MICRO WAVE NEWS

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INSIDE...

Mobile Phones, Cancer Not Linked In Two Short-Term Studies

Two epidemiological studies of U.S. mobile phone users have found no evidence of any increased risk of brain cancer, according to researchers at the National Cancer Institute (NCI) and the American Health Foundation (AHF). Both teams cautioned, however, that it may be too early to detect such risks, if they do indeed exist.

"Our results do not substantiate the concern that some brain tumors diagnosed in the United States during the mid-1990s were caused by the use of hand-held cellular telephones," Drs. Peter Inskip, Martha Linet and eight colleagues from the NCI in Rockville, MD, write in the January 11 *New England Journal of Medicine*.

The release of the NCI findings coincided with the publication of the long-awaited final results from another mobile phone study, led by Joshua Muscat of the AHF in Valhalla, NY, in the December 20 *Journal of the American Medical Association (JAMA)*. "The data showed no correlation between the use of cell phones and the development of brain cancer," Muscat said.

Both papers received widespread press coverage throughout the world.

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Federal Agencies' Report to Congress: EMFs May Present a Leukemia Risk

There is weak evidence that extremely-low-frequency electromagnetic fields (ELF EMFs) may present a leukemia hazard, according to the federal government's interagency committee (IAC) on EMFs.

The findings are contained in the IAC's long-overdue final report to the U.S. Congress on the six-year, $44 million EMF RAPID research program. They mirror the conclusions of the National Institute of Environmental Health Sciences (NIEHS) in its own 1999 report to Congress (see *MWN*, J/A99).

The IAC report has not yet been sent to Congress. Instead, it is languishing within the Office of Science and Technology Policy (OSTP) at the White House. A copy of the report, dated September 2000, was obtained by *Microwave News.*

Asked about the status of the report, Dr. Imre Gyuk, the cochair of the IAC, replied, "It's at OSTP. They will submit it to Congress, by and by." Given

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the change of administration and the fact that President Bush has not yet appointed a new science advisor (who also serves as the director of the OSTP), the report is not expected to be officially released anytime soon. Some federal employees believe the report may never be submitted to Congress, even though it is specifically required under the Energy Policy Act of 1992, which mandated the RAPID program.

The IAC report, which is eight pages long, simply repeats the NIEHS' own conclusions about the health risk: "ELF EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard," and "the associations reported for childhood leukemia and adult chronic lymphocytic leukemia cannot be dismissed easily as random or negative findings." (The full text of the IAC's "Findings and Conclusions" is reprinted below.)

The representatives* of seven federal agencies who wrote the report also reiterated the NIEHS' view that, although individual studies are weak, taken together the epidemiological studies demonstrate a fairly consistent pattern of a small, increased cancer risk with increasing residential exposure among children. Two recent pooled analyses of the childhood residential studies have added support for an EMF–cancer risk (see *MWN*, S/O00).

The IAC does not recommend any new regulations to limit exposures, due to the lack of a "convincing" dose-response relationship and uncertainties over the appropriate metric for EMF exposure.

EMF RAPID Interagency Committee's "Findings and Conclusions"

Health Effects

The IAC agrees with the NIEHS conclusions about health risk. Namely, "ELF EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard," and "...the associations reported for childhood leukemia and adult chronic lymphocytic leukemia cannot be dismissed easily as random or negative findings." While the support from individual studies is weak, epidemiological studies demonstrate for some methods of measuring exposure a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for adult chronic lymphocytic leukemia (occupational exposures) than for childhood leukemia (residential exposures). Nevertheless, because the scientific evidence is not strong, causality remains uncertain.

Recommendations for Remedial Actions

Extent of exposure: The IAC recognizes that power-frequency EMF exposure cannot be avoided in modern life. Information on the nature of exposure, both environmental and occupational, has been improved and better characterized by recent research including residential and occupational epidemiology studies, measurement surveys and engineering studies.

Personal risk reduction: There is not sufficient information to conclusively determine safety or risk due to power-frequency EMF exposure. Nor is there an understanding of what characteristics of the fields are biologically active at environmental exposure levels. For individuals who may wish to take action to reduce exposure, the most direct way to do this is to increase distance from a source of exposure and reduce the time duration of exposure near a source.

Regulation: Regulation that prescribes protective quantitative exposure limits for the public is not now recommended, because there is no convincing dose-response information on which to base quantitative exposure limits. Causality remains uncertain, and, in particular, no dose or exposure metric is confirmed to be causally linked to adverse environmental health risk.

For regulation of occupational exposures, OSHA refers to American Conference of Governmental Industrial Hygienists (ACGIH) guidelines for regulating exposures. Regulation to prescribe lower protective quantitative limits for the workplace is also not now feasible, for the same reason previously discussed.

Existing guidelines, such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for short-term immediate health effects, should be examined for their appropriateness. The IAC Committee also encourages government agencies to remain abreast of the activities of voluntary standards organizations such as the Standards Coordinating Committee 28 of the Institute of Electrical and Electronic Engineers (IEEE), the National Council of Radiation Protection and Measurements (NCRP) and the ACGIH. Agencies are also encouraged to determine the appropriateness of requiring hazard awareness training for highly exposed workers.

Information distribution: Information about ELF magnetic field exposure and possible health risk should be made available to the public. It would be valuable to continue the RAPID Program web site, now maintained by NIEHS at <www.niehs.nih.gov/emfrapid>. The IAC also encourages relevant government agencies to study further actions that may be deemed necessary such as considering ways to inform highly exposed members of the population whose welfare falls under their jurisdiction.

Electric utilities are encouraged to continue to provide EMF surveys, measurements, and information to their interested customers. The IAC acknowledges the merit of power industry efforts to investigate and implement methods for reducing or not increasing field levels around their facilities, and encourages their continuation. The EMF RAPID Program reviewed and evaluated technologies which can be used to reduce magnetic field exposure.

Research: Various biological effects of power-frequency EMFs have been reported in the scientific literature; however, any causal connection to adverse effects in humans is not yet established. Further research is necessary to provide more complete answers to open questions of power-frequency EMF health risks to the public. Replication of research results remains an important objective. Equally important is the need to identify the characteristics of the field (metrics) and mechanisms responsible for EMF bioeffects reported in the technical literature. Despite the lack of resources dedicated to EMF research with the end of the RAPID Program, the Interagency Committee believes that research efforts should continue, be long-termed and uninterrupted.

Coordination: Appropriate federal agencies should continue interagency coordination and communication. They should continue to monitor federal and private sector EMF research; coordinate research efforts; track international EMF research program findings; participate in activities concerning research, standards and regulation; reassess periodically the scientific evidence; and make any EMF prevention and control policy recommendations that become necessary under their areas of responsibility and jurisdiction.

In fact, the IAC does not specify any action levels for EMF exposures. "I am sorry that we could not agree on a number which would require an awareness training program for highly exposed workers," commented Robert Curtis of OSHA in Salt Lake City, a member of the committee.

Unlike the NIEHS report, which endorsed a policy of prudent avoidance to limit unnecessary exposures, the IAC simply states that those who wish to reduce their exposure should increase their distance from an EMF source and reduce the amount of time they spend near such sources.

The IAC does endorse the need for more research: "The committee believes that research efforts should continue, be long-termed and uninterrupted."

"There has to be more research to lay this issue to rest," said Norbert Hankin, an EPA senior scientist in Washington, who helped draft the report. "But they will probably find a cure for cancer first," he added—half in jest.

The report went through at least six drafts before it was submitted to the OSTP last fall (see *MWN*, S/O00).

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* The members of the IAC, who prepared the report, are: Dr. Imre Gyuk (cochair), Department of Energy; Lawrence Anderson, Federal Energy Regulatory Commission; Dr. Alan Cookson, National Institute of Standards and Technology; Robert Curtis, Occupational Safety and Health Administration (OSHA); Arnold Konheim, Department of Transportation; Dennis Rankin, Rural Utilities Service, Department of Agriculture; and Mary Smith, Environmental Protection Agency (EPA). NIEHS' Dr. Gary Boorman also served as cochair of the IAC but recused himself from preparing this report because the institute submitted its own report to Congress.

Plaintiffs' Experts Named in NSA Workers' EMF Lawsuit

Several well-known figures in the EMF research community are slated to testify on behalf of two former National Security Agency (NSA) workers who developed brain tumors after using a magnetic tape-erasing machine.

Tommy Grimes and Thomas van Meter both used the machine, known as a degausser, for several hours a week at the NSA over a period of several years in the 1980s. They are being represented by the law firm of Peter Angelos in Baltimore in their $10 million lawsuit against the machine's maker, Electro-Matic Products Co. in Chicago (see *MWN*, M/A00).

Among the plaintiffs' witnesses are:

- Dr. Henry Lai, University of Washington, Seattle.
- Dr. Abraham Liboff, professor emeritus of physics, Oakland University, Rochester, MI.
- Dr. Roger McLendon, neuropathology section chief, Duke University Medical Center, Durham, NC.
- Dr. Samuel Milham of Olympia, WA, consultant, formerly epidemiologist, Washington State Department of Health.
- Laurie Oppel, engineering consultant, Albany, NY.
- Dr. Jerry Phillips, consultant, Colorado Springs, CO.

IARC EMF Working Group

The International Agency for Research on Cancer (IARC) has invited scientists from ten countries to serve on its EMF working group. Epidemiologists make up more than one third of the 22-member panel.

The working group will meet in Lyon, France, June 19-26, to evaluate cancer risks associated with exposure to static and extremely-low-frequency EMFs (see *MWN*, N/D00).

In 1998 a 30-member working group set up by the National Institute of Environmental Health Sciences (NIEHS) performed a similar review and voted 19 to 9 in favor of classifying EMFs as "possible human carcinogens," using criteria developed by IARC (see *MWN*, J/A98). Four of those invited to Lyon were also on the NIEHS panel. Only one, Anderson, voted with the majority, while two others, Brown and Kheifets, voted against this designation. Portier served as the coordinator—and a nonvoting member—of the NIEHS working group.

Stolwijk and Tenforde are former members of the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Liboff was asked to replace Dr. Charles Polk of the University of Rhode Island on the IARC panel after Polk died in early November.

The list of invitees, listed below, was assembled by *Microwave News*. IARC's Dr. Robert Baan declined to disclose the membership of the panel.

Dr. Larry Anderson	Battelle PNL, Richland, WA
Dr. William Bailey	Exponent Health Group, New York
Dr. Carl Blackman	EPA, Research Triangle Park, NC
Dr. Arnold Brown	University of Wisconsin, Madison
Dr. Nicholas Day*	University of Cambridge, U.K.
Dr. Vincent DelPizzo*	California Dept. of Health, Oakland
Dr. Pascal Guénel*	INSERM, St. Maurice, France
Dr. Elizabeth Hatch*	Boston University, Boston
Dr. Jukka Juutilainen	University of Kuopio, Finland
Dr. Leeka Kheifets*	EPRI, Palo Alto, CA
Dr. Abe Liboff	Oakland University, Rochester, MI
Dr. David McCormick	IIT Research Institute, Chicago, IL
Dr. Meike Mevissen	University of Bern, Switzerland
Dr. Jörg Michaelis*	University of Mainz, Germany
Dr. Kjell Hansson Mild	NIWL, Umeå, Sweden
Dr. Junji Miyakoshi	Kyoto University, Japan
Dr. Jørgen Olsen*	Danish Cancer Society, Copenhagen
Dr. Christopher Portier	NIEHS, Research Triangle Park, NC
Dr. Richard Saunders	NRPB, Chilton, U.K.
Dr. Jan Stolwijk*	Yale University, New Haven, CT
Dr. Maria Stuchly	University of Victoria, BC, Canada
Dr. Thomas Tenforde	Battelle PNL, Richland, WA

* epidemiologist

• Dr. Daniel Wartenberg, epidemiologist, Institute of Environmental and Occupational Health Sciences, Piscataway, NJ.

Harold Walter of Tydings & Rosenberg in Baltimore, who is representing Electro-Matic, said that the defense will "probably" disclose its experts in April. In an interview, Walter also said that he plans to move to dismiss the case sometime this summer. Currently, it is scheduled to go to trial in the fall in Maryland state court.

A degausser erases information from audio, video and computer tapes by applying a powerful magnetic field. The machine that Grimes and van Meter used at NSA's headquarters in Ft. Meade, MD, generated extremely-low-frequency fields as strong as 2,500 G, according to documents from the intelligence agency. When operating the machine, workers could receive sustained exposures to fields as high as 44 G.

In 1993 the NSA took steps designed to keep employees' exposures to EMFs from degaussing equipment below 10 G—the limit endorsed by the American Conference of Governmental Industrial Hygienists (ACGIH). Following what it described as a policy of "prudent avoidance," the agency modified the degaussers and instructed workers not to sit or stand next to them.

Five years later, a survey conducted by the National Institute of Occupational Safety and Health found that more than 600 NSA workers had operated the Electro-Matic machine. About 150 employees had received exposures ranging from 20 to 70 G from another Electro-Matic degausser at NSA headquarters.

The Angelos firm is also representing Albert Meier and Nancy Ringler, who contend that their brain tumors resulted from using Electro-Matic degaussing equipment while working at the NSA. They filed suit in Maryland state court last July, but the U.S. Federal District Court in Baltimore later accepted a defense motion to move the Meier and Ringler cases there.

The Angelos firm is representing four others who used the degaussing machines at NSA headquarters and developed brain tumors, John Pica Jr., an attorney with the firm, told *Microwave News.* To date, no decision has been made on how to proceed with these cases, Pica said.

In addition to its EMF lawsuits, the Angelos firm has taken on litigation over cell phones and brain cancer (see p.5).

NAS–NRC's 1996 EMF Report "Biased," Professor Charges

The U.S. National Academy of Sciences–National Research Council's (NAS–NRC) 1996 EMF report is "culturally biased," according to a detailed analysis by Professor Magda Havas of Trent University in Peterborough, Canada. Her 80-page paper appeared in the September issue of *Environmental Reviews (8*, pp.173-253, 2000), a peer-reviewed journal published by Canada's National Research Council.

"Whenever a detectable biological response was observed, the authors of [two chapters on bioeffects] would end each paragraph by trying to downplay the effect in some way. This happened so frequently that I began to think 'Methinks, thou doth protest too much!'," Havas wrote.

In each case, the cautionary comments may be valid, Havas allows, "but they were expressed so frequently whenever a biological response was reported that I got a definite impression of bias, especially since the studies that showed no biological effects were not similarly scrutinized."

The NAS–NRC report concluded that there is "no conclusive and consistent evidence" that residential exposures to EMFs present a human health hazard, though it did find that children living near high-current power lines do have an increased risk of leukemia (see *MWN*, N/D96).

"I think that there are health effects due to EMF exposure," Havas told *Microwave News*, "but people cannot deal with noisy data." Havas explained that she is confident that EMFs have beneficial uses, not just negative impacts. "We can use this technology for medical therapies," she said.

In the conclusion of her paper, Havas observes that: "The debates and discussions we are having as a society about EMFs are no different to those that occurred with asbestos, lead, DDT and acid rain. All of these issues had their experts who stated that the results were inconclusive or contradictory or unproven until the mechanisms were identified."

Havas's paper is available on the Web at <www.nrc.ca/cgi-bin/cisti/journals/rp/rp2_tocs_e?er_er3-00_8>. It is free for Canadian citizens; others must pay C$20.00.

California EMF Survey Says 1,700 Classrooms Exceed 5 mG

About 1,700 classrooms in California have average EMF exposures above 5 mG, according to a survey sponsored by the California EMF Program in Oakland.

This estimate is based on a three-year study by Enertech Consultants of Campbell, CA, which conducted a detailed assessment of EMF sources in 89 public schools across the state between 1996 and 1999. The survey found that 20% of all school areas had average magnetic fields above 1 mG, while 1.1% have average fields above 5 mG.

"School areas" included outdoor spaces, hallways, etc. When the analysis was limited to classrooms, 0.63% had average fields of 5 mG or more—which, according to Enertech's estimate, would translate to about 1,700 classrooms across the state.

The most common source of higher field levels was net current due to a given school's wiring practices (see also *MWN*, M/J96). Enertech estimates that 11,000 classrooms in the state have field levels above 2 mG because of net current, while only 140 are above 2 mG because of transmission lines.

To reduce the average field level to less than 2 mG in all school areas throughout the state would cost $79 million, Enertech calculates—an average of $10,000 per school. The largest part of this cost would be for electricians' wages, since the materials cost for reduction of internal fields (the main source) is small. The report notes that highly skilled electricians could do the job at lower cost, since they would be more efficient in determining the sources of net current.

The report's 24-page executive summary is available on the Web at <www.dnai.com/~emf/research.html>.

« Wireless Notes »

Sir **William Stewart** is chairing the committe that will select the projects to be funded under the U.K.'s £7 million ($10 million) research program on mobile phone safety (see *MWN*, N/D00). Stewart previously headed the U.K.'s Independent Expert Group on Mobile Phones (IEGMP), which called for a government-run research effort last May (see *MWN*, M/J00). Several other members of the IEGMP are also on the committee, including Dr. **Michael Repacholi** of the WHO in Geneva and Professor **Colin Blakemore** of the University of Oxford. Among the other members are: Drs. **Ted Grant**, formerly of King's College, London, NRPB's **Alastair McKinlay**, the chair of ICNIRP, **Kjell Hansson Mild** of Sweden's NIWL and **Niels Kuster** of IT'IS in Zurich. One area deemed "particularly important" is an epidemiological study of users of the soon-to-be-introduced 3G phone service. The program, which is being funded on a 50:50 basis by government and industry, will be adminstered by the Department of Trade and Industry and the DOH. The new Stewart committee will hold its first meeting in London on February 9—a workshop for researchers and representatives from government and industry will be held earlier the same day. A request for proposals will be issued soon afterwards. Details are at: <www.dti.gov.uk/cii/regulatory/telecomms>.

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Peter Angelos's law firm has officially entered the cell phone litigation battle. On January 16, **John Pica Jr**. and **Gary Ignatowski**, two members of the Baltimore firm, filed an amended complaint on behalf of Dr. **Christopher Newman**, who claims that he developed a brain tumor after using a cellular phone (see *MWN*, S/O00 and N/D00). In early December, *Microwave News* announced Angelos's intention to enter the legal fray and the story was picked up worldwide (see for instance p.15). Angelos appeared to have some second thoughts, however, and on December 29 released a statement that he had not yet made a final decision about getting involved. But those concerns must have been short-lived: a couple of weeks later, his firm filed the 86-page amended complaint. In an interview, Pica declined to comment on the lawsuit, but confirmed that discovery was under way. No word on when the Angelos firm may file other lawsuits.

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New Zealand has endorsed **ICNIRP**'s limits for public exposures to RF/MW radiation in its new national guidelines for siting mobile telephone and broadcast antennas. In a report released on December 14, the Ministry of Health and the Ministry for the Environment called for the "strict application" of the ICNIRP limits. The U.K. government has made a similar commitment (see p.15). The purpose of the new guidelines is to foster a "consistent approach" by the country's local governments, which have the authority to adopt their own siting policies. The policy endorses voluntary "low- or no-cost" precautionary measures to reduce exposures in view of "the impossibility of proving any agent completely safe." It warns, however, that such measures should not involve "arbitrarily imposing exposure limits lower than the New Zealand standard." Adopted in 1999 by Standards New Zealand, a private body, the standard includes ICNIRP-based limits and calls for precautionary measures on a voluntary basis (see *MWN*, M/J99). While the new government policy is not legally binding, some local tower siting rules have been struck down in court because they were more stringent than the ICNIRP limits (see *MWN*, S/O99). But the 50 $\mu W/cm^2$ limit in New Zealand's largest city, **Auckland**, is not in danger of being overturned, according to **Roger Matthews**, a city planning official (see *MWN*, N/D96). In an interview with *Microwave News*, he explained that the Auckland standard is based on a different set of regulations than the local rules that ran afoul of the courts, and that he was confident that it would withstand a challenge. Matthews added that in his view, the new national guidelines "substantially water down" the New Zealand standard. The 94-page *National Guidelines for Managing the Effects of Radiofrequency Transmitters* is available as a PDF file on the Internet at: <www.mfe.govt.nz/about/publications/rma/Cellsite.pdf>.

German Academy of Pediatrics: Keep Kids Away from Phones

In Germany, pediatricians are advising parents to restrict their children's use of mobile phones and are calling for stricter RF/MW exposure limits.

"Unnecessary, frequent and extended use are to be strongly discouraged," stated the German Academy of Pediatrics on December 8. "Children only need mobile phones to communicate very infrequently, in exceptional situations."

Echoing the recommendations of the U.K.'s Stewart panel (see *MWN*, M/J00), the academy stressed the "considerable" gaps left by health effects research to date and the fact that risks "cannot be ruled out." The statement also cites studies linking phone radiation to tumor promotion and to changes in brain function and sleep patterns.

All mobile phone users should keep conversations "as brief as possible," the pediatricians advised. Additional precautions are appropriate for children, however, in view of the "special health risks" associated with their growing bodies.

The statement also endorses the ALARA (as low as reasonably achievable) principle for managing radiation from mobile phone base stations. As an example of how the principle could be applied, it cites with approval the 0.1 $\mu W/cm^2$ limit proposed by the government of Salzburg, Austria, last year (see *MWN*, J/A00).

The physicians' recommendations run counter to the German government's policy. The Federal Radiation Protection Office stated last year that wireless phone radiation poses no danger to health provided the ICNIRP-based national limits are not exceeded (see *MWN*, S/O00).

Last September, Dr. Heyo Eckel, a senior official of the German Medical Association, called on the radiation office to "take a serious look" at lab results indicating that "radiation at levels below the [German] limits can cause damage."

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In **Australia**, Dr. **Peter French** is consulting with lawyers after a government aide suggested that his work on RF health effects is "pseudo-scientific." French, the chief of immunology at St. Vincent's Hospital in Sydney, had submitted material documenting "important clues that point to a link between mobile phone radiation and cancer" to an Australian Senate inquiry on mobile phone safety (see *MWN*, J/F00 and S/O00). He was later chagrined to see the evidence described as faulty science by Ken Karipidis of the Australian Radiation Protection and Nuclear Safety Agency (**ARPANSA**) in Yallambie. Karipidis analyzed the documents presented to the senate panel for the Radiation Health Council, the ARPANSA committee that is developing a new national standard for public exposure to RF/MW radiation (see *MWN*, S/O99). Those contributing "erroneous information," according to Karipidis, were "mainly lobby groups or 'crusader' scientists such as Peter French." On November 16, French told the senate panel that Karipidis's remarks raised questions about "the motivation and the competence of ARPANSA." Dr. Colin Roy, the head of ARPANSA's non-ionizing radiation branch, did not respond to a request for comment. (Roy was on his way to Geneva to begin working at the WHO; see p.17.) The controversy found its way into the Australian press, as *Good Weekend*, a magazine published by the Melbourne newspaper the *Age*, ran Karipidis's comments in its December 16 issue. French told the magazine that the official's description of him was "highly offensive." In January, French confirmed to *Microwave News* that he is "currently undertaking legal action on this matter." A transcript of French's senate testimony is available as a PDF file at: <www.aph.gov.au/hansard/senate/commttee/s-ecita.htm>.

Sen. Kennedy Seeks NAS–NRC Study of PAVE PAWS Radar

Senator Edward Kennedy (D-MA) has asked the U.S. Air Force (USAF) to pay for a study of possible health effects of the PAVE PAWS radar on Cape Cod to be conducted by the National Academy of Sciences–National Research Council (NAS–NRC).

In a January 11 letter to Whitten Peters, the then Secretary of the Air Force, Kennedy requested that the study "should address, at a minimum, the effects, if any, of the PAVE PAWS radar over the past two decades."

The PAVE PAWS phased array radar, which became operational in 1980, operates at 420-450 MHz with a peak power of 582 kW. Since it was first announced in the 1970s, the radar has been the target of protests from those living nearby.

Community opposition to the radar has recently been fueled by concerns expressed by Dr. Richard Albanese, a USAF physician at Brooks AFB in San Antonio. In a letter to the Massachusetts State Department of Health, Albanese stated that, in "his personal medical opinion," the effects of the type of radiation exposure from phased array radars are "totally unexplored" and studies are needed for this "unique" type of signal. "This lack of testing makes me nervous indeed," he wrote (see *MWN*, S/O00).

Kennedy also asked the USAF to allow Albanese to express his ideas in a public forum on Cape Cod, to let Albanese continue his studies on radar radiation and to declassify Albanese's past work on radar.

Albanese has been sharply criticized by Dr. Robert Adair, an emeritus professor of physics at Yale University in New Haven, CT. In a January 11 letter to Kennedy, Adair stated that Albanese has "no competence whatsoever in this matter," and called Albanese's work "crackpot." The following day, Adair took his charges public by writing a letter to the *Cape Cod Times*.

Adair argues that, "The microwaves generated by the PAVE PAWS facility are *not* different in kind than those emitted by any other radar." Albanese counters that, "Phased array radiation, and specifically the radiation from PAVE PAWS, is qualitatively different from other forms, and therefore requires separate scientific and medical attention."

"The key difference is that there is no gap of silence between the pulses," Albanese told *Microwave News*. "There is no way for the tissue to recover its inertia."

Adair was not swayed. "It is very difficult to understand Albanese because he does not seem to understand basic physics," Adair said in a telephone interview. "There are no numbers—it is all vague talk."

Sweden's TCO Sets SAR Limit For Mobile Phone Certification

TCO Development, an arm of the Swedish white-collar union TCO, has issued a draft of its proposed standard for new mobile phones, with a maximum SAR of 0.8 W/Kg averaged over 10 g of tissue. Manufacturers would have to meet this requirement for their phones to be certified under the new TCO initiative, *TCO'01 Mobile Phones* (see *MWN*, N/D00).

TCO Development used the U.S. standard of 1.6 W/Kg over 1g of tissue "as a starting point," according to a document released for public comment on January 11. In order to use the test protocol to be finalized soon by the European standards group CENELEC, TCO increased the measurement volume to 10 g. Since SARs are lower when measured over 10 g rather than over 1g (see *MWN*, N/D00), TCO then cut the 1.6 W/Kg U.S. limit in half. Many international standards, including ICNIRP's, now mandate an SAR limit of 2 W/Kg over 10 g.

In addition to SAR, TCO is planning to require manufacturers to measure "telephone communication power" (TCP). In simple terms, this is an indicator of a phone's efficiency. TCO Development states that, ideally, a phone would combine a low SAR and a high TCP value.

A phone with a high TCP can operate at a low output power and therefore keeps SARs low, Dr. Yngve Hamnerius of Chalmers University of Technology in Göteborg, who helped develop the TCP measurement protocol, explained to *Microwave News*.

The draft of *TCO'01 Mobile Phones*, which also covers energy efficiency, ergonomics and recyclability, can be requested as a PDF file at <www.tcodevelopment.org>. The deadline for comments is March 1. TCO hopes to have the final version completed by the end of March.

Adair noted that no one had asked him to write the letter, although he had been contacted by the USAF. "The staff at Brooks were afraid that, due to politics, a lot of resources would be diverted to answer Albanese's concerns," he said. Adair's wife, Eleanor, works at Brooks (see p.15).

In 1979 the NAS–NRC issued two reports on PAVE PAWS radiation. One addressed exposure levels and potential bioeffects and the other the intensity of the radiation signals transmitted by the radar.

WTR Micronucleus Results Not Confirmed in Follow-Up Study

A follow-up study has failed to support findings of genetic damage from analog mobile phones that were first reported by Wireless Technology Research (WTR) in 1999.

The WTR study had found highly significant increases in the number of cells with micronuclei after human blood samples were exposed to mobile phone signals, both analog and digital. Those results, from experiments conducted by researchers at Integrated Laboratory Systems (ILS) in Research Triangle Park, NC, have been repeatedly cited as an indication of a genetic risk by Dr. George Carlo, former chair of WTR (see *MWN*, M/A99 and S/O00; also p.11).

The new research, led by Dr. Vijayalaxmi of the University of Texas Health Science Center (UTHSC) in San Antonio, exposed blood from four volunteers to analog phone signals at specific absorption rates (SARs) of up to 5 W/Kg. No effect was observed. "The numbers were very similar between the RF-exposed samples and the sham-exposed controls," Vijayalaxmi told *Microwave News.*

Vijayalaxmi and Dr. Martin Meltz of UTHSC collaborated with Dr. Joseph Roti Roti's lab at Washington University in St. Louis, where the blood samples were exposed. "There's not a whiff of any effect," Roti Roti said in a January interview. "It's pretty clearly negative." Their study appears in the January issue of *Radiation Research (155*, pp.113-121, 2001).

The WTR study found significant increases in micronuclei at 5 W/Kg, with larger increases at 10 W/Kg. In addition to analog signals, the ILS experiments also exposed blood samples to TDMA, CDMA and PCS radiation and showed a significant effect with each.

"I believe both sets of data—the question is why they are discrepant," said Dr. Ray Tice of ILS. One possibility is that the effect is not as consistent at lower exposures. "Without [the other lab] doing 10 W/Kg exposures, which is where we got most of our data, it's hard to draw too many conclusions," he said.

"I would love to have done a 10 W/Kg exposure as well," said Vijayalaxmi. She explained that the exposure system used by Roti Roti's lab could not produce exposures above 5 W/Kg. Roti Roti said that replication efforts at 10 W/Kg are needed. "We need to take the WTR experiments seriously," he said.

Roti Roti added that follow-up studies are needed with a different exposure system than that used by ILS. "There are lots of questions about thermoregulation" with ILS' system, he said.

When the ILS results were first released in 1999, Tice him-

Standards Watch

Czech Government Now Follows ICNIRP

The Czech Republic (and, previously, Czechoslovakia) has long had some of the strictest RF/MW exposure standards in the world. No more. On January 1, 2001, the Czech government began following the recommendations of the European Union and has now essentially adopted the guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) for public and occupational exposures. In an open letter to colleagues around the world, Dr. Jan Musil of the National Institute of Public Health in Prague explained that he opposed the change and that he had been removed as the chair of both the National Reference Laboratory and the Advisory Board on Non-Ionizing Radiation. "I was replaced by a person with no research experience in this area, who was willing to accept the ICNIRP limits without biophysical qualification," he told *Microwave News.* Musil, who favors prudent avoidance, said that he is against the adoption of the same limits for short and long-term exposures and against the "hurried harmonization of standards without objective verification of the facts." (For more on Musil's views on the precautionary principle and RF/MW radiation, see *MWN*, M/J00.)

Ear Proposal Ready for a Final Vote

Subcommittee 4 (SC-4) of IEEE SCC-28 has approved new language to incorporate the reclassification of the ear as an extremity in its non-ionizing radiation exposure standard, C95.1-1999. The change was prompted by measurements showing that many cell phones violate the C95.1 and FCC standards (see *MWN*, N/D99). In an earlier vote, the SC-4 had approved the rationale for the change (see *MWN*, S/O 00). The new language now goes to the full committee for a vote. Ron Petersen of Lucent Technologies, the secretary of SCC-28, told *Microwave News* that he hopes to complete the balloting by April or May.

IEEE Cell Phone Protocol Nears Completion

IEEE Subcommittee SCC-34/SC-2 on SAR Measurement Techniques for Wireless Handsets will meet in London, February 5-7, and may finally complete its work. "I am optimistic that we will settle outstanding issues at the London meeting," said the FCC's Dr. Robert Cleveland. FDA's Howard Bassen, the chair of SC-2, concurred. "It looks like we are finally done," he said not long before boarding a plane for London. "We'll need some editing after the London meeting and then we'll send the draft standard to the full SCC-34 for approval." The protocol for measuring radiation exposures from mobile phones, officially known as IEEE P1528, now runs some 125 pages. Work on the standard began in 1997 (see *MWN*, M/A97; see also J/F99). Bassen explained that the standard took a long time to complete because they wanted "to accommodate the diverse viewpoints of the many members of the subcommittee."

self raised the possibility that they might reflect a thermal effect. Although the experiment was designed to maintain a constant temperature, he said then, it was conceivable that there had been "some localized heating in the medium, and hyperthermia is known to cause micronuclei" (see *MWN*, M/A99).

"People are very interested in the details of their exposure system," said Vijayalaxmi, "to see if there are any hot spots." She noted in particular that at ILS, "the cells were exposed in the bottom of a test tube, a very narrow tube." In contrast, she said, "In my exposure system, the cells are in a flask with a flat bottom. They are not piled on top of each other."

This January, Tice said that this issue would not be settled "until the same lab compares the results for test tubes and petri dishes—to see whether the geometry makes a difference." He said that the hot-spots issue was a major focus at the FDA's RF Micronucleus Working Group meeting in August 2000, and in the related request for proposals for further micronucleus studies issued by the CTIA (see *MWN*, N/D99 and J/A00).

Tice, Roti Roti and Vijayalaxmi are all seeking funding from the CTIA–FDA partnership for replication of the initial WTR results. Vijayalaxmi and Roti Roti said that if they secured funding, they would carry out exposures at 10 W/Kg.

Last summer, Kheem Bisht of Roti Roti's lab presented initial results from a different study at the annual meeting of the Bioelectromagnetics Society (BEMS) in Munich. That experiment, which used mouse fibroblasts rather than human lymphocytes, did not find an effect at most exposure levels and durations. However, in six experiments there was a significant increase in the percentage of cells with micronuclei after a 24-hour exposure to a digital CDMA signal of 4.8-5.0 W/Kg. Exposures with a 5.1 W/Kg analog signal led to slight increases, but the differences with control cells were not significant.

Bisht stated that while his results "do not show a clear RF effect," the increases that were seen "could be consistent with the WTR data." But in a January interview, Roti Roti seemed to back off from that conclusion. "That's a case where we had no significant difference by the two-tailed t-test, but by the one-tailed test it was significant," he said. A one-tailed test is used to test a hypothesis which predicts a difference from controls in a given direction; a two-tailed test is used when researchers are equally interested in any change.

"It could be something, or it could be due to random chance," Roti Roti said. "That paper is under review, and we're going to be rewriting it."

"Well, you're not looking for a *decrease* in micronuclei," responded Tice, "so it should be the one-tailed test." In their BEMS presentation, Bisht and Roti Roti stated that their results were based on "six repeated experiments," and Tice commented that "the real test is repeatability."

Vijayalaxmi said that in some ways, the whole issue is much ado about nothing. "To be honest," she said, "who is going to be exposed to 10 W/Kg? Even a tower worker's exposure is not supposed to go that high." The duration of the experiment is also at odds with real-world experience, she said: "Who is going to sit and use a cell phone for 24 hours? Scientifically it is okay, but practically it is absurd." The bottom line, she argued, is that, "Even if we see a positive effect or a negative effect it is meaningless. It is not worth a dime in terms of people's health."

"Our finding may or may not be biologically relevant," said Tice. "But it's damned reproducible."

In another paper in the January *Radiation Research*, Roti Roti reports that 0.6 W/Kg exposures showed no effect on carcinogenesis (see p.14).

Although Vijayalaxmi's paper in *Radiation Research* was an attempt to replicate the ILS findings, the latter have still not been published. Tice said that the ILS study, which was submitted to *Bioelectromagnetics* in August 2000, is currently under review (see *MWN*, S/O00).

Supreme Court Rebuffs Challenge to U.S. Tower Policy

On January 8, the U.S. Supreme Court declined to review the Federal Communications Commission's (FCC) RF/MW radiation exposure rules or Congress' 1996 preemption of state and local authority on wireless telephone tower siting.

"Everybody understood that this was a long shot, but it was worth taking," said Whitney North Seymour Jr. of Landy & Seymour in New York City. Seymour is representing a coalition of activists that wants states and towns to have the right to set RF/MW exposure rules stricter than those adopted by the FCC (see *MWN*, N/D97, J/A98, S/O98 and M/A00). The coalition includes the Council on Wireless Technology Impacts, based in Novato, CA, and the EMR Network, a national grassroots organization (see *MWN*, N/D98).

Seymour asked the high court to reverse a federal appeals court that had ruled in favor of the federal tower policy (see *MWN*, S/O00). He contended that the preemption clause of the 1996 Telecom Act violates the Constitution and usurps the authority of the states. Seymour also argued that the FCC's exposure limits are not based on adequate research because Congress has not funded any RF/MW health effects studies at the Environmental Protection Agency since 1995 (see *MWN*, S/O95 and S/O00).

Others who filed petitions to the Supreme Court challenging the federal policy were Michael Worsham, an attorney in Forest Hill, MD, David Fichtenberg, an activist in Olympia, WA, and the Cellular Phone Taskforce in New York City, a group that speaks on behalf of the electrosensitive.

The court did not explain its decision. Seymour, a former U.S. Attorney in New York City, said in an interview that the decision "is not a comment on the issues we raised. It just means that the court didn't have time to hear it."

The citizen groups were supported by the entire Vermont congressional delegation: Sen. James Jeffords (R), Sen. Patrick Leahy (D) and Rep. Bernie Sanders (Ind.). All have sponsored bills to repeal the Telecom Act's preemption clause—none of which has passed (see *MWN*, S/O99). "The ball is once again in our court," the three legislators said in a joint statement on January 12. "We will continue to push forward with our efforts in Congress to repeal this ill-formed legislation."

Janet Newton of Marshfield, VT, who heads the EMR Network, said she will work to promote a new legislative initiative. "Getting a bill passed will be an uphill struggle," she conceded.

German Study: More Eye Cancer Among Mobile Phone Users

An epidemiological study in Germany has found that eye cancer is associated with heavy use of mobile phones and walkie-talkies at work. The links were statistically significant, but the researchers caution that the study cannot be seen as "clear evidence" of a real effect.

Between 1994 and 1997, a team of ophthalmologists and epidemiologists from the University of Essen led by Dr. Andreas Stang interviewed 118 people with uveal melanoma, the most common form of adult cancer of the eye, and 475 controls. The questionnaire asked about possible occupational exposure to electromagnetic radiation from a range of sources including radar, VDTs and high-voltage power lines. On handheld wireless devices, subjects were asked whether they had used mobile phones or walkie-talkies "at your workplace for at least several hours per day?" If so, they were asked for more details.

The analysis was based on 16 cases and 46 controls who reported using mobile phones or walkie-talkies for several hours a day for at least six months. Mobile phone users typically worked as real estate agents, tax consultants or sales representatives.

Stang's group found that walkie-talkie users were over three times more likely to develop uveal melanoma than those without RF exposure, a significant increase. Those who had used mobile phones were over four times more likely to get eye cancer, also a significant finding.

In addition, the researchers looked separately at those whose exposure began at least three years or at least five years before the study. They found increased risks of about the same size, but the numbers involved were smaller and no risks were clearly significant.

The paper, published in the January issue of *Epidemiology (12*, pp.7-12, 2001), notes that the study is limited by its very general exposure assessment and the small number of exposed subjects. While it is possible that those with cancer over-reported their use of walkie-talkies or mobile phones, the authors write that they do not think this is likely. They point out that no association was found between uveal melanoma and VDT use, despite public concerns about VDTs and eye diseases.

In an accompanying editorial (pp.1-4), Dr. Peter Inskip of the U.S. NCI criticizes the Stang study for the absence of data on UV exposure (see box at right; also p.1). Little UV radiation penetrates past the cornea and lens of the eye to reach the choroid, the part of the eye behind the retina where most uveal melanomas originate, Inskip concedes. But since UV radiation is an established risk factor for skin melanoma, he argues that it must be directly addressed. In a study of the causes of uveal melanoma, Inskip writes, "UV radiation is a stronger candidate, on *a priori* grounds, than RF radiation."

Stang's study is the first to investigate eye cancer and mobile phones. In March 1997, the U.S. Food and Drug Administration told the industry-funded group Wireless Technology Research (WTR) that, "Identification of potential risks should include end points other than brain cancer (e.g., ocular effects of RF radiation exposure)," but this advice went unheeded (see *MWN*, M/A 97 and N/D97).

In 1998, Canada's federal health department proposed that the government adopt a separate, stricter limit for RF exposure of the eye from cellular phones or walkie-talkies. But this idea was opposed by Canadian industry and was later abandoned (see *MWN*, S/O98, M/A99 and M/J99). In 1999 a Royal Society of Canada panel concluded that eye research was a priority, and the government announced that it was collaborating with the Eye Institute of Canada, in Ottawa, in a laboratory study (see *MWN*, M/J99).

Walkie-talkies were a focus of particular concern in the Canadian discussion of separate limits for the eye—because they often operate at higher power than mobile phones, and because when they are held in front of the face the antenna can be very close to the eyes.

Editorials Have Contrasting Reactions to Mobile Phone Studies

Two of the new epidemiological studies on mobile phones—the NCI's on brain cancer and the University of Essen's on eye cancer—were the subject of contrasting editorials in the journals in which they appeared.

In *Epidemiology (12*, pp.1-4, 2001), NCI's Dr. Peter Inskip advises against making too much out of the association between eye cancer and use of mobile phones and walkie-talkies reported by the University of Essen's Dr. Andreas Stang (see story at left). Inskip emphasizes the dramatically lower energy levels of RF radiation compared to X-rays or even UV radiation, and his editorial focuses on Stang's lack of data on UV exposure. While Inskip says that it is a "possibility" that mobile phones and eye cancer should be studied in the future, he does not specifically call for such research.

Inskip's own study on brain cancer, which found no increase in risk from the use of wireless phones (see p.1), is the subject of a more expansive editorial by Drs. Dimitrios Trichopoulos of the Harvard School of Public Health in Boston and Hans-Olov Adami of the Karolinska Institute in Stockholm in the *New England Journal of Medicine (344*, pp.133-134, 2001). They write that the NCI study's "minor deficiencies do not seriously challenge the important finding that the use of cellular telephones does not detectably increase the risk of brain tumors."

After acknowledging that the NCI study could not determine if there might be an increase in risk "after a very long period of latency," Trichopoulos and Adami state, "We believe that it is highly unlikely that the use of cellular telephones substantially increases the risk of brain tumors."

They draw the following distinction between the kind of public response required by BSE, or "mad cow disease," and wireless radiation: "When the real or presumed risk involves communicable agents, such as the prions that cause BSE," they write, "no precaution, however extreme, can be considered excessive." In contrast, "for noncommunicable agents, such as RF energy," Trichopoulos and Adami call for a policy of "cautious inaction."

The NCI Study

The NCI enrolled 782 cases and 799 controls from admissions to hospitals in Boston, Phoenix and Pittsburgh between 1994 and 1998. There were 489 patients with glioma, 197 with meningioma and 96 with acoustic neuroma.

18% of cases and 22% of controls were regular users, defined as a minimum of two calls per week. 17 cases (2%) and 28 controls (3.5%) used a mobile phone for fifteen minutes or more per day for at least three years. Proxy interviews to determine cell phone use, inter alia, were necessary for 16% of patients with glioma, 8% with meningioma and 3% with acoustic neuroma.

The relative risk of brain tumors (both malignant and benign) ranged from 0.6 to 1.1 for any duration or extent of wireless phone use. None of these risks was significant.

There was no link between the side of the head where people usually held their phone, and the side of the brain on which the tumor occurred. There was no excess risk of a tumor in any particular lobe of the brain.

The NCI study, led by Drs. Peter Inskip, Martha Linet and Robert Tarone, was published in the January 11 issue of the *New England Journal of Medicine (344,* pp.79-86, 2001).

The AHF Study

The AHF enrolled 469 cases and 422 controls from patients admitted to five different U.S. hospitals between 1994 and 1998. 102 eligible cases were eliminated because they had died, refused to participate or were too ill to respond.

14% of cases and 18% of controls were regular users of cellular phones, defined as having had a mobile phone service subscription. The average duration of use was 2.8 years for cases and 2.7 years for controls, with a median use of 2.5 hours a month for cases and 2.2 for controls. 17 cases and 22 controls used a cell phone for four years or more.

Risk of brain cancer did not rise with number of years of use, number of hours on the phone per month, or with hours of cumulative use: For each of these subdivisions, odds ratios ranged from 0.5 to 1.1, none of the risks being statistically significant.

Among cases, 26 had brain tumors on the same side of the head where the phone was usually held, compared to 15 whose tumor was on the opposite side. This was just short of a significant association ($p=0.06$). However, when the analysis was limited to tumors in the temporal lobe, the reverse was true: More patients had tumors on the opposite side from where they held the phone (9 vs. 5).

In examining the data on different tumor subtypes, only neuroepitheliomatous tumors showed any association with mobile phone use. For this type of cancer, phone users had an odds ratio of 2.1 (CI=0.9-4.7).

The AHF study, led by Joshua Muscat and Dr. Mark Malkin, was published in the *Journal of the American Medical Association (284,* pp.3001-3004, 2000).

Two New Epi Studies *(continued from p.1)*

TWO STUDIES REPORT NO LINKS TO CANCER IN CELL PHONES' USE, said a front-page headline in the *New York Times* (December 20). MOBILE PHONES CLEARED OF LINK TO BRAIN TUMORS, declared the U.K.'s *Daily Telegraph* (December 20). A few media outlets were more cautious—for instance, *Wired*'s online news service titled its story NO CANCER? TOO EARLY TO CALL (December 21).

"Based on the evidence we have today, not just our study but all studies taken together, I don't think we see any evidence of increased risk from using cell phones," Inskip told *Microwave News* in January. "To that extent the results are reassuring, but clearly it's not the end of the story." In a press statement in December, Inskip noted that, "If an increased risk of brain tumors occurs only after five or more years, or only among very heavy users, this study probably would not detect it."

Inskip is also the author of an editorial on the first study of eye cancer among wireless phone users, both published in the January issue of *Epidemiology* (see p.9). Another mobile phone–cancer study, by Dr. Christoffer Johansen of the Danish Cancer Society in Copenhagen, is scheduled for publication in February in the *Journal of the National Cancer Institute* (see box, p.12).

Many of the comments on the NCI and AHF studies focused on their relatively short time frame. For example, Dr. David Samuels of the Australian Radiation Protection and Nuclear Safety Agency told the Melbourne paper the *Age* (December 22), "Ionizing radiation, such as X-rays, which are a known carcinogen and which cause a number of cancers, can take up to 20 years" to have an effect. "Therefore these studies haven't been going on long enough," Samuels said (see box, p.11).

Inskip responded that, "You have to remember how this issue came up. It really was through case reports of glioblastoma in the early 1990s, which occurred in the same area where people had held their phones. And our study does show that there's no evidence that those tumors were caused by cell phone use."

David Reynard, whose appearance on *Larry King Live* shook the cellular phone industry in 1993, had said that his wife Susan's brain tumor made "a perfect bull's-eye" on the location of her phone's antenna (see *MWN*, M/J92 and J/F93). Public concern was heightened by reports of brain cancer among other heavy users of mobile phones, such as the head of Beatrice Foods and Republican political consultant Lee Atwater.

The NCI and AHF studies included few people with heavy cellular phone use. Only 13 of 469 cases in the AHF study used their phones more than 20 minutes daily, and only 35 of NCI's 782 cases had a daily average over 15 minutes.

The two studies also had few subjects who had been mobile phone users for very long. Out of 469 cases in the AHF study, only 17 had had a cellular phone subscription for more than three years. In the NCI study, only 54 out of the 782 people with brain cancer had used a mobile phone for three years or more.

The combination of heavy use and long-standing use was rarest of all: For example, only 17 of the NCI's cases averaged more than fifteen daily minutes for three years or more.

Dr. Mark Malkin, a neuro-oncologist at Memorial Sloan-Kettering Cancer Center in New York City and a coauthor of the AHF study, said, "It is not a complete vindication of cell phones."

Still, he added, "Based on what I know now, I am more reassured than I was in 1994." If there was a strong effect, Malkin argued, "The more years of use, the more minutes per month, you would expect to see higher risks of tumors—but we did not see this trend." While more research is needed, Malkin said, "I don't think that our study or the NCI study give any basis for concern."

Initial results from the AHF study were made public almost two years ago, and their interpretation immediately became the subject of public debate (see *MWN*, M/A99 and M/J99). A May 1999 press release from study sponsor Wireless Technology Research (WTR) announced that Muscat had found "a statistically significant risk of a rare tumor," known as a neuroepitheliomatous tumor, made up of neurons (nerve cells) and glia (connecting tissue). Dr. George Carlo, head of the industry-funded research group, described this as an important finding, but Muscat disagreed. "The findings are not straightforward, and they require a lot of interpretation," Muscat told *Microwave News* in March 1999 (see *MWN*, M/A99).

After WTR closed its doors, Carlo became increasingly visible as an industry critic, often citing the AHF study as evidence of a significant risk. His recently published book, *Cell Phones: Invisible Hazards in the Wireless Age*, relies heavily on the AHF study and a lab study of chromosome abnormalities (see p.7) to make its case.

But Muscat's paper in *JAMA* reports no significant increases in risk for any tumor subtype. For neuroepitheliomatous tumors, he gives an adjusted odds ratio of 2.1 (CI=0.9-4.7) among those who had ever had a subscription to a cellular phone service.

In a January interview, Carlo accused Muscat of using "shifting numbers" and "slicing and dicing the data." In a December 21 press release, he stated that, "If these unwarranted reassurances cause people to stop taking precautions to minimize radiation exposure, it will be a tragedy."

Carlo emphasized that the increase in risk for neuroepitheliomatous tumors was statistically significant unless adjusted for a long list of factors such as age, gender, race and years of education, and argued that adjustment is only justified when a given factor has been proven to individually bias the results. He contended that the AHF team had "overinterpreted" the lack of statistical significance in order to dismiss the possibility of an increased risk. "As an epidemiologist, the doubling in risk of neuroepithelial tumors, statistical[ly significant] or not, would be a caution for me," he commented in a widely circulated e-mail.

Dr. Russell Owen of the Food and Drug Administration (FDA) countered that, "An isolated result like that may merely be a chance finding." Owen told *Microwave News* that the AHF results are "certainly not cause for concern." But, he added, "Future studies should investigate the potential relationship between wireless phone use and histological subtypes of brain cancer." Muscat agreed, adding that Carlo's objection to the multiple adjustments represented "an old school of thought." Muscat said such adjustments are now standard practice in epidemiology.

Another early—and controversial—result from the AHF study was the finding that users who had a brain tumor were about twice as likely to get it on the same side of the head where they habitually held their phone. The *JAMA* paper states that this was

Too Soon To Tell?

The International Agency for Research on Cancer (IARC) began its multicountry study of cancer and cellular phones only after preliminary research indicated that there would be enough people with long enough histories of mobile phone use to give meaningful results. At the time, study coordinator Dr. Elisabeth Cardis said that any effect "would probably not be detectable in less than about five years from first use" (see *MWN*, S/O98).

By that measure, the Muscat and NCI studies might seem premature. Is five years of exposure a reasonable minimum? *Microwave News* asked several key players for their opinions:

"I have a very high opinion of Dr. Cardis, but I think that's speculative. If there is an effect, we don't know if it would take one year or 30 years," said **Joshua Muscat**, the lead author of the AHF study.

"After X-rays were used to treat scalp ringworm in Israeli children, the first cases of brain cancer began occurring about 15 years after exposure. The average latency was well over 20 years," said Dr. **Samuel Milham** of Olympia, WA, formerly an epidemiologist with the Washington State Department of Health.

"We do need some long-term studies of cell phone use for ten years or more. Five years is what we saw with ionizing radiation and leukemia. That's a good starting point. For solid tumors you'd like to have more time, but five years is a good place to start," said Dr. **Nancy Dreyer**, Epidemiology Division of Ingenix, Newton Lower Falls, MA.

"That's reasoned by analogy from other carcinogens. But this whole EMF issue—both RF and lower frequencies—is a very open question. If there is any effect on carcinogenicity, the mechanism is not necessarily the same. For example, if it were influencing the growth rate of small subclinical tumors, the timing might be very different," said Dr. **Peter Inskip**, the lead author of the NCI study.

"There's a bimodal incidence of brain tumors. They appear in infants and very young children, so obviously the induction period *can* be less than ten years. The curve flattens out in late childhood and the teens, then rises again in the 30s and keeps climbing. But if you look at the glioblastoma of a nine-year-old and a 90-year-old under the microscope, you can't tell the difference. So I think it's a bit foolhardy to argue that we know already how much cell phone use, if any, could possibly affect that process," said Dr. **Mark Malkin**, coauthor of the AHF study.

"It's still very early. Generally, the latency period for environmental cancers is in decades, and cell phones have only been in use for a short period. It's important to get these studies started to get baseline data. The next round of studies will be more refined," said Dr. **Steven Stellman**, Columbia University School of Public Health, New York City, coauthor of the AHF study.

just shy of a significant association (p=0.06). But when the analysis was restricted to tumors in the temporal lobe, which is closer to a phone's antenna than the frontal lobe, the opposite was true: Tumors were more likely to occur on the opposite side from the phone (p=0.33). For this reason, the AHF team did not see the first finding as evidence of a real effect.

This part of the AHF study drew particular notice when initial results were announced in 1999 because it paralleled a study by Dr. Lennart Hardell of the Örebro Medical Center in Sweden (see *MWN*, M/J99). Hardell found that when tumors developed they were more likely to occur near where the phone was usually held. In Hardell's case, the first report was of a nonsignificant association—but when adjusted for past exposure to X-rays, the link became significant (see *MWN*, M/J00).

Hardell's analysis was based on both the temporal and occipital lobes (at the side and rear of the brain), while Muscat's analysis was based on the temporal lobe alone. Muscat said that this choice was made based on discussions with Dr. Om Gandhi of the University of Utah in Salt Lake City. Hardell told *Microwave News* that some exposure would also occur in the occipital lobe, and that he and coauthor Dr. Kjell Hansson Mild had therefore decided to include it. He noted that this accounted for only a few of the tumors in their analysis.

Hardell said that his own results "should be interpreted with caution, since they are based on small numbers." He noted that neither he nor Muscat had found any overall increase. The main point, he said, is that "the issue of brain tumors and cellular telephones cannot be put to rest."

"Neither [the AHF nor the NCI] study showed any evidence of brain cancer risk, and that's an important contribution," Dr. Nancy Dreyer, of the Epidemiology Division of Ingenix in Newton Lower Falls, MA, said in an interview. "But the trouble with studying cell phones is that the technology is changing and public use is growing so rapidly." Dreyer pointed out that, "The prices are now so low that people are using them for many more minutes. But in 1994 the typical call in the U.S. was just two minutes long."

Dreyer noted the ascendancy of phones using digital signals. The NCI team cautions that, "Because of the timing of this study, we presume that our results pertain primarily to analog telephones with frequencies of 800 to 900 MHz." The AHF study asked participants which type of phone they used; 88% of all phones in the study were analog. Today digital phones are becoming dominant in the U.S., as they have been for some time in Europe.

Inskip said that the 12-country study being coordinated by the International Agency for Research on Cancer (IARC) in Lyon, France, will address some of these limitations (see *MWN*, J/F98, S/O98 and M/A00). "The IARC study is not only much larger, but is being carried out in countries where cellular phone use in large numbers began earlier than in the U.S., and where the switch to digital phones came earlier as well," Inskip said. "Plus it's simply being done later, and all those factors mean that it will tell us more." Inskip argued that the IARC effort showed that the issue was not being neglected: "The studies that need to be done, are being done." The AHF paper also notes the importance of the IARC effort.

But Dr. Kenneth Rothman, of the Boston University School of Public Health and the editor of *Epidemiology*, thinks that even the IARC study will be limited. "These two new studies are both very good, and they add a lot of information," Rothman told *Microwave News*. "But the bigger issue with these studies is that if people are hazy about the extent of their use, it can diminish the ability to see an effect." What is needed, argued Rothman, is a prospective cohort study, following users over time.

In a review article in the November 25 issue of the *Lancet (356*, pp.1837-1840), Rothman concludes that "it is too soon for a verdict on the health risks of cellular telephones."

Rothman and Dreyer worked together on two cohort analyses of cellular phone users in research funded by the industry group Wireless Technology Research (WTR). Their study was cut short by a lawsuit and by the end of WTR funding (see *MWN*, M/J96 and N/D97).

The small number of highly exposed subjects in the two just-published studies was highlighted by one table in the NCI team's paper in *NEJM*. It examines the relative risks in this study for various tumor subtypes. But the "phone user" group in this table is defined as those who had used a mobile phone more than five times in their lives, and the text of the paper notes that the study did not have sufficient statistical power to assess the risks of subtypes.

"Clearly we don't have the power to look at subtype," Inskip conceded in an interview. But he said the table was needed anyway because of the controversy over neuroepitheliomatous tumors in the AHF study. "It's out there in the literature," Inskip explained, "and some people have jumped on that." Inskip noted that this table showed a relative risk of neuroepitheliomatous tumors among phone users of 0.5 (CI=0.1-2.0)—a decrease in risk, opposite to the AHF finding. "That's precisely the kind of bouncing around that you'd expect if it's a chance finding," he said.

Dr. Anders Ahlbom of the Karolinska Institute in Stockholm said that in evaluating early epidemiological studies of mobile phones, "One should not forget that the basis of this research is not a hypothesis based on experimental or epidemiological data,"

Danish Cell Phone Epi Study Slated for Publication in February

A cohort study of 550,000 mobile phone users in Denmark is slated for publication in the February 7 issue of the *Journal of the National Cancer Institute*.

The study was led by Dr. Christoffer Johansen of the Danish Cancer Society (DCS) in Copenhagen, with financial support from the DCS and two Danish wireless firms, TeleDanmark Mobil and Sonofon. The companies provided information on the annual amount of use by each of their subscribers from 1982 to 1995, and the researchers linked this to incidence data in Denmark's national cancer registry.

Johansen and Dr. Jørgen Olsen, also of the DCS, published a description of the study design in *Radiation Protection Dosimetry (83*, pp.155-157, 1999). Johansen is heading up the Danish portion of the 12-country IARC study on mobile phones and cancer (see *MWN*, M/J99 and M/A00).

which the study will clearly prove or disprove. Instead, Ahlbom told *Microwave News*, these studies are based on "an apprehension that use of a new and, in significant aspects, unknown technology is rapidly expanding; that this technology could be associated with as yet unknown effects; and that some experimental data support the existence of nonthermal effects."

Rothman struck a similar note. In his review article in the *Lancet*, he suggests that if any brain cancer risk exists it is likely to be small. But he nonetheless believes that further studies are important. In particular, he said, a prospective cohort study which followed users over a long period of time would enable researchers to look at a variety of possible health impacts. "I think that the industry needs to be prodded to do this research," Rothman told *Microwave News*. "For such a widespread technology that's been introduced so rapidly, I think there's an obligation to study its effects."

FROM THE FIELD

2001 Conference Calendar (Part II)

Part I appeared in our last issue.

June 10-14: **23rd Annual Meeting of the Bioelectromagnetics Society (BEMS),** Radisson Hotel, St. Paul, MN. Contact: Dr. John Male, 2412 Cobblestone Way, Frederick, MD 21702, (301) 663-4252, Fax: (301) 694-4948, E-mail: <BEMSoffice@aol.com> and <bems@delasallecenter.org>, Web: <www.bioelectromagnetics.org>.

June 10-14: **2001 American Radiation Safety Conference & Exposition (46th Annual Meeting of the Health Physics Society),** Convention Center, Cleveland, OH. Contact: HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101, E-mail: <dave@npc-link.com>, Web: <www.hps.org/nochps>.

June 14-16: **1st Joint Meeting of the Society for Epidemiologic Research and the Canadian Society for Epidemiology and Biostatistics,** Westin Harbor Castle, Toronto, Canada. Contact: Harriett Telljohann, E-mail: <htelljoh@jhsph.edu>, Web: <www.jhsph.edu/Publications/JEPI/serdates.htm>.

July 8-13: **IEEE Antennas and Propagation Society (APS) International Symposium** and **USNC/URSI National Radio Science Meeting,** Sheraton Hotel, Boston, MA. Contact: Robert McGahan, (781) 377-2526, Fax: (781) 377-3469, E-mail: <mcgahan@ieee.org>, Web: <www.ieeeaps.org/2001APSURSI>.

July 15-19: **2001 IEEE PES Summer Meeting,** Vancouver, Canada. Contact: Yakout Mansour, B.C. Hydro, 6911 Southpoint Dr., Burnaby, BC V3N 4X8, Canada, (604) 473-2730, Fax: (604) 473-2731, E-mail: <yakout.mansour@bchydro.bc.ca>, Web: <www.ieee-spm2001.org>.

July 18-22: **Progress in Electromagnetics Research Symposium (PIERS 2001),** Cosmosquare International Education and Training Center, Osaka, Japan. Contact: Prof. T. Hinata, College of Science and Technology, Nihon University, 1-8 Surugadai, Kanda, Chiyoda, Tokyo 101-8308, Japan, (81+3) 3259-0762, Fax: (81+3) 3259-0783, E-mail: <hinata@ele.cst.nihon-u.ac.jp>, Web: <www.piers2001.gr.jp>.

August 13-17: **2001 IEEE Electromagnetic Compatibility (EMC) Symposium International Rendezvous,** Montréal, Canada. Contact: 2001 IEEE EMC Symposium Secretariat, JPdL Destination Management, 1555 Peel, Ste. 500, Montréal, PQ H3A 3L8 Canada, (514) 287-1070, Fax: (514) 287-1248, E-mail: <emc2001@jpdl.com>, Web: <www.2001emcmtl.org>.

August 20-22: **15th Symposium on Epidemiology in Occupational Health,** Copenhagen, Denmark. Contact: Ole Teller, Ramsingsvej 7, DK-2500 Valby, Denmark, (45) 36143162, Fax: (45) 36143180, E-mail: <ICOH.WORKandHealth@OSH-Council.dk>, Web: <www.OSH-Council.dk/web/information.htm>.

September 6-8: **5th International Congress of the European Bioelectromagnetics Association (EBEA),** Marina Congress Center, Helsinki, Finland. Contact: Solveig Borg, Finnish Institute of Occupational Health, Topeliuksenkatu 41 aA, FIN-00250 Helsinki, Finland, (358+9) 4747-2900, Fax: (358+9) 241-3804, E-mail: <solveig.borg@occuphealth.fi>, Web: <www.occuphealth.fi/e/project/ebea2001>.

September 17-21: **26th Annual Conference of the Australasian Radiation Protection Society (ARPS),** Gold Coast International Hotel, Victoria, Australia. Contact: ARPS Secretariat, PO Box 7108, Upper Fern Tree Gulley, Victoria 3156, Australia, (61+3) 9756-0128, Fax: (61+3) 9753-6372, E-mail: <arps@21century.com.au>, Web: <www.arps.org.au/ARPS26.htm>.

September 25-27: **31st European Microwave Conference (EuMC 2001),** ExCeL Conference Center, London, U.K. Contact: Steve Nightingale, ERA Technology Ltd., Cleeve Rd., Leatherhead, Surrey KT22 7SA, U.K., (44+1372) 367121, Fax: (44+1372) 367138, E-mail: <steve.nightingale@era.co.uk>, Web: <www.eumw.com>.

October: **WHO/EMF Biological Effects and Standards Harmonization Regional Meeting,** Seoul, South Korea. Web: <who.int/peh-emf/meetings.htm>. (Being finalized.)

October 21-26: **8th International Conference on Environmental Mutagens (8th ICEM),** Shizuoka, Japan, Prof. N. Kinae, School of Food and Nutritional Sciences, University of Shizuoka, 52-1 Yada, Shizuoka 422-8526, Japan, (81+54) 264-5528, Fax: (81+54) 264-5099, Web: <www.iaems.nl/meetings.htm>.

October 25-28: **23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society,** Convention Center, Istanbul, Turkey. Contact: Dr. Yorgo Istefanopulos, Institute of Biomedical Engineering, Bogazici University, 80815 Bebek-Istanbul, Turkey, (90+212) 263-1540, Fax: (90+212) 257-5030, E-mail: <istef@boun.edu.tr>, Web: <embc2001istanbul.bme.boun.edu.tr>.

October 28-November 2: **2001 IEEE/PES Transmission and Distribution Conference and Exposition,** World Congress Center, Atlanta, GA. Contact: Kara Clark, GE Power Systems Energy Consulting, 1 River Rd., Bldg. 2-624, Schenectady, NY 12345, (518) 385-5395, Fax: (518) 385-9529, E-mail: <kara.clark@ps.ge.com>, Web: <www.ieeet-d.org>.

Meeting Notes

• Staff from the U.S. EPA and the FCC are going to Taipei, Taiwan, for a seminar on the health effects of EMFs and RF radiation, February 12-14. There will be discussions on health effects, standards, regulations and enforcement issues. Officials from Taiwan EPA and university researchers will attend. EPA's Dr. Robert McGaughy is coordinating the U.S. technical program. Other members of the American delegation include Drs. Carl Blackman and Joe Elder, both of the EPA, and Dr. Robert Cleveland of the FCC.

• A WHO–Israeli government seminar on *Bioeffects and EMF Standards Harmonization* planned for March has been put off until a later date. Shaiela Kandel, who is helping to organize the meeting, attributed the delay to the current "sensitive" situation in Israel.

Hot New Papers

B. Grajewski et al., "Semen Quality and Hormone Levels Among Radiofrequency Heater Operators," *Journal of Occupational and Environmental Medicine, 42,* pp.993-1005, October 2000.

"[O]ver 250,000 [U.S. workers] operate RF dielectric heaters. We measured incident RF heater radiation exposures and RF-induced foot currents at four companies. For 12 male heater operators and a comparison group of 34 RF-unexposed men, we measured 33 parameters of semen quality and four serum hormones. Despite wide variation in individual exposure levels, near field strengths and induced foot currents did not exceed current standard levels and guidelines. We observed minor semen quality and hormonal differences between the groups, including a slightly higher mean follicle-stimulating hormone level for exposed operators (7.6 vs. 5.8 mIU/mL)....It is unlikely that any of the confounding chemical exposures measured were of sufficient magnitude to affect the results...It is possible that the modestly increased FSH levels of the RF heater operators indicate a chronic RF radiation effect on germinal epithelium with sufficient compensatory increase in gonadotrophin levels to maintain normal semen quality."

H. Brendel, M. Niehaus and A. Lerchl, "Direct Suppressive Effects of Weak Magnetic Fields (50 Hz and 16$^{2/3}$ Hz) on Melatonin Synthesis in the Pineal Gland of Djungarian Hamsters *(Phodopus Sungorus)," Journal of Pineal Research, 29,* pp.228-233, November 2000.

"In many investigations performed thus far on rodents, a suppression of melatonin synthesis was observed when animals were exposed to weak magnetic fields. However, among the several issues not yet resolved is the question of whether the observed changes are caused by direct effects on the pineal gland or by indirect effects, e.g., at the level of the eyes. We, therefore, performed a series of experiments in which direct effects of weak magnetic fields were studied in isolated pineal glands of Djungarian hamsters....Experiments (n=8) lasted for 8 hr. Magnetic fields (16$^{2/3}$ or 50 Hz at 86 μT [860 mG]) were generated....In all experiments, maximum melatonin concentrations were lower in the exposed groups compared with the sham-exposed controls. Statistical analyses for each frequency showed significant suppressive effects at 16$^{2/3}$ Hz ($p<0.01$) and 50 Hz ($p<0.001$). It is concluded that the suppressive effects of magnetic fields on the synthesis of melatonin are a result of primary mechanisms at the level of the pineal gland....Hence, the eyes are not necessarily involved in the response to the exposure, although they may be affected as well."

J. Roti Roti et al., "Neoplastic Transformation in C3H 10T$^{1/2}$ Cells After Exposure to 835.62 MHz FDMA and 847.74 MHz CDMA Radiations," *Radiation Research, 155,* pp.239-247, January 2001.

"In the present study, we found no effects on the frequency of neoplastic transformation after exposure to either 835.62 MHz FDMA or 847.74 MHz CDMA at 0.6 W/Kg for 7 days. Further, these radiations did not increase the frequency of transformation induced by 4.5 Gy of X-rays when the X irradiation was followed by an RF-radiation exposure of 42 days at an SAR of 0.6 W/Kg. Thus the results of the present study did not support the possibility that RF radiation from mobile phones is able to induce neoplastic transformation after exposures at 0.6 W/Kg.... Balcer-Kubiczek and Harrison...reported that there was an increase in transformation frequency when 2450 MHz microwave exposure was followed by TPA and that microwave exposure prior to or after X irradiation enhanced the transformation frequency induced by X-rays when followed by TPA [see *MWN*, J/A89]....[W]hile it may appear that our results for RF radiation + TPA and X-rays + RF radiation differ from theirs, there are several key experimental points that could account for this apparent difference." (See also p.7.)

Magnetic Fields in the Industrial Workplace

M. Methner and J. Bowman, "Hazard Surveillance for Industrial Magnetic Fields: I. Walkthrough Survey of Ambient Fields and Sources," *Annals of Occupational Hygiene, 44,* pp.603-614, December 2000.

"Sixty-two facilities from 13 Standard Industrial Classifications (SICs) with the highest monthly electric power usage were surveyed...with an EMDEX-II meter....The range of the [40-800 Hz] GM [geometric mean] magnetic field magnitude was 0.04-1.61 μT [0.4-16.1 mG], where the maximum was measured at a steel mill operating large electric furnaces. Maximum values for specific sources were highly variable across and within facilities (Hi-5 [five highest] range: 1.0-530 μT). Chemical and allied products and primary metal products had facilities with GM and Hi-5 magnetic fields greater than any of the other industrial categories. However, the SIC categories were found to be poor predictors of the ambient MF in this sample of factories....Overall, 89% of the GMs were at or below 0.4 μT."

J. Bowman and M. Methner, "Hazard Surveillance for Industrial Magnetic Fields: II. Field Characteristics from Waveform Measurements," *Annals of Occupational Hygiene, 44,* pp.615-633, December 2000.

"Magnetic field characteristics have been surveyed systematically in six factories with the Multiwave II waveform capture instrument. These six facilities manufactured plastics, pharmaceuticals, cement, liquid air products, aluminum parts, and aluminum-framed filters. The study goals were to survey the physical characteristics of magnetic fields that may be related to biological effects under various interaction mechanisms....The RMS vector magnitude of the ELF magnetic field (the usual exposure metric in most studies) had medians ranging from 0.53 to 12.83 μT....The frequency spectra of the most common fields is dominated by 60 Hz....The most common higher frequencies are the third, fifth and second harmonics of 60 Hz. However, magnetic fields in these workplaces had many other 60 Hz harmonics and non-harmonic frequencies due particularly to electric motors and computer monitors. The 60 Hz component magnetic fields have elliptical polarization with median axial ratio of 25.4%....This variability of magnetic field characteristics has implications for the evaluation of the possible cancer hazards.... Epidemiologic studies have reported significant associations of leukemia and brain cancer risks with the TWA magnitudes of workplace magnetic fields. However, occupational EMF was only rated a 'possible' carcinogen because of the lack of an established mechanism and inconsistencies between epidemiologic results....The diverse magnetic field characteristics observed in our survey provide further evidence that the varying risks associated with the ELF magnitude may be explained by a better assessment of occupational EMF exposures. The hypothesis that these characteristics may be effect modifiers can be tested by using waveform capture instruments like the Multiwave II to measure exposures in future epidemiologic studies. Such studies would not only clarify whether workplace EMF causes cancer, but also indicate which exposure characteristic should be measured during occupational hygiene surveys."

Across the Spectrum

"The precautionary principle is no longer an academic debate."

—Carolyn Raffensperger, executive director, Science and Environmental Health Network, speaking at a conference at the Kennedy School of Government, Harvard University, Cambridge, MA, quoted by David Appell, "The New Uncertainty Principle," *Scientific American,* p.19, January 2001

"I argue that the standard-setting process should (be broadened to) include doctors, lawyers and everyone else."

—Dr. John Osepchuk, chair, IEEE Standards Coordinating Committee 28 (SCC-28) and formerly with Raytheon Co., quoted by John Greenwald, "Buzzing About Safety," *Time,* p.50, January 15, 2001

"I feel very strongly that the federal government has closed its eyes to the potential health risks."

—Vera Katz, mayor, Portland, OR, who abstained from voting on a proposed cell tower, quoted by Courtenay Thompson, "Katz Cites Health in Stance Against Cell Phone Towers," *The Oregonian,* January 26, 2001

"All the emphasis that we need more research on power line fields, cell phones, police radar—this involves billions of dollars that could be much better spent on other health problems. Because there is really nothing there."

—Dr. Eleanor Adair, U.S. Air Force, Brooks AFB, San Antonio, quoted by Gina Kolata, "Tuning In to the Microwave Frequency," *New York Times,* p.F7, January 16, 2001 (see also p.19)

Robert Park will tell you categorically that the risk of injury from a cell phone is as small as the chance that a tree will fall on you as you take your morning run. Those words are reassuring until you discover that Park, who is a physicist, was badly injured recently when a big oak fell on him while he was jogging near his home in Maryland. You figure the odds.

—Johanna Seitz, "What Is It They're Really Saying About Cell Phones?," *Boston Globe,* p.E1, January 21, 2001

Plaintiff Attorney Peter Angelos Through the Eyes of the U.K. Press

BALTIMORE BRUISER RUMORED READY TO RUMBLE

—Headline, *Financial Times* (U.K.), December 29, 2000

LITTLE CAESAR TAKES THE WAR TO PHONE FIRMS

—Headline, *Sunday Times* (U.K.), December 31, 2000

'KING OF TORT' PUTS SQUEEZE ON VODAFONE

—Headline, *The Scotsman* (U.K.), December 31, 2000

(See also p.5.)

"It is the Government's view that if a proposed development meets the International Commission on Non-Ionizing Radiation Protection guidelines—commonly known as the ICNIRP guidelines—as recommended by Stewart on a precautionary basis, it should not be necessary for a planning authority, in processing an application, to consider the health effects further. It does not mean that individual local authorities should introduce their own precautionary policies for determining applications for mobile telephone base stations. That would be a recipe for confusion and uncertainty."

—Nick Raynsford, U.K. Minister for Housing and Planning, speaking during a Parliamentary debate on "Mobile Phone Masts," January 24, 2001; the full text of the debate is available on the Web at: <www.parliament.the-stationery-office.co.uk/pa/cm/cmhansrd.htm>, beginning at column 1034 (see also p.5)

"Pret-a-Port"

—Picture caption accompanying examples of wearable computers, Keith Kirkpatrick,"Functional Fashion Can Go Anywhere," *Mobile Computing & Communications,* p.19, February 2001

"MICROWAVE NEWS" FLASHBACK

Years 20 Ago

• A NIOSH investigation fails to connect a cluster of cancer cases among AT&T Communications Workers of America long lines workers in Ragerville, OH, with exposure to RF/MW radiation.

• A government advisory panel refuses to initiate a study on the health of Americans exposed to microwave radiation at the U.S. embassy in Moscow because of the lack of scientific plausibility.

• Dr. Allan Frey argues that an inappropriate statistical analysis led researchers to erroneously conclude that microwaves do not affect the permeability of the blood-brain barrier.

Years 10 Ago

• A panel of epidemiologists adds breast cancer to the list of critical targets for EMF research after a third study shows higher rates of male breast cancer among those occupationally exposed to EMFs.

• The NIH discloses that in 1988 three of its staff scientists violated institute guidelines when they accepted payments as expert witnesses on behalf of electric utilities in a cancer–power line trial.

• At an EPA advisory panel meeting, Dr. David Korn, chairman of the National Cancer Advisory Board, calls the association between EMFs and cancer "extraordinarily speculative." Korn later admits he had not read the relevant papers on cellular and animal effects.

Years 5 Ago

• The EPA indefinitely delays release of its eight-year assessment of EMF cancer risks, but a staffer calls the link stronger than ever.

• EPRI finds a "small, but significant" increase in brain cancer among workers exposed to EMFs in a meta-analysis of 29 occupational studies.

• University of Bern researchers in Switzerland report that residents living near the Schwarzenburg shortwave transmitter experience more neurological problems than those living further away.

UPDATES

BROADCAST RADIATION

Reassurance & Warnings on Sutton Coldfield... Two letters in the January 15 *American Journal of Epidemiology (153,* pp.202-205, 2001) take opposite tacks on Dr. Helen Dolk's 1997 epidemiological study of cancer and TV–radio signals from the Sutton Coldfield broadcast tower near Birmingham, U.K. (see *MWN*, J/F97). Dolk had found significant increases in leukemia risk among those living closest to the tower, but not around other antennas elsewhere in Britain. "Continuing local concern prompted a further study [of Sutton Coldfield] in which previous analysis was repeated and more timely cancer data were used," write Drs. Duncan Cooper, Karla Hemmings and Pat Saunders of the University of Birmingham. "If the TV transmitter were a cause of adult leukemia, one would assume both a higher than background incidence in the areas...closest to the transmitter," Cooper and colleagues write, "and a decline in risk with distance." But their own study for 1987-1994 does not support Dolk's results for 1974-1986. A letter from Dr. Neil Cherry of Lincoln University in Canterbury, New Zealand, argues that Dolk's study understates cancer risk because it did not take into account differences in radiation patterns from different antennas. In an accompanying comment, Dolk, of the London School of Hygiene and Tropical Medicine, writes that, "given the...imprecise risk estimates involved," it is hard to say whether the new University of Birmingham data "are consistent with or contradict our findings."

MEDICAL DEVICE EMI

Hospital Study: Cell Phones Can Zap Monitors... Mobile phones can change the readings on hospital equipment, and can sometimes even make a device shut down. But the odds of such serious interference are very slim. Those are the conclusions of a study by Jeffrey Tri, Dr. David Hayes and colleagues at the Mayo Clinic in Rochester, MN. The study, published in the *Mayo Clinic Proceedings (76,* pp.11-15, 2001), tested 17 hospital devices with five different mobile phones, with the phones at a variety of distances and angles to the equipment. An accompanying editorial by two Mayo Clinic physicians states that the results "should give us pause": Electromagnetic interference (EMI) was observed in 55% of the tests. In 7% of the tests, this interference was severe enough that it might be clinically important—that is, it could "hinder interpretation of the data or cause the equipment to malfunction." Some sort of EMI was observed with 41% of the devices tested. The editorial, by Drs. David Herman and John Abenstein, singles out the case of a ventilator which shut down and restarted due to mobile phone EMI. "Even more alarming," they write, "is the fact that the ventilator did not recover once the phone was...turned off." The actual likelihood of this sort of interference is extremely small, state researchers Tri and Hayes: It occurred only when a phone was used within 5-10 cm of the ventilator's communications port, which is located on the back of the machine and generally not accessible to patients or visitors. The most common type of EMI in this study was interference with an electrocardiogram readout. Noise on the baseline was the most common and was "generally produced by digital phones"; baseline movement was also observed and was mainly caused by analog models. The battery of tests included a "ring-

ing test," to study whether an incoming call could produce EMI—which it often did. Tri and Hayes conclude that if mobile phones are used "at some reasonable distance (60 inches based on our laboratory results)" from medical equipment, "it is unlikely that any serious malfunction would occur." On the other hand, they note, this study was restricted to cardiopulmonary monitoring equipment, and there are "literally thousands of pieces of electrical equipment commonly used in hospitals [which] could be tested." The editorial and the paper strike different notes on the bans on mobile phones which many hospitals have instituted. Tri and Hayes decline to endorse or reject such policies, saying that more testing is needed before rules on this subject "can be constructed objectively." In contrast, the editorial backs the bans, especially in areas like operating rooms and intensive care units where patients are most vulnerable. Hayes was the principal investigator on a study of cellular phone EMI with implanted pacemakers (see *MWN*, M/J95, M/J96, J/F97 and J/A97).

PEOPLE

Dr. **Colin Roy**, the director of the non-ionizing branch of ARPANSA, the Australian radiation agency (see p.6), is joining Dr. **Michael Repacholi** at the WHO in Geneva for the rest of the year. Repacholi said that Roy will be working mainly on UV radiation, but will also assist the EMF project....Dr. **Philip Chadwick** has left the U.K. Department of Health, where he was helping implement the Stewart panel's recommendations, to join Microwave Consultants Ltd., which is based in London. Chadwick said that he will be working on dielectric measurements and the construction of phantoms, as well as other projects, such as RF dosimetry....Dr. **Shoogo Ueno** of the University of Tokyo has been named a fellow of the IEEE for his "contributions to biomagnetic research in localized magnetic stimulation of the brain, impedance MRI and imaging of brain function."...**Al Gross**, a pioneer in the development of CB radios, cellular and cordless phones and pocket pagers, died on December 21 at the age of 82. Most of his patents expired before they were commercialized. Otherwise, Gross remarked not long ago, "I'd be as rich as Bill Gates."

VIDEO

Rallying the Troops..."Just what are the human health and environmental effects of the wireless revolution? Isn't it about time we found out?" asks the narrator at the beginning of Libby Kelley's new video. Over the course of the next hour, Kelley, director of the Council on Wireless Technology Impacts (CWTI), based in California, interviews many of those researchers who have spoken out on the possible health risks—including Drs. Neil Cherry, John Goldsmith, Olle Johansson, Henry Lai, Jerry Phillips and Cindy Sage. Other than Dr. Jerrold Bushberg, who is shown in a promotional video for Cellular One, voices from the other side of the controversy are noticeably absent. Sweden's Per Segerback appears in the most provocative part of the film when he argues for the rights of those who are hypersensitive to EMFs. VHS cassettes of *Public Exposure: DNA, Democracy and the Wireless Revolution* are available for $20 each, including shipping, from CWTI, 936B Seventh St. #206, Novato, CA 94945, (415) 892-1863, Fax: (415) 892-3108, E-mail: <libbykelley@energyfields.org>. PAL-formatted cassettes cost $30.00.

As We Go To Press

French Mobile Phone Report Calls for "Precautionary" Approach

A French government report on mobile phones has called for "a risk management approach *based on the precautionary principle.*" It urges both users and manufacturers to reduce RF/MW exposure "to the lowest possible level compatible with service quality."

"All ministries of the government are involved and are working on implementing the recommendations very quickly," Dr. Bernard Veyret of the University of Bordeaux told *Microwave News*. Veyret is one of six experts who prepared the report, *Mobile Telephones, Their Base Stations and Health*, at the request of health secretary Dominique Gillot.

Veyret said that SAR numbers "are likely to be provided before people buy a phone—not inside the box." The report urges users to practice individual "prudent avoidance measures," such as using an earpiece or keeping the phone away from "potentially sensitive tissues" such as a pregnant woman's belly or the gonads of adolescents. Parents who provide a child with a mobile phone are advised to ensure that it is used in "a measured way."

"Scientific data indicate, with relative certainty, that during exposure to RF from a mobile phone, a variety of biological effects occur" at nonthermal levels of exposure, the report concludes. "It is not yet possible to determine whether they represent a health hazard," the report states, but if any hazards do exist, "the risk, at an individual level, would probably be very low."

A summary of the report in English is on the Web at <www.sante.gouv.fr/htm/dossiers/telephon_mobil/resum_uk.htm>. The entire report, in French, will be available as a PDF file at <www.sante.gouv.fr/htm/dossiers/telephon_mobil/intro.htm>.

Keeping Current: Follow-Up on the News

◆ On January 29, Michael Weinstock of Weinstock & Scavo in Atlanta filed suit in Georgia state court on behalf of Brian Barrett, 38, who developed a brain tumor after using a handheld mobile phone. Among the defendants are Nokia Corp., BellSouth Mobility Inc. and the CTIA. Barrett began using a Nokia phone in 1994 and was diagnosed with an astrocytoma in February 2000.

◆ Dr. George Carlo's Washington consulting firm has closed its doors. The Health Risk Management Group's Web site now lists only a post office box and a voicemail number in Virginia. "We closed our office downtown in November," Carlo told *Microwave News.* "I'm still going to be active, but it's pretty hard to do work without funding." Last spring Carlo announced a new $60 million project, with "definite commitments" from unnamed sources (see *MWN*, M/J00).

◆ Swiss investigators are looking into the possibility that a mobile phone may have caused a Saab 340 airplane to crash last year after taking off from Zurich airport, the U.K.'s *Daily Telegraph* reported on January 11 (see also *MWN*, N/D00).

◆ Nokia estimates that at the end of the year 2000, there were more than 700 million users of mobile phones around the world. The NOP Research Group in the U.K. reports that nearly half of all British children aged 7 to 16 now have a mobile phone. And the Yankee Group, a research company based in Boston, predicts that by 2005 wireless phones in the U.S. will account for 45.1% of all conversations, compared to 6.5% in 1999.

◆ The U.K.'s National Radiological Protection Board has stopped publishing the print edition of its *Radiological Protection Bulletin.* Beginning this year, the *Bulletin* will be available at no charge on the board's Web site, <www.nrpb.org.uk/Rpb.htm>.

◆ Neotonus, an Atlanta company, is marketing its NeoControl Pelvic Floor Therapy System for urinary incontinence among women—with FDA approval. Treatment consists of sitting in a chair that beams "highly focused pulsed magnetic fields" for approximately 20 minutes twice a week for eight weeks or more. For more on this, go to: <www.neotonus.com>.

◆ Jane's, the leading publisher of defense information, will release a new special report on *Radiofrequency Weapons* in April. It will include "types and classifications of RF weapons, current and emerging technologies and a survey of world activities to help you manage the possible threat of RF weapons." The volume costs $995.00.

Reality Check

They sprouted like mushrooms after the rain: one headline after another declaring that cellular phones are safe. More than one said that wireless phones had been "cleared" of all suspicion, by epidemiological studies from the National Cancer Institute (NCI) and the American Health Foundation (AHF) (see p.1).

But anyone who read past the headline might have been left with some nagging questions:

- Do these studies reflect the way people actually use cellular phones today?
- Do they apply to digital phones?
- If someone has used a mobile phone a total of *six times*, does it make sense to define them as a mobile phone user?
- Do environmentally induced solid tumors usually appear within three years of first exposure?
- If a cancer risk exists, would these studies have found it?

It's time for a reality check. The studies by the NCI and AHF may someday be useful as baseline data, points of comparison once we are farther down the wireless road. But as a guide for concerned consumers, their value is extremely limited.

It is worth thinking about what risks might be apparent in an epidemiological study that included people who have smoked only six cigarettes. Or a tobacco study in which most people had smoked for less than three years. Today or 30 years ago, no newspaper in the world would have heralded results from such a study as an "all-clear" for tobacco.

This criticism is not aimed at the researchers. The NCI and AHF studies themselves avoid overly broad conclusions. They take note of their own limitations and call for more research.

We might quarrel with the investigators on some specific points. For example, with Dr. Peter Inskip when he says the NCI study should reassure us that the famous brain cancer cases of the mid-1990s were not caused by mobile phones. A study with so few heavy users tells us no such thing. Or with AHF's Joshua Muscat, who told the *Boston Globe* (January 21) that, "There's little reason to believe you'll get cancer from cell phones." This ignores several experiments whose results should at least give one pause.

But the problem here is not the studies *per se*—it's the way they have been portrayed by the scientific establishment and the mass media. The *Journal of the American Medical Association*, for example, prepared a "video press release," in which a "health reporter" declares that "the most extensive human study to report results...found no increased risk." Any caveats were buried at the end of the piece, easy to leave on the cutting-room floor.

The *New England Journal of Medicine* has already taken the view that mobile phone health concerns are something manufactured by "activists and the media" (see *MWN*, J/A97). Prejudging the question this way defines the task of scientific institutions as reassuring the public, rather than providing an honest, balanced view.

And so the *Journal*'s editorial on the NCI study insists that "it is highly unlikely" that mobile phones pose any appreciable cancer risk. While its authors, Drs. Dimitrios Trichopoulos and Hans-Olov Adami, concede that tumors with what they call "a very long period of latency" would not have been detected by NCI researchers, the phrase "very long" is spin that verges on falsehood. The NCI study would have missed any mobile-phone-related tumors that took more than five years to develop, and adult brain tumors typically have latencies of more than ten years.

A recent inquiry on the British government's mishandling of the BSE crisis provides the proper term for what's going on with mobile phones: a policy of "sedation."

The U.K. government was driven by the fear that "the public would react irrationally to BSE," according to the report, and ministers responded with unfounded assurances of safety. This led to grotesque scenes like the minister of agriculture trying to feed a British-beef hamburger to his daughter as the TV cameras rolled. The six-year-old girl had the good sense not to eat it.

When the scientific establishment, the mass media and the government dish out pablum, the public usually refuses to swallow as well. It's time they stopped treating the public like children: It isn't right and it doesn't work. Putting reassurance ahead of science only breeds mistrust and cynicism. Living with uncertainty is a part of modern life, and the general public is better at it than those in elite circles tend to think.

News Flash: RF Is "Harmless"

Don't bother reading our main editorial—or anything else in *Microwave News*. According to the *New York Times*, the RF/MW health debate is already settled.

Times science reporter Gina Kolata writes that "most academic scientists" agree that microwave radiation from cell phones is "harmless" (January 16).

Who are these academic experts? The only ones on Kolata's RF Rolodex: partisans like Drs. Eleanor Adair, John Moulder and Robert Park.

Kolata, sensitized to possible conflicts of interest, notes that Adair "accepts no money from industry" (a claim she cannot make for Moulder). But as a U.S. Air Force employee with rank equivalent to a brigadier general, Adair has conflicts aplenty. The Air Force's PAVE PAWS radar on Cape Cod alone puts out as much radiation as a million mobile phones. Taken together, the wattage beamed from military transmitters dwarfs that from all wireless devices.

Caveat lector!

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