, people said the effects weren't important because the studies weren't done with American technology," observed Dr. Roger Carrillo, the director of the Mt. Sinai study. "Well, now we've shown effects with American technology." U.S. hand-held digital cellular phones operate at 0.6W peak power, compared to a peak power of up to 2W in European phones.

"If a patient asked me if it was okay to use a cellular phone, I'd have to say I don't know," said the Mayo Clinic's Dr. David Hayes. "Because we can't answer the question, I'd be particularly cautious with patients who are completely pacemaker-dependent." At the same time, Hayes said, it is important not to overstate the problem. Hayes and Carrillo presented their results on May 3 at the *16th Annual Scientific Sessions of the North American Society of Pacing and Electrophysiology* (NASPE) in Boston.

Almost all cases of interference occurred with phones held over the chest, close to the implanted devices. "I can imagine a potential problem," said Carrillo, "if the telephone rings while it's in a pocket near the pulse generator." With a phone held against a patient's ear, Hayes only rarely found interference, and Carrillo found none at all.

Digital phones have been considered more likely to cause pacemaker EMI, since their pulsed transmissions can be interpreted by the pacemaker as a heartbeat. Hayes saw no interference from analog phones, and recommends that a pacemaker user who wants a cellular phone choose one with this older technology. While digital models constitute a small percentage of cellular phones in the U.S. today, they are expected to become dominant within a few years.

Carrillo also found that analog models caused no effects on pacemakers implanted in patients, but observed minor interference from analog phones in laboratory tests of the devices alone. He said in an interview that for now he is telling patients to keep all cellular phone antennas away from their

Pacemakers & Security Systems

Antitheft devices used in retail stores can cause EMI with implantable cardiac pacemakers, according to a recent study by a pacemaker manufacturer. More modern antitheft units caused less interference, and all pacemakers returned to normal afterwards.

Eric Lucas, Delos Johnson and Bryant McElroy of Pacesetter Inc. in Germantown, TN, tested five models of pacemakers attached to a heart simulator—not implanted in patients—with six types of electronic article surveillance (EAS) systems. The EAS devices included UHF, RF, magnetic and acoustomagnetic units, all of which transmit a pulsed signal.

"High-frequency and lower-power EAS systems, i.e., newer technology, produced fewer and less pronounced effects than older low-frequency and high-power EAS systems," according to the November 1994 issue of *PACE* (*17,* pp. 2021-2026). The UHF EAS device caused no interference at all.

Metal detectors such as those used in airports and courthouses operate differently from EAS systems. While cases of minor interference have been reported, a study of 103 pacemaker users found no interference of any kind (*PACE, 11,* pp.1386-1387, 1988).

pacemakers. For his part, Hayes told *Microwave News* that, "My gut feeling is that analog phones are safe," but that until more testing is done, patients might want to follow this precaution.

Five days before the NASPE conference, WTR issued a press release stating that it had completed a research protocol for its own study of EMI with pacemakers. "This study will help provide a basis to determine whether there is a public health risk from interference between pacemakers and wireless hand-held telephones, and the extent of the risk, if one is identified," explained WTR Chairman Dr. George Carlo.

Besides this patient testing funded by WTR, laboratory testing of pacemakers and cellular phones is being planned at the University of Oklahoma's industry-funded Center for the Study of Wireless Electromagnetic Compatibility in Norman (see *MWN,* J/A94). "The protocols for the clinical epidemiology study and the University of Oklahoma work have been jointly developed to complement each other," according to Carlo's statement.

Hayes and Carrillo are both serving on a 14-member committee, chaired by Carlo, which advised WTR on its protocol during nine months of discussions. Both researchers will take part in this larger patient study funded by WTR, along with Dr. Hans Moore of George Washington University Medical Center in Washington. Asked when the WTR experiments would begin, Carrillo told *Microwave News,* "You'd have to ask them." He noted that, "We have been working with WTR on this protocol since October, and it seems that every time we get closer and closer, it still doesn't move forward."

WTR spokesperson Mike Volpe responded that as far as WTR is concerned, its study is already under way, since the work of Carrillo and Hayes had played an important role in shaping the WTR protocol. Volpe said in an interview that the only steps remaining before WTR funds can be released for the new experiments are an internal budgetary review and the working out of contract language between WTR lawyers and the participating institutions.

Carrillo highlighted the importance of developing government standards "to be sure that new pacemaker units are well shielded against this kind of interference. Microwave ovens were once a problem for pacemaker patients, but are not today. In the same way, I think in 20 years this will be a piece of history."

In a May 3 statement, the FDA said that Carrillo's and Hayes's results are in line with the agency's laboratory testing so far: "Based on these preliminary findings, cellular phones do not seem to pose a significant health problem for pacemaker wearers. Still, people with pacemakers may want to take some simple precautions to be sure that their cellular phones don't cause a problem"—for example, by not carrying the phone in a shirt or jacket pocket. The FDA is conducting lab tests on a wide range of pacemakers, including older models no longer on the market. It will carry out a similar examination of implanted defibrillators, but does not plan any patient studies.

Medtronic Inc., of Minneapolis, the manufacturer of half of all pacemakers worldwide, said that laboratory testing of its own devices with a variety of cellular phones "indicated that there may be some temporary effects only in very close proximity to the implant." Since March of this year, the company has recommended that patients with implanted pacemakers follow these precautions when using a cellular phone: keep the phone at least six inches away from the implanted unit at all times; hold the phone against the ear farther from the implant; and do not carry the phone in a pocket or on a belt adjacent to the pacemaker. Medtronic spokesperson Dick Reid said that a total of 132,000 pacemakers were sold in the U.S. in 1994.

Carrillo said his interest in the issue began two and a half years ago, when a pacemaker user asked him whether it was safe to use a cellular phone. He could find no studies on the question and became interested in doing one himself. In Carrillo's experiments, ten different models of cellular phones were used by 59 volunteers with implanted pacemakers, none of whom were completely pacemaker-dependent. He found EMI with 19 different pacemaker models in 21 volunteers.

Hayes worked with 30 volunteers and noted interference with 16 of their pacemakers. His study used four different types of cellular phones, three hand-held models and one portable that transmits at a higher power of 3W. Hayes told *Microwave News* that the portable caused substantially more interference than the hand-helds.

Meanwhile the June 1995 issue of *PACE* (*Pacing and Clinical Electrophysiology, 18,* pp.1218-1224), NASPE's official journal, contains the first published paper from the European research efforts announced last year. Dr. Vincenzo Barbaro and a team at the Istituto Superiore di Sanità in Rome, Italy, studied the effects of European GSM digital phones on pacemakers in 101 patients, and found EMI in 26 of them.

Brain Tumor–Cell Phone Suit Dismissed; Review Requested

The first lawsuit alleging that cellular telephone use can cause or promote brain cancer has been dismissed. But the attorney for David Reynard, whose wife died of brain cancer in 1992, is asking the judge to reconsider.

John Lloyd, Reynard's St. Petersburg, FL, attorney, said he served papers on June 1 asking U.S. District Court Judge Ralph Nimmons Jr. to reconsider his May 17 decision. Lloyd said he was unable to submit all of his testimony in time because the court had not set a date for filing opposing affidavits, a procedural violation that, he said, should be grounds for reversing the dismissal.

At least seven other suits are still pending nationwide in which plaintiffs are seeking to link cellular phones with brain cancer.

"We're obviously disappointed and surprised. We had no idea this was going to happen," Reynard told *Microwave News*. "It seems it was just a slap in the face more than a real legal decision."

Nimmons dismissed Reynard's suit against Melville, NY-based NEC America Inc. and GTE Mobilnet of Tampa (FL) Inc. on the grounds that Reynard had not provided admissible evidence on medical causation. Nimmons cited the landmark U.S. Supreme Court decision, *Daubert v. Merrell Dow Pharmaceuticals Inc.,* which allows the trial court to determine the admissibility of expert testimony.

Dr. John Holt of the Microwave Therapy Center in Perth, Australia, and Dr. David Perlmutter, a neurologist in Naples, FL, provided testimony for Reynard. Expert testimony for the defense came from Dr. Kristian Storm of the University of Wisconsin, Madison, and Dr. Carl Sutton of the Medical College of Wisconsin in Milwaukee.

Nimmons devoted much of his opinion to explaining why he found Perlmutter's affidavit to be inadmissible: "[It] contains no reference to any scientific or medical research by Dr. Perlmutter independent of this litigation or any indication that he examined Susan Reynard or reviewed her medical records." Further, "...the conclusions of the affidavit are not supported by any objective source, such as a treatise or a published article in a reputable scientific journal."

Thomas Wheeler, president of the Washington-based CTIA, applauded the dismissal: "The court threw out the suit on the very specific grounds that it represented junk science."

Perlmutter, however, told *Microwave News* that "the reference to 'junk science' is simply a ploy. That's their interpretation of the research, but in fact it really is good science."

NEC America Senior Vice President James Carpenter said he welcomed the dismissal "as a verification of our position that cellular phones are safe." He added that, "Public safety is paramount to NEC."

Robert Holstein, whose Chicago-based firm, Holstein, Mack & Klein, represents six of the plaintiffs currently seeking to link cellular telephones with brain cancer, did not return telephone calls asking for comment. Trial dates for these cases have not yet been set, according to an attorney at the firm.

Reynard's suit, which was originally filed on April 8, 1992, alleges that his wife Susan Reynard's portable cellular telephone either initiated her brain tumor or accelerated the progress of an already existing tumor (see *MWN,* M/J92 and J/F93). Susan Reynard died in May 1992, two years after she was first diagnosed with cancer. She had used an NEC P9000 hand-held cellular phone for two years prior to her diagnosis, according to her husband.

CTIA Research Group Funds $1.5 Million Dosimetry Study

After 18 months of negotiations, Dr. C.K. Chou of the City of Hope National Medical Center in Duarte, CA, has received $1.5 million from the CTIA's Wireless Technology Research (WTR) Limited Liability Co. for a three-year study of human exposures to microwave radiation from cellular phones.

This is the largest grant that WTR (formerly known as the SAG—see p.8) has awarded to date as part of its $15-25 million research program, and it is the first for work that does not involve epidemiology. The first phase of Chou's project will be to design a head-only exposure system—to simulate the use of cellular phones—for use in animal experiments.

WTR has also signed two other, related contracts. Dr. Gregory Lapin of ComBioMed Labs in Deerfield, IL, has received $64,000 to develop computer models of experimental animals to help Chou design exposure systems. And Dr. Allen Taflove of Northwestern University in Evanston, IL, has received $28,000 to analyze proposed exposure systems for *in vitro* studies in order to protect against generating "hot spots" which could cause heating in tissue cultures.

Dr. George Carlo, the chairman of WTR, first announced Chou's award in December 1993 (see *MWN,* J/F94), but it was delayed by negotiations over the ownership of the research equipment and results, and by Carlo's insistence that Chou use good laboratory practices (GLPs). In an interview, both Chou and Carlo's spokesperson Mike Volpe played down any past differences. "We have been waiting a long time and now we are looking forward to a successful project," Chou said. Volpe refused to comment on the sticking points in the contract negotiations.

With the WTR funds, Chou will purchase a super-computer—he calls it a "baby Cray"—to carry out complex dosimetry calculations. At the conclusion of the study, WTR will donate the computer to the medical center.

When Carlo originally announced Chou's award, he also said that he would contract with Dr. Om Gandhi of the University of Utah, Salt Lake City, for additional dosimetry studies. No agreement has yet been reached, however. "I am very disappointed." Gandhi told *Microwave News,* "We were talking about such a small amount of money—less than $100,000." Gandhi said that he had submitted a number of proposals and revisions over the last 18 months. "There has been a lot of paperwork," he said. Neither Carlo nor Volpe

responded to queries on the status of the Gandhi contract.

In the second year of the project, once the exposure system is completed, Chou will develop computer and human models (from the navel up) to estimate the amount of microwave energy absorbed by a cellular phone user. In the third year, Chou will conduct MRI scans on human subjects and apply the data to refining his models.

Chou, the director of radiation research at the City of Hope center, was the associate director of the University of Washington's Bioelectromagnetics Research Lab in Seattle before moving to California ten years ago. At that time, the lab was run by Dr. Bill Guy, who, along with Carlo and Dr. Ian Munro of CanTox in Mississauga, Canada, run the three-member WTR. Chou worked with Guy on microwave dosimetry and the health effects of long-term microwave exposures. At the City of Hope, Chou has focused on the distribution of energy from hyperthermia applicators.

Dr. Susan Putnam of the Harvard Center for Risk Analysis in Boston said that WTR had not asked the center's advisory committee on cellular phones to review any of the three funded projects.

Communications Industry Seeks Ways To Facilitate Tower Siting

The communications industry is stepping up its efforts to expedite the expansion of the country's cellular phone and personal communications services (PCS) networks. Trade associations representing the wireless industry have turned to President Clinton and the Congress for assistance, in addition to petitioning the Federal Communications Commission (FCC).

In a March 22 letter, Thomas Wheeler, president and CEO of the CTIA in Washington, asked the President to issue an executive order directing federal agencies to facilitate the use of property that they control. "Too often the process of building transmission sites is thwarted or substantially delayed by federal agencies which control the sites on which antennas need to be located," Wheeler wrote. He suggested using the rooftops of General Services Administration buildings and public lands managed by the Park and Forest Services.

As of late May, the White House had not formally responded, according to CTIA spokesperson Mike Houghton. But, "There have been conversations," he told *Microwave News*.

FROM THE FIELD

Clippings from All Over

This is a large and well-done study. Its results can be relied upon....The study is overinterpreted with regard to the EMF–CNS [central nervous system] cancer relationship. Until this relationship can be shown to hold, in a dose–response fashion,...the study cannot be interpreted as anything other than negative or, at most, weakly positive for the EMF–CNS cancer association....The present study is categorically negative for virtually all forms of cancer. When seen in this light and when its high quality is taken into account the study gives us a transcendental perspective: As studies of occupationally exposed persons have increased in size and quality, the EMF–cancer link has become ever weaker and less consistent. A true cause–effect relationship would have moved the other way, becoming ever stronger. Indeed, in the last two years three large-scale, well-done studies of men occupationally exposed to EMF have been published. None of these studies presents impressive evidence for a cause–effect relationship between EMF and any form of cancer. And, no two of the studies even show an overall association for any one form of cancer. Thus, in broadest perspective, the present study is reasonably persuasive as to the absence of an EMF–cancer relationship.

—Dr. Philip Cole, *Evaluation of "Magnetic Field Exposure in Relation to Leukemia and Brain Cancer Mortality Among Electric Utility Workers" by David Savitz and Dana Loomis,* January 20, 1995

One key issue complicating the investigation of exposure to EMFs is the question of how to measure them. Not only is there imprecision in the technology currently used to assess EMFs in the field, there is also disagreement over what constitutes exposure and what elements the exposure monitors should be measuring. EMF is a very broad category, and scientists contend that any effects seen in epidemiologic or laboratory studies may depend on what elements of electric and/or magnetic fields (e.g., wavelength or frequency, intensity of the field, degree of polarization, whether the field is continuous, intermittent, or transient) are being measured, and what exposure parameters (such as time-weighted average, peak field levels, or lifetime exposure) are being investigated. Each element may play a role in the potential impact of EMFs, yet there is little consensus on what parameters we should be capturing. In other words, scientists agree that how EMFs are measured may matter a lot, but they do not yet know which exposure measures, if any, are physiologically meaningful.

—"Workers, EMFs and Cancer," *Risk in Perspective,* a publication of the Harvard Center for Risk Analysis, p.6, April 1995

Some members of such groups [e.g., Arizona Patriots] contend that the United Nations plans to conquer the United States, using a secret strike force made up of the National Guard and foreign troops and hiring Los Angeles street gangs to confiscate the guns of private citizens. Some think that United States currency is imprinted with secret bar codes so that government officials in vans equipped with microwave scanners can drive by their homes and count their money. Others fear that the United States is run by a secret organization.

—Tim Weiner, "FBI Hunts 2d Bombing Suspect and Seeks Links to Far Right; Rain Stalls Search of Rubble," *New York Times,* p.32, April 23, 1995

EPRI plans to compare the methodologies and results of the three studies [Sahl, Savitz and Thériault] to investigate the reasons for differences in the results and also plans to pursue other comparative analyses. The studies' focus on utility workers and their use of state-of-the-art exposure assessment are thought to offer a unique opportunity to better understand both exposure environments and potential risks in the industry. Explains [EPRI's Leeka] Kheifets: "We are planning to bring all the researchers together and have them examine their data in more detail so that, we hope, a clearer picture will emerge and we will know where to go from there."

—"Utility Workers and EMF Health Risks," *EPRI Journal,* p.17, March/April 1995

Meanwhile, Reps. Scott Klug (R-WI) and Tom Manton (D-NY), working with the Personal Communications Industry Association (PCIA), also based in Washington, have proposed amending the Communications Act to prohibit state and local governments from adopting RF/MW radiation safety rules that are more stringent than those previously adopted by the FCC.

The amendment, if enacted, would also force the FCC to complete its rules on RF/MW safety within six months. The commission has proposed adopting the 1992 American National Standards Institute limits (see *MWN,* M/A93), but final rules may now be delayed by the Environmental Protection Agency's (EPA) forthcoming draft RF/MW exposure guidelines (see p.15).

"It would be hard for the FCC to ignore what the EPA recommends," said Dr. Robert Cleveland of FCC's Office of Engineering and Technology. He explained that two former FCC chairmen have written to the EPA saying that the commission would defer to the agency regarding RF/MW safety guidelines. "Most likely," Cleveland added, "the FCC will incorporate the EPA recommendations in another proposal for comment later this year."

On May 17, the House Telecommunications and Finance Subcommittee passed the Klug-Manton amendment. The House Commerce Committee then passed the communications bill, including the amendment, on May 25. The bill will next be considered by the full House and then by the Senate.

The rewrite of the Communications Act is a complex and controversial piece of legislation—of which the cellular and PCS provisions are only a small part—and most observers do not expect it to emerge from Congress any time soon.

Last December, the FCC received petitions from the CTIA and from the Electromagnetic Energy Association for, respectively, federal preemption of state and local regulations on tower siting and a national RF/MW safety standard (see *MWN,* J/F95). The petitions have prompted a large number of comments, both for and against (see below).

In an April 18 letter to the mayor of Stanton, CA, who had argued against CTIA's petition, FCC Commissioner Rachelle Chong indicated how she is approaching her decision: "I believe that the commission must balance the federal interest in ensuring the development of a competitive, efficient mobile services infrastructure against legitimate interests of local governments in regulating zoning and land use matters."

The FCC has yet to rule on CTIA's petition. "We are looking at it and in the next couple of months something will certainly be moving," Jeff Steinberg, a senior attorney in FCC's wireless bureau, told *Microwave News*. In 1985, the FCC declined a similar request for federal preemption (see *MWN,* Ap85).

The Congressional Office of Technology Assessment is preparing a report, *Wireless Technologies and the National Information Infrastructure,* which addresses the tower siting issue (see also p.7). The cellular and PCS industries estimate that 100,000 antennas will have to be built over the next decade in order to expand the country's wireless network, according to a chapter entitled "Zoning Regulations and Antenna Siting: Local Control and Federal Preemption."

Battle Lines Drawn on CTIA Petition Seeking Federal Preemption of State and Local Cellular Phone and PCS Tower Rules

Excerpted below are comments submitted to the FCC in response to the petition filed by the CTIA on December 22, 1994. Comments were due by February 17 and reply comments by March 6 (see MWN, *J/F95). Reply comments are marked with a "‡". Note that CMRS stands for Commercial Mobile Radio Service.*

...The FCC, a federal agency, has no constitutional or legal or legislative right to challenge state and local regulatory procedures in this or any matter.

—Bert Dumpé, Ergotec Association Inc., Arlington, VA, February 13

The Aircraft Owners and Pilots Association (AOPA)...strongly objects to the [CTIA] petition....AOPA suggests that CTIA has not demonstrated any legal authority for such FCC preemption....This petition is at odds with the established and federally recognized responsibility of state and local governments concerning tall towers.

—Aircraft Owners and Pilots Association, Frederick, MD, February 15

This extraordinary proposal has no legal justification and would be contrary to the public interest....[S]tate regulation of siting does not conflict or impede the development of the telecommunication infrastructure; rather, state siting regulation serves the important purpose of ensuring that such development is consistent with other public interests of protecting the environment and residents. These important policy goals should not be lightly tossed aside in a rush to build the information superhighway.

—Connecticut Attorney General Richard Blumenthal and the Connecticut Siting Council, February 16

The [FCC] should deny the petition because it strikes at the heart of the power of municipalities and states to develop zoning rules that will protect the environment and public health. As a matter of policy, state and local governments should not be restrained in exercising their authority to issue and enforce zoning regulations that protect aesthetic, health and economic interests and that promote the public interest.

—Natural Resources Defense Council, New York City, February 16

APC supports the petition....In its efforts to establish the hundreds of base station sites necessary to offer PCS in this region, APC is now facing serious local zoning obstacles...that confirm the imminent need for the relief sought by CTIA....The delays, unnecessary costs and outright bars to tower siting to which local governments have subjected APC will continue to hamper development of PCS infrastructure unless the commission exercises its authority to preempt the patchwork of local regulations....[A] new commission rule concerning preemption of zoning restrictions on CMRS infrastructure could recognize *legitimate* local interests in health, safety and aesthetic regulation, while also constraining such regulation on the basis of reasonableness principles.

—American Personal Communications (APC), Washington, February 17

McCaw agrees that there is a substantial and immediate need for commission action to preempt the growing patchwork of state and local cell-siting restrictions that are impeding the development of the national telecommunications infrastructure....McCaw has observed in

recent years an alarming increase in the number and variety of state and local regulatory constraints that have the purpose or effect of preventing or substantially hindering the installation of cell-site facilities essential to the provision of innovative, efficient and economical CMRS services....Frequently, such regulations are developed as a political response to the unfounded claims of a few vocal constituents who wrongly assert that the low-level [EM RF] emissions generated by cell sites pose a health risk to the community. Although these charges are firmly belied by exhaustive studies, expert testimony and the commission's own determination that cellular facilities operate far below the well-established federal limits for RF radiation, an increasing number of states and localities have established their own standards for RF regulation.

—McCaw Cellular Communications Inc., Washington, February 17

Matters of public health, welfare and safety are, for the most part, issues of local concern....[L]ocal government officials live and work in the communities which they serve and are, therefore, more knowledgeable about the health, welfare and safety issues affecting their communities.

—National Association of Telecommunications Officers and Administrators, National Association of Counties, National League of Cities and U.S. Conference of Mayors, February 17

Because increased local oversight over tower site construction and operations is adversely affecting a licensee's ability to engage in commission-authorized activities, federal supremacy in the form of preemption must now be asserted....[T]he commission must consider the economic hardship of complying with conflicting federal, state and local regulations—many communications operations will expend considerable resources trying to comply with such conflicting regulations. In most cases, the expense will be passed along to the consumer. In other cases, the expense will suffocate the business and cause a withdrawal of service to the public.

—Personal Communications Industry Association (PCIA), Washington, February 17

[P]reemption of state and local authority is neither warranted as a matter of fact nor of law....CTIA cites not a single local siting ordinance or regulation which has "physically delay[ed]" or "prevent[ed]" the siting and build-out of CMRS towers....[H]ad CTIA examined the facts, the facts would have demonstrated graphically that state and local entities have fostered, not hindered, the efficient development of infrastructure necessary to support wireless carriers. ...[I]n the vast majority of cases in which the site proposed by the carrier was deemed incompatible with health, safety, environmental or aesthetic concerns in the community, the local entity typically found an alternative site. For example, the CPUC is aware of cases where a cellular carrier has sought to place its towers in a school yard or on a public beach. In these cases, the local entity has properly considered whether such placement is consistent with local zoning laws, and has suggested placement elsewhere to accommodate the carrier.

—California Public Utilities Commission (CPUC), March 3‡

[T]his proposal does nothing to ease the problem of finding willing property owners to take on cellular site leases. Property owners will increasingly demand assurances that any cellular facility located on their property is safe for them, their tenants, employees, families and neighbors....

—Cindy Sage, Sage Associates, Montecito, CA, March 4

Bell Atlantic Mobile is cognizant of the legitimate right of state and local governments to control land use in their states and communities....[I]t does not support complete preemption of local control over CMRS tower siting. At the same time, however, the record shows that some localities are barring new CMRS towers altogether, are imposing restrictions or waiting periods...or are assessing fees not charged other similar sites. It is this type of unreasonable and discriminatory interference with federally licensed communications services that not only justifies but compels federal preemption.

—Bell Atlantic Mobile, Bedminster, NJ, March 6‡

...[T]he commission has been very careful, in its disclaimer, to establish that it is not a health agency and would prefer to defer to one when addressing biological/radiation issues. If the FCC were to adopt the CTIA petition, it would most certainly be in the position of [having to prove], beyond all doubt, that there is absolutely no possibility of harm from any FCC-authorized system to anyone in any environment. That is not just an unenviable position, it's impossible.

—Kathleen Hawk, community activist, Butler, PA, March 6

Often the public has been forced to accept compromises in the provision of mobile services because of citizen groups that have used scare tactics based on unsubstantiated safety claims to prevent tower construction in areas where local zoning regulations should allow it.

—New Par, a regional cellular service provider, March 6‡

The FCC should grant CTIA's petition and initiate a rulemaking proceeding to propose rules preempting local zoning regulations which interfere with a federal licensee's efforts to provide wireless service. The rulemaking should propose uniform national zoning guidelines for wireless communications facilities. These guidelines should strive to balance the needs of CMRS providers and local and federal regulators.

—NYNEX Mobile Communications Co., White Plains, NY, March 6‡

The current system is working fine....Local governments' zoning allows towers and other facilities to be appropriately placed within communities. The current permitting system has checks and balances so that local community issues can be weighed and there is state oversight to ensure that the statewide goal of having reliable and widespread cellular service is met.

—Mayor Algird Leiga, Claremont, CA, March 8

More than 40 other California cities filed similar letters with the FCC, including Anaheim, Indian Wells, San Bernardino and West Hollywood.

Preemption of zoning ordinances could directly affect the "quality of life" in a community. Local planning authorities identify the needs and desires of residents based on a thorough knowledge of community conditions and resources. Plans are then developed with full citizen participation. Preemption of regulations to allow towers located at the provider's discretion would not serve the best interests of citizens or communities. Local governments are in the best position to balance the interests of the cellular telephone industry with surrounding areas.

—American Planning Association, Chicago, March 17‡

...[S]uch generic preemption is clearly precluded by the legislative history underlying the recently amended §332 of the Communications Act....[S]uch preemption could potentially overwhelm the already hardworking but overburdened FCC staff....[E]ven [if] we assume, *arguendo*, that preemption is permissible and the FCC staff could handle the additional workload, the CTIA petition has failed to present any evidence that any relief is warranted.

—National Association of Regulatory Utility Commissioners, Washington, March 17‡

[We] believe...[t]he FCC is not the appropriate federal agency to develop a federal [RF] standard [because] there has been no concerted effort by any federal agency to pursue such a standard. Given the uncertainty in the science, states should not be prevented from exercising their judgment as to the best approach to take.

—New Jersey Department of Environmental Protection, March 17

The preemption of state and local zoning siting regulations...would harm, not promote, the safety of life and property.

—Communications Workers of America, Washington, April 10

Cancer Incidence§ Among Polish Military Personnel Exposed to RF/MW Radiation (1971-1985)

Age Groups	All Cancers				Leukemia and Lymphoma			
Years	Exposed	Controls	Odds Ratio	C.I.◊	Exposed	Controls	Odds Ratio	C.I.◊
20-29	27.11	11.62	2.33*	1.23-3.12	17.30	2.12	8.16†	3.11-22.64
30-39	42.28	18.37	2.30*	1.04-3.06	26.43	3.08	8.58†	3.46-19.58
40-49	161.62	84.29	1.92*	0.98-2.84	73.25	8.32	8.80†	4.13-15.27
50-59	274.13	186.71	1.47	0.92-2.12	108.62	24.31	4.47†	2.56-6.81
All Age Groups	119.12	57.60	2.07*	1.12-3.58	43.12	6.83	6.31‡	3.12-14.31

§Average annual incidences per 100,000 subjects ◊Confidence interval *p<0.05 †p<0.01 ‡p<0.001

These included seven cases of chronic myeloid leukemia among the exposed population as compared to 17 among the controls, a rate which is close to 14 times expected.

The rates of cancers of the brain, colon/rectum and esophagus/stomach were also significantly elevated among soldiers exposed to RF/MW radiation.

"Confirmation of our findings will require a larger group of exposed personnel, which can probably only be done in cooperation with other countries," stated Szmigielski. Nevertheless, he concluded that there is an "urgent need" to investigate these high cancer rates further.

In his paper, Szmigielski explained that exposure information was collected from military safety groups, which measured RF/MW radiation intensities "at and around service posts where...emitting equipment is used, repaired or serviced." Most of the sources emitted pulsed radiation in the 150 MHz-3.5 GHz frequency range. The surveys indicated that 80-85% of the exposures did not exceed 0.2 mW/cm^2; the rest were exposed to 0.2-0.6 mW/cm^2, and occasionally to more than 0.6 mW/cm^2. These levels are well below those specified as safe by current safety standards. Szmigielski noted that the exposures were "considerably more uniform" than those found in electrical occupations.

In 1985, Szmigielski reported similar findings for military personnel exposed between 1971 and 1980 (see *MWN,* Mr85). The new analysis extends the database through 1985. That same year, he began working on a prospective epidemiological study of RF/MW-exposed soldiers; preliminary results also support a cancer risk (see *MWN,* J/F87 and S/O90). Szmigielski said that he will soon begin analyzing the prospective data collected through 1995.

No large-scale epidemiological cancer study of RF/MW-exposed workers has ever been done in the U.S. A 1992 investigation of U.S. Army artillery crews did find impaired reproductive function, but no attempt has been made to investigate this finding (see *MWN,* M/J93).

Szmigielski's paper, which has been peer-reviewed, will be published in a special issue of *Science of the Total Environment* devoted to papers presented at a conference on *The Effect of RF Electromagnetic Radiation on Organisms,* held in Skrunda, Latvia, in June 1994 (see *MWN,* M/A94 and S/O94). Professor Guntin Brumelis of the University of Latvia in Riga, who is editing the special issue, told *Microwave News* that it is "expected to be published in early 1996," due to a backlog at the printer. The journal is published by Elsevier in Amsterdam, The Netherlands. For more information, contact Elsevier in the U.S. at (212) 633-3750, or Fax: (212) 633-3764.

NCRP Review of Modulated RF/MW *(continued from p.1)*

of the committee should be "basic dosimetry." ORIA's Norbert Hankin added that, "We wanted the NCRP to provide us with a framework to incorporate modulation into exposure limits, not new numerical guidelines." The modulation study is one of EPA's first initiatives in the agency's revived non-ionizing radiation program (see *MWN,* S/O94).

But the chair of the panel, Dr. Om Gandhi of the University of Utah, Salt Lake City, said in an interview that, "We are going to look at biology." He added that his committee will be reviewing "a database of least 600-700 papers" on modulation bioeffects. Other members of the panel noted that bioeffects had been on the agenda at the committee's first meeting, held in Bethesda, MD, on April 28.

The move from dosimetry to biology is reflected in the change in the committee's mission statement since the NCRP first submitted a proposal to the EPA last July under the title *Consideration of Modulation in the Development of Maximum Permissible Exposure Limits for RF Radiation.* NCRP Committee 89-4 is now working on a *Commentary on Biological Effects and Exposure Recommendations for Modulated Radiofrequency Fields* (see box at right).

Some observers, who asked not to be named, are concerned that the committee is not well suited to evaluate health studies because most of the members are engineers or physicists. "Where are the biologists?" asked one federal official.

Others are concerned about potential conflicts of interest, given that five of the seven committee members are now, or were recently, consultants to the communications industry. This could be a problem because, as Dr. Tom Tenforde, who played a major role in assembling Committee 89-4, pointed out, "Cellular phones are the main issue" when it comes to devising safety standards for modulated RF radiation. "There is a real need for guidance" with respect to the phones, he said. Tenforde, the chief scientist of the health division at the Battelle Pacific Northwest Labs in Richland, WA, is the chair of NCRP Committee 89 on Non-Ionizing Electromagnetic

Charge of NCRP Committee 89-4

NCRP Committee 89-4 will prepare a Commentary on Biological Effects and Exposure Recommendations for Modulated Radiofrequency Fields. *The committee's charge is as follows:*

This NCRP commentary will address the fact that current standards for public and occupational RF fields do not account for potential differences in the biological responses and health effects of [continuous wave] versus modulated RF fields. There are laboratory findings which indicate that time-averaged specific absorption rate (SAR) is not an adequate dosimetric parameter or predictor of biological effects for modulated RF fields under conditions in which the interactions with tissue are non-thermal. The proposed committee activity will address the possible consequences of including the modulation of RF radiation as a factor in developing recommendations for human exposure limits. Aspects of modulated RF that will be considered include the RF carrier frequency, time-averaging, modulation characteristics (waveform, frequency, pulse width, repetition rate, etc.), selection of a biological basis for exposure limitations, etc. The results of this assessment will be a set of recommendations that incorporate modulation into permissible exposure limits for RF radiation.

Fields and a member of the NCRP board of directors.

In addition to Gandhi, the members of the panel are Drs. John D'Andrea of the Naval Aerospace Medical Research Institute's detachment at Brooks Air Force Base in San Antonio, TX; Kenneth Foster of the University of Pennsylvania, Philadelphia; Bill Guy, an emeritus professor at the University of Washington, Seattle; Don Justesen, recently retired from the VA Medical Center in Kansas City, MO; Indira Nair of Carnegie Mellon University in Pittsburgh; and Asher Sheppard, a consultant based in Redlands, CA.

Foster, Gandhi, Guy, Nair and Sheppard are engineers and/or physicists. Justesen is a psychologist and D'Andrea received his doctorate in physiological psychology.

Tenforde, who is a biophysicist, said that he has full confidence in the committee but conceded that its members have "more knowledge in the dosimetry domain than in biology." Dr. Thomas Koval, a senior staff scientist at the NCRP in Bethesda, also praised the expertise of Committee 89-4, saying it is an "excellent" group, and added that, "Although the background of the members is not principally in biology, they are people who have had a lot of experience with RF bioeffects."

Foster, Guy and Justesen have often represented communications companies. For instance, Justesen recently served as an expert witness for AT&T in the case of two workers who had died of a brain tumors (see p.5) and Guy is one of the three members of the WTR, which is sponsored by the CTIA (see p.8). Sheppard is a consultant to Motorola. Foster has consulted with cellular phone companies and Gandhi has done dosimetry work for McCaw Cellular Communications, now part of AT&T (see *MWN,* J/F94).

Tenforde maintained that there is no reason to be concerned about possible conflicts of interest. "I don't view it as a significant issue," he said. "It's more coincidental than anything else, because the best people are relatively few in number."

The EPA may not be the only sponsor of the committee's work, according to NCRP's Koval. He said that, if necessary, the council would supplement the EPA money with its own funds, which are collected from a large number of sources. For instance, the Motorola Foundation, an entity separate from the corporation, recently gave the NCRP an unrestricted $225,000 grant, to be paid over three years.

The primary focus of the NCRP, which was chartered by the U.S. Congress, has been ionizing radiation, but it has a number of ongoing projects on non-ionizing radiation (see *MWN,* J/F86, M/J92 and M/A94).

EPA To Release Draft RF/MW Exposure Guidelines

The EPA will soon circulate draft guidelines for public exposures to RF/MW radiation. The guidelines, which will be voluntary, are adapted from those recommended by the International Radiation Protection Association (IRPA) in 1988; they are somewhat more stringent than the 1992 limits adopted by the American National Standards Institute (ANSI).

"Our guidelines are intended to protect against shocks and burns and the effects of RF heating," explained Norbert Hankin of EPA's Office of Radiation and Indoor Air (ORIA) in Washington, who helped develop the draft proposal. "We did not address cancer and nonthermal effects." The EPA limits are keyed to a maximum whole-body specific absorption rate (SAR) of 0.08 W/Kg and a partial-body SAR of 1.6 W/Kg—in order to limit temperature increases to less than half a degree Celsius.

The two key differences between the EPA limits and prior guidelines are: (1) exposures are not averaged over the six-minute and 30-minute intervals specified by IRPA and ANSI, respectively; and (2) the partial-body exposure limit applies to all parts of the body. The ANSI guidelines specify a more lenient limit—4 W/Kg—for the hands, wrists, feet and ankles.

Dennis O'Connor, EPA's EMF team leader, told *Microwave News* that he plans to seek comments from all interested parties when a review by an interagency working group is completed. "Our intention is to move as quickly as possible without sacrificing the review process," he said.

Meanwhile, the International Commission on Non-Ionizing Radiation Protection (ICNIRP), IRPA's successor, has drafted a revision of its 1988 guidelines which will be discussed at ICNIRP's annual meeting, to be held at the Food and Drug Administration (FDA) in Rockville, MD, in June. "I don't anticipate any major changes though there will be some clarifications," said FDA's Dr. Mays Swicord, a member of the ICNIRP.

In addition, the NCRP is preparing to begin a revision of its assessment of RF/MW health risks. "We have the funding and an approved charter to evaluate and update Report No.86," said Dr. Tom Tenforde, the chairman of NCRP Committee 89 on Non-Ionizing EMFs. Report No.86, *Biological Effects and Exposure Criteria for Radiofrequency EMFs,* was issued in 1986 (see *MWN,* M/J86). He added that it was premature to say who will be on the review committee.

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UPDATES

CELLULAR PHONE INTERFERENCE

EMI to Hearing Aids... Self Help for Hard of Hearing People (SHHH) has asked the FCC to ensure that digital cellular phones and other wireless PCS devices will not cause interference with hearing aids. In a February 13 letter, SHHH Executive Director Donna Sorkin called on the FCC to "avoid a situation where retrofitting is needed." SHHH's concern was raised by reports of hearing aid EMI from GSM phones in Australia, Denmark and elsewhere. "It's like a bumblebee landing in your ear and buzzing away," said SHHH engineer Jack O'Keeffe, speaking of his own experience. GSM modulation is not now used in the U.S., but may be introduced for PCS devices. FDA's Howard Bassen said that preliminary tests by his agency found EMI from GSM phones and also from those on the North American Digital Cellular (NADC) standard, now used in some parts of the U.S. "We've confirmed that there's an audible hum, but we haven't quantified it yet," he told *Microwave News*. Both GSM and NADC are Time Division Multiple Access (TDMA) schemes. Bassen and O'Keeffe said that future Code Division Multiple Access (CDMA) phones might cause less EMI, but that this is uncertain. Bo Piekarski, vice president for PCS at Ericsson Inc. in Richardson, TX, disagreed: "This issue isn't specific to any one type of cellular phone or hearing aid. Some hearing aids have a better resistance to interference than others. And other devices can cause EMI, like fluorescent lights and stereo equipment."

CITIZENS GROUPS

Alliance Goes International... The National EMR Alliance has dropped "National" from its name. "We now have a worldwide network of contacts in 11 different countries," said Cathy Bergman, the president of the alliance, which is a coalition of citizens concerned with the potentially harmful effects of all types of non-ionizing radiation. The five-year-old organization is seeking nonprofit status from the IRS, which would make contributions tax-deductible. The alliance has a bimonthly newsletter, *Network News* ($35.00/year). For more information, contact: EMR Alliance, 410 West 53rd St., Suite 402, New York, NY 10019, (212) 554-4073.

MEETINGS

RF Radiation and Health in Finland...A workshop on the *Biological Effects Relevant to Amplitude Modulated RF Fields* will be held September 3-4 in Kuopio, Finland. Dr. Jukka Juutilainen of the University of Kuopio is the chairman of the organizing committee for the meeting, which will focus on the safety of hand-held mobile telephones: "The aim of the workshop is to discuss the available experimental evidence about the effects of weak RF fields, the importance of physical field parameters such as resonances, amplitude and frequency windows and coherence, to identify research needs, and to gain a better understanding of the interaction mechanisms of the suggested effects." The official language of the workshop will be English. Abstracts are due by June 30. For further information, contact: Joanne Robson, Center for Training and Development, University of Kuopio, PO Box 1627, FIN-70211 Kuopio, Finland, (358+71) 163 931, Fax: (358+71) 163 903.

MELATONIN

A Summit Meeting and Other Highlights... Some 25 research scientists from Germany, Japan, Sweden and the U.S. assembled at a *DOE Melatonin Summit Conference* in Troutdale, OR, May 3-6. "It was a resounding success," said Dr. Richard Stevens, who helped organize the invitation-only meeting with his colleagues at the Battelle Pacific Northwest Labs in Richland, WA. While few new scientific results were presented, Stevens said that the meeting was useful in providing attendees with insights that they might not learn from published papers. The Battelle Press will publish the proceedings next year under the provisional title *The Melatonin Hypothesis: Neuroendocrine Effects of Light and Electromagnetic Fields* — a companion volume to Battelle's 1990 book, *Extremely Low Frequency Electromagnetic Fields: The Question of Cancer*....There are two new reports on the possible effects of EMFs on sheep. Dr. Jack Lee of the Bonneville Power Administration (BPA) in Portland, OR, and coworkers have again shown that 60 Hz EMFs do not affect serum melatonin levels in sheep grazing near a 500 kV power line (see *Bioelectromagnetics, 16,* pp.119-123, 1995, for the new results and *MWN,* S/O91, for a summary of the original findings). A parallel study with a different group of sheep showed that the power line caused an immunological response: a statistically significant reduction in the activity of interleukin-1 (IL-1) among those sheep exposed to mean electric and magnetic fields of 5.8 kV/m and 35 mG, respectively. This observation was made in a pilot study and the BPA has now started exposing a new herd of sheep in an effort to learn more about this response. (See *Joint HVAC Transmission EMF Environmental Study: Final Report on Experiment 3* (Portland, OR: BPA), December 1994.)...Dr. Russel Reiter and colleagues at the University of Texas Health Science Center in San Antonio have published "A Review of the Evidence Supporting Melatonin's Role as an Antioxidant" in the *Journal of Pineal Research (18,* pp.1-11, 1995). Previously, Reiter had suggested that the suppression of melatonin by magnetic fields could counteract its antioxidant action and might explain the clustering of different types of cancers among people exposed to EMFs (see *MWN,* N/D93).

MILITARY SYSTEMS

HAARP Ignored No More... An article on the U.S. military's High Frequency Active Auroral Research Program (HAARP) in the Fall 1994 *Earth Island Journal* has won an award from "Project Censored" as one of the top ten stories ignored by the mainstream news media in 1994. The Pentagon is spending $26 million on a prototype for a proposed 1.7 billion watt transmitter in Alaska that HAARP documents say would act as an "ionospheric heater" for various military uses: creating a "virtual antenna in the ionosphere"; disrupting communications systems; and disabling missiles and satellites. The article, by Anchorage activist Clare Zickuhr and *Earth Island Journal* editor Gar Smith, was reprinted in *Censored: The News That Didn't Make the News and Why,* the 1995 yearbook of the media watchdog group. In a feature article about HAARP in the May/June 1994 issue of *Microwave News,* Zickuhr was quoted as saying that the military wants to "kick the atmo-

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sphere real hard and watch what happens." The *Washington Post* recently picked up the story, running a piece about HAARP on April 17. Project Censored was founded by Carl Jensen in 1976.

PROJECT ELF

Saved by a Single Letter... Project ELF, the U.S. Navy's submarine communications system, was spared the budget ax when it was apparently confused with the Navy's EHF satellite communications program. In March, the Senate Appropriations Committee voted to eliminate Project ELF after critics argued that the end of the Cold War had made it unnecessary. The $14 million budget item survived the House, prompting a conference committee to decide its fate. But before the committee could meet, the Navy held what Sen. Ted Stevens (R-AK) and Rep. Bill Young (R-FL) reported was a classified meeting on Project ELF. They later successfully convinced their colleagues to save the project. The Navy now says there was a major misunderstanding. "Stevens and Young were briefed on a program known as EHF—not ELF," according to Jack Anderson and Michael Binstein in their April 10 syndicated column. A week earlier, Sen. Russell Feingold (D-WI), an opponent of Project ELF, accused Young of pulling an old "trick" by summoning "'newly classified' Navy information." Feingold said that the Navy had told him there was no "classified" reason to maintain the program.

REPRODUCTIVE HEALTH

No EMF Risks Found for Women and Men...A prospective study of close to 3,000 pregnant women, funded by the National Institute of Drug Abuse and EPRI, has failed to find any EMF effects on fetal development. Dr. Michael Bracken and coworkers at the Yale University School of Medicine in New Haven, CT, had designed the study to see if EMFs from power lines and electrically heated beds—electric blankets and water beds—retard fetal growth. The findings appear in the May issue of *Epidemiology (6,* pp.263-270, 1995). (See also *MWN,* M/J86, N/D88 and J/A92.) Bracken also recently reported that he found no significant association between occupational exposures to EMFs, as determined by job titles, and subfertility, as defined by sperm morphology, motility and concentration. This report appears in *Fertility and Sterility, 63,* pp.384-391, February 1995.

RESOURCES

New CMU EMF Booklets... Dr. Granger Morgan of Carnegie Mellon University (CMU) in Pittsburgh has written a new booklet, *Fields from Electric Power,* explaining EMFs and their potential health effects. More precisely, there are four booklets: the "parent" booklet has three pouches, in each of which is a "details" booklet that elaborates on preceding overviews. The three details booklets are: *What are 60 Hz Fields?*; *Do 60 Hz Fields Pose Health Risks?*; and *What Can and Should Be Done About 60 Hz Fields?* This is the fourth EMF booklet published by CMU (see *MWN,* S/O92). To order, contact: Department of Engineering and Public Policy, CMU, Pittsburgh, PA 15213. The price of the new booklet is $6.50 for single copies; CMU offers discounts for bulk orders.

CLASSIFIEDS

MICRO WAVE NEWS

Vol. XVI No. 3 | A Report on Non-Ionizing Radiation | May/June 1996

INSIDE...

EMF NEWS pp.2-6

Power Line Talk:
Gaussmeter Sales Lag • Philippine Priest Fights Power Line • When Will EMF Research Stop? • Appeal in Jordan Case • Korn Defends Himself • Bromley on EPA Report • Three New RAPID Engineering Grants • Legal Database for Utilities

Glazer Suit Dismissed Due to Ground Currents

How Important Are Ground Currents?

NAS-NRC Report Set for Release in July

Excerpts from Jury's Verdict in Altoonian Case

HIGHLIGHTS pp.7-14

RF Radiation Successfully Treats Insomnia

Modulations for Insomnia and Anxiety

Digital Signals Protect Against Brain Tumors!

Cellular Phone Notes:
CTIA Lobbies EPA • U.K.'s Sunday Times Gets Confused • Tower Moratorium Stands • Double-Strand DNA Breaks • Reynard Abandons Brain Tumor Suit • Texas Family Sues over Brain Tumor • Cellular Industry's Explosive Growth

Hawaiian Officials Approve PCS Antennas

Fix Found for Pacemaker EMI

Microwave News on the World Wide Web

NCRP v. ANSI: Concern over Lobbying

No Excess Mortality for Cell Phone Users

FROM THE FIELD pp.15-16

Clippings from All Over

Letters to the Editor:
Medical Device EMI from Cellular Antennas
Dr. Ross Adey on NCRP Draft EMF Report

Flashback: 5, 10, 15 Years Ago p.13

UPDATES pp.16-19

NIOSH Finds No Radar–Male Infertility Link • OrthoLogic's Stock Soars • IEC's Guidelines for EMF Meters • Melatonin in the Eye • Skepticism on Radon Link • Prostate Shrinker Approved • People in the News

CLASSIFIEDS pp.17-20

Cell Phone Contracts Canceled; Health Research Program in Disarray

CTIA & WTR Accused of Mismanagement

Two major research contracts have been canceled and payments to other contractors have been halted because of a funding dispute that is raging around Wireless Technology Research (WTR) and the Cellular Telecommunications Industry Association (CTIA). Some in the industry accuse the trade group of siphoning off millions of dollars intended for WTR's research program. Others ask why WTR has barely begun investigating a possible brain cancer link after spending almost half of its entire $25 million, five-year budget.

"It seems that the CTIA spent a lot of money on things like PR," said John Madrid, Toshiba's representative on the committee that oversees WTR funding. "There have been outrageous administrative costs," he told *Microwave News*. "If WTR had received all the money it was supposed to, it would not have a funding dilemma at this moment." According to Madrid, the CTIA has collected $15-$16 million for research, but WTR has only been given about $12 million.

"We have $800,000 in unpaid bills in pacemaker research alone," said WTR's spokesperson, Mike Volpe. In a May 21 letter, Dr. George Carlo, the chair of WTR, warned that "continuation of the current cash shortage threatens the viability of WTR itself."

Others question what has happened to the funds that the CTIA has given to WTR. "We cannot really account for the money WTR has spent," Ron Petersen of Lucent Technologies in Murray Hill, NJ, said in an interview. "That is why

(continued on p.14)

Jury Finds No EMF–Cancer Link, But Orders Utility To Pay $760,000

The April 19 verdict in John Altoonian's lawsuit against Atlantic Electric held that electromagnetic fields (EMFs) had not caused his leukemia and that the value of his property had not been reduced by power line EMFs. Nevertheless, in the first damage award in an EMF personal injury case, the New Jersey Superior Court jury ordered the utility to pay $762,524 to Altoonian and his wife, most of it for emotional distress.

Both sides have filed motions asking for a new trial. Oral arguments are scheduled for May 24, and a ruling could come soon thereafter.

After a ten-week trial, a jury deadlocked 3-3 on the central issue of causation. Judge Charles Previti then took a step that the *New Jersey Law Journal* (April 22) called "inventive and unprecedented": He recalled the six alternate jurors, who had been sent home, and swore them in as a new jury. After ten hours of deliberations, this second panel reached a verdict (see p.6).

(continued on p.5)

« Power Line Talk »

Over the last few years, lagging sales have taken a toll on the gaussmeter industry. In early May, after more than ten years in the business, **NoRad** Corp. in Carson, CA, closed its doors. "Sales of meters have been declining steadily since 1993 or 1994 and are now down approximately 75% from the peak," said Michael Hiles, former CEO of NoRad, who left a year ago to start Field Management Services Corp., an EMF consulting firm based in Los Angeles (see *MWN,* M/J95). On May 13, **Teslatronics** Inc. was bought by **F.W. Bell** Inc., based in Orlando, FL. Steve Dakel, Bell's director of sales, told *Microwave News* that the company will incorporate Teslatronics' gaussmeters into its product line to fill its own need for low-cost devices for the consumer. "The Teslatronics meters complement our low-end portion of the gaussmeter line and enhance our market presence," Dakel said. He added that a large company such as Bell is better suited than a smaller one to withstand slow EMF meter sales since it offers a variety of instruments. Other manufacturers are devising their own strategies to deal with this slowdown. For example, **Enertech Consultants**, based in Campbell, CA, will try to stimulate sales in the U.S. by introducing two new devices—a transient meter and a waveform capture unit—according to Michael Silva, Enertech's president. Dr. Don Deno of **Electric Field Measurements** in West Stockbridge, MA, a pioneer in the gaussmeter industry, attributes the dip to recent medical journal articles that call into question evidence of an EMF–cancer link. But Karl Riley of **Magnetic Sciences International** in Tucson, AZ, argues that research alone is not to blame. "Sales are really a function of what the media do with the research," he said. "Reality doesn't necessarily govern the market—the media do." Riley cited two recent events that may have diminished public interest—the American Physical Society's statement and the PBS *Frontline* program, "Currents of Fear" (see *MWN,* M/J 95 and J/A95). The general public has become "complacent" in the absence of reports of potential health risks from EMFs, Joe Nowlan of **Walker Scientific** Inc., based in Worcester, MA, said in an interview. "We're talking about something that is very frightening to the general public. If it scares them enough, they will react," Nowlan added. John Rosadini of **Dexsil** Corp. in Hamden, CT, agreed that orders have been down in the last few years, but there continue to be "hot spots" where sales are brisk—usually in communities where transmission lines are being built. Some in the meter business contend that the power companies themselves are partly responsible. Utilities that provide EMF surveys to customers have reduced some of the demand for meters, according to William Bean of **Wandel & Goltermann** Inc., a German company with U.S. headquarters in Research Triangle Park, NC. The role utilities play, however, may run even a bit deeper. As one manufacturer noted: "Utility PR people continue to influence the media and have actually gotten much better at it."

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"Stop causing cancer in children!...People of the world unite against evil!" demanded a sign mounted on a 40-foot pylon in Olongapo, **Philippines**, by Irish missionary priest Father **Shay Cullen**. In a photograph reproduced in newspapers around the world, Cullen was smiling above the banner, which urged supporters to contact Philippine President **Fidel Ramos** to protest the construction of a high-voltage power line adjacent to a home for destitute children. Cullen believes that EMFs from the line pose a significant health threat to the 26 children living at the Preda Foundation, his nearby sanctuary for victims of prostitution and drug addiction. The 230 kV cable was installed to provide backup power for a November summit of the Asia-Pacific Economic Cooperation, which will be attended by 18 heads of state, including President Clinton. The priest lived atop a small perch built on the pylon—equipped with a cellular telephone, fax machine and portable toilet—for two weeks in April. After he came down from his post, he gained backing from Philippine Senator Juan Flavier and Congressman Antonio Diaz. "I do not belittle the government's efforts to make sure the meeting goes without a hitch," Flavier said in the April 16 edition of the ***Manila Times***, "but I want to know the effects of the cables on the health and environment of the people." Because the Preda Foundation is situated on the edge of a cliff, Cullen explained in a letter to *Microwave News,* the power lines are at the same height as three floors of the home. Cullen estimated that the children would be exposed to a field of 7.1 mG. He expressed concern, as this is well above the recommended safe exposure level of 2 mG specified in a draft report submitted to the U.S. National Council on Radiation Protection and Measurements (NCRP) last year (see *MWN,* J/A95). The priest's sentiments were echoed in a speech Diaz made to the Philippine Congress on April 29, in which he pointed out that, "Father Cullen and his staff have served the people for 27 years and have an international reputation for quality and honest service to the people and children of Olongapo." He then asked, "Can the same be said of the city government?"

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Now that the **RAPID** program has passed its midpoint, some observers are suggesting that EMF research may—or should—end with RAPID. They argue that in 1992, when it set up the program, Congress posed the question: Can EMFs affect human health? If the answer is "no," they contend, the research effort should be closed down. "Are we going to reach closure on the EMF problem?" asked Dr. **Peter Bingham**, the president of the Philips Laboratories in Briarcliff Manor, NY, and a member of the National EMF Advisory Committee (**NEMFAC**), at the April 29-30 NEMFAC meeting in Washington. Bingham hopes so, but Dr. **Tom Rozzell**, a NEMFAC member who is at the National Academy of Sciences, does not want anyone's expectations to be raised too high. "If you think you are going to solve this problem [in five years], you are deluding yourself," Rozzell stated. Dr. **Gary Boorman**, NIEHS' point man on RAPID, tried to stake out the middle ground. "It is not realistic to come to closure on EMFs, but I think we will be able to put some boundaries on the risk," he said. The job of evaluating health risks now lies with **Dan Vandermeer**, formerly of the NIEHS

and now a consultant to the institute. Vandermeer has recruited Dr. **Christopher Portier**, the head of NIEHS' Laboratory of Computational Biology and Risk Analysis, and together they are planning a series of workshops to be held next year when the results of the RAPID grants start to become available.

«« »»

On April 12, the Georgia Supreme Court agreed to hear an appeal by **Georgia Power** Co. and **Oglethorpe Power** Co. in the ***Jordan*** EMF–cancer lawsuit. An appeals court had overturned a jury verdict in the utilities' favor, ruling that it was improper for the power companies' experts to testify about a "scientific consensus" that EMFs had not caused Nancy Jordan's non-Hodgkin's lymphoma (see *MWN,* J/F96). Oral arguments are expected to be heard in June.

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In 1991, Dr. **David Korn** admitted to an **EPA Science Advisory Board** panel assigned to assess the agency's **draft EMF–cancer report** that he had not read the key papers on cellular and animal effects. Testifying on behalf of a group of utility companies, he concluded that the data on EMFs and cancer were "soft and noisy" and that any link was "extraordinarily speculative" (see *MWN,* J/F91). As ***Scientific American*** reported in its March 1991 issue, Korn, who at the time was the chairman of the President's National Cancer Advisory Board, had his "knuckles metaphorically rapped" at the meeting and was told by one committee member to "read the relevant literature before venturing any further opinions." Five years later, in the January/February 1996 issue of the *IEEE Engineering in Medicine and Biology Magazine,* IEEE's Committee on Man and Radiation (COMAR) revived the incident. The first section of "Unfounded Fears: *The Great Power-Line Cover-Up* Exposed" by Ruth Miller of Kansas State University, Manhattan —a two-part response to **Paul Brodeur**'s third book on EMFs— included Korn's side of the incident. Calling the EPA draft cancer report that he had read in lieu of the original papers "an exhaustive summary of the published literature," Korn said he felt that he had been exposed to the strongest evidence the EPA could assemble on the subject. In his view, however, these data were "internally inconsistent, entirely based on epidemiological associations that were far from robust statistically, and simply not conclusive." Korn also questioned how Brodeur's book depicted the incident, pointing out that Brodeur had neglected to cite Korn's strong support for further studies. He went on to say that the existing data are not substantial enough to justify regulatory action but support of additional research "would represent an appropriate response by the federal government to this matter of major public controversy." Korn, who was dean of Stanford University School of Medicine from 1985 to 1995, stepped down from the cancer board in 1991. He could not be reached for comment.

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Another footnote to the **EPA cancer report**: In a November 30, 1992 letter, Dr. **Allan Bromley**, President Bush's science advisor, congratulated Dr. **William Gordon** of Rice University in Houston for his work on the Oak Ridge report on EMF health hazards (see *MWN,* N/D90 and N/D92). Bromley had sought to counter EPA's conclusion of a possible cancer link. In the margin is a handwritten note from Bromley: "An excellent report even if it can't kill this monster!" Bromley has since returned to Yale University in New Haven, CT, where he is dean of engineering.

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The EMF **RAPID** program has awarded three new engineering contracts for research on methods of measuring and reducing EMF exposures. These are in addition to five related projects that were funded last year (see *MWN,* M/A95). The new projects will provide data needed for the final stages of the five-year program, including the extent to which EMF exposure affects human health, said DOE's RAPID Program Manager **Lynne Gillette**. Drs. **Luciano Zaffanella** and **Graham Kalton** of Enertech Consultants in Campbell, CA, received $434,000 to assess personal magnetic field exposures of about 200 people. This is the first phase of a larger effort to estimate EMF exposures of the U.S. population. Dr. **Dan Bracken**, a consultant based in Portland, OR, will develop a model to predict human EMF exposures accurately, without taking personal measurements, under a $138,000 contract. And **Tim Johnson** and **James Gauger** of the IIT Research Institute in Chicago got $124,000 to describe and evaluate existing techniques for reducing EMFs, including their economic costs and environmental impacts.

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As EMF litigation continues to be a major concern for electric utilities, **Associated Electric and Gas Insurance Services** Limited (AEGIS) and the law firm of **LeBoeuf, Lamb, Greene & MacRae** are trying to address this fear. Together they are assisting AEGIS' more than 300 clients in the public utility industry. LeBoeuf, Lamb's legal and science databases are the cornerstone of the service, which, according to AEGIS' eight-page glossy brochure, "can save utilities and their in-house or outside counsel time and money when preparing for EMF litigation." Interested utilities must first get approval from AEGIS before they can meet with attorneys from LeBoeuf, Lamb. The firm is no stranger to EMF litigation, having been involved in the defense in a number of key lawsuits (see, for example, p.4 and *MWN,* J/F94, M/J94 and S/O95). Although the program was created for AEGIS clients, it is open to all utilities involved in, or anticipating, EMF lawsuits. **Stan Schuldiner**, senior counsel at Aegis Insurance Services Inc., a division of AEGIS, told *Microwave News* that the company's primary reason for providing the service to members and nonmembers alike is its overall concern about the course of EMF litigation. Last year, at a meeting of insurance executives held in San Francisco, **Mark Warnquist** of LeBoeuf, Lamb's Denver office predicted, "We should...expect a protracted battle over EMFs...[but] if we remain vigilant in defending EMF claims, we should continue to be successful" (see *MWN,* M/J95). More recently, however, Warnquist told *Microwave News,* "In the last year we have not seen the number of cases that we had expected." For more information, contact Stan Schuldiner at: Aegis Insurance Services, 10 Exchange Pl., Jersey City, NJ 07302, (201) 521-1200.

Judge Dismisses Cancer Lawsuit, Ruling that EMFs from Ground Currents Are Not Utility's Responsibility

A Florida court dismissed a major EMF–cancer lawsuit on May 6, ruling that Florida Power & Light (FP&L) was not responsible for EMFs from ground currents. Both sides agreed that most of the power frequency fields in plaintiff Leonard Glazer's home came from currents flowing through the plumbing system, and that less than 1 mG came from FP&L's power lines.

Ground currents will have major implications for other EMF lawsuits, claimed FP&L lead attorney Alvin Davis of Steel, Hector & Davis in Miami. "Most cases, unless the plaintiff lives right under a high-voltage line, are going to run into the same problem," Davis said in an interview. "This issue could just steer them right off the track."

Another FP&L lawyer, Mark Warnquist of LeBoeuf, Lamb, Greene & MacRae in Denver, commented, "It definitely has the potential to affect other litigation. Plaintiffs' attorneys are generally interested in cases where there's higher exposure, and that tends to correlate with a higher contribution from ground currents" (see box at right).

Howard Talenfeld of Colodny, Fass & Talenfeld in Ft. Lauderdale, one of Glazer's attorneys, admitted that if other courts took the same position, "It would certainly favor the industry in future litigation." But he emphasized that he expects the ruling to be overturned on appeal. Talenfeld told *Microwave News* that the utility must be held liable for any effects of ground currents. "FP&L manufactured the electric current," he said. "Any time you manufacture a product, I think you're responsible for it in its foreseeable uses."

Glazer's lawsuit was filed in January 1994. His wife Elsa had died of chronic myelogenous leukemia (CML) in 1988, and Glazer learned in 1992 that he had the same disease. Several power lines ran across the Glazers' property, where they had lived since 1969. Two distribution lines ran within 32 feet of where they slept (see *MWN,* J/F94, M/J94 and S/O 95). Talenfeld said in an interview that EMFs in the Glazer bedroom averaged about 2.5 mG—and at times exceeded 6 mG.

But, according to FP&L engineers, EMFs due to power lines amounted to only 0.19 mG in the Glazers' home. Talenfeld disputed the exact figure, but agreed that the total from power lines was significantly less than 1 mG. The other fields in the home were due to ground currents. On April 22, Circuit Court Judge Thomas Spencer in Miami granted an FP&L motion asking that its responsibility be limited to EMFs from power lines.

FP&L then filed a motion asking for dismissal of the entire case, pointing out that 0.19 mG is "less than one-tenth of the level of exposure which plaintiff's medical experts assert causes cancer." On May 6, the judge agreed and decided for the utility. Glazer's lawyers are appealing the ruling.

Who's Responsible for Ground Currents?

Ground currents arise when a household electrical system is grounded to conductive plumbing, and some of the return current escapes through the plumbing instead of the neutral conductor in the service cable.

"How can we possibly be responsible for the water line?" asked FP&L's Davis. "We didn't hook it up to the electrical system. The contractor did—as required by the county building code." He insisted that, "A utility company's liability ends at the point where they deliver power to a house."

Glazer's lawyers maintain that FP&L bears ultimate responsibility for EMFs from ground currents. "It's not right to say that the seller of a product is no longer responsible for it after it's in the hands of consumers," said Talenfeld.

Another Glazer attorney, Larry Marraffino of Marraffino & Roth in Boca Raton, noted that it is often difficult to identify the different sources of residential EMFs: "The fact that so much was due to ground currents was a fortuitous fact for FP&L that it took them $150,000 worth of engineering to find out." Marraffino told *Microwave News* that FP&L had a duty to warn customers of the hazards of EMFs from *all* sources.

High Magnetic Fields Often Due to Ground Currents

How important are EMFs from ground currents in most homes? "In some cases they're not an issue, in others they're the dominant source," responded Fred Dietrich of Electric Research and Management Inc. in Pittsburgh. In an interview, Dietrich said that "the only good data" for any overall evaluation of their role was the *Survey of Residential Magnetic Field Sources,* better known as "the 1,000-home study," published by EPRI in 1993 (see *MWN,* J/F94).

"Ground currents can be very important," said Dr. Luciano Zaffanella of Enertech Consultants in Lee, MA, who headed the 1,000-home study. Zaffanella told *Microwave News* that, in most houses, the contribution of the power line fields is predominant. "But if one looks at the 5% of cases that have more extreme levels, the ground currents become the principal factor." He also noted that EMFs from ground currents are more localized than power line fields. Thus, even in a house in which power lines are the more important source overall, within a given room ground currents may create a "hot spot."

Ground currents can be a direct result of the configuration of a house's electrical wiring—but Zaffanella pointed out that they can also be induced by appliances in the home, or even in a neighbor's home.

In a study published last year in *Bioelectromagnetics*—and cited in the *Glazer* case—Dr. Nancy Wertheimer, Ed Leeper and Dr. David Savitz found "a high and significant cancer risk" associated with the likely presence of ground currents (see *MWN,* S/O95). Dr. Philip Cole, an expert witness for FP&L, gave a deposition in which he criticized this as "merely a hypothesis-generating study," containing "at least three sources of bias or potential bias." As evidence of an increased cancer risk, Cole told *Microwave News,* "My judgment is that the study is worthless."

NAS-NRC Report Due in July

As we go to press in late May, the National Academy of Sciences-National Research Council (NAS-NRC) EMF report is being edited to include comments from reviewers.

The report, *Possible Health Effects of Residential Exposure to Electric and Magnetic Fields,* is currently due to be released in July, according to NAS-NRC staff. It was mandated by Congress in 1991 but was delayed by budget problems (see *MWN,* S/O91, S/O95 and J/F96).

"Florida law says a duty to warn applies whenever the public would *reasonably want to know* of a hazard," he said. "The Glazers had no idea they were endangered by this, so they never got to choose to do anything different."

But Warnquist countered that this theory would require utilities "to mount a massive investigation of almost everything that carries electrical current and warn of any possible effects."

Lawyers and the Laws of Physics

FP&L court papers describe ground currents in water mains as "a highly variable and unpredictable phenomenon," which Davis contended are not subject to a utility's control. "The utility provides a neutral ground wire that goes back up the line," he said, "and very often that's the path that the return current takes." But not always.

The path of the return current is determined by many different factors, Davis explained. For instance, most of the current in the Glazers' pipes came from their neighbor's electrical service rather than from their own. A neighbor's home can be involved because electricity only flows into a water main if it can make a complete circuit, going out through one plumbing connection and back to the power line through another.

Talenfeld cited the circular flow of electricity to argue that FP&L cannot say that once it delivers power to a house, its job—and its legal responsibility—are over: "Not only does FP&L create the electricity in the plumbing lines—it comes back to them by virtue of the laws of physics." Marraffino also argued that ground currents were a normal and inherent characteristic of residential power: "It's predictable and expected in the delivery of electricity that a reasonable number of homes will have a problem with ground currents."

FP&L told Judge Spencer that even if it were somehow responsible for ground currents, "FP&L could do absolutely nothing to reduce EMF levels from water mains, because FP&L has no authority or jurisdiction to do so." But a new apparatus developed by the Electric Power Research Institute (EPRI) casts doubt on that assertion. EPRI's Net Current Control (NCC) device (see *MWN,* M/A96) can be easily mounted on the service cable outside the home. Without any changes to plumbing or water mains, the NCC device forces return current to come back through the service cable's neutral conductor. But an NCC device can cost as much as $2,000, and Warnquist pointed out that since it was not available until recently, it would not affect the issues in the Glazer case. Talenfeld concurred, but remarked, "It certainly would affect people who are exposed to ground currents."

Jury Finds No EMF–Cancer Link *(continued from p.1)*

Atlantic Electric announced that it was "very pleased" that the jury had decided it was not responsible for Altoonian's chronic myelogenous leukemia (CML). But the utility, based in Pleasantville, NJ, described the award for damages as "disappointing and confusing," and added, "We believe that the jury's decision on this issue may have been influenced by sympathy for Mr. Altoonian's illness."

Altoonian did not return calls requesting comment. Last fall Altoonian told *Microwave News* that he had no health insurance and could not afford a $300,000 bone marrow transplant that could keep him alive. The verdict does not yet clear the way for Altoonian's operation—his attorney, William Wolf of Bathgate, Wegener & Wolf in Lakewood, NJ, said that it could be as long as 15 months before Altoonian sees any of the money, even if the jury's decision is upheld. In an interview, Wolf called the utility "callous" for seeking to avoid immediate payment of the damages award.

Atlantic Electric EMF counsel Curtis Renner of Watson & Renner in Washington, told *Microwave News* that this award was "not supported by the testimony." He emphasized the jury's conclusion that EMFs had not caused Altoonian's cancer, and called it "a strong verdict" on causation. "I'm not aware of any other case that's been as comprehensive in terms of the scope of the science that the jury examined," Renner said.

Both juries wrestled with the meaning of "proximate cause" as applied to the issue of EMFs and cancer. The second jury asked the judge for a dictionary so it could look up the words—but instead Judge Previti repeated his own legal definition, stating that EMFs must have been "a substantial factor in bringing about the injuries or damages." The first jury had also asked for "proximate cause" to be defined again, and a few hours later sent the judge a note asking, "If a possibility exists that EMFs cause CML, is that enough to tip the scales?" According to attorneys for both sides, the judge indicated that the answer was "no."

The second jury's verdict may well have turned on testimony about the "Philadelphia chromosome," a mutation that is thought to cause CML. Renner explained that the Philadelphia chromosome—a translocation of genetic material between two specific chromosomes—is known to be present in 95% of all those with CML, including Altoonian, and that "if you have it, it's only a matter of time before you get the disease." Atlantic Electric's experts testified that 60 Hz fields do not have enough energy to bring about this kind of mutation.

In his motion for a new trial, Altoonian's attorney countered that "the jury was misled by the testimony of the defendant's experts and by the structure of the jury questionnaire" into focusing on the "totally irrelevant issue [of] whether EMFs had sufficient power to break a molecular bond and cause the Philadelphia chromosome." Some of Altoonian's expert witnesses referred to other ways that EMFs might lead to this defect, such as interference with genetic repair mechanisms.

One of Altoonian's witnesses, Dr. Andrew Marino of Louisiana State University, Shreveport, argued that the mechanism of action is irrelevant in this kind of case. "The relevant issue is *whether* EMFs caused the cancer, not how they did it," he said in an interview.

The Altoonian Jury's Verdict

Reprinted below are excerpts from the jury's April 19, 1996, verdict in Altoonian v. Atlantic Electric. *"Plaintiff" refers to Mr. Altoonian; "defendant" refers to Atlantic Electric.*

Was the [EMF] generated by defendant's underground transmission line...a proximate cause of Mr. Altoonian's [CML]? — *5 No, 1 Yes.* Did the defendant intentionally inflict emotional distress on the plaintiff? — *6 No*. Did the defendant negligently inflict emotional distress upon the plaintiff after his diagnosis of CML? — *6 Yes*. Did the plaintiff suffer severe emotional distress as a result of defendant's conduct? — *1 No, 5 Yes*.

What amount of money, expressed in a lump sum, would fairly and adequately compensate plaintiff for: a) noneconomic damages—injuries, pain, suffering, disability, loss of enjoyment of life: *$100,000*; b) medical bills incurred: *$0*; c) future medical bills: *$0*; d) psychological treatment: *$20,000*; e) past loss of earnings: *$149,000*; f) future loss of earnings: *$348,524*; g) Florida expenses: *$5,000;* (h) ...the amount to which the plaintiff is entitled on his *per quod* [special damages] claim: *$0*.

What amount of money...would fairly and adequately compensate Mrs. Altoonian for: a) noneconomic damages—injuries, pain, suffering, disability, loss of enjoyment of life: *$100,000*; b) psychological treatment: *$20,000*; c) Florida expenses: *$0;* (d) ...the amount to which Mrs. Altoonian is entitled on her *per quod* claim: *$0*.

Did the conduct of the defendant in the placement of the subject underground transmission line and the resultant EMF exposure to the Altoonian property proximately cause a substantial depreciation [in] the value of that property? — *6 No*. Are the plaintiffs entitled to recover punitive damages...? — *6 No*.

What amount of money...would...compensate plaintiffs for any depreciation in the value of their property...? — *$0*. What amount of money...would...compensate plaintiffs for: a) the loss of use of plaintiffs' property: *$0*; b) any discomfort and annoyance sustained by plaintiffs as a proximate cause of the nuisance: *$20,000*.

Did the conduct of defendant regarding its underground transmission line and the resulting presence of EMFs on the Altoonian property, constitute a private nuisance? — *6 Yes*. Was said conduct of the defendant a proximate cause of the reduction in the value of plaintiffs' property...? — *1 No, 5 Yes*.

Altoonian's other experts included Dr. Richard Clapp of Boston University, and, in written testimony, Dr. Peter Wright, who was affiliated with the Fred Hutchinson Cancer Institute in Seattle until his death in 1993. Judge Previti had barred Altoonian's lawyers from reading Wright's deposition to the jury, since Atlantic Electric's lawyers could no longer cross-examine the witness. But late in the trial, after the utility had rested its case, the New Jersey Supreme Court ordered that Wright's deposition be allowed into evidence after all.

Experts who appeared for Atlantic Electric included Dr. Edward Gelmann of the Vincent Lombardi Cancer Center at Georgetown University in Washington, Dr. David Golan of Harvard's medical school in Boston and Dr. Darwin Labarthe of the University of Texas Health Sciences Center in Houston.

Altoonian was diagnosed with CML in 1990, two years after he moved into a house in West Wildwood, NJ. A 69 kV power line ran under its deck, which Atlantic Electric admitted was outside of its right-of-way. At the start of the trial, the utility offered to pay $8,750 in damages for this trespass. According to Wolf, time-averaged readings of EMFs ran about 25 mG inside the home, a level which Altoonian considered dangerous. This caused him to move to Florida, where he lived for about eight months. Altoonian filed his lawsuit in 1991. The line was moved off his property in 1992 and was later deactivated (see *MWN,* N/D93, M/A94 and S/O94).

Despite finding Atlantic Electric innocent of causing Altoonian's CML and of devaluing his property, the jury did find that the utility had negligently inflicted emotional distress on John Altoonian and on his wife, Sandra. Judge Previti had instructed the jurors that violations of a New Jersey law against "unnecessary radiation" exposures could form the basis for a finding of negligence. An engineer who testified for the Altoonians stated that when the utility moved the power line, it could have reconfigured the line at a relatively small additional cost so that EMF levels inside the Altoonian home would have been cut to 2 mG or less. Wolf argued that Atlantic Electric's failure to do so was a violation of its stated policy of "prudent field management," and could cause a reasonable person to suffer emotional distress.

"The line was relocated in accordance with prudent field management," insisted Atlantic Electric's trial counsel, Randolph Lafferty of Youngblood, Corcoran, Aleli, Lafferty & Stackhouse in Pleasantville. Lafferty told *Microwave News* that the utility spent $250,000 to move the line, and that spending twice as much would have further reduced EMFs by only 10%. "That would *not* be prudent field management," he said, especially "in the absence of any known risk."

The *Altoonian* case was in the news last October when Atlantic Electric's lead attorney, Gerald Corcoran of Youngblood, Corcoran, withdrew from the case after receiving a series of death threats (see *MWN,* N/D95). The threats were also directed against attorney Tom Watson of Watson & Renner, and both attorneys blamed Altoonian—who denied responsibility. Watson remained on the case and sought contempt of court charges against Altoonian. According to Renner, those charges are still pending but no hearing date has been scheduled. Wolf said that he is not representing Altoonian on the contempt charges, and that Altoonian has been assigned a public defender. There have been no further threats since October.

In Atlantic Electric's motion for a new trial, it contends that the damage award should be set aside because the bulk of it was for lost earnings. The utility argues that "there was *no evidence* that John Altoonian's inability to work was related to 'emotional distress'"—rather than to his cancer. The motion also asserts that Altoonian's emotional distress was never proven to be "severe." However, when Atlantic Electric sought contempt charges against Altoonian last fall, it cited psychological profiles which concluded that he was "depressed, with profound and chronic feelings of anger" and had "signs of a burgeoning paranoid trend in his thinking," and which noted that "this profile is one that is usually associated with rather significant psychopathology."

Athermal RF Successfully Treats Chronic Insomnia; ELF Modulation Believed To Be Key to New Therapy

A Swiss–American team has firm evidence from double-blind clinical trials that nonthermal radiofrequency (RF) radiation can help treat insomnia, as well as anxiety disorders.

"We have found that a specific combination of extremely low frequency (ELF) amplitude-modulated signals is an excellent way to treat patients who have trouble falling asleep and staying asleep," explained Dr. Boris Pasche of Symtonic USA Inc., the company that, with its Swiss counterpart, developed this low energy emission therapy (LEET).

Symtonic's P40 therapeutic protocol—made up of four different modulation frequencies—produces "impressive results" among insomniacs, Pasche told *Microwave News*. Different sets of signals are used to treat anxiety, he said (see box below).

In a study of 106 insomniacs, conducted in La Jolla, CA, and Denver, Pasche and his colleagues found a statistically significant increase in total sleep time among those treated with P40, as compared to controls.[1] The study, published this May in *Sleep,* was designed in coordination with the Food and Drug Administration, Pasche said.

"Our subjects did not experience any serious side effects, and there was no indication of rebound insomnia, which frequently occurs with drug therapies," he pointed out.

Another study by the team, on the effects of LEET on anxiety, found a significant reduction in symptoms among 15 patients who received the treatment, as compared to an equal number who were given a placebo. "The results indicate that LEET may have broad psychiatric applications," Pasche said. The study—recently presented at the *Annual Meeting of the American Psychiatric Association,* May 6-10 in New York City—was carried out at Massachusetts General Hospital in Boston.

LEET is administered with a metal lollipop-like device placed directly against the roof of the mouth. Typically, the power is controlled so that the patient is exposed to specific absorption rates (SARs) of 0.1-100 mW/Kg in brain tissue, according to computer calculations by Dr. Niels Kuster of ETH in Zurich, Switzerland. Kuster estimated peak SARs of up to 10 W/Kg in tissue near the LEET mouthpiece. No temperature changes were observed in the subjects' mouths.

Pasche pointed out that the SARs from LEET are "markedly lower" than those from an MRI exam. Current ANSI and NCRP guidelines are based on a whole-body safe limit of 400 mW/Kg and a partial-body maximum of 8 W/Kg.

The Symtonic team has been awarded a series of patents over the last few years to establish proprietary rights to LEET, the most recent of which—issued in March—describes the P40 protocol.[2] Two different protocols that have been used for anxiety are also listed, but the patent does not cite a preference for one over the other. All of the signals use a carrier frequency of 27 MHz.

In the *Sleep* paper, Pasche and his colleagues found that after a dozen P40 treatments, applied for 20 minutes a day, three days a week, subjects slept on average more than an hour and a half longer each night. The amount of time required to fall asleep decreased significantly and the number of sleep cycles per night—determined by the number of rapid eye movement (REM) periods—increased by 30%. "This is the first treatment that has been found to increase the number of sleep cycles," which is an important aspect of sleep quality, Pasche noted.

"We found no evidence to support the hypothesis that LEET therapy was associated with short-term increases in the incidence of malignancy or coronary heart disease," concluded Pasche, along with Dr. David Amato of the Harvard School of Public Health in Boston, in a 1993 evaluation of the safety of LEET.[3]

The only side effect reported was a greater awareness of dreaming. "This could be part of the patients' recovery process," suggested Pasche, who holds a doctorate in biochemistry and a medical degree, both from the Karolinska Institute in Stockholm, Sweden. He is currently based in New York City, where he is discussing marketing for LEET with a number of large pharmaceutical companies.

This June, Pasche's team will publish another study, which provides additional evidence on how different types of LEET affect sleep.[4] Fifty-two healthy subjects received intermittent 42.7 Hz amplitude-modulated 27 MHz radiation (the P7 protocol). Each subject was monitored for 15 minutes during treatment and for 15 minutes while resting or sleeping afterwards. All of the participants received an active treatment on one visit and a placebo on another. The total sleep time was 20% longer after the therapy than after the sham procedure. And the subjects fell asleep sooner and achieved a deeper sleep after active treatment. This was also a double-blind study—that is, neither subjects nor researchers knew who was receiving what.

In their paper,[4] Pasche and his colleagues reported that they had tested various modulation frequencies from 1 to 100 Hz, and that 42.7 Hz caused "a possible effect on the [electroencephalograph] that was more pronounced than for other frequencies tested." Pasche noted that, "While the 42.7 Hz modulated frequency seemed to induce sleep, the P40 protocol, which

The Symtonic Modulations

According to Symtonic's March 26, 1996, patent[2]:

- The P40 protocol for insomnia is "2.7 Hz for about 6 seconds, followed by about a 1 second pause, 42.7 Hz for about 3 seconds, followed by about a 1 second pause, 48.9 Hz for about 3 seconds, followed by about a 1 second pause."
- Two protocols for anxiety are "1.4 Hz for about 40 seconds, 2.8 Hz for about 20 seconds [and] 3.4 Hz for about 15 seconds"; and "3.4 Hz for about 15 seconds, 14.6 Hz for about 4 seconds, 42.7 Hz for about 2 seconds, 48.9 Hz for about 2 seconds and 189.7 Hz for about 1 second."

In general, Symtonic claims that insomnia can be treated using two or more ELF modulations from the following bandwidths: 1-5 Hz, 21-24 Hz, 40-50 Hz, 100-110 Hz and 175-200 Hz. For anxiety, the preferred bandwidths are 1-5 Hz, 14-17 Hz, 40-50 Hz and 175-200 Hz.

When using 42.7 Hz LEET to induce sleep (P7 protocol), the researchers would alternate between 3 seconds on and 1 second off, Pasche told *Microwave News*.

was developed later, is more effective at restoring normal sleep in insomniacs without causing drowsiness."

While it is not clear how LEET works, Pasche suggested that the signals could affect the release of chemicals linked to sleep, including calcium and melatonin. The patent cites work done in the 1970s by Dr. Ross Adey of the VA Hospital in Loma Linda, CA, and Dr. Carl Blackman of the Environmental Protection Agency in Research Triangle Park, NC, on the movement of calcium across the cell membrane by ELF amplitude-modulated RF radiation.

"Whether different waveforms and frequencies affect human sleep differently will need to be assessed in other studies," Pasche cautioned.

Indeed, other types of signals could have a negative effect on sleep. For instance, a paper published earlier this year by Drs. Klaus Mann and Joachim Röschke of the University of Mainz in Germany found that sleep quality actually deteriorated among those exposed to pulsed microwaves mimicking signals from digital mobile radio telephones.[5] These results were first announced two years ago (see *MWN,* M/J94).

1. Boris Pasche et al., "Effects of Low Energy Emission Therapy in Chronic Psychophysiological Insomnia," *Sleep, 19,* pp.327-336, 1996. See also the letter by Pasche et al., "Diagnosis and Management of Insomnia," *New England Journal of Medicine, 323,* pp.486-487, August 16, 1990.

2. Chang et al., "Method for Applying Low Energy Emission Therapy," *United States Patent,* No.5,501,704, March 26, 1996. Previously, Symtonic was awarded the following patents: Charmillot et al., "Method of Treating Neurovegetative Disorders and Apparatus Therefor," *United States Patent,* No.4,649,935, March 17, 1987; Charmillot et al., "Method of Treating Neurovegetative Disorders and Apparatus Therefor," *United States Patent,* No.4,765,322, August 23, 1988; and Chang et al., "Method and System for Applying Low Energy Emission Therapy," *United States Patent,* No.5,441,528, August 15, 1995.

3. David Amato and Boris Pasche, "An Evaluation of the Safety of Low Energy Emission Therapy," *Comprehensive Therapy, 19,* pp.242-247, 1993.

4. Jean-Pierre Lebet et al., "Electroencephalographic Changes Following Low Energy Emission Therapy," *Annals of Biomedical Engineering, 24,* pp.424-429, June 1996. This is a replication of an earlier study: M. Reite et al., "Sleep-Inducing Effect of Low Energy Emission Therapy," *Bioelectromagnetics, 15,* pp.67-75, 1994.

5. Klaus Mann and Joachim Röschke, "Effects of Pulsed High-Frequency Electromagnetic Fields on Human Sleep," *Neuropsychobiology, 33,* pp.41-47, 1996.

Surprising Results in First Cellular Phone Animal Study: Digital Signals Appear To Protect Against Brain Tumors

Could using a cellular phone actually protect you from developing a brain tumor? This is a possible implication of a long-term rat exposure study by Dr. Ross Adey of the VA Hospital in Loma Linda, CA. Adey found that rats exposed to microwave radiation designed to mimic signals from a digital phone had fewer and smaller central nervous system tumors than control animals.

"One may speculate that the digital microwave signals may be increasing the efficiency or rate of DNA repair, or perhaps both," Adey told *Microwave News*. He was quick to point out, however, that his study was designed to test whether microwaves are tumor promoters, so he could not make any deductions about a possible beneficial effect.

Adey will present his results on June 13 at the *18th Annual Meeting of the Bioelectromagnetics Society* (BEMS) in Victoria, Canada. The five-year study was sponsored by Motorola Inc.

Rats were exposed to 0.58-0.75 W/Kg, 836 MHz radiation pulsed to match the North American Digital Cellular standard (a type of TDMA signal) for two hours a day, four days a week for 23 months. During the two-hour exposure period, the signals were turned on or off every 7.5 minutes, so the total microwave exposure was four hours a week.

Four groups of animals, each with approximately 60 rats, were used in the experiment. Prior to exposure and while still in their mothers' wombs, two groups of rats were given a single dose of the carcinogen ENU. One of the ENU groups and one of the carcinogen-free groups were exposed to microwaves.

Only four of the rats that were dosed with both ENU and microwaves developed brain or spinal cord tumors, as compared to 13 among the ENU-only rats. Similarly, among the two groups of ENU-free rats, there were only two rats with central nervous system tumors among those exposed to the cellular phone radiation, as compared to seven rats among those that were not.

Adey's results are a mixed blessing for Motorola and the rest of the cellular phone industry, according to one observer who asked not be identified. "There are two interesting points," the source commented. "On the one hand, the data indicate that there *was* an interaction between the rats and the TDMA signal, apparently a protective effect. But, on the other hand, in the absence of a mechanism to explain this effect, we cannot assume that there will be a similar response for other power densities, other exposure regimens and other radiofrequency signals. The take-home lesson is that many more experiments are needed to better understand how modulated microwaves affect living systems."

A second animal study using frequency-modulated (FM) microwaves similar to those from analog cellular phones is nearing completion at Adey's lab.

Also working on the animal studies were Dr. Craig Byus of the University of California, Riverside, Dr. Niels Kuster of the ETH in Zurich, Switzerland, and members of Adey's lab.

A spokesperson for Motorola declined to comment on Adey's results before they are presented at BEMS.

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« *Cellular Phone Notes* »

The **CTIA** has taken its case for the ANSI/IEEE RF/MW radiation standard to the **EPA**. On May 21, CTIA President **Thomas Wheeler** met with EPA Administrator **Carol Browner** in an effort to convince her that her staff should back off from its objections to the ANSI standard. The EPA wants the **FCC** to adopt the limits recommended by the NCRP (see *MWN,* J/F 94). Along with many others in the industry, the CTIA had lobbied the FCC directly, but the commission has long maintained that it has no expertise in health issues and will take its cues from the federal health agencies, notably the EPA (see *MWN,* M/A96). In a May 17 letter, Wheeler warned Browner that, "It would be a serious mistake for the FCC to adopt either the older 1986 NCRP standard or a 'hybrid' standard," adding that "departing from the widely accepted ANSI/IEEE guidelines will create confusion and delay in deployment of new cellular and PCS technologies." For technical support at the meeting, Wheeler brought along Dr. **Eleanor Adair** of the John Pierce Laboratory in New Haven, CT. Sources said that Browner held her ground and continues to support the policies of her staff at EPA's Office of Radiation and Indoor Air (ORIA). "I found her insistence on the EPA position interesting," Adair told *Microwave News.* "It left little room for discussion." Browner's office had no comment on the meeting, but **Mary Smith**, the director of ORIA's Indoor Environments Division, said that the EPA was expecting more information from the CTIA and that there would probably be another meeting at the EPA—although not with Browner.

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The headline on the front page of the April 14 **London *Sunday Times*** was certainly provocative: DANGER: MOBILE PHONES CAN "COOK" YOUR BRAIN. The *Sunday Times* was reporting on a draft proposal by a committee of CENELEC, the European standards organization, to exempt from compliance testing any hand-held phone with a power output of less than 20 mW. **Jonathan Leake** of the *Sunday Times* interpreted this to mean that 20 mW is the "safe limit," and, therefore, that any higher level is risky. From this perspective, the headline might make some sense—since phones in the U.S. and the U.K. routinely emit up to 30 times more than 20 mW. To bolster his claim, Leake cited confirmation from Dr. **Camelia Gabriel** of Microwave Consultants Ltd. in London. The story was picked up by other newspapers all over the world—sometimes with additional embellishment. At the *Advertiser* in Australia, an editor took the *Sunday Times'* logic one step further, telling his readers that the paper had "claimed most mobile phones on the market exceeded safe radiation levels." In a letter sent to, but not published by, the *Sunday Times,* Gabriel expressed her strong objections. "Had I been able to check the article before publication, I would have deleted or amended most of what was written," she wrote. Undeterred, Leake followed up with another story on April 21: SHIELD BLOCKS RAYS OF MOBILE PHONES. This story included a prediction by Dr. **Narendra Singh** of the University of Washington, Seattle: "It seems far-fetched but the mobile phone of the future may have to come with a supply of antioxidants" for protection against microwave exposure. Singh was as dismayed as Gabriel. "I deny that I made such a statement" to Leake, Singh wrote to the editor of the *Sunday Times.* Singh's disclaimer also never made it into print.

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In the first legal test of the **Telecommunications Act of 1996**, a federal judge in Seattle has refused to overturn a small town's moratorium on new wireless communications towers. Under the law, state and local governments retain their authority to regulate wireless facilities—except on the basis of RF/MW safety levels (see *MWN,* M/A96). On February 13, 1996, five days after President Clinton signed the telecom act, the City Council of **Medina, WA**, adopted Resolution No.236, putting a hold on all new permits for six months in order to provide "a reasonable period of time" to study the "potential health risks associated with cell sites." Medina, a small town near Seattle with a population of 3,000, had received applications for antenna construction from five different companies. **Sprint Spectrum**, which wants to build a 100-foot tower, took the town to court. In a May 3 ruling, U.S. District Judge William Dwyer ruled that the Medina moratorium is a legitimate exercise of zoning power. Dwyer wrote:

> There is nothing to suggest that Congress, by requiring action "within a reasonable period of time," intended to force local government procedures onto a rigid timetable where the circumstances call for study, deliberation and decision-making among competing applicants. The city [of Medina] is seeking to determine, among other things, whether tall antenna towers are still necessary for the purpose at hand. It is entitled to find that out.

The moratorium will expire on August 12.

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Drs. **Henry Lai** and **Narendra Singh** of the University of Washington, Seattle, have extended their study on the effects of 2450 MHz microwave radiation on the DNA in rat brains. They had previously reported an increase in single-strand DNA breaks (see *MWN,* N/D94) and have now found an increase in double-strand breaks. Writing in the April 1996 issue of the *International Journal of Radiation Biology (69,* pp.513-521), Lai and Singh noted that DNA breaks could lead both to cancer and to accelerated aging. "It is imperative that the effects of [RF/MW radiation] on DNA in brain cells be further studied and understood," they argued. Meanwhile, Dr. **Gary Williams** of the American Health Foundation in New York City has taken issue with the Lai–Singh paper on single-strand breaks. In a comment—with a reply from Lai and Singh—published in the most recent issue of *Bioelectromagnetics (17,* p.165), he charged that their data "are difficult to reconcile with current knowledge of physical or chemical damage to DNA." Williams, who was selected by the members of WTR to serve on their peer-review board, concluded that, "Considerably more research is required to establish whether microwave[s] interact with DNA in rat brain cells."

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David Reynard has dropped the lawsuit he filed in 1992 alleging that radiation from a hand-held cellular phone caused his wife's fatal brain tumor. Last year, a federal judge dismissed the case due to the lack of medical evidence on causation (see *MWN,* M/J92 and M/J95). Reynard is bitter about the outcome. "I'm real angry," he told *Microwave News* from St. Petersburg, FL. His attorney, **John Lloyd**, also of St. Petersburg, commented that, "I could not tell him to invest the money in an appeal and I could not afford it myself." Lloyd explained that the prospects for winning were not very strong. Lloyd had originally filed court papers to initiate an appeal of the May 1995 dismissal, but later decided to withdraw the suit against **NEC** Corp. and **GTE Mobilnet of Tampa** Inc. The withdrawals were approved by the district and appeals courts in January 1996. Though filed in April 1992, Reynard's suit only gained widespread publicity in January 1993 after he appeared on CNN's *Larry King Live*. The news caused cellular industry stocks to plunge—but only temporarily. The media attention led to CTIA's decision to set up a wireless safety research program (see p.1 and *MWN,* J/F93).

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Although David Reynard has abandoned his lawsuit, a number of cases seeking to link cellular phone use to brain cancer are still pending (see *MWN,* J/F94, S/O94, N/D94, M/A95 and S/O95). One of these is a little-noted suit filed last August in a Texas state court by the widow and children of **Dean Vincent Rittmann Jr.**, who died of a brain tumor in October 1994. Ellen Debrow Rittmann alleges that her husband's tumor was caused by the four different cellular phones—manufactured by defendants **Ericsson** Inc., **GE**, **Motorola** Inc. and **NEC** Corp.—that her husband used from September 1988 until he was diagnosed with a brain tumor in his right parietal temporal lobe in July 1994. The family, represented by O'Quinn, Kerensky, McAninch & Laminack in Houston, is also suing Rittmann's local cellular service providers. "I see [the Rittmann case] as a variation on a theme introduced in the Reynard case," said Norman Sandler, a spokesperson for Motorola, which is being defended by Fulbright & Jaworski in Austin. Sandler doubts that Rittmann's lawyers will do any better at establishing causation than John Lloyd did for Reynard. Fulbright & Jaworski defended EPRI against the claims brought—but later abandoned—by attorney Joseph Jamail on behalf of 11 children with cancer (see *MWN,* M/A95 and S/O95). Attorneys at O'Quinn, Kerensky are planning for a *Daubert* hearing later this year to address the problem of causation, among other issues.

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It should come as no surprise that the mobile phone market is exploding, but a new report by **Strategies Unlimited** in Mountain View, CA, on base station RF/MW equipment sales gives insight into just how fast the industry is growing. The research firm projects that in the year 2000 more than $10 billion will be spent on **cellular and PCS base station** equipment. RF/MW equipment represents approximately 30-40% of a station's infrastructure costs, Dr. George Bechtel, the author of the report, told *Microwave News*. When expenses such as land and construction are included, the total cost will add up to more than $30 billion in one year. Approximately 270,000 cellular and PCS base stations will have been built in the U.S. by the turn of the century—715,000 worldwide, according to Bechtel. In the year 2000 alone, 67,000 more base stations will be built in the U.S. and 150,000 others around the world. A majority of these will be extremely small—picocells, as Bechtel calls them—and placed, for example, inside buildings, hallways and subways. Strategies Unlimited also predicts that the share of digital subscribers worldwide will grow dramatically from 19% to 45% by the year 2000. For more information, contact Bechtel at (415) 941-3438, Fax: (415) 941-5120.

How Hawaiian Officials Decided PCS Antennas Are "Safe"

Reprinted below is an excerpt from "School Sites, State Haste Raise Questions" by Richard Borreca—the second article in a two-part series titled "Antenna Dilemma"—which appeared in the Honolulu Star Bulletin *on April 17, 1996. Borreca reported that Hawaii state and local officials are being forced to act quickly to process "a flood" of digital PCS antenna and transmitter site applications, some of which are for public school property. PrimeCo Personal Communications, which requested a high school site, is owned by AirTouch Communications, Bell Atlantic, NYNEX and U.S. West.*

Questions of safety also are raised—and generally quelled by the state health department.

"We have looked at information provided and made a preliminary determination that [the antennas] would not pose a significant health risk at those locations," said Bruce Anderson, the department's deputy director for environmental health.

He referred the safety question to Leslie Au, a toxicologist with the state's hazard evaluation and emergency response office. Au said there is no problem with putting antennas atop a 107-foot stadium light pole at Mililani High School, as requested by PrimeCo Personal Communications.

To arrive at his conclusion, Au took calculations provided by PrimeCo, a wireless phone company that plans to offer local digital phone service later in the year. He checked to ensure [that] the company used industry-approved formulas to figure out antenna power. Because the towers [had] not yet been fitted with the transmitters, there was no way to take actual measurements, Au said. "Our calculations confirmed...[and] indicated that anything at least seven feet away from the transmitting antenna itself would be in the safe zone. That high light pole provides a large margin of safety," he said in his report.

Au, however, acknowledged that cellular antenna technology is not his field of expertise. He is trained as a toxicologist and is the state's expert in determining if chemicals are hazardous.

Au also is a potential investor in the new digital phone technology. He, along with 30 others, [was] in a partnership that last year unsuccessfully attempted to purchase digital cellular phone licenses on the mainland. But Anderson said Au had no financial stake in the local firms holding cellular phone licenses. "I don't think it clouded his judgment in assessing the risks," said Anderson, when asked about potential conflicts of interest. He added: "I don't think Leslie would invest in a technology if he thought there was a health problem."

Au's stamp of approval was key to both the city and the state approval process[es].

Fix Found for Pacemaker EMI as Cell Phone Industry Group Focuses on "Potential Public Health Problem"

Dr. Roger Carrillo of Mt. Sinai Medical Center in Miami Beach, FL, has found a simple, off-the-shelf way to shield implanted cardiac pacemakers against interference from digital cellular phones. Meanwhile, Wireless Technology Research (WTR) and the Food and Drug Administration (FDA) have both announced that their own studies confirm earlier findings of an electromagnetic interference (EMI) problem.

In a presentation at the *45th Annual Scientific Sessions of the American College of Cardiology* in Orlando, FL, on March 24, Carrillo described how an electromagnetic filter developed over a decade ago can protect pacemaker users. In earlier experiments, Carrillo and colleagues had noted that a few pacemakers seemed resistant to EMI—and found that they were equipped with this type of filter. When the filters were removed, these devices were susceptible to EMI, indicating that the filters had made the difference. "It's not a very expensive piece of equipment," Carrillo said in an interview. "It costs less than $20."

Dr. David Hayes of the Mayo Clinic in Rochester, MN, confirmed that pacemaker users may be at risk from digital cellular phone EMI on May 16 at the *17th Annual Scientific Sessions of the North American Society of Pacing and Electrophysiology (*NASPE) in Seattle. Reporting on a three-center study funded by WTR, Hayes said that interference occurred in 54% of the 975 pacemaker users who took part.

In a May 10 letter to FDA's Elizabeth Jacobson, WTR Chair Dr. George Carlo stressed the importance of working together "to address this potential public health problem." WTR is funded by the cellular phone industry (see p.1).

Carlo told Jacobson that WTR now advises pacemaker users who are dependent on the device to use an analog, rather than a digital, cellular phone; urges others to avoid placing the phone over or near their pacemaker; and counsels all those with pacemakers to avoid putting their phones in a breast pocket. These interim guidelines are the first specific recommendations issued by WTR, and go beyond its statement last November urging those with pacemakers to "exercise caution when using...digital cellular telephones."

Also at the NASPE meeting, FDA's Paul Ruggera reported that results from the agency's own bench testing were similar to those found by WTR: one-third of the 30 pacemaker models tested experienced EMI. Only two pacemaker models suffered interference at a distance greater than six inches, and the FDA indicated that it was working with the manufacturers to correct the problem. Based on this study, which examined three types of digital cellular phone technology, the agency concluded that the six-inch separation distance it has recommended remains adequate.

The EMI-resistant pacemakers studied by Carrillo are made by Pacesetter Inc., but Carrillo said that he is not endorsing one company over another: "I'm sure this filter is used by more than one manufacturer, because it's a common device—and I'm not saying that filters are the only answer." Other pacemaker companies have sent him prototypes that use different techniques to avoid interference. "Let's make sure that all new models are equipped with some way of avoiding EMI," Carrillo stressed.

Carrillo does not recommend that people with nonresistant pacemakers have them replaced, but only that they observe certain precautions. Besides those supported by WTR, Carrillo also calls for using cellular phones with the ear farther from the implanted pacemaker. A summary of Carrillo's results was published in the *Journal of the American College of Cardiology (27,* p.15E, 1996). His research to date has been funded entirely by Mt. Sinai and physicians in private practice (see *MWN,* M/J95 and N/D95).

Hayes and his coworkers found that pacemakers from some companies were significantly more likely to be vulnerable to EMI, with the rate varying from 7% to 27% among manufacturers. As in earlier research, they found that analog phones had a much lower rate of interference than digital phones. Among the digital phones, the PCS 1900 type caused far less interference than any other. "There's no question that in the digital group, it's the least offender," Hayes told *Microwave News.* His study was carried out in collaboration with researchers at Tufts-New England Medical Center in Boston and at the University of Oklahoma Health Sciences Center in Oklahoma City.

The FDA also found a relative absence of interference from analog phones. Among the digital models, no EMI was found in testing of a GSM phone, though Ruggera noted that interference from such phones has been reported in Europe. GSM digital phones operate at the same 217 Hz modulation as the U.S. PCS 1900 device tested by Hayes, and Howard Bassen, head of the Electrophysics Branch of FDA's Center for Devices and Radiological Health in Rockville, MD, said that this could explain why both phones are far less likely to produce interference. "That modulation frequency is so high that it doesn't get into the pacemaker's detection circuitry," Bassen told *Microwave News.*

On May 9, 1996, WTR issued a progress report on its pacemaker EMI research that included the main findings of Hayes's study. "As the clinical trial passed the halfway point," the report stated, "WTR concluded that a risk of interaction between wireless telephones and implanted pacemakers existed."

"This is the first time that we've had the opportunity to both

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Soon you can visit *Microwave News* on the World Wide Web. You will find several key documents, including the full text of the EPA's 1990 draft report on EMFs (see *MWN,* M/J90) and our commentary on PBS' *Frontline* story, "Currents of Fear" (see *MWN,* J/A95). We have also included our tables of contents for every issue in the last two years. Find us at <http://www.microwavenews.com> after July 1.

identify a health risk and simultaneously work toward solutions," Carlo said in an interview. He noted that, "We've never seen a problem develop in a real-life situation," as opposed to an experimental setting. But he stressed that it is important to find solutions "before it becomes a serious issue." Carlo's letter to Jacobson noted that, "There is nothing in the data thus far to suggest that bystanders with pacemakers would be at risk...from others who are using [cellular] phones."

Motorola spokesperson Norman Sandler told *Microwave News* that, "Our position is that EMI is not a public health problem" for users of cellular phones. Sandler emphasized that the data presented at the NASPE meeting indicated that this type of EMI is preventable through simple precautions.

WTR announced that it would support research by Carrillo on the likelihood of EMI relative to distance and other parameters. Carrillo confirmed that he would be doing some work for WTR but declined further comment because of a confidentiality clause in the research contract. WTR's Mike Volpe said that WTR is providing Carrillo with funds for a clinical trial of 100 pacemaker users, which is also designed to examine the effects of a phone's modulation pattern.

Carrillo has agreed to serve as chair of WTR's risk management committee on pacemaker EMI, and Volpe said that Carrillo will receive a minimum of $100,000 for both this work and the 100-person study. The three-center study led by Dr. Hayes received $353,000, and Volpe indicated that Hayes will receive an unspecified amount of additional funding.

Carlo said that by this July WTR will have spent about $2.2 million on pacemaker research. WTR would not provide a breakdown of how that money was spent.

WTR plans for Carrillo to present initial results from the 100-person study at a symposium it will sponsor on July 16 in Washington. All those involved in phone/pacemaker interference will participate, including the FDA and researchers from the University of Oklahoma, according to Carlo. He will invite researchers from overseas as well, such as the Italian group led by Dr. Vincenzo Barbaro of the Istituto Superiore di Sanità in Rome (see *MWN,* J/A94 and M/J95). WTR will present the final report and recommendations from its pacemaker EMI research at the symposium.

NCRP Critical of Lobbying on RF/MW Radiation Health Limits

Members of a committee of the National Council on Radiation Protection and Measurements (NCRP) have been asked to stop using their NCRP affiliations when voicing personal preferences for the American National Standards Institute's (ANSI) limits for human exposures to RF/MW radiation over those set by the NCRP.

The NCRP's concerns stem from a lobbying campaign by two members of NCRP Committee 89-5, which is in the process of revising the council's 1986 report on RF/MW radiation (see *MWN,* M/J86 and S/O95). In letters to the Federal Communications Commission (FCC), Drs. Eleanor Adair and C.K. Chou urged the commission to adopt the ANSI C95.1 standard over NCRP's 1986 limits (see *MWN,* M/A96). Chou, who is at the City of Hope National Medical Center in Duarte, CA, is vice chair of committee 89-5.

In a March 14 letter to FCC Chairman Reed Hundt, Adair wrote that she could "already assure" him that the NCRP limits would closely resemble the 1992 ANSI standard (see *MWN,* M/A96). The problem is that the committee, which was set up last year, had only met twice and had hardly moved beyond organizational questions. Dr. James Lin, the chair of NCRP 89-5, estimated that the committee would take two to three years to complete its report.

In a March 27 letter, Lin, who is at the University of Illinois, Chicago, asked Adair to withdraw "your statement which gave the impression that you know what would be the outcome of the committee's efforts." Adair refused. In an April 4 reply to Lin, Adair said that retracting her letter to the FCC "would discredit my testimony in support of the FCC's proposed adoption of the ANSI" standard.

At the end of May, Adair told *Microwave News* that she was standing firm. "I will not write another letter to Mr. Hundt," she said. Adair, who is a fellow at the John Pierce Laboratory in New Haven, CT (see p.18), has close ties to the cellular phone industry, which is lobbying the FCC to adopt the ANSI standard (see p.9). Chou declined to comment.

"I and others at the NCRP are very much concerned because this could undermine the process," Lin said in an interview. Dr. Gregory Lotz, a member of the committee who is with the National Institute for Occupational Safety and Health (NIOSH) in Cincinnati, said that he was worried about "the credibility of the committee's work," noting that "strong statements by any member in advance may compromise our work."

Lin said that there had been a "lengthy" discussion of the matter at the committee's May 23-24 meeting, but that a final decision on any possible action has not yet been reached. "I indicated to our members that when we speak on these issues, we speak as individuals—not as committee members," Lin said. Dr. Thomas Tenforde of the Battelle Pacific Northwest Labs in Richland, WA, played down the significance of Adair's statements. "I suspect she wasn't thinking about what she was saying," he told *Microwave News.* Tenforde is the chairman of NCRP Committee 89, which has oversight over Lin's committee. Nevertheless, Tenforde urged members of all NCRP committees to "cease and desist from this unfortunate practice" of commenting on NCRP reports before publication.

NCRP President Dr. Charles Meinhold declined to comment on the Adair letter. Meinhold is aware of the controversy, according to Tenforde.

Last year, when a draft NCRP report on the health risks associated with power frequency EMFs was leaked to the press, Meinhold sent out a number of advisories that the report was still an internal document (see *MWN,* J/A95).

Tenforde said the NCRP would not follow the same course of action in this case: "It would be overkill to go into press releases—it is not the same magnitude of a problem."

Cell Phone Study: No Excess Mortality over Short Term

Users of hand-held cellular phones have similar mortality rates to those using two-piece phones, according to a study by Epidemiology Resources Inc. (ERI) in Newton Lower Falls, MA.

This is the "first hard information" on the effect of cellular phone use on mortality, Dr. Nancy Dreyer, one of the authors of the report, told *Microwave News*. However, she added that the paper is "still a preliminary finding, in that it looked at overall mortality only, not at specific causes of death."

Indeed, the ERI team itself pointed out two major limitations of its study. First, cellular phones have been in use for only a few years—probably less time than the latency period for brain cancer. And, second, because brain cancer is relatively rare, even a significant rise might well not show up in the overall mortality rate. The team conceded that, "These preliminary findings...do not directly address the issue of the relation between cellular telephone use and brain cancer."

In the paper, which appeared in the May issue of *Epidemiology (7,* pp.303-305, 1996), Dreyer and her coauthors stressed that they could only identify short-term effects. This could be a serious drawback, as a team from the National Cancer Institute (NCI) pointed out in a paper in the *Epidemiologic Reviews (17,* pp.382-414, 1995). "The introduction and widespread use of cellular telephones are very recent phenomena," the team noted. "Only if cellular phones influence a late stage in carcinogenesis would it be likely that epidemiologic studies could detect an effect at this time."

The ERI authors based their findings on the billing records of 256,000 customers of a large U.S. cellular telephone carrier with active accounts as of January 1, 1994. To qualify for inclusion, a customer had to have had at least two complete billing cycles (November and December 1993). Dreyer conceded that this was a short time period, but described this cutoff as "just a strategy to get a sample of people to study." She added that, "It's better than one month, but not as good as three or four." Of this cohort, 149,000 had accounts for two years and 63,000 for three years. Like the entire cohort, these two subgroups did not show any difference in mortality between users of hand-held phones and users of two-piece phones.

"You can criticize any surveillance program by saying it's too soon," Dreyer said. "I look at this in terms of responsible product stewardship." She added that a study is being planned in which the cohort group would be twice as large and for which cause of death would be included. Dreyer confirmed that brain cancer is the focus of concern, calling it "the hypothesis that's driving this study overall."

Dreyer reported that further studies may be put on hold due to a funding problem (see p.1). In addition, the new telecommunications act classifies customer lists as private, preventing the continued collection of data. If the law is not amended, Dreyer says, "We can't go forward."

In an accompanying editorial, Dr. Patricia Buffler, dean of the School of Public Health at the University of California, Berkeley, wrote that the results of the study "offer some reassurance, specifically that a large increase in mortality is not associated with radiofrequency exposures over the short term." However, she allowed that the findings merely represent "a first look," neither proving nor disproving that cellular phones pose a threat to users' health.

Dr. Kenneth Rothman, the lead author of the paper, is also the editor of *Epidemiology*. Dreyer said that Rothman had not participated in the peer-review process and that the journal does not disclose the authors to the reviewers. "Sometimes reviewers think they know who wrote the article," she said, "but they're not right as often as they think they are."

Two methodology papers, "Assessment of Cellular Telephone and Other Radiofrequency Exposure for Epidemiologic Research" and "Utility of Telephone Company Records for Epidemiologic Studies of Cellular Telephones," were published in the May issue of *Epidemiology* (pp.291-298 and pp.299-302).

"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

• Mice exposed to benzopyrene and microwaves show accelerated development of both spontaneous and chemically-induced cancers, according to Dr. Stanislaw Szmigielski of the Center for Radiobiology and Radioprotection in Warsaw, Poland.

• A House subcommittee led by Rep. Albert Gore (D-TN) announces that RF sealers and heaters present serious health risks and seeks new research and standards for the devices.

• China adopts a provisional 50 $\propto W/cm^2$ non-ionizing radiation standard for occupational exposures.

Years 10 Ago

• A British destroyer was sunk by an Argentinian missile in the 1982 Falklands war because its communications system interfered with its warning radar, reports a London tabloid.

• The NCRP recommends a 200 $\propto W/cm^2$ limit for public exposures to RF/MW radiation at 30-300 MHz.

• Miscarriages are more common among women who use electric blankets than among those who do not, according to a study by Dr. Nancy Wertheimer and Ed Leeper.

Years 5 Ago

• State legislators in Michigan, Rhode Island and Tennessee propose temporary moratoriums on power line construction, citing health concerns.

• People working near electric conductors in office buildings may be exposed to EMFs as high as 3,000 mG, according to Richard Tell of Richard Tell Associates in Las Vegas.

• Dr. Allan Bromley, science advisor to President Bush, denies that he quashed an EPA report that concluded that EMFs are a possible human carcinogen.

Lucent is upset." Petersen caused a stir when he told *RCR,* a trade newspaper, that, "The [cancer] research project is really nonexistent. There's nothing there" (see p.15).

WTR confirmed it had spent about $12 million by the end of 1995, but would not say how much of that had gone to cancer research or to research contracts in general.

Two contracts for dosimetric measurements were abruptly canceled by WTR in April on orders from the CTIA. Dr. Om Gandhi of the University of Utah, Salt Lake City, and Dr. Kenneth Foster of the University of Pennsylvania, Philadelphia, were each developing techniques to estimate how much of the energy radiated by a cellular phone is absorbed by the head. The cutoff brought both studies to a halt.

"WTR pulled the plug on April 17 without warning," Foster told *Microwave News.* In 1995 Foster was awarded a $300,000, two-year grant for dosimetry experiments (see *MWN,* N/D95). He said that just days before the WTR action, the university terminated his spending authority after administrators realized that the school had not received a single check. "This whole thing has been a big setback," Foster said.

Gandhi's award was announced with fanfare in December 1993, but the contract was not signed for another 18 months (see *MWN,* J/F94 and S/O95). In late May, Gandhi said he had received only one-quarter of the $185,000 that had been pledged.

WTR has also stopped payments to Epidemiology Resources Inc. (ERI) of Newton Lower Falls, MA, according to company president Dr. Nancy Dreyer. ERI is carrying out a major epidemiology study for WTR (see p.13). When asked if her funding might be restored in the future, Dreyer answered, "I would like to know that, too."

Volpe acknowledged that WTR has experienced "interrupted funding" since the first of the year. "Because of inadequate financial support," he said, WTR has been forced to favor certain projects, such as pacemaker research (see pp.11-12). "The WTR program remains on track," Volpe insisted, adding that Dreyer's funds will be restored at some point in the future, and that no further contracts will be canceled.

Tim Ayers, CTIA vice president for public relations, maintained that, "The cash flow to WTR is on schedule. We're on schedule, plan to stay on schedule and will meet the $25 million commitment." Ayers conceded that, "You may get different opinions from others. But *we* consider that we're on schedule." When asked why WTR had run out of money, Ayers said only, "They didn't."

In fiscal 1994, the CTIA spent more money on public affairs for its health effects program than it gave to WTR, according to the trade group's own budget documents. The next year, the CTIA spent $677,000 on public affairs out of funds that it had collected for health and safety work. For fiscal 1996, close to $1,000,000 was budgeted for an additional category called "CTIA-allocated expenses." Toshiba's Madrid said, "I have no idea what that means."

Senior CTIA officials did not respond to a request for an interview about the spending of WTR research monies.

"When it became clear that all the money wasn't going to WTR," said a source close to the situation, "some manufacturers who are not CTIA members refused to pay their assessments." This source agreed with Madrid that there is at least $2 million that the CTIA collected but failed to pay to WTR.

But Lucent's Petersen said that "there are a lot of questions" about how WTR spent the money it *did* receive. "The manufacturers are not satisfied with the pace of the research," he said. "We are not getting answers. Our questions are sometimes not even being acknowledged." When another senior industry official was asked where WTR's $12 million went, the response was, "That's a good question."

"There are some within the industry who want WTR to produce quick results to vindicate wireless products," Volpe told *Microwave News.* "That is not what WTR is about."

Volpe provided the following general breakdown of WTR spending through the end of calendar year 1995: $2.3 million for toxicology; $2 million for epidemiology; $2 million for scientific outreach; $1.8 million for dosimetry; $1.2 million for work on pacemaker interference; $800,000 for general support; $600,000 for ongoing surveillance; $300,000 for CTIA's certification program; $200,000 for WTR's peer-review board; $114,000 for work on antenna base stations; and $60,000 for risk management research. Volpe explained that each category includes all related spending—combining research contracts, consultants' fees and WTR's own expenses. He declined to be more specific.

In addition, Volpe said that in the same period WTR spent $420,000 out of its CTIA monies for litigation expenses.

The canceled contracts with Gandhi and Foster were part of the certification program, designed to assure that new cellular phones comply with Federal Communications Commission (FCC) regulations. "CTIA asked WTR to suspend work" on this program, CTIA President Thomas Wheeler wrote in a May 7 letter. One source attributed the need for the cut to CTIA mismanagement.

Madrid put it differently: "WTR was set up to do brain cancer research. The CTIA is spending money in other areas that some manufacturers don't believe that we agreed to." Petersen and some other manufacturer representatives have been critical of expenditures on issues like pacemakers. Madrid, however, stressed that, "I have no concerns about how WTR spends its money. My concerns are with what goes on at the CTIA." He noted that to criticize WTR's spending could raise questions about industry interference in the direction of the research effort.

Volpe argued that the cancellation of WTR's certification work does not call its independence into question: "The WTR charter expressly forbids the industry from meddling in how WTR spends research funds."

Wheeler stated in his letter that the fiscal 1997 budget "eliminates non-bioeffects activities from the manufacturers' assessment, but not from that of the carriers." This was confirmed by Madrid. Up to now, health and safety expenses have been split equally between carriers and manufacturers.

According to Madrid, Wheeler conferred with manufacturers on May 20 and promised to give WTR quarterly payments of $1.4 million on a regular schedule. Participating in the discussion were representatives from Ericsson, Hughes, Lucent, Mitsubishi, Motorola, NEC, Nokia, Nortel, Qualcomm and Toshiba, among others.

FROM THE FIELD

Clippings from All Over

"The scientist can afford to be skeptical much longer than the person concerned with protecting public health."

—Dr. Keith Baverstock, co-coordinator of the World Health Organization's International Thyroid Project, quoted by Michael Balter in "Children Become the First Victims of Fallout," *Science,* p.360, April 19, 1996

"If there was a health effect from cell phones, because of their popularity it would be a major public health concern."

—Dr. Arthur (Bill) Guy of Wireless Technology Research (WTR), quoted by Tom Paulson in "Cell Phones Are Found To Disturb Pacemakers," *Seattle Post-Intelligencer,* p.A12, May 17, 1996

"The [cancer] research project is really nonexistent. There's nothing there. The emperor has no clothes."

—Ronald Petersen, non-ionizing radiation protection manager at Lucent Technologies Inc. in Murray Hill, NJ, quoted by Jeffrey Silva in "True Goals of WTR Questioned by Industry," *Radio Communications Report (RCR),* p.33, May 6, 1996 (see p.14)

[Craig McCaw] has difficulty absorbing lengthy written documents and usually avoids them. That leaves time for him to do what he prefers anyway, which is to think and to stand back and take in the big picture.

—Andrew Kupfer, "Craig McCaw Sees an Internet in the Sky," *Fortune,* p.64, May 27, 1996

The Air Force has demonstrated a capability of countering air-defense systems by damaging their components through the use of "extremely" high-power microwaves, according to Secretary of Defense Perry's recently released 1996 Annual Report to the President and Congress. The report also reveals "there are similar programs for protection of land vehicles and ships."

—Gerald Green, "Air-Defense Countermeasures Demonstrated Using Extremely High-Power Microwaves," *Journal of Electronic Defense,* p.15, May 1996

Melatonin, the hormone of the pineal gland, is currently the subject of much ill-informed publicity and speculation in the entertainment media worldwide. Several books on the subject have made grossly exaggerated claims for its value, portraying it as a panacea and as an "anti-aging" treatment. These claims are distortions of current knowledge of the physiological functions of melatonin and its therapeutic potential.

—Dr. J. Arendt, professor of endocrinology at the University of Surrey in Guildford, U.K., and author of *Melatonin and the Mammalian Pineal Gland,* in an editorial, "Melatonin: Claims Made in the Popular Media Are Mostly Nonsense," *British Medical Journal* (U.K.), p.1242, May 18, 1996

"There's no doubt the controversy has exploded in the last two years. Eight or ten years ago people never commented. You just sold the houses under the power lines and they may have had a little bit of a grizzle about it. Now people are much more informed and ask themselves questions like: How are we going to be compensated? How will we be able to sell out? Certainly, none of the prudent or wise or informed will buy them. Women with children are scared. They don't want them playing in the backyard."

—Gerald Foley, a real estate agent in Keilor, Australia, who says that 90% of home buyers reject houses near power lines, quoted by Veronica Ridge in "High Voltage Living," *The Age* (Melbourne, Australia), p.3, April 17, 1996

Letters to the Editor

EMI to Medical Devices from Cellular Antennas

March 22, 1996

To the Editor:

We would like to make a comment on your article "California PUC Advises Against Cellular Antennas near Schools and Hospitals" [see *MWN,* N/D95]. In particular, we would like to comment on the issue of siting cellular antennas on or near hospitals.

The hospital administrations, medical boards and biomedical engineering departments are generally consulted in the siting of antennas and these people are surely in the best position to judge any health effects.

There is, however, one issue that should be considered when siting cellular antennas on or near hospitals and that involves the electromagnetic interference (EMI) to medical electrical equipment.

The U.S. Food and Drug Administration (FDA) issued a voluntary standard[1] specifying that medical electrical equipment should be immune from EMI in fields up to 7 V/m within the frequency range 450 to 1000 MHz. The International Electrotechnical Commission (IEC) has published a standard on electromagnetic compatibility for medical electrical equipment[2] in which it states that an immunity level of 3 V/m shall apply for the frequency range 26 to 1000 MHz. However, it is stated in this standard that the 3 V/m immunity level may be inappropriate because the physiological signals measured may be substantially below those induced by a field strength of 3 V/m.

In recognition of the fact that safety-of-life medical electrical equipment requires a higher level of immunity, the IEC has issued a draft standard for infusion pumps and controllers,[3] which states that an immunity level of 10 V/m shall apply for the frequency range 26 to 1000 MHz.

We have conducted extensive testing of the potential of cellular telephones to interfere with the operation of medical electrical equipment and consulted with manufacturers of that equipment. Our conclusion is that medical electrical equipment should not be exposed to levels above 1 V/m from mobile radio installations.

We ensure that protection is provided by, first, designing our antenna installations with a rule that no area that is likely to have sensitive medical electrical equipment will have a field strength of greater than 1 V/m. This can be achieved by transmit power control and suitable antenna design and positioning. Second, we confirm that the 1 V/m criterion is adhered to through measurement at the site.

Typical measured field strengths in hospital wards range from 6.7-67.5 mV/m (equivalent power densities of 0.012-1.2 nW/cm^2) per digital carrier or analog channel leading to total field strengths in the range 13.4-580 mV/m (0.048-89 nW/cm^2). The total field strength depends on the number of digital carriers (typically 2 to 4 per sector) or analog channels (typically 32 per sector) present, and an enhancement factor of 3 dB (numerical factor of 1.4 for field strengths and 2 for power densities) has been included to account for possible reflections.

Yours sincerely,

Ken Joyner, PhD
Manager, EMC Section
Telstra Research Laboratories
770 Blackburn Rd.
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1. FDA, Bureau of Medical Devices, *Electromagnetic Compatibility Standard for Medical Devices,* Pub. No.MDS-201-0004, October 1, 1979.
2. IEC, *Medical Electrical Equipment, Part 1: General Requirements for Safety, 2. Collateral Standard, Electromagnetic Compatibility—Requirements and Tests,* No.IEC 601-1-2, 1993.
3. IEC, *Draft First Edition 19, Medical Electrical Equipment, Part 2: Particular Requirements for Safety of Infusion Pumps and Controllers,* Draft No.IEC 601-2-24, 1994.

Adey on NCRP Draft EMF Report

April 12, 1996

To the Editor:

Your quotation from the report of the Australian Senate Economics Committee hearing of November 7-8, 1995, attributes the following remarks to Dr. Michael Repacholi, chief scientist at the Royal Adelaide Hospital, consultant to the World Health Organization (WHO) and chair of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), regarding the draft NCRP report of the Committee on Extremely Low Frequency Electric and Magnetic Fields [see *MWN,* J/F96]:

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

Please be advised that Dr. Repacholi's remarks are a total fabrication. The draft conclusions and recommendations of the NCRP are the unanimous conclusion of every member of the NCRP committee. They are the result of more than a year's intense deliberation by the committee in arriving at unanimity. Moreover, all deliberations were conducted in confidence. At no time has Dr. Repacholi been privy to the lengthy and painstaking discussions that led the committee to its final position.

One can only hope that such lying in high places will receive its just deserts. Echoing Winston Churchill's historic utterance, "The mills of God grind exceeding slow, but they grind exceeding sure."

Sincerely,

Ross Adey, MD
Chairman
NCRP Committee 89.3 on Extremely Low Frequency EMFs
Research Service, Veterans Administration Hospital
11201 Benton St., Loma Linda, CA 92357

UPDATES

INTERNATIONAL STANDARDS

IEC Preparing EMF Meter Guidelines... An International Electrotechnical Commission (IEC) working group has reached consensus on a draft standard for gaussmeter accuracy. Developed for meters that operate from 15 Hz to 10 kHz, the draft includes criteria for instrument specifications, calibration techniques and immunity to electromagnetic interference, according to Dr. Martin Misakian, who heads the group. The guidelines will govern overall performance from 1 mG to 300 G for magnetic fields and from 1 V/m to 50 kV/m for electric fields. Misakian, of the National Institute of Standards and Technology in Gaithersburg, MD, was also in charge of writing the 1994 IEEE Standard 1308, *Recommended Practice for Instrumentation: Specifications for Magnetic Flux Density and Electric Field Strength Meters—10 Hz to 3 kHz*. The IEC working group based its first draft on the IEEE standard, but later included a protocol on how to take measurements, Misakian said in an interview. The draft has already been criticized by one meter manufacturer for not addressing magnetic field measurements below 1 mG. "There is a tendency for physicists and engineers to be skeptical that half a milligauss here or there can possibly mean a thing, although most scientists would agree that no firm 'safe–dangerous' threshold has been established," Ed Leeper of Monitor Industries in Boulder, CO, told *Microwave News*. "We can't just ignore meter performance below some arbitrary level." Misakian responded that meters will yield accurate measurements of fields below 1 mG, provided that the IEC's calibration techniques are followed correctly. The standard will be reviewed by the IEC Technical Committee 85 in September in Dresden, Germany, and, if approved, will then go to the IEC national committees for ratification. Misakian is the only American in the 15-person working group, which has members from France, Germany, Hungary, Italy, Japan, Russia, Sweden, Switzerland and the U.K. One observer noted that different national interests among IEC members could delay final approval of the standard.

MALE FERTILITY

NIOSH on Army Radars... Men exposed to RF/MW radiation from military radars do not face an increased risk of infertility, according to a NIOSH study by Dr. Steven Schrader. He found similar sperm levels in 33 soldiers who worked with signal corps radar, in 57 who had potential lead exposure from firing howitzers and in 103 controls. The results conflict with those of a 1992 study in which intelligence officers who worked with radar were found to have higher infertility rates than soldiers in the other two groups (see *MWN,* M/J93). Schrader also worked on the earlier study, which was led by Dr. Timothy Weyandt, now retired from the U.S. Army's Biomedical R&D Labs in Frederick, MD. Schrader told *Microwave News* that the different types of radar used in signal corps and intelligence may account for the conflicting results, but that a comparison would be impossible since RF/MW measurements were not made. NIOSH's Dr. Gregory Lotz determined that the signal corps officers' RF/MW exposures were low, based on their responses in questionnaires about radar use. In both studies, sperm levels were the same for controls and howitzer operators. But while Weyandt did not measure lead exposures among the artillerymen, Schrader did—and found none. In a paper presented on April 27 at the *21st Annual Meeting of the American Society of Andrology* in Minneapolis, Schrader noted that the conflicting fertility results indicate the need for more research on the potential effects from radar. "From a scientific point of view, I would like to find out why the results were so different," he

said in an interview after the meeting, but added that such a study is unlikely due to lack of interest from the Army.

MEDICAL APPLICATIONS

Prostate Shrinker Okayed... On May 6, the FDA approved the Prostatron, which uses microwaves to kill excess prostate tissue—following the recommendation of its Medical Devices Advisory Committee (see *MWN,* N/D95). "This device provides another alternative for men who are unable, or do not wish, to have surgery for enlarged prostate," FDA Commissioner Dr. David Kessler said in a written statement. "While not a cure, it effectively treats the symptoms." The manufacturer, EDAP Technomed Group in Cambridge, MA, has agreed to study patients for a year to assess possible long-term effects of treatment with the device. The Associated Press reported that Prostatron therapy will be immediately available at the five hospitals that tested it. The company continues to decline to comment on specific absorption rates in neighboring tissue.

MELATONIN

The Eyes Have It...A new discovery has heightened concerns over the use of melatonin supplements. In the April 19, 1996 issue of *Science,* Drs. Gianluca Tosini and Michael Menaker of the University of Virginia, Charlottesville, reported that a mammalian retina synthesizes melatonin and has its own separate biological clock. The circadian production of melatonin is thought to control important processes in the eyes, including restoration of rods (for night vision) at the end of the night, and renewal of cones (for color vision) at the end of the day. Other scientists see these findings as an indication that taking melatonin pills could have unanticipated negative effects on eyesight (see *MWN,* M/A96). For years, mammals were thought to have only one biological clock, located in the brain, which regulated their circadian rhythms. Then, about 20 years ago, researchers found they could make the eye's circadian rhythm run at its own, different pace. In 1991, Dr. Michael Terman of the Columbia-Presbyterian Medical Center in New York City showed that the daily rhythm of a rat's retinas continued even after the biological clock was removed from its brain. This experiment also suggested that the eye produces its own melatonin, separately from the pineal gland. Many observers remained skeptical, however. Now, Tosini and Menaker have devised a technique for keeping hamster retinas alive and functioning in culture and have found that melatonin production continues to follow a circadian cycle. They argue that this supports the idea that "circadian rhythmicity of melatonin level is essential for normal photoreceptor function." Tosini and Menaker's findings led Dr. Al Lewy of Oregon Health Sciences University in Portland to comment, "If we knew with certainty that melatonin has an important function in the human eye, this hormone should be taken off the market immediately—no questions asked," reported Janet Raloff in the April 20 *Science News.* Ophthalmologist Dr. Charlotte Remé of the University of Zurich in Switzerland told Raloff, "When we have a high melatonin level in the retina and are exposed to very bright light, we risk light-induced damage."

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PEOPLE

Dr. **Eleanor Adair** is leaving the John Pierce Laboratory in New Haven, CT, to become a senior scientist working on electromagnetic radiation effects at the U.S. Air Force's Armstrong Lab at Brooks AFB, TX. She expects to move to Texas in September....Dr. **Antonio Sastre** has moved to Kansas City, MO, where he is now a principal scientist at the Health Assessment and Research Center at the Midwest Research Institute. Sastre will be collaborating with Drs. **Mary Cook** and **Charles Graham** on their continuing investigation of the effects of human exposures to EMFs. Sastre is keeping open his consulting firm, A.S. Consulting & Research Inc., which will operate out of nearby Overland Park, KS....**Robert Manor**, formerly of LeBoeuf, Lamb, Greene & MacRae, has joined the law firm of Schmeltzer, Aptaker & Shepard in Washington. He will be working on radiation and toxic tort litigation, including EMF cases. Manor is also an alumnus of Crowell & Moring. Schmeltzer, Aptaker has defended clients in cases about ionizing radiation and Agent Orange and has worked on EMF litigation both in the U.S. and in other countries....Attorney **Gina Fietsam** is again working on cellular phone health litigation. In 1994, she left the Chicago firm of Holstein, Mack & Klein to do corporate law. On May 1, she returned to the fray at Barnow & Goldberg, also in Chicago, where she will be part of the team representing **Robert Kane** in his brain tumor case against Motorola, as well as working on other related lawsuits. Holstein, Mack & Klein and Barnow & Goldberg are cocounsels in the Kane litigation. ...Dr. **Patricia Buffler** of the University of California, Berkeley, has been elected to the National Council on Radiation Protection and Measurements, based in Bethesda, MD....Dr. **Alessandro Chiabrera** of the University of Genoa in Italy and Dr. **Peter Semm** of German Telekom in Darmstadt have been appointed associate editors of *Bioelectromagnetics*. They are representatives of the European Bioelectromagnetics Association.

RADON HYPOTHESIS

Skepticism Abounds... Researchers in England and the U.S. have raised strong objections to Dr. Denis Henshaw's hypothesis that radon concentrated by electric fields from transmission lines and electrical appliances could explain the EMF–cancer link. In the January 1996 issue of the *International Journal of Radiation Biology,* Henshaw and his coworkers at the University of Bristol in the U.K. had reported observing up to 18 times higher-than-expected levels of radon daughters near power lines and outlined a number of possible ways electric fields could increase human exposure to these carcinogens (see *MWN,* M/A96). Other researchers are not convinced, however. It "seems most unlikely" that electric fields could increase radon doses to the lungs and other organs, four members of the U.K.'s National Radiological Protection Board in Chilton wrote in the May issue of the *Journal*. "The overall effect of the mechanisms considered by Henshaw et al. would be expected, if anything, to reduce slightly the activity of radon decay products deposited in the lung and hence reduce the dose to the lung and other tissues," they explained. A second letter in the *Journal,* from the U.K. Electricity Association, made a

similar argument. But Henshaw is standing firm. His response, which followed the two letters, tried to clear up what he called "a degree of confusion." He contended that, "Our measurements of increased airborne activity near a large source of [EMFs] lead directly to increased dose to all body organs via inhalation." He pointed out that his work could generate a number of "testable hypotheses" about the possible EMF–cancer link. Dr. Larry Toburen of East Carolina University in Greenville, NC, also questioned Henshaw's conclusions: "I am inclined to discount the electric fields–radon proposal," he wrote in the April 20 *Lancet*. Toburen, who is the project director of the NAS-NRC EMF health study (see p.5), argued that lung cancer, which is associated with radon exposure, "has not been detected in excess in people living near power lines." However, a letter published in the April 15, 1996 *American Journal of Epidemiology* cited five studies showing associations between lung cancer and EMF exposures. Dr. Thomas Erren of the University of California School of Public Health in Berkeley described three occupational studies—by a Swedish team (see *MWN,* D83), by Dr. Genevieve Matanoski of Johns Hopkins University (see *MWN,* N/D89) and by Drs. Ben Armstrong and Gilles Thériault of McGill University (see *MWN,* N/D94)—that found an association between lung cancer and EMFs, as well as two residential studies, one from the U.K. and one by Dr. Nancy Wertheimer and Ed Leeper. Given that lung cancer is multifactorial, "a (co)carcinogenic potential of electromagnetic fields cannot be refuted at this time," Erren wrote. And because lung cancer in the United States is epidemic, "a link of [EMFs] to this malignancy would have considerable public health relevance," he added.

WALL STREET

A Winning Bet on Nonthermal Effects... Move over Microsoft and Intel. OrthoLogic, based in Phoenix, has been one of the stock market's shining stars over the last year. In just one week in May, the stock skyrocketed $16 a share to $49. That's an increase of more than 45%. Not bad, but those who have held the stock for the last year have done much better. Last May, OrthoLogic was selling at $4. (The stock gave up some of these gains the following week.) The company's flagship product is the OrthoLogic 1000 Bone Growth Stimulator, which, by the end of 1995, had gained 20% of the non-union fracture market. The stimulator is taking clients away from the industry leader, EBI of Parsippany, NJ, by using weaker magnetic fields (peak amplitude of 400 mG) and shorter treatment times (30 minutes a day). The OrthoLogic 1000 uses a static (DC) magnetic field of 200 mG and an AC frequency of 15.3 Hz or 76.6 Hz to increase the synthesis of the growth factor IGF-II. These field parameters are based on the cyclotron resonance hypothesis championed by Drs. Abe Liboff, Bruce McLeod and Stephen Smith (see *MWN,* N/D90 and J/F94). Drs. Robert Fitzsimmons and David Baylink of the VA Hospital in Loma Linda, CA, have shown that these combined AC and DC fields can increase DNA synthesis (see *MWN,* M/J93). Baylink is a member of OrthoLogic's scientific and medical advisory board. A brief description of the OrthoLogic stimulator is featured in the May 25, 1996 issue of *The Lancet* (p.1474).

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Vol. XVII No. 3 A Report on Non-Ionizing Radiation May/June 1997

INSIDE...

EMF NEWS pp.2-5

Power Line Talk: Gillette Leaves RAPID • Final DOE Review? • Exogenous Fields Stronger than Endogenous Fields • Floderus Moves to Karolinska Institute • Warnquist Joins Watson & Renner • Debunking Fears

Adey Resigns from VA Medical Center

Breast Cancer Suit Dismissed

Savitz Has New Evidence for EMF–ALS Link

EPRI Shielding Software

New Epidemiology: Residential and Workplace Studies in Norway, Taiwan, U.K. and U.S.

NCI Childhood Epi Study Due in July

HIGHLIGHTS pp.6-12

Wireless Notes: Motorola Gets Tough with Microshield • Digital Phone Headaches • Guy Leaves WTR; Nessen Quits CTIA • Suits Against Carlo, WTR Dismissed • Senate Tower Siting Hearing Canceled • Industry and Activist Joust over Nonthermal Effects

Rep. Markey and FDA on Wireless Research

WHO Downplays RF/MW Health Risks

Link Upgraded After Lymphoma Study

Brodeur on U.S. Embassy in Moscow

CTIA and WTR Agree on Funding

Proposed Dutch RF/MW Limits

Reactions to Repacholi Lymphoma Study: What They Are Saying Advice for the Concerned

FROM THE FIELD pp.12-15

Motorola on Its Internal Lai-Singh Memo

Repacholi Responds to Microwave News

Clippings from All Over

Blank Verse on Peer Review

Flashback: 5, 10, 15 Years Ago

UPDATES pp.15-18

Zapped on a TV Tower • mm-Wave Effects on the Eye • Police Radar Suit Dismissal Upheld • Books from Lin and WTR • Comings and Goings at NAS-NRC • Defibrillators and EMI • Breast Cancer Conference and HPS Summer Course • People in the News

Digital Mobile Phone Radiation Boosts Cancer Rate in Mice

Twice as many mice exposed to microwave radiation developed lymphoma as did controls, according to an Australian study sponsored by Telstra, formerly called Australian Telecom. The radiation was designed to mimic signals from GSM digital mobile telephones.

One hundred transgenic mice—which were bred to be especially susceptible to lymphomas—were exposed to 900 MHz pulsed radiation for two 30-minute periods per day for up to 18 months. At the end of the experiment, 43% of the exposed mice had lymphoma, as compared to 22% of the unexposed controls. The exposed mice also developed cancer more quickly.

In a paper published in the May issue of *Radiation Research,* Dr. Michael Repacholi and his coauthors call the increased incidence of lymphoma among the exposed mice "highly significant." They add that it is very unlikely that the faster onset of cancer was due to chance.

"I believe this is the first animal study showing a true nonthermal effect," Repacholi told *Microwave News*. "I am pushing for its replication and extension." Repacholi, the director of the International EMF Project at the World Health Organization (WHO) based in Geneva, Switzerland (see p.8), is on leave from the Royal Adelaide Hospital in Adelaide, Australia.

"It's an interesting study. However, you can't draw any conclusions about

(continued on p.10)

Views on the News

Secrecy vs. Public Health: Industry Must Not Set the Standard

Imagine this: A company marketing a new fat substitute sponsors a study on its safety. The researchers discover that when rats are fed the fat substitute, their cancer rate doubles. But this finding is kept secret for the next two years. The researcher who led the study even chairs a conference on the safety of fat substitutes, but does not mention his own results. He gives an advance report to the company that sponsored him (as required by contract), but the public and the government are kept in the dark for several more months. In the time between the end of the experiment and the public announcement of its results, sales of the fat substitute double.

Change "fat substitute" to "cellular phone," and you have the story of Dr. Michael Repacholi's recent study, sponsored by the Australian telecom giant Telstra.

Withholding important health data from the public is, to be blunt, unethical. This is as true for wireless phones as it is for food additives or medicines.

Of course, one study cannot be the basis for definitive judgments about human health. But we reach clear conclusions by gaining *more* information,

(continued on p.19)

« Power Line Talk »

Walking down the corridors of the **DOE** headquarters in Washington, one can see clear signs of an agency in transition—including the winding down of the EMF program. Furniture is stacked up next to cartons of books, reports and papers waiting to be moved or to be put in storage. Dr. **Imre Gyuk** is now the DOE's last EMF staffer in Washington. **Lynne Gillette** has left her post as EMF RAPID research manager to become the program manager for biomass power in the DOE's Office of Solar Thermal, Biomass Power and Hydrogen Technologies. Dr. **Paul Gailey** of the Oak Ridge National Lab in Tennessee will watch over the RAPID engineering projects as they near completion. The DOE is planning to stop all EMF research in September 1998, the end of fiscal year 1998 (see *MWN,* M/A97). Congress appears to be willing to fund the DOE's last year of EMF work: $4 million for RAPID and $4 million for Gyuk's mechanisms program. "We are confident that we will get the budget we asked for," Gillette said at the National EMF Advisory Committee meeting in Washington on May 1, her last public appearance in an EMF context.

«« »»

If the DOE program does close down, this year's **EMF health effects review** will be the last. "We are waiting to see what happens," said Dr. **William Wisecup**, who has organized the meetings since the first in 1979. "We only had 25 people and we met in the basement of the DOE," he said. Since then, attendance has grown, peaking a couple of years ago at close to 400. This year's review will be held November 9-13 at the Holiday Inn by the Bay in **San Diego**. After the review, the NIEHS's Dr. Michael Galvin will host a grant-writing workshop and there will likely be a meeting of the National EMF Advisory Committee. For more information on the review, contact: Dr. William Wisecup, W/L Associates, (301) 663-4252, Fax: (301) 371-8955, E-mail: <75230.1222@compuserve.com>.

«« »»

Dr. **Om Gandhi** made some waves at the science symposium held by the **NIEHS** in March. He challenged one of the most basic objections to EMF health effects raised by some physicists. Gandhi reported that the fields induced in the human body by power lines and appliances—indeed, essentially *all* strong EMF sources—are much larger than the fields generated naturally inside the body. Or, in the jargon of the trade: The exogenous EMFs dwarf the endogenous fields. Gandhi, who is at the University of Utah in Salt Lake City, used a computer model to calculate the electric and magnetic fields in the 41-70 Hz frequency band from internal and external sources. The human heart is the strongest and most consistent source of EMFs, but even its fields in other organs are hundreds of times smaller than those induced by standing under a high-voltage power line or by using a hair dryer. "My assumption was that what is already in the body is pretty substantial, but that turns out to be incorrect," Gandhi said in an interview. He noted that he was "surprised" by his results. "It is time for people to reject false assumptions," he said.

«« »»

Sweden's Dr. **Birgitta Floderus** has moved just across town from the National Institute for Working Life (NIWL) to the Institute of Environmental Medicine at the **Karolinska Institute** in Stockholm, where she will work with Dr. **Anders Ahlbom**'s research group. She is continuing her epidemiological studies of the possible health effects of EMFs. While at the NIWL, Floderus was the principal author of a landmark study on occupational exposure to EMFs and cancer (see *MWN,* S/O92).

«« »»

After a short break from EMF litigation, **Mark Warnquist** has jumped back into the fray. Warnquist has joined the Washington-based law firm of **Watson & Renner** and will head its new office in Denver. "I am quite excited about joining Watson & Renner's 'scientific SWAT team'," he commented. Founding partner **Tom Watson** has the largest EMF law practice in the U.S.; Watson and Warnquist had worked together on EMF cases at Crowell & Moring, also based in Washington. Last summer Warnquist left the Denver office of **LeBoeuf, Lamb, Greene & MacRae**, where he was central to utility company victories in the *Pilisuk* and *Glazer* leukemia cases (see *MWN,* M/J95 and M/J96). Two other EMF specialists from LeBoeuf, Lamb's Denver office are moving to Watson & Renner along with Warnquist: lawyer **Chad Neuens** and epidemiologist-researcher **Warren Sateren**.

«« »»

"Despite the repeated assertions of reputable scientists that [prudent avoidance] expenditures are virtually pointless, utilities and the government continue to pour additional funds into studies of the possible health effects of EMF[s]." So writes Dr. **Cassandra Chrones Moore** in *Haunted Housing: How Toxic Scare Stories Are Spooking the Public Out of House and Home,* newly published by the **Cato Institute** ($11.95). The book focuses on radon, lead, asbestos and EMFs, giving much attention to the views on EMFs of Drs. **John Moulder** and **David Hafemeister**. Moore, formerly with the National Association of Realtors, is now an adjunct scholar at Cato and at the **Competitive Enterprise Institute**, both in Washington. She warns that the "drive to mitigate questionable environmental hazards penalizes...all taxpayers." To order the book, call (800) 767-1241 or (415) 541-9780.

Ross Adey Resigns from the VA

On May 2, Dr. Ross Adey resigned from the VA Medical Center in Loma Linda, CA, where he was the associate chief of staff for research and development.

For 20 years, Adey led a research team working on the biological effects of EMFs, principally for the DOE. More recently, his group at the VA has been doing health research on RF/MW radiation for Motorola. "The research will continue at the VA for the present time," Adey told *Microwave News.*

EMF–Breast Cancer Lawsuit Is Dismissed in New York

On April 7 a state court dismissed a lawsuit blaming a New York utility for an office worker's fatal breast and ovarian cancers. Shirley Marano had been exposed to electromagnetic fields (EMFs) from transformers one floor below her office at the national headquarters of the Columbia Broadcasting System in New York City. The suit charged that Consolidated Edison (Con Ed) was therefore responsible for her death (see *MWN,* M/A94).

"We're pleased with the result," Con Ed spokesperson Joseph Petta said from his office in New York City. "We feel that there is no reliable scientific proof that EMFs cause cancer." Petta told *Microwave News* that this was the first time Con Ed had faced an EMF-related personal injury claim.

"It was frustrating, because it was a winnable case in other circumstances," said Mitchell Perry of the law offices of Leopold Kaplan in New York City, who represented Marano's family. "Ms. Marano was someone who was very healthy. And then within 18 months of being transferred to a room right over two transformers, she started feeling the symptoms. In another 18 months she was dead." Perry said in an interview that some areas in the office had EMFs as high as 150 mG.

Con Ed's motion for dismissal argued that the suit was not based on sufficient legal evidence, and Judge Alice Schlesinger agreed. Schlesinger cited the deposition by Con Ed's expert witness, Dr. Darwin Labarthe of the School of Public Health at the University of Texas, Houston, in her ruling: "Dr. Labarthe...maintains that there is no scientific basis upon which to conclude that breast cancer can be caused by EMF exposure."

Perry introduced an affidavit from Marija Hughes, a technical information specialist for the Occupational Safety and Health Administration in Washington. But Judge Schlesinger was not impressed with Hughes's qualifications as an expert witness: "Ms. Hughes may well be knowledgeable in the area of EMFs but she is not a doctor nor a scientist. Rather, she is a librarian who has compiled information in the area."

"Marija Hughes was initially utilized in my background research," said Perry. "She was not the expert we would have used had we gone to trial." Perry said that there had been discussions with other expert witnesses. "But practical considerations governed the handling of this case. It was a decision made with the family, considering the potential expense and duration of the proceedings, the long odds we faced and the suffering they had already endured." The deadline for an appeal has now passed.

Judge Schlesinger was also impressed by a friend-of-the-court brief filed by the Atlantic Legal Foundation (ALF), a pro-business group that has intervened in recent EMF cases in California (see *MWN,* N/D95 and M/A97). The judge noted that the 12 scientists signing the ALF's brief contend that, "Con Ed's generators emit very low-level non-ionizing radiation which does not cause damage to human tissue."

The ALF's general counsel, Martin Kaufman, said that his organization intervened in the case because "we thought it would be useful to have a state trial court apply *Daubert*-type principles—that is, to act as a gatekeeper against inappropriate scientific evidence." He said he was also glad to see the ALF's position accepted in a jurisdiction beyond California.

Among the studies cited by Hughes was Dr. Samuel Milham's analysis of a cancer cluster in a California office located over electrical transformers, in which cancer risk rose with the number of years in the office (see *MWN,* S/O96).

Marano was diagnosed with ovarian cancer in 1990 and with breast cancer in June 1993. She filed suit against Con Ed in November 1993. After her death in June 1994, the suit was continued by her estate, represented by her sister, Myrtle Vaughters, and her brother, Donald Morris; the case is now known as *Vaughters and Morris v. Consolidated Edison.*

Savitz Adds to Evidence Linking EMFs and Lou Gehrig's Disease

Dr. David Savitz has found new evidence for an association between EMF exposure and amyotrophic lateral sclerosis (ALS), a neurodegenerative disorder more commonly known as Lou Gehrig's disease. Savitz will present his results at the *30th Annual Meeting of the Society for Epidemiologic Research,* which will be held June 11-14 in Edmonton, Canada.

Savitz examined data on 140,000 employees of five electric utilities, which he and coworkers had gathered for a previous study of EMF exposure and cancer (see *MWN,* J/F95). Employment for 5-20 years in jobs with EMF exposures was associated with a doubling of the risk for ALS. Those with more than 20 years of exposure faced three times the risk of the rare disease, a statistically significant finding.

Savitz also found that EMF exposure was "weakly related to Alzheimer's disease, particularly with a latency of 20 years."

In 1995, Drs. Zoreh Davanipour and Eugene Sobel first reported evidence of an association between EMF exposure and ALS (see *MWN,* N/D95 and J/F97). Sobel presented the first evidence of an EMF–Alzheimer's connection in 1994, a link which he has now detected in four separate groups of Alzheimer's patients (see *MWN,* J/A94).

A study in Sweden by Dr. Maria Feychting also showed an EMF–Alzheimer's association, though there were some inconsistencies between her findings and Sobel's (see *MWN,* J/F97).

"I think the ALS results in our study are intriguing," Savitz told *Microwave News.* "The Alzheimer's results are less so, but they're probably enough of a basis to argue for a study with good diagnostic information, like Sobel's, and good exposure data, like ours."

Neurodegenerative disease was listed as the underlying cause in 97 deaths in Savitz's study population, and was a factor in another 206; of these, ALS was the underlying cause in 28 deaths, and was a factor in 33 others.

Savitz's work was funded by the Electric Power Research Institute.

EPRI EMF Shielding Software

The Electric Power Research Institute (EPRI) has developed computer software that can estimate the effectiveness of multi-layered metallic shields in attenuating magnetic fields.

Called *Layers,* the program predicts the ability of a shield to reduce magnetic field levels based on the metals used, the shield's shape and thickness, and the frequency and strength of the ambient field.

According to an EPRI user's manual, a single layer of 0.05-inch-thick cylindrical steel can reduce a 100 mG, 60 Hz field to 51.3 mG. But an aluminum shield of the same shape and thickness is somewhat less effective—lowering the field strength to 58.1 mG. When aluminum and steel are combined to form a 0.05-inch-thick shield, however, the field strength falls to 49.9 mG. Several layers can be used with interspersed air gaps to reduce the fields even further.

Layers is based on an algorithm developed by Dr. James Hoburg of the Electrical and Computer Engineering Department at Carnegie-Mellon University in Pittsburgh. Hoburg devised it for Electric Research and Management Inc. in State College, PA, which was under contract to EPRI.

"[T]he algorithm is useful for predicting the shielding of ducts, conduits or enclosures that are used in actual shielding applications," according to a paper by Hoburg and colleagues that was presented on February 3 at the *IEEE Power Engineering Society 1997 Winter Meeting* in New York City.

The program was tested at EPRI's Power Delivery Center in Lenox, MA, and was found to give calculated values that were in good agreement with actual measurements. "It's a very versatile computational tool that accounts for both the thickness and dimensions of the shield," Hoburg said in an interview.

At this time, *Layers* is available only to sponsors of EPRI's EMF Management Program, according to EPRI's Frank Young in Palo Alto, CA. He added that it may be released later for use by consultants and government officials.

The *Layers User's Guide* has been published by EPRI. For more information, contact: EPRI Software Distribution Center, 11025 N. Torrey Pines Rd., Suite 120, La Jolla, CA 92037, (800) 763-3772.

New Epidemiology: Residential and Workplace Studies in Norway, Taiwan, U.K. and U.S.

Adult Leukemia Risk in Taiwan Residential Study

A residential study in Taiwan has found a significant increase in adult leukemia among those with high exposures to EMFs, and a significant trend of higher risk with increased EMF exposure.

"The excess risk was concentrated in cases of acute lymphoid leukemia" (ALL), report Drs. Chung-Yi Li of Fu-Jen Catholic University in Taipei, Taiwan, Gilles Thériault of McGill University in Montreal, Canada, and Ruey Lin of National Taiwan University in Taipei, writing in the January issue of *Epidemiology (8,* pp.25-30, 1997). They found no clear association between EMF exposure and either brain tumors or female breast cancer.

Magnetic field levels at the time of diagnosis were calculated on the basis of power company records. The models for estimating historic exposures were verified with on-site measurements. Those with calculated exposures over 2 mG had a 40% greater risk of leukemia, and a 70% higher risk of ALL.

The researchers also found a significant association between the risk of disease and distance from power lines. Those who lived within 50 meters of transmission lines of 69 kV or more had a leukemia risk that was twice as high as those living farther away.

The case-control study was based on data from Taiwan's National Cancer Registry, using information on 870 cases of leukemia, 577 brain tumors and 1,980 female breast cancers. Past residential studies of adults have presented a mixed picture (see *MWN,* N/D96).

No Clear Picture on Childhood Cancer in Norway

A new Norwegian study does not show an association between calculated historical exposure to EMFs and leukemia in children. However, the researchers suggest, "The lack of an association with leukemia in our study may be due to the small numbers involved." Drs. Tore Tynes and Tor Haldorsen of the Institute of Epidemiological Cancer Research at the Cancer Registry of Norway in Oslo further point out that few of the subjects in their study were exposed to field levels above 1.4 mG.

Tynes and Haldorsen did find increased leukemia risks for some subgroups, including "children who have lived for more than three years in a magnetic field of [0.5 mG] or more" and children exposed to higher magnetic fields in their first four years of life.

Due to the low power of the study, few of the associations are statistically significant. But those which are show links between calculated historical magnetic fields and a couple of specific types of cancer. "The association seen between exposure to magnetic fields and osteosarcoma is particularly interesting in light of the therapeutic use of magnetic fields in bone healing," they observe in the February 1 *American Journal of Epidemiology (145,* pp. 219-226, 1997).

The Norwegian researchers made separate estimates of past levels of electric fields and report that, "Electric fields were not significantly associated with cancer."

The study was based on cancer registry data on children living in census tracts that contained high-voltage power lines. Five hundred cases and 2,004 controls were evaluated.

Tynes and Haldorsen take note of Dr. Nancy Wertheimer and Ed Leeper's recent work on ground currents as a risk factor in childhood cancer (see *MWN,* S/O95). Because of different electrical practices, they explain, "less than two percent of the Norwegian population" is exposed to ground currents.

U.K. Utility Study: No Employee Brain Cancer Risk

"There was no indication of a positive trend for cumulative exposure [to EMFs] and risk of mortality from brain cancer" in

a recent British study of employees of national power companies. In fact, trend analyses show a decreased risk, though this is not statistically significant.

Dr. J.M. Harrington and colleagues at the University of Birmingham examined 112 cases of primary brain cancer diagnosed between 1972 and 1991 among 84,000 British power workers—employees of the Central Electricity Generating Board or its privately owned successors. The study, published in the January issue of *Occupational and Environmental Medicine (54,* pp.7-13, 1997), was funded by the National Grid Co. and other private British utility firms.

Exposure assessment was based a combination of 11 job categories and measurements of 151 workers at different job sites. The researchers also investigated exposures to 24 possible confounders, either carcinogens or neurotoxic agents. The etiology of brain cancer is not well understood, and Harrington's team reports that, "There was no significant association between the risk of brain cancer and exposure to any of the potential confounders.

The team notes that exposure was considered "unclassifiable" for 18 of the 112 cases—a group they described as, "unfortunately, rather large."

The researchers point out that exposure assessment is further complicated by "large variations in exposure within a job group, leading to unavoidable overlap in exposures between the job groups." There are also variations "within and between workers [on] the same job," and, in any case, "there is no agreement on the most appropriate exposure metric for EMFs."

Brain Cancer and Leukemia Risk Higher Among British Electrical Workers

U.K. electrical workers were found to have increased rates of brain cancer and leukemia, according to a recent study by Dr. N.T. Fear and colleagues at the Radcliffe Infirmary in Oxford. They examined national cancer registry data on the 372,000 cases of these diseases diagnosed between 1981 and 1987, and analyzed the 8,000 known to have occurred among electrical workers.

"Significant excesses of around 20% were observed," Fear's team reports in the *British Journal of Cancer (73,* pp.935-939, 1996). Although higher risks of male breast cancer and of melanoma were also observed, the numbers of cases were much smaller and the results were not significant.

There was a 10% lower risk of female breast cancer. While this finding is also not statistically significant, the researchers note that it "offers little support for the suggestion that this malignancy is affected by exposure to [EMFs]."

Fear's team cites the use of "a very large population-based data set" as an advantage of this study, but mentions poor data on occupation, limited information on confounding factors and the lack of specific occupational exposure data as weaknesses. The researchers conclude that, "The extent to which workplace exposures to [EMFs] explain the excesses seen here for leukemia and brain cancer requires further study."

"In analyses in which many associations are examined, some results may be significantly high or low by chance alone," they observe. Accordingly, they urge a cautious interpretation of their findings. A number of other studies have pointed to a link between occupational exposure to EMFs and elevated risks of leukemia and brain cancer (see *MWN,* N/D94, J/F95 and J/F96).

NCI Childhood Cancer Study in New England Journal in July

The results of the National Cancer Institute's (NCI) study of power-frequency magnetic fields and childhood leukemia, led by Dr. Martha Linet, will be published in the July 3 issue of the *New England Journal of Medicine*.

A researcher familiar with the study, who asked not to be identified, predicted that the NCI results will do little to settle the ongoing EMF–cancer controversy.

The case-control, epidemiological study, begun in 1989, compared over 600 children with acute lymphoblastic leukemia with a randomly selected control group (see *MWN,* J/F89). Dr. William Kaune, a consultant based in Richland, WA, headed the exposure assessment effort, which included measurements of residential power-frequency and geomagnetic fields, surveys of home appliance use and determination of wire codes.

Linet's team plans several additional publications: The NCI's Ruth Kleinerman is the lead author of a paper on epidemiological and exposure assessment methodologies, scheduled to appear in the September issue of *Epidemiology*. The NCI's Dr. Robert Tarone has submitted for publication a paper on the relationship between measured magnetic fields and wire codes. Kaune is preparing a paper on exposure aspects of static magnetic fields.

The *New England Journal of Medicine* declined to disclose any details of the Linet paper or to confirm its publication date.

SCE Employees Are "Healthy Workers"—Except for Leukemia and Prostate Cancer

A Southern California Edison (SCE) study of its employees concludes that "this workforce has lower rates for overall mortality, cardiovascular disease, cancer and nonintentional injury." Published in the May *American Journal of Industrial Medicine (31,* pp.534-544, 1997), the study included 40,335 SCE workers employed between 1960 and 1991, of whom 3,753 had died.

SCE's Dr. Jack Sahl (see also p.17) and Dr. Michael Kelsh of Environmental Health Strategies in Menlo Park, CA, explain that this reflects the "healthy worker effect"—that is, "the improved health status among a stable, financially secure worker population with adequate access to health care."

One exception is noted: "Among the entire Edison cohort, consistently low SMRs [standardized mortality ratios] were observed for all selected causes of death except prostate cancer and leukemia." The researchers state that, "The rate ratios for leukemia, which has been associated with benzene, solvent[s], ionizing radiation and magnetic field exposures, were inconsistent....They were higher among occupations with low exposure levels to these agents...."

Sahl and Kelsh previously analyzed these mortality records in relation to cancer and EMF exposure, and found no consistent association (see *MWN,* M/A93 and J/A93).

HIGHLIGHTS

« Wireless Notes »

Motorola is getting tough with makers of cellular phone shields. The company's attorneys have threatened to sue **Microshield Industries**, based in Luton, U.K., over statements in its product literature that Motorola calls "patently false," "deceptive" and "grossly misleading." Microshield makes a cover for mobile telephones that is designed to reduce users' exposure to radiation. In a February 28 letter, Motorola attorney Christine Peterson warned Microshield that its marketing brochure constituted false advertising under U.S. law. Peterson objected to the brochure's suggestions that RF energy from cellular phones heats the user's brain and eye tissue, and that scientific research had linked mobile phone use to various illnesses. She also asserted that the shield does not reduce RF exposure by more than 90%, as advertised, but in fact may *increase* exposure. Motorola demanded that Microshield stop distributing "any materials or claims that state or imply" that cellular phones are unsafe. If not, Peterson warned, Motorola would "consider more formal action." In its March 14 response, Microshield promised to stop distributing its product literature in the U.S. and to stop selling the shield to U.S. consumers on its Web site.

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Digital mobile phones are more likely to cause **headaches** than are analog phones, Dr. **Bruce Hocking** reported at the *Annual Scientific Meeting of the Royal Australasian College of Physicians,* held in Auckland, **New Zealand**, in May. Of 40 adults who described "unpleasant symptoms" after using digital or analog phones, he found that 30 had used digital units. Hocking, an occupational health consultant in Melbourne, Australia, who was formerly the chief medical officer of Telstra, the Australian telephone giant, has been tracking down such cases over the last two years (see *MWN,* N/D95). "The symptoms often began minutes after beginning a call but could come on later during the day ...sometimes ceased within an hour after the call but could last till evening...did not occur when using a handset and were different from ordinary headaches. There were several reports suggestive of intracranial effects," Hocking stated. A large study of phone users and headaches is ongoing in Norway and Sweden (see *MWN,* N/D96 and M/A97).

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Dr. **Bill Guy** has resigned from **Wireless Technology Research** (WTR). One of the three members of WTR since its founding (see *MWN,* S/O93 and S/O94), Guy told *Microwave News* in early May that he had resigned, at least in part, because, "I was not in a position to make decisions." He will continue to do some work for WTR on a consulting basis until the end of 1997, collaborating with Dr. **C.K. Chou** of the City of Hope National Medical Center in Duarte, CA, to complete the design of an exposure system for biological experiments (see *MWN,* M/J95). There have also been top-level changes at the **Cellular Telecommunications Industry Association** (CTIA), where **Ron Nessen**, vice president for communications and public affairs, has been replaced by **Margaret Tutwiler**. Nessen had served as press secretary for President Ford, while Tutwiler was the official spokesperson for the State Department under President Bush. Nessen said in an interview that he had resigned to host a nightly show on Nostalgia Television, a cable channel. Nessen is known among the press for his confrontational style. For example, in 1994 Nessen tried to suppress a UCLA press release on cellular phone dosimetry research by Michael Jensen and Dr. Yahya Rahmat-Samii (see *MWN,* J/F95), prompting this protest to the CTIA in a letter from **William Andrews**, the public information officer at UCLA's School of Engineering: "His phone manner was a one-way locomotive—him yelling, me constantly telling him to calm down....I put him on hold for a 30-second count, came back on and he was in midsentence, still yelling, and unaware I had been off-line. After he twice called me an 'asshole,' I hung up." Andrews also complained that Nessen had threatened to call "many people in the Pentagon," with the intent of "interfering with relationships between faculty and their funding agencies." Nessen's tactics were successful: UCLA withdrew the press release at the request of faculty who had received phone calls from their Department of Defense research program managers. Asked whether the CTIA had been dissatisfied with Nessen's general approach to press relations, CTIA spokesperson **Tim Ayers** said, "Not at all. I think Ron is appropriately celebrated for his aggressive defense of the industry."

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As **WTR** secured coverage for its legal costs and potential liability (see p.9), it was on a winning streak in the courtroom. On May 7, WTR, the **CTIA** and **Ron Nessen** were all dismissed as defendants in *Wright v. Motorola,* which is being heard in Illinois state court. **Debbra Wright**'s suit charges that use of **Motorola** cellular phones caused her to develop a brain tumor (see *MWN,* M/A95). The defendants dismissed from the case had been accused of conspiring with Motorola to falsely portray cellular phones as safe. WTR's chair, Dr. **George Carlo**, had been removed from the case at the end of January. "We'll appeal everything," said Wright's lawyer, **Robert Holstein**, who is based in Chicago. "We're dedicated to keeping this case going." **James Baller**, WTR's attorney in Washington, seemed unconcerned. "WTR is pleased with the result," he told *Microwave News,* "and believes it should never have been brought into the litigation in the first place." On April 24, Carlo was dismissed as a defendant in the lawsuit filed by **Jerald Busse**, which charges that WTR epidemiology studies amount to unauthorized human testing (see *MWN,* J/F96). Baller successfully argued that the Illinois court had no jurisdiction because Carlo neither resided in nor did business in the state. WTR itself and the CTIA remain defendants in the case.

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A few days before Senator **John McCain** (R-AZ) was to hold a hearing on the **siting of cellular phone and PCS towers**, it was abruptly canceled. **Cathy Bergman**, president of the EMR Alliance in New York City, credits citizen activists and local officials for delaying the May 13 hearing. "McCain's refusal to allow the

public to testify led to a flood of phone calls, faxes, E-mail messages and FedEx packages to his office," she told *Microwave News*. "An embarrassed McCain was forced to rethink the witness list, which reflected only industry views." A spokesperson for the senator denied that public outcry was the reason, saying that the hearing was being put off due to "scheduling conflicts." At press time, a new date had not yet been set.

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Sometimes a lone activist can cause headaches for a multibillion dollar industry. Last year **EPA** Administrator **Carol Browner** backed the FCC's new RF/MW exposure standard as providing "adequate protection of public health" (see also *MWN,* M/A96 and J/A96). The limits were stricter than industry would have liked, but it reportedly went along—with the understanding that the EPA would not criticize the new rules. The trade paper *RCR* reported that, "As part of the deal with the FCC, the wireless industry supposedly was assured that EPA would remain in the background on RF safety issues." Signed, sealed and delivered—until October, when **David Fichtenberg** of Olympia, WA, wrote the EPA to ask if the FCC standard gave protection against nonthermal effects. **Norbert Hankin** of the EPA's Office of Radiation and Indoor Air responded that there was not enough data on nonthermal effects to set specific limits. But, citing EPA policy, he added, "Both the NCRP and ANSI/IEEE standards [the FCC standard is based on both] are thermally based, and do not apply to chronic, nonthermal exposure situations. The statement referring to 'adequate protection' pertains to thermally related effects." Hankin's letter produced strong thermal effects within the wireless industry—company representatives got boiling mad. After a meeting with the EPA, the **Electromagnetic Energy Association** (EEA) was still unhappy; EEA chair John Welch of Motorola wrote to the agency to complain about continuing "confusion about EPA's official position." Welch demanded another public statement from the EPA in support of the FCC. On January 17, he got it: Assistant Administrator **Mary Nichols** wrote to the FCC "to reiterate EPA's support" for the FCC exposure rules and repeated Browner's wording. But rather than disavow Hankin's letter on nonthermal effects, she said it had been "incorrectly construed." In May, EEA executive director **Dinah McElfresh** told *Microwave News* that Nichols's letter "clarifies EPA's position," and asserted that "the FCC standard protects against all effects, based on the science known today." But Fichtenberg countered, "Many papers accepted for standard-setting by the IEEE show adverse effects below the FCC's hazard threshold. Prudence requires limits based on these observed effects."

Congressman Markey on Wireless Safety: Answers Needed, but Not with Federal Funds

Rep. Edward Markey (D-MA) wants to know whether cellular phones are safe but is unwilling to commit federal funds to the task. "We need to find the best ways to prioritize current research and accelerate getting answers to the public," Markey's legislative assistant, Colin Crowell, told *Microwave News*. "Then we can identify where gaps may exist. But we are not yet prepared to say that we need to spend millions of federal dollars."

In an April 7 letter, Markey asked the Food and Drug Administration (FDA) what the government has been doing to determine whether cellular phones pose a health risk. Markey also asked whether the research being done by Wireless Technology Research (WTR), which is funded by the Cellular Telecommunications Industry Association, would settle the safety question.

"The type of research proposed by WTR should provide part of the answer," stated Diane Thompson, FDA associate commissioner for legislative affairs, in a May 5 response. Thompson added that the FDA has "no information which would lead us to believe that the federal government and American consumers will not be able to rely on the results of the WTR research."

Thompson noted that there is "no federal government-sponsored research specifically directed toward cellular phone safety," though she pointed to related work sponsored by the Environmental Protection Agency, the Department of Defense and other agencies.

Thompson also described FDA efforts to monitor research sponsored by industry, including a March 13 letter the agency sent to Dr. George Carlo, chair of WTR (see *MWN,* M/A97). In that letter, the FDA recommended that the WTR research give the "highest priority" to lifetime animal exposure studies and stressed the need for replication of studies showing biological effects, such as the Lai-Singh experiments (see *MWN,* N/D94).

In a May 6 statement, Markey declared that, "The government has a responsibility to assess for consumers whether portable wireless phones pose a health risk," and that he would "follow up with the appropriate federal agencies and the cellular industry." Crowell said that a second letter with additional questions would soon be sent to the FDA.

The Markey letter concluded by asking when answers to cellular phone safety questions could be expected. The FDA's Thompson responded that, "It is difficult to predict when conclusive statements about health risks can be made."

Markey's renewed interest came in the wake of a detailed article in the April 6 *Washington Post* on the slow pace of industry-funded research (see p.14). The *Post* article followed stories in the trade publication *RCR* and in *Microwave News*.

In February 1993, Markey held a congressional briefing on cellular phone safety after the Reynard brain cancer suit put the issue on the front pages of newspapers around the world (see *MWN,* J/F93). He also asked for a report from the General Accounting Office, which was released in 1994 (see *MWN,* N/D94).

WHO: No Overall Support for RF/MW Radiation Health Risks

A group of 44 researchers assembled by the World Health Organization (WHO) EMF Project has found "scant" evidence linking RF/MW radiation and cancer. On the other hand, the WHO consensus report notes that, "Only a few studies have been published, and these are sufficiently indicative of an effect on carcinogenesis to merit further investigation" (see box below).

"It seems likely that any possible effect on health is subtle," according to the report. While the authors advise that more research is needed, they generally downplay studies indicating ill effects. For example, the report notes that "because it is not possible to prove the negative in hazard-evaluation studies, no definitive affirmation of safety can be made."

The report states that the Lai-Singh and Sarkar experiments—which showed that *in vivo* RF/MW exposure can lead to damaged DNA—"need to be replicated before the results can be used in any health-risk assessment, especially given the weight of evidence that RF fields are not genotoxic."

It discounts human studies as showing inconclusive links between RF/MW radiation and health effects: "Overall the epidemiological studies suffer from inadequate assessment of exposure and confounding, and poor methodology."

In particular, the report criticizes Dr. Stanislaw Szmigielski's study that indicates an increased cancer risk among RF/MW-exposed Polish military personnel. It states that his results are difficult to understand "because neither the size of the population nor the exposure levels are clearly stated." Szmigielski attended the WHO seminar.

The report calls for more *in vitro* studies addressing dosimetry, DNA damage and repair and biophysical mechanisms. Priorities for *in vivo* research include effects on cancer promotion, melatonin, the blood-brain barrier and the eyes. Heading the recommendations for epidemiological research are studies on mobile phones, pregnancy and occupational cancer.

The document, which was edited by Dr. Michael Repacholi, was drafted for discussion at the seminar, held in Munich, Germany, last November 20-22. The meeting was organized as part of the WHO's $3.3 million project on non-ionizing radiation, which Repacholi directs (see *MWN,* J/A96 and J/F97). The report was revised after the meeting and, in April 1997, submitted to *Bioelectromagnetics.*

Three working groups in Munich were charged with reviewing the scientific literature—one on *in vitro* studies, led by Dr. Thomas Tenforde of the Battelle Pacific Northwest Labs in Richland, WA; one on *in vivo* studies, chaired by Dr. William Pickard of Washington University in St. Louis; and one on epidemiological and human studies, led by Dr. Anthony Swerdlow of the University of London, U.K.

The Munich seminar, titled *Biological Effects of Nonthermal Pulsed and Amplitude Modulated RF Electromagnetic Fields and Related Health Hazards,* was sponsored jointly by the WHO, the Austrian Ministry of Health and Consumer Protection, the International Commission on Non-Ionizing Radiation Protection and the German Federal Ministry of Environment, Nature Protection and Nuclear Safety.

RF/MW Cancer Link Upgraded After Mouse Lymphoma Study

The WHO meeting in Munich was held many months after Repacholi's RF/MW–lymphoma study had been completed (see p.1). However, Repacholi's findings were not made available to the participants.

The summary of the Munich meeting, as originally submitted for publication, assesses the cancer risk this way: "Taken overall, the evidence fails to support an effect of RF exposure on mutagenesis or cancer initiation."

On May 6, a week after Repacholi's finding of a doubling of lymphoma incidence among RF/MW-exposed mice had been published, a revised manuscript was sent to *Bioelectromagnetics*—and this time it cited the new cancer results. The Munich conclusion now reads: "Although weak evidence exists, it fails to support an effect of RF exposure on mutagenesis or cancer initiation."

Was There a Nuclear Device at the U.S. Embassy in Moscow?

One of the enduring microwave mysteries is why the Russians beamed signals into the U.S. embassy in Moscow for decades beginning in the 1950s and why the American government treated the matter with so much secrecy.

In his newly published memoirs, Paul Brodeur speculates that the U.S. government's sensitivity might have been due to the presence of a nuclear device inside the embassy. If so, Brodeur argues, the government would have done everything possible to deflect attention away from radiation exposures—both ionizing and non-ionizing—at the embassy.

"I think it is possible there was a nuclear device there, but I don't have journalistic proof," Brodeur told *Microwave News.*

When asked about Brodeur's hypothesis, Dr. Sam Koslov, a longtime technical intelligence specialist, now retired, shot back, "It sounds like utter bullshit to me." He added that, "There were no nuclear connotations in those days. It's the first time I've heard it mentioned."

In *Secrets: A Writer in the Cold War* (Boston: Faber & Faber), Brodeur reports that a 29-year-old Marine who had been stationed at the Moscow embassy in the 1960s and who later developed lymphoma told him that he had seen "technicians wearing silver-colored radiation-hazard suits with full hoods, face masks and wire-mesh goggles on the eighth floor of the embassy, just below Ambassador Llewellyn Thompson's office." The marine did not know what was on the eighth floor; he was never allowed to go there. Thompson died of lymphoma. Walter Stoessel, an ambassador in the 1970s, died of leukemia in 1986.

Brodeur also wonders why access to cable traffic on the microwave signal between the American Embassies in Moscow and Paris required a "Q" clearance, which permits access to nuclear secrets.

"It's also possible that the Central Intelligence Agency or the National Security Agency had electronic countermeasures in the

embassy," Brodeur said, referring to sophisticated communications and jamming equipment.

Koslov maintains that the secrecy stemmed from "the government not wanting to admit that they had devices that could detect electromagnetic signals. The fact that we would admit that we could listen to their electromagnetic signals horrified the State Department."

As to why the Russians beamed microwaves at the embassy, Koslov said that they were either interfering with our ability to listen to them or activating their own concealed microphones. Koslov, formerly a special assistant for science in the Secretary of the Navy's office, went to Moscow in 1977 to help negotiate the turning off of the microwave signal.

At the end of *Secrets,* Brodeur notes that, "I have retired from *The New Yorker* and the public health wars I waged in its pages." He states that he has returned to writing fiction.

CTIA, WTR Announce Legal and Research Funding Agreement

On April 28, Wireless Technology Research (WTR) and the Cellular Telecommunications Industry Association (CTIA) finally signed an agreement covering WTR's legal fees, as well as possible future damage awards. It also specifies a timetable for the CTIA's payments for WTR's health research.

The pact should clear the way for progress in the CTIA-WTR research program, which has been stalled for over a year.

"It's been quite a difficult process," WTR chair Dr. George Carlo told *Microwave News* in early May. "I'm glad this is behind us." The CTIA's Tim Ayers agreed, saying, "We're looking forward to the research going ahead." Settlement of the long-running dispute had been predicted many times but was slow in coming (see *MWN,* N/D96 and M/A97); the accord followed a *Washington Post* article on cracks in the CTIA-WTR relationship and the lack of progress in research (see p.14).

Carlo offered this explanation for the delay: "When you have a written agreement, it forces people to look at every issue inside out." He noted that, "We never had an agreement before. The first $17 or 18 million was based on handshakes." Ayers stressed that the CTIA had to be cautious, saying, "You can't allow the deep pockets of industry to get set up as an attractive target."

Neither side would release a copy of the agreement. Carlo explained that to do so "would compromise our position in litigation—it's a privileged document." He said that the agreement combines cash reimbursement of legal fees with insurance against other costs, and will protect researchers from any liability that results from being sponsored by WTR.

Ayers and Carlo both confirmed that some CTIA members had suggested severing the group's relationship with WTR and finding another way to sponsor research. "This was coming from new people, who hadn't heard the arguments for an independent structure and wanted industry to have more control," said Carlo. Ayers added that, "When members raise concerns, we have to respond—but our commitment to WTR was constant."

Carlo indicated that the CTIA has now agreed to pay over $3.1 million in costs incurred through the end of 1996 that were outside of WTR's original $25 million research plan, including $2.2 million for pacemaker research and approximately $750,000 for litigation expenses. This brings the total CTIA commitment to more than $28 million, of which $9.8 million has yet to be paid. WTR will get the balance in eight quarterly installments. "The last one is due around the middle of 1999," said Carlo, "and I've been asked to stay on past my original five-year commitment, until the funds are exhausted."

Asked whether WTR will then close its doors, Carlo answered, "It's hard to speculate." If the group's studies show no risk to public health, he said, "then it's pretty clear that WTR would wind up business." But if evidence of a risk is found, Carlo said, the plan for the industry's health research would have to be redefined.

In mid-May Susan O'Donnell, WTR's public affairs manager, stated that WTR has now paid off all back debts and has at least $1.4 million in hand to begin biological studies. But WTR would not name the researchers who will be involved. "We still haven't gotten in touch with the people we had selected, to see if they still want to go ahead," said Carlo, adding, "We've got to regenerate some of our momentum."

Carlo predicted that by the end of 1997, *in vitro* genotoxicity studies will be completed and *in vivo* studies will have begun. Replication of the Lai-Singh experiments, he said, will be finished by March 1998 (see also *MWN,* N/D94, J/F96 and M/J96).

Proposed Dutch RF/MW Limits

The Health Council of the Netherlands' Radiofrequency Radiation Committee has recommended the adoption of RF/MW radiation safety guidelines based on a specific absorption rate of 0.4 W/Kg for workers and 0.08 W/Kg for the general public. These are essentially the same limits used by ANSI/IEEE, NCRP, NRPB and ICNIRP.

The thresholds are based on thermal effects. "In the literature, nonthermal effects, such as direct damage to DNA, have been reported. However, the committee considers the results of these studies not reliable enough to be used in setting exposure limits," Dr. J.A. Knottnerus, vice president of the health council, wrote in a letter to the Dutch Minister of Health, Welfare and Sport.

The report notes that there is a lack of evidence indicating that mobile phones pose a health hazard when used in "a normal" way—while stressing that "this conclusion is based on only very limited data."

The report was written by a ten-member committee, which was chaired by Dr. E.W. Roubos of the University of Nijmegen in the Netherlands, and included Germany's Dr. J. Bernhardt, the chair of ICNIRP, and Dr. Z.J. Sienkiewicz of the U.K.'s NRPB.

For a copy of *Radiofrequency Electromagnetic Fields (300 Hz-300 GHz),* which is in both Dutch and English, contact: Dr. Eric van Rongen, Health Council of the Netherlands, PO Box 1236, NL-2280 CE Rijswijk, The Netherlands, (31+70) 340-5730, Fax: (31+70) 340-7523, E-mail: <e.van.rongen@gr.nl>.

What They Are Saying

"Put simply, mobile phone users are not genetically engineered mice. More importantly, this study is no reason for the public to be in any way concerned about the safety of mobile phones."

—Peter Russell, director, Australian Mobile Telecommunications Association, quoted by Phil Bertolus in "Mice Cancer from Mobiles," *The Age* (Australia), May 5, 1997

"No firm in the world develops a drug that causes cancer in test animals and says, as mobile phone makers do, that it will not happen in humans."

—Dr. Wolfgang Löscher, School of Veterinary Medicine, Hannover, Germany, quoted in *Süddeutsche Zeitung* (Germany), May 22, 1997

"Indeed, I think about the most one can say at this stage is that if there are mice in the community who are genetically predisposed to developing lymphoma they would be well advised not to use mobile phones.... That applies to rats as well, I should say."

—Senator Richard Alston, minister of communications and the arts, comments in the Australian Parliament, May 7, 1997

So who is responsible for the safety of mobile phones? And will the mobile phone companies and industry representatives like Michael Repacholi cease calling for an increase in the human exposure limits in the light of this new research? Until the industry satisfactorily answers these questions, they will continue to be accused of acting and sounding like the tobacco industry.

—Australian Senator Lyn Allison, in a press statement, May 2, 1997

"The scientists are as good as you will get. The journal is very highly respected. Their paper certainly does raise questions—the results are extremely surprising."

—Dr. Peter Polson, consultant based in Cupertino, CA, quoted by Jonathan Marshall in "Cell Phones Linked to Cancer in Mice," *San Francisco Chronicle,* May 9, 1997

"The Australian research is one data point. This particular data point appears to conflict with other research showing no promotion effect as well as with epidemiological studies...."

—Thomas Wheeler, president, Cellular Telecommunications Industry Association, quoted in a press statement, April 30, 1997

"It would seem sensible to take a few precautions until more is known about the potential risk. "

—Steve Horrocks, senior policy officer, Australian Consumers' Association, quoted in a press statement, May 1997

"We don't know of any one person anywhere in the world who has died as a result of using a mobile phone."

—Dr. Brendan Nelson, member of Parliament and former president of the Australian Medical Association, quoted by *Reuter* news service, April 30, 1997

The suits being brought in the United States against the tobacco industry, which is finally being forced to take responsibility for the deadly effects of smoking, should provide a useful wake-up call to cellular phone companies.

—Editorial, *Jerusalem Post* (Israel), May 9, 1997

"The biggest hazard is the increased rate of automobile accidents from using (cell phones) while driving."

—Dr. John Moulder, Medical College of Wisconsin, Milwaukee, quoted by the *Associated Press,* May 9, 1997

risks to humans," Dr. Mary Elizabeth Jacobs of the U.S. Food and Drug Administration (FDA) in Rockville, MD, said in an interview. Jacobs is the director of the Division of Life Sciences at the FDA's Center for Devices and Radiological Health.

In the U.K., Dr. John Stather, assistant director of the National Radiological Protection Board (NRPB) based in Oxfordshire, told the *New Scientist* (May 10): "This needs to be investigated thoroughly." But, he added, "I think people should carry on using mobile phones."

Dr. Antony Basten of the Centenary Institute of Cancer Medicine and Cell Biology in Sydney, Australia, one of Repacholi's collaborators, also does not believe the results should prompt changes in phone habits. "For the time being, at least, I see no scientific reason to stop using my own mobile phone," he asserted in an April 30 statement (see also box on p.11).

Basten, like Repacholi, thinks the study should be repeated. Telstra does, too. Basten told *Microwave News* that the next step would be to examine multiple exposure levels and mice prone to different types of cancer.

Dr. Hugh Bradlow, director of Telstra Research Labs, said that further studies are needed "to independently extend the study...to understand if the result has significance for human health." He suggested that the Australian government make this part of its A$4.5 million (US$3.5 million) program on radiofrequency and microwave (RF/MW) radiation (see *MWN,* N/D96).

Word of the Australian results spread quickly around the world. Dr. John Goldsmith of Ben Gurion University in Beersheba, Israel, told the *Jerusalem Post* (May 2) that the results present "startling new evidence that must be carefully evaluated."

In the U.S., Dr. Henry Lai said that, "The main point is that RF radiation promotes cancer." However, he noted that it is "very unlikely" that cell phone use can cause lymphomas and, like Basten, recommended that mice prone to other forms of cancer be used in follow-up efforts. Lai and Dr. N.P. Singh, both of the University of Washington, Seattle, have found single-strand and double-strand DNA breaks in the brain tissue of rats exposed to low-level microwaves (see *MWN,* N/D94 and M/J96).

"I think the findings are very significant," Dr. Gregory Lotz of the U.S. National Institute for Occupational Safety and Health (NIOSH) in Cincinnati said in an interview. "They used a sizable number of animals and it appears to be a clear effect."

"While there are some difficulties in extrapolating from animal experiments to human health, the effect reported in this paper appears to be quite substantial," commented Dr. Stan Barnett of Australia's Commonwealth Scientific Industrial Research Organization (CSIRO). In 1995, Barnett prepared a report on mobile phone health risks, which recommended a national RF research program (see *MWN,* S/O95).

Dr. George Carlo, the head of Wireless Technology Research (WTR), told *Microwave News* that, "This transgenic mouse study plus the two Lai-Singh studies are clearly suggesting that there's some biological activity going on. I don't agree with the idea that it's impossible." WTR is sponsored by the Cellular Telecommunications Industry Association (CTIA).

The CTIA and Motorola, as well as trade groups in Australia, interpreted the results cautiously. "These findings cannot be directly related to human health or to the safety of mobile commu-

nications," said Dr. Mays Swicord, Motorola's director of biological research.

The Australian study is the second to show biological activity caused by a digital phone signal. Last year, Dr. Ross Adey of the VA Hospital in Loma Linda, CA, announced that a TDMA digital signal with a specific absorption rate (SAR) of 0.58-0.75 W/Kg appeared to be protective against cancer among exposed rats (see *MWN,* M/J96 and J/A96). When Adey repeated the experiment using a signal patterned after an analog phone—which is not pulsed—he found no effect (see *MWN,* M/A97).

"We now appear to have two nonthermal effects, both linked to pulsed fields, and once again we must investigate the possibility that it is the low-frequency modulation that is the essential element in the observed effect," Adey said in an interview.

Unlike analog cellular phones, the newer digital models, including those featuring TDMA and GSM technology, use pulsed signals. TDMA is used in the U.S., while GSM is the predominant system in Australia and Europe.

More than ten years ago, Dr. Bill Guy, then of the University of Washington, Seattle, released results from a long-term study in which rats exposed to 2450 MHz pulsed microwaves with an SAR of 0.15-0.4 W/Kg had statistically significantly more malignant tumors than controls (see *MWN,* J/A84, Mr85 and J/F93).

In 1995, Poland's Dr. Stanislaw Szmigielski reported significantly higher rates of lymphoma and leukemia among Polish military personnel exposed to RF/MW radiation from radar and communications devices, many of which use pulsed signals (see *MWN,* M/J95). Szmigielski is at the Center for Radiobiology and Radiation Safety and at the Military Institute of Hygiene and Epidemiology, both in Warsaw.

A Wide Range of Exposures

In the Australian study, the mice were exposed to a wide range of radiation levels depending on where they were in their cages. They were housed in groups of five and could move freely around their particular cage. The experiment was run "blind," meaning the research team did not know which mice were exposed and which were controls.

The exposures were in the far field. In contrast, most users of cellular phones are exposed in the near field.

SARs at any given time ranged from 0.008 W/Kg to 4.2 W/Kg depending on where the mice were in the cages. Other factors affecting the SARs were the weight of the mice, which changed during the course of the study, and the fact that the mice slept together in packs.

Under current rules, the U.S. Federal Communications Commission (FCC) deems exposures from cellular phones below 1.6 W/Kg to be safe.

"We did not have the resources to hold mice during exposure and irradiate them with a special antenna in the near field. However, we are recommending that this be done in follow-up studies to reduce the problem of a wide range of SARs," Repacholi wrote *Microwave News.*

"Since the variation is so wide, it is not possible to determine what SAR or SAR range was responsible for causing the increased incidence of lymphoma," Repacholi notes in the paper.

Guy, now a consultant based in Seattle, was critical of the dosimetry. "I can't tell whether they overestimated or underestimated the SARs, because there is not enough information in the paper," he said in an interview.

The use of mice that were genetically engineered to develop lymphoma in the first year of life has also prompted criticism. Motorola's Swicord, for example, has questioned "the validity of using this genetically engineered mouse strain for carcinogenicity testing."

In the paper, the Australian team states that humans do not have the same genetic predisposition as the transgenic mice, "but some individuals inherit mutations in other genes...that predis-

Advice for the Concerned

It will take years for the RF/MW cancer risk issue to be resolved. In the meantime, Australia's Dr. Antony Basten and the U.K.'s Dr. John Stather do not see any need to stop using mobile phones. For those who are concerned, here is what some others are advising:

- The Australian Consumers' Association, based in Sydney, recommends talking on standard phones instead of mobile phones whenever possible, limiting the duration and number of calls and not using digital phones inside buildings, where they have to transmit at higher power levels. The group also suggests considering the use of a headset and extending the antenna completely to reduce radiation exposure.
- Dr. Bruce Hocking, a consultant and former chief medical officer at Telstra, based in Melbourne, advises that children's exposures to radiation from mobile phones should be limited since the study "showed a marked rise in risk of cancer with duration." An important step in achieving this, Hocking told *Microwave News,* would be to prevent manufacturers from marketing phones to young people. In 1995, Hocking reported that children living near TV towers had higher rates of leukemia than did children living farther from the antennas (see *MWN,* N/D95 and N/D96).
- The Australian Democrats advocate the transfer of authority for mobile phone policy decisions from the Department of Communications and the Arts to the Department of Health, requirements that manufacturers and doctors record health complaints related to mobile-phone use, restrictions on marketing mobile phones to young people and a ban on cellular towers on school property. Democratic Senator Lyn Allison had asked for a review of safety standards because the "study recorded the damage at power levels similar to those 'deemed' safe...." Allison stated that Senator Richard Alston, minister of communications and the arts, has rejected her request.
- In Israel, where the study has been front-page news, the *Jerusalem Post* reported that one manufacturer, Cellcom, has suggested the use of a separate headset (May 6). Cellcom will help establish a research fund to study potential health effects, according to the *Post* (May 9).
- Dr. Peter Neitzke, a physics professor at the Institute for Social Ecological Research in Hannover, Germany, recommends keeping mobile phones away from one's body when not in use, since they generate radiation even in standby mode, according to Germany's *New Press* (May 9).

pose them to develop cancer, and these individuals may comprise a subpopulation at special risk from agents that would pose an otherwise insignificant risk of cancer."

Three Rejections Before Publication

The paper was submitted to *Radiation Research* on July 8, 1996, and accepted for publication on December 30. It had been previously rejected by the *Lancet, Nature* and *Science,* Repacholi told *Microwave News*. Newspapers in Australia and in Germany have reported that *Science* and *Nature* had expressed concern that the results would create a "panic" and wanted to wait for a replication study.

A spokesperson at *Science* would neither confirm nor deny these reports, noting the journal's confidentiality policy regarding the peer-review process. Repacholi said that the rejections were based on "nonscientific grounds."

The results of the Australian study were tightly held until the date of publication. *Radiation Research* would not make advance copies of the paper available to the press. Indeed, the journal's own Web site did not include a description of the paper, as it did for all the others appearing in the May issue.

Martha Edington, the managing editor of *Radiation Research,* said that, "The authors have asked us not to release any information about the paper prior to the date of mailing of the issue except for the title and the authors" (see also p.13).

The delay in the release of the results has spurred some harsh criticism. "I think it is very irresponsible and unwise to keep the data secret for two years, knowing their implication," Lai said in an interview. "The secrecy only reinforces the suspicion of the public that the industry is trying to cover up."

Dr. Niels Kuster of ETH in Zurich, Switzerland, told the Swiss newspaper *SonntagsBlick* (May 18): "It is incomprehensible to me that industry did not replicate this study 18 months ago, when the preliminary results became known. Now we won't know for at least two years whether, in fact, mobile phone radiation accelerates the development of cancer."

On April 30, 1997, Telstra held a news conference in Sydney announcing the study results. Repacholi addressed the attendees via a television satellite link from his office in Geneva. Telstra did not respond to a request for a transcript or a video of the press conference.

M. Repacholi et al., "Lymphomas in E∝-*Pim1* Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields," *Radiation Research, 147,* pp.631-640, May 1997.

FROM THE FIELD

Motorola on Its Internal Lai-Singh Memo

March 25, 1997

To the Editor:

I would like to convey Motorola's strong objections to your publication of highly selective excerpts from an internal Motorola memorandum about research at the University of Washington on the possible effects of RF/MW exposure on DNA [*MWN,* J/F97]. The published version of these documents painted an incomplete and possibly misleading account of our actions and intentions. When read in the proper context, these documents underscore the seriousness with which we addressed the issues raised by this research and questions that may arise about the safety of wireless communications technologies.

As documented by *Microwave News,* Motorola for years has been a world leader in studying the potential interactive effects of RF energy. And we have a strong basis for confidence in the safety of our products. When publicity surrounding the Reynard lawsuit in Florida—later dismissed for lack of evidence—first challenged the safety of cellular telephones in early 1993, we decided that if there were unknown health risks from exposure to RF energy, they could show up in the medical histories of our employees. We commissioned a large-scale epidemiological study of Motorola employees, who have spent decades working with and around RF energy. In a review of the health histories of more than 93,000 Motorola employees, Dr. Robert Morgan found no overall increase in cancer mortality and significantly fewer brain cancer deaths than would be expected based on national averages. Over the last few years, completed laboratory (*in vitro* and *in vivo*) research has produced additional scientific support for the absence of adverse health effects from the radio signals generated by wireless communications.

Now to the DNA experiment of Drs. Lai and Singh at the University of Washington. As documented by *Microwave News* at the time, Motorola devoted considerable time and attention to this research as soon as the findings became known and months before they were published. Results inconsistent with past research or otherwise in need of validation, verification and interpretation often require further investigation. And as you reported more than two years ago, Motorola promptly commissioned further research of this kind. This decision was based, in part, on the observations of experts who reviewed the methods and conclusions of the University of Washington study.

In the latter part of 1994, we were in contact with *Microwave News* as well as various other entities that had a need or interest in evaluating the University of Washington research and potential scientific follow-up. Motorola's actions at all times were guided by a dedication to sound science and corporate responsibility. We worked to effectively and factually address questions that might be seen by some, accurately or not, as bearing on the safety of our products. As noted above, the key element of that response was to commission independent research at Washington University in St. Louis, MO, to understand and replicate the Lai-Singh research. Beyond that, Motorola engaged only in the kind of responsible preparations needed to address questions raised in the scientific community and elsewhere about the design, findings and significance of the research conducted by Drs. Lai and Singh.

Albert R. Brashear
Corporate Vice President and Director, Corporate Communications
Motorola
1303 E. Algonquin Road, Schaumburg, IL 60196

We tried to make an objective journalistic decision about what parts of the lengthy Motorola memos would be of general interest. We believe we succeeded, but we invite readers to judge for themselves. The full memos may be obtained by sending a self-addressed 9x12 envelope stamped with $1.01 postage to Microwave News, *along with $5.00 for handling.*

Repacholi Responds: WHO Does Not Seek To Run EC Program

May 9, 1997

To the Editor:

As almost all the criticism that *Microwave News* has leveled at me over the past few years was repeated in your March/April 1997 issue, allow me to set the record straight. WHO does not want, nor is it asking, the European Commission (EC) to delegate its wireless research program, as your headline suggests. WHO has neither the resources nor the desire to run such a program. WHO merely identifies research it needs to make better health risk assessments.

The U.S. Air Force (USAF) can respond to criticism about the Toler study. I am accused of appointing three USAF members to working groups (WGs) at the November RF meeting in Munich. Members of WGs were *not* appointed. Independent scientists who felt they could contribute joined WGs. Considering that the USAF has the largest government-sponsored RF bioeffects research program in the world, it is not surprising that its members wanted to participate. The meeting organizers did not specifically invite them. They were free to attend at their own cost, as were other scientists.

Representatives of the EPA, FDA, NIEHS and NIOSH were invited to the Munich meeting. Since WHO normally funds only those scientists from developing countries, those from the U.S. were asked to pay their own way. At the next international advisory committee meeting, to be held in Geneva, June 2-3, three U.S. government agencies are scheduled to be represented. Further, the FDA has stated to U.S. Rep. Edward Markey (D-MA) that it will await the outcome of the WHO EMF Project before considering further action on mobile phones.

Criticisms of Ken Foster and William Pickard are unjustified. While they may believe that low-level RF fields have no health impact, they were asked how health effects could be found and established. Common sense suggests that one seeks scientists of all persuasions to reach a consensus.

Dr. Pickard agreed to chair a WG in Munich because he was going to report on the views of others. His appointment was in line with WHO policy that WGs have scientists with a wide range of views. WHO has used this technique for many years. Note that the conclusions and recommendations of the Munich meeting are in line with those of other reviews, particularly with the recent EC expert group report on mobile phones.

The title of the Munich report was changed to keep it concise. Note that "low-level" was defined in the text to include both "athermal" and "nonthermal."

Your criticism that only two U.S. participants at the Munich meeting do biological research suggests that no other country has anything to contribute. Xenophobia reigns supreme at *Microwave News*. Readers from other countries will be happy to learn that you consider their contributions to be less than those of Americans. Fortunately, WHO does not have this view. WHO welcomes input from *all* scientists from *any* country.

WHO considers the military to be an agency of a member state and entitled to be heard. Considering that WGs are composed of 20-25 scientists, from many countries, one or two military representatives would have to be very persuasive to convince the other members of a WG. WHO has not received any funds from the military.

WHO, IARC, FDA and EPA have long used scientific principles to assess health risks. My role in the WHO EMF Project is to facilitate its implementation, *not* to influence the science. I will *not* be a member of any WHO WG evaluating health risks.

You note that I tried to raise the limits of the Australia/New Zealand RF standard. What is not mentioned is that there is an anomaly in the Australian standard. In 1985, before I joined the standards committee, a more stringent MW limit was offered to placate the union representative. Later, when I chaired this committee, the Australian and New Zealand standards associations asked us to adopt, where possible, international standards to comply with the GATT agreement. Although a majority of the committee agreed, industry and a few others voted against the proposal. I later resigned from the committee. My stance to uphold valid scientific principles in the face of industry opposition could hardly be considered as demonstrating a pro-industry bias.

I am proud that ICNIRP has become one of the most influential groups setting standards on non-ionizing radiation. The U.S. NAS came to the same conclusions on EMFs as IRPA/ICNIRP did some seven years ago, but its review cost about $1 million while IRPA/ICNIRP's cost about $50,000. ICNIRP is very cost-effective and provides sound advice. WHO requested that I resign from ICNIRP to work on the EMF Project because ICNIRP is a full partner on the project.

It is true that, a few years ago, I suggested "off the record" that mobile phones interrupt my meals in restaurants (and they still do). Now, following publication of my animal study, I believe that there are real effects from low-level RF fields, which need further investigation.

The fact that the sponsors of my animal study asked for the results three months prior to publication did not delay it. In the past, studies have been released prematurely, only for us to find later that the conclusions did not hold up, or that they failed peer review because of some basic design flaw. The research team, not the sponsors, decided that the results would only be released on the day they appeared in *Radiation Research.*

My criticism of the draft NCRP report chaired by Dr. Ross Adey has been widely misconstrued. While it is true that I said it was a "nothing report" (in retrospect, a poor use of words) at an Australian Senate hearing, I meant that it had *no* status within NCRP since it had not been extensively peer-reviewed, as is required of all NCRP publications. It was irresponsible of *Microwave News* to disclose the draft conclusions, even when requested not to do so by the NCRP president. The draft conclusions of the Adey committee, as published in *Microwave News,* are at odds with *all* recent reviews of the ELF literature, and most recently, that of the U.S. NAS.

It is true that, as chief scientist of Royal Adelaide Hospital, I was asked by some Australian industries to assist on training videos for workers and the general public. I wanted to inform people about the science, since, unfortunately, the view provided by the press is extremely distorted. My appearance as an expert witness was to advise the court on the science and my written statements included *all* scientific studies, not only those showing negative results. As a WHO employee, I am not allowed to be an expert witness.

I chaired a conference in Brussels sponsored by the French and Belgian electrical utilities. My participation was to moderate discussions. I had no part in drafting the program. My paper at the meeting did not espouse the "no effect" view.

Microwave News quotes me as saying that the EMF Project will have "buckets of money." This is Louis Slesin's own quote. There are now ten countries contributing funds or supporting activities of the project. Many more are currently considering support. The project is financially sound and will continue for at least five years, until all tasks are completed.

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We stand by our editorial, including our reporting of Dr. Repacholi's comments on funding for his WHO EMF Project, which were made in an interview at the NIEHS EMF Science Review Symposium held in Durham, NC, March 24-27, 1997.

Clippings from All Over

When all is said and done, what was lacking in the [National Academy of Sciences-National Research Council's EMF] committee's assessment was common sense. After all, if multiple studies show that children who live in homes near power lines that give off strong magnetic fields are developing leukemia and brain cancer more often than other children, and if multiple studies show that workers exposed to strong power-frequency magnetic fields on the job are developing leukemia and brain cancer more often than other workers, wouldn't common sense tell one that exposure to magnetic fields ought to be considered a more likely suspect than some unknown factor having to do with the age or construction of a residence, the previously considered factor of traffic density, or a highly unlikely exposure to herbicides?

—Paul Brodeur, *Secrets: A Writer in the Cold War* (Boston: Faber and Faber, 1997), p.214 (see also p.8)

[R]esearch on EMF risks "hasn't been very productive...science isn't really up to the task of answering the question."

—Dr. Keith Florig, Carnegie-Mellon University, Pittsburgh, quoted in "ScienceScope: DOE Gets Out of EMF Research," *Science,* p.1867, March 28, 1997

A Peer at Peer Review

Martin Blank

Peer review is the fashion today.
"They're our equals," at least, we can pray.
But make no mistake,
peers can be on the make,
and good science they sometimes betray.

We tend to believe what our peers say,
be their words cheery bright or deep gray.
Though we all go along
their ideas can be wrong.
With self-interest the "truth" goes astray.

Peers claim they review with fair play,
and impartially facts they do weigh.
But it often appears
that it's only the peers
who get dough, and then get to make hay.

When peers sit to judge yea or nay,
they vote for themselves, come what may.
They're old-fashioned elite,
not always discreet,
and we are the ones who must pay.

They're not *US,* they are more like U.K.,
where for years age-old "peers" have had sway.
Despite the pretense,
we know the true sense.
When "peers" speak, we must do it their way.

Dr. Blank, of Columbia University's College of Physicians and Surgeons in New York City, is the president-elect of the Bioelectromagnetics Society.

STILL WAITING FOR THE CALL
Do Cellular Phones Cause Brain Tumors?
Researchers' Inability To Provide an Answer So Far
Is Only Raising More Questions

CELLULAR INDUSTRY RESEARCHERS HAVE SPENT
$17 MILLION WITHOUT RESULTS

CELLULAR PHONE RESEARCH GROUP'S
INDEPENDENCE QUESTIONED

—Headlines from a news story by Mike Mills, *Washington Post,* pp.H1, H7 and H8, April 6, 1997 (see also p.7 and p.9)

I commend the members of the Cellular Telecommunications Industry Association for their efforts to promote safety through the use of cellular technology. You can take great pride in your dedication to this endeavor and in your hard work on behalf of our communities. You are helping to create a brighter future for all of us.

—President Bill Clinton in a letter recognizing the CTIA's Wireless Safety Week, May 19, 1997

[W]hen big businesses like AT&T Wireless Services tell us those ugly towers they want to erect on our school grounds and through our communities are our friends, I'm skeptical. When they say there's no evidence of any health risk associated with the radio waves emitted by their communications towers, I say that's not good enough. And when government...says it's going to permit such a tower without insisting on assurances that the children in its care won't suffer the consequences 25 years from now, I get angry.

—Dave Lange, "They Can Live Without $100,000," commentary, *Chagrin Valley Times* (OH), p.12, May 15, 1997

Either deliberately or accidentally, the media was manipulated last week to largely ignore some very disturbing news about Australian research conducted over four years into cellular phones and their potential to cause tumors. The results were to be announced in Adelaide through a videoconference, but journalists who know about this stuff were not invited—and nor were some of the researchers who did the work.

—Stewart Fist, "Cancer Scare Story You Didn't Hear," commentary, *The Australian* (Australia), May 6, 1997 (see p.1)

Defendants' reply brief appears to argue that, although there is no FDA safety standard, there are standards set by the FCC and [ANSI] regarding the output allowed for cellular phones. This argument is irrelevant, as the FCC is empowered to regulate frequencies and power of telecommunications items. "Congress has not empowered the FCC to regulate cellular telephones with regard to health effects and public safety" [citation to *Verb v. Motorola* omitted].

—Judge Paddy McNamara, Cook County Circuit Court, Chicago, Memorandum and Order in *Wright v. Motorola,* May 7, 1997

This year, the Cannes Festival held its fiftieth anniversary. It was a fitting moment to take stock: to stand back and marvel at this luminous fortnight, as stars and stargazers came together to honor the greatest medium of mass communication that has ever existed. It was time, in short, to celebrate the mobile phone. True, there were ugly rumors flying around that some people were laying down their Motorolas and going to watch *films*....but there wasn't much solitude in the air at Cannes 1997, not with all the electronic messages crackling through the atmosphere. If you stood on the Croisette at noon and threw an egg into the sky, it would come down fried.

—Anthony Lane, "Postcard from Cannes," *The New Yorker,* p.78, May 26, 1997

UPDATES

BOOKS AND REPORTS

EMF and RF/MW Reviews... Dr. James Lin of the University of Illinois, Chicago, has assembled seven new papers for the second volume in the series *Advances in Electromagnetic Fields in Living Systems*. For low-frequency EMFs, Dr. Russel Reiter presents the literature on melatonin, while Drs. Leeka Kheifets and Jennifer Kelsey review the epidemiological studies on cancer. For the high frequencies, Lin discusses the health effects of wireless radiation, Drs. George Harrison and Elizabeth Balcer-Kubiczek look at the carcinogenic potential of RF/MW radiation and Richard Tell offers insights on how to interpret and apply the 1992 ANSI/IEEE exposure standard. The other two papers address computational bioelectromagnetics and medical applications. The first volume was published in 1994 (see *MWN,* J/F95). This new volume is available for $89.50 from: Plenum Publishing Corp., 233 Spring St., New York, NY 10013, (800) 221-9369, Fax: (212) 807-1047. Prices are 20% higher outside the U.S. and Canada.

WTR on WTR... The February issue of *Human and Ecological Risk Assessment,* published by CRC Press, is devoted to papers describing the work of Wireless Technology Research (WTR), the U.S. cellular telephone industry's research group. The papers are drawn from presentations by the seven staffers and consultants that WTR sent to the *Society for Risk Analysis Annual Meeting* in Waikiki, HI, in December 1995. They address topics such as dosimetry, post-marketing surveillance, tumor promotion studies and interference with cardiac pacemakers. Many of the papers have been updated to reflect developments since the 1995 conference. The special issue was guest-edited by Kelly Sund and Dr. George Carlo, both of WTR, with an introduction by Dr. Michael Gough of the Cato Institute in Washington. Copies of the journal or reprints of individual articles are available from: WTR, 1711 N Street, NW, Suite 400, Washington, DC 20036, (202) 833-2800, Fax: (202) 833-2801, E-mail: <Mary@HESGroup.com>.

CELLULAR PHONE EMI

New Data on Defibrillators... One type of implantable cardiac defibrillator (ICD) did not experience electromagnetic interference (EMI) from cellular phones, according to a paper presented on May 8 at the *18th Annual Scientific Sessions of the North American Society of Pacing and Electrophysiology (NASPE)* in New Orleans. Dr. Roger Damle and colleagues at the University of Colorado, Denver, held a TDMA-type digital cellular phone over the chest or abdomen of 48 people with Ventritex ICDs. Previous research has shown that cellular phones can cause EMI with cardiac pacemakers (see *MWN,* J/A94, M/J95 and N/D96); Damle suggested that the sophisticated circuitry of ICDs may make them more resistant to cellular phones. "There were no cases of ICD reprogramming, pacing inhibition or sensing of extraneous signals," Damle stated. "This suggests that one of these phones can be used and it will not cause the device to shock patients inappropriately or turn off." But Dr. Hans Moore of George Washington University in Washington cautioned, "I wouldn't use that to draw conclusions about other models. With pacemakers, Dr. Roger Carrillo found a wide range of responses between different devices" (see *MWN,* M/J96). Moore noted that his own lab had found Ventritex ICDs less susceptible to cellular phone interference than some other types. Two other papers presented at the NASPE sessions reported that ICDs did not appear vulnerable to other forms of EMI. Strong magnetic fields have been one source of concern—for instance, those generated by antitheft monitors. Dr. Marshall Stanton reported on a recent study at the Mayo Clinic in Rochester, MN, in which a degaussing coil was held four to six inches away from three brands of ICDs in a total of 12 people. Interference occurred in only two devices, and was never triggered at less than 2.5 gauss. In a study of ICDs and cellular phone base stations, a team led by Dr. Charles Gottleib at the Allegheny University Hospitals in Philadelphia observed a Ventritex ICD at distances from 20 to 1000 feet away from the tower. No interference was observed. But users of ICDs have more to worry about than

"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

• In an antitrust case brought by Hydrolevel Corp., the U.S. Supreme Court rules that the American Society of Mechanical Engineers is liable for the actions of its committee members, prompting a reorganization of voluntary standard-setting groups.

• Two English researchers report in *Nature* that a 500 Hz pulsed magnetic field stimulates the release of noradrenaline from PC12 cells.

• In a unanimous decision, a New York appeals court upholds a workers' compensation award to the widow of Samuel Yannon, who worked near microwave transmitters on top of the Empire State Building.

Years 10 Ago

• A report from the Hawaii Department of Health finds "significantly higher" cancer rates near broadcast towers in Honolulu than in nearby areas without towers.

• The Cancer Research Center of Hawaii reports that, between 1979 and 1985, there were more than four times the expected number of leukemia cases among children living within five miles of the U.S. Navy's communications complex at Lualualei.

• A Denver FM radio station agrees to reduce broadcast power from 100 kW to 1 kW at a campsite where its tower is located.

Years 5 Ago

• In the first case of its kind, Susan and David Reynard sue NEC America Inc. and GTE Mobilnet, claiming the use of a cellular phone promoted the development of Susan's brain tumor.

• The U.S. House of Representatives names the National Institute of Environmental Health Sciences as the lead federal agency for EMF health effects research, replacing the Department of Energy.

• Researchers at the University of Zagreb in Croatia find epidemiological and laboratory evidence pointing to similar genetic effects from exposure to microwave radiation.

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Time after time,
***Microwave News* breaks the story:**

Microwave News, July/August 1995

"Draft NCRP Report Seeks Strong Action To Curb EMFs"

"Leak Links Power Lines to Cancer"

New Scientist (U.K.), October 7, 1995

MWN

Microwave News, July/August 1994

"Digital Cellular Phones Can Disrupt Implanted Pacemakers"

"Cellular Phones May Affect Use of Pacemakers"

Wall Street Journal, April 28, 1995

MWN

Microwave News, November/December 1995

"Higher Leukemia Rates Among Those Living Near Australian TV Towers"

"Living Near TV Towers a Leukemia Risk for Children, Claims Researcher"

Sydney Morning Herald (Australia), December 10, 1996

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cellular phones: At last year's NASPE sessions, Dr. Antonio Madrid of the Ramón y Cajal Hospital in Madrid, Spain, reported on four cases in which ICDs fired due to EMI from slot machines.

MEETINGS

Breast Cancer Conference... Dr. Bary Wilson of the Battelle Pacific Northwest Labs, who is now based in the United Arab Emirates, will be among the featured speakers at the *1st World Conference on Breast Cancer* in Kingston, Ontario, Canada, July 13-17. The conference is being coordinated by the New York-based Women's Environment & Development Organization (WEDO) and the Kingston Breast Cancer Conference Committee with the theme "Joining Together to Prevent Cancer." July 16 is devoted to environmental factors. Wilson and Dr. Meike Mevissen of the School of Veterinary Medicine in Hannover, Germany, will participate in an afternoon workshop. Mevissen has long collaborated with Dr. Wolfgang Löscher on studies of breast cancer among EMF-exposed animals. Later that day, Cindy Sage of Sage Associates, an environmental consulting firm in Santa Barbara, CA, and Dr. Kjell Hansson Mild of the National Institute for Working Life in Umeå, Sweden, will lead a workshop on EMF public policies. In addition to EMFs, the environment day is slated for addresses on ionizing radiation and pesticides. For more information, contact: WEDO, 355 Lexington Ave., New York, NY 10017, (212) 973-0325, Fax: (212) 973-0335, E-mail: <wedo@igc.apc.org>; or look up <www.wedo.org> on the World Wide Web.

HPS Summer School... This year's Health Physics Society (HPS) summer school is devoted to *Non-Ionizing Radiation: An Overview of the Physics and Biology.* Dr. Martin Meltz of the University of Texas Health Science Center in San Antonio is one of the organizers of the five-day course, which will be held in San Antonio, June 23-27. Among the scheduled speakers are other members of the university's faculty, as well as a number of staffers at the Armstrong Lab at nearby Brooks Air Force Base. Battelle's Larry Anderson, attorney Robert Manor and Lucent Technologies' Ronald Petersen are also scheduled to speak. For registration information, contact: HPS, (703) 790-1745, Fax: (703) 790-2672; E-mail: <hpsburkmgt@aol.com>. For a copy of the program, contact: Meltz, (210) 567-5560, Fax: (210) 567-3446. E-mail: <meltz@uthscsa.edu>. The HPS annual meeting follows the summer session.

MILLIMETER WAVES

No Damage Found to Rabbit Eyes... After repeated exposure to millimeter-wave radiation at 60 GHz, rabbits' eyes showed no signs of damage, according to researchers at Johns Hopkins University's Applied Physics Laboratory in Laurel, MD. The work was funded by Hewlett-Packard Co. (HP), which is developing a new class of wireless computer networking devices that would operate over short distances at 59-64 GHz (see *MWN,* M/A 96). Henry Kues, who led the study, had previously found damage to primate eyes at frequencies between 0.9 and 2.45 GHz. "It is extremely important to evaluate the biological absorption and potential health hazards at the specific frequencies of interest rather than attempting to extrapolate data gathered at other frequencies," Kues wrote in his report to HP in January. Below 24 GHz,

he noted, past research has shown a clear relationship between frequency and the depth of penetration into biological tissue. But above 24 GHz, "the absorption of energy and the depth of penetration appear to depend on a complex relationship between the conductivity and permittivity of the specific tissues being irradiated." In Kues's most recent experiment, each rabbit had one eye exposed to continuous 60 GHz waves at a power level of 10 mW/cm^2, the same power at which Kues had observed damage at lower frequencies. "We were very thorough in looking for any effect, whether transitory or longer-term," Kues said, but none was found. In his report, Kues advocated repeating the experiment with primates instead of rabbits. In early May, Kues told *Microwave News* that HP will fund a study with a small number of rhesus monkeys. "We're gearing up to do the exposures now," he said, "and expect to conclude the work in about three months." In his studies between 0.9 and 2.45 GHz, Kues had found that pulsed signals caused much more damage than continuous-wave radiation, and that drugs used in the treatment of glaucoma had a synergistic effect that could result in damage at power levels down to 1 mW/cm^2. HP is not interested in funding research on pulsed millimeter waves or on combined effects with ocular drugs, said Kues. "But they have gone to other companies to help us secure funding on those two issues," he added. The device HP plans to market uses continuous waves only. "Now that we have the protocols," Kues noted, "it would be fairly easy to do similar research on other devices."

NAS-NRC

Committee and Staff Changes... The National Academy of Sciences-National Research Council committee reviewing research conducted under the RAPID program has been reshuffled. Dr. John Ahearne, director of Sigma Xi in Research Triangle Park, NC, succeeds Dr. Charles Bean of Rensselaer Polytechnic Institute in Troy, NY, as chairman. Also joining the committee are Dr. Raymond Erickson, a biologist at Harvard University in Cambridge, MA, Dr. Peter Marler of the Animal Communication Lab at the University of California, Davis, and Dr. Thomas Tenforde of the Battelle Pacific Northwest Labs in Richland, WA. Dr. Jerry Williams of the Johns Hopkins University Oncology Center in Baltimore has left the committee. Dr. Steven Simon, a specialist in ionizing radiation, has joined the staff of the NAS-NRC's Board on Radiation Effects Research after five years in the Marshall Islands. He replaces Dr. Larry Toburen. The board's Dr. Evan Douple takes over as director, replacing Dr. John Zimbrick, who is now at Purdue University in West Lafayette, IN.

PEOPLE

Dr. **Russell Owen** has officially taken over as the chief of the Radiation Biology Branch at the FDA's Center for Devices and Radiological Health in Rockville, MD. Owen has been serving as acting chief since October 1995, after Dr. **Mays Swicord** resigned to join Motorola....Dr. **Jack Sahl** is planning to leave Southern California Edison, where he is the manager of health research, at the end of the summer. Sahl said that he will continue to work on health and safety issues, but "not primarily on EMFs."...Dr. **Peter Semm** has left German Telekom and is now doing research at Frankfurt University....**John Graham** of the Harvard

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School of Public Health in Boston has been elected to the NCRP. Drs. **John Boice Jr.** of the International Epidemiology Institute in Rockville and **William Hendee** of the Medical College of Wisconsin in Milwaukee were reelected to the council....**George Oram Jr.** has resigned as president of OrthoLogic Corp. in Phoenix. In May, a search for a new president was continuing....**Michael Volpe** is no longer working as spokesperson for WTR. **Susan O'Donnell**, WTR's public affairs manager, now handles press relations. In late May, Volpe told *Microwave News* that he has not been paid for work done in 1997 (see also p.9). "My relationship with WTR is in limbo," he said.

POLICE RADAR

Dismissal of Medical Monitoring Suit Upheld... On March 24 an Illinois appeals court affirmed the dismissal of *Blesy v. Kustom Signals Inc.,* a class-action suit against several makers of traffic radar devices. The suit was filed three years ago by Harold Blesy and several other police officers with cancer, but unlike in other police radar litigation, the plaintiffs did not ask for damages for their disease or try to prove that it had definitely been caused by the radar units, which they used on the job (see *MWN,* M/A95). Instead, they asked for the creation of a medical monitoring fund "in order to detect the onset of illness" in the future, arguing only that the radar units had exposed them to an increased health risk. But the Appellate Court of Illinois in Chicago found that "a significantly increased risk is not a compensable injury in Illinois," and upheld a lower court's dismissal of the case. The three-judge panel ruled that any lawsuit could only be based on disease or injury that the officers had already suffered. Mark Oium of O'Connor, Cohn, Dillon & Barr in San Francisco, one of Kustom's lawyers, told *Microwave News* that *Blesy* was the 23rd lawsuit against Kustom that has been "dismissed without payment of any judgment or settlement." The attorneys for Blesy and the other police officers, Philip Fertik and Norman Rifkind of Biegel, Schy, Lasky, Rifkind, Goldberg & Fertik in Chicago, declined to comment on the decision, and would not say whether they planned to appeal.

RADIATION ACCIDENT

Zapped on a TV Tower... In June 1993, three men were accidentally exposed to high levels of UHF radiation while servicing a TV transmitter in the U.K. The men were in the antenna's near field and were exposed to 785 MHz radiation at a power level of approximately 50 mW/cm^2 or higher for between 50 seconds and 2.5 minutes. All three experienced "an immediate sensation of intense heating," followed by pain and a reddening of the skin, like a sunburn, in those areas of the head most exposed, according to Dr. Christopher Schilling, an occupational health consultant in London, U.K. An hour after the accident, the three men began to have severe headaches. For the two most exposed, the headaches were still a problem three years later. Writing in the April 1997 issue of *Occupational and Environmental Medicine (54,* pp.281-284), Schilling reports that it took a year for these two men to feel better, "particularly from the feelings of lassitude and general malaise." Even the least-exposed worker complained of facial discomfort 18 months after the accident. For reports of other RF/MW radiation accidents, see *MWN,* N83, D84, J/A86, J/F88, J/A88, N/D90, N/D92 and M/J93.

not by hiding what little we have. Had the results of the Telstra study been made public when the experiment was finished, attention would have been focused on the need for further research—and we would know more today.

Repacholi insists that the secrecy was necessary to ensure a careful, deliberate consideration of his findings (see p.13). This won't wash. Presenting important findings at scientific conferences is itself an important part of peer review.

In our last issue we wrote, "If he has found evidence of a cancer risk, Repacholi's secrecy would be scandalous." We have little to add. But the problem is bigger than the conduct of any one researcher: Almost all health studies on cellular phones are sponsored by the cellular industry and safety standards are based on the resulting information—or, more often, the lack of it.

This situation is a breeding ground for ethical lapses. There is no reason why Telstra should see health information months—or even years—before anyone else. It must have helped Telstra figure out how to spin the news. But that hardly serves public health.

If the cancer risk found in the Telstra study was observed for a chemical, U.S. law would require that it be "immediately" reported to the Environmental Protection Agency. Not two years later, not two months later, but "immediately."

Telstra is not alone in stifling the free flow of information. Deutsche Telekom, France Telecom and other European companies act as though the results of company-sponsored research were trade secrets. Journalists' inquiries are routinely ignored.

And keeping data under wraps is only one way to achieve delay. In the U.S., the cellular phone industry has managed to avoid even beginning the research. After four years and $18 million, Wireless Technology Research (WTR) has yet to start a single biological study (see p.6). While disappointing, this is no surprise. WTR was established by the industry to serve its own needs: to control the process and avoid having the Food and Drug Administration (FDA) in charge of research (see *MWN,* J/A93).

Motorola's research program shows how much more could have been done. It has moved faster than WTR and sponsored some important work. Yet Motorola is hardly a disinterested defender of public health. The company has sought to manipulate both the research and the public's perceptions. At times, Motorola has muzzled its own scientists (see *MWN,* M/A97; also J/A96).

Who Will Revise the Health Standards?

We have been stonewalled so often that it is natural to ask: Why is industry afraid of research? The answer goes beyond any single product: Existing RF/MW safety standards are unreliable. And the more research is done, the clearer that will become.

Current exposure limits on non-ionizing radiation all have one thing in common: They are based only on possible *thermal* effects—the heating of tissue, as in a microwave oven. The engineers, physicists and others on the committees that wrote these standards—ANSI/IEEE, IRPA/ICNIRP, NCRP—have argued that at nonthermal levels, RF/MW radiation simply does not have enough energy to have a significant biological impact.

One who held this view was Repacholi himself, who until recently was the chair of ICNIRP. Now he has changed his position, and says that his Telstra study demonstrates "a true nonthermal effect." When a card-carrying member of the "thermalist" club defects, others are likely to follow.

The Telstra study is far from the only evidence of nonthermal RF/MW bioeffects. It is, in fact, the *third* animal study to show an influence on cancer, and it joins important work by Adey, Becker, Cleary, Guy, Hocking, Kues, Lai, Milham, Persson, Salford, Singh, Szmigielski, Tofani, Verschaeve and others. The position that nonthermal bioeffects do not exist has been untenable for some time—but as science historian Thomas Kuhn pointed out, old paradigms do not die fast or willingly.

As the evidence for nonthermal effects increases, pressure for revising exposure standards will grow. And just as we cannot trust industry to take care of wireless safety research, we cannot allow industry-controlled committees to set safety standards. If human health is our objective, public health agencies should be in charge. Both research and exposure limits must come under their direction.

Unfortunately, public health agencies are also invested in the *status quo*. In Germany, for example, the first reaction of the Federal Radiation Protection Office to the Repacholi study was to declare, "There is no scientifically supported reason to change the existing limits." And in the U.S., the FDA has declined to criticize WTR's lack of progress (see p.7).

Since government agencies have largely ceded the field of wireless safety to private corporations, they are now reluctant to admit that there are any problems. Governments may not want to take charge of wireless safety research and standards—but we should demand that they do so anyway.

The distortion of health research has recently gotten some much-needed attention. A commentary in the April 17 *New England Journal of Medicine* warns of cases in which "special-interest groups block or delay the publication of unwanted findings." It adds that, "The huge financial implications of many research studies invite vigorous attack."

The *Journal* article gives several examples, such as the lead industry's intimidation of researchers "through coordinated attacks at scientific meetings." But the financial stakes in those conflicts look like spare change next to the money involved in the wireless safety debate.

If the Telstra study is replicated, it will be clearer than ever that existing RF/MW safety limits must be thrown out the window. What will replace them? That will be the subject of a prolonged battle. And for the telecom industry, it will not be an academic argument. It will be a holy war.

Old paradigms die hard—especially when there are billions of dollars at risk.

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MICRO WAVE NEWS

Vol. XVIII No. 3 A Report on Non-Ionizing Radiation May/June 1998

INSIDE...

EMF NEWS pp.2-6

Power Line Talk:
DOE EMF Research May Continue • EPRI's Science Advisors • State Courts Diverge on Injury Suits • RAPID Research on Internet • More on Breast Cancer Animal Studies

The Talk of Phoenix and Charleston: Searching for "Real World" Transients

Survey Says: Most Americans Exposed to Less than 1 mG, But 1 Million Above 10 mG

Indiana Bank Settled Power Line Damage Suit

EPRI Weighs Epidemiological Study on Workplace EMFs and Female Breast Cancer

Ahlbom, Feychting and Savitz Critical of NCI on Power Line Study, p.13

HIGHLIGHTS pp.6-10

Norwegian Navy Report on Birth Defects Cluster: Cover-Up Alleged

U.K.'s NRPB To Hold Dosimetry Workshop

Japan Boosts EMF & RF/MW Health Research

First Cell Phone Brain Cancer Claim in U.K.

Australia and New Zealand Retain "Flat" Standard for RF/MW Exposures

Vermont Law Helps Towns Control Towers

Japanese Digital Phone Radiation Study: No Promotion of Liver Cancer in Rats

Do German GSM–Sleep Studies Show a Dose-Response Trend?

FROM THE FIELD pp.14-15

Medical Device EMI: Letter and Report

Clippings from All Over

Flashback: 5, 10, 15 Years Ago

UPDATES pp.16-18

Pacemaker EMI: Safe Distance from Cell Phones Redux • Auto Exhaust and Childhood Cancer • More on Comet Assay Sensitivity • Suit Charges Human Tests of MW Weapons • New Faces on NAS–NRC RAPID Panel • EMF Risk Proceedings • People in the News

VIEWS ON THE NEWS p.19

The Deep Roots of Public Skepticism

NCI Study Links Appliance Use and Childhood Leukemia

But Institute Calls EMF Effect "Unlikely"

Children's use of several types of electrical appliances was associated with significant increases in the risk of leukemia in a new study by the National Cancer Institute (NCI). But the NCI argues that it is "unlikely" that electromagnetic fields (EMFs) are the cause.

The NCI study on appliances and acute lymphoblastic leukemia (ALL) used the same cases and controls as its 1997 power line study. For electric blankets, hair dryers and video games, most of the increases in risk were statistically significant, including all those for children with the most years of exposure. There was, however, no clear increase in risk with years of exposure (see table, p.12).

Watching television and using curling irons, microwave ovens or sound systems with headsets were also linked to some significant increase in the risk of ALL, the most common form of leukemia among children.

The NCI team also found some increased risks among children whose mothers used certain appliances during pregnancy. Children whose mothers had used electric blankets while pregnant had a 59% higher risk of ALL, a statistically significant finding. Significant risks were also found for children whose mothers had used heating pads or humidifiers during pregnancy.

"The inconsistencies in the data and the lack of a dose-response trend make us think that EMFs are not likely to be the cause," Dr. Elizabeth Hatch of the

(continued on p.12)

More Calls Mean More Headaches in Scandinavian Cell Phone Study

Heavy users of cellular phones had more headaches and other subjective symptoms in a recent Swedish-Norwegian study. Complaints increased along with calling time, indicating a clear dose-response trend.

About 12,000 Swedish and 5,000 Norwegian mobile phone users took part in the study, which was led by Drs. Kjell Hansson Mild of Sweden's National Institute for Working Life (NIWL) in Umeå and Gunnhild Oftedal, now with the Norwegian University of Science and Technology in Trondheim.

Dose-response trends were observed for a variety of symptoms. "The trends reached statistical significance for warmth sensations behind and on the ear, headache, fatigue and burning sensations in the facial skin," Mild told *Microwave News*.

In Norway, for example, when compared to those who used a mobile phone less than 2 minutes a day, the risk of headaches doubled for those with 2-15

(continued on p.11)

« Power Line Talk »

A lobbying campaign to save the **DOE EMF research** program appears to be having some success. There is now a chance that the program may not close down in September, as DOE had originally planned (see *MWN,* M/A97). On April 2, **Shirley Linde** and Dr. **Peter Bingham** of the National EMF Advisory Committee (**NEMFAC**) met with **Dan Reicher**, the DOE Assistant Secretary for Energy Efficiency and Renewable Energy, to plead the case. Bingham argued that, "There is a convergence of opinion that the work should continue," he later told *Microwave News.* In an interview, Bingham pointed to the incontrovertible evidence of EMF cellular effects. "We must persevere and understand this more and decide the public health implications," he said. Bingham, who recently retired from **Philips Labs** in Briarcliff Manor, NY, explained that, "Within the company, a number of my colleagues do believe we owe it to our customers to ensure that our products are safe." Speaking at the NEMFAC meeting in Washington on May 8, Bingham echoed what he had told Reicher: It would be a "national disgrace" if the program was not kept in place. At the April 2 meeting, Linde presented Reicher with more than 1,000 signatures of breast cancer activists and survivors who support more DOE EMF research. The petitions had been collected by **Nancy Evans** of San Francisco, a member of the Breast Cancer Fund's board. Linde, the chair of NEMFAC, said that Reicher appeared to be receptive and that she was cautiously optimistic. But, she stressed, Reicher had made no promises to keep the program in place. Reicher has also been the target of a letter-writing campaign. On April 24, Rep. **Nancy Pelosi** (D-CA) wrote to Reicher to point out that closing down the DOE program "could cause the U.S. to lose the immeasurable expertise of these scientists and their historical understanding of EMF exposure and health effects." Dr. **Ross Adey** of the University of California, Riverside, who has long received DOE support for his EMF research, had made a similar case in a March 28 letter to DOE Secretary **Federico Peña**. His letter also argued that knowledge of potential hazards could lead to therapeutic applications of EMFs. The decision on whether to save the program has been complicated by Peña's decision to leave the DOE in June and by the fact that President Clinton has not yet named a successor. In a May 14 reply on behalf of Peña, Reicher told Adey that, "[I]n light of remaining public concern as well as new scientific results, some of which you outline in your letter, we are presently considering possibilities for a continued federal EMF research effort."

«« »»

The Scientific Advisory Committee for **EPRI**'s EMF research program has some new members. In fact, half of the panel has joined in the last three years. New since 1995 are Drs. **Jennifer Kelsey** of Stanford University in Stanford, CA, **Susan Preston-Martin** of the University of Southern California in Los Angeles, **Charles Stevens** of the Salk Institute in La Jolla, CA, **Roger Webb** of the Georgia Institute of Technology in Atlanta and **Jerry Williams** of the Johns Hopkins Oncology Center in Baltimore. EPRI refused to say exactly when the new members joined the committee. After discussing the matter with the head of EPRI's EMF research, Dr. **Leeka Kheifets**, spokesperson **Barbara Klein** told *Microwave News* that this information is "confidential." She explained that, "We don't just give it out." Stevens, who chaired the **National Academy of Sciences** panel on EMFs that issued its report in 1996, is also a member of **Motorola**'s advisory board on product safety (see *MWN,* J/F98).

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It's now a matter of law in California: You can't file a civil suit over a power line EMF personal injury claim. In 1996, the state's Supreme Court ruled in the ***Covalt*** case that the **California Public Utilities Commission** (CPUC) had sole jurisdiction over EMF property disputes (see *MWN,* M/J95, S/O95 and N/D96), and an appellate court later applied the same logic to the ***Ford v. PG&E*** brain cancer case (see *MWN,* M/A95, M/A97 and J/F98). On March 18, the California Supreme Court refused to consider an appeal in *Ford,* leaving the CPUC in charge of personal injury cases as well. But it is unclear what impact this will have beyond the borders of California. On March 20, an Indiana judge rejected the idea that the **Indiana Utility Regulatory Commission** should decide all EMF claims in that state. Lawyers for **Indiana Michigan Power Co.** called the *Covalt* decision "thorough and well reasoned," but could not convince the Marshall County Circuit Court to follow the California courts and dismiss the suit by **Raymond** and **Tina Runge** (see also p.5).

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Summaries of the research projects on EMF bioeffects sponsored by the **RAPID** program are now available on the Internet. Go to: <www.niehs.nih.gov/emfrapid/html/resinfo.htm>.

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The **breast cancer** studies by **Germany**'s Drs. **Wolfgang Löscher** and **Meike Mevissen** were the subject of the most contentious exchanges at the NIEHS' *in vivo* EMF research symposium, held in Phoenix, April 6-9. Some progress was made—for instance, there was general agreement that while Löscher and Mevissen had not seen a significant increase in tumor incidence or in tumor multiplicity (number of tumors per animal), they had found a flux-dependent increase in tumor growth. But a number of those in Phoenix do not think that the observed increase points to any real health hazard. At one point, Dr. **Gary Boorman**, who is more and more openly skeptical that EMF animal studies show any cancer risk, presented a table showing that out of six initiation-promotion studies conducted at exposures of 50 Hz and 1 G, five had found no effects. But one study was quickly deleted because it had, in fact, been done at 100 mG. Boorman, who directs the EMF RAPID program at the NIEHS, apologized, saying that he had been up until 3 a.m. the previous night assembling the list. Then Dr. **Larry Anderson** dismissed another of the studies, which he had himself conducted at the Battelle labs in Richland, WA. Anderson pointed out that in this 13-week exposure study, the controls had received too much initiator (the carcinogen DMBA) to leave room to show any promoting action of the magnetic field (see *MWN,* M/A98). Boorman's tally

was now three of four showing no effect. Löscher was not pleased with Boorman's table: "You left out the dose-response studies. What is the chance that the dose-response [we found] is just nothing?" he asked. "I think it's possible," Boorman replied. Some, like Dr. **Jerry Williams** of Johns Hopkins University in Baltimore, argued that chronic bioassays were "more relevant" than initiation-promotion studies and that those bioassays had essentially shown no increased risk from EMF exposure. Others disagreed. Dr. **Hiroshi Yamasaki** of the International Agency for Research on Cancer in Lyon, France, said that the DMBA studies are "very important, because we are all exposed to carcinogens." In any case, he told *Microwave News,* "The German studies are too credible to throw away." For his part, Williams said in an interview that, "If EMFs have a biological effect, it is small, subtle and complex." When it was time to go home to Hannover, Löscher commented that he had been "very frustrated, because people tried to introduce a false interpretation to our data." Still, he said, it had been "a constructive meeting."

The Talk of Phoenix and Charleston: Searching for "Real World" Transients

"The more careful we are to make sure that the exposures are sinusoidal—with no transients—the less and less effects we see. It's almost blatant," said Dr. Larry Anderson at the third, and last, NIEHS science symposium,* held in Phoenix in April.

Anderson, of the Battelle labs in Richland, WA, made his comments during a discussion of EMFs and melatonin. The 40-odd participants agreed that while controlled laboratory experiments on humans and animals have yielded mixed results, all five observational studies of humans exposed to EMFs at work or at home do show a reduction in melatonin levels (see *MWN,* M/A97).

This distinction between such laboratory and environmental exposure studies parallels that between animal and epidemiological studies of EMFs and cancer. Overall, both residential and occupational epi studies show a small but consistent EMF–cancer risk, but controlled animal experiments tend not to. At the NIEHS *in vivo* effects symposium in April, only Dr. Wolfgang Löscher reported consistent EMF effects in his animal studies—and these are controversial (see p.2 and *MWN,* M/A98).

Part of the answer to this apparent paradox could be that the electromagnetic environment that people actually experience day to day is not well represented by pure sinusoidal 50 or 60 Hz magnetic fields. That is, transients or some other, more complex EMFs may be responsible for the observed effects.

To test this hypothesis, the NIEHS last year asked Dr. David McCormick of the IIT Research Institute (IITRI) in Chicago to see if harmonic, transient or intermittent EMFs could alter pineal function in live rats (see *MWN,* J/F97). In Phoenix, McCormick announced that his melatonin results were "uniformly negative." These results will be presented at the *Annual Meeting of the Bioelectromagnetics Society* in St. Petersburg Beach, FL, June 7-11.

McCormick's new findings might have appeared to put the transient hypothesis to rest. But another Phoenix participant, Dr. Antonio Sastre of the Midwest Research Institute in Kansas City, MO, pointed out that IITRI's exposure facility could not in fact generate most of the transients that occur "in the real world."

"The IITRI exposures resemble 'real world' transients about as faithfully as Ken and Barbie resemble real men and women," Sastre told *Microwave News.* He explained that the IITRI facility was "artificially bandwidth-limited," because it generated transients with a frequency content that stopped at a few kilohertz. In the real world, he said, frequencies can reach hundreds of kilohertz, if not the low megahertz range.

There are indeed an infinite variety of transients in the real world. These short, intense pulses, or spikes, of energy are quite different from gently undulating sine waves, at least in part because of their high frequency components.

William Feero of Electric Research and Management Inc. (ERM) in State College, PA, who designed the IITRI facility, confirmed that it could only generate transients with frequencies up to 2 kHz. Feero explained that the reason was largely budgetary. "High frequency transients are doable in a lab," he said in an interview, "but it's not cheap."

The transients used by IITRI were collected in a real world environment and then "replayed" to the lab animals, as Fred Dietrich of ERM's Pittsburgh office noted at the DOE engineering symposium,† held in Charleston, SC, at the end of April. But when challenged by Sastre, Dietrich conceded that they were all "low frequency," with no "fast" transients.

The distinction between the two is significant. As the frequency content of the transients goes up (at least up to about 100 kHz), so does the ability of living cells to detect the signal, thus eliminating the objection of some physicists who claim that environmental EMFs are drowned out by the background level electromagnetic noise in the human body (see *MWN,* S/O95).

How common are slow and fast transients in the environments where people live and work? No one really knows. The DOE RAPID engineering program has essentially ignored them. "Nobody has yet done a decent transient dosimetry study for an average person in the normal environment," Feero said.

But Sastre pointed to a survey of more than 5,000 transients in 21 homes by Dr. Jeffrey Guttman of Enertech Consultants in Campbell, CA, which found that virtually all had frequency components above 10 kHz (see also *MWN,* M/A94 and S/O95).

In 1994, Dr. Gilles Thériault of McGill University in Montreal, Canada, put a spotlight on the transient issue when he reported a strong association—with a clear dose-response—between exposures to high frequency transients and the incidence of lung cancer among electric utility workers (see *MWN,* N/D94).

At the Charleston meeting, Charles Boeggeman, of PECO Energy in Plymouth Meeting, PA, asked why no one has looked at possible confounding of power line epidemiological studies

* *Clinical and* In Vivo *Laboratory Findings,* organized by the National Institute of Environmental Health Sciences (NIEHS), Phoenix, AZ, April 6-9, 1998.

† *EMF Engineering Review Symposium,* organized by the Department of Energy (DOE), Charleston, SC, April 28-29, 1998.

by high frequency signals. Part of the answer is that Hydro-Québec, the Canadian utility that owns Thériault's transient data, took it away from the McGill group and barred further analyses by any researchers other than its own (see *MWN,* N/D94).

While university researchers are still denied access to these data, Hydro-Québec's own researchers are trying to identify possible sources of electromagnetic transients. Dr. Michel Plante and coworkers at IREQ, Hydro-Québec's research arm, plan to present their findings at the IEEE's *1998 Summer Meeting of the Power Engineering Society* in San Diego on July 14.

Even though the future of EMF research is cloudy in the U.S., with no government funds committed for next year, work on transients is seen by many as a priority. "We need to deal with transients," said Dr. Daniel Driscoll of the Department of Public Service in Albany, NY, at the Charleston meeting.

And in Phoenix, Dr. Gary Boorman, who leads the RAPID program at the NIEHS, told *Microwave News,* "I think we made a mistake not looking at transients and breast cancer."

Most Americans Are Exposed to Less than 1 mG, But More than 1 Million Average Over 10 mG

The majority of the U.S. population is exposed to power frequency magnetic fields that average less than 1 mG. More than 6% are exposed to more than 3 mG, however, and some 1 million Americans are exposed to average fields greater than 10 mG.

These are some of the findings of the most detailed measurement survey ever undertaken (see Table 1). Dr. Luciano Zaffanella of Enertech Consultants in Lee, MA, who led the project, presented the survey results on April 29 at the Department of Energy's *EMF Engineering Review Symposium* in Charleston, SC. The project was commissioned by the EMF RAPID program.

The study involved more than 1,000 people, who wore magnetic field meters for 24 hours while keeping diaries of their activities. The meters sampled the fields over the frequency range 40-1,000 Hz every half-second. The results presented here are time-weighted averages.

Some of the other key findings are:

• About 26% and 9% of the people spend more than 1 hour in fields greater than 4 mG and 8 mG, respectively;

• About 1.6% of the people are exposed to at least 1,000 mG during the 24-hour period;

• About 3% of the students are exposed on average to more than 2 mG at school;

• The greatest average fields were recorded at work and the lowest average fields were recorded at home in bed (see Table 2);

• There is essentially no difference between the exposures of men and women;

• Exposures are very similar in different regions of the country;

• Electrical and service occupations have the highest average on-the-job exposures.

Zaffanella defined electrical occupations in the same way that Dr. Samuel Milham had in his July 22, 1982, letter to the *New England Journal of Medicine,* which first linked worker exposures to EMFs with leukemia (see *MWN,* J/A82). Electrical occupations include electricians, power station operators and line workers. Those in the service sector include cooks, housekeepers, policemen, prison guards and waiters. Zaffanella pointed out that those working in fast-food jobs may be exposed to high fields from a host of electrical appliances.

Zaffanella also noted that the frequency content of exposures at school is different from that at home: There is a "much higher" contribution from the third harmonic (180 Hz) at school "due to the widespread use of fluorescent lights."

"Our results are not that different from those of our 1,000-home study," said Zaffanella, comparing his new results with those from his 1993 survey for the Electric Power Research Institute (see *MWN,* J/F94 and M/J96).

Dr. Dan Bracken, a consultant based in Portland, OR, who organized the Charleston meeting, is assembling a book with the results of the EMF RAPID research projects. The final reports of each project will also be available from the National Technical Information Service in Springfield, VA, (703) 605-6000, Internet: <www.ntis.gov>.

Table 1: Estimated Average Magnetic Field Exposures of the U.S. Population*

Average 24-Hour Field (mG)	Population Exposed (%)	95% Confidence Interval (%)	People Exposed (millions)
>0.5	76.3	73.8-78.9	197-211
>1.0	43.6	41.0-46.5	109-124
>2.0	14.3	11.9-17.2	31.8-45.9
>3.0	6.3	4.8-8.3	12.8-22.2
>4.0	3.35	2.4-4.7	6.4-12.5
>5.0	2.42	1.67-3.52	4.5-9.4
>10.0	0.43	0.21-0.90	0.56-2.4
>15.0	0.1	0.02-0.55	0.05-1.5

*Based on population of 267 million

Table 2: Magnetic Field Exposures for Various Activities (in mG)

	Home	Bed	Work	School	Travel	24-Hour
Subjects*	1,010	996	525	139	765	1,012
50th %ile†	0.75	0.48	0.99	0.60	0.98	0.87
90th %ile	2.49	2.44	3.32	1.64	2.18	2.38
95th %ile	3.89	3.63	5.00	1.77	2.73	3.38
Mean (SD‡)	1.29 (2.54)	1.11 (2.06)	1.73 (3.09)	0.82 (0.70)	1.22 (0.99)	1.25 (1.51)

*Number of participants with valid data †Percentile ‡Standard deviation

Bank Made $50,000 Settlement in Indiana EMF Property Lawsuit

An Indiana bank agreed to a $50,000 settlement of a power line lawsuit that appears to be the only case of its kind. After financing Raymond and Tina Runge's purchase of a home, the bank became the target of their EMF suit in 1991. The settlement came about a year later, but was little noticed at the time.

The Runges got more attention on March 20 of this year, when a state judge refused to dismiss their separate lawsuit against Indiana Michigan Power Co. (I&M). While the court found that there was insufficient evidence that EMFs from a 345 kV I&M power line in the Runges' backyard had caused their medical problems, their claims of negligence, failure to warn and infliction of emotional distress were allowed to stand (see also p.2).

The Runges moved into the Middlebury, IN, house in March 1989, after purchasing it for approximately $61,000. They say they experienced repeated shocks from stray voltage while walking in the backyard. Tina Runge's obstetrician advised her to move after she suffered a miscarriage in December 1989, citing reports of EMF-related pregnancy loss in experiments with mice. Her husband's physician urged him to move as well. Raymond Runge has metal sutures and clips in his skull, which hold a permanent plastic plate in place, and his doctor was concerned that induced currents in the metal might cause seizures or brain damage.

The family filed suit against I&M in 1990. But in 1991 the Runges opened a new page in EMF litigation when they sued Ameritrust National Bank of South Bend, IN, which held the mortgage on their home. The Runges accused the bank and the title company of failing to inform them fully of the terms of a permanent easement, which I&M had purchased in 1969, allowing the utility to operate high-voltage power lines on the property with few restrictions. I&M built the power line in the property's backyard in 1971.

Around 1992, Ameritrust gave the Runges title to the property, releasing them from the $50,000 still owed on the mortgage.

"We were going to give the house back to the bank, so they could sell it or do whatever they wanted with it," Raymond Runge said in a recent interview. "But we told them, you make sure you disclose all the information we've gathered on the problems we've had to anyone who buys it." The Runges gave Ameritrust copies of the letters from their physicians and EMF measurements taken in the backyard and inside the home, as well as other documentation. Magnetic field readings as high as 30 mG were measured in the Runges' backyard.

"When the bank came back and said, 'The house is yours,' it's our opinion that they just didn't want the liability," said Runge.

The Runges then sold the house at auction for approximately $11,000—on the condition that it be moved to another location. "I didn't want to be responsible for someone else getting exposed to the EMFs," Ray Runge told *Microwave News* this May. "No way in hell was I going to put any other family through what we went through." Ironically, he and his wife still own the land. "What I'd like to do is donate it for EMF research," Runge said.

Key Bank of South Bend, IN, which has absorbed Ameritrust, did not respond to a request for comment. Attorney Curt Renner of Watson & Renner in Washington, which is representing I&M, said his firm had not been involved in the suit against the bank, but he suggested that, "The bank may have just decided it was cheaper to settle than to fight it in court."

In their continuing suit against I&M, the Runges charged that a range of medical injuries—including the miscarriage, headaches, sleeplessness, depression and skin rash—were caused by EMFs from I&M's power line. A judge in Marshall County Circuit Court ruled this March that the Runges had failed to present evidence of these claims. But he refused to dismiss the other seven counts of the lawsuit, and specifically mentioned that, "The shocking sensation itself is an injury for which damages may be recoverable."

"We're pleased that the judge agreed with us and dismissed the medical injury claims," said Renner. "This is no longer an EMF case *per se*. It's now an electric shock case." I&M is a subsidiary of one of the largest utilities in the U.S., American Electric Power (AEP) of Columbus, Ohio, but Renner said that AEP is not involved in the suit.

The Runges' attorneys, Robert Palmer and Spencer Walton of May, Oberfell & Lorber in South Bend, IN, maintain that Indiana law "allows the Runges to recover [damages]...for any fear and emotional distress resulting from exposure to excessive magnetic fields resulting from I&M's negligence....This emotional distress was increased by the opinions they received from physicians who advised them to leave the property."

If the judge's ruling is not appealed, Renner said, a trial date is likely to be set for sometime later this year.

EPRI Weighs Study of Female Breast Cancer and EMFs at Work

Next year, the Electric Power Research Institute (EPRI) may launch a major epidemiological study of occupational EMF exposure and breast cancer in women.

EPRI has issued a request for proposals (RFP) for a feasibility study, with responses due by June 15. The winning team will have nine months to develop a detailed plan for the large-scale effort.

"Breast cancer rates are highest in North America and northern Europe and lowest in Asia and Africa," with a 30-fold variation among countries, notes the RFP. "It has been suggested that one factor [in these differences] could be the use of electric power, which leads to higher exposures to light-at-night or to magnetic fields," EPRI states. Both have been reported to suppress the production of melatonin.

There have been few studies of women's exposure to EMFs at work, and EPRI points out that these have often suffered from small numbers and/or poor exposure assessment.

In 1996, Dr. Patricia Coogan of Boston University reported that women in jobs likely to have high EMF exposure had a rate of breast cancer that was 43% higher than other female workers (see *MWN,* S/O96). In 1994, Dr. Tore Tynes, then of the Cancer Registry of Norway in Oslo, found even higher rates in a study of female radio and telegraph operators aboard ships (see *MWN,* J/A94). A 1993 study by Drs. Dana Loomis and David Savitz of

the University of North Carolina, Chapel Hill, found that the risk for female electrical workers was 40% greater than for women in the general population (see *MWN,* N/D93). But a 1995 reanalysis of that same data, by Dr. Kenneth Cantor of the NCI in Bethesda, MD, found no increase in risk (see *MWN,* M/A95).

Last year, Sweden's Dr. Maria Feychting reported ambiguous results from her study of women living in homes near high-voltage power lines, with an indication that EMFs increased breast cancer risk among women who were both under 50 and estrogen-receptor-positive (ER+) (see *MWN,* N/D97).

There are now three ongoing residential studies of EMFs and female breast cancer (see *MWN,* S/O96).

In EPRI's current RFP, researchers are asked to specify how they would ensure a large enough number of subjects at high levels of exposure. They are urged to consider how to include transients in their exposure assessments.

EPRI prefers to sponsor an epidemiological study of workers in the electric utility industry, but it concedes that there may not be enough women with sufficient history of employment in electric industry jobs with high EMF exposures. Thus, proposals to study women in other industries would also be considered.

EPRI expects to decide who will do the feasibility study by the end of July. In 1991, EPRI's Dr. Leeka Kheifets voiced support for such work at an EMF workshop (see *MWN,* J/F91). At that time, three recent studies had linked male breast cancer to EMF exposures on the job (see *MWN,* N/D89, J/A90 and J/F91).

EPRI refused to make a copy of its recent RFP available to *Microwave News*.

HIGHLIGHTS

Norwegian Navy Report on Birth Defects Cluster: Cover-Up Alleged

A bitter controversy has surrounded the Norwegian navy's report* on birth defects among children whose fathers served on the *Kvikk,* a torpedo boat equipped for electronic warfare. Naval officers have accused the government of a cover-up and assert that not all children were counted.

Dr. Jan Helge Halleraker, chief medical officer at Haakonsvern Naval Base in Norway, told *Microwave News* that the navy "found no connection between working on the *Kvikk* and congenital malformations." Halleraker said that all children had in fact been included, and called the criticisms "unfair."

Espen Keim, who was the second-ranking officer aboard the *Kvikk,* said he was not surprised by the official conclusion because, he stated, the Norwegian military is led by "cowards." In remarks to Norwegian newspapers, Keim charged that, "Any other conclusion would have caused a scandal, because NATO and Norway use the same standards." Thus, Keim argued, a different conclusion would have had "wide repercussions."

Keim is the father of three children who were born with birth defects. "Two of my children died shortly after birth. Why are they not counted in the report?" Keim demanded, according to *Aftenposten* (March 3), Norway's largest newspaper.

The article also quotes Admiral Hans Kristian Svensholt, the navy's Inspector General, as saying, "The number of babies with birth defects born to servicemen on board the *Kvikk* during this time period is higher than normal, but the number is not so high as to show a statistical link to radiofrequency and microwave [RF/MW] radiation."

"The research is trustworthy because the most advanced experts at home and abroad have participated," Svensholt told the newspaper *Nationen* (March 3). A NATO conference on the *Kvikk* birth defects cluster was held in Norway last August (see *MWN,* S/O97; also J/A96), and naval personnel from Britain, the Netherlands and the U.S. helped carry out the study.

The report refers briefly to a 1971 study by Dr. Peter Peacock on birth defects among children of helicopter pilots at Fort Rucker, AL, which Peacock suspected were linked to radar exposure. The U.S. Army blocked Peacock from doing further research by denying access to medical records (see *MWN,* J/A96).

Norges Offisersforbund, Norway's labor organization for military officers, supports Keim's criticisms of the report. "It appears that the two deceased children were not included in the statistics," it stated. Erling Petter Roalsvig, a representative of the public employees' federation YS Stat, told *Aftenposten* (March 3) that the navy report appears to have been tailored to fit the desired conclusions.

Halleraker told *Microwave News* that the navy had met with a group of concerned parents to discuss criticisms of the study. After the first couple of days of controversy, the navy announced that parents would be given an opportunity to see the raw data for the study, to ensure that all of their children had been counted.

In an interview with *Aftenposten* (March 8), Admiral Svensholt responded to some of the public criticism. "The report does not state that such [RF/MW] radiation is not dangerous," he said. "It states that no connection can be proven. This conclusion contains an uncertainty."

Despite repeated requests, *Microwave News* was unable to obtain a copy of the report from Halleraker. An English translation, which he said was being prepared for "NATO colleagues," was also not made available. A copy of the report in Norwegian was later obtainedfrom the Ber gen newspaper *Bergens Tidende*.

The report states that out of 85 children born to fathers who served on board the *Kvikk,* the Norwegian navy received reports of 11 who were born with birth defects, although some of these children's fathers served before 1987, at which time high-power antennas were installed on the ship.

"It cannot be concluded that there is any connection between the actual birth defects and the high frequency EMFs on board the *Kvikk,"* the report concludes. It cites epidemiological studies of naval personnel, mapping of fields of RF/MW exposure on board the boat and "relevant medical literature."

** Mulig Sammenheng Mellom Høyfrekvente Elektromagnetiske Felt og Medfødte Misdannelser [Possible Connection Between High Frequency Electromagnetic Radiation and Birth Defects]* (No.633-71331-100-002), February 9, 1998.

U.K.'s NRPB Workshop on Exposure Metrics and Dosimetry

The National Radiological Protection Board (NRPB) is organizing an *International Workshop on Exposure Metrics and Dosimetry for EMF Epidemiology,* to be held September 7-9 in Oxfordshire, U.K. Sir Richard Doll, the country's leading epidemiologist, will chair the meeting, which will address both EMF and RF/MW issues.

The objectives of the meeting include the development of protocols for pooling data from different studies and identifying ways for industry to provide practical assistance.

The workshop is by invitation only. Dr. Alastair McKinlay, the head of the NRPB's non-ionizing radiation department, told *Microwave News* that only "those with extensive expertise in the field" were being invited. Observers and journalists cannot attend, he said. The proceedings will be published.

The NRPB is also sponsoring a one-day course on *Epidemiology of EMFs and Human Health,* to be held on September 10. The speakers will include some of those attending the workshop. The cost of attending the course is £170 (approx. $275). Further details are available on the NRPB's Web site: <www.nrpb.org.uk>.

Among those scheduled to participate at the workshop are: Drs. Anders Ahlbom and Birgitta Floderus of the Karolinska Institute (Sweden), Dr. Q. Balzano of Motorola (U.S.), Dr. Elisabeth Cardis of the International Agency for Research on Cancer (France), Dr. Leeka Kheifets of the Electric Power Research Institute (U.S.), Dr. Martha Linet of the National Cancer Institute (U.S.) and Dr. Mary McBride of the British Columbia Cancer Agency (Canada).

"I have no problem with the report's conclusion, in light of the available data," Dr. Tore Tynes of the Norwegian Radiation Protection Authority in Østerås told *Microwave News.* While Tynes was skeptical that any children had been deliberately left out, he noted that some officers and enlisted personnel "with rather short-term stays on board are not identified and included." He called this "a problem." Tynes previously reported that Norwegian women working as shipboard radio and telegraph operators had an elevated rate of breast cancer (see *MWN,* J/A94).

Dr. Lorentz Irgens of Norway's Medical Birth Registry in Bergen stressed that, "We cannot draw the conclusion that there is no connection between RF/MW radiation and birth defects," according to *Bergens Tidende* (March 5). Registry officials will conduct a study of birth defects among children of all naval personnel who served between 1967 and 1997, examining whether the rate of defects is linked to jobs that involve exposure to RF/MW radiation.

Most of the report's discussion of RF/MW exposure focuses on a 750 W high frequency (2-30 MHz) transmitter. Despite having measured radiation levels in 124 different locations, the navy provides no information on power densities anywhere on the ship. The report does note that when high frequency antennas transmit at 750 W, it is possible to exceed the navy's safety standard. It states that radar antennas on the *Kvikk,* with peak pulse power of 25 kW and 200 kW and operating at 8.5-9.6 GHz, were not a significant source of exposure due to their placement and low average power.

Halleraker told *Microwave News* that the navy is currently conducting a second study of those who had served on the *Kvikk,* using measurements on board to define which jobs caused the most RF/MW exposure. The Navy will attempt to see if any dose-response patterns exist.

Japan Boosts Research on EMFs and RF/MW Radiation

Public and scientific interest in the possible health effects of non-ionizing radiation are on the upswing in Japan. The government has increased support for EMF and RF/MW radiation health research with the participation of a number of its ministries and of scientists around the country.

A fresh round of activity began when the current fiscal year started in April. The Ministry of Trade and Industry is sponsoring EMF–cancer animal studies and the Japanese Environment Agency is planning an EMF epidemiological study. The Ministry of Posts and Telecommunications (MPT) is looking into RF/MW bioeffects.

Japanese officials have been reluctant to disclose specific figures for funding, but a source at the MPT said that $300,000 was allocated in 1997 and $400,000 was earmarked for 1998. (In Japan, researchers' salaries are generally not included in project budgets.)

Last December, the MPT outlined plans for a five-year program. It has established a committee of 17 scientists, drawn primarily from universities and medical centers, to direct the effort. The MPT has also formed a study group to update Japan's RF/MW exposure guidelines.

The Environment Agency's National Institute for Environmental Studies (NIES) in Ibaraki is conducting a feasibility study for an EMF–childhood cancer epidemiological study, according to the institute's Dr. Michinori Kabuto. Funding for the full-scale study has yet to be approved.

Speaking in Tokyo in April (see below), Dr. Anders Ahlbom of the Karolinska Institute in Stockholm, Sweden, expressed support for a Japanese EMF epidemiological study. Ahlbom later told *Microwave News* that such a study would include a substantial exposed population because exposure levels appear to be high, especially in Japan's metropolitan areas.

The Environment Agency is also coordinating the investigation of EMF health effects, said Kabuto, who has been working to establish a network of Japanese EMF scientists. The group, which now numbers over 100 researchers, held its first meeting in January.

The boost in government funding has been spurred by public interest—and, apparently, public apprehension. The new national effort was established to "dispel public concern" and insure that technologies that generate electromagnetic radiation can be used "safely and with peace of mind," the MPT stated. "There has been a rapid increase in public concern" about possible EMF health effects, Kabuto noted, "which has stimulated the govern-

ment to respond."

Interestingly, these developments coincide with the decline of EMF research in the U.S. "It seems unfortunate that the Japanese effort is gaining momentum just as the EMF RAPID program in the U.S. is drawing to a close," one observer, Dr. Yoshihisa Otaka of the Mitsubishi Chemical Safety Institute in Kashima told *Microwave News*.

Japan is taking advantage of U.S. expertise, however. For example, Dr. Charles Graham of the Midwest Research Institute in Kansas City, MO, told *Microwave News* that last year he advised Japan's NIES on setting up a human EMF exposure facility.

A measure of Japan's interest in the EMF health issue came at an April 7 symposium in Tokyo, *Exposure to Electromagnetic Fields and Related Health Risks*. The symposium drew an audience of approximately 450, according to attendee Dr. Thomas Tenforde, a member of the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Tenforde works at the Battelle Pacific Northwest Labs in Richland, WA.

While utility and telecommunications company representatives predominated, one observer said that the diverse audience also included anti-power line activists.

The seminar featured presentations by many ICNIRP members and by its former chairman, Dr. Michael Repacholi, who now directs the WHO International EMF Project in Geneva, Switzerland. Both power frequency EMFs and RF/MW radiation were covered. Among the presentations were talks by Ahlbom, by Tenforde on mechanisms of static and low frequency EMF interaction and by Dr. Alastair McKinlay of the National Radiological Protection Board in Chilton, U.K., on the European Commission Expert Group's program of mobile phone safety research (see *MWN,* M/A97).

The ICNIRP members were in Tokyo for the commission's annual meeting. Dr. Masao Taki of Tokyo Metropolitan University, also an ICNIRP member, arranged for them to appear at the symposium, which was hosted by both the Environment Agency and the Japan Health Physics Society (see also p.9).

Executive To Bring Britain's First Cell Phone-Brain Tumor Lawsuit

A 27-year-old business executive in the U.K. has charged that her brain tumor was caused by microwave radiation from her cellular phone. If she files suit, it would be Britain's first personal injury action against the cellular phone industry, according to the British Broadcasting Corp.

"Our client has no family history of cancer," said her solicitor, Tom Jones of Thompsons law firm. "She has never been exposed to radiation in any other form, [and] there's no other reason why she should have a brain tumor." Jones would not provide his client's name and released few other details about the case. Thompsons, which has its main office in London, describes itself as the country's largest personal injury law firm.

The case has also received press attention in the U.K. from the *Times* (May 16), the *Guardian* (May 16), the *Mirror* (May 15) and *Sunday Business* (May 17). See also *MWN,* N/D97.

Australia and New Zealand Keep "Flat" RF/MW Exposure Standard

An Australian-New Zealand standard-setting committee has decided to retain its frequency-independent 200 ∝W/cm^2 limit for public exposures to RF/MW radiation—at least on an interim basis.

The interim standard, designated AS/NZS 2772.1, was issued on March 5 by Standards Australia and Standards New Zealand. The standard, which must be withdrawn, confirmed or revised by March 5, 1999, is a revision of the Australian standard first adopted in 1985 and renewed with minor changes in 1990 (see *MWN,* M/A86). At that time, it was also affirmed by New Zealand (see *MWN,* J/F90).

The 1985 and 1990 versions of the standard endorsed the ALARA principle, which holds that exposures to RF/MW radiation should be kept "as low as reasonably achievable." In the revised standard, the ALARA language has been cut.

Instead, the standard includes a recommendation that exposures "should be kept to the lowest levels that can be achieved" consistent with current international practice and cost efficiency. Avoidance of unnecessary exposures is "considered prudent," reads the rationale for the new standard, since knowledge of possible health effects is "incomplete."

The foreword to the interim standard states that Committee TE/7, which developed the standard, found "no conclusive evidence" that nonthermal effects of radiation above 10 MHz pose a health hazard.

A number of groups wanted the standard to take more explicit account of possible nonthermal health effects. Voting against the final draft were TE/7 members representing "occupational health and safety, a major group of scientists and the general public," Dr. Ivan Beale of the University of Auckland in New Zealand told *Microwave News,* adding, "How can the public have confidence in a standard that has been rammed through in this way?" Beale represents the public on the committee.

AS/NZS 2772.1 also covers workplace exposures, for which it retains a flat limit of 1 mW/cm^2 for radiation above 10 MHz.

In keeping its frequency-independent limits, AS/NZS 2772.1 continues to differ from the RF/MW exposure standards issued by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and by the American National Standards Institute (ANSI), which have the strictest limits only in the 10-400 MHz and 100-300 MHz frequency ranges, respectively (see *MWN,* Mr84, J/F88, N/D91 and N/D92).

Other flat limits include that instituted in 1984 by the Johns Hopkins University Applied Physics Lab (JHU–APL) in Laurel, MD, for its employees, which is set at 100 ∝W/cm^2 for the 30 MHz-100 GHz band (see *MWN,* D84). In 1993, the U.S. Air Force's (USAF's) Phillips Lab at Kirtland Air Force Base, NM, issued a similar rule, departing from other USAF policies (see

Vermont Law Backs Towns Seeking To Regulate Towers

Under a new Vermont law, communities can adopt zoning laws regulating telecommunications towers and can put new towers on hold for up to six months while they write their ordinances.

The measure is "a win for local control, helping towns plan for a technological landscape that is constantly shifting," declared Governor Howard Dean (D) at the signing ceremony for Vermont's H.616 on April 15.

The law also authorizes towns to hire technical experts to review permit applications and bill applicants for the experts' fees. If a moratorium is challenged, the town can call on the state's lawyers to defend it in court. To assist communities that do not have zoning rules for towers, the Vermont League of Cities and Towns in Montpelier has written a model ordinance.

The law affects towers only; antennas mounted directly on buildings, such as churches, are outside its scope. No moratorium may extend past July 1, 1999.

Vermont has been a hotbed of controversy over the expansion of wireless telephone service. Federal Communications Commission Chairman William Kennard visited the state in March and heard both sides of the dispute at a crowded town meeting in Hardwick (see *MWN,* M/A98).

The text of H.616 is available on the Internet at: <www.leg.state.vt.us>.

MWN, S/093). The Hughes Aircraft Co. in Fullerton, CA, adopted the JHU–APL standard in 1991 for personnel in its military radar unit (see *MWN,* S/093).

Interestingly, all these standards assume the same threshold for ill effects—that RF/MW exposures are safe for whole-body specific absorption rates (SARs) below 4.0 W/Kg. Above this level, thermal insults are known to occur. A safety factor of 10 is incorporated for occupational exposures, resulting in a maximum SAR of 0.4 W/Kg. For public exposure limits, a further safety factor of five is added to obtain a maximum whole-body SAR of 0.08 W/Kg.

The TE/7 committee opted to retain the flat limit, despite a move to adopt a well-shaped limit similar to the ICNIRP's. The telecommunications companies Telstra and Optus opposed the change, fearing public reaction to any increase in the limit, Dr. Ken Joyner, a former Telstra scientist now with Motorola, told *Microwave News.*

Dr. Michael Repacholi, former chair of the TE/7 subcommittee that drafted the RF/MW standard, told *Microwave News* that the adoption of a well-shaped limit was requested by the Australian and New Zealand standards organizations, which were anxious to harmonize national and international guidelines (see *MWN,* M/J97; also M/A97). Repacholi, who himself favored the change, resigned from the TE/7 committee when he went to Geneva to run the World Health Organization's EMF project. He did not vote on the adoption of the interim standard.

According to the foreword to the new standard, the decision to retain limits often below the ICNIRP's was influenced by the WHO's ongoing research on RF/MW health effects, as well as "public concerns about RF radiation, particularly from cell phone systems" (see *MWN,* J/A96).

The spectrum covered by the standard has been extended downward from 100 kHz to 3 kHz and the exposure limits for the range below 100 MHz have been lowered to protect against potentially hazardous induced currents. From 100 kHz to 100 MHz, currents induced by occupational exposures must not exceed 200 mA through both feet or 100 mA through either foot. Below 100 kHz, maximum induced currents decrease with frequency to 6.0 mA through both feet at 3 kHz.

In Japan, Digital Phones Did Not Promote Liver Cancer in Rats

Exposure to digital mobile phone radiation does not promote liver cancer in rats, according to a new study from Japan. The researchers did find, however, that the animals exposed to the pulsed 929 MHz signal had significant increases in their levels of the hormones melatonin, ACTH and corticosterone — although these effects may have been due in part to stress.

The cellular phone signal "does not show any significant effect on rat liver carcinogenesis," wrote Dr. Katsumi Imaida and coauthors in the February issue of *Carcinogenesis (19,* pp.311-314, 1998). Their research, sponsored by Japan's Association of Radio Industries and Business, used the rat liver medium-term bioassay, a well-established method for identifying carcinogens.

The team has conducted the same bioassay with animals exposed to 1.5 GHz radiation and is preparing to publish the results, Imaida told *Microwave News.* A follow-up to the 929 MHz study is planned.

Imaida, who is at the Nagoya City University Medical School, initiated two groups of six-week-old male F344 rats with single doses of the chemical carcinogen diethylnitrosamine. There were 48 animals in each group. Starting two weeks later, one group was exposed 90 minutes each day, five days a week, for six weeks. The second group served as controls.

Dr. Masao Taki of Tokyo Metropolitan University designed the exposure system. The 929 MHz radiation was pulsed at 50 Hz, using the Japanese standard for time division multiple access (TDMA) signals. Taki is a member of the ICNIRP.

Both the exposed and control animals were confined during the daily exposure periods in narrow plastic tubes placed 1 cm from a quarter-wavelength monopole antenna to maximize direct exposure of the animals' midsections. Average specific absorption rates (SARs) in the liver did not exceed 1.7-2.0 W/Kg, while whole-body average SARs were 0.58-0.80 W/Kg. To control for the effects of stress due to confinement, a third group of 24 animals was initiated with the carcinogen but was neither exposed to the signal nor confined in plastic tubes.

Six weeks after the exposures were begun, the animals were sacrificed and each rat's liver, spleen, thymus, kidney, testes and adrenal glands were examined for tumors. Imaida found no significant differences between the exposed and unexposed groups in either tumor incidence or tumor size.

Imaida noted that the liver bioassay technique can also iden-

tify carcinogens for which the liver is not the primary target organ of cancer initiation or promotion. Its odds of detecting a carcinogen from this broader class are about one in four.

The Japanese researchers were surprised by the melatonin results. RF/MW exposure "was unexpectedly associated with a significant increase," they wrote. "The reason for this remains to be clarified." Levels of ACTH, corticosterone and melatonin were all significantly higher ($p<0.01$) in the exposed animals than in the controls.

The team speculated that confinement stress may explain some parts of the results. Levels of both ACTH and corticosterone, which are markers for stress, were significantly higher in the controls confined in plastic tubes than in those that were not.

Researchers at the University of Mainz in Germany report finding no change in melatonin levels in volunteers exposed to GSM digital signals while sleeping (see below).

Do German GSM–Sleep Studies Show a Dose-Response Trend?

In a new study by German scientists, digital wireless phone radiation appeared to have generally weaker and less significant effects on sleep than in a previous experiment. But the second study was conducted at a lower power density, and the researchers suggest that the effects may be dose-dependent.

"Preliminary results point to a biological window of power density that might influence the sleep profile," Dr. Joachim Röschke of the University of Mainz Psychiatric Clinic told *Microwave News*. Röschke leads the research group, which includes Drs. Klaus Mann and Peter Wagner. The new results appear in *Bioelectromagnetics*.

Both studies were sponsored by Deutsche Telekom. A third study is under way with GSM radiation at a "much higher" power density to check for a dose-response trend, according to Röschke.

In its original study, published in *Neuropsychobiology* in 1996, the Mainz group found statistically significant changes in the length of time it took subjects to fall asleep (sleep latency) and in the duration of rapid eye movement (REM) sleep (see *MWN,* M/J94). On average, the 12 volunteers fell asleep about 3 minutes (22.4%) sooner while exposed to the GSM digital signal ($p<0.005$) and had about 15 minutes (17.7%) less REM sleep ($p<0.05$).

In the follow-up study, the 22 volunteers' REM sleep was reduced by a smaller amount—about 5 minutes (5.5%). This change is just short of statistical significance ($p=0.08$). Sleep latency was only slightly shorter—half a minute (3.8%)—with GSM exposure.

The radiation exposures in the follow-up were less than half those in the original study. The second study used a new exposure system, with a measured incident power density of 20 ∝W/cm^2, as compared to an estimated 50 ∝W/cm^2 in the first study.

Not all the results fit a dose-response pattern, however. In the original study, subjects entered REM sleep about 8 minutes (9.7%) later while exposed to the GSM signal. In the new study, subjects took some 15 minutes (25.4%) longer to enter REM sleep while exposed. This new result is also just short of statistical significance ($p=0.07$).

Röschke explains in the paper that he abandoned the original exposure system because it did not allow for direct measurement of the applied power density. In addition, the new system generates a more uniform field.

Rather than using a phone with a standard stick antenna, as in the first study, Röschke used a phone connected to a circular antenna 40 cm in diameter, which produces circularly polarized radiation. In contrast, the stick antenna produces a linearly polarized signal. Volunteers slept in a room specially designed by Deutsche Telekom and lined with radiation-absorbing material.

"We chose the circular antenna because we could generate a homogeneous field," Röschke told *Microwave News.* Because the two antennas were different and because the antenna in the second study is not actually used in any cellular phone, the paper notes, the new findings "cannot be generalized to cellular phone technologies." Röschke also said that it is "absolutely necessary" to confirm the stick antenna results.

In both studies, male volunteers were exposed for eight hours on one of three overnight stays at the Mainz lab. The 900 MHz signal was GSM-modulated (217 Hz with a pulse width of 577 ∝sec). The subjects served as their own controls. They were unaware when the antenna was switched on. Subjects' ages ranged from 21 to 34 in the first study and from 18 to 37 in the second.

During the second study, the Mainz group also monitored the volunteers' neuroendocrine function. Writing in *Neuroendocrinology,* Röschke reports that exposure to GSM radiation was not associated with any statistically significant changes in overall nocturnal levels of growth hormone, cortisol, luteinizing hormone or melatonin.

Immediately after the onset of GSM exposure, however, the level of cortisol increased and remained elevated for one hour. This statistically significant increase ($p=0.017$) was followed by a second increase in the final hour of exposure ($p=0.046$). Cortisol, also known as hydrocortisone, is a hormone secreted by the adrenal glands.

Röschke writes that the changes in cortisol levels are nonthermal effects of pulsed radiofrequency radiation. While noting that, in themselves, the cortisol effects are not clinically significant, he stresses that it would be a mistake to conclude that such radiation has no further effects on neuroendocrine function: "Our results are strictly limited to the given experimental conditions." Other nonthermal effects "might be dose-related and thus might become visible only under exposure to fields of higher intensity."

A Swiss-American team led by Dr. Boris Pasche previously found that nonthermal levels of RF/MW radiation are effective in treating insomnia (see *MWN,* M/J96).

Peter Wagner et al., "Human Sleep Under the Influence of Pulsed Radiofrequency Electromagnetic Fields," *Bioelectromagnetics, 19,* pp.199-202, 1998.

Klaus Mann et al., "Effects of Pulsed High Frequency Electromagnetic Fields on the Neuroendocrine System," *Neuroendocrinology, 67,* pp.139-144, 1998.

Klaus Mann and Joachim Röschke, "Effects of Pulsed High Frequency Electromagnetic Fields on Human Sleep," *Neuropsychobiology, 33,* pp.41-47, 1996.

minutes of calling time, tripled for those with 15-60 minutes and went up sixfold for those who used their phones for over an hour a day. An increase was also seen in Sweden, with the observed risk roughly tripling among the hour-plus users (see table at right).

For the sensation of warmth behind the ear, Swedes with 2-15 minutes of daily use saw the odds rise three- to fourfold, users with 15-60 minutes had about a tenfold increase and those using cellular phones over an hour per day were 20-30 times more likely to feel heat in these areas. In Norway, the numbers showed a 15- to 20-fold increase for the heaviest users.

The study was prompted by complaints from cellular phone users in Australia, Sweden and the U.K. in 1995 (see *MWN,* N/D95 and N/D96). In Sweden, such anecdotal reports came most often from users of digital GSM phones, which use pulsed signals. The Swedish-Norwegian study was designed to test the hypothesis that GSM users would have a higher rate of symptoms than users of analog phones.

This did not prove to be the case. In fact, there were no significant differences between the two systems, except that users of NMT (Nordic Mobile Telephone) analog phones were *more* likely to feel warmth behind or on the ear—the opposite of what was predicted.

In what Mild and colleagues describe as "side findings," they report dose-response trends for a range of symptoms with respect to both calling time and number of calls per day. Their abstract calls for more studies "to explore the role of various physical factors" that could explain these associations. It notes that "bias might to a certain extent be responsible" for some findings.

The Swedish-Norwegian results will be presented at the *Annual Meeting of the Bioelectromagnetics Society* in St. Petersburg Beach, FL, June 7-11. They have not yet been submitted for publication.

A second part of the study will analyze the timing of symptoms and examine reported difficulties in concentration, but Mild does not expect this to be completed before the end of the year.

"We're very interested in this study," said Dr. Gregory Lotz of the National Institute for Occupational Safety and Health (NIOSH) in Cincinnati. "NIOSH thinks it's important, and we're going to look at it closely." Lotz belongs to an advisory committee for the study, which also includes Drs. George Carlo of Wireless Technology Research in Washington, Nancy Dreyer of Epidemiology Resources Inc. in Newton Lower Falls, MA, Trevor Hughes of the U.K.'s Oxford University, who is a consultant to Motorola, and Michael Repacholi of the World Health Organization in Geneva, Switzerland.

"The data on headache and fatigue were interesting, but could be due to any number of things," commented Dreyer. "It could be the phones themselves, or the more stressful circumstances in which you tend to use one—on the street, or while doing other business." Both Dreyer and Mild pointed out that static or signal loss during wireless phone conversations may also increase stress.

"Now we must go on and find out what really causes the problems," Mild told the Swedish magazine *Ny Teknik* (May 22).

The Swedish-Norwegian study caused a stir in the European press, but has been essentially ignored in the U.S. In the U.K., the May 15 *Express* featured it on the front page, with the headline, WARNING ON MOBILE CALLS—HEALTH DANGER 'STARTS AT JUST TWO MINUTES.' The next day *The Express*' lead editorial insisted that, "The industry has a responsibility beyond making a fast buck. It should not be casually dismissing well-founded fears about the safety of its products."

Headaches and Cell Phone Calling Time

Relative Risk*
(95% Confidence Interval)

	NMT (Analog)		GSM (Digital)	
Phone Use	**Sweden**	**Norway**	**Sweden**	**Norway**
2-15 min.	**1.81** (1.22-2.69)	1.81 (0.82-3.98)	**1.49** (1.02-2.19)	1.94 (0.90-4.20)
15-60 min.	**3.24** (2.12-4.95)	**3.31** (1.53-7.18)	**2.50** (1.66-3.75)	**2.69** (1.24-5.88)
>60 min.	**3.40** (1.43-8.12)	**6.36** (2.57-15.8)	**2.83** (1.37-5.85)	**6.31** (2.35-17.0)

**Relative to those who used mobile phones less than 2 minutes a day. Relative risks that are statistically significant appear in bold. The study had 16,992 participants—5,000 in Norway and 11,992 in Sweden.*

Sweden's *Aftonbladet* (May 15) warned readers that frequent use of a mobile phone "is a threat to your health." Swedes have nicknamed mobile phones the "yuppie teddy bear," and *Aftonbladet* declared the symptoms reported by Mild to be "the new teddy bear disease."

In an internal memo to its members on how to respond to media inquiries about the Scandinavian study, the Australian Mobile Telecommunications Association (AMTA) insisted that "the heating sensation...is a normal response to holding a warm object against the cheek and is not due to the very low radio signals used by the phone." The Canberra-based AMTA declared that, "Warm or cold, cellular phones can be used with confidence."

Mild and colleagues do note that "heating from the current drawn from the battery" might contribute to symptoms—but they do not rule out possible effects of microwave exposure. In the 1960s, Dr. Allan Frey of Randomline in Potomac, MD, stopped his studies of auditory sensations from microwaves after volunteers complained of headaches (see *MWN,* M/A97). Frey details these experiments and discusses the headache issue in the March 1998 *Environmental Health Perspectives (106,* pp.101-103).

The AMTA also contends that, "Wireless users have [no] greater incidence of headaches than the general population." Mild confirmed that Swedish mobile phone users as a whole had "about the same percentage of complaints about headache as found in earlier studies." But he explained that this did not contradict the findings linking heavier mobile phone use to headaches: "In the group that used mobile phones the most, we have only 65 people. Even if their risk of headache is increased threefold, this does not make a lot of difference to the total."

The study was funded by the Swedish Mobile Telecommunications Association, the Norwegian Industries Organization, Telenor (Norway's recently privatized phone company) and Norway's state telecommunications agency. A summary of the study in English is on the Internet at: <www.niwl.se/niwl.htm>.

Appliances with Significant Risks of Childhood Leukemia

Appliance & Use	Cases/Controls (640/640)	Relative Risk (95% Confidence Interval)
Curling iron		
No use	176/183	1.00
Some use	93/78	1.74 (0.91-3.31)
<1 yr	21/16	1.50 (0.53-4.23)
1-2 yrs	41/39	1.47 (0.68-3.15)
≥3 yrs	31/23	**3.56** (1.05-12.12)
Electric blanket/mattress pad		
No use	593/619	1.00
Some use	45/19	**2.75** (1.52-4.98)
<1 yr	10/3	**5.45** (1.14-26.06)
1-2 yrs	18/9	2.19 (0.95-5.05)
≥3 yrs	17/7	**2.63** (1.05-6.59)
Hair dryer		
No use	374/416	1.00
Some use	266/221	**1.55** (1.18-2.05)
<1 yr	33/16	**2.50** (1.28-4.87)
1-2 yrs	127/110	**1.41** (1.02-1.96)
≥3 yrs	106/95	**1.54** (1.02-2.30)
Microwave oven		
No use	198/220	1.00
Some use	374/335	1.33 (0.99-1.79)
<1 yr	24/25	0.85 (0.43-1.66)
1-2 yrs	152/108	**1.59** (1.10-2.31)
≥3 yrs	197/201	1.30 (0.92-1.83)
Sound system with headset		
No use	407/412	1.00
Some use	164/143	1.34 (0.97-1.84)
<1 yr	44/48	0.94 (0.58-1.53)
1-2 yrs	82/76	1.40 (0.94-2.09)
≥3 yrs	37/19	**3.04** (1.48-6.26)
Video games (arcade)		
No use	215/230	1.00
Some use	251/213	**1.66** (1.18-2.33)
<1 yr	42/51	1.10 (0.66-1.82)
1-2 yrs	115/101	**1.70** (1.14-2.54)
≥3 yrs	92/60	**2.78** (1.64-4.72)
Video games (television)		
No use	215/261	1.00
Some use	253/203	**1.91** (1.36-2.68)
<1 yr	35/39	1.31 (0.73-2.35)
1-2 yrs	154/113	**2.04** (1.40-2.98)
≥3 yrs	64/50	**2.36** (1.31-4.25)
Television		
viewing time		
<2 hrs/day	84/108	1.00
≥2 and <4 hrs/day	202/257	0.98 (0.65-1.46)
≥4 and <6 hrs/day	171/163	1.38 (0.89-2.14)
≥6 hrs/day	178/109	**2.39** (1.50-3.80)
distance from set		
>6 ft	90/125	1.00
≥4 ft and ≤6 ft	363/348	**1.71** (1.20-2.44)
<4 ft	166/142	**1.60** (1.08-2.37)

Listed above are appliances for which the NCI study found any statistically significant association between childhood use and the risk of ALL. Those relative risks that are significant appear in bold. No significant associations were found for ***air conditioners***, ***bedside electric clocks***, ***electric heat***, ***electric stoves***, ***humidifiers***, ***night lights***, ***personal computers***, ***stereo systems without headsets*** *or* ***water beds****. The NCI researchers did not assess number of years of television use because nearly all children watched television from an early age.*

NCI in Rockville, MD, told *Microwave News.* "Also, childhood leukemia rates have not increased, despite a huge change in the level of appliance use—especially TV viewing, which just exploded between 1950 and 1970."

Writing in the May 1998 issue of *Epidemiology (9,* pp.234-245), Hatch, Dr. Martha Linet and colleagues also argue that their results on appliance use must be interpreted in the context of "the lack of an effect for measured 60 Hz magnetic fields or wire codes in our companion study."

Last summer, the NCI reported that its power line study had found no evidence of a health risk for EMFs, but that interpretation was challenged by other researchers (see *MWN,* J/A97 and box at right).

The appliance study has provoked a new round of controversy. Many observers have pointed to the large number of appliances for which a significant risk was observed, and have criticized the NCI for being too quick to discount its own findings. "I don't understand it," said Dr. Imre Gyuk, EMF program manager at the Department of Energy in Washington. "Why did they bother to do the study if they don't believe the results?"

Norbert Hankin of the Environmental Protection Agency's Office of Radiation and Indoor Air in Washington told *Microwave News,* "The conclusions don't seem to follow from the results."

A senior federal health official, who asked not to be identified, said that on some points "there's an improper interpretation of their own data." The official added, "I think there's some evidence here that these fields are causing the disease—mostly from the electric blanket data, both for pregnancy and children's use."

All of the 25 significant associations observed for children's use of appliances indicated an increased risk of leukemia. Of the six significant links found for appliance use during pregnancy, four showed an increase in risk and two showed a decrease. Hatch said that while some of the increases in risk may be due to chance, she certainly does not think that all of them are. Others, she suggested, may reflect various kinds of bias.

The paper states that the mother of a child with leukemia may be more likely to remember or overestimate past use of various appliances, "as she tries to identify some specific action that led to the illness." Hatch said that, "This might especially be a factor for something like electric blankets, since they have been mentioned a lot in the media" as having high EMF levels.

More recent patterns of children's behavior may bias parents' reporting of past activities, the paper adds. If children watch more TV after they develop ALL, the NCI team speculates, this might bias reports of how much they watched before diagnosis.

In an editorial in the same issue of *Epidemiology,* Drs. Anders Ahlbom, Maria Feychting and David Savitz agree that this is possible. "The use of electric blankets, however, seems unlikely to have increased after diagnosis," they write (see also box at right).

Hatch argues that some of the data in the NCI appliance study contradict the idea that EMF exposure leads to leukemia. For example, she said, children of mothers who used sewing machines during pregnancy were only three-quarters as likely as other children to develop ALL, a significant reduction in risk. The paper notes that this is "inconsistent with a causal effect of magnetic fields, since sewing machines have rather high mag-

Ahlbom, Feychting and Savitz Dispute NCI on Power Line Study

Three leading epidemiologists have taken issue with the NCI's conclusion that its 1997 study of childhood leukemia found no evidence of a risk from power line EMFs (see *MWN,* J/A97).

In an editorial in the May 1998 *Epidemiology,* Drs. Maria Feychting and Anders Ahlbom of the Karolinska Institute in Stockholm, Sweden, and Dr. David Savitz of the University of North Carolina, Chapel Hill, criticize the NCI for "a tendency to judge a finding as either entirely negative or positive, instead of viewing it quantitatively and integrating it with the results of other research."

The editorial notes that the power line study's findings on measured EMFs did show some elevation in risk, "as well as a dose-response gradient." It concludes that, "The cumulative results still lend some support for a weak association between childhood ALL and [EMF] exposure."

In fact, the authors state, the NCI found "exactly the same" relative risk as two previous studies of EMFs and childhood leukemia that used 24-hour measurements: a 1991 study by Drs. Stephanie London, John Peters and colleagues at the University of Southern California in Los Angeles (see *MWN,* J/F91, M/A 91 and S/O91), and a 1997 study by Drs. Jörg Michaelis, Joachim Schüz and colleagues at the University of Mainz in Germany (see *MWN,* J/A 97 and S/O97). Feychting, Ahlbom and Savitz state that pooling the data from all three studies points to a significant 50% increase in risk.

The three scientists also write that, "The wire-code result in [the NCI's] companion study was indeed negative, but it also differed from most previous studies." While this is "intriguing" and will weaken "the combined estimate of the wire-code association from all published studies," they argue, it does not by itself render all other studies invalid.

NCI's Dr. Elizabeth Hatch said that perhaps more could have been done to put the NCI's conclusions in the context of other power line studies. "But our study is the largest to date and the others, even the Swedish study, basically only deal with very small numbers of cases." The NCI study had 640 cases of leukemia, compared to 232 for London-Peters, 176 for Michaelis-Schüz and 39 for Feychting-Ahlbom (see *MWN,* S/O92).

The editorial marks the first formal comment by Feychting, Ahlbom and Savitz—all of whom have conducted landmark studies on EMFs and childhood cancer—on the NCI's power line study since it was released last year. Several letters published in the *New England Journal of Medicine* argued that the NCI's own data in fact supported a link between measured EMFs and ALL (see *MWN,* N/D97; also S/O97).

Others have criticized the NCI's power line study for downplaying a statistically significant 72% increase in risk for exposures over 3 mG. "Testing your *a priori* hypothesis is the main thing," responded Hatch. "The other findings have to be considered more exploratory than anything else." The *a priori* hypothesis of the NCI power line study focused on exposures over 2 mG, for which a small, nonsignificant increase was observed.

"Even if it's eventually shown that there is a small increase in risk at high levels," Hatch said, "the number of additional cases that could be attributed to this exposure would be very small."

netic field levels, and the user's abdomen would usually be quite close to the motor."

To detect potential biases, NCI researchers included several "red herrings," appliances with negligible EMF exposures—ceiling fans, night-lights and stereos without headphones. None of these appliances showed an increased risk, for either children's use or exposure during pregnancy, and they concede that this could argue against recall bias as a major factor.

No EMF measurements were taken from the actual appliances in each home. Dr. William Kaune, a physicist and a coauthor of both NCI papers, has reported that in a recent U.K. residential study, he and his collaborator, Dr. Alan Preece of the U.K.'s Bristol University, found that questionnaire data did not accurately predict time-weighted averages of EMF exposures. They suspect that participants tended to overestimate how much time they spent near appliances.

"This reduces the likelihood that the observed associations are due to appliances' contributions to time-weighted averages," Kaune told *Microwave News*. If the links are actually caused by EMFs, he said, it would more likely be a result of another aspect of the fields, such as peak exposure. Kaune is with EM Factors in Richland, WA.

"We do not wish to dismiss the associations observed for certain electrical appliances out of hand," the NCI paper in *Epidemiology* concludes, "and accordingly, we are studying whether some aspects of measured magnetic fields associated with [certain] appliances could explain the elevated ALL risks of the magnitude reported." Hatch explained that this study will involve appliances used by about 50 families, including TV sets (with and without video games), audio headphones, sewing machines and hair dryers. NCI researchers will look at EMFs over a range of frequencies, Hatch said, but they will not examine high frequency transients.

In their editorial, Ahlbom, Feychting and Savitz call the NCI's evaluation of its appliance data "overly narrow." While agreeing that the appliance findings must be viewed with caution, the editorial argues that Hatch and colleagues would have provided a more useful analysis if they had viewed their study more "quantitatively, and integrat[ed] it with results from other studies."

"It's difficult to do that with the appliance study," responded Hatch. "There are only two other studies of children's appliance use and leukemia. One, the London study, only reported regular use and didn't appear to be able to investigate dose-response trends. And the Savitz study (see *MWN,* M/J90) was incredibly small—with only 59 cases of ALL. It's hard to look for trends in that kind of data."

The 1991 study by Drs. Stephanie London, John Peters and colleagues at the University of Southern California in Los Angeles found that children's use of electric hair dryers almost tripled the risk of leukemia, a significant increase. For use of black-and-white TVs, there was a significant 49% increase, though no risk was found for color TVs. Electric blanket use was linked to a sixfold increase in risk, but this involved a small number of cases and was not significant (see *MWN,* S/O91; also J/F91, M/

A91 and N/D91).

"Ours is really the first comprehensive study of appliance use among children," stated Hatch. "That in itself is a reason why its results have to be taken with such caution."

The NCI team did extra analysis of children's use of both television and video games connected to a TV. Here, every comparison revealed a significant increase in risk. Heavy, moderate and light users of video games all showed about an 80% increase in the risk of ALL, as compared to nonplayers. As time spent on TV and video games combined went up, so did the chance of developing ALL. Finally, children sitting closer than six feet from the TV had a significantly higher risk than those who sat farther away.

But Hatch was skeptical that this showed any real EMF effect, pointing out that children who reportedly sat four to six feet from the TV had a slightly higher risk (1.71) than did those who sat closer (1.60). "You could look on TV as partially a red-herring variable," she commented, "since past three or four feet there's virtually no field." The paper states that the observed effect "was similar regardless of the distance from the television, implying that magnetic fields are unlikely to be a causal factor."

Hatch said that another planned follow-up study might shed some light on the question of bias in responses: "We'll try to interview mothers very soon after diagnosis and then a year later to see if there's a difference in how they recall their children's appliance use." She expressed hope that, "Eventually, all this will get sorted out, and these methodological studies should help with that."

FROM THE FIELD

Electromagnetic Interference with Medical Devices at Both ELF and RF/MW Frequencies

Letter to the Editor

May 11, 1998

To the Editor:

Increasingly, the normal operation of delicate electronic circuitry is being disrupted by power or radiofrequency fields. Often these are annoying or unpleasant problems—as in the case of electromagnetic interference (EMI) with computers. But sometimes they can be life-threatening.

A large manufacturing company in Atlanta recently complained of interference patterns playing havoc with a group of computer-assisted design (CAD) terminals. Floor-level extremely low frequency (ELF) magnetic fields in the vicinity of the CAD terminals were found to be greater than 100 mG over an area of several hundred square feet.

Company managers were about to shield the terminals with our "JitterBoxes" when the problem became much more critical: the failure of an automatic insulin delivery system used by an executive visiting the high-field area.

The system, which is worn on the ankle, senses the user's blood insulin levels and delivers insulin as needed. Medical experts concluded that the elevated fields caused a circuit failure in the delivery system.

The cause of the high fields was traced to frayed insulation in the electrical wiring embedded in the base of the modular walls of an office cubicle. Once identified, the problem was corrected with a small section of electrical tape. The insulin delivery system, with new circuitry, now functions normally again.

This incident is not unique. Industry representatives cited a similar incident at the April 28-29 Department of Energy's *EMF Engineering Review Symposium* in Charleston, SC.

It should be stressed that in this case the elevated fields were suspected because of the disruption of the computer monitors. Without such interference, the cause would have been much more difficult to diagnose.

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Report Excerpt

Reprinted below are the conclusions of a report from the Institute of Electrical and Electronics Engineers' (IEEE) Committee on Man and Radiation (COMAR), "Radiofrequency Interference with Medical Devices—A Technical Information Statement." The report, written by Howard Bassen of the Food and Drug Administration's (FDA) Center for Devices and Radiological Health in Rockville, MD, with contributions by other COMAR members, appears in the May/June issue of IEEE Engineering in Medicine and Biology Magazine (17, *pp.111-114, 1998). The report will also be posted on COMAR's web site: <http://homepage.seas.upenn.edu/~kfoster/comar.htm>. For more information, contact Bassen at: FDA, HFZ-133, 12725 Twinbrook Parkway, Rockville, MD 20852, E-mail: <hib@cdrh.fda.gov>.*

Today, many medical devices that are tested for susceptibility to RFI [radiofrequency interference] cannot meet the 3 V/m minimum immunity requirements of the current International Electrotechnical Commission Standard 60601-1-2. Hand-held cellular telephones produce field strengths greater than 3 V/m at distances of up to 1 meter, while higher-power transceivers produce 3 V/m at distances of up to 2.6 meters. This situation may be responsible for serious failures of life-sustaining medical devices. It is imperative that immunity to RFI be designed into new medical devices. Because mobile transceivers can generate field strengths of hundreds of volts per meter at close range, fail-safe mechanisms should be designed into medical devices that cannot be made immune to such high RF field strengths.

The field strength to which a medical device may be exposed depends on many conditions that are beyond the control of the designer or manufacturer. Therefore, administrative controls should be implemented that include education of the user, both in the clinic and at home. The possibility of incomplete RF compatibility between RF transceivers and medical devices must be recognized and dealt with. In healthcare facilities, mobile transceivers should be restricted to distances that have been determined to be safe, especially in areas where critical devices are operated. By developing both short- and long-term solutions like those suggested above, electromagnetic compatibility between mobile RF sources and medical devices can be maximized.

Clippings from All Over

Presently, there is no consistent experimental data that prove that EMFs have any detrimental effects on living organisms.

—Office of Cancer Communications, National Cancer Institute, Bethesda, MD, in a press backgrounder, *Questions and Answers About the National Cancer Institute/Children's Cancer Group Study of the Magnetic Fields Associated with Electrical Appliances and the Risk of Childhood Acute Lymphoblastic Leukemia,* April 20, 1998 (see p.1)

Once again, the U.S. National Cancer Institute (NCI)—one of those RICH health bureaucracies—has done a study examining the possible connection between EMF and childhood cancer. Once again, their study weakly corroborates that such a connection DOES EXIST!!! But they just can't bring themselves to admit what their own data reveal. You will recall...that was the same problem they had with the results of their earlier power line study.

—Posted on the Internet by Roy Beavers, also known as the "EMF Guru," April 22, 1998, archived on the Internet at: <www.feb.se/EMF-L/EMF-L.html> (see p.1, p.13 and p.19)

"The safety of human exposure to an ever-increasing number and diversity of EMF sources both at work and at home has clearly become a public health issue. In 1995, the Russian government declared this issue a social problem....EMF technology does not stay still, and research into their possible adverse health effects should continue. But like in many other fields, the problem in Russia today is the lack of funds and coordination of such research."

—Dr. Nikolai Izmerov, Director, Institute of Occupational Health, Russian Academy of Medical Sciences (RAMS), Moscow, quoted in a May 20 World Health Organization (WHO) press release, "Scientists Meet in Moscow To Discuss Adverse Health Effects of Electromagnetic Fields," reporting on a seminar organized by the RAMS and the WHO International EMF Project, in Moscow, Russia, May 18-22, 1998 (see *MWN,* N/D97); the press release is available at: <www.who.ch>

[T]he average scientist is exposed to religious and political views at his mother's knee, long before he is exposed to science. Such views have a way of occupying whatever gaps are present in scientific understanding.

—Dr. Robert Park, American Physical Society, Washington, DC, in an op-ed article, "Scientists and Their Political Passions," *New York Times,* p.A15, May 2, 1998

"There is no possibility that mobile phones are involved in a cancer scenario because the power output of phones is just too low. We are talking about devices that can be powered on four double-A batteries, not 600-watt microwave ovens."

—Dr. Ken Joyner, director, EME strategy & regulatory affairs Asia/Pacific, Motorola, Scoresby, Victoria, Australia, quoted by Stan Beer in "Phoney Research, Says Expert," *Australian Financial Review,* p.24, April 1, 1998

"People ask, 'Isn't there someone out there looking after us?' The answer is no. There is no scientific or professional group evaluating this problem."

—Dr. John Goldsmith, Ben-Gurion University of the Negev, Beer Sheva, Israel, on possible health hazards of mobile phone radiation, quoted by Ruth Mason in "Punching In a Cell Phone Warning," *Jewish Week,* p.48, May 8, 1998

There is a small but real danger in using a mobile phone at a petrol filling station. The batteries that are used in the phone can deliver enough power to ignite petrol.

—Allan Gibson, responding to another reader's question on a mobile phone company's warning to switch off the phone when in a gas station, in the column "The Last Word," *New Scientist* (U.K.), p.105, May 9, 1998

The lack of frequency coordination symbolizes the commission's long-lived practice of ignoring engineering expertise in favor of attorney stupidity.

—Brad Dick, editor, in an editorial, "Screw the Laws of Physics, We're the FCC," *Broadcast Engineering,* p.10, April 1998 (on EMI with medical telemetry devices from WFAA's DTV transmitter in Dallas, TX; see *MWN,* M/A98)

"Microwave News" Flashback

Years 15 Ago

• Epidemiologist Dr. Annemarie Crocetti reports to the New York State Power Lines Project that the Wertheimer-Leeper findings linking power lines to cancer are probably not due to research design flaws and recommends that their work be repeated.

• Concerned about emissions from the Raytheon naval weapons test center, the town of Wayland, MA, adopts a 5.0 ∝W/cm^2 exposure limit for microwave radiation on private property.

• Writing in *Science,* a team led by Dr. Sol Michaelson relates that it found no effect on white blood cells from *continuous* RF/MW radiation at 4.0 W/Kg and concludes that ANSI's 4.0 W/Kg threshold is protective. Left open are questions raised by Polish studies showing effects of low-level *pulsed* radiation.

Years 10 Ago

• Using a video display terminal for 20 hours or more each week during early pregnancy more than doubles the risk of miscarriage, according to epidemiologists at Kaiser Permanente in Oakland, CA.

• The U.S. Army and Navy agree to turn off—or reduce the operating power of—their electromagnetic pulse (EMP) simulators while they assess their environmental impacts.

• Beaming 20 kHz-1.8 MHz radiation into the upper atmosphere to disrupt communications, and possibly the weather, could pose a serious environmental threat, warns physicist Dr. Richard Williams.

Years 5 Ago

• A jury finds San Diego Gas & Electric Co. was not negligent in failing to warn customers about potential health effects of EMFs. Ted and Michelle Zuidema's suit blamed their daughter's kidney cancer on the utility's power lines.

• Taking issue with EPRI, Dr. Genevieve Matanoski of Johns Hopkins University says her EPRI-sponsored study of telephone linemen shows an EMF–leukemia link. But she is unable to secure funding for a replication of the study.

• Following reports in *Florida Today,* Rep. Jim Bacchus (D-FL) calls for a federal investigation of a cluster of eight cases of Lou Gehrig's disease near an air traffic radar in South Patrick Shores.

REQUEST FOR PRE-PROPOSALS

The Johns Hopkins University Center for VDT & Health Research announces a request for research pre-proposals focusing on musculoskeletal disorders associated with computer use in various work settings (office, home, remote office, etc.). Proposals should be for studies costing up to $100,000 total cost per year (including a maximum of 15% indirect costs) for up to two years, focusing on the following subject areas:

1. Development or application of methods for the diagnosis of musculoskeletal disorders of the upper extremity, including shoulder and neck, suitable for application in a variety of work settings, using non-invasive and inexpensive procedures for epidemiologic studies.
2. Measurement of psychosocial and work organization stressors, and stress responses, associated with health outcomes and work related outcomes such as productivity.
3. Application and comparison of multiple methods for comprehensive measurement of ergonomic stressors in a variety of work settings. Such measures should include metrics of force, posture and time, and should be non-invasive, low cost and feasible for large epidemiologic studies.

Priority will be given to proposals that integrate exposure measures of both psychosocial and ergonomic stressors, particularly if these can be linked to health or work outcomes, mechanisms, or pathways. Projects nested within existing prospective or intervention studies, or secondary analysis of existing data sets will also be given priority if they are cost effective. Cross-sectional or case-control studies of specific populations with contrasting exposures will also be considered.

Applications for pre-proposals can be obtained by written request from Ms. Maria Zanella, Program Administrator, Johns Hopkins University School of Hygiene and Public Health, 615 N. Wolfe St., Room 4030, Baltimore, MD 21205 (Fax 410-955-0792). All pre-proposals must be received by September 1, 1998. After review by the Center's Scientific Advisory Board, successful applicants will be invited to submit full proposals by December 1, 1998 for final review. The Center has conducted two workshops, one on diagnosis of musculoskeletal disorders and the other on exposure assessment, which review and summarize the status of research in these areas. These reports will be made available on request.

UPDATES

CELLULAR PHONE EMI

Pacemakers: What's the Safe Distance?... In a recent laboratory study, no case of interference between cellular phones and implantable cardiac pacemakers was observed beyond a distance of three inches. The Center for the Study of Wireless Electromagnetic Compatibility (EMC) at the University of Oklahoma in Norman tested five types of cellular technology and six pacemaker models known to be vulnerable to EMI. The pacemakers were submerged in a saline solution to simulate the electrical characteristics of the chest. The headline of the EMC Center's April 20 press release declared, SAFE SEPARATION DISTANCE...MUCH LESS THAN PREVIOUSLY RECOMMENDED, and the statement emphasized that, "This is half the distance previously given by [pacemaker industry] recommended labeling." But no one, including the EMC Center, is proposing any changes to the six-inch separation distance supported by the FDA, Wireless Technology Research (WTR) and the pacemaker industry (see *MWN,* N/D96). "Nothing in the data from Oklahoma is inconsistent with the information we considered previously," Don Witters of the FDA's Center for Devices and Radiological Health in Rockville, MD, said in an interview. "I don't think it would alter our recommendations." WTR chair Dr. George Carlo told *Microwave News* that, "The Oklahoma data are corroborative but add nothing new." A 1996 review of clinical data for WTR by Dr. Roger Carrillo of Mt. Sinai Medical Center in Miami found that "effects that could pose a major risk to the patient all occurred within a range of three inches," but that less severe EMI can also occur beyond this range (see *MWN,* N/D96). Carlo emphasized that WTR's recommendations were based on extensive clinical tests with people who actually have implanted pacemakers, not just simulations in the lab, and he argued that, "Clinical data should always supersede *in vitro* data...in making public policy decisions." Bernard Liebler of the Health Industry Manufacturers Association commented, "None of my companies have a problem with the current recommendation. A study like this should create a level of comfort with it." This May, the Oklahoma EMC Center's director, Dr. Hank Grant, told *Microwave News* that the center is not in fact calling for any change in the six-inch rule. "The center really tries to stay out of influencing that kind of decision," Grant said. "We just report the facts and let the standard-setting bodies draw their own conclusions."

CHILDHOOD CANCER

Auto Pollution Increases Risk... Air pollutants from motor vehicles increase the risk of childhood cancer, according to a recent study by Dr. Maria Feychting, Daniel Svensson and Dr. Anders Ahlbom of the Karolinska Institute in Stockholm, Sweden. Published in the *Scandinavian Journal of Work and Environmental Health (24,* pp.8-11, 1998), the study analyzed 142 cases and 550 controls drawn from the Feychting-Ahlbom study of power line EMFs (see *MWN,* S/O92). Children with the highest exposure to auto exhaust had almost four times the rate of cancer of those with low or moderate exposure, a statistically significant finding. Risks for leukemia and brain cancer were also elevated, but the estimates were imprecise because of the smaller numbers of cases for individual cancers. The Karolinska team notes that only two other epidemiological studies have exam-

ined childhood cancer and auto pollution: Dr. David Savitz (see *MWN,* N/D87) and Dr. Nancy Wertheimer each found significantly increased risks. Interestingly, all three studies used data sets originally developed in studies of childhood cancer and EMFs. These studies have had to control for the effects of other potential factors, such as motor vehicle exhaust.

DNA BREAKS

Sensitivity of Comet Assays... Drs. Robert Malyapa, Joseph Roti Roti and coworkers at Washington University in St. Louis have published new data to back up their claim that they can detect DNA damage at low doses of ionizing radiation, using the comet assay developed by Dr. Peggy Olive of the British Columbia Cancer Research Center in Vancouver, Canada. The Olive method's sensitivity had been challenged by Drs. N.P. Singh and Henry Lai of the University of Washington, Seattle, who have used Singh's version of the comet assay (see *MWN,* J/F98). The controversy is part of the debate over whether microwave radiation, specifically cellular phone signals, can increase the frequency of DNA breaks. Writing in the April issue of *Radiation Research (149,* pp.396-400, 1998), Malyapa and Roti Roti affirm that they can reliably measure DNA damage below 1 cGy. They say that prior to their recent series of experiments there had been no previous "sustained effort" to determine the lower sensitivity limit of the Olive method. They conclude that the sensitivities of the Olive and Singh methods are "similar and comparable." In an interview, Singh commented that he was "surprised by the consistency and sensitivity" of the Malyapa-Roti Roti results.

MEETINGS

All About Risk... Last October 22-23, scientists and policymakers met in Vienna, Austria, to discuss public perceptions of EMF health risks. The International Commission on Non-Ionizing Radiation Protection (ICNIRP), a cosponsor of the seminar, has now published the proceedings, *Risk Perception, Risk Communication and Its Application to EMF Exposure*. Many people "seem much more alarmed than the scientific community" about potential EMF health hazards, write the volume's editors, Dr. Jürgen Bernhardt and Rüdiger Matthes, ICNIRP chairman and scientific secretary, respectively, both of the German Radiation Protection Office, and Dr. Michael Repacholi, director of the WHO International EMF Project in Geneva, Switzerland. To reduce this "gap," they continue, it is necessary "for government, scientists and industrial organizations to understand and apply the knowledge from the risk perception and risk communication sciences." Among the papers presented were "Risk Communication: The Focus in the NIEHS RAPID Program's Review of EMF Health Hazards," by Drs. Christopher Portier and Mary Wolfe of the NIEHS in Research Triangle Park, NC; "Mental Models and EMF Risk Perceptions of the U.S. General Public," by Dr. Gordon Hester of EPRI in Palo Alto, CA; and "Scientists as Communicators: Addressing the Media and the Public," by Matthew Gaines, now retired from the U.K.'s NRPB. Copies of the 369-page volume are available for $50.00 plus shipping from Matthes at: ICNIRP, Institut für Strahlenhygiene, Ingolstädter Landstraße 1, D-85764 Oberschleißheim, Germany, Fax: (49+89) 31603 289, e-mail: <matthes@bfs.de>.

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MICROWAVE WEAPONS

Lawsuit Charges Illegal Experiments... On April 15, the International Committee on Offensive Microwave Weapons charged in federal court in Washington that the Department of Defense and the CIA have conducted "classified research on human subjects without their informed consent," in efforts to develop weapons using EMFs, lasers, microwaves and sound waves. The lawsuit cites an article by retired Lt. Col. Timothy Thomas in the Spring 1998 issue of *Parameters,* the journal of the U.S. Army War College. The article, "The Mind Has No Firewall," appears in a section on "Future Land Warfare." The committee, headed by Harlan Girard of Philadelphia, asks for an injunction to end the alleged illegal experiments.

NAS–NRC

RAPID Review Committee... The Board on Radiation Effects Research of the National Academy of Sciences-National Research Council (NAS–NRC) has made some changes to its committee charged with reviewing the research carried out under the EMF RAPID program. Dr. James Hoburg, an engineer at Carnegie Mellon University in Pittsburgh, has replaced Fred Dietrich of Electric Research and Management, also in Pittsburgh. Dr. Maria Stuchly of Canada's University of Victoria was set to join the committee but dropped out due to other commitments. The board has nominated Dr. Edwin Carstensen of the University of Rochester, NY, to fill the gap. In addition, Dr. Rick Jostes has replaced Dr. Steven Simon as the study director. (See also *MWN,* M/J97.) Dr. Maurice Fox of MIT in Cambridge, MA, a committee member as well as a member of the academy, told *Microwave News* that the RAPID program has been an exercise in looking at very small effects—"if they exist at all," adding that, "The money would probably have been better spent somewhere else." The committee, which completed an interim report on RAPID at the end of 1995 (see *MWN,* N/D95), has begun evaluating approximately 60 RAPID project summaries. Jostes said that the committee's report would not be completed until 1999.

PEOPLE

Drs. **C.K. Chou** of Motorola in Plantation, FL, and **Keith Florig** of Carnegie Mellon University in Pittsburgh have been elected to the National Council on Radiation Protection and Measurements (NCRP), based in Bethesda, MD. Dr. **David Sliney** of the U.S. Army's Aberdeen Proving Ground in Maryland has been reelected. Dr. **Bill Guy**, professor emeritus at the University of Washington, Seattle, has been named an honorary member of the NCRP.... Dr. **Jukka Juutilainen** of Finland's University of Kuopio has been appointed an associate editor of *Bioelectromagnetics*. Juutilainen takes the place of Germany's Dr. **Peter Semm**. In addition, Dr. **Richard Luben** of the University of California, Riverside, and **Janie Blanchard** of Bechtel Corp. in San Francisco have joined the journal's editorial board, replacing Drs. **Tom Tenforde** of the Battelle Pacific Northwest Labs in Richland, WA, and **Carl Blackman** of the EPA in Research Triangle Park, NC....**Edward Aslan** of Narda Microwave in Hauppauge, NY, has been elected a fellow of the IEEE for his work on the measurement of electromagnetic fields and radiation.

VIEWS ON THE NEWS

The Deep Roots of Public Skepticism

Public fears of EMFs and RF/MW radiation are groundless, according to so many official statements that we've lost count. Yet the public refuses to be reassured. If we look at how government and industry handle these issues, we get some idea why.

* * *

Many people had similar reactions to the NCI study on appliances and childhood leukemia (see p.1), but DOE's Dr. Imre Gyuk put it best. "I don't understand it," he said. "Why did they bother to do the study if they don't believe the results?"

When 29 out of 31 statistically significant findings show an increase in risk, and only two show a decrease, most scientists would at least say, "Hmmm. Perhaps there's something there."

But the NCI responded to its own data with a one-sided dismissal. Its press release described the study as "concluding that it is unlikely that magnetic fields from household electrical appliances increase a child's chances of developing...leukemia."

Later in the press release, there is a revealing shift of language: "The authors were unable to draw a clear conclusion from the data....The scientists *speculate* that the magnetic fields from electrical appliances are unlikely to increase the risk of ALL" (emphasis added).

And so a speculation is palmed off as a scientific conclusion. In fact, the NCI's report is full of speculations. It is not that any one of these is inherently unreasonable, but why are the NCI researchers so intent on explaining away their findings? Apparently, the data are telling them something they don't want to hear.

In last year's study of power lines and childhood leukemia, the NCI took a strong position, which has proved controversial. The institute is not about to back down now, even if the price of consistency is discounting the results of the appliance study.

Three prominent epidemiologists have questioned the NCI's rush to judgment (see p.13). Harsh comments about the institute have cropped up on the Internet (see p.15). The NCI's credibility has suffered in the eyes of both its colleagues and the public, and the institute has only itself to blame.

* * *

Is the Norwegian navy covering up evidence of a link between RF/MW radiation and birth defects? We don't know—but the fact that the navy wouldn't give us a copy of its report doesn't exactly inspire confidence (see p.6).

Once we obtained a copy from a Norwegian journalist, the report turned out to be astonishingly vague. Although it states that over 120 measurements were made on board the *Kvikk,* a torpedo boat with powerful transmitters, the report contains no data on power densities anywhere on the vessel. The presentation of the epidemiological results is also poor.

The whole affair reminds us of a cluster of birth defects observed among children of U.S. helicopter pilots at Fort Rucker, AL, in 1971. After an investigation by an independent researcher suggested a link to radar exposure, the U.S. military blocked further research by denying access to the necessary records.

The authors of the *Kvikk* report say they had access to plenty of information. But what it comes down to is that the Norwegian military investigated itself, and the results are not so different from those obtained 27 years ago in Alabama.

* * *

EPRI has started responding to normal journalistic inquiries as if it were a public relations firm, not a research institute. Routine requests from *Microwave News* are being answered with, "That's confidential" (see p.2 and p.5).

In the past, EPRI has given us generous access to its documents and has been quick to answer questions. We're not sure why this has changed. Maybe it's related to cutbacks in funding from electric utilities, who are feeling the financial pinch of deregulation. If utilities see EPRI as a potential source of bad news, are they less likely to contribute? Whatever the answer, you cannot get away from the role of money in the EMF controversy.

Wagons are also circling at Britain's NRPB. Its September meeting on dosimetry and epidemiological studies will be closed to the press and the public (see p.7).

We don't accept that the only way to have a frank discussion is to keep the public out. Maybe that's true for a public relations firm discussing how to spin unpleasant news—but not for scientists who are planning to spend taxpayers' money on research.

It is troublesome to see the public excluded from a publicly funded meeting. In the U.S., such a conference would be required by law to be open. This open-meeting legislation has a nice nickname: the "sunshine laws." The NRPB ought to let a little more sun shine on its internal workings.

* * *

Many officials and experts are frustrated that the public is still worried about EMF and RF/MW health effects (see p.17). Polls show many people in the U.S. will not buy a home next to a power line, and local opposition to cellular phone towers is giving the wireless industry headaches.

Officials often seem to think that the public is worried because the public is stupid. But in fact people are worried because they know they are not being told a straight story. The only way to inspire public confidence is to make decisions out in the open. If you act like you've got something to hide, people will think that you probably do.

If important facts are not yet known, then scientists need to have the intellectual honesty to say so. In our experience, citizens are usually better than officials at dealing with uncertainty.

If we want the public to have more respect for scientific authority, spin and secrecy are the wrong way to go.

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MICRO WAVE NEWS

Vol. XIX No. 3 A Report on Non-Ionizing Radiation May/June 1999

INSIDE...

HIGHLIGHTS pp.2-7

Wireless Notes:
BBC Probes Cell Phone Safety • U.K. Police, Military Cut Exposures • MP Hosts Tower Briefing • Cathedral Rents Cell Site • CTIA Queries FDA on Future Research • WHO EMF Project Meeting

Canada's Royal Society RF/MW Panel: Nonthermal Effects Exist and Need Study

Canadian Health Agency Drops Eye Limit Plan

New Zealand Abandons "Flat" RF/MW Limit; Australian Guidelines in Limbo

IEEE Revises 1991 RF/MW Standard

Overviews of New Swedish and U.S. Brain Tumor-Cell Phone Epidemiological Studies

Sweden's Hardell on Prudent Avoidance

Danish Brain Cancer Study Under Way

EMF NEWS pp.8-11

NAS–NRC Advises Against New EMF Effort
The Panel's Recommendations

EMFs Help Chick Embryos Survive Stress

New Childhood Cancer Study in Japan

International Meta-Analysis Coming

McBride Study: Corrected Wire-Code Risks

FROM THE FIELD pp.12-15

To the Editor: Carlo, Chou on Lai-Singh Letter

NAS–NRC Panelists on Release of 1996 Report

Flashback: 5, 10, 15 Years Ago

Hot New Papers: Two RF–Cancer Reviews • and much more

Clippings from All Over

UPDATES pp.16-18

Babies, Night-Lights and Myopia • EMFs from Planes, Trains & Autos • People in the News • URSI Meeting • More 1999 Conferences

Keeping Current: Follow-Up on the News

VIEWS ON THE NEWS p.19

What About EMF Exposures Above 5 mG?

Cell Phone SARs: Make Them Public

Mobile Phone–Brain Tumor Risk In the Limelight Again

Focus on Swedish and U.S. Epi Studies

Two studies have brought new attention to concerns about cellular phone use and brain cancer. Both provide some evidence that cellular phone users are more likely to develop brain cancer on the side of the head where they hold the phone.

Neither study, however, found any overall increase in brain tumor risk.

The two studies touched off a flurry of news stories about mobile phones and cancer in late May, and in the U.S. the subject got more prominent coverage than at any time since the 1993 controversy over the Reynard lawsuit (see *MWN*, J/F93). An article in the May 22 *Washington Post* was picked up by newspapers across the U.S.— the *Boston Globe*, the *Los Angeles Times* and others — while the new research was featured in virtually every major newspaper in Britain (see p.2). Television coverage included reports by the BBC and CNN, both on May 24, and stories are in the works at CBS News and ABC's news magazine, *20/20*.

"Increased risk was found for both left- and right-side brain tumors," writes Dr. Lennart Hardell of the Örebro Medical Center in Örebro, Sweden, in a paper that has been accepted for publication in the *International Journal of Oncology*. It will be the first published research on mobile phone users and cancer. "The results were based on low numbers, and must be interpreted with

(continued on p.6)

Canadian Childhood Leukemia Study: No Magnetic Field or Wire Code Link

A major epidemiological study has found no association between childhood leukemia and exposure to electromagnetic fields (EMFs). There also was no observed link between childhood leukemia and the presence of nearby high-current electrical wiring.

"These results provide little support for a relation between power frequency EMF exposure and risk of childhood leukemia," concluded a team of Canadian researchers led by Mary McBride in a paper that appeared in the May 1 issue of the *American Journal of Epidemiology (AJE, 149,* pp.831-842).

"Given the results of our study and those of the NCI, I think the balance of the weight of evidence has definitely shifted towards a conclusion that, if there is a risk, it is undetectable through epidemiological studies," McBride told *Microwave News*. She is with the Cancer Control Research Program at the British Columbia Cancer Agency in Vancouver, Canada.

In July 1997, a National Cancer Institute (NCI) study found "little evidence" that living near power lines is linked to childhood leukemia (see *MWN,*

(continued on p.10)

HIGHLIGHTS

« Wireless Notes »

On May 24, the **BBC** showed that it was not immune to the **U.K. media**'s love affair with the cell phone health controversy. The influential and respected TV news magazine ***Panorama*** devoted an unprecedented 40 minutes of airtime to the issue in a report titled "The Mobile Mystery." The program highlighted the latest epidemiological results from Sweden's Dr. **Lennart Hardell** and from the U.S.' **Joshua Muscat** (see p.1). To drum up interest, the BBC released some of their discoveries to the newspapers, which rushed them into print the day of the broadcast. MOBILE PHONE RESEARCH ADDS TO SAFETY FEARS warned the *Times*. The *Express* took a more conspiratorial tack: MOBILE PHONE COVER-UP. The same day, the BBC Web site ran its own promo for the show under the headline FEARS RAISED OVER MOBILE PHONES, but, later in the day, that headline had morphed into MOBILE PHONE CANCER STUDY "FLAWED." The change was prompted by a statement from the National Radiological Protection Board (**NRPB**), the government's official advisory group, which argued that the Swedish study "lacks statistical precision to draw conclusions on specific aspects of phone use and tumor location"—largely because it was based on a small number of cases. On the show itself, NRPB Director Dr. **John Stather**, when pressed by *Panorama*'s Paul Kenyon, endorsed the idea that manufacturers should tell consumers about potential radiation exposures. Muscat himself did not appear on the show, but Dr. **George Carlo** of **WTR**, which funded the study, detailed Muscat's results. Kenyon also cited the research by Drs. **Henry Lai** and **N.P. Singh** showing DNA breaks following RF/MW exposures. He asked **Motorola** spokesperson **Norman Sandler** about his now-infamous "War-Gaming" memo, written in anticipation of the release of the Lai-Singh DNA results (see *MWN,* J/F97). "We have never attempted to put a corporate spin on the science," Sandler said. At the end of the program, Carlo said: "The science that we have today clearly shows that this is not black and white, that we have moved now into a gray area. That suggests that there could be a problem that needs to be looked at very, very carefully." Kenyon then returned to **Peter Harrison** of **Nokia**, who opined that mobile phones do not present a health risk: "The scientific consensus is that there is no problem," Harrison said. When Carlo was asked whether he agreed, he replied, "At this stage, that is not a responsible position to take."

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A week later, on June 2, the **BBC** reported that the **Metropolitan Police** force in **London** was advised to limit the length of mobile phone calls to five minutes due to health concerns. Staff were told that, "There would be no harm in using an earpiece." Previously, on May 30, the ***Sunday Telegraph*** printed a copy of a purchase order from the **Ministry of Defense**'s research agency for 20 mobile phone shields from **Microshield Industries** in Enfield. The protective cases attenuate microwave exposures, according to company literature. Microshield said that at least 20 more had been sold to the defense agency.

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The next major **U.K.** event will occur on June 15, when **Phil Willis**, a Member of Parliament, sponsors a briefing on mobile phone towers. The meeting, which is being organized by **Northern Ireland Families Against Telecommunication Transmitter Siting** and the **Friends of the Earth Scotland**, will be held in the House of Commons. Among the scheduled speakers are: Drs. **Gerard Hyland** of the U.K.'s University of Warwick, **Michael Kundi** of Austria's University of Vienna and Dr. **Henry Lai** of the University of Washington, Seattle, as well as Libby Kelley of the **EMR Network** and representatives from the U.K.'s **NRPB**. Willis has been critical of the U.K. goverment's tower-siting policies (see *MWN,* J/F99).

«« »»

Motorola pays about $100,000 a year for antenna space on the **National Cathedral** in Washington, according to *Wired* magazine (February). Motorola's Sandler confirmed that the cathedral is a cell site, but did not confirm the dollar figure.

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The **CTIA** is planning to fund more research on wireless phone health effects. In an April 26 letter to Dr. **Elizabeth Jacobson** of the **FDA**, CTIA President **Thomas Wheeler** noted that the efforts of CTIA-funded **WTR** were "nearing completion," and affirmed "the industry's commitment to fund appropriate research following up on the work of WTR." Emphasizing that U.S. research must be coordinated with international efforts, such as the **WHO EMF project**, Wheeler asked for the FDA's guidance on how to proceed. A CTIA representative had attended a meeting with the FDA in March, at which WTR briefed federal agencies on its research results (including the **Muscat** study), and Wheeler expressed hope that the FDA and the CTIA could "continue the productive industry/agency relationship we have enjoyed over the past years." At press time, a CTIA spokesperson had no comment on the FDA's response, or on whether there would be a role for WTR in any future CTIA-funded research.

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Representatives from mobile phone companies outnumbered those from electric utilities by a two-to-one margin at the **WHO International EMF Project** Research Coordination Committee meeting, held in Geneva on December 8. Of the approximately 65 attendees, some 18 were from telecom companies, including **British Telecom, Cable & Wireless, Ericsson, France Telecom, Nokia** and **Optus**. **Motorola** was best represented, with four staffers at the one-day meeting. **Jo-Anne Basile** of the **CTIA** and Dr. **Gerd Friedrich** of **FGF** were also there. Interestingly, Americans were selected for all the key positions. At the suggestion of Dr. **Michael Repacholi**, the head of the WHO EMF project, Dr. **Christopher Portier** of the NIEHS was elected chair of the committee, with Dr. **Jon Klauenberg** of the U.S. Air Force as vice-chair. Two different working groups were set up: Dr. **Jack Sahl**, a consultant formerly with Southern California Edison, and Dr. **Leeka Kheifets** of EPRI were selected as chair and rapporteur, respectively, of the Static and EMF Fields Group, while Klauenberg and Dr. **Russell Owen** of the FDA were named as chair and rapporteur of the RF Fields Group. The next meeting of the committee is scheduled for November 26 (see p.18).

Canada Panel: Nonthermal Effects Exist and Need Study; Some Workplace Limits May Not Protect from Heating

An expert panel convened at the request of the Canadian government has concluded that radiofrequncy and microwave (RF/MW) radiation can have biological effects without causing heating. It also found that the country's current exposure standard may not always protect workers — even against thermal effects.

Last fall, the federal agency Health Canada asked the Royal Society of Canada (RSC) to examine RF/MW safety issues, with a focus on cellular phones (see *MWN,* S/O98). It also requested that the RSC evaluate Canada's RF/MW standard, known as Safety Code 6 (SC6), which Health Canada is now in the process of revising (see box at right).

"There are documented biological effects of RF fields even at low, nonthermal exposure levels, below SC6 limits," stated the RSC panel's report, which was released on May 17. It cited changes in the permeability of the blood-brain barrier, in calcium regulation and in the activity of the growth enzyme ODC.

Cellular phone users may experience some of these nonthermal effects, the RSC panel found. But it concluded that, for two reasons, SC6 should not be changed to take nonthermal bioeffects into account.

First, the panel argued, the nonthermal effects demonstrated to date have not been shown to harm human health. "There is no evidence *at this time* of a health risk," panel member Mary McBride told *Microwave News*. Second, the causes of nonthermal effects are poorly understood. "If you don't know the mechanisms for nonthermal RF effects, then you can't set a limit to avoid them," said panel member Dr. Frank Prato in an interview. "You don't know which parameters to protect from."

For thermal effects, the RSC panelists agreed that the limits presently in SC6 give good protection for whole-body exposure. Whole-body maximum SARs are 0.08 W/Kg for the general public and 0.4 W/Kg for workers.

For partial-body exposures, the panel found that SC6 may not always protect workers against heating, and called for strengthened limits for such exposures in the workplace.

SC6 currently allows workers' partial-body exposures to be as high as 8 W/Kg in the head, neck and trunk, and 20 W/Kg in the extremities — with no time limit. "For a worker, this exposure could be eight or more hours per day," said Prato. This "creates a situation where thermal effects could occur even within the limits of SC6," the panel noted, and "may in some cases lead to adverse health effects." Prato commented that, "We think this may be an issue for safety codes in other countries as well."

The report contrasted the lax time limits for workers with the strict time limits that apply when hospital patients are exposed to high RF/MW levels for diagnosis by MRI, or for anticancer therapy. For example, the report pointed out, in the U.S., patient head exposure can also reach as high as 8 W/Kg — but only for a maximum of five minutes.

In this context, the RSC panel expressed particular concern about exposure of the eye, especially given its limited ability to dissipate heat. "Because of the unique physiological characteristics of the eye," it wrote, "the panel recommends that a lower exposure limit be established." But the panel concluded that there are not enough data to set a precise limit for eye exposures, and therefore identifies research on ocular effects as a top priority. As an "interim measure," the report suggested, the general-public limit for head exposure, 1.6 W/Kg, should also be applied to eye exposure on the job.

It is unclear how widespread the effect of this interim proposal might be — whether, for example, it would apply to workers who use walkie-talkies on the job. "We thought that a real estate agent using a cell phone probably would not fall within SC6's definition of an RF worker," said panel chair Dr. Daniel

New Canada RF/MW Standard Will Not Set Strict Eye Limit

Health Canada will not include a strict limit on eye exposures from cellular phones and walkie-talkies in its revision of Safety Code 6 (SC6). The federal health agency has abandoned a proposed eye exposure limit of 0.2 W/Kg for the general public, which it had supported as recently as last fall (see *MWN,* S/O98).

The new standard will be released this summer; officials would not comment further on what it might contain. Last year, manufacturers expressed concern that most walkie-talkies would violate the proposed eye exposure rule, though they said that virtually all cellular phones would comply.

"The latest draft of SC6 says that lower exposures are desirable, but 0.2 W/Kg is not required," said Dr. Art Thansandote of Health Canada's Radiation Protection Bureau in Ottawa. In an interview with *Microwave News,* Thansandote cited the RSC's report, which concluded that more research is needed before definite conclusions can be drawn about RF/MW ocular effects.

Thansandote noted that Health Canada is currently carrying out such research in collaboration with the Eye Institute at the University of Ottawa. "It's a study with a corneal construct, a model of the human cornea made from a cell line of the human eye," he explained. Thansandote said that work on the exposure system is almost finished, and that preliminary results should be available in about a year.

The RSC report proposes limiting workplace exposures of the eye to 1.6 W/Kg as an interim measure, but Thansandote would not comment on whether this will be included in the new SC6.

When the revised version of SC6 is published this summer, it will take effect immediately, said Jeff Pender, a spokesperson for Health Canada. "At some point after that, we'll hold consultations with stakeholders like workers, Industry Canada and so on," Pender told *Microwave News,* and those meetings could lead to "some tinkering" with the new standard if it is warranted. The revision of SC6 began in 1993.

The new version of SC6 will be available on the Web at <www.hc-sc.gc.ca/ehp/ehd/catalogue/rpb.htm>.

Krewski. "It might be that only a small number of people would be affected. But our charge was not to survey individual occupational exposures — it was to look at the limits in SC6."

The report was silent on whether a separate eye exposure limit for the general public may be desirable. Health Canada had proposed limiting eye exposures to 0.2 W/Kg for the public, but has now dropped that idea (see box on p.3).

On DNA damage, the report concluded that "most genotoxicity studies conducted to date have been negative." However, it noted that the issue was "reopened" by the work of Drs. Henry Lai and N.P. Singh: "In carefully conducted experiments they report a dose-response for DNA breakage" at nonthermal levels of exposure (see *MWN,* N/D94). The issue is unresolved, the panel stated, since other labs have failed to reproduce these results, and it called for more research.

Similarly, the RSC panel cited Dr. Michael Repacholi's finding of a doubling of lymphoma among RF-exposed mice (see *MWN,* M/J97) as "very interesting," but not as a basis for any firm conclusions until it is replicated elsewhere.

Cellular phone base stations have been a focus of public concern (see p.15). But the RSC panel wrote that since mobile phone towers expose the public only to very low field strengths, "neither biological nor adverse health effects are likely to occur."

The report concluded with a wide-ranging proposal for research on RF/MW safety, calling for "targeted research funds [to] be made available for an extended period of five to ten years." But it is unclear whether such support will be forthcoming.

Jeff Pender, a spokesperson for Health Canada in Ottawa, said that the agency does not yet have a formal response to the RSC report, nor to its proposed research agenda.

A statement from the Canadian Wireless Telecommunications Association (CWTA), a service providers' group based in Ottawa, expressed general support for the RSC panel's call for more research. But CWTA President Roger Porier said in an interview that the group has no plans to help fund any research effort. "We would certainly look at any proposal," said Porier. "But we have always been reluctant to directly fund research, because doing so is often perceived as trying to influence it."

Porier pointed out that the wireless industry already pays the Canadian government $140 million Canadian dollars (about US$95 million) a year in fees for use of the broadcast spectrum. "If the government considers research in this area to be a priority," he commented, "even 10% of that money would make a fairly substantial contribution."

The members of the RSC Expert Panel on Radiofrequency Fields were: Dr. Craig Byus, University of California, Riverside, U.S.; Dr. Barry Glickman, University of Victoria, British Columbia; Dr. Daniel Krewski (chair), University of Ottawa, Ontario; Dr. Gregory Lotz, National Institute for Occupational Safety and Health, Cincinnati, U.S.; Dr. Rosemonde Mandeville, Biophage Inc., Montreal, Quebec; Mary McBride, University of British Columbia, Vancouver; Dr. Frank Prato, University of Western Ontario, London, Ontario; Dr. Donald Weaver, Queen's University, Kingston, Ontario.

The RSC report, *A Review of the Potential Health Risks of RF Fields from Wireless Telecommunication Devices,* is on the Web at <www.rsc.ca>. Copies may be bought for C$15.00 from: RSC, 225 Metcalfe St., Ottawa, ON K2P 1P9, Canada, (613) 991-6999, Fax: (613) 991-6996.

New Zealand Drops "Flat" RF/MW Limit; Australia in Limbo

Standard-setting bodies in Australia and in New Zealand have abandoned their frequency-independent 200 $\mu W/cm^2$ limit for public exposures to RF/MW radiation, which was in effect in both countries since 1990. Standards New Zealand has moved to replace the "flat" standard with a new standard based on ICNIRP's less stringent exposure guidelines, while Standards Australia has allowed the flat standard to lapse without reaching consensus on a replacement.

TE/7, a committee jointly formed by Standards Australia and Standards New Zealand, was responsible for developing new rules. When a push to adopt ICNIRP-based limits failed last year, TE/7 did reaffirm the flat standard, but only as an interim measure, through March 5, 1999 (see *MWN,* M/J98).

On March 4, members of TE/7 voted 20-9 in favor of the ICNIRP-based limits — short of the 80% support needed for adoption. But on April 22, New Zealand's TE/7 members separately voted 7-1 to adopt the ICNIRP limits following some revisions, and Standards New Zealand issued them as NZS 2772.1:1999. A similar proposal failed to pass in Australia.

This spring, the Australian Communications Authority (ACA) told Standards Australia that it would continue to use the old, flat standard as the basis for its regulations, despite the fact that TE/7 had allowed it to lapse. In February, the ACA had issued new regulations that made the flat standard legally binding in Australia.

Proponents of the ICNIRP-based standard include various government agencies and radiation labs of both countries, as well as their telecommunications industries. Those opposing the standard include national labor organizations, consumers' groups, Australia's Commonwealth Scientific Industrial Research Organization (CSIRO) and Australia's National Occupational Health and Safety Commission.

In 1998, opponents of an ICNIRP-based standard included Australia's two leading wireless carriers, Telstra and Optus, which were concerned about negative public reaction to higher limits. They have both since changed their position. "Telstra believes that the ICNIRP guidelines should form the scientific basis for a revised Australian RF standard," Telstra's Jack Rowley told *Microwave News* this May.

Speaking for the Australian Mobile Telecommunications Association (AMTA), Dr. Ken Joyner of Motorola said that, "The AMTA strongly supports international harmonization of technical standards in order to reduce costs and break down nontariff barriers to trade."

The TE/7 process has been marked by controversy. According to Stewart Fist, an Australian journalist who has followed the deliberations, there has been a "long and bitter fight."

In TE/7's March ballot, those opposing the proposed standard were required to submit detailed explanations of their votes, while those favoring the proposal were not. Fist called the one-sided requirement "an interesting new trend in making democratic decisions."

After the ICNIRP-based standard failed to win adoption in

March, Standards Australia and Standards New Zealand moved to split TE/7 into two national groups to enable New Zealand to adopt the ICNIRP limits, where they faced less opposition. Dr. Ivan Beale of the University of Auckland in New Zealand, who represented the public on TE/7, objected to this strategy as a possible breach of the standards groups' bylaws.

"I am fed up with this result after ten years of attending the meetings," Beale told *Microwave News*. Beale said that he has resigned from TE/7 and has asked Dr. Neil Cherry of Lincoln University in Canterbury, New Zealand, a longtime advocate of strict exposure limits, to take his place (see *MWN,* M/A97).

The opposition Democratic Party in Australia's Senate is preparing to call for an investigation of the standard-setting process, an aide to Senator Lyn Allison told *Microwave News*.

The flat standard's exposure limits for frequencies from 10 MHz to 300 GHz were 200 $\mu W/cm^2$ for the public and 1 mW/cm^2 for workers. The ICNIRP exposure limit for the public is 200 $\mu W/cm^2$ from 10 MHz to 400 MHz, and increases with frequency above 400 MHz to a maximum of 1 mW/cm^2 at 2 GHz. ICNIRP's occupational limits are higher than those for the public by a factor of five, and are similarly frequency-dependent.

TE/7 members in both countries who oppose the ICNIRP-based standard consider the ICNIRP exposure limits to be inadequate because they do not protect against possible nonthermal health effects. "While the potential risk to human health remains unknown, it is advisable to set exposure limits as far below levels known to cause adverse biological effects as is technically, economically and socially feasible," CSIRO's Dr. John Hunter told Standards Australia. "Increases in those compliance levels are unwarranted and imprudent."

These opponents are also dissatisfied with the standard's language endorsing precautionary measures. "What we now have in the current draft standard is a 'homeopathic' dose of prudent avoidance, which has been diluted to the extent that virtually nothing is left of the original intent," Australia's Don Maisch, a consultant based in Hobart, told Standards Australia.

Daniel Dwyer of Australia's Communications, Electrical Plumbing Union told *Microwave News* that he would have considered the ICNIRP limits if the precautionary language had been stronger. But, he said, the proposed standard "was basically an ultimatum to accept ICNIRP with a 'feel-good' precautionary approach."

The precautionary language is found in the standard's foreword, which states that, in view of ongoing RF research, "Generally, it is...sensible in achieving service or process requirements to minimize unnecessary or incidental RF exposure."

The flat standard was initially adopted in Australia in 1985 (see *MWN,* M/A86) and renewed in 1990, when it was also adopted in New Zealand (see *MWN,* J/F90). It originally included an endorsement of the "ALARA" principle — that exposures be kept "as low as reasonably achievable" — but TE/7 deleted that wording in 1998, substituting milder language calling for prudent avoidance.

The vote that allowed Standards New Zealand to adopt the ICNIRP limits was cast by Roger Matthews of the City of Auckland, who represents local government. Matthews voted against the proposal in March of this year, but in April he changed sides following revisions that he believes tighten the standard's compliance rules and allow local officials to adopt precautionary measures. Although he admits that he is "not happy with the ICNIRP high frequency numbers," Matthews told *Microwave News* that he stands by his decision: "We now have a standard that we can actually enforce in court if need be."

IEEE Adopts Some Changes in Standard for RF/MW Exposure

On April 16, the Institute of Electrical and Electronics Engineers (IEEE) published a revised version of its exposure standard for fields of 3 kHz to 300 GHz — a key standard for RF/MW radiation.

IEEE C95.1-1999 reflects changes proposed by the IEEE's Standards Coordinating Committee 28 (SCC-28) on Non-Ionizing Radiation Hazards last September, and approved by the IEEE Standards Board at the end of 1998.

"The full revision of the 1991 standard will take a few more years, but there were some changes that the committee felt should be included now," Ron Petersen, the secretary of SCC-28, told *Microwave News*. The changes affect limits on induced and grasping-contact currents, definitions of radiated power and spatial averaging and some measurement distances. The last major changes were adopted by the IEEE in 1991 (see *MWN,* N/D91), and the standard was reaffirmed in 1997 (see *MWN,* J/A97).

"The induced current limits were relaxed," said Petersen, who is with Lucent Technologies in Murray Hill, NJ. "But now they also have a ceiling, so they can't increase without bound anymore."

Induced currents no longer have to be measured if electric field strength is below certain values. In addition, for the 100 kHz to 100 MHz frequency band, the induced current limit was changed from a simple average over one second to the root-mean-square over any six-minute interval. "For frequencies above 100 kHz, where specific absorption rates are important, it needed to be changed," Petersen said. For these higher frequencies, the six-minute average is supplemented by a 500 mA ceiling on peak exposures. Similar changes were made to the limits on grasping-contact currents.

For hand-held mobile phones, the term "radiated power" is now explicitly defined as "the power radiated into free space in the absence of any nearby objects." (For cellular phones in the U.S., for instance, the FCC limits radiated power to a maximum of 0.6 W.) "When we polled the committee, we found we had ten different definitions among ourselves," Petersen explained. "Everything from antenna input power, to the power radiated by the antenna with the head present, without the head present and so on. I was really surprised — I always thought I knew what 'radiated power' was."

The standard formerly stated that measurements to check compliance must be made at a distance of at least 20 cm from an RF source. "The new standard says that for directly radiating devices you can take measurements no closer than 5 cm, and for objects that cause reflecting and scattering, no closer than 20 cm,"

said Petersen.

Dr. John Osepchuk, chair of SCC-28, said in an interview that the American National Standards Institute is likely to adopt the new IEEE standard sometime later this year.

"There are still some mistakes in it," Petersen remarked. "For instance, in the induced current limits for the general public, the averaging time should have been changed to 30 minutes, but it stayed 6 minutes and nobody caught it."

The changes were drawn up by SCC-28's Subcommittee IV, whose cochairs are Drs. C.K. Chou of Motorola in Plantation, FL, and John D'Andrea of the Naval Medical Research Institute at Brooks Air Force Base in San Antonio. Petersen is the secretary of both the subcommittee and the full SCC-28. Osepchuk, formerly of Raytheon, is now a consultant based in Concord, MA; SCC-28's vice-chair is Dr. Eleanor Adair of Brooks Air Force Base.

Two Studies Link Mobile Phone Use and Brain Cancer *(continued from p.1)*

caution." Hardell told *Microwave News*.

"I did a similar analysis, looking at where the tumor occurred," Joshua Muscat of the American Health Foundation in New York City said in an interview. "There was a correlation between the hand that holds the phone and tumor laterality — the side of the brain where the tumor occurs." But Muscat stressed that there were "inconsistencies" in the data from his study, and that his analysis was not yet complete.

Until more is known, Sweden's Hardell is recommending that mobile phone users practice "prudent avoidance" by taking steps to reduce their exposure (see p.7). "Use a hands-free earphone," he said. "I always do."

In normal use, the typical mobile phone antenna is positioned just behind the ear; the areas of the brain closest to that spot are the temporal and occipital lobes. Hardell found that cellular phone users were two-and-a-half times more likely to develop tumors in these lobes on the side of the head where the phone was normally held. This was true for both right- and left-side phone users. Hardell found no increased risk for the frontal or parietal lobes, which are farther from the phone's antenna.

Since cellular phone radiation does not penetrate very far into the head, Hardell explained, tumor location may well be a more sensitive indicator of a small increase in risk than the incidence of cancer in the brain as a whole. "Based on our experience, it is necessary to have anatomical tumor localization" to study this issue effectively, he said.

Muscat gave qualified support to this idea: "It could be that you have a very localized exposure, and anything beyond a small area is irrelevant."

On the other hand, Muscat said, it is far from clear that mobile phone radiation is the cause of any of the associations observed in his study. Though his analysis is still unfinished, Muscat said, he found that tumor location also appears to be linked with the side of the head to which a traditional wired phone is held. "The correlation is uneven," said Muscat, but it raises the possibility that the link may be to handedness rather than to the use of mobile phones *per se*.

In the Hardell study, the overall odds of brain cancer were about the same whether or not people had used a cellular phone. How can this finding be reconciled with an increased risk of a tumor near to where the phone is held? Hardell said that the results on tumor location might be due to chance. Alternatively, he said, there may be an increase in overall brain cancer risk, but one that is too small to be detected easily in a study with such a large margin of error. (None of the Swedish risks were statistically significant.)

The Swedish findings on tumor location were due almost entirely to data from people who had used analog NMT (Nordic Mobile Telephone) phones. "There are two ways you can discuss this," said Hardell. "It might be because the analog phones produce higher exposure" — three times higher than do digital GSM phones, according to Hardell. "Or it might be because we don't have enough people or long enough exposures for the digital phones." Hardell's paper states that "few subjects had used the [digital] GSM system, and [for them] the tumor induction period is still short since the digital system was introduced in the

The Hardell Study

The study by Dr. Lennart Hardell found that:

- The overall chance of developing brain cancer among mobile phone users, as compared to nonusers, was essentially the same (odds ratio = 0.98, with a confidence interval (CI) of 0.66-1.41).
- Cellular phone users who held the phone on the right side were 2.45 times more likely to develop a tumor in the temporal or occipital lobes on the right side of the brain (CI=0.78-7.76). For left-side phone users, such tumors were 2.40 times more likely to occur on the left side (CI=0.52-10.9).
- Mobile phone users showed no increase in the risk of acoustic neurinoma, a benign tumor of a nerve that leads from the brain to the inner ear.

Hardell's study was based on 209 cases, diagnosed in the areas around Uppsala (1994-96) and Stockholm (1995-96), and 425 controls.

The Muscat Study

The study by Joshua Muscat found that mobile phone users had:

- No overall increase in brain cancer.
- A higher risk of developing a tumor on the side of the cerebellum on which they held the phone. But such a risk was also found for users of traditional wired phones.
- A statistically significant two- to threefold increase in the risk of neuroepithelial tumors. There was no dose-response relationship, however: In fact, the highest risk was among people who spent less time on the phone.

Muscat's research was based on 466 brain cancer cases and 420 controls. Work on the study, which was funded by WTR, began in 1996.

Advice from Dr. Hardell

"Until this problem is solved, I think it's necessary to be somewhat cautious and reduce exposure," said Dr. Lennart Hardell, following the release of his findings on cellular phones and brain cancer.

In an interview with *Microwave News,* Hardell offered three pieces of advice for users of mobile phones:

• "Use a hands-free device." Using an earphone increases the distance between the phone's antenna and the user; Hardell said that doing so will reduce exposure by about 95%.

• Buy a low-radiation phone. "Ask about the specific absorption rate (SAR) when purchasing a mobile phone," said Hardell, "and buy one with as low an SAR value as possible."

• "Restrict use by children and young adults." Young people have been shown to be more sensitive to ionizing radiation and chemical carcinogens. We do not know whether cellular phones have any effect on growing bodies, noted Hardell, but he thinks it is best to err on the side of caution.

"I think these three points fit well under the idea of prudent avoidance," Hardell explained. "We have the technological ability to reduce exposure — so why not use it?"

Dr. Kjell Hansson Mild, a coauthor of Hardell's brain cancer study, gave qualified support to use of a hands-free device: "If I were to use a mobile phone regularly for an hour or more a day, I would definitely get an earpiece," he told *Microwave News*. "But I do not think that temporary use is of too much interest."

early 1990s."

Hardell's recently completed study included 209 people with brain cancer. His team is now working on a larger study, which will include 1,500 cases and an equal number of controls (see *MWN,* N/D97). "In our first study, the cases came from 1994 through 1996," he said. "The new one will have data from 1997 through 1999, and from two additional geographic areas in Sweden — which adds up to most of the country." Dr. Kjell Hansson Mild of the National Institute for Working Life in Umeå, a coauthor of the smaller Hardell study, said that they hope to present results from the new research at the annual meeting of the Bioelectromagnetics Society (BEMS) in 2000.

Muscat commented that, "Fifteen hundred cases will be a very large study," and will represent a major step forward in statistical power. "Even if you start dividing up the numbers by different lobes and so on," he explained, "that's big enough that if there's a real effect, you might expect to find it."

Also under way is a multicountry study by the International Agency for Research on Cancer, based in Lyon, France, for which Hardell is the main collaborator in Sweden (see *MWN,* J/F98 and S/O98). Results are expected in 2003 or 2004. A brain cancer study by the U.S. National Cancer Institute in Rockville, MD, which is examining a number of possible risk factors, will not be completed until next year, the institute's Dr. Peter Inskip told *Microwave News* (see *MWN,* J/F93 and N/D97). Another U.S. study, by Epidemiology Resources Inc. (ERI) in Newton Lower Falls, MA, has been on hold for a combination of financial and legal reasons (see *MWN,* M/J96 and N/D97).

A May 24 press release from Wireless Technology Research (WTR), an industry-funded group that is sponsoring both the Muscat and the ERI studies (see *MWN,* J/A96 and M/A99), stated that Muscat had found "a statistically significant risk of a rare tumor called a neurocytoma" among cellular phone users as a whole.

In fact, Muscat told *Microwave News,* the significant increase was not in neurocytomas but rather in neuroepithelial tumors — a broader class of which neurocytomas are one type. He said that cellular phone users had a two- to threefold greater risk of neuroepithelial tumors than did nonusers.

Muscat said he was "not inclined to emphasize" the increase in neuroepithelial tumors, for several reasons. "When you start chopping up the data and doing multiple comparisons," he explained, "you increase the odds of a chance finding." Also, he noted, neuroepithelial tumors are a rare form of brain cancer, and his study included an unusually large number: "The number is considerably out of the ordinary, which indicates that there's some ambiguity in the classification of these tumors."

As for the media focus on the fact of a statistically significant increase, Muscat commented that, "This is an isolated finding that's being taken out of context."

"I told WTR that these data were to be kept strictly confidential," Muscat said.

The May 22 *Washington Post* indicated that Muscat had found an association between cell phone use and tumor location for right-handed — but not left-handed — cellular phone users. Muscat told *Microwave News* that while this was an accurate description of his data, it is "not appropriate" to separate the two sides this way, in terms of statistical analysis.

Muscat hopes to submit his study for publication by the end of the summer. He is scheduled to present preliminary results in mid-June at a WTR symposium prior to this year's BEMS meeting in Long Beach, CA.

"Hopefully, when this study and Hardell's are both published," he said, "people will be able look at all the data and make some comparisons." If the results are inconsistent, he added, it would be important to look at differences in types of phone or patterns of use.

Danish Epi Study Under Way

An epidemiological study of cancer among cellular phone users is now under way in Denmark. It is based on annual use of mobile phones by 550,000 Danish cellular phone subscribers from 1982 through 1995.

"We are ready to begin risk calculations," Dr. Christoffer Johansen of the Danish Cancer Society (DCS) in Copenhagen told *Microwave News*. Partial funding for the study has been obtained from two of the main wireless phone companies in Denmark, TeleDanmark Mobil and Sonofon, as well as from the DCS.

While more funding must be secured before the study can be completed, Johansen is optimistic. He hopes to submit a paper for publication before the end of the summer. The study design is described in a paper in *Radiation Protection Dosimetry (83,* pp.155-157, 1999).

NAS–NRC Panel Criticizes RAPID Program; Sees No Need for New EMF Health Research Effort

There is no need to fund an EMF health effects research program, according to a National Academy of Sciences-National Research Council (NAS–NRC) committee that reviewed studies conducted under the EMF Research and Public Information Dissemination (RAPID) program. An NAS–NRC report released in May discounted reported EMF bioeffects on the grounds that they have not been replicated.

All replications attempted in the RAPID program had either negative or equivocal results, the committee concluded. It called this lack of confirmation "an important contribution," which has "reduced the credibility of many of the claims of biologic effects of power frequency magnetic fields."

The report also discounted RAPID studies that reported new EMF bioeffects, arguing that unreplicated findings "have little value in answering the basic question of whether there are biologic effects of low-level power frequency magnetic fields." In RAPID's *in vitro* studies, it contended, "the few reported effects were small and their connection to disease processes are speculative at best and irrelevant at worst."

(Dr. Robert Liburdy's work showing that EMFs can block the anticancer action of melatonin, which has been successfully repeated three times since 1992 (see *MWN*, J/A98), is acknowledged in a footnote, with the comment that none of the replications of Liburdy's work have yet been published.)

The RAPID research program, established by Congress in 1992, was intended "to determine whether or not exposure to electric and magnetic fields...affects human health." Congress directed the NAS to "evaluate the research activities under the program," while the National Institute of Environmental Health Sciences (NIEHS) was directed to give Congress an overall report on the program. The latter report is expected to be released in June.

Since the health effects observed in epidemiological studies "range from none to weak," the NAS–NRC panel argued, they cannot be accepted without "evidence that supports the biologic plausibility of such an association."

It acknowledged, however, that:

> People evaluating epidemiologic findings in this field can arrive at different conclusions, depending on their starting viewpoints. Those concerned about protecting public health might lean towards acceptance of a possible association between magnetic fields and cancer risk, whereas others might reject such an association based on the lack of a plausible mechanism and the inability to identify possible confounders.

The NAS–NRC committee was critical of the NIEHS Working Group on EMF health effects, which decided last June that power frequency EMFs should be regarded as a "possible human carcinogen" — based mainly on the epidemiological evidence. According to the NAS–NRC panel, the Working Group's statement "conveys to the public a conclusion that our committee believes is not supported by the underlying research."

The committee conceded that the Working Group's reading of the evidence was "not greatly dissimilar" from that of the NAS-NRC's own committee on EMF health effects in 1997, though it was "differently worded." But the report argued that the NAS–NRC's 1997 formulation — that there was "no conclusive and consistent evidence" for EMF health risks — "more accurately convey[s] the health implications of the underlying research to the public." It blamed the discrepancy mainly on the Working Group's use of the criteria developed by the International Agency for Research on Cancer, which the NAS–NRC panel considered inappropriate for EMFs.

The one member of the NAS–NRC panel who also served on the Working Group, Dr. Walter Rogers, was the only member of the Working Group to vote that the evidence actually showed that EMFs "lack" carcinogenic properties (see *MWN*, J/A98).

The NAS–NRC committee stated that it was "difficult to judge the quality, completeness or significance of the biologic studies funded by the EMF RAPID program" because many of

NAS–NRC Recommendations on EMF Health Research

These are the recommendations of the NAS–NRC committee reviewing research conducted under the RAPID program:

1) The committee recommends that no further special research program focused on possible health effects of power frequency magnetic fields be funded. Basic research on the effects of power frequency magnetic fields on cells and animals should continue but investigators should compete for funding through traditional research funding mechanisms.

2) If, however, Congress determines that another time-limited, focused research program on the health effects of power frequency magnetic fields is warranted, the committee recommends that emphasis be placed on replications of studies that have yielded scientifically promising claims of effects and that have been reported in peer-reviewed journals. Such a program would benefit from the use of a contract-funding mechanism with a requirement for complete reports and/or peer-reviewed publications at program's end.

3) The engineering studies were initiated without the guidance of a clearly established biologic effect. The committee recommends that no further engineering studies be funded unless a biologic effect that can be used to plan the engineering studies has been determined.

4) Much of the information from the EMF RAPID biology program has not been published in peer-reviewed journals. NIEHS should collect all future peer-reviewed information resulting from the EMF RAPID biology projects and publish a summary report of such information periodically on the NIEHS Web site.

5) The communication effort initiated by EMF RAPID is reasonable....There are two limitations to the effort. First, it is largely passive, responding to inquiries and providing information, rather than being active. Second, much of the information produced is in a scientific format not readily understandable by the public. The committee recommends that further material...be written for the general public in a clear fashion....

the results had not yet been published. "Some papers reported to be submitted or in preparation have not appeared," it noted, "raising concerns about the reproducibility or quality of their data." Project summaries provided to the committee were said to be "of uneven quality," with most not giving complete results.

Some observers were surprised that the NAS–NRC issued its report when the NIEHS had yet to submit its own report to Congress. "I am absolutely stunned," Dr. Michael Marron of the Office of Naval Research in Washington told *Microwave News*. "I had been told that the academy could not possibly issue its report so quickly." Marron heads the federal interagency group on EMF health effects research, which is to release its own report on the RAPID program later this year.

"Every report by the academy — including this one — goes through a formal review process," said Dr. Rick Jostes of the NRC, study director for the report. Far from being premature, he said, the release of the report did not occur until months after a December 31, 1998, deadline.

The NAS–NRC report had few positive comments about the RAPID engineering studies. "Many of the engineering studies were of little use," the committee stated. It complained that:

> The projects were commissioned without any convincing evidence of specific linkages between low-level magnetic field exposure and human health effects. As a result...they anticipate all possible field parameters of potential relevance, without good reason to focus on any specific one.

Of the 11 engineering studies conducted under RAPID, "only two are regarded as noteworthy," according to the panel: the Enertech 1,000-person exposure study and an Illinois Institute of Technology study of field-reduction technologies. Overall, the panel felt that the engineering studies were of "questionable" value.

One significant conclusion from the engineering studies, according to the panel, was that most people's EMF exposures at home or at work are "remarkably similar." The panel stated that most people are exposed to 1-2 mG, and "very few" to more than 4 mG. (See also p.19.)

The members of the NAS–NRC panel were: Drs. John Ahearne (chair), Duke University, Durham, NC; Edwin Carstensen, emeritus, University of Rochester, NY; Raymond Erikson, Harvard University, Cambridge, MA; Maurice Fox, emeritus, MIT, Cambridge, MA; James Hoburg, Carnegie Mellon University, Pittsburgh; Walter Rogers, University of Texas Health Sciences Center, San Antonio; Jan Stolwijk, Yale University, New Haven, CT; and Thomas Tenforde, Battelle Pacific Northwest Laboratories, Richland, WA.

The NAS–NRC panel expressed its thanks to several people, "chosen for their diverse perspectives," who reviewed and commented on a draft of the report. The reviewers were: Drs. Robert Adair, Yale University; Leeka Kheifets, EPRI, Palo Alto, CA; Ross MacDonald, emeritus, University of North Carolina, Chapel Hill; John Moulder, Medical College of Wisconsin, Milwaukee; Richard Saunders, NRPB, U.K.; Herman Schwan, emeritus, University of Pennsylvania, Philadelphia; and Charles Stevens, Salk Institute, La Jolla, CA.

The panel's report, *Research on Power Frequency Fields Completed Under the Energy Policy Act of 1992,* is available on the Internet, and a hard copy can be purchased, at <books.nap.edu/catalog/9587.html>. It can also be ordered for $26.75, plus shipping, from: (800) 624-6242.

EMFs Protect Chick Embryos Against Cardiac Stress

Weak power frequency EMFs can help chick embryos survive severe cardiac stress, according to Drs. Theodore Litovitz and Andrea DiCarlo of the Catholic University of America in Washington. They attribute the protective effect to the increased production of heat shock proteins in response to EMF exposure.

"There's nothing subtle about the experiment," Litovitz explained. "At the end, the embryos are either alive or dead."

The starting point for the studies was Dr. Reba Goodman's research showing that low-level EMFs can activate gene expression of heat shock proteins in human HL60 cells. Despite their name, heat shock proteins are formed not only in response to heat, but also as a defense against a variety of other stresses. They are known to minimize the damage to cardiac tissue caused by oxygen deprivation and reoxygenation, both of which can be lethal. Litovitz and DiCarlo believe that magnetic fields can prepare chick embryos for such stress.

Litovitz and DiCarlo exposed chick embryos for 20 minutes to 60 Hz EMFs ranging from 40 mG to 100 mG. One hour after the EMF treatment, the exposed eggs and the unexposed controls were placed in sealed containers and deprived of oxygen until at least 60% of the controls' hearts had stopped beating. At this point, the containers were opened, allowing oxygen levels to return to normal.

Writing in the February 16 issue of *Circulation (99,* pp.813-816, 1999), Litovitz and DiCarlo reported that 68.7% of 506 exposed embryos had a heartbeat 30 minutes after reoxygenation, compared to 39.6% of the controls — a highly significant difference ($p<0.0001$).

These new chick embryo results "confirm our cellular studies and extend them to an animal model," Goodman, who is at Columbia University in New York City, said in an interview. "In each case, there are changes in transcription and translation caused by relatively weak magnetic fields."

Interestingly, Litovitz and DiCarlo found that a minor change in the strain of hens was a key variable. In a paper recently published in *Bioelectrochemistry and Bioenergetics (48,* pp.209-215, 1999), they document different results with embryos from two flocks of the same breed of hens.

While embryos from the first flock showed a response after a 20-minute, 80 mG exposure, those from the second flock did not. Litovitz and DiCarlo failed to see a protective effect in these embryos until they extended the exposure to at least 60 minutes.

Litovitz and DiCarlo believe that such genetic variations may explain the inconsistent biological responses seen in EMF experiments. In the "henhouse project," for example, one of six participating labs could not reproduce an experiment by Spain's Dr. Jocelyn Leal in which very weak pulsed magnetic fields impaired the development of chick embryos. That lab used eggs from a different breed of hens (see *MWN,* Mr83 and M/A88).

"In other areas of biology, genetic factors are well known to affect experimental results," DiCarlo told *Microwave News*. But, she added, "When researchers can't replicate an EMF biological effect, people tend to assume that the effect doesn't exist."

J/A97). A number of prior studies had shown such an association, leading a panel at the National Academy of Sciences (NAS) to conclude that children living near high-current power lines did appear to have higher-than-expected rates of leukemia. The NAS panel doubted, however, that EMF exposure was to blame (see *MWN,* N/D96).

"This study is good enough to add evidence against there being a substantial association," Dr. David Savitz, chair of the Department of Epidemiology at the University of North Carolina School of Public Health in Chapel Hill, said in an interview. In the 1980s, Savitz reported increased cancer among children living near high-current power lines (see *MWN,* N/D86).

McBride's study was based on 399 children in five Canadian provinces, who were diagnosed with leukemia at up to 14 years of age between 1990 and 1995. In addition, McBride's team selected 399 matched controls. EMF exposures were estimated with personal measurements over a 48-hour period and with 24-hour EMF measurements in each child's bedroom, both taken with a Positron meter. In addition, the researchers noted local power line characteristics and magnetic field measurements at the perimeter and the front door of both the mother's residence in the year prior to the child's birth and the child's residence from birth to the date of diagnosis, all using an EMDEX-C magnetic field meter. Power line characteristics were classified according to both the wire-coding scheme first devised by Dr. Nancy Wertheimer and Ed Leeper for their landmark 1979 study and the modified scheme developed by Savitz and Dr. William Kaune.

For measured magnetic fields and for high-current wire codes, there were no elevated leukemia risks. For all leukemia and for acute lymphatic leukemia (ALL) alone, the adjusted odds ratios (OR) for personal magnetic field exposures were 0.95 and 0.93, respectively.

"There were no clear associations with predicted magnetic field exposure two years before the diagnosis/reference date or over the subject's lifetime or with personal electric field exposure," McBride wrote in the *AJE*.

The study was the first to ask children to wear an EMF dosimeter for two days. "By looking at personal exposures, we addressed some of the limitations of previous studies," McBride said. She also highlighted the short time between the identification of cases and the measurements.

Key Error in AJE *Paper and Abstract*

One of the few elevated risks reported in the McBride paper turns out to have been an error. In the abstract, published in the *AJE,* the McBride team highlighted an OR of 1.72 for ALL among those children who lived in houses with very high-current wiring configurations two years prior to diagnosis compared to those who lived next to underground wiring. This OR was actually 0.84 (see table, p.11). The error was due to a mistabulation of several columns of numbers, according to McBride.

Most of the children were exposed to EMFs of less than 2 mG (0.2 μT) based on a time-weighted average: Of the 293 children for whom 48-hour personal exposure data were available, 54 were exposed to 2 mG or more. The adjusted OR for these exposures was 1.12, with a confidence interval (CI) of 0.69-1.80, relative to exposures of less than 2 mG. McBride did not calculate risks for those exposed to more than 3 mG.

Only eight children and six controls were exposed to 5 mG or more. This group had an unadjusted elevated risk of 1.48 with a CI of 0.49-4.42 — but after adjustment for the age at which each mother gave birth, maternal education, household income and the child's ethnicity and number of residences, the OR went down to 0.89 (CI: 0.24-3.36).

"The study tells you that kids are not highly exposed. This is reassuring," Dr. Richard Gallagher, a coauthor and the chief cancer epidemiologist at the BC agency, told *Microwave News*.

Gallagher, who was the initial principal investigator on the McBride study, noted that little could yet be said about the cancer risk for exposures over 5 mG: "No study to date has had the statistical power to examine the high-exposure group," he said. "My feeling is that we have not yet demonstrated that there is a risk at high exposures, but we cannot rule it out."

In an interview from her home in Boulder, CO, Dr. Nancy Wertheimer also stressed the importance of looking at the children who are most-highly exposed. "The McBride study has unusual and potentially serious exposure assessment problems, particularly for the highest exposure groups," she said.

Japan Set To Begin Childhood Cancer Epi Study

The Japanese government has approved funds for a three-year epidemiological study of power line EMFs and childhood cancer. The effort will be the first of its kind in Japan.

The Environment Agency's National Institute for Environmental Studies (NIES) in Ibaraki will lead the study, with the institute's Dr. Michinori Kabuto as the principal investigator. Kabuto has been assessing the feasibility of such a large-scale study for over a year (see *MWN,* M/J98).

The institute aims to go beyond measuring power frequency exposures. "The study will evaluate the relationship between children's cancers...and EMF exposures that previous studies have neglected to examine, such as high-level exposures, harmonics and transients," according to the NIES.

Dr. Anders Ahlbom of the Karolinska Institute in Stockholm, Sweden, who is advising the NIES on the study, told *Microwave News* that the study's importance will be enhanced by its large number of highly exposed subjects.

The study will include as many as 1,000 children with leukemia and 500 with brain cancer, with each case matched to three controls, the *Mainichi Shinbun,* a leading newspaper, reported on April 20. The institute has not yet released details of the project's expected cost.

Researchers at the NIES and at Tokushima University will be responsible for the EMF exposure assessment, as well as for the evaluation of other possible risk factors, including air pollution, radon and medical radiation exposures.

The study will be part of a national research effort on the potential health effects of non-ionizing radiation that was launched last year in response to growing public concerns (see *MWN,* M/J98).

The NIES said that it plans to exchange information with the World Health Organization's International EMF Project in Geneva as the study proceeds.

The one remaining elevated risk found by McBride was that for children living near high voltage power lines. The adjusted ORs for those whose homes were within 50 meters of a transmission line of at least 50 kV were 1.31 and 1.65 for all types of leukemia and for ALL, respectively. For children living within 100 meters, the ORs were 1.81 for all leukemias and 1.99 for ALL. These results were not statistically significant and had large CIs — due to the small number of cases. There were seven cases and four controls within 50 meters and 14 cases and seven controls within 100 meters of power lines of at least 50 kV.

McBride pointed out that the cancer risk was higher at distances greater than 50 meters from a power line. But one of her coauthors, Dr. Gilles Thériault, was not swayed by this apparent inconsistency. "When you have so few cases, you expect variation," he told *Microwave News*. "You cannot put much weight on this lack of dose-response." Thériault is the chair of the Department of Epidemiology, Biostatistics and Occupational Health at McGill University's medical school in Montreal.

"A review of the literature shows that those living in houses that were next to high voltage transmission lines have a fairly constant risk," Thériault said. "We keep observing this anomaly."

One of the most important studies to show a link between living near transmission lines and cancer among children is the Swedish, Feychting-Ahlbom study (see *MWN*, S/O92). But Gallagher commented that he prefers his and the NCI's strategy of investigating the myriad possible causes of cancer. "We want to know what is causing childhood leukemia, while the European studies are only looking at EMFs."

In addition to measuring electric and magnetic fields, the Positron dosimeter also captures high frequency transients (see *MWN*, M/A94 and N/D94). The McBride paper did not detail any results based on transient exposures. "We have taken an initial look at the transient data and we plan to publish them," she said. "But there does not seem to be much exposure."

Initial funding for the study came from the Canadian government, through the federal agency Health Canada. Later, the Canadian Electricity Association (CEA) paid for half of the study's total cost, and half of the CEA share was paid by the U.S.' EPRI. "We sent a report to our sponsors a year ago," McBride said.

Two additional papers have been prepared. The first, which addresses exposure variability in the personal measurements, will appear in the June 1999 issue of the *Scandinavian Journal of Work, Environment & Health*. The lead author is Dr. Jan Deadman of McGill University. The second, which is in review at the same journal, looks at the use of statistical modeling to predict lifetime exposures. The lead author of this paper is Dr. Ben Armstrong of the London School of Hygiene and Tropical Medicine in the U.K.

Multinational Meta-Analysis on Childhood Leukemia Due Next Year

The McBride childhood leukemia data are included in a meta-analysis being carried out by Drs. Anders Ahlbom and Maria Feychting of the Karolinska Institute in Stockholm in collaboration with an international group of researchers.

The meta-analysis combines epidemiological studies from nine countries — Canada, Denmark, Finland, Germany, New Zealand, Norway, Sweden, the U.K. and the U.S. — Ahlbom told *Microwave News*. He said that it should be completed by January 31, 2000.

The National Cancer Institute study headed by Dr. Martha Linet is the single U.S. study to be part of the multinational meta-analysis, which is being funded under a contract from the European Community (see *MWN*, J/F96).

In a separate meta-analysis of 15 EMF–childhood leukemia studies, published at the end of 1998, Dr. Daniel Wartenberg of the Environmental and Occupational Health Sciences Institute in Piscataway, NJ, found "relatively strong and consistent support for a somewhat weak elevated risk" (see *MWN*, J/F99).

At the request of *Microwave News*, Wartenberg added the McBride data and recomputed the risks. He found only small changes. The odds ratio for wire code risks went down approximately 10%, he said, while there was no change in the risk associated with spot measurements. For calculated fields, the odds ratio decreased but the association became statistically significant because of the larger number of cases.

"Unless we get an additional study with either extremely different results or an extremely large sample size, we are unlikely to see a substantial change in the average effect," Wartenberg said.

Revised Table 6 in McBride AJE Paper

The revised data presented below were provided to *Microwave News* by Mary McBride. The errors in Table 6 of the published paper (*AJE*, p.839) were first pointed out by Dr. Nancy Wertheimer. McBride will be publishing a correction in the *AJE*.

Wire configuration code of residence two years before diagnosis/reference	Cases	Controls	Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio*	95% Confidence Interval
Underground	59	44	1.00			
Very low current	57	69	0.61	(0.35-1.08)	0.59	(0.31-1.09)
Ordinary low current	60	60	0.75	(0.42-1.34)	0.72	(0.38-1.35)
Ordinary high current	74	83	0.66	(0.38-1.17)	0.69	(0.37-1.28)
Very high current	24	22	0.84	(0.40-1.75)	0.70	(0.31-1.56)

*Adjusted for maternal age at birth of subject, maternal education, household income, ethnicity and number of residences of subject since birth.

Letters to the Editor

Carlo Defends WTR's Record

May 15, 1999

To the Editor:

Enough is enough!

Your pattern of libelous and uninformed commentary, "reporting" and editorializing on the activities of Wireless Technology Research (WTR) over the past six years has reached a new level of absurdity with your most recent attack (see *MWN*, M/A99). While I personally have refrained from dignifying your ad hominem attacks on me with any response, I am compelled to set the record straight as you have now attempted to impugn the reputations of my colleagues Drs. Don McRee and Graham Hook, Joshua Muscat, the American Health Foundation and Integrated Laboratory Systems (ILS).

First, the letter you published from Drs. Lai and Singh in your latest issue is a mesh of innuendo, half-truths and outright lies about WTR, Drs. McRee and Hook, and ILS. That you should publish such a long letter without first allowing those who are mentioned in it a chance to respond takes the letter out of the realm of "letter to the editor" and into the realm of reporting. Further, the reporting over the years in your own newsletter substantiates that you knew or should have known of the inaccuracies before you published it. What is your motive?

Second, your position that I would "dangle" positive results in front of your reporter to induce "a major story" to help secure follow-up funding for WTR is preposterous on its face and self-aggrandizing on your part. In your May/June 1997 issue, you reported that the WTR program would end in the middle of 1999 and that I had been asked by the industry and agreed to stay on until that time. You knew in 1997 that my tenure at WTR would be up this year and that the future of WTR was in the hands of the industry, not mine. Nothing has changed, so why report otherwise?

Third, your implication that the evidence of "genetic damage has been around for a long time, and WTR never seemed too worried before" betrays the fact that no one anywhere in the world has been able to substantiate the peculiar findings of Lai and Singh regarding genetic damage from RF, although many scientists have tried, including Lai and Singh themselves. That your bias in reporting shows through is no surprise, but your pattern of frivolously playing with the emotions and concerns of millions of consumers who use cellular phones borders [on the] criminal.

Fourth, your attempt to create a controversy regarding the interpretation of the Muscat study to support your thesis that WTR is "crying wolf" is ridiculous. When the peer-review process is completed and the study is made public, those data will speak for themselves. Joshua Muscat and I are not in disagreement about the findings, as will be abundantly clear.

Fifth, your assertion that the credibility of WTR rests with funding disclosures to you is outright arrogance. Since its inception, WTR has been subjected to the most rigorous of annual audit procedures, mandated by the industry, implemented by top accounting firms and reported to the industry by an independent audit committee. Furthermore, in your newsletter you have published WTR research expenditure information every year since 1995, and in significant detail. You have repeatedly refused to come to WTR and review our material and learn about our program. Your "reporting" with respect to WTR is therefore uninformed and just plain wrong.

Overall, your treatment of the very important public issue of the potential health impact of wireless technology amounts to theater masquerading as journalism. You have attempted to propagate this controversy in the same manner you have propagated the controversy regarding power lines — all presumably to sell newsletters and to promote yourself as a television news personality.

You have continuously overlooked the important contributions of both WTR and the wireless industry. You have derogated the wireless industry, who, in an unprecedented manner for business, has voluntarily and publicly assumed the responsibility for health impacts from their products and services. The mechanism they chose, including surveillance and research through WTR, was developed in concert with the Food and Drug Administration, the government's Interagency Working Group on RF and the reasoned recommendations of a congressionally mandated report by the General Accounting Office. This is a model that should be emulated.

The process has worked, the necessary science continues to unfold and the public continues to be protected. That should be your bottom line.

George Carlo, PhD, MS, JD
Chair, Wireless Technology Research
1711 N Street, NW, Suite 400
Washington, DC 20036

Carlo Accuses Lai and Singh of Libel

In a May 14 letter to Dr. Richard McCormick, the president of the University of Washington, Seattle, WTR's Carlo called the Lai-Singh letter to *Microwave News* "libelous." Carlo charged that the two university researchers engaged in "a pattern of slanderous conduct" over the past several years.

In his four-page letter, Carlo disputed the factual accuracy of Lai and Singh's account of their dealings with WTR, and requested a meeting with McCormick "to discuss this very serious problem" in order "to resolve this outside of the courts." Carlo has circulated this letter widely to the press.

An assistant to McCormick told *Microwave News* in early June that a "formal review" is under way and that no meeting has yet been scheduled.

Chou Issues Clarification

May 27, 1999

To the Editor:

I would like to clarify the statements made in the Lai and Singh letter concerning my involvement with the WTR-sponsored DNA study (see *MWN*, M/A99).

1) Before I left the City of Hope, which was after my three-year WTR contract expired on April 16, 1998, I made all necessary arrangements to ensure that our obligation in exposing animals was fulfilled. I made two trips to the City of Hope during May and June of 1998 to check on the progress of the extended contract. There was no problem with our part of the contract.

2) A WTR representative was our quality assurance [QA] monitor, according to good laboratory practices. Following the contract, the exposure results including the codes were submitted to WTR. John McDougall, who exposed the rats, was the only one from the City of Hope who knew the codes. After he signed the data sheets, they were turned over to the WTR QA monitor. My departure did not alter the submission process.

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NAS–NRC Panel Members on Press Release on 1996 EMF Report: "We Had No Input"

One of the most controversial aspects of the release of the National Academy of Sciences-National Research Council's (NAS–NRC) report, Possible Health Effects of Exposure to Residential Electric and Magnetic Fields, *on October 31, 1996, was the academy's press release. At the time, a number of the members of the NAS–NRC panel complained that the press release did not properly reflect the substance of the report (see* MWN, *N/D96). A few weeks later, seven members of the 16-member panel made their views known directly to Dr. Bruce Alberts, the president of the academy (see* MWN, *J/F97). The full text of their letter, which was recently obtained by* Microwave News, *is reprinted below.*

January 2, 1997

Dear Dr. Alberts:

As members of the NAS–NRC Committee on the Possible Biological Effects of Electromagnetic Radiation, we write to express our concern over the press efforts associated with our report and to recommend a strategy to lessen the chance of a similar occurrence with other reports.

Our report addressed a fairly controversial issue of concern to scientists and the public. In our view, the press releases (both hard copy and video) tended to emphasize one aspect of the committee's conclusions rather than providing a more balanced presentation, and the news reports reflected this. Even the headline on the video release misrepresented the results: "New Report Finds No Evidence of Health Hazard from Residential Electromagnetic Fields." Certainly we found evidence; the debate was on the reliability and consistency of these data. The specific wording contained in the report, which we all stand by, was arrived at after careful review, consideration and negotiation. We believe that people not involved in the committee process were not sufficiently sensitive to the careful crafting of the report and the importance of nuance and specific wordings arrived at by the committee. In-depth reporters who compared the report to the press release noted the disparity and, in some cases, questioned the credibility and objectivity of the NAS–NRC on this issue. It has put us as committee members in an awkward position of being asked to explain the contradictions.

Given the concern over the possible misinterpretation of our study, at least three committee members asked to be involved in the review of all public release materials well in advance of the release, in addition to the committee chair and cochair. Two were not involved and one involved only days before the release, and major concerns were not addressed. The result was that nearly half of the 16-member committee was dissatisfied with the final release materials, over which we had no input. Is there some action the NAS–NRC can take to give the public a more balanced understanding of the report? We look to you for suggestions.

In addition, we have one recommendation. For developing press release or public informational documents related to the release of future reports, we urge you to involve any and all interested committee members in the review process at the same time as the committee chairs and cochairs. While this does increase the complexity of the logistics, it will result in better and more accurate press materials.

As the NAS–NRC continues to take on cutting edge, controversial issues, abiding by the fragile consensus carefully crafted by committee members is increasingly important.

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"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

• The EPA delays the release of its proposed RF/MW radiation exposure guidelines, citing an "internal debate." The agency's assistant administrator indicates that the guidance may be abandoned.

• After exposing rats to 2.45 GHz radiation, Drs. Don McRee and H.G. Davis of the NIEHS find that local SARs in the brain can be two-to-three times higher than whole-body SARs.

• Dr. Mays Swicord of the FDA and Dr. Christopher Davis and Glen Edwards of the University of Maryland report that microwave radiation can cause "direct excitation of the DNA molecule" at 8-12 GHz.

Years 10 Ago

• Antoinette Yannon settles with RCA Corp. for $250,000 to conclude a 13-year wrongful death suit. She charged that 15 years of microwave exposure from RCA's relay equipment at the New York Telephone Co. gave her husband, Samuel Yannon, the neurological disease that killed him.

• BC Hydro offers to buy the homes of those living along a right-of-way on which it has built a new 230 kV power line. The Canadian utility says that it will put any property it buys back on the market.

• Paul Brodeur publishes a three-part series in *The New Yorker* addressing health, scientific and political issues related to EMFs from power lines, radar and VDTs.

Years 5 Ago

• Utility companies win three EMF lawsuits in a row, prompting a Georgia Power Co. lawyer to comment that, "The plaintiffs' bar should look long and hard before bringing another one of these cases."

• The U.S. military nears completion of a transmitter in Alaska that will use powerful RF radiation to modify the ionosphere for possible military applications. The project is known as HAARP, or the High Frequency Active Auroral Research Program.

• Digital mobile phone radiation affects the duration of, and the brain waves associated with, REM sleep, German scientists Drs. Klaus Mann and Joachim Röschke discover.

Hot New Papers

Christoffer Johansen, Nils Koch-Henriksen, Søren Rasmussen and Jørgen Olsen, "Multiple Sclerosis Among Utility Workers," ***Neurology, 52,*** **pp.1,279-1,282, April 12, 1999.**

"Although MS is a relatively common, chronic neurologic disease in young and middle-aged adults, its causes remain largely unknown; nevertheless, the evidence from epidemiologic studies seems consistent with an environmental influence occurring on a background of genetic susceptibility. Our results do not support the hypothesis that EMFs are one of the environmental agents that play a significant role in the etiology of MS."

Jan Walleczek, Esther Shiu and George Hahn, "Increase in Radiation-Induced *HPRT* Gene Mutation Frequency After Nonthermal Exposure to Non-Ionizing 60 Hz Electromagnetic Fields," ***Radiation Research, 151,*** **pp.489-497, April 1999.**

"Our findings should not be linked to the health concerns raised by recent epidemiological surveys, since the flux densities we applied were higher by three orders of magnitude than those ($B_{rms} \approx 0.3$-0.4 μT [3-4 mG]) that were found to be associated with small increases in cancer rates. On the other hand, while the flux densities tested here are well above residential exposure levels, they are near or within the recommended safety limits for occupational exposures to magnetic fields. In summary, our results are the first to suggest that moderate levels of at least one type of non-ionizing field, oscillating 60 Hz magnetic fields of about 1 mT [10 G], may enhance mutagenesis in a mammalian cell system. Future studies should investigate whether such magnetic fields can act as an enhancer of *HPRT* gene mutations in conjunction with DNA-damaging agents other than ionizing radiation, such as environmental chemical genotoxins."

S. Velizarov, P. Raskmark and S. Kwee, "The Effects of Radiofrequency Fields on Cell Proliferation Are Nonthermal," ***Bioelectrochemistry and Bioenergetics, 48,*** **pp.177-180, February 1999.**

"Since the changes in cell proliferation due to [GSM] MW radiation [at an SAR of 2.1 mW/Kg] are of the same order of magnitude at both temperatures [35°C and 39°C], there must be another mechanism that initiates the cell cycle reactions. The induction of stress to the cells could be related to an increased release of stress proteins, e.g., heat shock proteins (hsp), which need not be induced by heat only....Others applying RF/MW radiation at much higher power levels and prolonged exposure times did not find a change in hsp level after exposure. However, in these studies very long exposure times were used, in some cases up to one week. EMF exposure causes only transient effects and long exposure times (hours, days) could result in a kind of adaptation, so that small changes may not be detected." (See also p.9.)

B. Nelson, D. Snyder and P. Shaw, "Developmental Toxicity Interactions of Salicylic Acid and Radiofrequency Radiation or 2-Methoxyethanol in Rats," ***Reproductive Toxicology, 13,*** **pp.137-145, March/April 1999.**

"Combined exposure to RF radiation (10 MHz) and the industrial solvent 2-methoxyethanol (2ME) produces enhanced teratogenicity in rats. [See *MWN,* N/D91.] The purpose of the present research was to determine if the synergistic effects noted for RF radiation and 2ME are generalizable to other chemicals. Since salicylic acid (SA) is widely used as an analgesic and is teratogenic in animals, SA was selected to address generalizability. Based on the literature and our pilot studies, 0, 250 or 350 mg/Kg SA were administered by gavage on gestation Day 9 or 13 to rats. Concurrently, rats given SA on Day 9 were exposed to RF radiation sufficient to maintain colonic temperature at 41°C for 60

Two Assessments: Little Evidence for RF/MW Radiation-Cancer Link

J.E. Moulder, L.S. Erdreich, R.S. Malyapa, J. Merritt, W.F. Pickard and Vijayalaxmi, "Cell Phones and Cancer: What Is the Evidence for a Connection? (A Review)," ***Radiation Research, 151,*** **pp.513-531, May 1999.**

"A biophysical evaluation indicates that it is implausible to expect that cell phone RF radiation would have biological activity at the subthermal power levels characteristic of the current generation of cell phones. The published epidemiological studies of RF radiation do not suggest a causal association, but the studies are few and all suffer from deficiencies in exposure assessment. Cellular studies have largely been limited to genotoxicity testing. Although a few of these studies have suggested the possibility of genotoxicity, the weight of evidence is that RF radiation is not genotoxic. Assessment of the epigenetic potential of RF radiation in cell culture has been minimal, and the results are equivocal at best. The studies of long-term exposure of animals present no compelling evidence that long-term exposure has a negative impact on overall health and show no convincing evidence that RF radiation is genotoxic in animals. However, some of the studies of long-term exposure suggest the possibility that RF radiation may have epigenetic activity, particularly at high exposure levels. A weight-of-evidence evaluation indicates that the evidence for a causal association between exposure to RF radiation and cancer is weak. However, relevant data in some areas are sparse. In particular, the epidemiological evidence is limited, and there is little immediate prospect for improvement, since highly exposed populations are relatively small and assessment of exposure remains a serious problem. The studies of long-term exposure of animals are also relatively weak.... It is often stated that the risks from exposure to RF radiation, even if real, are too low to be of significance to public health. However, if the cancer risks suggested by some of the studies were real, then RF radiation could conceivably be a significant environmental cause of cancer."

Mark Elwood, "A Critical Review of Epidemiologic Studies of Radiofrequency Exposure and Human Cancers," ***Environmental Health Perspectives, 107, Supplement 1,*** **pp.155-168, February 1999.**

"The studies individually are weak and, as a consequence, the results cannot be easily interpreted in terms of cause and effect. The major impression from these studies is their inconsistency. There is no type of cancer that has been consistently associated with RF exposures. The epidemiologic evidence falls short of the strength and consistency of evidence that is required to come to a reasonable conclusion that RF emissions are a likely cause of one or more types of human cancer. The evidence is weak in regard to its inconsistency, the weak design of the studies, the lack of detail on actual exposures and the limitations of the studies in their ability to deal with other likely factors, and in some studies there may be biases in the data used. Whereas the current epidemiological evidence justifies further research to clarify the situation, there is no consistent evidence of any substantial effect on human cancer causation."

min (or sham). Those given SA on Day 13 were also given 0 or 100 mg/Kg 2ME (gavage). Dams were sacrificed on gestation Day 20, and the fetuses were examined for external malformations. The data provide no evidence of synergistic interactions between RF radiation and salicylic acid (resorptions and malformations)." (See also B. Nelson et al., "Effect of Environmental Temperature on the Interactive Developmental Toxicity of Radiofrequency Radiation and 2-Methoxyethanol in Rats," *International Archives of Occupational and Environmental Health, 71,* pp.413-423, 1998.)

G. Boorman, L. Anderson et al., "Effect of 26-Week Magnetic Field Exposures in a DMBA Initiation-Promotion Mammary Gland Model in Sprague-Dawley Rats," *Carcinogenesis, 20,* pp.899-904, May 1999.

"The present study does not support the hypothesis that magnetic field exposure enhances breast cancer growth in the DMBA rat breast cancer model. In fact, there were fewer rats with tumors in the 1 G, 60 Hz exposure group compared with DMBA controls. When all carcinomas were considered, the total number of carcinomas induced was lower in all magnetic field exposure groups and this was significant for the 1 G, 50 Hz and 60 Hz exposure groups....While this data is not sufficient to establish a definitive protective effect, it does suggest that we are not missing a subtle promoting effect of magnetic fields....These data are, in part, inconsistent with studies suggesting that magnetic field exposure may promote chemically induced breast cancer in rats....The positive effects reported by Löscher and colleagues were often an earlier onset of tumors or an increase in tumor size. There are also differences between the studies of Löscher and colleagues and the present study...." (See also *MWN,* M/A98 and M/J98.)

Bu-Tian Ji et al., "Occupation and Pancreatic Cancer Risk in Shanghai, China," *American Journal of Industrial Medicine, 35,* pp.76-81, January 1999.

"The most consistent finding in our study was the positive association between employment as an electrician and pancreatic cancer. Over a sevenfold overall risk was observed and the [odds ratio] rose to 9.3 for subjects with more than 35 years of employment among men. In addition, intensity and probability of EMF exposure, as estimated by a [job exposure matrix], were associated with risk. However, no such consistent excesses were found among women because of the small number of female cases who were electrical and electronics workers or exposed to high levels of EMFs. Electrical or electronics worker was the most frequent job category among those with high intensity of EMF exposure (24 of 28 exposed men and 14 of 15 exposed women had at least one job related to electrical or electronics work). A possible explanation for the increased risk among electricians may be related to EMF exposures, although other exposures related to electrical machinery manufacturing are possible, such as solvents, solder fumes and cutting oils."

Artnarong Thansandote, Gregory Gajda and David Lecuyer, "Radiofrequency Radiation in Five Vancouver Schools: Exposure Standards Not Exceeded," *Canadian Medical Association Journal, 160,* pp.1,311-1,312, May 4, 1999 (the paper is also available on the Internet at:<www.cma.ca/cmaj/vol-160/issue-9/1311.htm>).

"Although the purpose of the survey was to determine the actual levels of RF radiation in the analog (first-generation cellular phone) and personal communications services (PCS, the new generation of digital cellular phone) cellular base-station frequency bands, measurements also covered AM, FM and TV broadcast frequencies where possible....The measureed power densities did not exceed the safety code limits. In light of the current scientific understanding of the risks of RF radiation exposures, we conclude that the levels measured during our study posed no health risk to the students, school staff or the general public in or around the five Vancouver schools involved."

Clippings from All Over

"What we don't want to do two, three, four years from now is to say, 'God — this was the tip of the iceberg, and we didn't see it!'"

— Dr. George Carlo, chair, Wireless Technology Research, Washington, on the need for continued research into possible health effects of mobile phone radiation, quoted by John Schwartz (who notes that Carlo uses a cell phone with a plug-in earpiece, allowing him to talk without holding the phone to his head) in "Study: Cell Phone Use May Have Cancer Link," *Washington Post,* p.E2, May 22, 1999

What is remarkable is how little public anxiety has been generated by almost a year of health scares about [mobile telephones]. Despite being told that they might give us cancer or cause memory loss, we have just gone out and bought them in record numbers....

— Matt Ridley, in a column, "Mobile Phones Dangerous. Ah, Well...," *Daily Telegraph* (U.K.), April 12, 1999

"Concerns have been raised that the precautionary principle may be too simplistic to guide decision makers facing complex choices involving technologies with uncertain risks, benefits and costs to current and future generations."

— Dr. John Graham, Harvard Center for Risk Analysis, Boston, in a May 1999 press release announcing the center's workshop, *The Precautionary Principle: Refine It or Replace It?,* held June 3-4 in Washington (the featured speaker in a session on EMFs was Dr. Ralph Keeney of Pros and Cons Consulting in San Francisco and the discussants were Drs. Leeka Kheifets of EPRI in Palo Alto, CA, and Timothy McDaniels of the University of British Columbia in Vancouver, Canada)

One of the prominent features of the recent *Annual Meeting of the Society of Toxicology* in New Orleans was the debate on a hypothetical motion to have the results of mechanistic toxicity studies supersede ambiguous epidemiological data in chemical risk assessments for humans....The motion implies that one should choose either weak epidemiology data or mechanistic information. However, both mechanistic data and epidemiological findings are often suggestive, but not conclusive, when taken alone. With this in mind, it seems imprudent to discard one set of inconclusive data for another set of inconclusive data. Instead, scientists and policy makers should attempt to integrate all of the available data into health risk assessments.

— Dr. George Lucier, director, Environmental Toxicology Program, National Institute of Environmental Health Sciences (NIEHS), Research Triangle Park, NC, in an editorial, "Why Not Use It All?," *Environmental Health Perspectives* (published by the NIEHS), p.A232, May 1999 (the editorial is also available on the Internet at: <http://ehpnet1.niehs.nih.gov/docs/1999/107-5/editorial.html>)

"My seven-year-old will start school in the fall, and he's already worried that he'll be the only kid in first grade without a phone."

— Olli Martikainen, Helsinki University of Technology, Finland, quoted by T.R. Reid in "Letter from Finland: A Cell Phone in Every Pocket," *Washington Post,* p.C3, May 26, 1999

"I wouldn't let a child sleep up under an old electric blanket or put a motorized alarm clock beside their bed. My feeling is there is no risk here, but there are these little nagging things."

— Dr. Richard Gallagher, British Columbia Cancer Agency, Vancouver, Canada, quoted by Margaret Munro in "Home, Dangerous Home," *National Post* (Canada), p.A17, April 27, 1999 (see p.1)

Sir, "Mobile Phones 'Quicken the Brain'," *(Times* headline, April 8, 1999). At last I know how my student son manages to do nothing much but still gets results.

— Christopher Balkwill, Abingdon, Oxfordshire, U.K., in a letter to the editor, the *Times* (U.K.), April 13, 1999 (see *MWN,* M/A99)

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UPDATES

EXPOSURE ASSESSMENT

EMFs in Transportation...A new survey of EMFs encountered in various transportation systems includes assessments of both gasoline- and electric-powered cars, trucks and buses, passenger aircraft, ferryboats and self-powered electric commuter trains. Sponsored by the U.S. Department of Transportation (DOT) and the RAPID research program, the study was conducted by Electric Research, a consulting firm based in State College, PA. Interestingly, it concludes that electric cars have field levels "similar to their conventional internal combustion counterparts," based on prototype electric vehicles with technology similar to that of those now coming into mass production. For both gasoline- and electric-powered cars and light trucks, the fields were predominantly below 60 Hz, and "magnetized steel belts in radial tires appeared to be the common dominant source." (See also a letter by Dr. Samuel Milham on EMF exposure from steel-belted radials, *MWN,* M/A98.) Fields above 60 Hz were stronger in some electric cars than in their gasoline-powered kin, but were still "only a minor part of the total field environment" within the car and were largely localized around travelers' ankles. Passenger jets were the only form of transportation that showed substantial fields above 300 Hz, due to the fact that the AC power used onboard aircraft operates at 400 Hz. By far the highest magnetic fields (and the only significant electric fields) were found in the self-powered commuter train, the only type of transit that produced high readings at 60 Hz. In all systems, fields varied widely with both time and location within a vehicle. Electric Research previously assessed EMFs for DOT in subway systems, passenger trains and an experimental maglev train (see *MWN,* J/A93). Its new study, *Survey and Assessment of EMF Public Exposure in the Transportation Environment* (Report No.PB99-130908) can be ordered for $51.00 (or $23.00 for microfiche) from: National Technical Information Service, Springfield, VA 22161, (703) 605-6000, Fax: (703) 605-6900, Web: <www.ntis.gov>.

MEETINGS

URSI Preview... Four different sessions will address mobile phone health risks at the International Union of Radio Science's (URSI) general assembly in Toronto, Canada, the week of August 16. On the 17th, speakers from three continents will be featured at "Hazard Assessment for Wireless Communication," chaired by Italy's Dr. Paolo Bernardi and France's Dr. Bernard Veyret. On the 18th, Drs. Ross Adey of the U.S., E. Bonek of Austria and Niels Kuster of Switzerland will present a session titled "Health Effects of Mobile Telephones." On the 19th, Drs. Om Gandhi and Yahya Rahmat-Samii, both of the U.S., will chair "Computation of EMFs in the Human Body." And on the 20th, the U.S.'s Dr. C.K. Chou and Japan's Dr. Masao Taki will host "Exposure Assessment for Cellular and Personal Telecommunications." The emphasis on wireless communications health research follows a resolution adopted by URSI's Commission K on Electromagnetics in Biology and Medicine at the Kyoto, Japan, meeting in 1993 to promote a "broad-based research program" (see *MWN,* N/D93). URSI general assemblies are held every three years. Other noteworthy sessions include two on the bioeffects of EMFs and one on biomedical applications. In ad-

dition, on August 20, there will be a session on EMI with medical devices. The URSI meeting will be held at the University of Toronto. For more information, contact the URSI management office at (613) 993-7271, by E-mail at <ursi99@ nrc.ca> or on the Internet at <www.nrc.ca/confserv/ursi99/welcome.html>.

PEOPLE

Dr. **James Lin** of the University of Illinois, Chicago, has been elected to the National Council on Radiation Protection and Measurements (NCRP), which is based in Bethesda, MD. Among those reelected were: **Ronald Petersen** of Lucent Technologies/ Bell Labs in Murray Hill, NJ, Dr. **Paul Slovic** of Decision Research in Eugene, OR, and Dr. **Marvin Ziskin** of the Temple University School of Medicine in Philadelphia....Dr. **Ron Cameron** has taken over from Dr. **Colin Roy** as editor of the *Journal of the Australasian Radiation Protection Society*....**Tim Ayers** has left the CTIA, where he was vice president for communications, to become the president of North Light Public Affairs, an offshoot of North Light Communications in College Park, MD. Among the parent group's clients are the American Institute of Physics and the Chemical Manufacturers Association.

VISIBLE LIGHT

Myopia and Light-at-Night... Children who had slept in a room with a night-light before the age of two were more likely to become nearsighted, according to a study by researchers at the University of Pennsylvania Medical School in Philadelphia. Those who slept in a fully lighted room were even more likely to become myopic. " The absence of a daily period of darkness during early childhood" appears to increase the risk of nearsightedness, Dr. Graham Quinn and colleagues reported in the May 13 issue of *Nature (399,* pp.113-114, 1999). The study, based on 479 children aged 2-16, found no link to the level of nighttime light after the age of two. Only 10% of children who had slept in darkness before they were two were later found to be myopic. For children who had slept with a night-light, the figure jumped to 34%. Among those who had slept with a room light on before the age of two, a majority — 55% — are nearsighted today. The data show a strong dose-response relationship. The risk of nearsightedness increased with increasing light, in a trend that is extremely significant (P<0.00001). The University of Pennsylvania team cautioned that these findings do not prove a causal connection: For example, it is not known whether parents' lighting preferences might have been related to known risk factors for nearsightedness, such as socioeconomic status or their parents being nearsighted themselves. But the researchers pointed out that a link between light-at-night and nearsightedness is biologically plausible. Myopia "commonly arises from excessive postnatal eye growth," they explained, and the length of daily exposure to light has been shown to affect eye growth in chicks. Myopia in humans usually does not occur before the age of two, but it has been shown that in various animal species "early neonatal visual experience markedly affects refractive development." Although the case is not closed, Quinn and colleagues wrote, for the time being "it seems prudent that infants and young children sleep at night without artificial lighting in the bedroom."

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—*Steven Milloy, publisher,* Junk Science Home Page, *<www.junkscience.com>, May 25, 1999*

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More 1999 Conferences

August 13-16: **6th Annual Michaelson Research Conference,** Cloudcroft, NM. Immediately preceding the meeting, August 11-12, the U.S. Air Force will sponsor a **Workshop on Infrared and Millimeter Waves.** For more information, contact: Dr. Eleanor Adair, AFRL/HEDR, 8308 Hawks Rd., Brooks AFB, TX 78235, (210) 536-4698, Fax: (210) 536-3977, E-mail: <eleanor.adair@aloer.brooks.af.mil>.

September 16-17: **Mobile Telephones and Health: An Update on the Latest Research,** Radisson SAS Scandinavia Hotel, Göteborg, Sweden. Contact: Les Wilson, Microshield Industries, 59 Southbury Rd., Enfield EN1 1PJ, U.K., (44+181) 363-3333, Fax: (44+181) 372-3232, E-mail: <microshld@aol.com>, Web: <www.microshield.co.uk>.

October 4-6: **Effects of Electromagnetic Fields on the Living Environment,** Munich, Germany. A seminar hosted by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the World Health Organization (WHO) and the German Federal Office of Radiation Protection. For more information, contact: R. Matthes, Institut für Strahlenhygiene, Bundesamt für Strahlenschutz, Ingolstädter Landstrasse 1, D-85764 Oberschleißheim, Germany, (49+89) 31603 288, Fax: (49+89) 31603 289, E-mail: <rmatthes@bfs.de>, Web: <www.icnirp.de> or <www.who.int/emf/>.

November 21-24: **Biological Effects, Health Consequences and Standards for Pulsed Radiofrequency Fields,** Erice, Sicily, Italy. A seminar sponsored by ICNIRP and the WHO. On November 26, there will be a **WHO EMF Research Coordination Meeting** and on November 27 a **WHO EMF Standards Harmonization Meeting.** For more information, see October 4-6 above or contact: Dr. Michael Repacholi, WHO, 1211 Geneva 27, Switzerland, (41+22) 791-3427, Fax: (41+22) 791-4123, E-mail: <repacholim@who.int>.

Keeping Current: Follow-Up on the News

◆ The IEEE's Committee on Man and Radiation (COMAR) has drafted a "Technical Information Statement" on *Possible Health Hazards from Exposure to Power Frequency Electric and Magnetic Fields*. The text and the list of contributors are available at <www.eece.ksu.edu/~rdmiller/COMAR60HZ.html>.

◆ For those who will not be attending the annual meeting of the Bioelectromagnetics Society in Long Beach, CA, June 20-24, the abstracts are up on the Web at <www.bioelectromagnetics.org>. Paper No.15-6 is especially noteworthy.

◆ The May 21 *Wall Street Journal* reports that the FAA is now advising airlines to allow their passengers to use mobile phones "anytime the aircraft is stationary and is going to remain stationary." However, FAA rules still leave the decision on whether to permit cell phone use to the discretion of the captain (see *MWN*, S/O96).

◆ In an editorial in its May 26 issue, the *Irish Times* called for a national research effort on mobile phone safety. "It is not appropriate that this work fall to scientists and institutions working abroad," the paper declared, noting that there are some one million wireless phone users in Ireland. While suggesting that the Irish government "could take a more proactive role" in getting answers to the public, the *Times* called on telecom companies to fund the research.

◆ After issuing mobile phones equipped with earpieces to employees of his company, the Virgin Group (see *MWN*, N/D98), the U.K.'s Richard Branson has decided to sell phones that will include this exposure-reducing device as a standard feature, the U.K.'s *Times* reported on June 7. The phones, which Virgin will market in a joint venture with the U.K. wireless carrier One 2 One, are expected to go on sale before Christmas.

As We Go to Press

The National Institute of Environmental Health Sciences (NIEHS) has announced that it will release its long-awaited report to Congress on the RAPID EMF health research program on June 15 (see p.8).

The full text of the report will be available on the NIEHS Web site: <www.niehs.nih.gov/emfrapid/home.htm>.

Microwave News will present detailed coverage of the report in its July/August issue.

VIEWS ON THE NEWS

What About EMF Health Risks Above 5 mG?

We hate to spoil the party being organized by the National Academy of Sciences (NAS) and the electric utility industry, but we are not quite ready to toss EMF cancer risks onto the junk science heap.

We do agree with Canada's Dr. Richard Gallagher that his and Mary McBride's study is good news (see p.1). Most children are not exposed to EMFs of over 5 mG, and below 5 mG, the leukemia risk is small, if there is any risk at all at these low levels.

But we also agree with Gallagher that these childhood EMF studies really don't tell us much about what may be going on above 5 mG. As Dr. Gilles Thériault, who collaborated with Gallagher and McBride, told us: "We keep seeing smoke, but have not yet been able to spot the fire." He was referring to those exposed for long periods of time to higher field levels.

The new NAS report on the RAPID program states that only "very few" people are exposed to more than 4 mG (see p.8). In percentage terms, the number is relatively small, but the absolute number is large: One million Americans are routinely exposed to average fields of more than 10 mG and over 5 million to fields of more than 5 mG (see *MWN,* M/J98). This statistic comes from an Enertech survey, one of only two RAPID engineering reports that the NAS panel singled out as noteworthy.

The focus on childhood leukemia was propelled by mothers around the country who demanded answers to power line health questions. Workers, however, who may be exposed to higher levels, have never organized in the same way about their own risks.

This is surprising because meta-analyses by EPRI, the industry's own research arm, indicate a significant increase in both leukemia and brain cancer among workers (see *MWN,* J/F96 and N/D97). The 1996 NAS study that many interpret as dismissing EMF cancer risks conceded that the workplace studies "have increased rather than diminished the likelihood of an association between occupational exposure to [EMFs] and cancer."

And cancer is not the only potential problem. Despite repeated requests, the NIEHS RAPID program never sponsored any studies into Alzheimer's disease and other neurological effects. Those concerns have been left hanging.

No one should forget that the ICNIRP magnetic field limits, touted by industry and the WHO EMF Project as the model standard to be adopted worldwide, allow children to be exposed continuously to 1,000 mG and workers to 5,000 mG. We wonder how many of those who endorse the standard would allow themselves to be exposed to such levels day after day.

It is welcome news that the McBride study does not show a leukemia risk, but that does not mean we should ignore the millions exposed to higher levels both at home and at work.

Mobile Phone Radiation Levels Should Be Made Public

The latest study by Sweden's Dr. Lennart Hardell suggests a possible link between mobile phone use and brain cancer. He cautions against jumping to conclusions, however, and is the first to say that more research is needed.

In the meantime, Hardell has some advice for cellular phone users: Do what you can to reduce your exposure (see p.7). "Ask about the specific absorption rate (SAR) when purchasing a mobile phone," says Hardell, "and buy one with as low an SAR value as possible."

But that is easier said than done. When consumers ask how much radiation they will get from a phone, they cannot get an answer.

Mobile phone manufacturers will not disclose SAR values for the phones they sell. When BBC's *Panorama* pressed a Nokia representative to reveal the numbers (see p.2), he bobbed and weaved around the question — and ultimately refused.

So far, only one company has broken ranks. In 1997, the small German company Hagenuk began an ad campaign featuring the slogan "Low Radiation Is Better" (see *MWN,* S/O97). Hagenuk had reason to brag: In tests by Dr. Niels Kuster of ETH in Zurich, the Hagenuk phone scored the lowest out of 16 mobile phones tested — with an SAR one-fifth as large as the highest-exposure model. It was also one of the least expensive (see *MWN,* N/D97).

But Hagenuk met with unified hostility and pressure from other companies. "I feel threatened by representatives of the industry," said a Hagenuk official in Sweden. And today, the Hagenuk low-radiation phone seems to have sunk from sight.

The industry's standard position is that consumers have no reason to know each phone's SAR, because every phone meets legally required safety standards. That misses the point: The current debate is precisely about whether those standards are adequate. People who are curious about how much radiation their phones emit ought to be able to find out.

Consumers can now choose their favorite color or style of mobile phone — but for a choice that might affect their health, they can't get the information they need.

Hundreds of millions of wireless phones have been sold, and the industry has made billions of dollars in profit. Yet the public is not given the results of tests that the government requires before any phone is allowed on the market.

Intelligent people disagree about whether there is any reason to be concerned about mobile phone health effects. That is precisely why the industry should make SAR numbers public — and let consumers decide for themselves.

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MICRO WAVE NEWS

Vol. I No. 3 A Monthly Report on Non-Ionizing Radiation March 1981

INSIDE...

SPECIAL REPORT

AT THE WORLD TRADE CENTER p. 6

CONFERENCES p. 10

GOVERNMENT p. 5
Agencies & Congress

MICROWAVE CIRCUIT p. 4
People in the News

VDTs p. 2

STOP PRESS

The New York State Workers' Compensation Board upheld Yannon decision and award. Details next month.

RARE BLOOD DISORDER LINKED TO MICROWAVES

An Army pathologist has observed an asssociation between microwave exposure and polycythemia, a rare blood disorder. Polycythemia victims suffer from an excess of red blood cells, and are believed to stand an increased risk of developing leukemia.

Dr. Hylar Friedman, a pathology resident at the William Beaumont Army Medical Center in El Paso, Texas, reported his observation in a letter to the *New England Journal of Medicine* (February 5, 1981). Friedman's preliminary analysis indicated an incidence rate of three cases per year, or 18.7 per 100,000 men over forty—as compared to an average rate of 1.5 to 5.6 per 100,000 men between the ages of 40 and 59. Friedman himself identified seven male patients with polycythemia, who had "strong histories of past and present chronic exposures to microwaves."

The letter took the microwave research community by surprise. No prior connection between microwaves and polycythemia had been reported; many scientists have been directing their attention to the white rather than the red blood cells. As one researcher pointed out, the finding may not be so hard to explain since both types of cells originate in the bone marrow.

Dr. Charlotte Silverman of the Bureau of Radiological Health (BRH) in Rockville, Maryland, a co-author of the only epidemiology of Navy radar workers (*American Journal of Epidemiology 112,* 39, 1980), said that she found the letter "extremely interesting," and that BRH would be following up this new lead. The letter prompted Silverman to check the data in her radar study: she found no indication of polycythemia as a cause of death or as a secondary condition. She noted that there were some leukemias among the radar workers, but that poly-

(continued p. 5)

ANSI News

Committee Fails to Agree on New RF/MW Safety Standard

Meeting in New York City on February 26, 1981, the C95 Committee on Radio Frequency Radiation Hazards of the American National Standards Institute (ANSI) could not agree on a new RF and microwave safety standard. Professor Saul Rosenthal of the Polytechnic Institute of New York, the C95 chairman, sent the standard back to Subcommittee IV in a final attempt to reach consensus. Now Professor A.W. Guy of the University of Washington will try some new language, and circulate it among the subcommittee members before bringing it back to the full Committee for approval.

Microwave News will have a full report on the ANSI meeting and the sources of disagreement in our next issue.

Editorial Note

As the items that follow show, VDT operators continue to worry about radiation emissions from their sets. A central question in this controversy is: where does the radiation come from and what are its characteristics?

There is general agreement that the flyback transformer circuit, which has a fundamental frequency of 15 to 20 kHz, is the principal source of the radiation. (This frequency corresponds to the number of lines the machine traces a second.) The number and strength of the associated harmonics is less certain, however. Some sources said that the harmonics frequencies vary up to the 100 kHz range, while others say they may go even higher.

Dr. Samuel Hopfer, vice-president and director of R&D at the General Microwave Corporation in Farmingdale, New York, offered the following explanation for the distribution of the harmonics frequencies. They depend on the flyback or retrace time, that is the time interval in which the voltage goes from the full value to its starting value: the faster the retrace time, the richer the content of the harmonics. Normally the higher harmonics have a weaker intensity. A precise frequency distribution can only be experimentally determined with a spectrum analyzer. Furthermore, according to antenna theory, as you increase the frequency, the possibility of radiation emissions also increases. (This relationship only holds up to a point: in this case somewhere above 50 MHz.)

Microwave News *will continue to cover this story, and invites comments on the question posed above.*

RADIATION MEASUREMENTS

Holaday Warning

Holaday Industries of Eden Prairie, Minnesota, has issued a bulletin warning against the use of its HI-3001 E-field probe to measure VDT radiation. The company bulletin (#026), dated January 26, 1981, reads:

> WARNING!!!!!
> DO NOT ATTEMPT TO MEASURE E-field levels
>
> around video display terminals, television sets or any CRT. All of these units do emit low frequency, low level signals and do have a relatively high voltage which can induce false readings into the HI-3001 monitor. Any significant field strength can be characterized as having most of its energy spectrum well below the usable frequency range of the HI-3001 E-field probe. These fields will cause a reading, however, at this time it does not appear that this reading can be related to a meaningful value.

(According to the Holaday HI-3001 specification sheet, the meter's range is 0.5 MHz to 300 MHz.)

New York Post

In a survey of 16 VDTs at the *New York Post* on January 12, the National Institute for Occupational Safety and Health (NIOSH) recorded a 1500 V^2/m^2 reading at a Harris 1740 terminal with a Holaday HI-3001 meter. Levels of about 500 V^2/m^2 were found at several Burroughs terminals. The significance of these readings is uncertain, however, since the HI-3001 is not recommended for measuring frequencies below 0.5 MHz. (See above.) Dr. Wordie Parr and Bill Murray of NIOSH's Physical Agents Effects Branch in Cincinnati, who took the readings, had not seen the manufacturer's warning.

Parr had initially planned to investigate the terminals, although NIOSH does not think the reported levels pose any health risk. The high readings from the Harris particularly perplexed Parr because it is a solid state model, without a flyback transformer that is the usual source of radiation (15 kHz) emissions from VDTs.

NIOSH must now re-evaluate the *Post* results. In an interview last month, Murray said, "We are aware of measurement problems with VDTs, but we have not seen the Holaday warning letter. We are reconsidering our measurement data." Instrumentation clearly poses difficulties. Murray confessed, "We still don't know which meter to measure VDT radiation with."

Shields: Metal v Plastic

Radiation measurements from three VDT models used at the *Lexington Herald-Leader* in Kentucky have prompted the Newspaper Guild to recommend installing protective metallic shields around all plastic-cabinet VDT models as a precautionary measure.

NIOSH recorded high readings from the back of Ontel OP-1 and OP-1/16 and Systems Integrated ET960 models last August while measuring a sample of the *Herald-Leader's* VDTs. NIOSH dismissed these measurements as false readings, however, and concluded that there was no radiation hazard. The levels were attributed to electrical interactions between the Narda 8619 meter and the flyback transformer of the units. (NIOSH Technical Assistance Report 80-105-757, October 1980)

The Guild is not convinced the machines are safe. David Eisen, research and information director for the union, issued a memo to local presidents this January advising them to insist on either a shield for the Systems Integrated model, or a test indicating no radiation leaks exceeding 1 mW/cm^2. The Guild had already made this recommendation for the two Ontels and another plastic-bodied model, the Teleram 2277 Mark 1, after NIOSH tests found the same high readings from these terminals. Eisen stated, "By this time, it is clearly possible to generalize this recommendation to apply to all plastic-cabinet VDTs."

Montreal *Gazette*

Radiation readings from VDTs at the Montreal *Gazette* have alarmed the paper's unions despite government assertions that VDTs do not pose a health risk.

Quebec's Ministry of Environment, using a Raham Model 4 meter, checked about 24 *Gazette* VDTs on January 7. The readings were very low except for those taken from plastic-bodied Sperry-Univac UTS 400 and PSI Lobbyist (portable) models. According to John Saunders, a business reporter at the *Gazette*, some measurements from these models went "right off the dial"—over 20 mW/cm^2.

Since these measurements were taken, the VDTs in question have been rigged with makeshift aluminum foil shields. A second check made on January 21 showed these effectively reduced these readings, except for one terminal.

The significance of the initial measurements, however, is disputed. Dr. Maria Stuchly, an expert at the federal radiation protection bureau in Ottawa, insists the Raham meter must have been out of order. "There is no other explanation," she said. The Ottawa bureau did extensive tests on the same type of VDTs at the *Gazette*'s Ottawa office and recorded only low levels.

UK Survey

The United Kingdom's National Radiological Protection Board has completed a comprehensive field survey of all types of VDTs currently manufactured or marketed in the UK. More than 200 different termin-

als were tested for radiation emissions from the RF through the X-ray frequencies.

The maximum recorded readings were: X-ray: less than 10 microrems per hour; UV: none detected above 336 nanometers and 12.4 uW/cm² otherwise; visible: 0.25 mW/cm²; near IR: 5 uW/cm²; far IR: only hot body radiation.

In the microwave and radiofrequency range, a reading of 0.5 mW/cm² was found at one unit using a Narda 8300, while all the rest gave readings below 0.1 mW/cm². (The Narda's frequency range is 300 MHz-18 GHz.) Using a Raham 12 meter, 14 terminals gave responses greater than 10 mW/cm², with the maximum "approaching" 100 mW/cm². Using an EFS 1 meter, 39 units gave readings over 200 V/m, with a maximum over 300 V/m.

An outside contractor tested four of the terminals that had indicated electric field intensities above 300 V/m with a spectrum analyzer. The measurements, taken close to the line output transformer, showed field intensities above 1000 V/m at the fundamental and harmonics frequencies of the line scan frequency up to about 150 kHz. On all the units, the level fell rapidly to 1 V/m between 150 kHz and 3 MHz and to less than 0.2 V/m at 30 MHz. (The electric and magnetic field measurements were equivalent.)

The detailed readings were consistent with those taken with the EFS 1 meter and led the Board to conclude that the Raham 12 readings were "spurious."

E.A. Cox reported these results in his paper, "Radiation Emissions from Visual Display Units," presented at the Loughborough University conference last December. Given that an operator would be exposed to less radiation than that measured under test conditions of properly functioning VDTs, Cox concluded that "the radiation normally emitted from a VDU (video display unit) does not pose a hazard to operators either in the long or short term."

STUDIES

Mount Sinai Study

The Newspaper Guild and the Mount Sinai School of Medicine in New York City have announced plans for an epidemiological study of the health effects of VDTs. The study, coordinated by Dr. Arthur Frank at Mount Sinai, will include eye examinations, radiation tests, and a survey questionnaire. Approximately 2,000 employees, including both VDT users and controls, from four to six Guild locals will participate.

A questionnaire developed by Mount Sinai's Environmental Sciences Laboratory with assistance from the Guild will be tested soon at the Vancouver-New Westminster and the Los Angeles Newspaper Guilds. The full survey should begin this summer or fall.

If the questionnaire response indicates a need, Mount Sinai will seek funds for an additional study phase of full medical examinations for affected employees.

Charles Perlik, Jr., president of the Newspaper Guild, believes the study should help to determine if VDTs are responsible for eye damage or other radiation effects.

Baltimore *Sun* Study

Ophthamological tests are underway in a study of VDT operators at the Baltimore *Sun*. Dr. Shiro Tanaka of NIOSH is conducting the study in cooperation with the local Newspaper Guild, which requested the investigation, and the Baltimore Typographical Union.

The study includes a brief questionnaire and eye examinations performed by the University of Maryland. Up to 500 union members will be tested by mid-April. Tanaka says a report on the study results may be issued as early as this July. (See also *Columbia Journalism Review* story, March/April 1981.)

HEALTH EFFECTS

Toronto Star Follow-Up

News that four women working on VDTs at the *Toronto Star* had given birth to children with defects stirred widespread concern last summer. Calls requesting radiation checks for VDTs flooded the radiation protection service of Ontario's Ministry of Labor. The anxiety continued even after the Ministry's measurements of all 296 terminals at the *Star* failed to find any radiation.

The cause, if there is one linking the four defects, has remained undiagnosed. Checks for insufficient ventilation and hazardous chemicals have also turned up nothing.

John Brooks, director of communications at the *Star*, stressed that the paper "will take whatever further and reasonable steps are necessary to reassure our own employees and the public that there are no known environmental factors at the *Star* that contribute to birth abnormalities." This year the *Star* will consult three health experts, including an epidemiologist, for recommendations on possible ways to settle this case.

The announcement of this decision closely followed criticism from the City's Department of Public Health of the paper's initial follow-up study. After the Department ruled out radiation from VDTs as a possible cause of the defects last June, Dr. Murray Cathcart, the *Star*'s medical director, prepared a lengthy questionnaire to investigate other factors that might be responsible. Only two of the four women filled out the survey, however.

Gerald Caplan, coordinator of the Advocacy Unit of the Public Health Department, told Brooks that he considered the survey "quite unsatisfactory" and urged the *Star* to conduct a broader epidemiological survey that would include all *Star* employees.

The Southern Ontario Newspaper Guild welcomed the Health Department's concern. The Guild is still not convinced that no radiation hazard exists. It has set up its own ophthmalogical study of VDT operators and intends to "continue demanding testing for and monitoring of radiation as a right of all VDT users," according to John Bryant, executive officer of the Guild.

Toronto Cataract Case

An Ontario government employee has filed a claim with the Workmen's Compensation Board seeking compensation for cataracts, which she believes were caused by radiation from VDTs. Ms. Darlene Weiss's case is the first of its type before the Board.

Weiss, who is 40, said she first noticed problems with her vision while using VDTs at the Ministry of Transportation and Communications. An eye examination taken before she began her job at the Ministry did not indicate any abnormalities. Now, according to the Ontario Public Service Employees Union (OPSEU), Weiss has cataracts that must be surgically removed. She worked on terminals for 19 months, beginning in August 1978.

Dr. Milton Zaret, a well known ophthamologist specializing in nonionizing radiation effects, examined Weiss and is convinced her cataracts are radiation-induced.

The Ministry of Labor's occupational health and safety division must check the VDTs Weiss worked on before a decision from the Board can be reached. (One of these terminals was lost after its return to Bell Canada for checks, but it has since been found.)

According to Robert DeMatteo, occupational health and safety coordinator for the union, the Provincial government does not have the equipment to take detailed radiation measurements OPSEU thinks are necessary. Therefore, the union is hiring a private contractor to perform

(continued p. 4)

comprehensive tests on the Viewcom 3 and the three Sycor terminals Weiss used at the Ministry.

The union has also commissioned Zaret to design a questionnaire for its members who work on VDTs. This survey should get underway in mid-March.

Rashes

Reports from Europe are linking facial rashes to VDT use. Dr. H.H. Tjønn of the Norwegian Directorate of Labor Inspectorate in Oslo has verified that 16 cases of rash among VDT operators during 1979 and 1980 were related to the work environment.

According to Tjønn, Dr. Walther Cate Olsen at the Christian Michelsens Institute in Bergen, Norway, is researching the possible role of static electricity and airborne dust in causing the skin reaction. All of the reported cases occured during the winter in workplaces with low relative humidity and synthetic fiber carpets, factors that helped produce high measured levels of static electricity.

Radiation from the units was among the factors checked and ruled out as possible causes.

The rash symptoms are itching followed by redness on the cheeks, and sometimes the chin and forehead. Redness appears at the office, and usually disappears a few hours after work.

Four similar cases at one English office were observed by Drs. R.J.G. Rycroft and C.D. Calnan, from St. John's Hospital for Diseases of the Skin in London.

The Norwegian and English reports were presented at the Loughborough University Conference on VDTs last December.

Meanwhile, across the Atlantic, twelve cases of facial rashes among VDT operators have been reported to the Ontario Public Service Employees Union in the past 18 months. Robert DeMatteo, at the Union, says the Ministry of Labor does not think these complaints require radiation check of the VDTs in question.

The cause of this unusual problem remains undiagnosed.

Government Assurances

US and Canadian government officials assert there is no radiation hazard from VDTs. Commenting on the Weiss case and the *Toronto Star* incident, M.H. Repacholi, head of the non-ionizing radiation section in Ottawa, stated, "I cannot conceive of cataracts or birth defects coming from VDTs." David Conover of NIOSH's Physical Agents Branch in Cincinnati also argues there is nothing to worry about. He stressed that there is little field-body coupling and little absorption at 15-20 kHz, the frequencies most often emitted from VDTs.

BRIEFS

The long awaited **NIOSH Bay Area VDT study** will go to the printers soon. Copies of the report have been sent to the participating companies and unions...the **Bureau of Radiological Health** (BRH) is putting the final touches on its study, *An Evaluation of Radiation Emissions from Video Display Terminals.* The report of BRH's investigation of ultrasound, RF, microwave, X-ray and light emissions is due out by April...This month, **Dr. Steven Sauter** at the University of Wisconsin Department of Preventative Medicine and Wisconsin State officials are discussing possible State action on VDTs. Sauter may assist the State in designing a training program for public employees in proper VDT use and in developing a design standard for terminals used by the State...The **Cold Type Organizing Committee** has written a pamphlet, *Don't Sit Too Close to the TV: VDTs/CRTs and Radiation.* Copies are available for $1, or $1.50 by mail from the Committee at P.O. Box 40, Jerome Avenue Station, Bronx, NY, 10468...Visual fatigue and VDTs will be the focus of a sesesion at the 1981 **American Industrial Hygiene Conference,** May 24-29 in Portland, Oregon.

James H. Stebbings, Jr. Sc.D., has been selected as the tenth member of the Scientific Advisory Panel for the New York State Overhead Power Lines Project. Stebbings is an Associate Professor at the University of Minnesota School of Public Health.

Final approval of the Panel, which will oversee and evaluate a five year study on the health effects of electromagnetic radiation from the lines, is expected soon.

•

The **Bioelectrical Repair and Growth Society** announced its formation "as a result of the burgeoning interest around the world in electrical mediation of biological repair and growth." The current president is Dr. **Carl T. Brighton,** while Dr. **Joseph Watson** is president-elect pro tem. (See conference calendar for address.)

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The **Georgia Institute of Technology** is seeking a new director for its **Electromagnetics Laboratory** at the Engineering Experiment Station. The laboratory has 65 research professionals studying such areas as millimeter/submilimeter wave technology; microwave solid-state technology; infrared/electro-optical systems; remote sensing, and physical sciences. All inquiries to D.W. Robertson, principal research engineer, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA 30332.

•

History Professor **Nicholas H. Steneck** of the University of Michigan, Ann Arbor, is continuing his work on the development of microwave radiation safety standards. Steneck's chronicle of events up to 1960 was published last summer: "The Origin of US Safety Standards for Microwave Radiation," *Science, 208,* 1230, 13 June 1980, and "Early Research on the Biological Effects of Microwave Radiation: 1940-1960," *Annals of Science, 37,* 323, 1980. Funded by a National Science Foundation grant, Steneck will be bringing the microwave history up to the present.

Steneck would like to hear from anyone who can help him reconstruct the events leading to the microwave standard: Professor Nicholas Steneck. Department of History, University of Michigan, Ann Arbor, MI 48109. (313) 763-2230.

•

Four researchers have joined the US Environmental Protection Agency's Experimental Biology Division at Research Triangle Park in North Carolina. They are: Dr. **James A. Rabinowitz,** a research physicist in the cellular biophysics branch, where he will study the interaction of microwaves with molecular systems. Dr. **Ronald J. Spiegel,** an electronics engineer in the bioengineering branch, whose studies center around the development and verification of numerical models to predict induced power densities and the thermal response to exposure to electromagnetic fields. Dr. **Christopher J. Gordon,** a physiologist in the developmental biology branch, who is interested in the effects of microwaves on the temperature regulation in test animals. And Dr. **William P. Watkinson,** also a physiologist in the developmental biology branch, who will be working on the cardiovascular effects of environmental agents on laboratory animals.

AGENCIES

The implications of the Reagan budget cuts for radiation programs are still unclear. As of the end of February, rumors were rampant in the Capitol, but federal agency officials were unwilling to speak "on the record" about the extent and impact of the cuts. *Microwave News* will have a complete report next month.

Bureau of Radiological Health

BRH has granted the Finessa Corporation of Threvos, Pennsylvania a variance from the microwave oven performance standard for the Microwave Tunneloven, model 7800-03/15 manufactured by Kreis AG in Switzerland. (46 *Federal Register* 7444, January 23, 1981) The variance is effective for two years.

The oven has a conveyor belt and can heat food on a continuous basis. Its main use is intended to be in hospital and hotel kitchens to reconstitute chilled food. The unit may also be used as an industrial heater for grain and cereal products.

The variance was granted under the conditions that permanent warning labels be attached to the oven, that the oven have three safety interlock switches on two different circuits, that there be microwave-absorbing material in both entry and exit channels and that the user and service manuals contain appropriate cautionary instructions.

Federal Trade Commission

The final FTC order requiring Litton Industries to stop making unsubstantiated claims about its microwave ovens, and forcing it to keep accurate records of any tests and surveys on oven performance used in such claims, has been published in the *Federal Register* (46 *FR* 8445, January 27, 1981). See *Microwave News*, February 1981.

National Cancer Institute

NCI has issued a request for proposals (RFP: NCI-CM-17480) to assess the performance of at least two heat generating and at least two thermometry systems. At least three patients with tumors in each of the major anatomic sites (e.g. brain, neck and head, lung, deep lymph nodes, etc.) must be treated with each system, and the temperature measured at multiple locations. A detailed analysis will be required, as well as the development of guidelines for the use of the equipment. Copies of the RFP may be obtained by submitting a request, in writing, to: Harold Thiessen II, Treatment Contracts Section, Research Contracts Branch, NCI, Room 228, Silver Spring, MD 20910.

RARE BLOOD DISORDER *(continued from p. 1)*

cythemia was not linked as a co-existing condition in the death certificates. Silverman had also looked through the Moscow epidemiology and found only one case of polycythemia; the case involved an individual who had not been exposed to microwaves.

Silverman warned that the reason her epidemiology had not picked up an increase in polycythemia may be that only a limited amount of morbidity data was collected for discharged Naval personnel. Her study would have picked up only those veterans who were treated in Navy or VA hospitals or who had service connected disabilities. Thus, a more extensive follow-up would be needed to indicate the presence or absence of such a rare disease.

In a telephone interview, Dr. Friedman said that he had originally met with considerable opposition to the publication of these findings; "The military was quite concerned—many people thought that it was premature to publish such unsubstantiated findings." Indeed, the Army had pointed to the negative data in the radar epidemiology as grounds for withholding publication.

After numerous written appeals, Friedman's Commander approved the letter. Friedman said that he had received considerable support from Captain Paul Tyler, director of the Armed Forces Radiobiology Research Institute, and Colonel Lawrence Larsen of the Walter Reed Army Institute of Research.

Friedman is planning to pursue his research on polycythemia by asking the patients to complete a questionnaire. He is especially interested in gaining information about microwave exposures. In order to protect his study against spurious symptoms suggested by microwave exposure, Friedman plans to confine his review to physical findings.

In his letter, Friedman noted that his patient population included many microwave exposed workers from the US Army Defense Center and the White Sands Missile Range.

Next month, Friedman is going overseas for more training and will return at the end of May.

On learning of the letter, Dr. Arthur Frank, an epidemiologist at the Mount Sinai School of Medicine, advised that the new results should be evaluated by doing complete blood counts on a large number of microwave exposed workers.

Harrison's *Principles of Internal Medicine* (seventh edition) describes polycythemia rubra vera, that is the type of polycythemia that does not develop in response to a known stimulus as a "disease of unknown cause, insidious onset, and chronic course. It is characterized by a striking absolute increase in the quantity of circulating red corpuscles and usually also by evidence of increased production of myeloid leukocytes and platelets." The symptoms are described as, in part:

> The onset is insidious and the progress gradual. Headache, dizziness, ringing in the ears, or visual disturbances; dyspnea lassitude, or weakness; skin or mucous membrane hemorrhages; pruritis, especially after a hot shower or bath; a sense of weight in the abdomen because of the enlarged spleen; or irritability, depression, forgetfulness, or vague symptoms suggesting neurasthenia are complaints which may be encountered in many patients. Various gastrointestinal symptoms, such as fullness, belching, or constipation may be present, or symptoms of peptic ulcer may be found. Sometimes the symptoms are those attributable to increased metabolism: lassitude, increased sweating, and loss of weight. Swelling and pain in the extremities may be very troublesome. However, in still other patients the symptoms are so insignificant that the polycythemia is discovered only accidentally.
>
> The face is a deep red rather than truly cyanotic....The blood pressure is more often normal than elevated. Enlargement of the liver is frequent, and spenomegaly is found in at least 75 percent of cases.

Confusion and Controversy in New York City

The new broadcast antennas atop the World Trade Center (WTC) in New York City continue to radiate confusion and controversy.

The twin 110-floor towers of the WTC—owned and operated by the Port Authority of New York and New Jersey (PA)—will eventually house most of the TV and FM stations in the New York metropolitan area, as well as many other specialized transmitters. Relocation of broadcast facilities from the Empire State Building—where the bulk of them have been until now—downtown to the $20 million master antenna at the WTC has touched off disputes about radiation levels near the antennas, and the radiation safety standards that should apply to them.

The shrinking TV broadcast range and loss of reception that followed the move, combined with citizen apprehension over microwaves, have produced an anxious situation for the broadcasters and the public alike. To a point, the PA is caught in the middle as the reluctant landlord.

Radiation Measurements

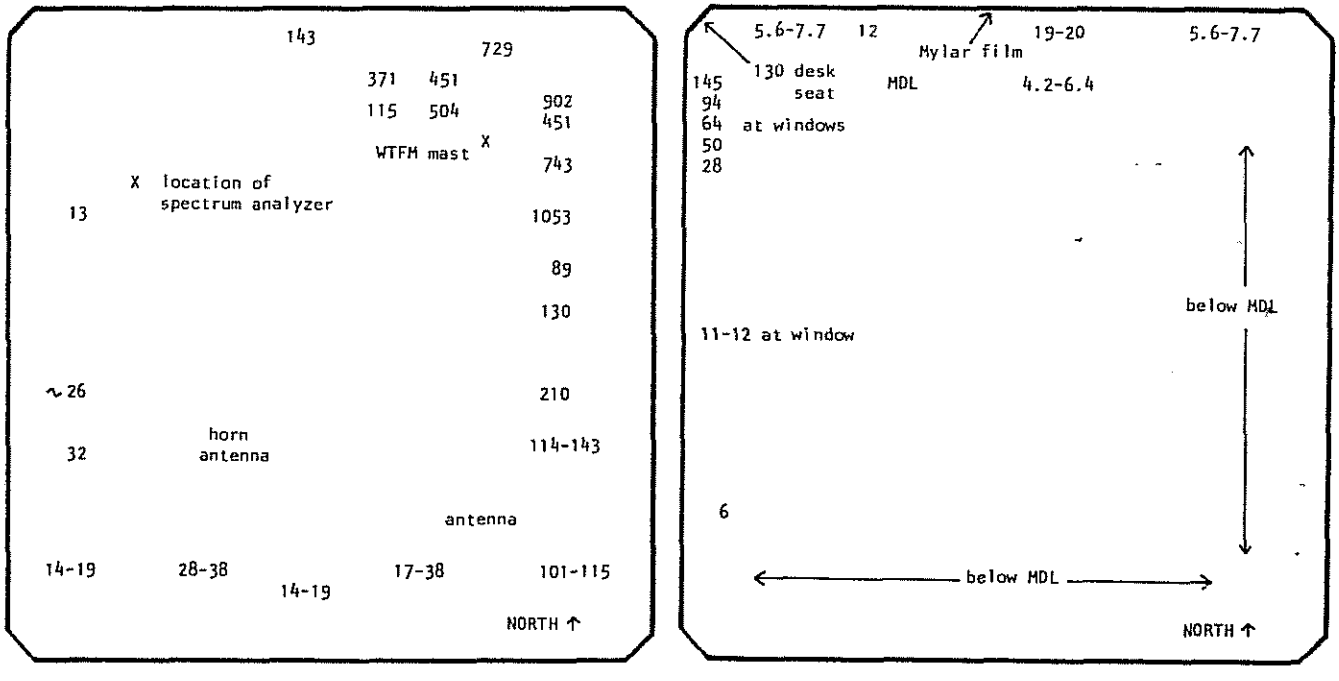
The only WTC radiation measurements now available were taken by Richard Tell, of the Environmental Protection Agency (EPA), during the early morning hours of July 16, 1980, and released to *Microwave News* in late January. At that time, two VHF TV stations (WCBS-2 and WNEW-5) and two UHF stations (WXTV-41 and WNJU-47) were broadcasting from the master antenna on the north tower; one TV translator (W60A1) and one FM station (WTFM) were broadcasting from the south tower. (Since then, WABC-7, located on the master antenna, the main mast, has been turned on.) Tell took a series of readings with a broadband Holaday meter (HI-3001) on the public observation deck on the roof and on the 107th floor observatory of the south tower. Due to high winds, Tell could make only one set of roof measurements of the individual station signals with a spectrum analyzer.

The maximum reading on the roof was 1053 uW/cm², due largely, according to Tell, to WTFM. Exposures below on the 107th floor fell in the 6-17 uW/cm² range generally, but peaked as high as 145 uW/cm² near the windows. A level of 130 uW/cm² was identified at a desk in the far northwest corner. (See accompanying diagrams for full set of measurements.) No readings were taken on the north tower, home of the main antenna.

Before and after the EPA survey, the PA's consultant, Robert Silliman, of Silliman and Silliman in Washington DC, took detailed measurements. They have not been released. Some of the numbers did reach the New York papers last February ("Making (Micro)waves over Trade Center TV," *Daily News,* February 25, 1980, and "Microwave Threat Stalls Trade Center TV Tower," *New York Times,* February 26, 1980). The resulting commotion prompted the PA to install mylar reflecting material on some windows in the northwest corner of the south tower. The mylar was already in place by the time Tell arrived. Though Silliman's numbers are still confidential, The PA maintains that they are significantly lower than Tell's EPA measurements.

Joyce Feldman, EPA's radiation representative in New York,

Broadband power densities (uW/cm²) measured by EPA's Tell on the south tower roof (left), and the 107th floor observatory (right). All dimensions are approximate. (MDL = Minimum Detectable Level)



explains that a report on the Tell measurements has not been issued because they are now out-of-date. After Tell's visit, the PA installed a protective shield, known as a wagonwheel, on the WTFM mast on the south tower. The wagonwheel has changed the radiation patterns on the towers.

Contradictory Results

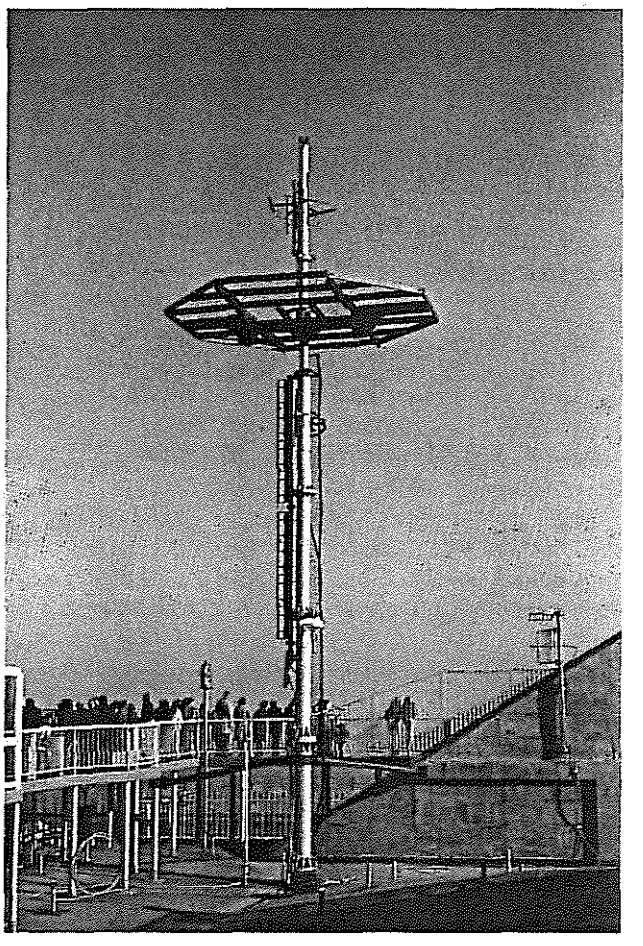
At a February meeting, PA officials, including Franklin Bass from the general counsel's office, Joseph Milano, manager of telecommunications and information systems, and Thomas Sorensen, broadcast coordinator, told *Microwave News* that the Tell numbers were "wrong" and "unreliable." In a yet to be released letter, Silliman had written the PA arguing that Tell's readings were really peak values, which had to be divided by an empirically derived factor of 1.54. The 1.54 factor was required because Tell, according to Silliman, had used the "peak hold" button on the Holaday meter when taking his readings. Silliman also wrote that any measurements of TV signals had to be further corrected to discount for synchronization pulses.

Speaking from his office in Las Vegas, Tell denied using the peak hold button. And Reed Holaday, president of Holaday Industries in Eden Prairie, Minnesota, said that his 3001 meter does not respond to TV "synch pulses."

On hearing about Tell's and Holaday's responses, Silliman withdrew his 1.54 conversion factor, and said, "There is some doubt that my point [about the meter] is valid."

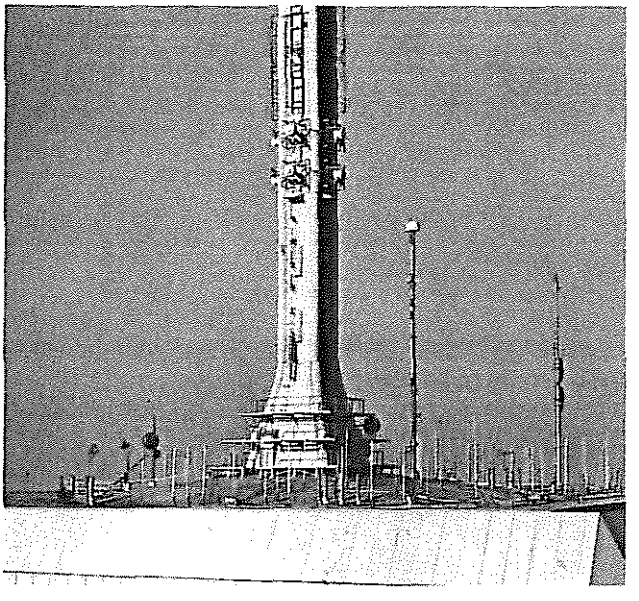
The PA and Silliman now explain the differences between the two reports by the method each used to take measurements. Tell surveyed a number of small areas and identified local maxima while Silliman took his readings at specific locations along a predetermined grid.

EPA's Feldman offered the same explanation. But no one outside the PA—including EPA—has yet seen the Silliman reports. Asked about all the confusion over the radiation levels, Feldman said that in the absence of federal standards, she had no legal authority to intervene, and that communication problems arose when so many people were involved in such an informal way.



Station WTFM mast with "wagonwheel" protective shield on the south tower. Behind, tourists enjoy New York views.

The base of the master antenna on the north tower.



The wagonwheel shield, installed to reduce WTFM radiation, had an unanticipated result. Signals from WKCR, an FM station originally located on the same mast under WTFM, were reflected downward by the wagonwheel. Silliman said that while local peaks had changed, the general radiation levels were about the same. WKCR-FM is not now operating from the WTC. The PA stressed that, before WKCR begins broadcasting, it will be moved to another antenna.

The PA claims to have spent more than $50,000 on monitoring—or a total of $200,000 when corrective action is included. Future PA surveys are planned, but no firm dates have been set.

At the end of his report, Tell recommended that a "more exhaustive field survey be accomplished to determine the absolute contribution of fields from the various broadcast frequencies."

(continued p. 8)

(continued from p. 7)

He also advised: "a survey of field levels inside the offices of several top floors would be worthwhile." Tell said that he could not predict if, or when, he would be able to return to the WTC to do such follow-up surveys for EPA. Federal travel budgets have been slashed, and he could not come to New York before the next fiscal year. If he does return, he wants to take a detailed set of measurements over the course of several days.

Safety Standards

The PA has consistently maintained that it will meet a 100 uW/cm² general population exposure standard. This level, set for the PA by Dr. Paul Tyler, director of the Armed Forces Radiobiology Research Institute in Bethesda, Maryland, is purely voluntary. The EPA has not issued any guidance for public exposures to non-ionizing radiation.

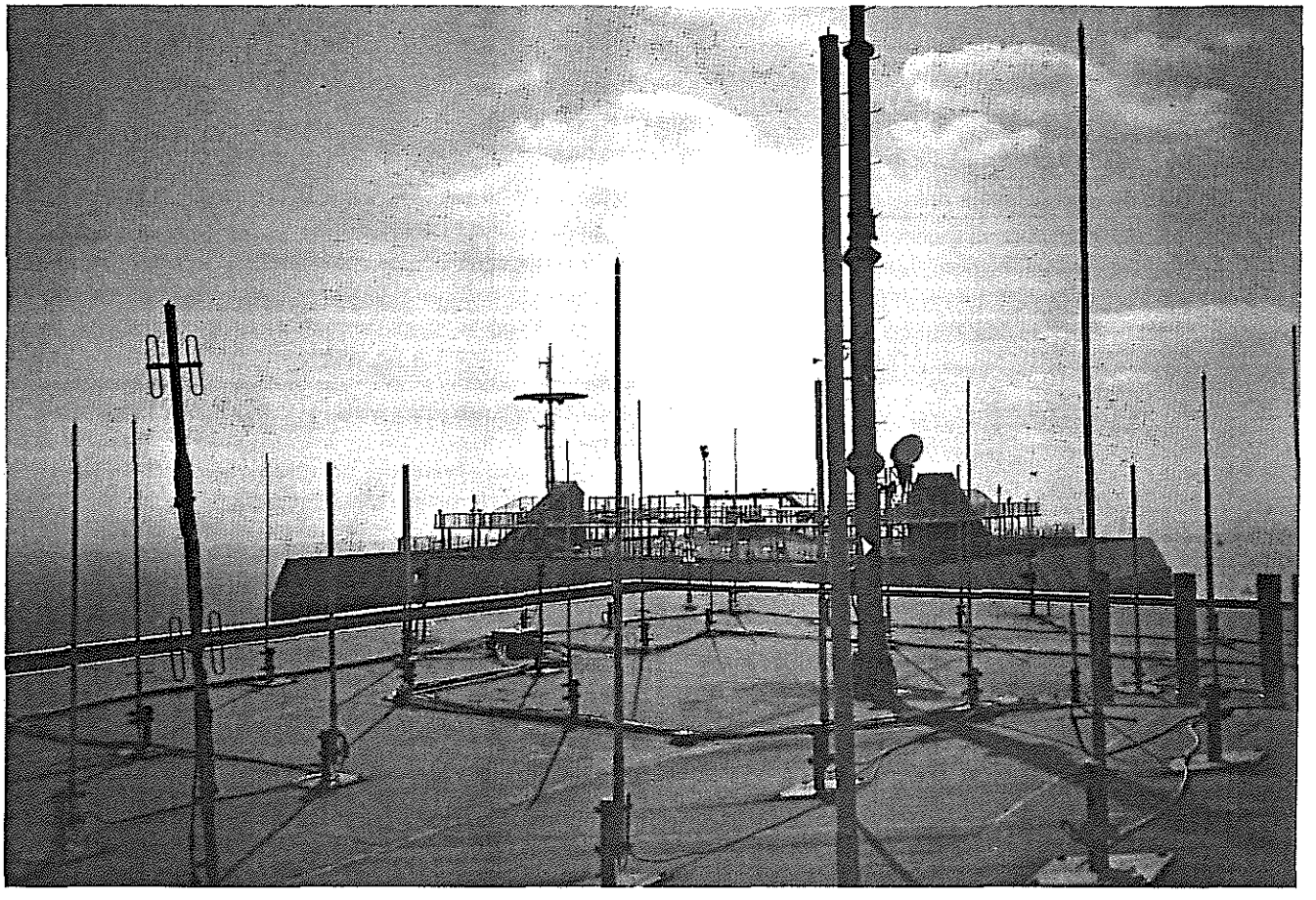
At a New York State Senate committee hearing, held last summer at the WTC, Patrick Falvey, general counsel and assistant executive director of the PA, testified that the PA "has undertaken a moratorium wherein no new broadcasting will be permitted from the [WTC] unless it can meet this strict standard."

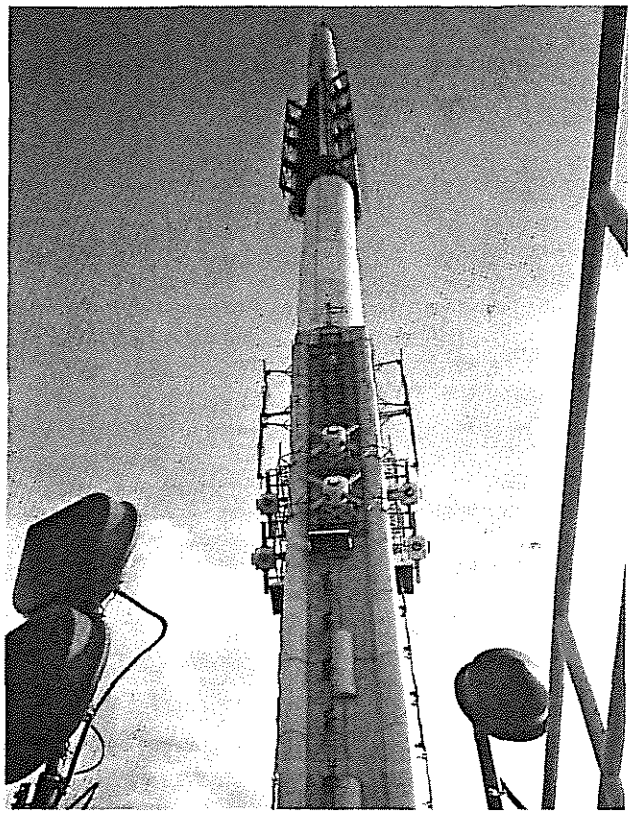
The PA's safety standard is twice as high as the 50 mW/cm² level proposed by Dr. Leonard Solon, the director of the City's Bureau for Radiation Control. The broadcasters, on the other hand, feel that the PA standard is far too stringent. Otis Freeman of WPIX, and a member of the TV Broadcasters All Industry Commitee—an organization of New York City's TV stations—says "100 is much too low." In Freeman's view, such a standard would interfere with the TV industry, disrupting the City's—and if applied generally, the nation's—communications system.

Attempting to meet its standard, the PA has kept the UHF stations (41 and 47) operating at only 50 percent power, and has turned away many other potential clients. Bass, the PA attorney, complained of losing a lot of money from unrented space as a result. He added that one of the UHF stations was lobbying the State legislature to force the PA into letting them turn up the power. Some, tired of the delays, are threatening to sue the PA for breach of contract.

In some ways the PA is a reluctant landlord. It agreed to house the antenna in 1967, but only after public reaction to TV interference that could have been caused by the WTC threatened to block the towers' construction. The PA wound up having

The south tower from the base of the master antenna on the north tower. In the foreground, various specialized communications antennas.





Master antenna on the north tower, flanked by receiving antennas.

to pay for moving the antenna downtown to the Empire State Building. As the WTC neared completion, however, the PA sought a review of its commitment. It was rejected by the Federal Communications Commission.

Two more TV stations (WOR-9 and WPIX-11) plan to move into the WTC by late March, and two more (WNBC-4 and WNET-13) by Labor Day. The dates for moving the five FM stations (WNYC, WPIX, WNEW, and WPAT) onto the master antenna have yet to be announced. WKCR will not go on the air until it is moved to another antenna, being built for the Coast Guard by Motorola.

TV Reception

The stricter the safety standard, the lower the broadcast power and hence the smaller the audience that can be reached. Ironically, stations threatened with losing their outlying markets due to weak signals also face troubles close to the antenna. As TV stations move to the WTC, viewer complaints follow. When WCBS moved, it began to receive 100 calls a day; people grumbled about fuzzy reception, ghosts, and poor color. Jim Baker, chief engineer at WABC, reports that his station heard from some 2000 disgruntled customers. WABC has since distributed 7500 pamphlets, "How to Improve Television Reception on Channel 7."

Part of the problem is that viewer antennas are still pointed towards the Empire State Building. Freeman of WPIX said that the biggest mistake was moving the stations piecemeal: They should have all gone to the WTC at the same time.

Local Apprehension

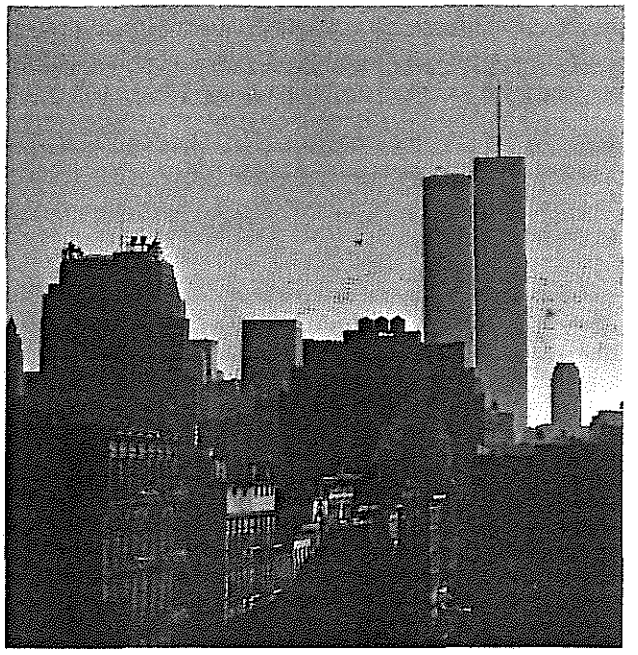
Meanwhile, residents living in neighborhoods near the WTC are worried about the potential threat of microwave radiation. On January 29, Community Board No. 1 in lower Manhattan sponsored a briefing session on microwaves. Some eighty residents heard the EPA's Feldman and a representative of Solon's Bureau for Radiation Control explain that the radiation levels emitted by the WTC antennas were very low. But one reaction from the audience summed up the prevailing attitude: "Do we have cause for concern or not? That is why we came here, the numbers don't mean anything to us."

* * * * *

This article very nearly became academic. According to news stories released February 26, an Argentinian Boeing 707 jet, with 58 people aboard, just missed crashing into the WTC mast last February 20. The jet was less than a minute and a half away from the bottom of the 350 foot mast (each of the towers is 1350 feet high), when an air traffic controller ordered it to turn and climb out of danger.

As we go to press, the PA has agreed to release the Silliman data to Microwave News. *They will be featured in the April issue.*

The World Trade Center, as seen looking south from lower Manhattan.



CONFERENCES

PROCEEDINGS

Now Available:

Thermal Characteristics of Tumors: Applications in Detection and Treatment, papers presented at a conference at the New York Academy of Sciences, March 14-16, 1979. Edited by Rakesh K. Jain and Pietro M. Gullino. *Annals of the New York Academy of Sciences, 335*, 1980.

•

The Mechanisms of Microwave Biological Effects, a report of a workshop held at the University of Maryland, College Park, Maryland, May 14-16, 1979. Edited by Leonard S. Taylor and Augustine Y. Cheung. Available free from the Office of Naval Research, Code 441, Arlington, VA 22217: enclose a self-addressed label.

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Direct Broadcast Satellite Communications, a symposium conducted by the Board on Telecommunications-Computer Applications and the Space Applications Board on April 8, 1980. Available from the Space Applications Board, National Research Council, 2101 Constitution Avenue, NW, Washington DC 20418.

•

Health Hazards of VDUs?, a conference held on December 11, 1980. Available for £5 from the HUSAT Research Group, Department of Human Sciences, Loughborough University of Technology, The Elms, Elms Grove, Loughborough, Leics. LE 11 1RG, England.

CALENDAR

• April 13-15: Annual *Conference and Trade Show of the International Association of Satellite Users*, Washington Hilton Hotel, Washington DC. Contact: A. Fred Dassler, IASU, 6845 Elm Street, Suite 710, McLean, VA 22101.

• May 31-June 4: 29th Annual Scientific Meeting of the *Radiation Research Society*, Hyatt Regency Hotel, Minneapolis, MN. Contact: Office of the Executive Director of the Society, 4720 Montgomery Lane, #506, Bethesda, MD 20014.

• June 9-12: 16th Annual *Symposium of the International Microwave Power Institute*, Royal York Hotel, Toronto, Canada. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.

• June 15-19: *IEEE and URSI Symposium*, Bonaventure Hotel, Los Angeles, CA. Sponsored by the Antenna and Propagation Society and the Microwave Theory and Techniques Society of the IEEE and four Commissions of URSI. Contact: IEEE, 245 East 47th Street, New York, NY 10017.

• June 27-July 2: 6th International Symposium on *Bioelectrochemistry and Bioenergetics* and 1st Meeting of the *International Bioelectrochemical Society*, Kibbutz Kiryat Anavim, Israel. Contact: Mrs. R. Goldstein, Secretary, Bioelectrochemistry Symposium, The Aharon Katzir-Katchalsky Center, The Weizmann Institute of Science, Rehovot, Israel.

• June 30-July 4: *International Symposium on Biomedical Thermology*, Palais de la Musique et des Congres, Strasbourg, France. Includes sessions on hyperthermia in cancer treatment (July 3) and bioelectromagnetics (July 1). Simultaneous translation in English, French, and German. Contact: Dr. M. Gautherie, Laboratoire de Thermologie Biomedicale, Faculte de Medicine, Universite Louis Pasteur, 11 rue Humann, 67085 Strasbourg, France.

• July 13-16: 10th *L.H. Gray Conference: The Biological Action of Radiofrequency, Microwave, and Ultrasonic Radiations*, Oxford England. Contact: Dr. G.R. ter Haar, Physics Division, F Block, Institute of Cancer Research, Clifton Avenue, Sutton, Surrey SM2 5PX, England.

• August 10-12: 3rd Annual *Bioelectromagnetics Society Meeting*, Washington DC. Contact: BEMS, P.O. Box 3651, Arlington, VA 22203.

• August 10-19: 20th *General Assembly of the International Union of Radio Science (URSI)*, Hyatt Regency Hotel, Washington DC. Includes a series on "Interaction of Electromagnetic Waves with Biological Systems," on August 13-14, chaired by Professor Saul Rosenthal of Polytechnic Institute of New York, and an "Open Symposium on Millimeter and Submillimeter Waves." Contact: Mr. Richard Y. Dow, Organizing Committee of URSI General Assembly, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington DC 20418.

• August 19-21: 3rd Annual *Satellite Communications Users Conference*, Regency Hotel, Denver, CO. Contact: SCUC '81, Satellite Communications Magazine, 3900 S. Wadsworth Blvd, Denver, CO 80235.

• September 7-11: 11th *European Microwave Conference*, Amsterdam, The Netherlands. Contact: Microwave Exhibitions & Publishers Ltd., Temple House, 36 High Street, Sevenoaks, Kent TN13 1JG, England.

• November 9-11: 1st Annual Meeting of the *Bioelectrical Repair and Growth Society*, Philadelphia, PA. Contact: Executive Secretary of the Society, 425 Medical Education Building, 36th and Hamilton Walk, Philadelphia, PA 19104.

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MICRO WAVE NEWS

Vol. I No. 1 A Monthly Report on Non-Ionizing Radiation January 1981

INSIDE...

AROUND THE COUNTRY p. 6

BIOLOGICAL RESEARCH p. 4

CONFERENCES p. 8
News & Calendar

GOVERNMENT p. 2
Agencies & Congress

MICROWAVE CIRCUIT p. 6
People in the News

SOLAR POWER SATELLITES p. 5

TECHNOLOGY p. 5

COMING UP

- Portland's New Population Standard
- Microwave-Drug Synergy
- First Long-Term, Low-Level Microwave Exposure Study
- Yannon Decision

MICROWAVES IN MOSCOW

At its August 26, 1980 meeting, the Electromagnetic Radiation Management Advisory Council (ERMAC) concluded that an investigation, such as the formal study of the health of Americans exposed to microwave radiation in the U.S. embassy in Moscow, would be pointless. Without dissent, members of ERMAC agreed that, based on current knowledge, there are no scientific or theoretical grounds to predict potential health impacts of the Moscow signal.

A consequence of the ERMAC finding may well be that the State Department will do no further epidemiological research on the 1,827 employees who worked at the embassy during the 22 year period when the Russians irradiated the upper floors with low levels of mostly continuous and some pulsed microwaves. As Stephen Cleary of Virginia Commonwealth University, an ERMAC member, explained, the sample population is too small and the dose too low for anything but a grave risk to show up, and therefore any money allocated to such research could be better spent elsewhere. One ERMAC member went so far as to say that he would not hesitate to expose himself or his family to those levels of microwaves found in the embassy.

ERMAC is an advisory committee to the Administrator of the National Telecommunications and Information Administration, Mr. Henry Geller.

(continued p. 7)

ANSI News

Meeting Scheduled

There will be a meeting of the C95 Committee on Radio Frequency Radiation Hazards of the American National Standards Institute (ANSI) on Thursday, February 26, 1981 at the ANSI headquarters in New York City (1430 Broadway). The main purpose of the meeting is to seek final approval of the new subcommittee IV standard on radiofrequency and microwave safety levels. Other business will include the new standards on measurements (subcommittee I) and hazard signs (subcommittee II/III).

Standard Nears Completion

The ANSI safety standard went out for C95 Committee vote last July. Although the standard was accepted by a majority vote of the Committee three important organizations withheld their approval: the Bureau of Radiological Health, the Environmental Protection Agency, and the Electronic Industries Association.

At a meeting in Bethesda in late October, the subcommittee was able to satisfy BRH objections and it is now very likely that the Bureau will cast a positive vote on the new standard. While an attempt was also made to win EIA's approval, it is not yet clear how EIA will vote. Apparently EPA does not intend to vote at all.

Microwave News will present an in-depth look at the new ANSI standard in a forthcoming issue.

GOVERNMENT

CONGRESS

The Congressional Research Service of the Library of Congress has updated its issue brief on "Radiation Health and Safety Issues of Congressional Interests." The brief written by Christopher Dodge of the Science Policy Research Division covers both ionizing and non-ionizing radiation and includes a listing of legislative authorities, federal regulatory authorities, pending legislation, hearings, and a chronology of events. (Brief Number IB77062, October 23, 1980.)

AGENCIES

Air Force

The Air Force wants to develop new and improve existing hardening techniques for its systems exposed to a nuclear electromagnetic pulse (EMP). See *Commerce Business Daily*, November 7, 1980.

Bureau of Radiological Health (FDA)

BRH promulgated a final rule amending the performance standard for microwave ovens in the *Federal Register* on November 28, 1980 (45 *FR* 79028). The rule, which becomes effective on November 30, 1981, deletes the error limit and effective aperture requirements for instruments used to detect leaks from microwave ovens.

The rule was on the agenda of the Technical Electronic Product Radiation Safety Standard Committee (TEPRSSC) meeting held on December 3-4 in Washington.

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BRH proposed a performance standard for microwave diathermy products in the July 29, 1980, *Federal Register* (45 *FR* 50359). A summary of the comments on the standard submitted to BRH will appear in our February issue.

Department of Commerce

The Commerce Department ruled in early December that the Toshiba Corporation of Japan sold countertop microwave ovens at prices so low that they were unfair and violated the Tariff Act. The case has been forwarded to the US International Trade Commission, which will determine whether Toshiba ovens injured domestic production. If the ITC makes such a finding, penalty duties will be assessed.

According to the December 3 *Federal Register* (45 *FR* 80157) notice, ovens made by the Matsushita Electric Industrial Company, the Sanyo Electric Company, and the Sharp Corporation were not dumped in the American market. The four companies accounted for 98% of the 740,000 ovens imported into the United States from Japan in 1979 at a value of $149 million.

Environmental Protection Agency

EPA sponsored a workshop on RF measurements in Las Vegas last November 3-5. Thirty government officials and a limited number of outsiders held intensive discussions on the current status of measuring electromagnetic fields. According to Richard Tell of EPA, the workshop organizer, "This was the first time all the instrumentation experts from the government were in the same room at the same time."

The participants agreed to two sets of recommendations:

1. That a group, such as the American National Standards Institute (ANSI), should set the following standards for broad band RF survey instruments: a) minimum, uniform reporting requirements of performance characteristics for existing instruments; b) minimum testing procedures for evaluating instrument performance; and c) performance characteristics for future instruments.

2. That standardized measurement techniques be developed based on: a) existing instrumentation, b) applicable safety standards, and c) specific exposure situations.

The second set of recommendations arose from the lack of uniformity in the way measurements are taken.

The recommendations will be published at a later time, though the form of publication has yet to be decided, perhaps an EPA technical report or a journal article.

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The Nonionizing Radiation Surveillance Branch of EPA is providing all the Agency's regional offices with a new Holaday electric field probe to permit local surveys of radiofrequency levels. According to Branch Chief, Dave Janes, "We are providing only the training and equipment, the time and resources devoted to this are up to each individual regional office."

EPA is also buying higher frequency probes: one of five or six Narda probes will be lent to a regional office when requested as soon as they are delivered by the manufacturer. A single field intensity meter and associated antennas which can identify the frequency of a particular source will also be available for loan. A four day training course for regional personnel was held by EPA in mid-December in Las Vegas.

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Department of Energy

The DOE's Office of Electric Energy Systems held its annual contractors review meeting on the biological effects of electric fields from overhead transmission lines in Washington DC last November 18-19. Researchers from about a dozen on-going projects in the multi-million dollar program reviewed their progress.

The DOE program is now focused on AC work, but in the years ahead the emphasis will change to DC lines.

For a copy of the abstracts presented at the November meeting contact: Mr. Alec O. Bulawka, US DOE/EES, Mail Stop 3344, 12th and Pennsylvania Avenue, NW, Washington DC 20461, (202) 633-8638.

Federal Communications Commission

At the end of January, the FCC will issue a statement in response to the comments received on its 1979 Notice of Inquiry (NOI) [44 *FR* 37008, June 25, 1979] concerning the biological effects of radiofrequency radiation.

The FCC has decided not to issue any interim radiation standards, according to Robert Cleveland of the Commission's Technical Planning Staff. But the FCC will participate in the rulemaking proceedings of other agencies on RF issues. The statement will include a summary of the some 25 comments submitted to the FCC in response to the NOI.

Cleveland said that the FCC issued the NOI to meet its duties to promote safety under the Communications Act, and to satisfy its responsibilities under the National Environmental Policy Act.

National Cancer Institute

NCI has issued a request for proposals for the synthesis and evaluation of radiosensitizers, chemicals which selectively sensitize hypoxic (oxygen deficient) tumor cells to radio-therapy. A three year project is planned. RFP NCI-CM-17485 is available from Maria Decker, NCI, Treatment Contracts Section, Blair Building, Room 228, NIH, Bethesda, MD 20205.

National Institute for Occupational Safety and Health

The schedule for the NIOSH criteria document on radiofrequency and microwave (RF/MW) radiation is still slipping. Drafts of the document were released in 1979, but were withdrawn due to unfavorable reviews. NIOSH is now aiming for a substantially shorter document, one that is less encyclopedic with more critical analysis. NIOSH's consultants are in the process of evaluating the RF/MW biological data. This phase of the operation is going slowly, and the agency cannot proceed until it is completed. A review draft may be finished by the spring.

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The NIOSH procurement office in Cincinnati has issued a request for quotation [RFQ 81-12; November 14, 1980] for the writing of two television scripts on the health risks associated with Video Display Terminals (VDT's).

NIOSH, BRH, OSHA

A team from NIOSH, BRH and OSHA is developing a bulletin on control technologies for dielectric heaters, including RF sealers.

Preliminary tests indicate that shielding can have a significant effect on both the magnitude and direction of the impinging field. The team is not yet ready to make firm recommendations on control technologies.

The joint bulletin is due to be out in late Spring.

National Telecommunications and Information Agency

The Electromagnetic Radiation Management Advisory Council (ERMAC), the advisory committee to NTIA, is anticipating holding a meeting at the end of January or early February in Washington.

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The BENER Task Force report, "Nonionizing Electromagnetic Radiation Safety: A Program of Coordinated Federal Activities Related to Biological Effects of Nonionizing Electromagnetic Radiation (0-300 GHz)," was published last summer, but has yet to receive any official attention.

Dr. Howard Clark of the National Bureau of Standards who served as the Task Force chairman hoped that the report would provide "a frame of reference for examination of the various agency programs and budgets that relate to the coordinated federal BENER program," and would be "useful to federal agencies in planning or describing their individual activities as related to a common goal."

The Task Force was set up by Henry Geller, the Administrator of NTIA at the request of Dr. Frank Press, the President's science advisor. Nevertheless, the report has not been officially forwarded to Press, nor does it seem to be a planning tool of the individual agencies involved in bioeffects research.

Occupational Safety and Health Administration

Bob Curtis of OSHA's Salt Lake City office organized a training session for two members of each of OHSA's ten regional offices to teach them how to measure radiofrequency and microwave radiation levels in the workplace. As a result of the December 3-4 sessions, held in Salt Lake City, workers will have a greater opportunity to check their on-the-job exposures to non-ionizing radiation.

Helping Curtis were Michael Larsen and Alfred Owyand of OSHA and Edward Aslan of Narda.

Radiation Policy Council

The US Radiation Policy Council, the interagency group created by the President in February 1980, has issued its "Progress Report and Preliminary 1981-1983 Agenda." (No. RPC-80-001, September 30, 1980).

The Report concentrates on ionizing radiation to the virtual exclusion of non-ionizing radiation. Beyond intending to grapple with general radiation policy which may (or may not) spill over

(continued p. 4)

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BIOLOGICAL RESEARCH

Frey Reworks BBB Data

Allan Frey of Randomline Inc. believes he has resolved some of the contradictions in the experimental results of the blood brain barrier (BBB) research. Writing in the November 1980 issue of the *Bioelectromagnetics Society Newsletter*, Frey argues that the use of inappropriate statistical analysis explains why many researchers erroneously concluded that microwaves do not change the permeability of the BBB.

At least three teams of researchers, including one led by Frey himself, have shown that microwaves can cause certain dyes to pass through the BBB into the brain. In one of the most significant studies, Oscar and Hawkins discovered that pulsed 1.3 GHz radiation could change the permeability of the BBB at average power densities of only 0.03 mW/cm² (*Brain Research, 126*, 281, 1977).

However, three groups of scientists cast doubt on these results by reporting no microwave effects on the BBB for various exposure conditions. Frey has taken the published data of two of the groups, and, by applying what he thinks are more appropriate statistical tests, found that the opposite conclusions hold: they demonstrate increased permeability. One set of results by Merritt *et al.* now supports Frey's original paper, and another by Preston *et al.* confirms Oscar and Hawkins' work. Frey also speculates that the third group, Spackman *et al.*, may have also used inappropriate statistical analyses and a faulty experimental design.

As Frey concludes: "The supposed conflicting and controversial data actually are quite consistent and indicate that something is happening in the brain under low intensity microwave energy exposure."

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New Review Article

Richard Lerner has published a comprehensive review of current research on health effects of non-ionizing radiation, with special emphasis on low-level effects, in the December 1980 issue of *IEEE Spectrum*: "RF Radiation: Biological Effects." The article also details some of the controversy surrounding the new ANSI standard.

EPA Funds Teratological Study

The Environmental Protection Agency's Health Research Laboratory has awarded Dr. Mary Ellen O'Connor and Dr. Robert Strattan of the University of Tulsa a contract to study the teratological effects of microwave radiation.

The two-year, $230,377 study will consist of exposing mice *in utero* throughout the gestation period with 2450 MHz continuous wave radiation. The irradiation will stop after they are born. The experiment will begin with exposures to power levels of 30 mW/cm²; the levels will decrease to 10, 1, and 0.1 mW/cm² until no effects are observed. The mice will be monitored for fetal weight and developmental abnormalities.

Dr. O'Connor is with the Department of Psychology and Dr. Strattan is with the Electrical Engineering Department.

New Idea about Cataract Formation

A new explanation for cataract formation has been developed by a group of physiologists at Rush University in Chicago (*Science, 209*, 1007, August 29, 1980). The group has rejected the view that the lens of the eye is a homogeneous mass. Instead, based on a combination of biophysical techniques and mathematical models, the scientists have proposed that the interior cells of the lens have imperbeable membranes that block the entry of small ions. These fibrous cells can stop the flow of sodium and water into the lens' interior, thereby preserving its volume and transparency.

Microwave Hearing

How do people hear pulsed microwaves? The mechanism for the perceived buzzing or clicking sound is still a mystery; various hypotheses continue to be proposed, rejected, and defended. In a tart exchange of views in *Science* (*209*, 1143, 5 September 1980), two opposing camps reaffirmed their positions. One group led by C.K. Chou of the University of Washington Medical School maintains that hearing results from a tiny pressure wave in the head when the radiation pulse is converted to thermal energy. Allan Frey and Elaine Coren of Randomline, Inc. continue to offer the hypothesis that microwave hearing is the result of the thermoacoustic expansion within the cochlea, the small snail-shaped region of the inner ear.

GOVERNMENT *(continued from p. 3)*

to the non-ionizing portion of the spectrum, the RPC agenda promises little attention to microwave, radiofrequency, or ELF radiation.

Included in the report are summaries of the RPC public meetings held across the country during 1980, and the public comments submitted to the Council.

Three of the public comments address non-ionizing radiation:

- AFL-CIO, Food and Beverage Trades Department: strengthen occupational exposure standards for microwave and radiofrequency radiation from microwave ovens and sealing equipment, and radiation emanating from video display terminals. (p. E-12)
- Natural Resources Defense Council: Examine both ionizing and non-ionizing radiation since many of the problems that have hindered past work on ionizing radiation are also obstacles in the study of non-ionizing radiation. (p. E-4)
- Raytheon Corporation: Encourage EPA to develop a mandatory Federal standard on exposure of the general public to non-ionizing radiation or recommend a definition of current consensus standards (ANSI C95) by Congress as a mandatory national standard until formal Federal standards are developed. Ensure active participation by federal agencies in legitimate efforts of public education in the area of non-ionizing radiation. (p. E-8)

If you want to be on the RPC mailing list, write to: US Radiation Policy Council, Room 3026, New Executive Office Building, 726 Jackson Place, NW, Washington, DC 20503.

RF Radiation, A New Tool in Cancer Treatment

Radiofrequency radiation is a promising weapon against cancer, according to a December 1980 *IEEE Spectrum* article. "RF Therapy for Malignancy" explains how this treatment works and describes equipment design and function, tissue models used in research, and various hyperthermia methods.

Radiofrequency induced heating of tissue (42 to 43.5°C) is used alone or in conjunction with radiation (ionizing) therapy or chemotherapy to treat malignancies. A range of frequencies is used; higher ones—up to 2450 MHz—are easier to focus than the lower frequencies which can penetrate more deeply into the body. Because solid tumors generally have poor blood circulation, a tumor can be selectively heated without significantly increasing the temperature of surrounding, healthy tissue. The authors state that for localized treatment, there are no serious side effects from radiofrequency hyperthermia.

VDT's

The *Columbia Journalism Review* will feature a story on VDT's in the newsroom in its January-February issue. The article looks at both the health hazards associated with the machines and the reporting of this story by the press.

Electrotherapy Controversy

New York Magazine, in a two-part article that ran November 23 and December 1, detailed the controversy over the use of low-level electricity for bone healing.

The story began as a profile of Arthur Pilla, a chemical engineer at Columbia University. Pilla, who claimed to have played a major role in developing the electrical technology to treat fractures that previously would not heal, piqued the reporter's interest by claiming that the device was now being tested for its efficacy in treating cancer and that human applications could start within the year.

Dr. Andrew Bassett, a doctor at Columbia's medical school, cautioned that Pilla was overstating the prospects and further, downgraded Pilla's contributions in their research.

Bassett had worked with Dr. Robert Becker, then at the VA Hospital in Syracuse, New York, to show that stress applied to any bone is translated into electricity. Bassett's later cooperation with Pilla resulted in a practical, non-invasive electrical coil device, which Pilla and another colleague patented. They all formed a private corporation, Electro-Biology, Inc. of Fairfield, New Jersey with the financial backing of Wall Street entrepreneurs.

Zimmer-USA, Inc. and Telectronics Proprietary Ltd. offer other bone-growth stimulators, although Electro-Biology's is the only one which does not require implanting an electrode under the skin.

Dr. Bassett received more than $1 million in government grants in the course of his research. The writer, Lally Weymouth, raised questions about transferring medical research paid for by public funds to profit-making private companies. She noted that the government gets a share of Zimmer-USA royalties because its product was underwritten by the Navy.

New Reports

Two major studies of the Department of Energy's SPS system are nearing completion. Each will contain an analysis of the impact of microwave radiation on human health and the environment.

One study by the National Research Council (NRC) is due to be completed by the end of June 1981, with a draft report by early January 1981. The other by the Congressional Office of Technology Assessment (OTA) was due to be published by the end of January 1981, but is running late.

NRC

The Environmental Studies Board (ESB) of the NRC appointed a Committee on Satellite Power Systems to provide an independent review of DOE's assessment of the SPS concept. Towards this end, the ESB organized a "Workshop on Mechanisms Underlying Effects of Long-term, Low-level, 2450 MHz Radiation on People." A workshop summary, prepared by Christopher Dodge of the Science Policy Research Division of the Library of Congress, was released last fall. (See box for conclusions of workshop participants.)

OTA

The two-year OTA project was requested by the House Committee on Science and Technology. The completed study will compare the impacts of beaming energy from collecting satellites by lasers, microwaves, and reflected light. With respect to microwaves, the study will look at both the DOE reference system and a solid state system which would use lower power densities and smaller rectenna sites.

SRI

Last summer, SRI International completed a study for the Environmental Protection Agency, "An Assessment of the Potential Impact of Microwave Radiation from a Solar Power Satellite." This then became the basis for a chapter in the DOE report, "Environmental Assessment of the Satellite Power System (SPS) Concept Development and Evaluation Program (CDEP)," prepared by Anthony Valentino of Argonne National Laboratory (No. DOE/ER-0069, August 1980).

CONCLUSIONS OF SPS-NRC WORKSHOP

A. There are relatively little microwave health and bioeffects data available of direct relevance to the radiation parameters of the proposed SPS. What data are available are difficult to evaluate in terms of a potential health impact of the SPS.

B. There is no presumptive evidence in the data available that exposure of the general public to 0.1 mW/cm² or lower at the frequency of 2450 MHz generated by the SPS will result in any health decrements. However, because a number of functional phenomena of known significance have been reported in response to exposure to low-intensity microwaves, further research and evaluation...is necessary in order to decrease present uncertainties about potential low-level microwave health effects.

Georgia Power Challenged on Microwaves

A group of 27 residents of rural Clayton, Georgia, have filed suit in county court to prevent Georgia Power Company from erecting a 180-foot microwave tower on top of nearby Screamer Mountain. Citizens Against Microwaves, led by homeowner David Kraft, brought the case in September, shortly after the Rabun County Commission approved the tower in a 2-1 vote before a packed hearing room.

The suit, which names the power company and the two county commissioners who approved the tower, charges that allowing Georgia Power to build on land seized by the county for nonpayment of taxes is a violation of covenant, will create a health hazard and constitutes an improper disposal of county property. *Atlanta Weekly*, the Sunday magazine of the *Atlanta Constitution*, ran a long article on the controversy in its November 23, 1980 issue.

HBO Cancels Out

In late November, Home Box Office (HBO), Time-Life's subscription TV network, withdrew its application to build a satellite communications complex in Rockaway Township, New Jersey.

The HBO proposal was under intense scrutiny by the Rockaway Board of Adjustment which had to grant a variance before construction could begin. The Concerned Citizens' Committee of Rockaway Township was formed to oppose the HBO proposal. The Committee was worried about the siting of a major source of microwave radiation in a residential area, only 1000 feet from a neighborhood school. The Board had held 16 hearings since last spring, and another 30 were scheduled.

Edward Horowitz, HBO vice-president of studio and network operations, explained that while "the local Board was responsive and HBO was overcoming the local opposition, we could not afford the delay."

The cancellation will not hurt HBO's immediate programming. The Rockaway site would have provided the pay TV system with added flexibility. As for a new site, Horowitz said that HBO will look for suitable areas across the country: "The primary interest is in the New York-New Jersey Metropolitan area, but once away from here, it doesn't really matter where you go."

California OSHA

California's Occupational Safety and Health Standards Board has proposed a substitution in the State's General Industry Safety Orders on non-ionizing radiation. The standard remains at 10 mW/cm^2; the purpose of the change is to make it more enforceable. Cal OSHA held a public hearing on the proposal on November 19, 1980.

Dr. Daniel Cahill of the Environmental Protection Agency's Health Effects Research Laboratory in Research Triangle Park, North Carolina, has been awarded the Public Health Service Commendation Medal. Dr. Cahill, the Director of the Lab's Division of Experimental Biology was cited for: "Outstanding research and research management in the areas of ionizing and non-ionizing radiation health effects in the environment."

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Mays Swicord, Chief of the Electromagnetics Branch at the Bureau of Radiological Health, was awarded his doctorate last month from the Electrical Engineering Department at the University of Maryland. He completed the thesis: "Studies of Microwave Absorption in Liquids by Optical Heterodyne Detection of Thermally Induced Refractive Index Fluctuations" in November. The objective of the research was to develop a spectroscopic method, flow spectroscopy, to look at microwave absorption of specific molecules. Swicord investigated DNA and found enhanced absorption as predicted by E.W. Prohofsky of Purdue University.

•

COMAR wants to make a movie about microwaves. **John Osepchuk** of the Raytheon Corporation and **Don Justesen** of the VA Medical Center in Kansas City, two active members of the Institute of Electrical and Electronics Engineers' (IEEE) Committee on Man and Radiation (COMAR), are exploring the idea of producing a 30-minute film on non-ionizing radiation for public television. The project is in its early stages of development and must still be approved by the IEEE. Once the go ahead is given, Dr. Osepchuk estimates that it will take a year and a half to complete.

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Over a hundred colleagues and friends of Professor **Herman Schwan** gathered at the University of Pennsylvania in Philadelphia last November 24-25, to wish him a happy 65th birthday.

Those who attended the two-day *Festschrift*, "The Interaction of Acoustical and Electromagnetic Fields with Biological Systems," funded by the Office of Naval Research, heard twenty presentations. The proceedings will be published in a special issue of *Bioelectromagnetics*, the Journal of the Bioelectromagnetics Society.

Professor Schwan is currently on sabbatical at the Max Planck Institute of Biophysics in Frankfurt, Germany.

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A profile of **Dr. Andrew Marino** of the Veterans Administration hospital in Syracuse, New York, "Law with a Spark," appeared in the September 29, 1980 issue of the *National Law Journal*. Marino, who is both a biophysicist and an attorney, does research on the bioeffects of ELF and at the same time is participating in various cases involving high voltage transmission lines. The article was written by Jill Jonnes.

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MOSCOW *(continued from p. 1)*

Follow-Up Studies

If the State Department decides to discontinue formal follow-up studies of Moscow employees, the decision would be at odds with the earlier advice of Professor Abraham Lilienfeld of Johns Hopkins University who completed an epidemiology of the Moscow employees in 1978, and of the Senate Commerce Committee. Both urged the State Department to pursue the health studies.

Dr. Herbert Pollack, a medical consultant to the State Department, did say, however, that he and Dr. Charles Brodine were continuing to monitor those employees present during the period of maximum exposure (May 1975-February 1976). "We have a complete roster of all those exposed, and every time they get a medical check up, one of us reviews their complete medical history," Pollack emphasized.

"a follow-up would buy a sense of security."
— Lilienfeld

In a recent interview, Professor Lilienfeld agreed that from a scientific point of view he would not expect to see any deleterious effects at such low doses. But from a political and personal point of view, he felt that continued examinations would be a "prudent thing to do." "It's a matter of judgment," he said, "a follow-up would buy a sense of security." Professor Lilienfeld pointed out that the major costs had already been spent and future surveys would be comparatively cheap.

The ERMAC advice could have some effect on pending claims by former embassy workers. John Parker Hills, an attorney who is handling four claims, said that up to now the State Department has been basically "ignoring" him. Hills has two claims before the Workmen's Compensation Board and two before the State Department, one of which is a class action on behalf of all women irradiated in Moscow. According to Justice Department and Veterans Administration spokesmen, neither agency has any Moscow-related claims pending.

ERMAC took up the question of a follow-up to the 1978 epidemiology at the request of the State Department, which paid the expenses for the ERMAC meeting. In a January 16, 1980 letter to Henry Geller, the State Department asked whether there was any basis for continued study. Mr. Geller referred the matter to ERMAC. According to Pollack, the State Department is waiting for the ERMAC recommendation before responding to any Moscow claims.

Before debating the merits of a follow-up investigation, ERMAC heard R.C. Mallalieu of Johns Hopkins University's Applied Physics Laboratory describe the results of his attempt to reconstruct the radiation levels on the upper floors of the embassy. According to Mallalieu's report ("A Model of the Microwave Intensity Distribution Within the US Embassy in Moscow, 1966 to 1977," No. FS-80-166, JHU-APL, August 1980), the most intense microwave exposures occurred between May 1975 and February 1976, with average levels of continuous wave radiation of 3.5 to 5.0 uW/cm² and average peak intensities due to multiple reflections of 7 to 10 uW/cm². The largest recorded power density was 24 uW/cm². From 1966 to 1975, the average signal strengths for those rooms with the greatest exposure was about 1.5 uW/cm² with maximum levels of 4 uW/cm², though there were transient peaks of as high as 20 uW/cm². Areas more distant from the radiation sources had microwave levels of less than 0.1 uW/cm². In February 1976, protective shielding was installed which reduced all exposures to 0.1 uW/cm² or less. Based on these data, the State Department has estimated that over a 22 year period, about 240 employees were exposed to average power levels of about 1.5 uW/cm² for about 2 hours during the workday. ("Exposure of Model Personnel," State Department, August 26, 1980.)

Lilienfeld Study

The Lilienfeld epidemiology failed to identify any major differences in either mortality or morbidity between Moscow embassy personnel and a comparative population working in other embassies in Eastern Europe. Lilienfeld had only minimal information on the signal strength inside the embassy building, though he did know that the maximum exposure took place during the nine months ending in February 1976. The radiation surveys were classified until after his study was released. Since only a short time has elapsed between the period of maximum exposure and his study, Lilienfeld recommended that "it would seem desirable that this particular study population should be contacted at periodic intervals, of 2 to 3 years, within the next several years, in order to ascertain if any health effects would appear." He went on: "it would be important to develop a surveillance system for deaths in the entire study population to be certain that no mortality differences occur in the future and to monitor the proportion of deaths due to malignancies, especially among the women."

"every time they get a medical check up, one of us reviews their complete medical history," — Pollack

In an April 1979 report, the Senate Committee on Commerce, Science and Transportation "urged" that the State Department pursue this Lilienfeld recommendation, especially for those people exposed between June 1975 and February 1976. ("Microwave Irradiation of the U.S. Embassy in Moscow") The Committee noted that its recommendation reflected a "precautionary attitude."

A subcommittee made of Dr. Marylou Ingram (chairwoman), Professor Cleary, Professor Mary Ellen O'Connor and George Wilkening wrote up the ERMAC recommendations, which are now circulating among the full ERMAC membership. A statement is expected to be released in January.

CONFERENCES

NEWS

BEMS

More than 300 people attended the second annual meeting of the Bioelectromagnetics Society in San Antonio, Texas, last September. Some 160 papers were presented providing a rich blend of new research findings and open discussion.

In the months ahead, *Microwave News* will feature a series of articles on some of the important topics covered in San Antonio. The first in this series, "Microwave-Drug Synergy," will appear next month. Later, we will run a piece on Professor A.W. Guy's long-term experiment which began last fall at the University of Washington in Seattle.

VDT's

A one day conference on "Health Hazards of VDU's" was held at the Human Sciences and Advanced Technology Research Group, Department of Human Sciences, Loughborough University in Leicestershire, England on December 11, 1980. (VDU is the European equivalent of our VDT.) Among the papers presented were two reports of skin rashes among VDT operators in England and Norway.

IMPI

The International Microwave Power Institute (IMPI) held a symposium on "The Washington Impact: How It Affects Microwave Users" on November 13-14, 1980. A host of government officials briefed the more than two dozen attendees on what the government agencies are doing.

The proceedings of the symposium will be available from IMPI for $40.00 for members and $50.00 for non-members. Order from: IMPI, 211 East 43rd Street, New York, NY 10017.

PROCEEDINGS

Now Available:

Proceedings of a Workshop on Thermal Physiology, held in Rockville, Maryland, March 29, 1979. Edited by Dr. T. Whit Athey, Bureau of Radiological Health, sponsored by the Radiofrequency and Microwave Committee of the Interagency Regulatory Liason Group. Dated March 1980. Available from BRH, Rockville, MD 20857.

Non-Ionizing Radiation, Proceedings of a Topical Symposium held in Washington D.C., November 26-28, 1979, sponsored by the American Conference of Governmental Industrial Hygienists. Order from: ACGIH, P.O. Box 1937, Cincinnati, OH 45201.

Proceedings of the International Symposium, *Electromagnetic Waves and Biology,* held in Jouy en Josas (outside Paris) France, June 30-July 4, 1980. Send $40.00 to Dr. A.J. Bertaud, CNRS, 2 rue H. Dunant, 94329 Thiais, France.

CALENDAR

• January 12-16: *National Radio Science Meeting,* University of Colorado, Boulder, CO. Sponsored by the US National Committee of IEEE Societies. Contact: Center for Conferences and Management/Technical Programs, 970 Aurora Avenue, University of Colorado, Boulder, CO 80302.

• February 16-17: *Treatment of Cancer by Radiofrequency and Microwave Thermotherapy,* Princess Kaiulani Hotel, Honolulu, HI. A short course arranged by the Bioelectromagnetics Corporation of Rockville, MD. Fee: $495. Contact: Dr. S.S. Stuchly, Department of Electrical Engineering, University of Ottawa, Ottawa, Canada K1N6N5.

• April 13-15: Annual *Conference and Trade Show of the International Association of Satellite Users,* Washington Hilton Hotel, Washington DC ($95 IASU Members; $195 Others). Contact: A. Fred Dassler, IASU, 6845 Elm Street, Suite 710, McLean, VA 22101.

• June 9-12: 16th Annual *Symposium of the International Microwave Power Institute,* Royal York Hotel, Toronto, Canada. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.

• June 15-19: *IEEE and URSI Symposium,* Bonaventure Hotel, Los Angeles, CA. Sponsored by the Antenna and Propagation Society and the Microwave Theory and Techniques Society of the IEEE and four Commissions of URSI. Contact: IEEE, 245 East 47th Street, New York, NY 10017.

• June 30-July 4: *International Symposium on Biomedical Thermology,* Palais de la Musique et des Congres, Strasbourg, France. Includes sessions on hyperthermia in cancer treatment (July 3) and bioelectromagnetics (July 1). Simultaneous translation in English, French, and German. Contact: Dr. M. Gautherie, Laboratoire de Thermologie Biomedicale, Faculte de Medicine, Universite Louis Pasteur, 11 rue Humann, 67085 Strasbourg, France.

• August 10-12: 3rd Annual *Bioelectromagnetics Society Meeting,* Washington DC. Contact: BEMS, P.O. Box 3651, Arlington, VA 22203.

• August 10-19: 20th *General Assembly of the International Union of Radio Science (URSI),* Hyatt Regency Hotel, Washington DC Includes a series on "Interaction of Electromagnetic Waves with Biological Systems," on August 13-14, chaired by Professor Saul Rosenthal of Polytechnic Institute of New York, and an "Open Symposium on Millimeter and Submillimeter Waves." Contact: Mr. Richard Y. Dow, Organizing Committee of URSI General General Assembly, National Academy of Sciences. 2101 Constitution Avenue, NW, Washington DC 20418.

• August 19-21: 3rd Annual *Satellite Communications Users Conference,* Regency Inn, Denver, CO ($145 pre-paid; $195 at the door). Contact: SCUC '81. Satellite Communications Magazine, 3900 S. Wadsworth Blvd, Denver, CO 80235.

MICRO WAVE NEWS

Vol. I No. 4 A Monthly Report on Non-Ionizing Radiation April 1981

INSIDE...

GOVERNMENT
Budgets & Briefs p. 2

LETTERS p. 3

LITIGATION
Directories of Plaintiff Attorneys & Corporate Defendants p. 6

PUBLICATIONS p. 8

SHORT COURSES p. 8

UPDATE
Around the Country, Health Effects & VDTs p. 3

YANNON APPEAL DECISION
Full Text p. 5

NEXT MONTH

The report on the new ANSI standard and the Port Authority's data on radiation levels atop the World Trade Center, originally scheduled for this issue, will appear next month.

CORRECTIONS: March

- In the report on the World Trade Center, the proposed New York City population standard was mistakenly given as 50 mW/cm². The correct value is 50 uW/cm².
- In Cox's UK survey of VDTs, no UV radiation was detected at wavelengths *less* than 336 nanometers—not above 336 nm as originally stated.

MICROWAVE DEATH AWARD UPHELD IN COMPENSATION COURT, NY TEL APPEALS AGAIN

In a precedent setting decision, the Workers' Compensation Board of New York has upheld a previous ruling that Samuel Yannon, a New York Telephone Company radioman, had died of overexposure to microwave radiation. On February 26, the three member Board panel found that "there was a direct causal relationship between decedent's exposure to microwave radiation during his employment and his subsequent disability all of which ultimately resulted in his death." New York Telephone immediately filed another appeal, taking the case to the Appellate Court of New York for review. (See p. 5 for complete text of decision.)

The case, brought by Yannon's widow, Nettie, in 1974, is the first to successfully establish chronic exposure microwave radiation as a cause of death. Yannon spent the last 15 of his 42 years with the phone company adjusting microwave relay equipment on the 87th floor of the Empire State Building.

As a result of the February decision, New York Telephone has paid more than $29,000 in retroactive awards to Mrs. Yannon and will now pay her $45 a week for life, or until she remarries. (Yannon has already received the award, regardless of the appeal, as dictated by a New York State law.) "I never gave up," Mrs. Yannon says of her six-year case against the phone company. "They

(continued p. 4)

Navy May Scrap Project ELF

The Secretary of the Navy has recommended abandoning its controversial, extremely low frequency (ELF) submarine communications system, according to a spokesman for Michigan Senator Carl Levin.

The one-way communication system, known as Project ELF and previously named Project Sanguine and Project Seafarer, is designed to send messages to submerged submarines, especially during a nuclear war. The signal, with a carrier frequency of 76 Hz, would be transmitted by a large underground antenna. The Navy has been trying to find a site for the antenna since the late 1960's, but has met repeated opposition in Wisconsin, Texas, and Michigan. Democratic Senator Levin has been a long-time opponent of the project, and has sought to stop its construction in his home state.

In the past, the Navy has said that the ELF system is essential to the national defense. Now, however, the Navy is no longer in favor of the project because the system would be vulnerable to nuclear attack, according to James Crutchfield, press aide to Senator Levin. Critics have charged that the system is too expensive and may not work. Questions about the biological and ecological effects of the ELF signals have also been raised.

The latest recommendation was made in a letter from Navy Secretary John Lehman and Under-Secretary Robert Murray to Defense Secretary Caspar

(continued p. 8)

GOVERNMENT

BUDGETS

Key agency officials have indicated that non-ionizing radiation programs will not be badly hurt by the proposed Reagan-Stockman budget cuts—though as some noted, the programs were not large to begin with. Through a series of interviews, *Microwave News* compiled the following agency-by-agency analysis:

Bureau of Radiological Health: For FY81, Reagan cut the total BRH budget by $1 million to $26 million, while staff years were cut to 545 from 556. In FY82, staff years were down to 528 from 556 and the budget to $26.6 million from $27.8 million. According to Neil Goldstein, associate director for management and systems, these cuts must now be allocated among the various programs (e.g.: ionizing and non-ionizing radiation, ultrasound, nuclear medicine, etc...) The FY82 planning process has begun, and will be completed over the summer. Goldstein believed the cuts could be met by postponing certain contracts and by retirement and attrition. One early indication of the FY81 cuts is that the publication office has had to delay printing certain reports until FY82.

Environmental Protection Agency: (1) Office of Research and Development: Daniel Cahill's Division of Experimental Biology reports that the 10% reduction in staff and 1.5% budget cut from the original Carter FY82 budget will cause essentially no impact on the non-ionizing radiation technical program at Research Triangle Park. The total FY81 budget is $2.98 million (about $2 million for Cahill's Division). This will now be reduced to $2.94 million in FY82. Full time staff equivalents will go from 27.6 to 24.9. (2) Office of Radiation Programs: No positions were lost in the non-ionizing radiation group, although the office suffered a 35% staff cut, according to David Rosenbaum, deputy assistant administrator for radiation programs. (Non-ionizing radiation has about 6–10% of the staff.) While the Office's contract budget will be reduced to $2 million in FY82 from $8 million in FY81, this will not affect non-ionizing programs too much since they do not depend heavily on contracts, according to Dave Janes, chief of the electromagnetic radiation analysis branch. The Office's equipment budget will rise to $1 million in FY82 from zero in FY81. In sum, as Janes put it: "It doesn't look too bad."

Radiation Policy Council: The FY81 budget was cut from $942,000 to an estimated $600,000, and the FY82 budget of $980,000 was eliminated altogether, according to Carl Gerber, RPC director. The budget of the Council, which was set up after the Libassi report was released in 1979, may still be restored, but the decision will lie with the many high-level officials still to be nominated and appointed. While the RPC has focused almost exclusively on ionizing radiation, if it does survive, the budget cuts will no doubt block it from extending its work to non-ionizing radiation.

National Institute for Occupational Safety and Health: Reagan cut the FY81 budget to $64 million and 835 positions from Carter's proposed $83 million and 928 positions. The FY82 budget was further reduced to $59 million and 773 positions. These cuts have yet to be allocated among the various programs, and so their impact on the development of the MW/RF criteria document and Wordie Parr's Physical Agents Effects Branch in Cincinnati is still unknown. Institute priorities will not be set until a replacement for Anthony Robbins, who was fired by HHS Secretary Schweiker March 5, is in office.

Other Agencies: Spokesmen from the **National Bureau of Standards, the Office of Naval Research,** and the **Naval Medical R&D Command** could not say what the impact of the new budget would be. In each case, non-ionizing radiation is not a line item, and the outcome of the budget deliberations is some months away.

BRIEFS

The Interagency Regulatory Liaison Group (IRLG) published Volume II, Issue II of its *Regulatory Reporter,* dated December 1980, outlining EPA, FCC, FDA, NIOSH & OSHA's on-going and future activities on radiation control....The Frequency Management Advisory Council (FMAC) held a meeting in Washington on February 20. On the agenda were the SPS program, long-range spectrum planning, and FCC rules and regulations (Part 15) on radiofrequency devices....Recent contract awards: $254,179 to Bendix Field Engineering of Columbia, MD, from the Naval Research Lab in Washington for "microwave oceanographic sensing system tasks;" on January 30; $646,700 to a joint venture group of A.D. Ring & Associates, Jules Cohen & Associates, and DataWorld, all of Washington, DC, from the FCC for "conversion of AM station directional antenna radiation patterns to standard patterns;" on March 4; $112,134 to UCLA from DOE, Nevada office, for "microwave experimental simulations"; and $5,807,700 to Eaton Corp. in Farmingdale, NY, from NASA for the delivery of two microwave scanning beam landing system ground stations on February 13; $140,784 to the Franklin Research Institute in Philadelphia from the Bureau of Mines for the "study of RF hazards at low and medium frequencies to blasting in underground mines;" on February 18....The Naval Air Development Center in Warminster, PA, is looking for a contractor to design, fabricate, and deliver test panels of radar absorbing materials....Kirtland AFB in New Mexico is soliciting R&D proposals on "theoretical and analytical investigations and testing of equipment and facilities to effects of EMP phenomenon"....The building housing the non-ionizing radiation office of the Naval Medical R&D Command at the National Naval Medical Center in Bethesda was severely damaged by fire last February, forcing the office to move to another building in the compound. The new telephone number is (202) 295-0134.

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UPDATE

VDTs....A bill specifying occupational safety and health requirements for VDT operators has been introduced in the Maine State Legislature. Legislative Document No. 1049 includes requirements for workplace conditions, eye tests and rest periods....*Health Hazards of VDTs? 2, "Some Solutions to the Common Problems",* a second HUSAT conference at Loughborough University, England, was scheduled for March 19. Indirect health effects from VDT use were on the agenda this time....Several presentations on VDTs are scheduled for the May 25–29 American Industrial Hygiene Conference in Portland, Oregon: J.S. Johnson on job stress in office work; R.H. Arndt on telephone operator reactions; and M.S. Gottlieb and co-workers, also on job stress—all from the University of Wisconsin; W. Loew from BRH on radiation emissions; and O. White, Jr. and E.J. O'Connell from Occupational and Environmental Health Analysts and H. Siegel and A. Blayer from the *New York Times* on a mass screening program. For conference information, contact Margaret Jordan, American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, OH 44311, (216) 762-7294.... Canada's Ministry of Labor has issued its report on radiation measurements from the VDTs used by Darlene Weiss, a government employee who is seeking workers' compensation for cataracts she believes are VDT related....WNYC-FM radio in New York City will air a series of five special reports on VDTs April 6–10. Station reporters Tom Vitale and Sandy Tolan interviewed a broad range of experts and workers on the workplace impact and possible health effects of the terminals ....VDTs can cause high-level strain, according to a recent *New York Times* story. On March 24, Edwin McDowell reported that Jimmy Carter "endured several hours of anxiety" when he accidentally erased several manuscript pages from his word processor's memory. The former President is writing his memoirs on a Lanier "No Problem" unit.

Health Effects....A British neurologist believes the flashing display of an electronic space war game, "Astro Fighter", is of a "size, brightness and frequency that can cause seizures in sensitive individuals." In a letter to *Lancet,* the British medical journal (February 28, 1981), D.N. Rushton of the Department of Neurology at King's College Hospital in London wrote that a "multicolored stroboscopic effect, flashing at about 15 Hz," provoked attacks in a 17-year old youth after 20–30 minutes of playing the game.

Around the Country....The Scientific Advisory Panel for New York State's study on the health effects of high-voltage power lines scheduled its first public meeting for March 23 in Albany....The National Park Service of the Department of Interior has prepared a draft environmental impact statement on the Appalachian Power Co. proposal to cross the Blue Ridge Parkway with a 765 kV electric transmission line. Copies available from the NPS, 75 Spring Street, SW, Atlanta, GA 30303, (404) 221-5835....New York City's transit authority cancelled plans to spend more than $500,000 designing a way to protect its ailing subway system from EMP radiation.

LETTERS

To the Editor: Your conclusion that the report of the BENER Task Force*, which I chaired, does not "seem to be a planning tool of the individual agencies involved in bioeffects research," [see *Microwave News,* January 1981, p. 3] is an editorial opinion, not a conclusion based upon careful investigation of the facts.

The process of writing the document was, in and of itself, a planning and coordinating exercise. Note, for instance, statements like the following (which refers to the assessment of occupational exposure):

> BRH will take the lead role in identifying and/or developing appropriate instrumentation and survey techniques. NIOSH has the lead role in the collection of exposure data to support epidemiological studies. OSHA and BRH will continue to conduct field surveys as part of their compliance programs. (p. 21)

Such statements give a clear indication of the roles that the various agencies do or do not plan to assume.

Several new efforts, called for in the task force document, are now underway. For instance, on p. 33, the task force recommended "Future research will need to explore functional and morphologic consequences of NER exposure with an emphasis on the development of quantitative dose-response data." The award of a contract by EPA for conducting such a study was announced on p. 4 of your newsletter. Similarly, the report concluded,

> Developing new or improved instruments for numerically characterizing electric and magnetic fields under near- and complex radiofrequency field conditions represents one of the most important needs in this area and will continue to receive major attention.

At the IMPI symposium, "The Washington Impact: How It Affects Microwave Users;"** Col. Winter announced, "The Navy is developing a personnel dosimeter which will measure and record important variables in an individual's RFR exposure." The National Bureau of Standards is participating in this effort.

I have also been told that the task force report is used by personnel within the federal agencies to demonstrate how their work fits into the larger, more cohesive, national program. In this way, scientists can demonstrate to budget examiners how their work supports the efforts of the larger group and meets the priorities agreed upon by representatives of 16 other federal agencies including the Office of Science and Technology Policy. A number of other uses were specified on p. 5 of the task force report.

In conclusion, I congratulate you on a fine start and thank you for the opportunity to "set the record straight." Finally, I will admit that the report of the BENER Task Force could be an even more effective planning tool if it were to receive a broader distribution.

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*"Nonionizing Electromagnetic Radiation Safety, A Program of Coordinated Federal Activities Related to Biological Effects of Nonionizing Electromagnetic Radiation (0–300 GHz)," NTIA-SP-80-7, available from Office of Public Information, National Telecommunications and Information Administration, 1800 G Street, NW, Washington, DC 20504.

**Proceedings available from the International Microwave Power Institute, 211 East 43rd Street, New York, NY 10017. $40 for members, $50 for nonmembers.

(continued from p. 1)

wanted me to say there was no connection between Sam's illness and microwaves, but that just wasn't true!"

Speaking from her home in Staten Island, New York, Mrs. Yannon says she expected the appeal victory after the initial favorable ruling by Administrative Law Judge Mary Egan on June 12, 1980. Egan found that Yannon had "sustained an occupational microwave radiation disease...resulting in brain changes, tissue destruction and an acceleration of arteriosclerosis, whose etiology was the exposure to the harmful effects of microwave radiation." Asked about the phone company's latest action she said, "It might take years, but the truth will prevail."

Mr. Angelo Gucciardo, who represented Mrs. Yannon before the Workers' Compensation Board anticipated this appeal and is confident the ruling will be upheld again.

A spokesman for New York Telephone would not comment on the case, beyond confirming the appeal.

RCA Suit

In addition to her case against the phone company, Mrs. Yannon has also brought a third party suit against the RCA Corporation, the manufacturer of relay equipment Yannon used at the Empire State Building. The $3.5 million suit, filed in 1976 in the New York State Supreme Court, Richmond County, charges RCA with breach of warranty and negligence. Mrs. Yannon's lawyer, David Paully, who recommended workers' compensation specialist Gucciardo to her, says the February ruling will be extremely helpful in their action against RCA. This suit, now in pre-trial proceedings, involves a very different burden of proof, however, and may require years to complete.

Neither Donald Dietemann, the RCA attorney handling the case, nor Bower and Gardner, the law firm representing RCA, would comment on the case. However, Mrs. Yannon reports that RCA asked New York Telephone for transcripts of all the hearings in the compensation suit. When the phone company refused to cooperate, Gucciardo agreed to supply them. He also allowed *Microwave News* to review these records, which are otherwise accessible only to concerned parties at the Workers' Compensation Board offices at Two World Trade Center in New York City.

Working At the Empire State Building

During the hearings, Daniel Rieu, a colleague of Yannon's at the phone company, described the 87th floor facilities and the work schedule. (See p. 6 for list of hearing witnesses.) Yannon was there almost continuously from 1954 to 1969. "No one had ever worked up there as long as Sam Yannon," he said. Other employees, including Rieu, had only brief tours at the Empire State Building.

Radiomen spent part of each shift adjusting low power (mostly one watt) transmitters mounted in a separate room on the 87th floor. The number of transmitters operating at any one time varied, but Rieu guessed there were two or three on average, and occasionally as many as 15. Adjustment required removing the rear housing on a unit and tuning the Klystron tube, which converts direct current into RF current. Sometimes a man had to stand in front of a transmitter, but according to Rieu, procedural instructions required cutting off the power before stepping in front of the transmitter dish and into the beam path.

From the hearing testimony, it is unclear exactly what equipment Yannon tuned over the years. RCA transmitters installed after his departure operating at 6 GHz and 11 GHz were similar to previous ones, according to phone company engineer Robert Vuono, but no detailed description of earlier equipment was entered into the record.

Conflicting Diagnoses

Nettie Yannon says her husband began to complain about headaches in 1964. He continued to work his usual long hours, but by 1968 he was persistently plagued by fatigue, eye trouble, sleep problems, forgetfulness, and clumsiness. By the time Dr. Alfredo Santillo of Staten Island examined Yannon in June 1970, he was physically and mentally disoriented. Yannon was unable to write his own name or to recognize his wife, he had very poor vision, and he had lost 30 of his usual 160 pounds. In his testimony before the Board, Santillo said he soon realized that this case "was in a field all by itself." Yannon, at 58, was too young to fit into the category of advanced cerebral arteriosclerosis, a diagnosis Santillo had initially reached.

The phone company terminated Yannon for medical reasons in the same month as Santillo's first examination. Thereafter, his condition rapidly deteriorated. By his death in 1974, Yannon, aged 62, weighed under 70 pounds and had lost almost all sight, memory, speech, and motor coordination. Santillo remained Yannon's doctor until 1973 and finally diagnosed his condition as "chronic brain syndrome with psychotic overtones due to biological brain changes resulting from prolonged exposure to short wave radiation."

New York Telephone has maintained throughout the compensation case the Yannon suffered from retinitis pigmentosa, or pigmentary degeneration of the retina, and pre-senile dementia, probably Alzheimer's disease—a common cause of senility. Neither ailment is known to be associated with microwave radiation. To support this claim, Professor Sol Michaelson and Dr. Robert Herndon from the University of Rochester School of Medicine, and Dr. Paul Tyler, director of the Armed Forces Radiobiology Research Institute, testified for the phone company. "I can find no evidence to suggest that [Yannon's] illness was unusual or mysterious," Herndon said, "and nothing to suggest it was due to microwave irradiation."

Testifying for Mrs. Yannon, Dr. Milton Zaret, a well-known New York ophthalmologist and controversial expert on microwave radiation, supported Santillo's diagnosis. He had no doubt after examining the medical records that Yannon suffered from "an extreme case of microwave radiation sickness, and that it resulted ultimately in his death."

The only neurologist to perform tests on Yannon did not make a definitive diagnosis. In 1969 Dr. Martin Geller, then at St. Vincent's Hospital in Staten Island, examined Yannon. According to Gucciardo, Geller's report suggested looking in-

to Yannon's exposure to microwave radiation for a possible link to his illness. Geller was not called to testify and the phone company's lawyer did not contest Geller's report.

No Exposure Data

The lack of data on the radiation levels at the Empire State Building during Yannon's tenure there, as well as the difficulty of diagnosing his condition, presented problems for both sides of this case. No measurements were taken on the 87th floor prior to Yannon's death. Finally, in 1975 at the request of Mrs. Yannon, Bell Labs helped the Occupational Safety and Health Administration take measurements. But by this time all the equipment Yannon worked on had been replaced. It is now impossible to determine how much radiation Yannon received.

Although the Yannon decision is not the first workmen's compensation award for microwave radiation health damage, Yannon's is the first death attributed to microwaves by a Compensation Board.

Text of Appeal Decision

The self-insured employer seeks review of the Workers' Compensation Law Judge (Referee) decision filed 6/18/80 insofar as findings are made that the decedent sustained a causally related occupational microwave radiation disease within the meaning of Paragraph 30, Section 3, Subdivision 2 of the Workers' Compensation Law, notice and causally related death, and from the awards made pursuant to such findings. The self-insured contends that the decedent suffered from Alzheimer's Disease which was not demonstrated to be occupationally induced and that based on the evidence, the decision in both cases should be rescinded in toto and the claims dismissed.

Case #2308 was indexed on behalf of claimant for exposure to radiation with a subsequent claim filed by widow (case #3602) for death in connection with radiation exposure. Dr. Santillo testified that he treated claimant from 6/24/70 to 2/20/73 with an original diagnosis of premature senility that upon final diagnosis he felt was caused by prolonged exposure to microwaves. Dr. Santillo stated his diagnosis was based on his own questioning and research in medical literature which showed that a hazard exists when working near microwaves, and debilitation can occur. Dr. Santillo stated at time he first saw claimant, he had lost 30 lbs; was unable to care for himself and had almost complete removal of memory and said while there was no test he could carry on the claimant, he felt condition was perhaps very strongly related to microwaves. Dr. Shaner, testifying from N.Y. Telephone Company medical records for the claimant, stated that original diagnosis received from claimant's treating physician was left homonymous hemianopsia with possible disease of the right eye, with a final diagnosis of bilateral encephalopathy (dissection of the brain) degenerative with no evidence whatsoever of any job relationship. Dr. Shaner stated her research showed any exposure severe enough to cause internal damage due to excessive heat would cause so much heat to surface of the skin that person would not stay in the area but admitted her medical experiences were limited to the N.Y. Telephone Company and she was not conversant with any foreign research on the subject of microwave exposure.

D. Rieu, Radioman, testified he worked same job as claimant from May 1955 tuning microwave equipment varying from 2/3 to over 15 microwave lengths at one time. Rieu testified that one would have to go up to unit and open a door to tune the unit inside or walk between a glass area and the dish to fix a feedhorn. Rieu stated that claimant worked an exceptionally long number of years compared to other craftsman in the group; that claimant also worked a good bit of overtime during that time; that he noticed a deterioration of sight, hearing and coordination in claimant and said that Radiomen are issued a sheet cautioning them about the hazards of the equipment. Dr. Santillo on retestimony stated nothing he heard of Mr. Rieu's testimony causes him to change his opinion.

R. Vuono, Sr. Staff Engineer, testified that he had over 24 years experience with microwave irradiation; that he is experienced with physical set up of the facility and that there is a difference between emission and exposure; pointed out the range of emission (power output) from radar (high) to microwave radio used in T.V. pick-up (low); stated that the equipment in use would not produce a power output greater than 1.5 watts and that studies in the U.S. show there is no cumulative effect of even 10 milliwatts and continuous exposure.

C. Hinson, Service Foreman, testified that he worked with claimant as a co-worker; agreed that claimant would be close to a machine about 2-3 times a day, 20 minutes each time; that claimant would be in same room as transmitters about one-half of each day and that for each signal received a transmitter was used. Hinson testified that shields were removed when they were being adjusted; that he did not believe levels that were transmitted could damage one's body but admitted he would not stand in front of one.

O. Tamuzs, NYS Sr. Radiological Health Specialist, testified his testing found radiation levels within Federal guidelines permitted (10 milliwatts per square centimeter permitted; 9 milliwatts per square centimeter found), but admitted some of the information his report was based on was given by Phone Company personnel and that machines were not working except for his testing purpose.

Dr. Zaret testified that in his field of ophthalmology, he performed studies for various departments of the U.S. Government on the effects of exposure of microwaves on the ape, primates, etc. Dr. Zaret testified that the standard accepted by the Federal Government had become void in 1971 and revalidated without further study in 1973; that Soviet standard is around 1,000 times less than U.S. standard and that studies involving microwaves and apes showed some monkeys were being killed at lower intensity than anticipated. Dr. Zaret stated, in answer to a hypothetical question incorporating claimant's work history, activities and autopsy findings, that claimant suffered an extreme case of microwave or radiowave sickness which resulted ultimately in his death. Dr. Zaret stated direct action is one of the two ways microwave radiation can produce the kind of brain damage claimant exhibited and said there are Soviet and American studies documenting this. Dr. Zaret, on retestimony, stated that while claimant's physician's diagnoses were similar in some degree to other conditions, he agreed with Dr. Geller's findings of degenerative disease attributed in some form to microwave exposure.

Dr. Michaelson testified that he is a Doctor of Veterinary Medicine and a Professor of Radiation, Biology and Biophysics; that based on his research with the biologic effect of microwave exposure that there is no reason to believe there is a cause/effect relationship between the injury and microwave frequency exposure. Dr. Michaelson stated safety factor standards were based on some information related to functional change in animals and said that his opinion was based on his review of those records and depositions made available to him. Dr. Michaelson testified he disagreed with the findings of the Bureau of Radiological Health which analyzed and criticized his findings because of lack of adequate evidence to substantiate the conclusions.

Dr. Hendon testified he reviewed claimant's records and concluded that he suffered from retinitis pigmentosa and pre-senile dementia, probably Alzheimer's Disease. Dr. Hendon stated that based on his reading and research work, he finds no material indicating a relationship between microwave exposure and Alzheimer's Disease or cataract

(continued p. 6)

YANNON AWARD

(continued from p. 5)

formation or causal relationship between claimant's work and his disability or death. Dr. Hendon stated he was associated at same school as Dr. Michaelson; was suggested by him as a consultant in the case and had discussed it with him prior to testifying and admitted he had no personal exposure to people who were alleging exposure to or damage from microwaves.

Dr. Tyler testified that he is qualified in radiobiology as a specialist; that he reviewed all records made available to him and agreed with autopsy report which gave immediate cause of death as bilateral lower, low bronchial pneumonia with secondary findings of pre-senile dementia, retinitis pigmentosa and generalized arteriosclerosis. Dr. Tyler stated that retinitis pigmentosa is found with some degenerative diseases of the brain but he found no medical literature associating it with pre-senile dementia; that he finds no relationship between claimant's microwave exposure and diseases found and that he disagrees with Dr. Zaret's diagnosis. Dr. Tyler stated that his clinical impression was claimant had Alzheimer's Disease although it was possible there were two other types of brain disease similar to the above. Dr. Tyler admitted that there was a book in print critical of himself and accusing him of conducting a coverup for Defense Department in relation to microwave exposure and that Dr. Geller, a neurologist, did not diagnosis Alzheimer's Disease in the claimant. Dr. Michaelson, on retestimony, identified studies done by an ad hoc review committee on which he sat which found part of Dr. Zaret's experiments as adequate and part not well done. Dr. Michaelson admitted that he had been contacted by claimant's widow and had recommended that claimant's attending physician would be in best position to give an answer as to causal relationship.

Upon review the Board Panel finds based on the entire record and particularly the testimony of D. Rieu and Drs. Santillo and Zaret, that there was a direct causal relationship between decedent's exposure to microwave radiation during his employment and his subsequent disability all of which ultimately resulted in his death. The Board Panel further finds that the decedent sustained an occupational microwave radiation disease within the meaning of Section 3, Subdivision 2, Paragraph 30 of the Workers' Compensation Law and that his death was causally related to his occupation.

Accordingly, the Workers' Compensation Law Judge (Referee) decision filed 6/18/80 is AFFIRMED and the case is continued.

All concur.

Francis J. Griffin Daniel J. Higgins Ferdinand Tremiti

Workers' Compensation Board

New York City February 26, 1981

Witnesses at the Yannon Workers' Compensation Board Hearings

(In order of appearance.)

Dr. Alfredo Santillo, Staten Island, New York

Dr. Alice Shaner, Medical Specialist, New York Telephone Company

Daniel Rieu, Radioman, New York Telephone Company

Robert Vuono, Senior Staff Engineer, New York Telephone Company

Charles Hinson, Service Foreman, New York Telephone Company

Olgerts Tamuzs, Bureau of Radiological Health, White Plains Regional Office, New York State Department of Health

Dr. Milton Zaret, Scarsdale, New York

Dr. Sol Michaelson, Professor of Radiation Biology and Biophysics, University of Rochester

Dr. Robert Herndon, Center for Brain Research, University of Rochester

Dr. Paul Tyler, Director of Armed Forces Radiobiology Research Institute

LITIGATION

Collecting information on current and past cases involving microwave radiation is difficult: most defendant companies and plaintiff attorneys refuse to comment on on-going litigation, and many cases are settled out of court, leaving few records. Filed complaints are a matter of public record and many plaintiffs and defendants were willing to confirm official details.

A spokeswoman for Western Electric, which has three cases pending, issued a statement to *Microwave News,* stating in part: "We will defend ourselves, and deny the equipment was hazardous and that the equipment caused the injury." She would not comment, however, on the Imoto case, which was settled out of court, saying that this was company policy for cases where more than one company was involved.

The litigation survey presented below was collected during the last couple of months. While we have no reason to doubt its accuracy, because of the secrecy surrounding these matters, we advise the interested reader to check with the attorneys and corporations listed in the appended directories.

Air Traffic Controllers: Young has settled four claims of air traffic controllers with job-related cataracts under the Federal Employees' Compensation Act, winning substantial awards. Eight more cases are pending, seven cataract injuries and one non-operable eye disability. Young's clients are from all over the country.

Ovens: Two women, who claim to have been burned by a microwave oven while working in a restaurant in Spokane, Washington, are suing Litton for $3 million. They are represented by Deglow and Belli.

Moscow: A number of suits have been filed against the US government over the irradiation of the US embassy in Moscow. Two attorneys believed to be handling some of these cases are Hills (see *Microwave News,* January 1981) and Peery.

Radar: Suits over microwave-related injuries are the most common type of litigation. Among the plaintiffs were and are:

- Robert Barbee, a former radar repairman with cataracts, represented by Leavitt, filed a complaint against Bendix, GE, Raytheon, and RCA in federal court in Nevada in November 1979, and against Western Electric in March 1980. Barbee is seeking $500,000 in damages and $5 million in punitive damages.
- Stanley Burgis, a former M-33 radar technician represented by Stopford, alleges microwave-induced cataracts and retina damage in a products' liability claim against Western Electric filed in Pennsylvania state court in summer 1980 (later moved to federal court in eastern Pennsylvania). According to Stopford, Burgis is now blind.
- Robert Engell, a TACAN radar repairman from 1964 to 1975, represented by Moller and Shafner, alleges microwave-induced pancreatic cancer and endocrine disorders. The $4.5 million suit against General Dynamics, ITT, Raytheon, Rockwell, Teledyne, and Varian was filed in federal court in Hartford in 1977 and is still in discovery. A jury trial is due to begin soon.
- William Farnham, represented by Ellison, alleges microwave-induced cataracts sustained aboard USAF aircraft in a complaint against Hughes, Northrop, and Rockwell filed in state court in San Francisco in October 1978.

- Leo Foley, represented by Ellison, alleges radar induced cataracts while aboard an EC-121 constellation in a complaint against GE, Hazeltine, Hughes, Lockheed, Philco-Ford, Raytheon and Telerad-Lionel filed in state court in Sacramento in April 1979.
- Tobias Imoto, a former radar maintenance man represented by Davidson, settled a case out of court against GE, Raytheon, and Western Electric, alleging cataracts as well as skin and brain disorders.
- Roy Josey, represented by Sweeney, developed bilateral posterior subcapsular cataracts after working on radar development at Elgin AFB for Bendix. The AF settled out of court for $171,000 in 1971, with Bendix making a substantial contribution. Josey also won a workers' compensation claim for about $20,000. Five years later Josey, aged 38, died of a brain tumor.
- Ronald Karras, a former radar repairman represented by Phillips, suffers from multiple, serious injuries. While there are reports that this case was just settled out of court, repeated calls to Phillips for confirmation were not returned.
- Joseph Kerch, a pilot for Air America from June 1965 to June 1974, has a case represented by Shafner before a Department of Labor administrative law judge alleging a radiant energy cataract as well as hearing loss. Briefs were filed in December 1980.
- Glenn Lough, represented by Ellison, alleges radar-induced cataracts in a complaint filed against ITT, Raytheon, Sperry Rand, and Western Electric in state court in San Francisco in late 1978.
- Don Turner, represented by Ellison, alleges cataracts sustained aboard US aircraft in a complaint against Hughes, Lockheed, McDonnell Douglas, and Northrop filed in state court in San Francisco in May 1978. The case has since been moved to Los Angeles.

In addition, Spears has just abandoned a case against RCA and Western Electric, alleging radar-induced ocular damage. Leonard and Lyons are both considering bringing legal action. Leonard represents a former B-47 crew chief, who believes he was badly injured by an electronic countermeasure jamming device. Lyons's client is a former EC-121 radar operator, who has assorted serious injuries.

Lyons is interested in forming a bar group for the attorneys representing the victims of radar and microwave injuries.

CORPORATE DEFENDANTS IN MICROWAVE CASES

Air America
Bendix
Ford Motor (Philco Division)
General Dynamics
General Electric
Hazeltine
Hughes Aircraft
ITT (ITT Electron Tube Division)
Lionel (Telerad Division)
Litton
Lockheed
McDonnell Douglas Aircraft
Northrop Aviation
RCA
Raytheon
Rockwell International
Sperry Rand
Teledyne
Varian Associates
Western Electric

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PUBLICATIONS

BOOKS

A.J. Baden Fuller, *Microwaves, An Introduction to Microwave Theory and Techniques,* second edition (Elmsford, NY: Pergamon), 1979, 326 pp., $30 hardbound, $13 paperback.
This revised and expanded edition now includes up-to-date information on semiconductor oscillations and amplifiers as well as a chapter on stripline devices.

Charles Panati and Michael Hudson, *The Silent Intruder, Surviving the Radiation Age* (Boston, MA: Houghton Mifflin), 1981, 208 pp., $9.95
Using a question and answer format, Panati, a radiation health physicist and former Newsweek *science editor, and Hudson, a* Newsweek *staffer, discuss the various types of radiation and their health effects. A chapter on RF and microwaves and one on ELF review some of the work of Adey, Becker, Frey, Marha, Schwan, and Zaret in language easily accessible to a general audience.*

REPORTS AND PERIODICALS

BRH

Carl I. Vassar, Jr., et al., *Report of State and Local Radiological Health Programs,* Fiscal Year 1979, Bureau of Radiological Health, October 1980, No. FDA 81-8034.

ELF

Roland J. Starkey, Jr., "The Renaissance in Submarine Communications, Part III, The ELF Odyssey 1958-1979," *Military Electronics/Countermeasures,* January 1981, p. 26.

Ovens

"Microwave Ovens," *Consumer Reports,* March 1981, p. 128. *A feature report including brand name ratings.*

Power Lines

John A. Molino, et al., *Psychoacoustic Evaluation of Transmission Line Audible Noise: Building Attenuation Effects, Methodology Comparison, and Field Study Feasibility,* January 1, 1979 to December 31, 1979, Volume 1, Department of Energy, No. DOE/RA/29323-1.

Stephen Shoenholz, Joel Ray, "High Power Lines," *Bulletin of the Atomic Scientists,* February 1981, p. 59. *An exchange about an earlier article by Ray.*

RF Heaters

Guide for Submission of Information on Industrial Radiofrequency Dielectric Heater and Sealer Equipment Pursuant to 21 CFR 1002.10 and 1002.12, Bureau of Radiological Health, November 1980, FDA 81-8137.

Report on the Survey of Radiofrequency Heaters, Environmental Health Directorate, Health Protection Branch, Ottawa, 1980, 80-EHD-47. Available from the Information Directorate, Minister of National Health and Welfare, Brooke Claxton Building, Ottawa, K1A 0K9.

VDTs

Colin Mackay, *Human Factors Aspects of Visual Display Unit Operation,* Health and Safety Executive, London (UK): Her Majesty's Stationery Office, 1980.

SHORT COURSES

- May 5-8, *Modern Antenna Measurements,* Holiday Inn of Bethesda, MD. Contact: Technology Service Corporation, 8555 16th Street, Silver Spring, MD 20910, (301) 565-2870 or 2950 31st Street, Santa Monica, CA 90405, (213) 450-9755. Fee: $525.

- May 27-29, *Microwave Technology and Applications for Industry,* Central New Jersey, Center for Professional Advancement, in conjunction with the International Microwave Power Institute. Contact: Mrs. Edith Webb, P.O. Box 964, The Center for Professional Advancement, East Brunswick, NJ 08816, (201) 249-1400. Fee: $390 for two days, $560 for three days.

- June 9, *Measurements for Microwave Safety and Compliance,* Royal York Hotel, Toronto (immediately prior to the International Microwave Power Institute annual meeting). Contact: IMPI, 211 East 43rd Street, New York, NY 10017, (212) 867-4659. Fee: $125 IMPI members, $150 non-members.

- July 6-8, *Diagnostic and Therapeutic Applications of Microwave Technology,* George Washington University. Contact: Continuing Engineering Education Program at GWU, Washington, DC 20052, (202) 676-6106 or (800) 424-9773 toll free. Fee: $595.

- August 17-21, *Ultrasound, Microwaves, Laser, and Ultraviolet: Biophysical and Biological Basis, Applications, and Hazards in Medicine and Industry,* Massachusetts Institute of Technology. Contact: Office of the Summer Session, Room E19-356, MIT, Cambridge, MA 02139. Fee: $725.

Navy May Scrap Project ELF

(continued from p. 1)

Weinberger. Crutchfield said that the decision was based on the advice of Chief of Naval Operations Thomas Hayward. A spokesman for the Navy would only say that the Secretary of the Navy had sent his recommendation to the Secretary of Defense, and that the final decision would be made by the President.

In a 1979 report, the General Accounting Office recommended that the project be scrapped. And in its FY81 Department of Defense authorization last August, Congress required the President to report back on the Administration's plans for the deployment of Project ELF or its cancellation by April 1, 1981.

More than $100 million have been spent on the ELF project, and another $500 million would be needed to complete it.

MICRO WAVE NEWS

Vol. II No. 3 A Monthly Report on Non-Ionizing Radiation April 1982

INSIDE...

HIGHLIGHTS pp. 2–5

OSHA Stops RF/MW Enforcement
Massachusetts Proposed Standard Delayed
Guidelines for Exposure to NMR Systems
Bioeffects Literature Digest Published
Power Line Studies Chosen in NY
Miscarriage Cluster in Toronto
BRH Reorganization Moves Forward
EISs Out for Proposed Satcom Stations
Hyperthermia Systems Under Study

CONFERENCE CALENDAR p. 8

UPDATES pp. 5–8

Biological Effects
Communications
Compatibility & Interference
EMP
Government
Litigation
Medical Applications
Military Systems
Occupational Health
Ovens
Satellite Communications
Short Courses
Standards
Technology
VDTs
Etc.

Microwave News is conducting a survey of microwave-related litigation. If you have already received our questionnaire, please return your completed form as soon as possible. If you would like to participate, please contact us for more information. Survey results will appear in the newsletter this spring.

Microwave Oven Cataract Trial Adjourned—All Parties Silent

After one day of a jury trial, in which two legal secretaries sought damages for radiation-induced cataracts from an Amana microwave oven, the attornies for both sides agreed to an adjournment. None of the parties would comment on the resolution of the case.

According to the clerk at the US District Court in Providence, RI, a "consent decree was entered for the defendant on March 22, and the case was dismissed." But no further details on the nature of the agreement could be discovered.

Mark Decof of Decof and Grim in Providence, RI, representing the plaintiffs, refused to discuss the case. Steve Gustafson, general counsel for Amana Refrigeration Co. in Amana, IA, would only say that it was "company policy not to discuss litigation, especially litigation of this type."

Dolores Delsesto and Lynn Spinella had been seeking $3 million from Amana; they claimed they had developed cataracts from microwave radiation leaking from a Radarange oven. (See *MWN,* November 1981.) Delsesto had two cataracts and Spinella one. Dr. Milton Zaret, an ophthalmologist in Scarsdale, NY, had concurred with another diagnosis that the cataracts had been caused by "radiant energy."

The two women, both in their 30's, worked as legal secretaries for the firm of Adler, Pollack and Sheehan in Providence. The lunch room at the office had an Amana oven, Model RR-4D operating at 2450 MHz and purchased in 1975. The employees had assigned seats in the room, with Delsesto and Spinella closest to the oven.

The oven was tested for leaks by Dr. Marc Richman of the mechanical engineering department at Brown University. His measurements indicated

(continued p. 8)

NMR Indicates Rabbit's Lens May Be Wrong Model for Human Lens

The biochemistry of the rabbit's eye is significantly different from that of the human eye, according to recent studies of phosphorus-containing metabolites in the lens. The findings could have a profound impact on the study of cataract formation due to microwave radiation.

Using phosphorus-31 nuclear magnetic resonance (NMR), researchers from the Chicago College of Osteopathic Medicine have studied the enzymatic processes that regulate the metabolism of the lens. They conclude: "Overall results indicate that the cat and dog lenses most closely resemble the human lens in that they have the fewest number of significant metabolite differences, four and three respectively, relative to the human. The rabbit and cow lenses are the least similar to the human with 10 and 12 significant metabolite differences, respectively."

Rabbits' lenses have long been used to study cataract formation in humans. Drs. Stephen Kopp, Thomas Glonek and Jack Greiner report in the March 26 *Science* that their previous studies had indicated a pronounced difference between rabbit and human lenses—greater than they had anticipated—and

(continued p. 8)

HIGHLIGHTS

OSHA Stops Enforcement of RF/MW Hazards

According to new enforcement guidelines, Occupational Safety and Health Administration (OSHA) inspectors can no longer issue citations to companies for exposing their workers to radiofrequency and microwave (RF/MW) fields of greater than 10 mW/cm^2.

New instructions, dated March 17, from OSHA's Office of Compliance Programming and approved by OSHA Administrator Thorne Auchter specify that the general duty clause "may not be used to enforce 'should' standards." The 10 mW/cm^2 RF/MW standard was found to be an "advisory" or a "should" standard in the *Swimline Corporation* case (decided in 1975 and affirmed in 1977) and, as such, was ruled unenforceable. Occupational standards for RF/MW are therefore in limbo; the 10 mW/cm^2 standard is unenforceable and OSHA will not enforce the standard under the general duty clause.

The general duty clause is Section 5(a)(1) of the Occupational Safety and Health Act, which provides that each employer shall furnish employees with a work place that is free of recognized hazards.

Officials at OSHA confirmed that the enforcement of nonionizing radiation standards was now "up in the air." Harold Engel of the Solicitor's Office said that OSHA was in the process of deleting all "should" standards and that the effort could be accomplished in about a year. Work on a new standard continues; a spokesman from the Office of Physical Agents Standards said that the estimated schedule for publishing an advanced notice of proposed rule making in the *Federal Register* is now the early fall.

Massachusetts Proposed Standard Delayed

The Massachusetts ad hoc committee on radiofrequency/microwave radiation has delayed issuing its draft guideline for general public exposures. At a March 26 meeting, the committee extended the peer review period for its working draft 90 days to June 15 and cancelled a public hearing scheduled for April 29. Release of an official draft is now tentatively set for late August, with public hearings to follow in the fall.

The guideline sets a 200 uW/cm^2 limit for public exposure to 30-300 MHz radiation, more stringent by a factor of five than the new ANSI standard. Like its ANSI counterpart, the Massachusetts draft is frequency dependent, with higher exposure limits at other frequencies. (See *MWN*, March 1982.)

According to Robert Watkins of the state's Radiation Control Program, the 20 or so comments received so far are generally favorable. The Canadian Department of Health and Welfare has suggested a safety factor of 10, while a couple of reviewers have recommended adopting ANSI's 1 mW/cm^2 limit. The largest number of comments have addressed registration and exemption issues.

In a telephone interview, Professor A.W. Guy of the University of Washington, Seattle, said that the Massachusetts plan for combining a lower exposure limit with a longer averaging time for measuring exposures was a "clever" way of dealing with the chronic exposure problem. Guy chaired the panel that drafted the new ANSI standard.

Several experts contacted by *Microwave News* feared that the Massachusetts action was part of a trend toward independent state and local regulation which could create problems for manufacturing and communications companies. In fact, Arizona has begun work on a guideline that, said the director of the state's Radiation Regulatory Agency, Charles Tedford, "won't necessarily be the same as Massachusetts'."

Guidelines for Exposure to NMR Systems

The Bureau of Radiological Health (BRH) has issued guidelines to help evaluate the risks from nuclear magnetic resonance (NMR) devices in clinical trials. Exposure below the following levels is believed to be free of unacceptable risk. *Static (DC) Magnetic Fields:* Whole or partial body exposures of 2 tesla. *Time-Varying Magnetic Fields:* Whole or partial body exposures of 3 tesla/second. *Radiofrequency Electromagnetic Fields:* Exposure to RF fields that result in a specific absorption rate (SAR) that exceeds 0.4 W/Kg as averaged over the whole body or 2 W/Kg as averaged over any one gram of tissue.

Under Food and Drug Administration (FDA) rules, medical devices can qualify for an investigational device exemption (IDE) for use in trials if they do not present a "significant risk." By meeting these new BRH guidelines, NMR devices can win exemption from a local institutional review board. A finding of significant risk does not mean the device is too hazardous for clinical trials, only that an IDE must be submitted to the FDA for approval.

BRH's Dr. Whit Athey explained that the guidelines "are not meant to be general safety standards." They simply indicate permissible levels for clinical trials, he said.

The guidelines are modeled after those recently published by Professor Thomas Budinger of the University of California, Berkeley ("Nuclear Magnetic Resonance (NMR) *In Vivo* Studies: Known Thresholds for Health Effects," *Journal of Computer Assisted Tomography, 5,* 800, 1981), and by the National Radiological Protection Board (NRPB) ("Exposure to Nuclear Magnetic Resonance Clinical Imaging," *Radiography, 47,* 258, 1981). The BRH proposal for time varying magnetic fields is more stringent than that of the NRPB, which recommends a limit of 20 tesla per second for pulses of 10 msec or less. BRH's Athey explained that the bureau had opted to set one level to cover all contingencies, including variations in waveforms and repetition rates.

The guideline for partial body exposure to RF fields is stricter than the new ANSI standard which specifies an allowable SAR of 8 W/Kg. BRH notes that the ANSI standard is "based on the assumption that the far-field or near-field exposure produces a localized maximum in SAR." But in the case of NMR coils, "the peak SAR is deposited regionally in a layer of near-surface tissue that extends completely around the body. Therefore, a lower level of 2 W/Kg was chosen as the limit on peak SAR to prevent overloading the thermoregulatory system in any region of the body."

A number of NMR clinical trials are underway across the country. To date, there have been no reports of unanticipated effects from use of the machines.

For a copy of the guidelines contact: Robert Phillips, HFX-460, BRH, Rockville, MD 20857, (301) 443-3426. See also: 47 *FR* 11972, March 19, 1982.

Bioeffects Literature Digest Published

The National Telecommunications and Information Administration (NTIA) has resumed publication of its quarterly compilation of the bioeffects literature, *Biological Effects of Non-Ionizing Electromagnetic Radiation: A Digest of Current Literature.* This issue, Volume VI No. 1, covers July-

September 1981 and is the first to appear since work on the digest was suspended in September 1980 (after Volume V No. 1) because of lack of funds. A catch-up volume for the intervening period, ending June 1981, is at the printer now and should be available soon. Volume 6 No. 2 is due out in June.

The digest includes full citations and abstracts for current research as well as author and subject indexes. Continued publication of the series, which began in 1974, is very uncertain. There are no funds for it in the present NTIA budget.

The new volume is available from the National Technical Information Service (NTIS), Springfield, VA 22161. At press time its NTIS accession number and price had not been assigned, but it can be ordered by its NTIA number, NTIA-CR-81-15. For more information contact: Eugene Zucker, acting executive secretary of ERMAC, NTIA, 1325 G Street, NW, Washington, DC 20005, (202) 724-3323.

Power Line Studies Chosen in NY

The New York State Overhead Power Lines Project's Scientific Advisory Panel has recommended funding 15 studies on the health effects of power line radiation. These two- and three-year studies will receive the bulk of the project's $3.5 million research budget.

The panel will initiate two other efforts to confirm and to replicate Dr. Nancy Wertheimer's epidemiological study that found a correlation between 60 Hz magnetic fields and the incidence of childhood cancer. ("Electrical Wiring Configurations and Childhood Cancer," *American Journal of Epidemiology, 109,* 273, 1979.) First, $25,000 will be allocated to put Wertheimer's data into a machine-readable format suitable for re-analysis. Second, the state will soon issue a request for proposals for a replication study slated to cost about $500,000.

The advisory group has chosen three engineering experts to assist with the dosimetry in the various studies. They are: Dr. Don W. Deno of General Electric Co., Pittsfield, MA; Dr. Stephen D. Umans of MIT, Cambridge, MA; and Dr. Anthony R. Valentino of Argonne National Laboratory, Argonne, IL.

Dr. Maria Reichmanis, the scientific research coordinator for the project, resigned as of April 1. Michael Rampola of the state's Department of Health will fill in until a replacement is found.

Recommended Awards

Genetic, Cytogenetic, Teratogenic and Reproductive Studies: Dr. Maimon M. Cohen; University of Maryland School of Medicine, Baltimore, MD; $162,813; 2 years; *In Vitro* Genetic Effects of Electromagnetic Fields. Dr. Gordon K. Livingston; University of Utah Medical Center, Salt Lake City, UT; $151,088; 2 years; Reproductive Integrity of Mammalian Cells Exposed to 60 Hz Electromagnetic Fields. Dr. Arland L. Carsten; Brookhaven National Laboratory, Upton, NY; $384,864; 3 years; Mutagenicity and Toxicity of Electric and Magnetic Fields.

Cell and Organ Culture Studies: Dr. Wendell D. Winters; University of Texas Health Science Center, San Antonio, TX; $125,668; 2 years; Biological Functions of Immunologically Reactive Human and Canine Cells Influenced by *In Vitro* Exposures to Electric and Magnetic Fields. Dr. Ross W. Gundersen; University of Wisconsin-Parkside, Kenosha, WI; $122,374; 3 years; Effects of 60 Hz Electromagnetic Fields on Calcium Efflux and Neurotransmitter Release. Dr. Prasanta K. Basu; University of Toronto, Toronto, Ontario; $134,380; 2 years; Biological Effects of Extremely Low Frequency Electric and Magnetic Fields on the Ocular Tissues; An *In Vitro* Study. Dr. Gideon A. Rodan; University of Connecticut Health Center School of Dental Medicine, Farmington, CT; $106,513; 2 years; Effect of 60 Hz Electric and Magnetic Fields on Neural and Skeletal Cells in Culture.

***In Vivo* Animal Physiology and Pathophysiology:** Dr. Frank M. Sulzman; State University of New York at Binghamton, Binghamton, NY; $134,161; 3 years; Effects of Electromagnetic Fields on Circadian Rhythms.

Animal and Human Neurobiology: Dr. Amos G. Gona; University of Medicine and Dentistry of New Jersey, Newark, NJ; $118,306; 3 years; Effects of 60 Hz Electric and Magnetic Fields on the Developing Rat Brain. Dr. Jonathan R. Wolpaw; New York State Department of Health, Albany, NY; $251,785; 3 years; Chronic Effects of 60 Hz Electric and Magnetic Fields on Primate Central Nervous System Function. Dr. Klaus-Peter Ossenkopp; University of Western Ontario, London, Ontario; $32,993; 2 years; ELF Low Intensity Magnetic Fields and Epilepsy.

Animal and Human Behavior: Dr. John R. Thomas; Naval Medical Research Institute, Bethesda, MD; $110,390; 2 years; Investigation of Potential Behavioral Effects of Exposure to 60 Hz Electromagnetic Fields. Prof. Kurt Salzinger; Polytechnic Institute of New York, Brooklyn, NY; $199,365; 3 years; Biological and Behavioral Effects of ELF.

Multidisciplinary Human Studies with Controlled Exposure Conditions: Dr. Charles Graham; Midwest Research Institute, Kansas City, MO; $375,000; 2 years; Influence of 60 Hz Fields on Human Behavior, Physiology and Biochemistry.

Epidemiology of Human Populations: Dr. Samuel D. Kaplan; SRI International, Menlo Park, CA; $280,958; 2 years; Historical Cohort Mortality Study of Electric Utility Workers Exposed to Strong Electromagnetic Fields.

Miscarriage Cluster in Toronto

A cluster of miscarriages among employees in Toronto's Old City Hall is being investigated by the Ontario government. In 1980-1981, 10 out of 19 pregnant women working for the provincial Ministry of the Attorney-General had miscarriages; the 10 included all four of the pregnant women working in an office with two video display terminals (VDTs). All of the women used two photocopy machines located in a separate room. The ministry employs approximately 150 women in the office complex.

At the attorney-general's request, the Ontario Ministry of Health will soon appoint Dr. John Harkins, a physician at the University of Toronto, to determine if the ratio of miscarriages to pregnancies is statistically significant and if further investigation is necessary. Meanwhile, the Ministry of Labor has tested the VDTs for radiation leaks and has collected air samples from the offices to check for abnormal levels of ozone and toners and other potentially hazardous substances. According to a spokesman for the Ministry of Labor, Harkins could finish his investigation by early May.

Union officials are not satisfied with the government action. Robert DeMatteo of the Ontario Public Service Employees Union has called for a "thorough and truly independent investigation to resolve office safety issues," rather than a "statistical manipulation" that could dismiss a potential problem. At the Communications Workers of Canada, Gary Cwitco agreed that an epidemiology is needed, adding that "at this point simply testing the VDTs is not conclusive proof of their safety." US and Canadian government experts are of the opinion that the five other recently reported clusters of pregnancy problems among clerical workers were probably statistical quirks. (See *MWN,* November 1981 and January/February 1982.)

Dr. Anthony Muc of the labor ministry's Radiation Protection Service reported that the radiation levels from the two

VDTs "conform to levels seen in all other responsible testing." He said, "There is no adequate indication, and I don't think there will be, of any link between alleged clusters and something in the working environment."

The government's investigation began after minority party members of the provincial legislature questioned Labor Minister Russell Ramsay and Attorney-General Roy McMurtry on March 15 about the miscarriages. The situation, which has received national television coverage in Canada, has prompted the legislature's Richard Johnson to reintroduce his VDT safety bill, which failed to reach committee earlier this year. (See *MWN,* December 1981.)

According to DeMatteo, workers first told a supervisor at the ministry about the miscarriages last November. At the same time, the workers complained that using the photocopy machines, located in an unvented room, caused respiratory problems.

BRH Reorganization Moves Forward

The reorganization of the Division of Biological Effects (DBE) at the Bureau of Radiological Health (BRH) has taken another step forward with the announcement that four new branches have been approved by the parent agency, the Food and Drug Administration (FDA). Last year BRH revealed that it would transform DBE into the Division of Risk Assessment to reflect a greater emphasis on risk analysis (see *MWN,* December 1981). This change requires approval from FDA's parent, the Department of Health and Human Services, and is not expected until the end of the year.

In a shift from past practice, the four branches are arranged by radiation type rather than by biological or medical area. The new branches and their chiefs, who are expected to be named soon, are: Electromagnetic Radiation, Dr. Mays Swicord; Light, Dr. Elizabeth Jacobson; Ionizing Radiation: Dr. Richard Chiacchierini; and Ultrasound, Dr. Melvin Stratmeyer.

The electromagnetics branch will have responsibility for non-ionizing radiation with a staff of 10–12 professionals—significantly larger than before. The ultrasound program has also been increased.

EISs Out for Proposed Satcom Stations

RCA

A draft environmental impact statement (EIS) for RCA's proposed satellite communications station on Bainbridge Island, WA, has been released for public review. The facility would relay commercial communications to and from the Seattle area.

The two-volume document, prepared at RCA's expense by CH2M Hill, Inc., in Seattle, contains lengthy discussions of the bioeffects of microwave radiation prepared by Professor A.W. Guy of the University of Washington, Seattle, Dr. Don Justesen of the VA Medical Center in Kansas City, MO, and the Battelle Human Affairs Research Center in Seattle.

The maximum public radiation exposure next to the 7.9 acre site is estimated to be 4.14 uW/cm² with 14 transponders on each of three antennas in use. RCA wants to start with only two 12-meter parabolic antennas, each with three transponders in use, though, which drops potential exposure to 0.228 uW/cm².

Comments on the EIS are due by April 14. Officials at the Kitsap County Department of Community Development hope to publish a final EIS around mid-May. The county hearing examiner and the Board of County Commissioners will then hold public hearings before the board issues a final ruling. Rick Kimball of the development department said a decision could come as early as mid-August. Either side could then appeal the decision to the courts.

A draft EIS for an alternative site in a forest north of Bainbridge Island was released on March 31, with comments due by May 5. RCA opted to process two separate proposals simultaneously after the Bucklin Hill Neighborhood Association, led by Jerome Hellmuth, delayed construction plans for Bainbridge by successfully arguing that the county should require an EIS. (See *MWN,* October 1981.)

Copies of both draft EISs are available from CH2M Hill. After initial supplies are gone, the company will charge ten cents per page. Contact: Signe Gilson, CH2M Hill, Bellevue, WA 98105, (206) 453-5000.

Hughes Aircraft

The National Satellite Services, Inc., a subsidiary of Hughes Aircraft Co., has filed a draft EIS with the City of New York on its proposal to build a satcom station in the Spring Creek section of Brooklyn, NY. The draft EIS, released March 5, was prepared for Hughes by Fred Hart Associates of New York, NY, and has already been favorably reviewed by the city's Department of Environmental Protection and Department of Health.

The Hughes station would be part of its $20 million domestic communications satellite network known as the "Galaxy System." The Brooklyn proposal calls for building a total of seven 33-foot antennas operating at 6 GHz (with a 4 GHz downlink), though only two would be built initially.

According to an analysis by Hughes, public exposures to electromagnetic radiation from the station will never exceed 1–2 uW/cm². The power density study was performed by E. Villaseca and R. Berchtold of Hughes' Communications and Radar Division. They used Geometric Theory of Diffraction which, they claim, "provides precision computation of the fine structure of the antenna patterns." The calculations were validated by Dr. Samuel Koslov of the Johns Hopkins University's Applied Physics Laboratory.

Hughes also contracted with Dr. Herbert Pollack for an evaluation of the health implications of the station. Pollack concluded: "The power density at ground level and the nearest buildings from the proposed [station] will be in the very low microwatt level....In no area of the world is this considered a health hazard."

The site will have a microwave link with a relay facility on the roof of Two World Trade Center in downtown Manhattan. An interference analysis by Spectrum Planning of Richardson, TX, indicates that the station is compatible with Kennedy airport, local TV stations and other RF sources. A 40-foot wall will be built, however, to "improve interference margins."

According to Mira Ledman, director of the city's Office of Environmental Impact, a monitoring procedure will be set up once the station becomes operational to check ambient radiation levels. If the levels exceed some still to be determined level, mitigation measures will be initiated, she said.

The EIS is now being reviewed by Community Board No. 5 in Brooklyn. The board held a hearing on the proposal on March 24; neighborhood residents approved of the plan in concept, but wanted more information on the health effects of microwaves. Another hearing is scheduled for April 28. If it is approved by the board, the proposal will be the subject of a joint hearing by the city's Department of Environmental Protection and Department of City Planning this summer.

For information on the availability of the EIS contact: James Coyle at Fred Hart Associates, (212) 840-3990.

Hyperthermia Systems Under Study

Five teaching hospitals are in the process of evaluating hyperthermia systems for the National Cancer Institute (NCI). Each institution will be testing at least two systems. (See *MWN,* November 1981.) At the request of *Microwave News,* NCI has released a list of the types of equipment available at each medical center. The table given below is a modified and updated version of the NCI data.

The deadline for proposals in NCI's hyperthermia quality assurance program—a second and separate initiative—has been extended to April 30 and a pre-proposal conference was held on March 17 at NCI in Bethesda, MD.

Institution and Principal Investigator	*Type of Equipment*					
	Interstitial	*RF Capacitive*	*RF Inductive*	*Microwave*	*Phased Array*	*Ultrasound*
University of Arizona Medical Center Dr. Michael Manning, (602) 626-6723	✓*	✓*	✓+&*	✓*	✓*	
M.D. Anderson Hospital, University of Texas Dr. Peter Corry, (713) 792-3292	✓*	(✓*)	✓*			✓*
MIT-New England Deaconess Hospital Dr. Padmakar Lele, (617) 253-5235		✓†	✓+		✓‡‡	✓*
Stanford University Medical Center Dr. Malcolm Bagshaw, (415) 497-5650	✓*			✓‡	✓‡‡	✓*
University of Utah Medical Center Dr. J. Robert Stewart, (801) 581-8793			✓+	✓‡	✓‡‡	

* = in-house design; + = Henry Radio Magnetrode; † = IIMS System; ‡ = BSD-1000; ‡‡ = BSD Phased Array; (✓*) = rarely used; IIMS = International Institute for Medical Sciences.

UPDATES

Biological Effects....Some 35 scientists and engineers participated in the March 16–19 *Workshop on the Behavioral Effects of Microwave Radiation Absorption.* Workshop organizer Professor John D'Andrea said he was pleased with its outcome: "It gave everyone an opportunity to hash out controversial subjects." The proceedings, papers and excerpts from the discussions will be edited by D'Andrea and BRH's John Monahan and should be available next February ....Dr. William Morton's study correlating RF/MW levels with cancer among Portland, OR, residents (see *MWN,* January/February 1982) has been circulated for peer review by EPA....The AF's School of Aerospace Medicine at Brooks AFB will issue an RFP at the end of April for research on the physics of RF/MW interactions with biological systems. The AF wants to develop data on mechanisms. For more information contact: Dr. David Erwin, (512) 536-3582, cite PMRN 82-95....Drs. Przemyslaw Czerski and Ewa Manikowska's paper on their recent work, which we said last month would be covered in this issue, has been delayed at the typist. We hope to report on it next month....Drs. Robert Becker and Andrew Marino's new book *Electromagnetism and Life* has just been published by the State University of New York Press in Albany, NY (cloth: $33.50, paper: $10.95). And John Ott's *Light, Radiation, & You* will soon be released by Devin-Adair Co. of Old Greenwich, CT (cloth: $14.50). We will review both books in a forthcoming issue.

Communications....Local opposition could hold up the World Christian Broadcasting Corp.'s plans for a 100 kW shortwave (5.9–17.9 MHz) radio station near Anchor Point, AK. An informal objection filed with the FCC by a citizen's group last November has prompted the commission to ask EPA to analyze radiation levels from the proposed Alaskan station....Another community group, in Scotts Mills, OR, has hired a lawyer in its fight against an existing KECH-TV broadcasting tower that it fears might pose health risks....The FCC has published its notice of proposed rule making to bring RF/MW hazards under its environmental protection rules in the February 25 *Federal Register* (47 *FR* 8214). (See *MWN,* March 1982.) Note the correction for a formula footnoted in the original notice (47 *FR* 10871, March 12)....The commission is seeking comments in preparation for the 1984/1986 WARC on the use of the HF bands allocated to the broadcasting service....Five companies must compete for the new AM stereo market. Broadcasters and receiver manufacturers had hoped the FCC would approve a single system in its final rules for AM stereo broadcasting (47 *FR* 13152)....On the cellular communications front, Western Union has entered the arena by acquiring an interest in Cellular Communications Inc. of New York City and by joining a venture with three other companies to get franchises for mobile telephone networks....Meanwhile, Millicom Inc. plans to begin testing its mobile telephone system in the Raleigh-Durham, NC, area this month.... The FCC published its final rules for the new cellular service on March 9 (47 *FR* 10018)....Up to 4,000 new low-power television stations are expected to spring up in the next few years. The FCC is bracing itself for as many as 18,000 new license applications for the stations, which received final approval on March 4....At the request of Marti Electronics Inc., the commission has released a notice of proposed rule making for microwave boosters, a relay device that receives and retransmits a signal at the same frequency.

Compatibility and Interference...."Do radio broadcasts and radar transmissions pose a threat to chemical plant safety? The answer is yes, according to a small body of experts, who now suspect that large metal structures can act as receiving antennas for wave energy. Under the right conditions, they say, this energy can be converted into sparks of static electricity strong enough to cause explosions of flammable gases." So begins a special report on RFI in the chemical and oil industry in the March 8 *Chemical Engineering* magazine. According to the article, while no one has yet linked a disaster with electromagnetic energy, the UK and West Germany will soon issue guidelines for the joint siting of antennas and chemical plants. The authors refer to the case of a local AM station in Scotland which will have to move to make way for a tanker-loading terminal. They quote a British expert's view that loop-shaped structures like cranes and piping are the most efficient absorbers at frequencies below 30 MHz; radar at higher frequencies is also a threat due to its high energy pulses. An accompanying editorial advocates regulation before an accident happens "that would put vast areas of the country off-limits to the builders of new plants."...The space shuttle's third mission was hailed as a success despite problems with the mechanical arm and radio transmitters. The *Washington Post*'s Thomas O'Toole reported on a less publicized disturbance: every time the spacecraft flew north toward the Soviet Union, the astronauts heard loud static noises. Engineers at the Johnson Space Center in Houston speculated that the interference was caused by the Soviet's "Woodpecker" over-the-horizon radar at Rostov....The FCC has decided that anyone applying to build a new TV station on channel 14 or 69 (or modify an existing one) will have to protect against "objectionable interference to existing land mobile facilities in the 460–470 MHz (channel 14) or in

the 806–816 MHz (for channel 69) band *prior to program test authorization*."...The National Association of Broadcasters released a report on interference to US AM radio stations from Cuban transmitters to a House Foreign Affairs Committee hearing on March 4. The administration wants to set up a 50 kW station, Radio Marti, at 1040 kHz to broadcast news to Cuba. Some fear that Cuba will retaliate by building more interfering transmitters. At the mark up of HR 5427, which allocates funds for Radio Marti, Congressman Dante Fascell (D-FL) added a provision that would compensate AM stations for Cuban RFI. For a copy of the NAB report call (202) 293-3557....A team from Japan reports on an experimental study of noise generated by microwave oven magnetrons in the December 1981 *Journal of Microwave Power.*

EMP....William Broad continues to report on the potentially crippling effects of electromagnetic pulse (EMP) radiation in the March 12 *Science.* In his article, "A Fatal Flaw in the Concept of Space War," he writes that a single nuclear blast in outer space "would instantly set up an electric pulse of up to a million volts per meter in hundreds of satellites and battle stations....A 2-megaton blast just outside the earth's atmosphere would set up a pulse in objects as far away as geosynchronous orbit, some 36,000 kilometers above the earth." Such pulses could knock out laser weapons that DoD is developing at a cost of $300 million a year. Broad attributes part of the snafu to the lack of coordination between the Defense Advanced Projects Agency (DARPA) and the Defense Nuclear Agency (DNA). DARPA is responsible for the laser program and DNA for radiation effects....In contrast to Broad's article, William Scott writes in the March 15 *Aviation Week and Space Technology* that recent test data from DNA indicate that satellite hardening techniques currently in use are "more effective than predicted initially."...With respect to the vulnerability of electronics on earth, the February *Microwave Systems News* quotes James Wade, the deputy under secretary of defense for research and engineering, as telling a closed session of the House Armed Services Committee's r&d subcommittee that he favors an above ground nuclear test to gauge the impact of EMP on hardened electronics....In contract news, the air force at Kirtland AFB, NM, has awarded the Dikewood Corp. of Albuquerque, NM, more than $6 million for "EMP hardening and hardness assurance development." And the Naval Surface Weapons Center in Silver Spring, MD, is negotiating with Rockwell International of Anaheim, CA, for EMP testing of Tacamo aircraft.

Government....The Senate Judiciary Committee's subcommittee on agency administration will hold a hearing on the *Feres* doctrine on April 14. Under the doctrine, the federal government is not liable for injuries to members of the armed services on active duty. A suit is possible, however, if Congress passes a "private release bill." Spokesmen from DoD, the VA and Justice will address such bills at the hearing. In addition, Senator Claiborne Pell (D-RI) will testify on the Charles Day case. Day died under mysterious circumstances while in the Navy—some people suspect microwaves were involved. (See *MWN,* December 1981.) Christopher Scanlan has written a long piece on the case for the *Providence Sunday Journal Magazine* (March 28): "What Killed Chuck Day? His parents blame malnutrition, malpractice and microwave radiation. The Navy won't talk about it."... BRH has announced the names of the new members of the Technical Electronic Product Radiation Safety Standards Committee (TEPRSSC). They are: Dr. Thomas Budinger, University of California, Berkeley; Janice Gordon, International Union of Electrical, Radio and Machine Workers; David Janes, Environmental Protection Agency; Maurice Neuweg, Illinois Department of Nuclear Safety; David Sliney, US Army Environmental Hygiene Agency; and Dr. Max Weiss, Bell Laboratories. For more information contact: BRH's Dr. Zory Glaser, (301) 443-3429....DOE is planning to prepare an EIS on the construction and operation of an overhead, 450 kV powerline, which will run between a Hydro-Quebec substation in Sherbrooke, Quebec, and a New England Power Pool facility in Grafton County, NH. For more information contact DOE's Linda Desell at (202) 252-6374 and see 47 *FR* 8619, March 1.

Litigation....A trial date of May 10 has been set in the case of Leo and Muriel Schuerman v Pacific Telephone and Telegraph Co. in Superior Court of California, County of Riverside (No. 136703). Pacific Telephone is building a line of sight microwave relay system between Los Angeles and San Diego with seven 55-watt transmitters. The Schuermans own property that lies beneath the proposed microwave beam. In their complaint (filed September 16, 1980, and amended August 5, 1981), they charge Pacific Telephone with nuisance and trespass as well as conducting an "ultra hazardous activity." Dr. A.W. Guy and Don Justesen are scheduled to testify for Pacific Telephone. The Schuermans, represented by Joseph Aklufi of Redwine and Sherrill in Riverside, want the telephone company to buy their property and are seeking punitive damages.

Medical Applications....There is a new association for those interested in NMR: *The Society of Magnetic Resonance in Medicine.* Its president, Dr. Paul Lauterbur of SUNY, Stonybrook, is being assisted by Dr. Gerald Pohost of Mass General Hospital (MGH). The new group was incorporated on the first of the year, and has already received some 500 inquiries about membership. Its first meeting is scheduled for August 16–18 in Boston; see conference calendar on p. 8 for details....On April 21, Professor Robert E. Steiner of Hammersmith Hospital, London, UK, will deliver the 15th Aubrey O. Hampton Lecture at MGH and NMR and its clinical applications. Contact Dr. Juan Taveras at MGH for details (617) 726-8344....The meeting on the *Application of Optical Instrumentation in Medicine,* scheduled for New Orleans, LA, May 9–12, will feature two sessions on NMR. For more information contact the Society of Photo-Optical Instrumentation Engineers in Bellingham, WA 98227, (206) 676-3290....Yet another popular article on NMR ran in the April *Discover*....Dr. Betty Sisken of the University of Kentucky, Lexington, was this month's participant at the ONR seminar series in Bethesda, MD. She spoke on "Electrical Stimulation of Nerve Growth in Vitro and Limb Regeneration in Vivo."...Recent studies of hyperthermia applicators (operating at 2450 and 434 MHz) by a team of French scientists demonstrate "the necessity of surface cooling and the advantage of 'cross-fire' configuration in localized hyperthermia." Their report appears in the most recent issue of the *Journal of Microwave Power,* December 1981....And a group from the University of Utah is working on models to determine the optimal arrangement of dipoles in regional and whole-body applicators. See the March *Proceedings of the IEEE.*

Military Systems....The Wisconsin state senate did not pass a resolution calling for the dismantling and removal of the Project ELF antenna on March 23. The vote was 19–13 with one abstention....Dr. Thomas Amlie, the former technical director (1968–70) of the Naval Weapons Center at China Lake, CA, has caused quite a stir with an article in the April *IEEE Spectrum:* "Radar: Shield or Target? Costly radar being developed by the US may give an opponent a decisive advantage by broadcasting the position and makeup of forces." Before the issue reached the IEEE membership, it was front page news in the *Washington Post,* and the next day a feature story in the *New York Times.* Amlie does not want to eliminate radar but to reduce its vulnerability. He cites the case of an American Shrike missile homing in on a US destroyer's radar in the gulf of Tonkin....The navy's development of a laser submarine communications system continues: the Naval Ocean Systems Center is negotiating a contract with W.J. Schafer Associates of Wakefield, MA, for research on operational concepts; the Naval Electronic Systems Command in Washington, DC, has signed a $1.3 million contract with GE's Space Systems Division in Philadelphia, PA, for a conceptual design study; and ONR is negotiating with the Westinghouse R&D Center in Pittsburgh, PA, for work on the blue-green laser itself....The army's Electronics R&D Command in Fort Monmouth, NJ, has contracted with Hughes Aircraft Co. of Fullerton, CA, for 12 AN/TPQ-37 artillery-locating radar systems at a cost of $59.7 million.

Occupational Health....Two congressmen have introduced bills which would move NIOSH out of CDC and into NIH. After holding hearings before the subcommittee on labor and HHS of the House Appropriations Committee on February 25, Congressman David Obey (D-WI) sponsored HR 5914, which would reorganize the Public Health Service, with NIOSH becoming one of the institutes under the NIH umbrella. Congressman Henry Waxman (D-CA), chairman of

the health and environment subcommittee of the Committee on Energy and Commerce, introduced HR 5919 on March 22, which, among other provisions, would have the same effect on NIOSH. Hearings on the Waxman proposal are scheduled for April 23....The Rocky Mountain Center for Occupational and Environmental Health (RMCOEH) at the University of Utah is sponsoring a course on *Current Issues and Trends in Controlling Occupational Exposures to RF/Microwave Radiation,* September 8–10 and again February 9–11, 1983. Robert Curtis, a clinical instructor at RMCOEH and a senior industrial hygienist with OSHA, will teach the course. For more information contact: Ms. K. Blosch, RMCOEH, Bldg. 512, University of Utah, Salt Lake City, UT 84112, (801) 581-5710.

Ovens....Worries about the spread of trichonosis from the incomplete cooking of infected pork in microwave ovens cropped up again last month when newspapers picked up some comments by Dr. Peter Schantz of CDC. The Department of Agriculture had warned customers about the possibility of non-uniform heating of pork in microwave ovens and the attendant risk of failing to kill any *Trichinella* larvae last year (see *MWN,* June 1981). Schantz wrote up the USDA report for CDC's *Veterinary Public Health Notes;* this was picked up by the Atlanta papers and by others across the country. The message remains the same as last year: be sure to heat *all* parts of the pork to above 137° F (58.3° C). Or at least about the same. USDA had recommended that the pork reach 170° F. Schantz's warning appeared in the last issue of the *Notes;* CDC stopped its publication due to budget cuts....Factory shipments of microwave ovens were down again in February in relation to both January and February 1981. The Association of Home Appliance Manufacturers' statistics show that 261,800 ovens were produced or imported in February, compared with 333,900 in February 1981 and 304,000 in January 1982.

Satellite Communications....*NASA Space Communications Program,* February 1982, a report on the 30/20 GHz project, is now available from the House Committee on Science and Technology.... NASA has scheduled its third industry briefing on the 30/20 GHz program for April 20–21 in Cleveland, OH....Comsat is building a satcom station with a 61-foot dish antenna near Lenox, WV, to serve as a backup for its Etam facility 22 miles away....The company is also building an earth station at Palau, Micronesia, the first of seven Intelsat earth stations planned for island communications....The first international teleconferencing service could start this year. Intercontinental Hotels Corp. and Comsat plan to link New York and London in December....The FCC has received many unfavorable responses to its proposed reduction of satellite spacing to 2° from 4°. Both the March 29 *Electronic News* and the March 15 *Broadcasting* review the comments on the plan....The National Association of Broadcasters has come out against quick approval of direct broadcast satellite (DBS) service. In a recent policy statement, the NAB favored developing high definition television in the 12 GHz band over DBS, which would not provide a new service....But the FCC's broadcast bureau chief, Larry Harris, has said the commission will authorize DBS this summer or earlier, according to a report in *Broadcasting,* March 22....United Satellite Television is ready for this move. The company plans to offer four channels of programming via DBS next year....Britain has already approved the service, which could begin there in 1986....European worries over DBS are explored in the March 22 *Wall Street Journal*....The RCA transponder saga continues: the FCC approved RCA's plans to lease transponders on its new Satcom IV satellite at a price reflecting market demand. A suit filed by UTV Cable Network and Kentucky Educational TV temporarily blocked the scheme, but then a federal appeals court freed the company to offer transponders at $13 million each.

Short Courses....• April 27–29: *Electromagnetic Radiation Hazards and Medical Applications* by Dr. L. Larsen and J. Jacobi of Walter Reed Army Institute of Research at Georgia Institute of Technology, Atlanta, GA, fee $400. Contact: (404) 894-2400....• May 17–18: *Hazardous Electromagnetic Radiation and its Biological Effects* by Dr. Bernhard Keiser at George Washington University (GWU), Washington, DC, fee $530. Contact: (202) 676-6106 or (800) 424-9773....• August 9–13: *Laser, Microwaves, Ultraviolet and Ultrasound: Biophysical and Biological Basis, Applications, and Hazards in Medicine and Industry* by Dr. P. Lele at MIT, Cambridge, MA, fee $775. Contact: Director of Summer Sessions, Room E19-356, MIT, Cambridge, MA 02139. In addition, GWU sponsors a host of other courses on radar, spectrum management, remote sensing, and microwave and millimeter technology. Contact GWU for details. See also occupational health update.

Standards....ANSI is making a last minute effort to reach consensus on its new RF/MW standard, which is already in galleys. ANSI asked Allan Eckhaus of Consumers Union to reconsider his negative vote; it would have settled for an abstention. In a March 12 letter, Eckhaus stood firm; he still could not agree with ANSI's six-minute averaging time for measuring exposures (see *MWN,* May 1981). It's not clear what action, if any, ANSI will now take....There will be a session on state regulations for non-ionizing radiation on May 26 at the *Conference on Radiation Control;* see conference calendar (p. 8) for details.

Technology....Microwave landing systems are beginning to be installed at airports across the country. With them come citizen apprehension over radiation risks; FAA officials are attempting to reassure them that there are no hazards....The FAA's 20-year, $10 billion program to modernize and automate the national airspace system is described in the March 8 *Aviation Week & Space Technology* and the April *Technology Review*....The March 1 *Aviation Week* reports that Westinghouse has successfully demonstrated a railgun that fired a projectile at more than 13,000 feet per second. The launcher will now be moved to the Picatinny Arsenal, NJ, where tests will resume in August....Microwaves continue to dominate the *Wall Street Journal*'s weekly "Technology" column: on March 12, the *Journal* reported that Ideal Research Inc. of Rockville, MD, has developed a device that can measure the thickness and growth rate of ice on a plane's surface—ice changes the principal frequency of the beam. There is one hitch, though: the instrument does not work too well if there is water mixed with the ice. On March 19, the *Journal* ran a piece about a radar system developed by the Canadian government for use on satellites to gather data on ice fields in shipping lanes....*Science* ran a two-part series on the first ten years of Landsat in its March 26 and April 2 issues....A three-day international conference on *Electrotechnologies in Industry* is scheduled for May 25–27 in Montreal, Canada. There will be a number of sessions on the use of RF energy. Contact: Sandra Wilkins, MITRE Corp., 1820 Dolley Madison Blvd., McLean, VA 22102, (703) 827-6211.

VDTs....The Massachusetts legislature will consider a VDT safety bill during its 1982 session. House bill 2910, introduced by Rep. John Driscoll, a Republican from Northbridge, MA, includes a number of ergonomic requirements for VDT work stations and calls for periodic rest breaks and annual eye exams for operators....Bell Canada tested several hundred of its VDTs for X-ray radiation between July and November of last year. According to the company's regional director of safety, Jim Allan, "nothing came up to cause any concern whatsoever, so we don't plan to do more testing."...An Australian Postal and Telecommunications Union's report on VDTs (or VDUs), *VDUs and Ill-Health: The Evidence,* found "a sufficiently large body of evidence to cast grave doubts on the claim that [VDTs] are completely safe." Its concluding policy statement calls for a three-day week for full-time operators until more is known about the terminals. Contact: G. Slater at the union, PO Box 208, Carlton South, Victoria, 3053, Australia....David Eisen of the Newspaper Guild and William Murray of NIOSH have called for research on the low-level, low-frequency radiation emitted by VDTs. According to an article in the March 12 *Guild Reporter,* both men noted the complete absence of knowledge about 15–125 kHz radiation at the American Industrial Hygiene Association seminar on VDTs, March 1–2 in Denver....A summary of the National Academy of Sciences' August 1981 symposium on VDTs and vision will soon be published in *Behavior and Information Technology.* In their abstract, authors Barbara Brown and Key Dismukes of the NAS Committee on Vision and Edward Rinalducci of the Georgia Institute of Technology recommend "properly designed epidemiological studies comparing the incidence of visual problems in VDT operators with that of non-VDT workers."

Etc....Professor James Gould of Princeton University has published "The Map Sense of Pigeons," in the March 18 *Nature,* and

Thomas Maugh II reviews the implications of recent findings that species ranging from humans to algae contain magnetic material in "Magnetic Navigation and Attractive Possibility," in the March 19 *Science*.... Could quartz-bearing rock emit radio waves before an earthquake? If so, they could become the basis of a warning system. See the March 20 *Science News* for details.... IMPI's membership directory is now available to the institute's members for $10. Contact: IMPI, 301 Maple Ave. W., Tower Suite 520, Vienna, VA 22180.... Dr. Vernon Riley died of a sudden heart attack on March 30 while attending the American Cancer Society meeting in Daytona Beach, FL. Riley had been affiliated with the Hutchison Cancer Research Center and the University of Washington Medical School in Seattle. He was well known for his work on the relationship between stress and cancer.

Microwave Oven Trial *(continued from p. 1)*

that the oven met the Bureau of Radiological Health's 1970 emission standard, which specifies a maximum leakage of 5 mW/cm^2, five centimeters from the external surface of the oven after purchase.

Zaret, who was scheduled to testify at the trial, said that he thought the adjournment of the case was a "form of censorship," placing the cataract case out of reach of the medical community. "There is no reason in the world to settle," he added, "if the cataracts were not caused by the oven."

Others scheduled to participate at the trial were Leo Birenbaum of the Polytechnic Institute of New York in Brooklyn, NY, for the plaintiffs and Drs. Przemyslaw Czerski of BRH, A. William Guy of the University of Washington, Seattle, and John Osepchuk of the Raytheon Co. for the defendant. Amana is a subsidiary of Raytheon.

In the first and only day of the jury trial, Leonard Decof made the opening statement for the secretaries, followed by their testimony and cross-examination. Before the trial could resume the next day, both parties agreed to call it off.

Rabbit's and Human Lenses *(continued from p. 1)*

that they had undertaken the present work to identify the type of mammal whose lens most resembles the human one.

Speaking from the NMR Laboratory at the college, Kopp warned that the rabbit's eye should not be used as a surrogate for the human eye. "We need to reassess the animal models we are using," he said.

Most experts on the effects of microwaves on the eye contacted by *Microwave News* had not had a chance to review the paper. All agreed, however, that the rabbit's eye had been the preferred experimental system to study microwave-induced cataracts because of its size, its general anatomical similarity to the human lens and because rabbits are cheap and easy to work with. Professor Stephen Cleary of Virginia Commonwealth University pointed out that research to date indicates the rabbit is one of the species most sensitive to cataract development.

Kopp and his co-workers found that, "generally, the rank order of lens metabolism from most to least similar to human is: cat > dog > pig > rat > sheep > rabbit > cow."

See also: J.V. Greiner *et al.*, "Organophosphates of the Crystalline Lens: A Nuclear Magnetic Resonance Spectroscopic Study," *Investigative Ophthalmology & Visual Science* (St. Louis), *21*, 700, 1981; and S.J. Kopp *et al.*, "Analysis of Intact Lens Metabolites by P-31 NMR Spectroscopy," *Current Eye Research* (London), *1*, 375, 1981.

Microwave News *invites letters from its readers. We ask writers to be brief, and we reserve the right to edit contributions for length.*

CONFERENCE CALENDAR

• May 24–27: 14th Annual *National Conference on Radiation Control,* Holiday Inn, Portland, ME. Contact: Wallace Hinckley, Maine Dept. of Human Services, 157 Capitol St., Augusta, ME 04333.

• May 24–28: *International IEEE/APS Symposium, National Radio Science Meeting and Nuclear Electromagnetic Pulse Meeting,* University of New Mexico, Albuquerque, NM. Contact: Dr. Kendall F. Casey, Dikewood Corp., 1613 University Blvd., NE, Albuquerque, NM 87102.

• June 3–8: *International Symposium on Electromagnetic Effects,* University of Ottawa, Canada. Contact: Dr. Patrick Babin, 1982 Learned Societies Conference, University of Ottawa, 65 Halsey Street, Ottawa, Ontario, Canada K1N 6N5.

• June 15–17: IEEE MTT-S *International Microwave Symposium,* Hyatt Regency Hotel, Dallas, TX. Contact: J.R. Griffin, Texas Instruments, Mail Stop 3432, PO Box 405, Lewisville, TX 75067. On June 18 immediately after the conference, there will be a one-day workshop on *Medical Applications of Electromagnetic Energy.* Contact: Dr. Gordon Short, BSD Medical Corp., 420 Chipeta Way, Salt Lake City, UT 84108.

• June 28–July 1: *Conference on Precision Electromagnetic Measurements,* University of Colorado, Boulder, CO. Contact: Robert Kamper, National Bureau of Standards, Boulder, CO 80303.

• June 28–July 2: 4th Annual *Bioelectromagnetics Society Meeting,* Beverly Wilshire Hotel, Beverly Hills, CA. Contact: BEMS, 1 Bank Street, Suite 307, Gaithersburg, MD 20878.

• July 20–22: IEEE Annual Conference on *Nuclear and Space Radiation Effects,* Caesars Palace, Las Vegas, NV. Contact: A. Ochoa, Jr., Div. 2144, Center for Radiation-Hardened Microelectronics, Sandia National Laboratory, Albuquerque, NM 87185. This meeting will be followed on July 23 by the *Hardened Electronics and Radiation Technology Conference* hosted by the Defense Nuclear Agency. A Secret security classification is required to attend. Contact: Director, DNA, Attn: ISSO/Barbara Perkins, Washington, DC 20305.

• July 25–30: 17th Annual Symposium of the *International Microwave Power Institute,* Town and Country Hotel, San Diego, CA. Contact: IMPI, 301 Maple Ave. W., Tower Suite 520, Vienna, VA 22180.

• August 11–13: 4th Annual *Satellite Communications Users Conference,* Regency Inn, Denver, CO. Contact: Satellite Communications Magazine, 3900 S. Wadsworth Blvd., Denver, CO 80235.

• August 16–18: 1st Annual *Meeting of the Society of Magnetic Resonance in Medicine,* Boston, MA. Contact: Deedee Correia, NMR Laboratory, Research 501, Massachusetts General Hospital, Boston, MA 02114.

• September 5–11: *World Congress on Medical Physics and Biomedical Engineering,* including the 13th *International Conference on Medical and Biological Engineering* and the 6th *International Conference on Medical Physics,* Congress Center, Hamburg, Germany. Contact: MPBE 82, Congress Organization, PO Box 302360, D-2000 Hamburg 36, Federal Republic of Germany.

• September 6–10: 7th *Colloquium on Microwave Communication,* Budapest, Hungary. Contact: Secretariat of the 7th Microcoll, H-1525, Budapest 114, POB 15, Hungary.

• September 8–10: *International Symposium on Electromagnetic Compatibility,* Marriott Hotel, Santa Clara, CA. Contact: Dr. Andrew Nalbandian, 20617 Debbie Lane, Saratoga, CA 95070.

• September 13–17: 12th *European Microwave Conference,* Helsinki, Finland. Contact: Prof. M. Tiuri, Helsinki University of Technology, Radio Lab, Otakaari 5A, 02150 Espoo 15, Finland.

• September 20–21: 4th Annual *Conference of the IEEE Engineering in Medicine and Biology Society,* Marriott Hotel, Philadelphia, PA. Contact: Dr. Alfred R. Potvin, Department of Biomedical Engineering, PO Box 19138, University of Texas, Arlington, TX 76019.

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MICRO WAVE NEWS

A Monthly Report on Non-Ionizing Radiation April 1983

Vol. III No. 3

INSIDE...

HIGHLIGHTS pp.3-5

More Comments on EPA's RF/MW Guidance

EMP and Nuclear Power

NAS To Study EMP Threat

Air Force EMC Center to Close

FDA Withdraws Diathermy Standard

FY84 Military Budget: Requests and Dissent

COMMENTS ON EPA'S PLANS FOR RF/MW GUIDANCE p.3-4
Selected Excerpts

SHORT COURSES p.8

UPDATES pp.5-8

Biological Effects
Communications
Compatibility & Interference
Government
Measurement
Medical Applications
Satellite Communications
Standards
VDTs

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A report on the 1983 EMC conference held in Zurich on March 8-10 will appear next month.

States Propose VDT Legislation

State regulations for video display terminals (VDT) may be on the way. An informal survey conducted by *Microwave News* last month found safety bills or requests for VDT studies pending in five states and planned in four others.

For the most part, legislators are addressing ergonomic issues. As the list of proposed actions on page 2 shows, guidelines for lighting, furniture and terminal design are the central elements in bills from Connecticut, Illinois, Maine, Massachusetts and Oregon. Groups in California, Ohio, Texas and Washington are also considering introducing legislation.

Only Oregon and Massachusetts would require employers to offer alternative work to pregnant women, a clause included in several Canadian union contracts. Many of the states would require regular eye examinations.

No state has proposed monitoring VDT radiation emissions. A provision requiring radiation checks for VDTs was cut from Connecticut's safety bill before it left committee.

In addition to bills with specific regulations, Connecticut and Massachusetts are considering setting up committees to investigate VDTs and then draft legislation if necessary. In New York, a hearing on VDTs scheduled for April 14 could result in the introduction of a safety bill.

Several bills have also been introduced in Canadian provincial legislatures but none has become law.

Though growing public awareness of VDT health issues has prompted some legislators to propose rules, the need for regulations is under dispute. At a March hearing on Connecticut's proposed VDT safety bill, for example, spokesmen for IBM advised that long experience and numerous studies show that VDTs are completely safe. Further, the company maintained that marketplace competition assures manufacturer responsiveness to the needs of users.

(continued on p. 2)

VDT-VLF Radiation Tests in Canada

Two recent reports from Canada describe measurements of the very low frequency (VLF) radiation emitted by video display terminals (VDTs). One by Dr. Stuart Harvey of Ontario Hydro details the characteristics of pulsed 16 kHz radiation. The other by Dr. Hari Sharma of the University of Waterloo, Ontario, presents the results of his VDT surveys at Surrey Memorial Hospital in Vancouver, BC.

As part of an ongoing investigation of VDTs at Ontario Hydro, Harvey measured and analyzed terminal emissions below 10 MHz. His tests of four VDTs found "no fields having characteristics presently known or suspected of being detrimental to human health."

For VLF, the peak pulse value of the 16 kHz field ranged from 19 to 170 V/m at a distance of 30 cm from the front of the sets: the pulses had a rise time of 2 to 4 microseconds and harmonics were observed up to 1 MHz. The root mean square (rms) varied from 3 to 30 V/m at 30 cm. VLF levels at the back of the terminals near the flyback transformers were much higher than at the front and Harvey notes that someone working within one foot of a VDT's rear casing "could receive an exposure in excess of the most restrictive standards." He describes this risk as being "largely confined to service personnel."

(continued on p. 2)

VLF Radiation Tests *(continued from p.1)*

Sharma, on the other hand, is not convinced exposure to pulsed VLF fields is safe. On the basis of his radiation tests at Surrey Memorial and an informal survey of workers at seven other British Columbia hospitals, Sharma believes a careful study at the hospitals is warranted. But he warns that a "linkage" between adverse health effects and VLF radiation may not be inferred at this time. He recommends shielding to reduce VLF emissions as a precautionary step.

Radiation measurements were taken at the request of the Hospital Employees Union last fall after six out of seven pregnancies among workers in Surrey's accounting office ended in miscarriage, birth defects or premature birth (see *MWN*, July/August 1982). Sharma's survey of hospital clerks using the same type of plastic-cased VDTs found an unexpectedly high incidence of pregnancy problems: workers, including the Surrey operators, reported only five normal births out of 17 pregnancies.

An arbitration panel was recently set up to hear the union's grievance against Surrey's administration for its handling of VDT safety issues. The hospital maintains that the terminals are safe; radiation tests by its consultant, Professor A.W. Guy of the University of Washington, Seattle, found no emissions over a few volts/meter (see *MWN*, March 1983). The union seeks guaranteed safeguards against potential VDT health hazards. Meanwhile, concerned workers in the accounting office staged a protest last month and turned off their machines for four days.

According to Sharma's preliminary report released last month, the "maximum average value" of VLF radiation at the back of the VDTs near the flyback transformers was as high as 1,250 V/m, with a peak pulse value of up to 15,000 V/m. The average value of the field at 30 cm from the sets dropped to 25 V/m. Sharma found no evidence of significant emissions of X-ray, ultraviolet, infrared or microwave radiation or of PCBs.

The December 16 Ontario Hydro report states that available evidence suggests shielding for VLF is unwarranted. Harvey did investigate the effectiveness of shielding, however, and found that lining the inside of a plastic-cased terminal with copper foil and then grounding the foil substantially reduced 16 kHz emissions.

Harvey, who is with Ontario Hydro's research division in Toronto, also looked at the DC fields produced by the positively charged display screen: field levels ranged from 700 to 7,000 V/m at a distance of 30 cm. The DC field was "modulated, when a display is present, by the process of writing on the CRT screen." He found that "the modulation waveform has a 60 Hz repetition rate and can be quite complex, depending on the display format." The report states that "although there are no known direct health effects from such fields, an indirect effect from atmospheric positive ions has been suggested."

Ontario Hydro has also completed an ergonomics survey among some of its clerical workers. See the VDT update on page 8.

VDT Legislation *(continued from p.1)*

Labor representatives disagree. Carl Rude of the CWA in Washington state argued that "we need rules because there are still too many unanswered questions and too many user complaints. Until more research is done, we need some type of protection." Commenting for the Newspaper Guild, David Eisen said "legislation will provide a minimum workplace standard to protect millions of non-union workers." He is confident that "sooner or later, laws will be pushed through."

The Computer and Business Equipment Manufacturers Association (CBEMA) opposes the proposed regulations. The trade association maintains that "inflexible regulation" of this fast developing technology will hurt businesses, users and manufacturers. The threat of VDT legislation has been targeted as a major issue by CBEMA and will be addressed by Columbia University Professor Alan Westin at the group's annual spring meeting in Phoenix, AZ.

Proposed State VDT Legislation

Connecticut: House Study Bill 5132: An Act Establishing a Committee To Investigate Workplace Hazards Caused by Video Display Terminals. Sponsor: Rep. William Kiner. Would set up a study committee which could develop appropriate VDT legislation. Status: approved by the Committee on Labor in March and sent to the Appropriations Committee.

Connecticut: Senate Bill 811: An Act Concerning Protection for Users of Video Display Terminals. Sponsor: Senator Michael Skelley. Employers would be required to inform workers of potential hazards associated with VDTs, including eye problems, headaches and musculoskeletal problems. Workers would also be informed of the advisability of annual eye exams and the need for a rest period of up to 20 minutes after two hours of work. Also calls for study of VDTs. Status: approved by the General Law Committee in March.

Illinois: House Bill 274: An Act to Provide Occupational Safeguards for Operators of Video Display Terminals. Sponsor: Rep. John Matijevich. Parallels Maine's proposed bill (see below) with the addition of specific requirements for terminal design, office furniture and lighting as presented in an earlier Maine bill (HP 880, 1981). Status: tabled after March hearing and unlikely to see action this session.

Maine: House Paper 657: An Act to Provide Occupational Safeguards for Operators of Video Display Terminals. Sponsors: Reps. Edith Beaulieu and James Mayo. Would require employers to ensure safe workplace conditions, inform employees of potential hazards associated with VDTs, provide semiannual terminal maintenance, pay for annual eye exams, provide a 15-minute rest break every two hours. Status: hearing before the Joint Standing Committee on Labor expected late March or early April. An almost identical bill, HP 880, failed to win approval in 1981.

Massachusetts: House Study Bill 2267: Untitled. Sponsor: Rep. Timothy Bassett. Order for the Committee on Commerce and Labor to investigate VDTs and draft legislation, if necessary. Status: hearing scheduled for April 20 in Boston.

Massachusetts: House Bill 2658: An Act to Provide Occupational Safeguards for Employees Resulting from the Introduction and Utilization of Video Display Terminals. Sponsor: Rep. Elizabeth Metayer. Employer intending to install over $5,000 in hardware would be required to notify employees six months in advance, pay for annual eye exams, provide properly designed furniture, terminals, and lighting and adequate air quality, provide 15-minute breaks every one or two hours depending on visual demands of work, provide semiannual terminal maintenance and offer alternative work to employees during pregnancy without loss of pay. Limit total VDT work to five hours per day. Status: hearing scheduled for April 20 in Boston.

New York: Hearing on VDT safety issue and possible need for legislation tentatively scheduled for April 14 in New York City. Sponsor: Rep. Frank Barbaro.

New York: Hearing on consumer products and radiation, including VDTs, expected in late spring. Sponsor: Senator Tony Masiello.

Oregon: Senate Bill 568. Untitled. Sponsor: Senator Margie Hendriksen. Employers would be required to ensure adequate lighting, furniture and terminal design, pay for annual eye exams, provide semiannual terminal maintenance, inform workers of potential hazards associated with VDTs, provide 30-minute break from VDT work after two hours at terminal, provide alternative work for pregnant women on request. Status: hearing before Labor Committee expected mid- to late April.

Washington: Plans underway to place rules similar to those in the Maine bill (see above) in the state's administrative code. Status: the Department of Labor and Industries plans to form a committee this spring to draft rules.

HIGHLIGHTS

More Comments on EPA's RF/MW Guidance

The Environmental Protection Agency (EPA) has received 23 sets of comments on its plans to propose a public exposure guideline or "guidance" for radiofrequency/microwave (RF/MW) radiation. Of the fifteen responses summarized below and the eight reviewed last month (see *MWN*, March 1983), the majority call for quick action in adopting a pre-emptive federal guideline.

Federal Communications Commission (FCC) Chairman Mark Fowler summed up the concern of his agency and of the companies it regulates: both, he wrote, "are concerned about safe exposure levels and the possiblity of a confusing and costly proliferation of inconsistent state and local standards." Fowler asked EPA to set standards for use by the FCC and other agencies "as expeditiously as possible." The problems posed by local regulations were also addressed by the American Radio Relay League (ARRL), Raytheon, RCA and Westinghouse Electric.

The New Jersey Department of Environmental Protection cited its own plans to adopt an RF/MW exposure standard in urging the EPA to speed up its schedule for the guidance. Comments submitted by the Commission on Radiation Protection Chairman M.M. Weiss of Bell Labs and Frank Cosolito of the NJ Bureau of Radiation Protection explained why the state's action is necessary: local decision makers, spurred by growing public apprehension, are "inhibiting the often vital expansion of the nation's communications system by declining to issue required permits, variances, etc."

Many of those commenting suggested modeling federal rules on the American National Standards Institute (ANSI) standard. Robert Misterka of the New England Power Service, for example, called the ANSI guideline "the latest most comprehensive document available" and "well recognized as the authoritative guide" for evaluating exposure to non-ionizing radiation. Also recommending the ANSI standard were John Mitchell of the Air Force School of Aerospace Medicine, Raytheon's John Osepchuk, F.S. Beal of Western Electric, S. Baron of Burns and Roe and Christopher Imlay for the ARRL.

EPA received the following responses to specific questions in its advanced notice of proposed recommendation (47 *FR* 57338, December 23, 1982):

- Many of the comments recommended that the guidance cover frequencies below the 300 kHz cutoff in the ANSI standard. L.J. Chapman of Madison, WI, urged including frequencies down to 1 Hz, Ford and the Motor Vehicle Manufacturers Association recommended starting at 60 Hz and the ARRL at 1 kHz. Raytheon suggested including frequencies down to at least 100 kHz. Westinghouse preferred ANSI's 300 kHz and the air force suggested starting higher, at 3 MHz.
- All comments comparing a flat with a frequency dependent standard concluded the guidance should set different exposure limits for different frequencies.
- Responses varied over whether limits should be set for partial body exposures. The Air Force, the ARRL, the Federal Aviation Administration and Westinghouse recommended addressing only whole body exposures. Raytheon and the NJ Department of Health supported partial body exposure rules and Ford suggested that these rules be developed later. Motorola advocated a detailed approach, which is excerpted below.

EPA's Office of Radiation Programs is finishing its preliminary draft of the guidance and plans to meet April 14 with the interagency group established to help with guidance development. The final draft of the agency's criteria document on RF/MW bioeffects, the basis of the guideline, will be reviewed by an ad hoc committee of the Scientific Advisory Board in May (see *MWN*, March 1983). The document will be made publi at that time.

For a review of EPA's notice of proposed recommendation, see *MWN*, January/February 1983.

Excerpts From Comments on EPA RF/MW Guidance Development

The 15 sets of comments excerpted below, along with eight sets reviewed in Microwave News *last month, were submitted to EPA in late February. (See* MWN, *March 1983.)*

Air Force School of Aerospace Medicine: Whole body average specific absorption rate (SAR) with a maximum localized SAR should be used to establish exposure limits in terms of incident power density (mW/cm^2)....The ANSI standard...is intended to apply to non-occupational (general public) as well as to occupational exposures and should receive serious consideration in setting safety guidelines for public exposure to [RF] radiation.

American Radio Relay League: We emphasize the need to distinguish between biological *effects* from RF energy and biological *hazards* from RF energy. While advances in technology and science may increase our ability to detect biological effects, such advances need not directly result in changes in protection standards.

Burns and Roe: Our view is that the ANSI standard provides sufficient guidance while additional necessary research is being performed and we therefore endorse the proposed standard.

L.J. Chapman: Present standards and research programs do not adequately address the low frequency portion of the RF spectrum. Especially in the frequency range from 1 to 100 Hz, population exposures may have significance and the existent research information base is minimal.

Federal Aviation Administration: In developing your guidance document you should consider setting limits for maximum as well as average exposure. We urge you to address nonthermal effects and their health implications, an issue which is far more sensitive in the general public arena than in the occupational.

Federal Communications Commission: The FCC lacks the necessary expertise and statutory authority to promulgate its own health and safety standards and, therefore, must look to EPA and other responsible agencies for guidance in this area....We would like to make clear our support for your guidance development. We encourage the EPA to complete this process as expeditiously as possible so that a uniform federal standard will be available for use by the FCC and other affected agencies.

Ford: We see no reason to limit the range of frequencies included in the guidance. In particular, those frequencies which are known to be used by powerful radiating sources should be included. These frequencies could extend, for example, from the 60 Hz employed in domestic electric power transmission and the 10.2 to 13.6 kHz employed by Omega radionavigation systems through the commercial AM and FM broadcast spectrums to the frequencies employed by microwave radar and the satellite communications/energy systems.

Motor Vehicle Manufacturers Association: MVMA is particularly interested in whether mobile radio transmitters, not specifically identified in the ANPR, will be considered in the course of this rule making....MVMA recommends that the [frequency] ranges not be limited. In particular, we recommend that frequencies of known high field strengths in the proximity of public roads should be included.

Motorola: In the close vicinity of sources, reactive electric energy can cause high readings in E-field sensing instruments, even though limited

power flow (in the far-field sense) may be present. It is therefore recommended that the EPA weigh the H-field levels more heavily than E-field levels in the case of partial body exposure. In addition, it is recommended that the EPA allow the same peak and average SAR in human organs for whole and partial body exposure....The best known (and independently repeated) of [non-thermal] effects is the change of [calcium ion] efflux from brain tissue in certain amplitude modulated fields... This effect may concern the EPA because it points out that there might be particular windows of bio-response to certain weak electric signals. Motorola would like to point out that the frequency modulated (FM) signals usually employed by the land mobile communications industry do not cause such [a calcium ion] efflux effect.

New England Power Service: It is in the best interest of the public and the users of devices which generate electromagnetic fields that any regulations promulgated to regulate exposures to these fields provide a clear, understandable and straightforward standard of compliance which will allow both EPA and the radio users to easily insure that exposure guidelines are not exceeded....We recommend that EPA consider [adopting the ANSI standard] in its guidance.

New Jersey Department of Environmental Protection: The subject of radiofrequency hazards has become of increasing concern to this [Commission on Radiation Protection] in the face of increasing proliferation of [RF] radiation sources in the state and an accompanying and inevitable apprehension on the part of residents as to whether they are being unduly exposed to possibly hazardous radiations....In the absence of a national guide for [RF] radiation limits, and lacking the resources to independently develop state limits, this commission is in the process of adopting guideline limits patterned after [ANSI's].

New Jersey Department of Health: Even though the Eastern European studies, which were based on behavioral and clinical studies, have not been repeated in the United States, we recommend that the data from these studies be used for setting exposure limits until a peer reviewed study from the Western countries either confirms or disproves the findings of the Eastern European countries.

Raytheon: The exposure limits should exhibit frequency dependence as in ANSI C95– so that the safety factor or real risk is the same regardless of which part of the spectrum is involved. Furthermore, such limits should be expressed as continuous functions of frequency. Mixed fields or sources can be evaluated as in ANSI C95 by adding fractions representing ratios to exposure limits for the respective frequencies. The relatively minor calculations are a minor burden to those responsible for using the guidance (professional users, not the public) and are a small price to pay for the avoidance of a distorted and unfair perspective on risk which would result if a simplistic single number approach were to be followed....Survey instruments will measure only time-averaged fields (averaging time in the order of 1 second). At present there is no limit on instantaneous fields or power densities such as exist in a pulsed radar beam. There is no evidence that existing environmental radar fields are hazardous. Certainly any limitation on peak fields should be set above those already in the environment accessible to the general public. In such existing cases the peak values may be 10,000 times the six-minute average or more.

RCA: The lack of a general population radiation limit has seriously complicated siting plans for the communications industry....In the absence of national guidance, state and local jurisdictions have felt the need for establishing radiofrequency exposure limits. Not surprisingly, these limits lack uniformity; e.g., Texas has an exposure limit of 10,000 uW/cm^2, New Jersey is proposing 1,000 uW/cm^2, and Massachusetts is proposing 200 uW/cm^2. The consequences of this regulatory patchwork quilt are that those who are concerned about the potential hazards are confused and fearful, and those who have responsibility for maintaining the communications resources of this country cannot allay these fears by comparing their predicted exposure levels with nationally accepted, uniform exposure limit levels.

Westinghouse Electric Corp.: The ANSI committee, as well as other scientific committees (e.g. National Council on Radiation Protection), use the threshold for adverse biological effects concept and include an order-of-magnitude safety factor when establishing limits for exposure to humans. This conceptual approach should be used by EPA in order to maintain consistency in establishing limits for exposure to the general public....The range of frequencies to be included should be from 300 kHz to 100 GHz....The standard should consider only whole body exposure rate. The only partial body exposure rate to the general public would be from sources to which they are in close proximity such as microwave ovens. Exposure rates from these and other consumer products are best controlled through product performance standards.

EMP and Nuclear Power...

Electromagnetic pulse (EMP) radiation from a high altitude nuclear blast would not stop a nuclear power plant from achieving a safe shut down, according to a report prepared for the Nuclear Regulatory Commission (NRC) by Sandia National Laboratories. A number of experts have taken issue with the study's conclusions, however.

Critics of the report contend that the study's assumptions —especially the way the EMP problem is defined— seriously undermine the value of its findings. As Dr. Conrad Longmire cautioned, "with a sufficiently long chain of plausible assumptions one could reach almost any conclusion desired." He advocated an investigation of the EMP threat on reactors "with the maximum degree of realism." Longmire, who is with Mission Research Corp. in Santa Barbara, CA, offered these comments on a draft of the report. The authors contend that the assumptions are "solid and reasonable" and that running tests with a nuclear power plant would be "extremely expensive."

In an interview, NRC's Demetrios Basdekas said that "the report presents a pre-conceived set of conclusions." Calling the study a potential "embarrassment" for the agency, Basdekas said that the primary damage from EMP is not due to the energy imparted by the radiation itself, but from the secondary and tertiary effects on the system as a whole. "These can be very significant and are left out of the report," he said. Basdekas was the first to publicly raise the issue of an EMP-nuclear power plant threat at congressional hearings in 1976.

A spokesman for the NRC said that the question of whether or not more research is needed is still "under review and is not resolved."

Interaction of Electromagnetic Pulse with Commercial Nuclear Power Plant Systems by David Ericson, Jr., *et al.* (No. NUREG/CR-3069; SAND82-2738/1&2; Volume 1: Executive Summary, Volume 2: Main Report) is available from the NRC/GPO Sales Program, NRC, Washington, DC 20555 or from the National Technical Information Service, Springfield, VA 22161. The GPO price for Vol. 1 is $4.75 and Vol. 2 is $11.00. An appendix to the main report contains reviewers' comments.

...NAS To Study EMP Threat

The National Academy of Sciences (NAS) has set up a committee to evaluate models which estimate electronic stress and failure due to EMP radiation from nuclear explosions. The Committee on Electromagnetic Pulse Environment of the National Research Council held its first meeting in early February, and is scheduled to issue its report in the summer of 1984.

The committee, which is working under the council's Energy Engineering Board, will determine the reliability of methodologies now used to determine EMP effects and the efficacy of shielding and other protective strategies.

Much of the data for the committee's work is classified, but according to Dr. John Richardson, the study's director at the NAS, "the present thinking is that an unclassified report would make the widest and greatest contribution to the problem."

Members of the committee are: Dr. John Pierce, Professor Emeritus, California Institute of Technology (chairman); Profes-