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EMF-Breast Cancer Link Still Unclear

Low-level electromagnetic fields (EMFs) can reduce the nocturnal release of melatonin in women, according to a new study led by Dr. Scott Davis of the Fred Hutchinson Cancer Research Center in Seattle. While the effect was small, it occurred at milligauss levels and followed a dose-response trend.

Speaking at a breast cancer workshop on November 19, Davis called the results "intriguing" given the "very low level of exposure" which reflects "real-world" conditions. The strongest effect was found among women on medication that also reduces melatonin. Davis was quick to add that the biological significance of the results is "not known at this time."

"This is the first time we are seeing evidence that relatively small changes in magnetic fields at night can be associated with decreases in melatonin levels *that night* among humans living in a normal environment," Davis told *Micro-wave News*.

"It's very provocative," commented Dr. David Blask of the Mary Imogene Bassett Hospital Research Institute in Cooperstown, NY, a longtime melatonin researcher. "These are some of the best data available so far linking EMFs to an important biological parameter that relates to breast cancer."

"The results offer support for one key link in the melatonin hypothesis,"

(continued on p.4)

Swiss Tests Show Wide Variation in Radiation Exposure from Cell Phones

The amount of microwave radiation absorbed by users of 16 different European digital cellular phones varies widely, according to newly released measurements. Swiss television presented these results on October 21, the first time such systematic comparisons have been made public.

The figures were published the next day by the largest newspapers in Sweden and Norway, and by a leading Swiss consumer magazine. The story was also aired on German national television on November 18.

Kassensturz, a Swiss television show on consumer issues, commissioned Dr. Niels Kuster of the Swiss Federal Institute of Technology (ETH) in Zurich to carry out the measurements. Kuster assessed the specific absorption rates (SARs) of microwave radiation from the 16 GSM phones, all with a maximum antenna input power of 0.25 W.

The phones had SARs ranging from 0.28 W/Kg to 1.33 W/Kg (see p.11). All fell within current European and international guidelines, which specify a maximum SAR of 2 W/Kg. Kuster told *Micro-wave News* that two phones of the same model can differ by as much as 30%.

(continued on p.10)

The Talk of San Diego: Last Rites for EMF Research

"It's like a wake," said Dr. Charles Graham when asked to describe the mood at this year's DOE EMF review in San Diego.* Dr. Antonio Sastre, who works with Graham at the Midwest Research Institute (MRI) in Kansas City, MO, used the same simile, with a little embellishment: "A wake where people are not drinking enough."

There were fewer participants, fewer papers and fewer utility staffers in San Diego for what was billed as the last DOE EMF meeting. Some researchers who were unable to find effects have moved on. Many others are disheartened by the handling of the NCI study and the NAS review, as well as the announced end of EMF work at the DOE.

Most of those who had received NIEHS research grants did not even bother showing up. Nonattendees included Drs. David McCormick of the IIT Research Institute, Jeffrey Saffer of the Battelle Pacific Northwest Labs and Jerry Williams of Johns Hopkins University, each of whom won RAPID contracts for more than \$1 million.

Nevertheless, the vast majority of those who did attend the San Diego review believe EMF research should move forward. While the scientists might be discounted as motivated by self-interest, those who will have to pay the bill for future studies agreed with them—or were unwilling to say otherwise in public.

"I never believed that the RAPID program would tell us all the answers," said Leonard Hough of the municipal electric utility in Austin, TX. "The research should continue because our customers want to know if there is a health risk."

Some utilities say they will pay for more studies if their ratepayers give their blessing. "We are very responsive to the concerns of our customers and employees and will take that into consideration," said Michael Herz, the EMF program coordinator at Pacific Gas & Electric (PG&E) in San Francisco.

Citing polling data indicating that 40% of the Canadian public sees a "potential health risk from transmission lines," Dr. Kelly Gibney of BC Hydro in Burnaby, Canada, warned that, "There could be a big backlash if the public feels that this issue is being abandoned."

Clearly, the utilities are of two minds: Although they would be happy to save money, they cannot appear insensitive to public concerns. Richard Loughery of the Edison Electric Institute (EEI), whose members have contributed a large part of the RAPID funds, expressed this conflict. On the one hand, he said, "EEI is not a research organization"; on the other, "My management realizes this issue will not go away."

The funding picture is cloudy due to competition within the utility industry brought on by deregulation, said Dr. Paul Zweicker of Texas Utilities in Dallas, the chair of EPRI's EMF advisory committee. "EPRI will have to market the EMF program to a changing industry," he said. "It will be a challenge." Zweicker pointed out that, while EMFs were once the utilities' num-

ber one research priority, the issue is now ranked behind global warming, toxic air pollutants and ozone and particulate air pollutants.

In the midst of all the anxiety over the future, there were some intriguing new studies that brought home the potential for EMFs to do good as well as harm. As Dr. Theodore Litovitz of Catholic University of America in Washington put it: "The question is not *whether* there are weak EMF bioeffects, but rather *when* they are adverse and when they are beneficial."

Litovitz made his point with an experiment, which he described as "easy enough for a theoretical physicist to do and whose biological relevance would be obvious to a congressman." He showed that an 80 mG, 60 Hz magnetic field can have a lifesaving effect on chick embryos by prompting the synthesis of stress proteins.

MRI's Graham himself has found a highly significant effect on sleep due to intermittent exposure to a 200 mG, 60 Hz magnetic field. Exposed subjects got less sleep and a less effective night's sleep, he reported. "When they woke up, they felt they had slept poorly and felt they were much less well rested than usual," Graham said. He emphasized that sleep is intimately connected with the immune and endocrine systems.

Not even those who reported negative data want the work to stop. Dr. Rosemonde Mandeville of the University of Quebec in Laval, Canada, reported that she had found no increase in cancer among rats chronically exposed to 60 Hz magnetic fields in a multimillion dollar study. "We are making a big mistake closing down research," she said.

At last year's meeting, Mandeville reported pervasive effects of EMFs on the production of ornithine decarboxylase, an enzyme linked to tumor promotion, in her rats. "I believe there are effects at levels down to 20-40 mG that have been demonstrated and repeated," she said. Mandeville noted that within five weeks after the exposures began, the immune function of her rats was disturbed, but the rats adapted to the field. "The animals sense the stressor and adjust," she said.

Many utility representatives, including PG&E's Herz and EEI's Loughery, said that any funding decisions would have to wait until the final report of the RAPID program was completed. "I am not going to prejudge the NIEHS risk assessment," said Douglas Bannerman of the National Electrical Manufacturers Association.

The final report will not be completed for about another year. But Dr. Gary Boorman, who is responsible for the NIEHS work on the RAPID program, was willing to say that, as of now, the research should go on. "It's just getting interesting," he said.

Meanwhile, some are not waiting to see if the utilities or the government will come up with more money. Lobbying is going on behind the scenes to try and restore the DOE's EMF research program, and, at the very least, to make sure that there is enough money for another meeting next November.

Dr. William Wisecup of W/L Associates in Frederick, MD, who organizes the EMF review for the DOE and EPRI, left San Diego sounding a note of optimism. "I've been told to find a site for a meeting next year," he said.

* *Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity*, sponsored by the Department of Energy (DOE) and the Electric Power Research Institute (EPRI), San Diego, CA, November 9-13, 1997.

Multiple Sclerosis Patients Improve with PMF Therapy

Multiple sclerosis (MS) patients have reported improvements in their mental and physical performance after treatment with pulsed magnetic fields (PMFs). Energy Medicine Developments (EMD) in Vancouver, Canada, will now seek Food and Drug Administration (FDA) approval for its "Enermed" therapy and is preparing clinical trials of its efficacy.

The results of the pilot study, which was run double-blind, are "encouraging," said Dr. George Kraft, director of the MS Clinical Center at the University of Washington Medical Center in Seattle. But he cautioned people with MS not to expect PMF therapy to "in any way alter the disease course."

Writing in the *Journal of Alternative and Complementary Medicine* (3, pp.21-29, 1997), Dr. Todd Richards and coworkers report that the PMF therapy had a statistically significant effect on patient-reported physical and mental performance and on patients' brain wave activity. Richards, a radiologist at the University of Washington, has also proposed a mechanism by which PMFs may affect brain and nervous system functions.

Richards told *Microwave News* that he encountered "a lot of skepticism" when he presented his findings to neurologists at *Systems of Care in Multiple Sclerosis*, a conference held in September in Calgary, Canada. Many medical researchers consider the study "wacky," he conceded.

Patients were monitored with an electroencephalograph (EEG) while doing language tasks and while receiving retinal stimulation from a flashing light. In both tests, they had significantly stronger alpha brain waves following PMF exposures.

Richards maintained that the EEG data demonstrate that PMFs do affect brain function. He considers the EEG findings "more astounding" than the performance results.

MS is a chronic, progressive disease of the brain and central nervous system in which a hard plaque forms on the myelin sheath that covers nerve fibers in the brain and spinal cord, interfering with the transmission of nerve signals. The disease leads to speech disorders, impaired vision, cognitive difficulties, muscular weakness, spasticity and paralysis.

Richards measured the endogenous EMFs in the 1-25 Hz range in each subject's head and neck. Then, to compensate for "possible energy deficits," he applied a 50-100 mG field with a pulse width of 1 msec and pulse repetition rates at 4-13 Hz.

Richards noted that prior studies showed that MS patients have low electrical potentials at certain brain frequencies. These deficits, he believes, may reduce the brain's efficiency and disrupt the timing of signals to other parts of the brain and to the rest of the body.

Patients wore a wristwatch-size PMF device on an acupuncture point on the shoulder, back or hip for two months. On the first day, exposures lasted four hours; they increased by one hour on each following day until the units were on continuously.

Richards became interested in the possibility of treating MS patients with PMFs when EMD treated him for migraine with pulsed fields—an application approved for use in Europe and Canada since the 1980s.

In the pilot study, 15 subjects were given an active device

and 15 were given an otherwise identical device in which the magnetic coil was disconnected. Neither the patient nor the physician knew whether a device was active.

Nine of the 15 patients with an active coil reported "major" improvements in their performance, while four reported virtually no change and two reported slight deterioration. As a whole, this group had significant improvements in cognitive function, mobility and vision, as well as reduced fatigue and spasticity.

In the placebo group, three patients reported significant improvements and two reported minimal improvements. Four patients in the placebo group reported no change and six reported a worsening of their symptoms.

Some patients in the active group experienced increased headaches in the first week of treatment, and some placebo patients reported more depression.

Double-blind, clinical trials of the Enermed therapy will begin in early 1998 and will involve approximately 140 patients at three sites, Dr. Martha Lappin, EMD's research director, told *Microwave News*. Results should be available by the fall of 1998.

The Enermed therapy for MS has been in use in Canada since 1995, and approximately 120 patients have been treated there, according to EMD's president, Fraser Lawrie.

EPRI Meta-Analysis Finds Worker EMF-Leukemia Risk

A meta-analysis by the Electric Power Research Institute (EPRI) of 38 epidemiological studies has found "a small but significant elevation in risk of leukemia in relation to... workplace magnetic field exposure." But the EPRI team concludes that the lack of a clear dose-response relationship "substantially detracts from the hypothesis" that EMFs are responsible for the increase.

Dr. Leeka Kheifets, who heads EPRI's EMF health research group in Palo Alto, CA, found a statistically significant 18% increase in risk for workers in electrical occupations.

In the November *Journal of Occupational and Environmental Medicine* (39, pp.1074-1091), Kheifets and four coworkers write that biases internal to each study did not appear responsible for the observed increases in risk. Studies that controlled for many potential confounders showed higher odds ratios for leukemia, they report. On the other hand, "studies with complete work history or measurements of EMF exposure did not produce higher estimates."

To see if there was selective publication of positive results, Kheifets did a second analysis of overall risk, which included unpublished data. The increase in risk was reduced to 10%, but was still significant. The paper cites this as "some evidence of publication bias."

This meta-analysis is similar to one on brain tumors and occupational EMF exposure—conducted by essentially the same group—which found a significant 10-20% increase in risk (see *MWN*, J/F96). The new paper comments: "The 38 leukemia studies in this meta-analysis showed considerably less heterogeneity than the 29 studies of brain cancer."

Drs. Patricia Buffler of the University of California, Berkeley, and Abdelmonem Afifi of the University of California, Los Angeles, also served on the study team.

said Dr. Richard Stevens, who is collaborating with Davis on both the melatonin study and a major epidemiological study of a possible association between breast cancer and exposure to EMFs and/or light-at-night.

First proposed ten years ago by Stevens, the melatonin hypothesis posits that the rise in the use of electric power is partially responsible for increases in breast cancer in Western societies (see *MWN*, J/F87). Stevens is with the Battelle Pacific Northwest Labs in Richland, WA. Dr. William Kaune of EM Factors, also in Richland, is responsible for assessing exposures in both studies.

A Hint of Risk for Some Young Women

At the same November workshop,* Dr. Maria Feychting of the Karolinska Institute in Stockholm, Sweden, reported that women under the age of 50 exposed to 2 mG or more had an 80% greater incidence of breast cancer than did those exposed to less than 1 mG. This result, based on only 15 cases and nine controls, was not significant, according to Feychting. She saw no increased risk among women over 50, or women of all ages combined, who were exposed to 2 mG or more.

When Feychting limited the analysis to women under 50 whose breast cancer was estrogen-receptor-positive (ER+), the relative risk of developing breast cancer jumped to 7.4 among those exposed to 1 mG or more. This result was of borderline significance but included only six cases and one control.

“There is an indication of an increased risk in younger women, especially for ER+ breast cancer,” Feychting said, “but the small numbers make this result unreliable and it may be explained by random error.”

In an interview with *Microwave News*, Feychting called her results for premenopausal women with ER+ breast cancer “inconclusive”: “Our study cannot stand on its own. We need other studies to confirm or refute our results.”

Feychting identified 699 cases of breast cancer among those living in single-family homes within 300 meters of high-voltage power lines in Sweden. The cases came from the same population that she and Dr. Anders Ahlbom used in their landmark childhood leukemia study (see *MWN*, S/O92). There were only nine cases of male breast cancer—“too few to allow a conclusion,” according to Feychting.

Feychting will publish the results next year in *Epidemiology*. Ahlbom also collaborated on the breast cancer study.

Dr. Nancy Wertheimer noted that the pattern of risk observed by Feychting is the same as she saw in her own study of adults living near high-current power lines. In a 1987 paper, Wertheimer and Ed Leeper reported a statistically significant increased risk of breast cancer among women under the age of 55. “Feychting’s study strengthens the idea that there may be an association, but it may be limited to certain types of breast cancer,” she said in an interview.

The results of Davis’s breast cancer epidemiological study—sponsored by the National Cancer Institute (NCI)—were not ready for release at the workshop. “We hope to have some inter-

* *A Workshop on Electromagnetic Fields, Light-at-Night and Human Breast Cancer*; sponsored by the National Action Plan on Breast Cancer, Washington, DC, November 18-19, 1997.

EMFs, Light-at-Night: “Potential” Risk Factors for Breast Cancer

“According to an international panel, electromagnetic fields and environmental light may be considered potential risk factors for breast cancer, based on existing scientific evidence,” declared a press statement issued by ten speakers at the EMF and light-at-night workshop, organized by the Etiology Working Group of the National Action Plan on Breast Cancer.

The statement was signed by: Dr. David Blask, Bassett Research Institute, Cooperstown, NY; Dr. George Brainard, Jefferson Medical College, Philadelphia; Nancy Evans, Breast Cancer Fund, San Francisco; Dr. Charles Graham, Midwest Research Institute, Kansas City, MO; Dr. Cristina Leske, State University of New York, Stony Brook; Dr. Robert Liburdy, Lawrence Berkeley National Laboratory, Berkeley, CA; Dr. Wolfgang Löscher, School of Veterinary Medicine, Hannover, Germany; Dr. John Reif, Colorado State University, Fort Collins; Cindy Sage, Sage Associates, Santa Barbara, CA; and Dr. Louis Slesin, *Microwave News*, New York City.

esting results in three or four months,” Davis said. He noted that the melatonin findings are “clearly relevant” to the breast cancer study.

The melatonin study was supported by the Electric Power Research Institute (EPRI) in Palo Alto, CA. It is an “excellent study,” EPRI’s Dr. Kristie Ebi told *Microwave News*. Ebi said that Davis’s report to EPRI should be available in December.

Davis investigated the influence of magnetic fields and light-at-night, as measured in the bedroom, on the nocturnal secretion of 6-sulphatoxymelatonin in the urine of 200 healthy women over three consecutive nights. The women, whose ages ranged from 20 to 79, with the majority between 40 and 74, were selected from the larger control population of the breast cancer epidemiological study.

A number of factors are known to alter melatonin production in humans: age, alcohol consumption, body weight, darkness-at-night and a variety of drugs, including beta-blockers, calcium channel-blockers and psychotropics. Each of these variables was taken into account in assessing EMF effects.

EMF Effect on Melatonin Strongest with Drugs

Davis found statistically significant decreases in the concentration of 6-sulphatoxymelatonin among women who were exposed to magnetic fields and who took melatonin-lowering drugs. A doubling of nighttime magnetic field exposures led to an 8% decrease in urinary 6-sulphatoxymelatonin. Tripling and quadrupling the magnetic field exposures resulted in 12% and 15% decreases in 6-sulphatoxymelatonin, respectively. The magnetic field effect was also observed among subgroups that would be expected to have lower melatonin due to other factors.

“There was a weaker effect of magnetic fields on 6-sulphatoxymelatonin among women not on drugs, but it was not significant,” said Stevens. “The data did not allow us to reach a conclusion on the nature of a dose-response relationship for this group of women,” he added.

“New England Journal of Medicine” Publishes Responses to the NCI’s EMF Study and Campion’s Editorial

In its November 13, 1997 issue, the *New England Journal of Medicine* published seven letters responding to the National Cancer Institute’s (NCI) study of EMFs and acute lymphoblastic leukemia (ALL) in children by Dr. Martha Linet and coworkers (see *MWN*, J/A97), along with replies from the researchers and from Dr. Edward Campion, who wrote the accompanying editorial, “Power Lines, Cancer and Fear.” Below are excerpts from the exchange, as well as from “Controversial Journal Editorials,” which appeared in the same issue.

Even when the negative results obtained with the use of wire codes to categorize exposure are included in the meta-analysis I originally conducted for the National Academy of Sciences, the combined result is still positive and statistically significant.

—Dr. Daniel Wartenberg, Environmental and Occupational Health Sciences Institute, Piscataway, NJ

It is unclear why the authors highlighted the results of the unmatched analysis [odds ratio=1.24] in the abstract when the results of the matched analysis [odds ratio=1.53] were appropriate.

—Dr. Richard Stevens, Pacific Northwest National Laboratory, Richland, WA

...a statistically significant association was observed for levels ≥ 0.3 μTVery few people are usually exposed to residential magnetic-field levels ≥ 0.3 μT . However, this level might be regularly exceeded among people living close to high-voltage power lines.

—Dr. Patrick Levallois and Denis Gauvin, Centre de Santé Publique de Québec, Beauport, PQ, Canada

...an odds ratio of 1.24 can hardly be considered a negative result, as Campion and the press reported. One must remember that the true odds ratio is just as likely to be 1.79 as it is to be 0.86....many persons would take seriously a 20% increase in their own risk of leukemia....far from laying the issue to rest...recent studies point to the need for additional high-quality studies.

—Dr. Michael Gochfeld, University of Medicine and Dentistry of New Jersey, Piscataway, NJ

...it appears that there is a statistically elevated odds ratio at the level of 0.400 to 0.499 μT : 3.28 in the unmatched analysis and 6.41 in the matched analysis. I looked for an explanation in the text, but there is none.

—Harold Funk, Communications, Energy and Paperworkers Union of Canada, Local 226, Vancouver, BC, Canada

The real qualitative advance of the study by Linet et al. was to obtain measurements within two years of the diagnosis. Perhaps this is why they came almost as close as the Swedish researchers in showing a direct effect of measurements of EMFs.

—Dr. Raymond Richard Neutra, California Department of Health Services, Berkeley, CA

Far from having been wasted, the money spent on this research has yielded important information regarding the apparent lack of a strong association between [EMFs] and childhood leukemia. This information should both help allay the fear and galvanize researchers to pursue new hypotheses.

—Dr. Geoffrey Kabat, University Medical Center, Stony Brook, NY

We did not “summarily dismiss” [the significant odds ratio of 1.72 at exposure levels of 0.3 μT or greater] but mentioned it three times in the discussion section and noted the possibility of an increased risk at such high levels. We tended to discount the increase in our interpretation because of the post hoc nature of the analysis, the inconsistent dose-response pattern (a markedly increased risk at a level of 0.400 to 0.499 μT but no increased risk at a level of 0.5 μT or higher), the absence of a significant trend and the small number of exposed children.

—Drs. Martha Linet and Robert Tarone, NCI, Bethesda, MD, and Dr. Leslie Robison, Children’s Cancer Group, Arcadia, CA

Years ago, on the basis of inadequate data, a premature conclusion that residential exposure to [EMFs] was hazardous and caused ALL was widely publicized. That belief produced the pressures that made the larger studies necessary. We now find that there is little evidence to support such a conclusion, so we really have not learned anything at all about leukemia. It is unfortunate, even irrational, if large amounts of research dollars are spent because of fear and suspicion....

—Dr. Edward Campion, deputy editor, *New England Journal of Medicine*

In the *New England Journal of Medicine*, editorials are always signed by individual authors, and they represent the opinions of the authors alone, not those of the *Journal* itself...[W]e believe that publishing opposing articles on every controversial issue discussed in the pages of the *Journal* would not only be unwise but also tedious....We cannot afford to be too concerned about whether some people or groups will be offended.

—Dr. Jerome Kassirer, editor in chief, and Dr. Marcia Angell, executive editor, *New England Journal of Medicine*, in “Controversial Journal Editorials”

Davis said that he was encouraged by the internal consistency of his results—that is, melatonin levels were lower among those whose age and alcohol and drug use would be expected to reduce melatonin. “It gives us some assurance that the magnetic field effects are real,” he said.

“I think Davis’s results are fascinating, and they suggest that we should look more closely at individual melatonin patterns in humans,” said Dr. Charles Graham of the Midwest Research Institute (MRI) in Kansas City, MO. In his talk at the breast cancer workshop, Graham pointed to a “strange paradox”: researchers see an EMF–melatonin effect in the real world but not in

controlled laboratory exposures (see *MWN*, M/A97).

How important are EMFs in the melatonin equation? Dr. Daniel Kripke of the University of California, San Diego, who also spoke at the workshop, argued that “any effects of light-at-night or EMFs on melatonin would be dwarfed by the drugs in the older age groups, where the incidence of breast cancer is highest.”

Davis agreed that his study shows certain drugs have a greater impact on 6-sulphatoxymelatonin than any other factor. But, he added, “I think it is remarkable that even after accounting for the effect of the drugs, we still see a magnetic field effect.”

« Wireless Notes »

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The British cellular phone industry is facing trouble on two fronts. **MOBILE PHONES GAVE US CANCER** read the headline of a story in *The Express*, a major U.K. tabloid, on September 28. The article profiled financial trader Giovanni de Dominicis and demolition worker Terry Clark, both of whom have developed Hodgkin's disease, a type of lymphoma. Clark, 23, and de Dominicis, 25, blame the disease on their frequent use of cellular phones. "Both me and Giovanni got the lumps just next to our right ears where we held the phones," Clark told *The Express*. In a separate article, *The Express* reported that a number of engineers at **British Telecom** (BT) blame their cellular phones for serious health problems. One BT engineer told the paper that he had been unable to work for the past two years, and that his memory is so impaired that he sometimes forgets his daughters' names. While his co-workers were too frightened to speak out, he said, he wanted to talk—at least anonymously—because "I've got nothing left to lose." Dr. **John Rao**, who has been treating the engineer, told *The Express*, "The only possible explanation is his frequent exposure to the radiowaves from mobile phones." Rao is a psychologist at Luton and Dunstable Hospital in Luton, north of London. The articles came in the wake of British media attention to studies on microwave exposure and memory loss (see *MWN*, S/O97), and appear to be the first press reports in the U.K. to link cellular phones to health problems of specific individuals. In a September 30 follow-up article, **MENACE OF THE MOBILE**, *The Express* stated that health effects of microwave exposure "could have something to do with the pulsing nature of the microwave radiation...emitted by the new digital phones." Many BT engineers have refused to carry or turn on the digital GSM mobile phones which they'd been assigned, according to **Alasdair Philips**, an EMF consultant based in Sutton, Cambridgeshire. He told *Microwave News* that workers say that the company responded by allowing engineers to use older analog models instead (see also p.14). Philips has received over 50 calls from BT employees about health problems and mobile phones. Besides memory impairment, the complaints include anxiety attacks and persistent headaches. "We have had some complaints, and obviously we are looking into them," BT senior press officer **John Moggeridge** said in an interview, but he added that the number of such complaints has not increased. "We take any issue that allegedly affects the health of our people very seriously," he declared, "and as a company we are committed to closely following the research." Moggeridge noted that the U.K.'s **National Radiological Protection Board** (NRPB) maintains that there is "no firm evidence" linking mobile phone use to any health problems. Moggeridge said that while some local supervisors may have allowed the use of analog phones, this did not reflect any national company policy. Philips has now begun a survey on mobile phone health effects. He explained that the issue has been little studied in the U.K., and commented that, "Many users are suffering in silence, or, if they visit their doctor, they are sent to the psychiatric services." The survey is being conducted jointly with a consultant to the National Health Service and with the personal injury law firm of **Leigh Day & Co.** in London, which has been in the forefront of EMF litigation in the U.K. (see *MWN*, S/O97).

Meanwhile, Dr. **John Stather**, deputy director of the **NRPB**, now says that the idea of nonthermal microwave bioeffects must be taken seriously. In the past, the NRPB and other advisory panels held that the only possible harmful effects from microwaves would be those due to heating. But in November, Stather told *Microwave News* that, "A number of studies have been published reporting effects that were not necessarily simply the result of thermal heating." He specifically cited recent work by Dr. **Henry Lai** of the University of Washington, Seattle, which indicated that microwave exposure could interfere with the learning abilities of rats. "In the specific case of possible effects on behavior," Stather cautioned, "the studies that have been reported are not representative of human exposure conditions arising from the use of mobile phones and, therefore, effects on memory and other brain functions in people using mobile phones, under normal conditions of use, are not expected." But he added that the NRPB believes more research is needed in this area, including replication of reported nonthermal effects. Stather noted that the NRPB supports the proposed **European Commission** research project on cellular phone health effects, which is still awaiting funding (see *MWN*, M/A97 and J/A97).

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On its cover last February, *Consumer Reports* posed the question, **CELL PHONES: DO YOU REALLY NEED ONE?** It promised to tell readers "how to decide"—but made no mention of possible health effects (see *MWN*, M/A97). Now the magazine has broken its silence: A November article comparing different models of cellular phones includes a sidebar titled **THE HEALTH ISSUES**. *Consumer Reports* notes that "scary news stories in 1993" raised the cancer question, but also points out that there have been few studies specific to cellular phones. The magazine reports that "a few studies suggest that there may be an association between exposure to RF energy and some kinds of cancer," but concludes that "there is no convincing evidence to date of any causal connection." Those who want to be cautious anyway, it suggests, can use a plug-in headset, which puts distance between the user and the phone's antenna. The brief sidebar also deals with driver safety and interference with cardiac pacemakers.

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The **Swedish Work Environmental Fund** is sponsoring a new epidemiological study on cellular phone radiation and brain tumors. Dr. **Lennart Hardell** of the Örebro Medical Center is working with a team of researchers that includes Dr. **Kjell Hansson Mild** of the National Institute for Working Life in Umeå. They will survey approximately 600 brain tumor patients and 600 controls on their history of cellular phone use. The cases will be drawn from among the 1,500 people expected to be diagnosed with brain tumors in central Sweden in 1997-98. "Only living cases with histopathologically confirmed brain tumors will be included," Hardell told *Microwave News*, explaining that this will increase the study's accuracy. Exposures will be assessed by questionnaires and, if necessary, supplemented by phone interviews.

Three other studies are already under way—all initiated after David Reynard charged in 1992 that his wife's fatal brain tumor was caused by her cellular phone. At a congressional briefing in February 1993, the **National Cancer Institute** (NCI) announced plans for a five-year study of brain tumors that would examine the cellular phone link (see *MWN*, J/F93). The NCI's Dr. **Martha Linet** said data collection should be completed by September 1998, but that results will not be published before late 1999. Meanwhile, the **American Health Foundation** (AHF) is in the midst of a study similar to the one in Sweden, involving 500 brain tumor cases and 500 controls. The AHF effort, funded by WTR, should be completed in about six months (see p.8 and *MWN*, J/A96). In another WTR study, **Epidemiology Resources Inc.** (ERI) announced some "preliminary findings" last year, indicating that hand-held phones were not linked to an increase in overall mortality among 256,000 cellular phone customers. At the time, however, ERI said that it could not draw firm conclusions because it had not examined cause of death. This October—after a delay of over a year and a half due to funding difficulties—ERI began the study's second phase, in which it will analyze both mortality and cause of death among more than a half-million hand-held and car phone users (see below and *MWN*, M/J96). ERI plans to publish results by next fall.

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Rep. **Edward Markey** (D-MA) is again asking questions about cellular phone safety. In a November 21 letter, Markey requested that the **FDA** report on its "ongoing oversight of this issue," re-

iterating his view that "it is incumbent upon the government" to ensure that there is enough research to assess potential health risks. The letter lists a number of detailed questions, including one as to whether the FDA agrees with the Harvard Peer Review Board that the industry-funded research group, **WTR**, should release the audits of its spending (see p.9). Last April, in response to an inquiry from Markey, the FDA said that research proposed by WTR "should provide part of the answer" to the safety question. At that time, a Markey aide told *Microwave News* that the congressman was unwilling to commit federal funds to the effort (see *MWN*, M/J97). Markey, the ranking Democrat on the House telecommunications subcommittee, requested that the FDA respond to his latest questions by December 19.

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Mohamed Al Fayed, owner of the British department store Harrods, is contesting a decision to permit a mobile phone tower near his estate in Oxted, Surrey, outside of London. On December 1, a judge allowed Al Fayed to challenge a local planning board ruling on the 70-foot tower, but rejected a request to halt construction while the case is pending. Al Fayed's solicitor, Alan Meyer of Halsey Meyer Higgins in London, views the case as an opportunity to air concerns about the potential health risks of cellular antennas, according to the December 2 *Daily Telegraph*. The *Telegraph* reported that Al Fayed is himself a wireless phone user, but that, Meyer said, he "believes in helping his community." Al Fayed's son, **Dodi**, was courting **Princess Diana** before they both died in a car accident in Paris last summer.

Victories for Industry in Cellular Phone Litigation

In November, the U.S. cellular phone industry prevailed in one lawsuit and won a partial victory in another. Plaintiffs withdrew the *Rittmann* brain tumor lawsuit in Texas. In Illinois, four of five counts were dismissed in the *Busse* suit, which charged industry with illegally using consumers as research subjects.

"These developments...should further dispel the cloud some have tried to cast over the safety of cellular telephones," said Norman Sandler of Motorola, a company which was a defendant in both cases. Sandler declared that there is "a sound, scientific basis for confidence in the safety of wireless technologies."

The *Rittmann* suit was filed in August 1995 by the family of Dean Vincent Rittmann Jr., a physician who died of a brain tumor in 1994 (see *MWN*, M/J96). Besides Motorola, defendants included Ericsson and service provider Cellular One. Attorneys for both companies did not respond to requests for comment, and the *Rittmann* family's lawyers at O'Quinn & Laminack in Houston also did not return repeated phone calls. John O'Quinn is one of the most prominent attorneys representing plaintiffs in litigation over the safety of breast implants.

According to Sandler, 12 cellular phone actions have now been rejected or withdrawn in the U.S. The only cases still known to be active are *Busse* and the brain cancer suit filed by former Motorola engineer Robert Kane (see *MWN*, J/F94 and S/O97).

Filed in October 1995 in Cook County Circuit Court, the *Busse* suit accused the wireless industry of conducting illegal human

testing on cellular phone health effects (see *MWN*, J/F96 and M/J97). Lawyers cited an epidemiological study that Epidemiology Resources Inc. (ERI) in Newton Lower Falls, MA, is conducting for WTR, the industry's research group, and the fact that the phones were marketed without any health warnings.

In November, Judge Ellis Reid dismissed the charge that lead plaintiff Jerald Busse and others were exposed to potentially harmful microwave radiation from their cellular phones. The judge also dismissed three related claims, but allowed the one count that Busse's attorneys say is central to their case.

"The court upheld the invasion-of-privacy count," attorney Ben Barnow of Barnow & Goldberg in Chicago, told *Microwave News*. "This vindicates the position of the plaintiffs," Barnow asserted. "Every defendant was kept in—CTIA, ERI, WTR, Ameritech and Motorola." Busse is challenging the use of telephone billing records and medical information in the ERI study.

"The question of invasion of privacy is the key issue underlying everything," Dr. Nancy Dreyer, president of ERI, said in an interview. "They're challenging the idea that industry should be able to study the safety of its products." Dreyer argued that such studies are standard in the pharmaceutical industry.

The cost of ERI's defense "is into six figures," said Dreyer, "and none of it's being borne by the industry. WTR is picking up zero." She added that, "If I wasn't already this far down the line, I'd have to seriously consider whether to take on this research without any protections." In her 18 years of research, Dreyer stated, "This is the only instance where the sponsor has taken such a hands-off position." WTR would not comment.

Cell Phone Industry's Research Group Lowers Its Sights: WTR Drops Plans for Chronic Exposure Animal Studies

The wireless industry's research group has announced that it will not carry out any long-term animal studies. "The funding level currently committed by the industry...will not allow for extensive subchronic nor whole-life animal studies," Wireless Technology Research (WTR) declared on November 3.

The announcement represents a major retreat from WTR's previously announced goals. Its 1994 research agenda called for a series of chronic studies with rodents, in which the animals would be exposed over their entire life span of about two years. A WTR report in 1995 predicted that these long-term studies would be completed by the end of 1997 (see *MWN*, S/O95). WTR later committed itself to additional, subchronic experiments, which would expose the animals over a 90-day period.

"Given the lack of funds available to WTR to finish this work," the statement continued, "it is up to the government and the industry to work out how they wish to resolve this issue."

WTR is funded by the Cellular Telecommunications Industry Association (CTIA), which in 1993 pledged that the industry would contribute \$25 million for health research. Last spring, "the CTIA told us that the last set of payments we would provide was going to be used for these lifetime rat studies," said John Madrid, Toshiba's representative to the CTIA committee on research funding (see p.14).

WTR's decision runs counter to recent advice from the Food and Drug Administration (FDA). In a March letter to WTR chair Dr. George Carlo, the FDA's Dr. Elizabeth Jacobson urged that lifetime animal studies "should be given highest priority" with WTR's remaining funds. But WTR now says that Carlo believes

animal studies are of limited value.

"We're not in a position to tell WTR what to do," Dr. Mary Beth Jacobs of the FDA's Center for Devices and Radiological Health (CDRH) told *Microwave News* from her office in Rockville, MD. In fact, WTR is following very little of the FDA's advice. The FDA's March letter also called on WTR to study the interaction of cellular phone radiation with chemical carcinogens, and to look at other possible health problems besides brain cancer, such as eye damage (see *MWN*, M/A97). Neither of these issues is addressed in WTR's plans for its last two years of work.

Susan O'Donnell, WTR's public affairs manager, declined to elaborate on the press statement, and said that Carlo is not doing any interviews. "He wants to focus on the work that needs to be done, rather than on talking to the media," she explained.

WTR still plans to complete two epidemiological studies, as well as carry out some *in vitro* genotoxicity work and a follow-up to the Lai-Singh experiments, in which rats were exposed to microwaves for just a few hours.

WTR's Peer Review Board (PRB) has asked WTR to revise its 1994 research agenda and make no further commitments of research funds until the revision is completed. The PRB, based at Harvard University's Center for Risk Analysis in Boston, explained in a July 15, 1997 letter that this was needed "to enhance the scientific integrity of WTR," and predicted that a revised agenda could be drafted in a matter of weeks.

While the Harvard letter did not specify what kind of changes the PRB wants to see, it did urge that WTR increase its support for epidemiological studies (see also p.6). The PRB particularly

George Carlo's Many Projects: From Dioxin to Breast Implants

Dr. George Carlo's role as head of WTR will end in 1999. But Carlo will not be out of a job, for WTR is just one of his many projects. Carlo's consulting firm, Health and Environmental Sciences Group Ltd. (HES), has also been working on breast implants, air pollution and tobacco.

Before WTR, HES was perhaps best known for its work on the dioxin issue. The Chlorine Institute hired Carlo as a \$150-an-hour consultant as part of its effort to relax federal restrictions on the chemical. Carlo prepared a report which contended that an industry-sponsored scientific conference had reached a consensus that dioxin causes no damage below a certain "threshold" level. But there was no such consensus, as the Chlorine Institute later had to admit. The *Wall Street Journal* (February 20, 1992) described Carlo's attempt to control the message as part of "a well-financed public-relations campaign."

Carlo shares the decision-making at WTR with Dr. Ian Munro, head of the Canadian toxicology consulting firm CanTox in Mississauga. As reported in *Science* magazine (July 9, 1993), CanTox has also been employed by the Chlorine Institute, producing reports which argue that the dangers of chlorine compounds have been exaggerated.

Today the wireless industry is not Carlo's only patron: He is also director of the "Breast Implant Public Health Project" (BI-

PHP), which shares the same phone number with HES and WTR. Founded last year, the BIPHP has received \$1.3 million from Dow Corning Corp. of Midland, MI. The BIPHP is dealing with problems like scar tissue and causes of implant rupture, and the project states that "at this time" it will not address the controversy over the risk of systemic disease.

HES is also working on airborne particulates and ozone, both subjects of intense industry lobbying. An Environmental Protection Agency proposal for stricter standards "is not only inconsistent with scientific and medical data, but runs contrary to the tenets of public health protection," according to a paper that HES will present at the *Annual Meeting of the Society for Risk Analysis* December 10 in Washington. "Nobody's given us any money for this," said HES' Susan O'Donnell. She explained that the paper was prepared in response to interest from a Washington consultant.

Last summer, HES provided staff for an advisory committee, cochaired by former Surgeon General Everett Koop and former FDA Commissioner David Kessler, that reviewed a proposed settlement of lawsuits against tobacco companies.

Carlo also teaches at "The Carlo Institute." Among the topics covered in a recent six-session, \$650 course were "Media Relations" and "Effective Management of Research Funds."

How Has WTR Spent the CTIA's Research Money?

When WTR's funding runs out, much of the work proposed in its 1994 research agenda will remain undone. WTR has argued that it was simply not possible to move any faster. Indeed, WTR chair Dr. George Carlo recently said on Canadian television that, "We are moving at the speed of light" (see p.14).

A different point of view was expressed by John Madrid, Toshiba's representative to the CTIA committee that deals with research funding: "The bottom line is, a lot of money was collected and not very much research got done." In the future, Madrid said, "I wouldn't give the CTIA or WTR a plugged nickel. I don't think either of those organizations has properly managed the money given to them for health research. I don't know what they've done with more than \$20 million."

WTR's Peer Review Board (PRB), based at the Harvard Center for Risk Analysis, has urged Carlo to reveal details about WTR's finances. In a July 15 letter, the PRB specifically asked WTR to release its audited financial statements. But WTR rejected the idea.

In its November 3 press statement, WTR declared that, "All required [financial] procedures have been followed by both WTR and the industry, and both parties remain satisfied." It explained that:

The large amount of work done by WTR in preparation for *in vitro* and *in vivo* experiments was [necessary]....New systems were invented and existing systems were modified based on tedious scientific study....Cash flow problems resulting from the dispute with CTIA about legal expenses slowed some work, but the essence of the WTR program has remained intact throughout.

According to the CTIA's Tim Ayers, an audit of WTR is done annually by Deloitte & Touche, and copies are provided to WTR and to the CTIA's CEO Council. Ayers argued that there was no need for anyone else to see it: "It's been delivered to the people who pay the bucks, and they're satisfied."

But Madrid said that the audit may not have addressed the main issues—"where was the money spent, what kind of research did they do and how much did it cost? I'm satisfied that they probably did the accounting, but that's meaningless if WTR didn't get the job done. And the CTIA has to share the blame for that."

WTR has consistently declined to provide the financial details of its outside research contracts. *Microwave News* asked for this list in May 1996 and again this November, as did the PRB in July. WTR has refused every time. "If they do eventually account for it all," said Madrid, "I think you'll find that several million dollars were spent on research," he said. "But what happened to the rest of it?"

The other unanswered question is what will happen to the unfinished portion of the WTR research agenda. When the agenda was released in 1994, then-CTIA vice president Ron Nessen commented, "It's probably going to take more than \$25 million. The industry has said that it will spend whatever it takes" (see *MWN*, S/O94). But this November, CTIA spokesperson Tim Ayers would say only, "Our commitment is to provide the remainder of the \$25 million." Ayers told *Microwave News* that any decision on further funding of health research "will be reviewed at a future time—whether or not we do it, as well as in what way to do it."

Postponing that decision worries the PRB. Its July letter declared that, "The PRB is concerned that industry has not come forward with a plan to support a continued program of health research" after WTR's funding ends.

Dr. John Graham, head of the Harvard Center for Risk Analysis, would not reveal how much money the center has received from WTR for the work of the PRB. The center's Dr. Susan Putnam told *Microwave News* that Graham and Harvard University feel that, "It's not a government grant, and they see no reason why it should be publicized."

objected to WTR's decision "not to fund several highly rated epidemiologic case-control studies of phone users." Five of the PRB's 12 members are epidemiologists, while a sixth—Dr. Gary Williams of the American Health Foundation in New York City—works for an organization that is conducting a half-million dollar epidemiology project for WTR. (Carlo is an epidemiologist as well.)

No contracts have yet been signed for any short-term WTR animal studies. Drs. Henry Lai and N.P. Singh of the University of Washington, Seattle, met with WTR representatives on November 24 at the City of Hope National Medical Center in Duarte, CA, to discuss replication of their experiments showing increases in DNA breaks in the brains of rats after two hours of exposure to microwave radiation (see *MWN*, N/D94, N/D95 and M/J96).

When WTR's research agenda was unveiled in 1994, Carlo said that genotoxicity studies would be under way "with checks signed" by the end of that year.

In vitro work is finally about to begin, at Integrated Laboratory Systems (ILS) in Research Triangle Park, NC. ILS' Dr. Ray Tice said that after fine-tuning the exposure system, researchers

are scheduled to do dry runs in November, with the first experiments following in December.

WTR is also considering a set of short-term studies with transgenic mice—animals genetically altered to be prone to cancer. In theory, this susceptibility makes it possible to obtain useful results in less time. But, in some cases, the incidence of cancer among controls can vary widely, which makes it difficult or impossible to detect weak effects (see also *MWN*, M/A97).

These and other issues on the use of transgenic animals will be discussed at a WTR scientific workshop in early 1998, at which "the fate of transgenic mouse studies...will be decided," WTR stated on November 3. "We are very supportive of the workshop," Dr. Russell Owen, chief of the CDRH's Radiation Biology Branch, told *Microwave News*.

"WTR projects that the results of more than 30 WTR-sponsored *in vitro*, *in vivo* and epidemiology studies will be released between February 1, 1998, and June 30, 1999," the November 3 statement declared. When asked for a list of the 30 studies, WTR refused to provide one, but revised the number downward to about 25.

Some models have high SARs because their designs place the antenna close to the user's head. According to Kuster, this was true of the Philips and Ascom models. Phones with shorter antennas also tend to have higher SARs, since this concentrates the radiation in a smaller area.

Motorola's tiny StarTac, with an antenna directed away from the head, had the second-lowest SAR. The phone with the lowest SAR of all is made by a little-known German manufacturer, Hagenuk. The antenna of the Hagenuk GlobalHandy is built into the handset, and is shielded to minimize the amount of radiation directed towards the user's head (see *MWN*, S/O97).

"We are satisfied that the reported test results confirmed what consumers deserve to know," said Norman Sandler, Motorola's director of global strategic issues. "All of the phones in question meet recognized safety standards that are accepted around the world as adequate safeguards of public health."

The Swedish Mobile Telecommunications Association, known by the Swedish acronym MTL, emphasized that, "There is...no evidence today that normal use of mobile phones presents any risk to public health." The MTL added that while cellular phones connect with a base station at maximum power, they are then turned down to the lowest power needed for a clear signal.

"For particularly sensitive people," the MTL conceded, "it is known that some discomfort may occur. A mobile phone can then be equipped with a portable 'hands-free' device, with an ear-piece and a microphone," so that the phone and its antenna can be placed farther from the user. "In many cases this helps," stated the MTL. "If problems persist, a doctor should be contacted."

Bo Albertsson, spokesperson for Ericsson, a major cellular phone manufacturer, told *Aftonbladet* that Ericsson has no plans to develop lower-radiation phones. "But if consumers see this as an important issue," he added, "then we would have to begin to think about this differently."

"Most manufacturers don't give priority to reducing radiation exposure," wrote *Aftonbladet's* Christofer Fager. "They go in for design—for example, to make the phone as thin as possible." The Swiss consumer magazine *K-Tip* pointed out that the phone with the highest SARs, made by Ascom, comes from a company that has won design awards—but owns no radiation-testing equipment. Kuster told *Microwave News* that manufacturers see the antennas as "an annoying accessory." They are purchased from subcontractors for no more than a dollar each, he said.

The Olé antenna, a Swedish design in which the antenna comes out of the bottom of the phone and extends away from the user's head, was featured in the October 29 *Aftonbladet*. The paper ran a photo of Dr. Kjell Hansson Mild of Sweden's National Institute for Working Life in Umeå using a phone with an Olé antenna. THE DANGER RAYS ARE ALMOST COMPLETELY REMOVED, a headline explained. The concept is similar to a design patented by Hitachi in 1991 (see *MWN*, N/D96).

Controversy over SARs and phone safety was touched off in Europe this summer when Hagenuk launched an ad campaign with the slogan, "Low radiation is better" (see *MWN*, S/O97). Now the company says it has been subjected to pressure and threats from the rest of the wireless industry. "Networks and service providers have fought hard against our position," Hagenuk's Detliv Driemeier wrote to *Aftonbladet*. "Since we are dependent on

What About U.S. Phones?

All phones tested by Kuster for Swiss television complied with European and international exposure standards. But simple calculations suggest that analog phones of the same design would violate U.S. limits.

U.S. analog cellular phones have a maximum antenna input power of 0.6 W. If the 0.25 W phones tested by Kuster were operated at 0.6 W, this would result in significantly greater SARs—2.4 times higher.

In addition, under FCC rules, SARs are estimated in a way that is stricter than under European standards: SARs are determined by averaging the energy absorbed over 1 g of tissue, instead of 10 g. This change increases SARs by about 50%.

Thus, if the phones tested by Kuster were operated at 0.6 W, and their SARs were averaged over 1 g of tissue, most would exceed the FCC's 1.6 W/Kg standard. The SARs of two models would be three times the level allowed by the FCC (see table, p.11).

Kuster confirmed that SARs increase linearly with increasing power, but added that they can also be affected by the configuration of the electronics, the casing of the phone and other factors. "To get more than a very rough estimate," he cautioned, "you would have to measure the phones."

Dr. Quirino Balzano of Motorola in Plantation, FL, argued that extrapolating SARs from Kuster's measurements to other phones could be misleading. "because the guts of the radio in Europe can be very different."

"For the Motorola StarTac," Balzano told *Microwave News*, "I've seen both the U.S. and European models and they are about the same." For this phone, he said, such an estimate would probably be acceptable, but for others it might not be.

Kuster measures phones in up to 16 positions (see notes to table at right). "To me, this is an unnatural way of testing," said Balzano. "In real-life use, the numbers would be lower." He noted that in the U.S., the FCC calls for testing phones only in the normal position—directly alongside the ear and mouth. SAR figures for both the Hagenuk and StarTac phones would be similar under either testing protocol, he said, "but I think the other phones are getting a bit of a shaft."

"If you watch someone using a cell phone, you'll see that they move the phone around," argued Kuster, "and small shifts can have a big effect." He described one prototype antenna with an SAR of 0.2 W/Kg in the standard position, but 3.5 W/Kg when tilted towards the head by only 20°. "The tests reflect real-life use, not the 'worst-case' position, which would result in much higher SARs," he said.

these market structures, we bowed to the pressure and pursued a toned-down ad campaign."

"I feel threatened by representatives of the industry," Hagenuk's Swedish representative told the paper. He complained that Arvid Brandberg of the MTL called to put pressure on him as soon as the Hagenuk ad campaign began. "It's scandalous that people still try to conceal the radiation levels," he added. Brandberg did not respond to a request for comment.

"Parts of the industry are run by lawyers who don't want SAR results to be published," Kuster said in an interview.

K-Tip told its readers about recent Australian mouse experi-

Ranking Mobile Phones: Radiation Absorbed by the Human Head

Manufacturer & Model No.	Antenna Type*	Measured SAR (W/Kg)		Estimated SAR (W/Kg)		Antenna Efficiency [†]	Price (SwFr [‡])
		0.25 W Antenna Input Power Averaged over 10 g		0.6 W Antenna Input Power Averaged over 10 g Averaged over 1 g			
Hagenuk GlobalHandy	B	0.28	0.7	1.0	83	379	
Motorola StarTac	D	0.33	0.8	1.2	41	1,190	
Sony CM-DX1000	D	0.41	1.0	1.5	98	379	
Nokia 8110i	H	0.73	1.7	2.6	39	719	
Motorola d160	D	0.81	1.9	2.9	∅	289	
Sony CMD-Z1	D	0.88	2.1	3.2	100	789	
Ericsson GF788	H	0.91	2.2	3.3	50	849	
Ericsson GH688	H	0.95	2.3	3.4	55	599	
Panasonic EB G500	D	0.98	2.3	3.5	98	589	
Sharp TQ G700	D	1.01	2.4	3.6	80	499	
Philips Genie	D	1.05	2.5	3.8	28	998	
Nokia 1611	H	1.06	2.5	3.8	67	319	
Philips Diga	H	1.06	2.5	3.8	44	379	
Ascom Axento	D	1.25	3.0	4.5	72	590	
Bosch M-COM 906	D	1.32	3.2	4.8	61	639	
Ascom Elisto	H	1.33	3.2	4.8	28	299	

* Antenna types: B—Built-In; D—Dipole; H—Helix †Relative scale: Sony CMD-Z1=100 ‡ 1 SwFr ≈ \$0.68 ∅=Not measured

The first column of SARs shown above were measured in Dr. Niels Kuster's Laboratory for EMF and Microwave Electronics at the ETH in Zurich, Switzerland. They were first released on the Swiss television show *Kassensturz* on October 21. The following day, they appeared in the Swedish tabloid *Aftonbladet* and the Norwegian newspaper *Verdens Gang*. *Aftonbladet* also listed the efficiency of each of the antennas, which are reproduced here on a relative scale. According to Kuster, these efficiencies are not very accurate (see article below).

Each phone was tested in up to 16 different configurations, as specified by the European standards group CENELEC: with the phone placed on the right and left sides of the mannequin's head in each of four different positions (see *MWN*, S/O97) and, when appropriate, with the antenna extended and collapsed. After identifying the configuration with the highest SAR, Kuster then measured two other phones of the same model in that configuration. The SARs presented in the first column above are maximum values: the average of these three measurements plus the standard deviation.

The measurements reflect the maximum SAR for 90% of users, including children, with a precision of better than ±25%, with a repeatability of ±5%. (See N. Kuster et al., "Dosimetric Evaluation of Hand-Held Mobile Communications Equipment with Known Precision," *IEICE Transactions on Communications*, E80-B, pp.645-652, May 1997. The journal is published in Japan.)

All the phones tested were digital GSM units operating at 900 MHz, with a nominal maximum antenna input power of 0.25 W (time-averaged). In the U.S., analog hand-held phones operate at up to a maximum of 0.6 W. Included above are *Microwave News*' estimates of SARs for this higher operating power. These were calculated with a simple linear transformation: The SARs at 0.6 W are 2.4 times those at 0.25 W.

Kuster measured SARs averaged over 10g of tissue, as specified in European standards, which limit SARs to 2 W/Kg. In the U.S., the FCC follows the ANSI/IEEE guidelines, which specify averaging SARs over 1g, and a maximum SAR of 1.6 W/Kg.

The SARs averaged over 1g were also estimated by *Microwave News*. The 1g values presented here are 50% higher than the 10g values. (See Volker Hombach et al., "The Dependence of EM Energy Absorption upon Human-Head Modeling at 900 MHz," *IEEE Transactions on Microwave Theory and Techniques*, 44, pp.1865-1873, October 1996, especially figures 14 and 15. See also Klaus Meier et al., "The Dependence of Electromagnetic Energy Absorption upon Human-Head Modeling at 1800 MHz," *IEEE Transactions on Microwave Theory and Techniques*, 45, pp.2058-2062, November 1997, especially figures 5 and 6. Both papers are from Kuster's lab.)

ments linking cell phone radiation to an increase in cancer (see *MWN*, M/J97). But, the magazine commented, "as long as there is no conclusive evidence, [the industry] wants to continue to profit from the worldwide boom in cellular phones."

Kuster's measurements were carried out with a robot-controlled probe inside a fiberglass model of a human head filled with fluid to mimic the electrical properties of living tissue. His system is used by over 30 labs around the world, including those of Ericsson, Motorola and Nokia.

Aftonbladet also published figures for the "antenna efficien-

cy" of each phone, which compare the amount of power actually transmitted (see above). "These were unofficial numbers and *Aftonbladet* was told not to publish them," Kuster angrily told *Microwave News*. The newspaper got these figures by photographing charts left posted in Kuster's lab. "They are not reliable since we couldn't measure the full three-dimensional radiation pattern," Kuster said. "Nevertheless, this is an important factor since phones use the lowest power needed to communicate with the base station," he added. "The most efficient phones will thus transmit at a lower power."

Toler Microwave Mouse Study: Some Answers, New Questions

Dr. James Toler's mouse study shows no evidence that chronic exposure to low-level microwave radiation promotes cancer, Toler and his U.S. Air Force (USAF) sponsors conclude in the September issue of *Radiation Research*. Inconsistencies between Toler's 1994 report to the USAF and the published paper raise new questions, however, about the interpretation of the study's tumor data.

According to the paper in *Radiation Research* (148, pp.227-234, 1997), the study found "no evidence to suggest" that exposure to 435 MHz radiation affected tumor incidence, tumor onset and growth, or cancer-related mortality among the test animals, which were infected with a virus that induces breast cancer tumors. That conclusion echoes the assessment that Toler, then at the Georgia Institute of Technology in Atlanta, reported to the USAF in June 1994.

Like Toler's report, the paper notes that mammary tumor onset occurred earlier among the exposed animals than among the unexposed controls. Both the report and the paper conclude, however, that the difference ($p=0.09$) is due to chance.

Interestingly, the published paper ignores a statistically significant ($p=0.03$) excess incidence of hemangioma, a benign blood vessel tumor, among the exposed mice. Toler noted the difference in his report to the USAF, but James Merritt and his coworkers at the Armstrong Lab at Brooks Air Force Base in San Antonio omitted this fact when they prepared the paper for publication.

The detailed pathology data, obtained by *Microwave News* but not presented in either Toler's report or the new paper, show that exposed animals with hemangioma outnumbered controls nine to two. Toler maintained in his report that there is no excess incidence if benign tumors are combined with malignant blood vessel tumors (hemangiosarcoma).

The benign and malignant forms of the disease differ greatly, however, Dr. Ted Gansler, a pathologist at the American Cancer Society's national office in Atlanta, told *Microwave News*.

Neither Toler nor Merritt responded to repeated requests for comment. Toler has retired from Georgia Tech.

The data also show that 14 mice in the control group developed hemangiosarcoma, as compared to seven in the exposed group. Toler's report did not indicate whether this difference in malignant tumor incidence is statistically significant, and the USAF is silent on the question.

The paper notes a statistically significant ($p=0.03$) excess incidence of benign "epithelial stromal" tumors in the ovaries of the exposed mice—a finding not cited in Toler's report. Gansler, however, found that tumor classification peculiar. He explained that it combines two types of ovarian tumors that ordinarily are kept separate—epithelial and stromal—since each type corresponds to a different tissue of origin.

Dr. Michael Stedham, the pathologist who conducted the tissue analysis for Toler and the USAF and a coauthor of the *Radiation Research* paper, told *Microwave News* that the "epithelial stromal" nomenclature is indeed commonly used. Stedham, formerly of Pathology Associates International in Frederick, MD,

is now a consultant based in Washington state.

The paper maintains that the incidence of these ovarian tumors, whether stromal or epithelial, can be combined with that of other ovarian stromal tumors, whereupon the difference between the exposed animals and the controls disappears, as with the incidence of benign and malignant blood vessel tumors.

Beginning in March 1989, Toler exposed 200 female, mammary tumor-prone mice to 435 MHz radiation pulsed at a rate of 1 kHz and with a pulse width of 1 μ sec. According to the paper, the frequency and modulation were "chosen to investigate the possible bioeffects of a USAF surveillance tracking radar system (PAVE PAWS)," which is "capable" of emitting such a signal. The intensity of the radiation was 1 mW/cm², resulting in an average specific absorption rate (SAR) of 0.32 W/Kg. The mice were exposed for approximately 22 hours a day, seven days a week for 21 months, concluding in December 1990.

The USAF released Toler's report to *Microwave News* in April 1996 under the Freedom of Information Act, after denying its existence for almost a year (see *MWN*, M/A97).

The three-year interval between the report's submission to the USAF in 1994 and publication of the paper is shorter than the delay in the publication of Dr. Bill Guy's long-term microwave exposure study of rats. Guy reported his study to the USAF in 1985, but it did not appear in a journal until 1992 (see *MWN*, J/A84, Mr85 and J/F93). That report remains one of the most controversial in the microwave bioeffects literature. The USAF and Guy have long maintained that it shows no microwave-cancer link, while others, including the FDA, see the study as indicating enhanced cancer promotion by microwave radiation (see also p.18 and *MWN*, N/D86 and M/A97).

Push To Overturn Federal Preemption of Antenna Siting

Momentum is building for an end to federal preemption of state and local authorities on the siting of wireless antennas. Bills have been introduced in Congress and petitions filed in federal courts to restore local control.

On October 30, Sen. Patrick Leahy (D-VT) introduced a bill (S.1350) that would reverse parts of the 1996 Telecommunications Act to allow communities to adopt stricter rules for public exposure to radiofrequency and microwave (RF/MW) radiation from cellular transmitters. Leahy's target is the act's federal preemption clause, under which state and local officials cannot include RF/MW health considerations in siting plans, provided antennas comply with the FCC's limits (see *MWN*, M/A96).

"I do not want Vermont turned into a giant pincushion" with antennas "sprouting on every mountain," Leahy told the Senate on introducing S.1350. Rep. Bernie Sanders (I-VT) is sponsoring a similar bill (H.R.3016) in the House of Representatives.

The wireless industry has moved quickly to quash the initiative. "This approach is not the right one," the CTIA's Jeff Nelson told *Microwave News*. Jay Kitchen, president of the Personal Communications Industry Association (PCIA), went further, describing S.1350 as "the most anticonsumer plan to come out of Washington in years."

Leahy's bill also prohibits federal preemption for the siting

of digital television (DTV) transmitters. Last summer, the FCC asked for public comment on a proposal, put forward by the broadcasting industry, to deny states and localities a say in DTV antenna siting (see *MWN*, S/O97). In a letter to President Bill Clinton, Vermont's Democratic Gov. Howard Dean warned that the proposal would "eviscerate state land use control law."

As to the Leahy and Sanders bills' chances in Congress, the CTIA's Nelson said that there is "no great concern that they will go anywhere." S.1350 must pass through the Commerce Committee, chaired by John McCain (R-AZ). Pia Pialorsi, the committee's press officer, told *Microwave News* that McCain "does not believe it is the answer" to the antenna siting problem.

Meanwhile, in several different actions in November, cellular activists, local officials and organized labor asked federal appeals courts to set aside the FCC's rules on RF/MW exposure and issue interim rules "sufficient to protect the environment and public health" while the FCC develops a new standard.

The Ad Hoc Association of Parties Concerned About the FCC RF Health and Safety Rules filed petitions in Washington and San Francisco on November 12. David Fichtenberg, a critic of the FCC's RF/MW rules based in Olympia, WA, organized the group (see also *MWN*, M/J97).

The petitions contend that the FCC's RF/MW rules are "arbitrary" and that the FCC does not require sufficient proof of compliance (see *MWN*, S/O97). John Schulz, an attorney based in San Rafael, CA, who is representing the petitioners, maintains that the FCC's science review for the RF/MW rules is flawed because the commission ignored the EPA's advice to include findings on nonthermal effects (see *MWN*, J/F94). "That's a pretty interesting position for the FCC to take," Schulz told *Microwave News*, noting that the FCC "does not consider itself an expert" on public health.

The Communications Workers of America filed a similar petition in Washington on November 12 which argues that the FCC's RF/MW rules are "beyond the scope of the agency's delegated

Romanians To Study Health of Radar Workers

Romanian researchers will soon begin a health survey of radar operators and technicians. "Civilian radar workers are complaining of health problems, including allergies, and there are reports of a high mortality rate in the 45-55 age group," the team's physicist, Simona Miclaus of the Army Academy in Sibiu, told *Microwave News*.

Physicians at the academy and at the Sibiu Military Hospital will examine approximately 30 civilians and military personnel. Preliminary results may be available at the end of 1998, Miclaus predicted.

"Conditions in radar-related occupations are bad in our country," Miclaus emphasized. Much of the radar equipment in use is more than 20 years old and leaks significant amounts of radiation, she explained.

In March 1996, the Romanian Labor Ministry issued new limits for occupational RF/MW exposures identical to the International Radiation Protection Association's (IRPA) guidelines (see *MWN*, Mr84 and J/F88). Miclaus reported, however, that the government offers a 10% pay increase to workers exposed to levels exceeding the IRPA limits.

Miclaus said that the Sibiu team will build on the RF/MW exposure studies of Dr. Stanislaw Szmigielski of the Military Institute of Hygiene and Epidemiology in Warsaw, Poland (*MWN*, Mr85, J/F87 and M/J95), and those of Drs. Jasminka Goldoni and Vera Garaj-Vrhovac of the University of Zagreb, Croatia (see *MWN*, J/F92).

authority."

The Cellular Phone Task Force, also represented by Schulz, filed a petition in New York City on November 10 contending that the FCC's RF/MW rules violate the civil rights of electro-sensitive people.

"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

- A Canadian federal task force recommends allowing women who work with VDTs to transfer to other jobs during pregnancy without pay loss.
- Dr. Lennart Tomenius, a Swedish epidemiologist, links childhood cancer to power lines. Dr. Nancy Wertheimer says, "It feels good not being out there all alone anymore."
- With nine radar-exposure cases working their way through U.S. courts, word leaks out about Ronald Karras's \$200,000 settlement from GE and Western Electric. Karras claimed that radiation from Nike Hercules radars made him deaf and caused his eyes to bleed.

Years 10 Ago

- Drs. Craig Byus and Ross Adey report that the activity of ODC, an enzyme linked to cellular growth, increases when tumor cells

are exposed to weak EMFs.

- EMI is suspected as the cause of five Black Hawk helicopter crashes in five years. The U.S. Army denies the claim but increases shielding on its Black Hawks.

Years 5 Ago

- CIRRPC, a White House advisory group, says EMFs are not a public health hazard and recommends against any expansion of EMF research.
- A Swedish electrician's brain tumor is declared a work-related injury, marking the first time occupational exposure to EMFs is recognized as a cause of cancer in Sweden.
- ANSI adopts new RF/MW safety guidelines endorsed by the IEEE, but questions the balance of the IEEE committee that developed them.
- A lawyers' group charges that EPRI slanted funding toward studies likely to provide evidence against an EMF-cancer link.

FROM THE FIELD

Clippings from All Over

Madrid: If there's \$25 million that was intended to be spent on cancer-related research, I think that money should have been spent that way. Instead, it was spent on other things.

CBC: Like what?

Madrid: A lot of money was spent on PR.

CBC: How much of that budget has actually gone towards studies on brain cancer?

Madrid: I don't know. And that's a problem. I suspect not very much.

—**John Madrid, a consultant to Toshiba, on the CTIA's WTR cellular phone research program, interviewed on *Undercurrents*, a television news show produced by the Canadian Broadcasting Corp. (CBC), September 30, 1997 (see also p.9)**

"It's like trying to find an astronaut that hadn't worked for NASA."

—**Gene Zastrow, manager of Sutro Tower Inc., on a proposal to disqualify any RF health expert with industry links from reviewing an environmental impact statement on DTV broadcasting from Sutro Tower in San Francisco, quoted by Carol Dimmick in "Lobbyist Plots Course for Health Dept., Sutro Tower EIR," *City Voice* (CA), p.10, September 16-October 14, 1997**

The solicitude for unimpaired photography was not extended to public health authorities, milk producers, and certainly not to the general public.

—**Daniel Greenberg on "hot spot" information given to Eastman Kodak from 1951 to 1962 to protect the company's film supplies from nuclear fallout, in "Hidden Data and Abuse in Research Come To Light in the USA," *The Lancet* (U.K.), p.1083, October 11, 1997**

"Eventually there will be litigation from antennas on rooftops. Someone will accuse a company claiming personal harm or injury....It is al-

most inevitable that someone will accuse a carrier of something like cancer and blame it on the antennas. The problem is the industry has to educate the public about RF. Is it dangerous? Yes, under certain circumstances. Can it be managed? Yes. Quite a few in site management don't know what it is though."

—**Ron Gibbs, President and CEO, Lodestar Towers, Tequesta, FL, quoted by Cindy Loffler Stevens in "The RF Emissions Issue," *Wireless Business & Technology*, p.77, October 1997**

"Knowing the results earlier rather than later can be extremely valuable. That's one reason that EPRI is a sponsor."

—**Chuck Hakkarinen, Electric Power Research Institute (EPRI) representative and chair, ACACIA Executive Board, explaining EPRI's sponsorship of research on climate change, quoted in "ACACIA: A Consortium for the Application of Climate Impact Assessments," *EPRI Environment Update*, p.10, September 1997**

"There is a lot of evidence going around that shows something is going on" that could allow low-intensity microwaves to affect the brain.

—**Dr. Frank Barnes, University of Colorado, Boulder, quoted by Tim Beardsley in "Say That Again? Researchers Plan To See If Cell Phones Affect Memory," *Scientific American*, p.20, December 1997**

Individual governments...should reject pending licence applications from Iridium, which wants to operate a multisatellite mobile telephone system with no guaranteed protection for radioastronomy frequencies. The customers of Iridium, and similar companies, must be forced in this way to pay for nonpolluting systems.

—**"Make Radio Polluters Pay: Governments Need To Do More To Curb Pollution of Astronomically Essential Radio Bands," Editorial, *Nature* (U.K.), p.101, November 13, 1997**

Letter to the Editor

CDMA vs. TDMA: Health Impacts

November 17, 1997

To the Editor:

I believe that the European—and planned world—GSM digital mobile phone standard will be found to have been a disastrous choice. GSM signals appear to be biologically active and capable of causing disabling health effects.

New evidence shows that the regular pulsing of GSM signals disrupts important biological processes.^{1,2} While Time Division Multiple Access (TDMA) systems (e.g., GSM and TIA IS-54) emit regular short bursts of high-energy data pulses at extremely low frequencies (ELF), the Code Division Multiple Access (CDMA) digital system (e.g., TIA IS-95) emits a far more continuous stream of data with very little periodicity.³ Indeed, as far as our bodies are concerned, the CDMA signal resembles a noisy, fully amplitude-modulated, analog signal. The handsets can also run at considerably lower peak transmission power than those using GSM.

In the long run, microwaves may play a role in the development of cancer. However, it is becoming increasingly clear that the regular pulsing of the TDMA signal may cause neurological problems in the short and medium terms. GSM, IS-54 and digital cordless (DECT) phones deliver sharp-edged ELF magnetic pulses with an amplitude of several microtesla into the user's head. These pulses arise due to current surges from the battery.³ Most studies have only simulated the microwave signals and ignored these magnetic ELF pulses.

I believe that the headaches, fatigue, confusion, memory loss and

anxiety problems that are now being regularly reported by users of GSM phones will be confirmed in the large-scale EC-funded study which is due to be completed next February.⁴ Memory loss, which can eventually appear as permanent dementia, does not appear to occur with the use of analog mobile phones.

On the other hand, I do not believe that memory and dementia problems will be seen among users of the IS-95 CDMA system. South Korea has selected this technology for its second-generation cellular system, making it a good place for an epidemiological study.

If the CDMA signals do not produce early dementia effects, the imperatives of public health would justify scrapping the GSM and IS-54 systems and replacing them with the safer CDMA digital system.

Alasdair Philips, Consultant
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<aphilips@gn.apc.org>

[1] L.M. Penafiel et al., "Role of Modulation on the Effect of Microwaves on Ornithine Decarboxylase Activity in L929 Cells," *Bioelectromagnetics*, 18, pp.132-141, 1997.

[2] H. Lai, A. Horita and A.W. Guy, "Microwave Irradiation Affects Radial-Arm Maze Performance in the Rat," *Bioelectromagnetics*, 15, pp.95-104, 1994.

[3] J.B. Andersen and G.F. Pedersen, "The Technology of Mobile Telephone Systems Relevant for Risk Assessment," *Radiation Protection Dosimetry*, 72, pp.249-257, 1997.

[4] The study is being carried out by a Norwegian-Swedish research team—see *Microwave News*, p.10, N/D96. See also p.6 of this issue.

CONFERENCES

1998 Conference Calendar (Part I)

Web site addresses are in italics. Part II will appear in our next issue.

January 5-9: **4th International Conference on Millimeter and Submillimeter Waves and Applications**, Town and Country Hotel, San Diego, CA. Contact: Prof. Mohammed Afsar, Dept. of Electrical Engineering and Computer Science, Tufts University, Medford, MA 02155, (617) 627-3219, Fax: (617) 627-3220, E-mail: <mafsar@emerald.tufts.edu>.

January 5-9: **International Union of Radio Science (URSI) National Radio Science Meeting**, University of Colorado, Boulder. Contact for Commission K on Electromagnetics in Biology and Medicine: Dr. James Lin, Dept. of EECS, M/C 154, University of Illinois, 851 S. Morgan St., Chicago, IL 60607, (312) 413-1052, Fax: (312) 413-0024, E-mail: <lin@eeecs.uic.edu>, <cires.colorado.edu/ursi/rfp.html>.

January 6-9: **7th Joint Magnetism and Magnetic Materials: InterMag Conference**, Hyatt Regency Embarcadero, San Francisco, CA. Contact: Diane Suiters, Courtesy Associates, 2000 L St., NW, Suite 710, Washington, DC 20036, (202) 973-8668, Fax: (202) 331-0111, E-mail: <magnetism@courtesyassoc.com>, <www.aip.org/edops/mmmconf.html>.

January 12-14: **2nd RAPID Science Review Symposium: Epidemiological Research Findings**, Camberley Gunter Hotel, San Antonio, TX. Contact: Dr. Mary Wolfe, NIEHS, PO Box 12233, Research Triangle Park, NC 27709, (919) 541-7539, Fax: (919) 541-0144, E-mail: <wolfe@niehs.nih.gov>.

January 26-29: **Short Course on Management of Electromagnetic Energy Issues: Relevant Strategies**, Fairmount Hotel, San Antonio, TX. Contact: Amy Nelson, Electromagnetic Energy Association (EEA), 1255 23rd St., NW, Suite 850, Washington, DC 20037, (202) 452-1070, Fax: (202) 833-3636, E-mail: <anelson@eleccenergy.com>, <www.eleccenergy.com>. The EEA may not hold an annual meeting in 1998.

January 31-February 5: **1998 IEEE Power Engineering Society (PES) Winter Meeting**, Hyatt Regency Westshore, Tampa, FL. Contact: J. Howard, Tampa Electric Co., PO Box 111, Tampa, FL 33601, (813) 228-4653, Fax: (813) 228-1333, E-mail: <j.howard@ieee.org>, <www.ieee.org/power/wm98prev.htm>.

February 15-19: **2nd International Conference on Bioelectromagnetism**, Monash University, Melbourne, Australia. Contact: Irene Thavarajah, Office of Continuing Education, Monash University, Wellington Rd., Clayton, VIC 3168, Australia, (61+3) 9905-1344, Fax: (61+3) 9905-1343, E-mail: <irene.thavarajah@adm.monash.edu.au>.

February 23-25: **Wireless '98**, World Congress Center, Atlanta, GA. Contact: Cellular Telecommunications Industry Association, Suite 200, 1250 Connecticut Ave., NW, Washington, DC 20036, (202) 785-2842, Fax: (202) 785-0721, <www.wow-com.com>.

March 1-5: **1998 Annual Meeting of the Society of Toxicology**, Washington State Convention Center, Seattle, WA. Contact: Society of Toxicology, 1767 Business Center Dr., Suite 302, Reston, VA 22090, (703) 438-3115, Fax: (703) 438-3113, E-mail: <trish@toxicology.org>, <www.toxicology.org>.

March 21-26: **29th Annual Meeting of the Environmental Mutagen Society (EMS)**, Disneyland Hotel, Anaheim, CA. Contact: Maureen Thompson, EMS, 11250 Roger Bacon Dr., Suite 8, Reston, VA 22090, (703) 437-4377, Fax: (703) 435-4390, E-mail: <emsdmg@aol.com>.

March 22-26: **EPRI Course on Design of Underground Transmission Systems**, Holiday Inn Downtown, Denver, CO. Contact: Kathleen Lyons, EPRI, PO Box 10412, Palo Alto, CA 94303, (650) 855-2656, Fax: (650) 855-8997.

April 1-2: **34th Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP)**, Crystal City Marriott, Arlington, VA. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652, Fax: (301) 907-8768, <www.ncrp.com>.

April 6-9: **3rd RAPID Science Review Symposium: In Vivo and Clinical Research Findings**, Hyatt Regency at Civic Plaza, Phoenix, AZ. Contact: Dr. Mary Wolfe, see January 12-14 above.

April 6-9: **Annual Convention of the National Association of Broadcasters (NAB)**, Las Vegas, NV. Contact: Kathy Muller, 1771 N St., NW, Washington, DC 20036, (202) 775-3527, <www.nab.org/conventions>.

April 14-16: **60th Annual Meeting of the American Power Conference**, Mar-

riott Downtown Hotel, Chicago, IL. Contact: Robert Porter, Illinois Institute of Technology, Chicago, IL 60616, (312) 567-3196, Fax: (312) 567-3892, E-mail: <apc@iit.edu>, <www.apc.iit.edu>.

April 18-24: **6th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine (ISMRM)**, Convention and Exhibition Center, Sydney, Australia. Contact: ISMRM, 2118 Milvia St., Suite 201, Berkeley, CA 94704, (510) 841-1899, Fax: (510) 841-2340, E-mail: <info@ismrm.org>, <www.ismrm.org>.

April 24-May 1: **57th Annual American Occupational Health Conference**, John Hynes Memorial Convention Center, Boston, MA. Contact: American College of Occupational and Environmental Medicine, 55 W. Seegers Rd., Arlington Heights, IL 60005, (847) 228-6850, Fax: (847) 228-1856, <www.acoem.org>.

April 26-29: **Electricity '98 Conference and Exposition**, Metro Convention Center, Toronto, Canada. Contact: Canadian Electricity Association, 1155 Metcalfe St., Sun Life Bldg., Suite 1120, Montreal, PQ H3A 2V6, Canada, (514) 866-6121, Fax: (514) 866-1880, E-mail: <info@canelect.ca>, <www.canelect.ca/e98.html>.

April 26-30: **8th International IEEE PES Conference on Transmission and Distribution Construction, Operation and Live-Line Maintenance (ESMO '98)**, Renaissance Orlando Resort, Orlando, FL. Contact: ESMO '98 Registration, 9800 Metcalf Ave., Overland Park, KS 66212, (913) 967-7299, Fax: (913) 967-1898.

May 12-14: **IEEE Radar Conference**, Sheraton Hotel, Dallas, TX. Contact: Scott Ramey, 2501 W. University, MS 8056, McKinney, TX 75070, (972) 952-4409, Fax: (972) 952-3071, E-mail: <sramey@ti.com>, <www.ieee.org/tag/section1.html>.

May 17-20: **30th Annual National Conference on Radiation Control**, Mesa, AZ. Contact: Conference of Radiation Control Program Directors, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543, Fax: (502) 227-7862, E-mail: <cariganlin@aol.com>, <www.webpub.com/crcpd>.

May 18-20: **Instrumentation and Measurement Technology Conference (IMTC/98)**, St. Paul Hotel, St. Paul, MN. Contact: Robert Myers, 3685 Motor Ave., Suite 240, Los Angeles, CA 90034, (310) 287-1463, Fax: (310) 287-1851, E-mail: <bob.myers@ieee.org>.

May 18-22: **EMFs: Biological Effects and Hygienic Standards**, Moscow, Russia. Contact: Dr. Nikolay Izmerov, Institute of Occupational Health, Russian Academy of Medical Sciences, Prospect Budennogo 31, 105275 Moscow, Russia, (7+95) 365-0209, Fax: (7+95) 366-0583, E-mail: <izmerov@orc.ru>; or Dr. Michael Repacholi, World Health Organization, 1211 Geneva 27, Switzerland, (41+22) 791-3427, Fax: (41+22) 791-4123, E-mail: <repacholim@who.ch>. See p.16.

May 23-29: **14th International Symposium on Bioelectrochemistry and Bioenergetics**, Vingstedcentret, Denmark. Contact: Dr. Sianette Kwee, Dept. of Medical Biochemistry, University of Aarhus, Bldg. 170, DK-8000 Aarhus C, Denmark, (45) 8942-2869, Fax: (45) 8613-1160, E-mail: <bes98@biokemi.aau.dk>, <www.health.aau.dk/conf/bes98.htm>.

May 24-28: **Annual Meeting of the Canadian Radiation Protection Association (CRPA)**, Ottawa, Canada. Contact: Gary Kramer, President CRPA, Human Monitoring Lab., RPB, 775 Brookfield Rd., PL 6302D1, Ottawa, ONT K1A 1C1, Canada, (613) 954-6668, Fax: (613) 957-1089, E-mail: <Gary_H_Kramer@inet.hwc.ca>.

June 7-11: **1998 Annual Meeting of the Bioelectromagnetics Society**, Trade Winds Hotel, St. Petersburg, FL. Contact: Dr. William Wisecup, W/L Associates, 7519 Ridge Rd., Frederick, MD 21702, (301) 663-4252, Fax: (301) 371-8955, E-mail: <75230.1222@compuserve.com>, <biomed.ucr.edu/bems.htm>.

June 14-19: **1998 European Electromagnetics Conference (EUROEM '98)**, Dan Panorama Convention Center, Tel Aviv, Israel. Contact: Secretariat EUROEM '98, PO Box 50006, Tel Aviv 61500, Israel, (972+3) 514-0000, Fax: (972+3) 514-0077, E-mail: <euroem98@kenes.com>, <physics.technicon.ac.il/~peter/euroem98.html>.

June 15-24: **RAPID Science Working Group Meeting**, Northland Inn and Conference Center, Minneapolis, MN. Contact: Dr. Mary Wolfe, see January 12-14 above.

COST 244bis

New Leadership and Workshop Plans...The European cooperative program for research on biomedical effects of EMFs and EMR—known as COST 244bis—has a new leadership team. Dr. Arne Wennberg of the Department of Neuromedicine at the National Institute for Working Life (NIWL) in Solna, Sweden, takes over as chair from Dr. Zlatko Koren, who died suddenly last August (see *MWN*, S/O97). The vice chairs are Dr. Dina Simunic of the University of Zagreb in Croatia and Joe Wiart of France Telecom in Issy-les-Moulineaux. The working group on epidemiology and human health effects is headed by the NIWL's Dr. Ulf Bergqvist. Dr. Norbert Leitgeb of the Institute for Biomedical Engineering at Graz University of Technology in Austria heads the working group on basic research, while Dr. Guglielmo d'Inzeo of the University of Rome "La Sapienza" leads the working group on engineering and measurements. COST 244bis is planning a series of workshops over the next year: on power deposition in the heads of cellular phone users, in Trento, Italy, December 13-14; on EMFs at intermediate frequencies, in Madrid, Spain, in March or April; on health risks of prolonged EMF exposure, in Graz, Austria, in September; and on biomedical effects of wireless equipment, in Zagreb in November.

MEETINGS

Moscow EMF Seminar...The World Health Organization's (WHO) International EMF Project is holding a seminar, *EMFs: Biological Effects and Hygienic Standards*, in Moscow, May 18-22, 1998. Russian researchers first alerted the world to the possibility of health hazards from EMFs in the early 1970s, but much of their pioneering work on biological effects has been inaccessible due to the language barrier. Russian EMF research "has largely been lost to the scientific community," Dr. Michael Repacholi, the EMF Project's director, told *Microwave News*. The seminar's aim is to bring this research "into the wider community" for evaluation and dissemination. "This large body of evidence must not be ignored," Repacholi stressed. The seminar, which will cover the non-ionizing spectrum from ELF EMFs to microwaves and millimeter waves, will bring Russian and Eastern European scientists together to summarize their work. Although little research has been done on bioeffects from radiation at high microwave frequencies, scientists at the Russian State Research Center's Institute of Biophysics in Moscow recently reported that exposure to 10 GHz radiation can cause memory failure in chicks (see *MWN*, S/O97). Rationales for current standards will also be discussed. For example, Repacholi noted, Russia's State Committee of Sanitary-Epidemiological Surveillance adopted a standard for mobile phones in 1994. Ultimately, Repacholi hopes, Russian findings "can properly be taken into account" in the WHO's assessments of EMF health risks. The seminar will be hosted by the Institute of Occupational Health of the Russian Academy of Medical Sciences. The WHO's EMF Project will publish the proceedings of the seminar in English. For more information, contact the institute's director, Prof. Nikolay Izmerov, or Repacholi (see "Conference Calendar," p.15).

OBITUARIES

Dr. **Samuel Koslov** died of cancer on October 3 at his home in

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McLean, VA. Koslov, who was 70, was long involved in the RF/MW health debate and played a key role in the investigation of the irradiation of the U.S. embassy in Moscow. From 1972 to 1978, Koslov served as the principal advisor to the Assistant Secretary of the Navy for R&D. It was during this time that he founded, and served as a member of, the Electromagnetic Radiation Management Advisory Council (ERMAC), which coordinated the government's work on non-ionizing radiation. Koslov then spent 15 years at the Johns Hopkins University's Applied Physics Lab in Laurel, MD, as the assistant director for technical assessment. While at the lab, Koslov worked with Henry Kues on studies of the effects of microwave radiation on the eye.

On November 21, **Gary Poynter** died of a heart attack at the age of 51. Poynter served with the Ohio State Highway Patrol for 15 years. He is best known for his efforts to find out whether his fellow policemen were developing cancer due to exposure to microwaves from radar guns. He published his research findings in *Law Enforcement News* in November 1990 (see *MWN*, M/A91). At the same time, Poynter collected names of officers who had developed cancer after using the radars. Within a few years, he had a list of over 200 officers, many of whom had testicular cancer and melanoma. In 1992, Poynter was prominently featured in a segment on *60 Minutes*, then the most-watched television news show in the U.S. (see *MWN*, M/J92). That same summer, Poynter testified at hearings called by Sen. Joseph Lieberman (D-CT) (see *MWN*, S/O92).

Dr. **Brian Maddock** died of a heart attack on October 11, while on vacation in the Seychelles. He was 63. Starting in 1984, Maddock led the U.K.'s research effort on the possible health effects of EMFs at the Central Electricity Research Labs. After his retirement in 1993, he administered the EMF Biological Research Trust, which was funded by the National Grid Co. Maddock was the chair of a committee that wrote CENELEC's provisional standard for environmental ELF EMFs.

PEOPLE

Dr. **Carl Durney** has retired from the University of Utah. In recognition of his 34 years at the university and his work on RF health studies, the USAF's Armstrong Lab at Brooks AFB sponsored a symposium in his honor October 20-21. Among the speakers at *RF Dosimetry: 25 Years of Progress* were Drs. Eleanor Adair, Om Gandhi, Bill Guy, Don Justesen, John Osepchuk and Herman Schwan....Dr. **Meike Mevissen** has left Dr. **Wolfgang Löscher**'s lab at the School of Veterinary Medicine in Hannover, Germany, where they collaborated on landmark studies on the promotion of breast cancer by EMFs. Mevissen has joined the Institute of Veterinary Pharmacology at the University of Bern in Switzerland. She said that she is still consulting with Löscher on follow-up breast cancer studies....Dr. **Valerio Canè** of the University of Modena's Faculty of Medicine in Italy has been appointed to the editorial board of *Electro- and Magnetobiology*. Canè has been the coordinator of Modena's Interuniversity Center for Interactions Between EMFs and Biosystems since 1992. ...**Thomas Trotter** has been appointed president and CEO of OrthoLogic Corp. in Phoenix. Dr. **Allan Weinstein**, the former chairman and CEO, is now the vice-chair. OrthoLogic makes

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New Scientist (U.K.), October 7, 1995



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



Microwave News, November/December 1995

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bone-healing stimulators and other medical devices....Dr. **Constantine Maletskos**, who is shepherding the NCRP's EMF report through its long review process—two and a half years and counting—is the first recipient of the Evans Medal from the Health Physics Society.

RF EXPOSURE

Goldsmith Argues for Prudent Avoidance... It is time to consider a policy of prudent avoidance for RF exposures, according to Dr. John Goldsmith, an epidemiologist at the Ben-Gurion University of the Negev in Beer Sheva, Israel. “The notion that non-ionizing radiation, and in particular RF radiation, was harmless—the assumption of innocence—is no longer tenable,” Goldsmith argues in a commentary in the December issue of the *American Journal of Industrial Medicine* (32, pp.689-692, 1997). Goldsmith was led to this conclusion by recent studies of radio and TV broadcast towers in Australia and the U.K. (see *MWN*, N/D95 and J/F97). “Taken together,” he writes, “they suggest that exposures of residents living near (within 5 km) broadcast facilities may have small increases in leukemia.” While the size of the increase and the distance at which it may occur are “subjects for legitimate debate and additional studies,” Goldsmith believes, various measures of prudent avoidance should now “be debated, and possibly applied.” Among these are building new broadcast facilities at least 5 km away from residential areas, and making RF shielding more available and effective for existing housing with a high level of exposure. A second article by Goldsmith, in *Public Health Reviews* (25, pp.123-149, 1997), compares non-ionizing radiation issues today with the social response to air pollution problems in the decades after World War II. Goldsmith joined the California Department of Health in 1957 and led its air pollution research for the next 20 years. He credits the Air Pollution Foundation, funded by the auto and oil industries, for research that “contributed substantially to the understanding of the atmospheric reactions involved.” But he recounts in detail how the Lead Industries Association was able to prevent the disclosure of research results that it found inconvenient. He also notes how the auto and oil industries later used their influence to deny funding to research proposals “not on their merits, but on the basis of the information not being of the type...the industries wanted to have in the public domain.” On cellular phone research, Goldsmith holds that WTR's epidemiological studies are “unlikely...to produce relevant evidence of excess cancer, since they were done too soon after exposure to accommodate the known latency of 10-15 years for radiation-induced solid tumors” (see also p.6 and p.12). And Goldsmith is harshly critical of the decision by Dr. Michael Repacholi and his industry sponsors to delay announcing the results of Repacholi's own study of RF-exposed mice, which found an increase in lymphomas (see *MWN*, M/J97). While noting that there is no proof that cellular phones have caused any increase in cancer, he argues that there is “abundant evidence” that RF exposure has the potential to increase risk of the disease. “Today's situation resembles the situation for carbon monoxide exposure from motor vehicles in the 1960s,” Goldsmith writes. Although much more research is needed, he contends, any “delay in protective measures” is likely to mean more cases of cancer.

VIEWS ON THE NEWS

Freedom of Information and the Cellular Marketplace

It all started with an ad campaign. Last summer, a small cellular phone maker rolled out the slogan, "Low Radiation is Better." The German firm Hagenuk bragged that its phones exposed users to less microwave radiation than any others on the market.

The company's ads caused quite a stir (see *MWN*, S/O97). But while Hagenuk compared the specific absorption rate (SAR) of its GlobalHandy phone with industry averages, it did not name names or give specific numbers for its competitors.

The competitors weren't talking, either. The wireless industry wants to keep these numbers under wraps. In fact, Hagenuk now says its ad campaign was toned down in response to industry pressure.

But consumers want to know. A Swiss consumer TV show stepped into the breach and commissioned its own survey. Now the information is out, and people who want a low-radiation phone know which models to consider—at least in Europe.

All this reminds us of another piece of consumer electronics whose safety was questioned: computer video display terminals, or VDTs. When first introduced, VDTs exposed the user to EMF levels that were high enough to cause public concern. But the radiation levels of most units sold today have been drastically reduced. It was consumer demand that changed the situation.

For VDTs, Sweden was the key. An ad hoc committee there was the first to adopt a rigorous testing protocol, and a set of emission standards—known as MPR2—that manufacturers acknowledged was readily achievable. Mandatory limits were never imposed. The Swedish government, the country's largest single buyer, simply made it clear that it would not purchase any VDTs for which EMF levels were not available. The cost of lower emissions turned out to be less than \$1 per unit.

Low-emission monitors soon became the norm. This reflects a precautionary approach. Then, as now, there were more questions than answers on EMF health effects, and no definitive proof of a problem. But consumers quite reasonably did not want to be the guinea pigs. Given the choice, they preferred the VDTs that conformed to Swedish standards.

Computer monitor EMF levels were pushed even lower, not by the Swedish government but by a labor union. TCO, the federation of white-collar workers, was not satisfied with existing guidelines, and it relentlessly pushed industry to answer the question, "How low can you go?" TCO set its own standard, and a growing number of big companies soon won the TCO seal of approval.

Let's be clear: Neither MPR2 nor the TCO guidelines are health standards. They are engineering standards, limits that are "as low as reasonably achievable." But if the Swedes had decided to wait for enough EMF research to set health-based limits, they'd still be waiting. The industry was in no rush to find out if there was a health risk—as is the case today with cellular phones.

Indeed, we still don't have a clear picture of whether VDT radiation is harmful to health. But today the levels are so much lower that it doesn't matter much anymore. Any potential danger has been drastically reduced—because consumers wanted it that way.

VDTs represent a market-driven success story. But as any economist will tell you, markets only work when consumers have

full information about competing products. And there's the rub. Most cellular phone makers don't want consumers to know how much radiation their phones put out.

In the U.S., the FCC now requires cellular phone makers to show that their products comply with its new exposure standard (see *MWN*, J/A96). In theory, the SAR for every new phone is publicly available information. In practice, it is filed in a way that is confusing and inaccessible. "Consumer-friendly" it's not; based on our own experience, we'd call it "consumer-hostile."

Committees are now refining U.S. testing protocols for SAR measurements. Unfortunately, the FCC has so far required only that phones be tested in a single position. People do not stand like statues when they use a cellular phone, and Europe's CENELEC protocol requires testing in many positions to reflect this normal variation. Testing in multiple positions is the only way to get a realistic picture, and consumers should insist on it.

As wireless phones become ubiquitous, they will be used not just by busy executives, but by everyone. A teenager slouching on the couch, a five-year-old child who has no idea what an antenna is, your elderly aunt calling from the basement of her church—all will experience different SARs, and testing procedures must cover them all.

We should not be surprised if the U.S. government turns out to be less than zealous about getting consumers the information they need. The FCC is not a health agency, and one of its mandates is to encourage the growth of the telecom industry. And the health agencies have been happy to stay in the shadows. Maybe some U.S. consumer group—Consumers Union, perhaps—will fill this gap by conducting tests of its own.

After all, inquiring minds want to know. And in the long run, as the cyber-saying has it, "Information wants to be free." One way or another, these numbers will eventually come out, and will start to have an impact on sales.

Today the industry is reported to spend less than \$1 on each phone's antenna, and the Hagenuk phone is among the less expensive digital models in Europe. The cost of low-radiation phones is likely to be quite reasonable.

Research on RF/MW radiation bioeffects is important, for both scientific and public health reasons. But there are powerful social forces that ensure it will move forward at a glacial pace.

So which would you rather have under your Christmas tree—reliable SAR measurements for the top 20 cellular phones, or another five-year plan from WTR?

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