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U.K. Panel Discourages Use of Mobile Phones by Children

A high-level panel appointed by the U.K. government has recommended that children be discouraged from using mobile phones and that the industry not market phones to children. Although the Independent Expert Group on Mobile Phones, chaired by Sir William Stewart, found that there was no evidence of a health risk, it favored a "precautionary approach" given current "gaps in knowledge."

"I have got a grandchild of four and a grandchild of two and I would not be

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recommending that they have mobile phones," Stewart told the BBC, noting that he would continue to use his own phone. Stewart was science advisor to the prime minister from 1990 to 1995.

The 12 members of the expert group issued their report on May 11. They asked that radiation exposure data for different phones—specific absorption rates (SARs)—be "readily accessible to consumers" and that there be no shortcuts in the planning process for the siting of mobile phone base stations. (For the main conclusions and recommendations, see p.10. A list of panel members appears on p.11.)

The U.K. Department of Health, which asked for the mobile phone report

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Strong Electric Fields Implicated in Major Leukemia Risk for Workers

Long-term employees of Ontario Hydro who worked in strong electric fields had much higher risks of leukemia, Canadian researchers have found. Significant risks were also found for non-Hodgkin's lymphoma (NHL) in a related study.

The elevated risks were seen among workers who spent the most time in electric fields above certain thresholds, in the range of 10 to 40 V/m. The largest increases occurred among those with more than 20 years on the job. Senior workers with the greatest time above the thresholds had an eight- to tenfold increase in the risk of leukemia—much higher than in past epidemiological studies of electromagnetic fields (EMFs).

"It's very interesting that there seems to be a threshold effect," Dr. Anthony Miller, a coauthor of the study, told *Microwave News*. "These studies confirm that electric fields are very important, if not dominant," Miller said. "I think

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that's a very important message." Both studies were based on data from Miller's 1996 study of Ontario Hydro employees, which put a spotlight on cancer risks and electric fields (see *MWN*, J/A 96). Formerly at the University of Toronto, Miller is now with the German Cancer Research Center in Heidelberg.

Paul Villeneuve of the University of Ottawa, who led the studies as part of his doctoral dissertation, said, "It's remarkable that we saw similar threshold effects for both leukemia and NHL." The threshold levels were "relatively consistent" in the two studies, he noted.

In an interview, Dr. Lois Green of Ontario Power Generation (formerly part of Ontario Hydro) in Toronto described this work as the first of its kind. "No one has ever taken a systematic look at threshold effects before," she said. Most previous studies have focused on cumulative effects or time-weighted averages, which Green called "a very limited way to view EMF exposures." The new work by Villeneuve, Miller and colleagues "shows that there are other important ways of looking at exposure," she said. "We can't close the door on this question."

The new Canadian results stand in sharp contrast with past EMF epidemiological studies, most of which have focused almost exclusively on magnetic fields. Dr. David Savitz of the University of North Carolina, Chapel Hill, told *Microwave News* that the new findings "suggest that those doing future studies reconsider the pessimism about the value of electric field data."

"Our results suggest that there is no association between exposure to magnetic fields and NHL," Villeneuve and colleagues write in the April issue of *Occupational and Environmental Medicine,* and no threshold effects were seen with magnetic fields in either study. In the leukemia study, some nonsignificant elevations in risk were observed for workers with higher average magnetic field exposure.

Miller's 1996 study also described electric fields as the main source of risk, but indicated that the highest risks came from combined electric and magnetic exposure. While the two new studies "tend to confirm the dominance of electric fields," he said, "I'm not sure they remove any effect for magnetic fields." For electric fields, however, Miller now believes that the threshold analysis in the new papers is a more precise way of measuring their impact.

The leukemia study, published in the June issue of the *American Journal of Industrial Medicine,* found that the amount of time spent above these thresholds was a "significant predictor of leukemia risk." While average exposure was also linked to an increase in risk, Villeneuve and colleagues write, their results indicate "that leukemia risk is more sensitive to exposures above a threshold."

For workers employed for more than 20 years, the findings were especially striking. Of these, the one-third who spent the most time above 10 V/m were ten times more likely than others to develop leukemia, a significant increase. The one-third with the most time above 20 V/m had a risk eight times higher than others. These odds ratios, however, had very wide confidence intervals.

The case-control study was based on 50 cases of leukemia and 200 controls, drawn from a cohort of over 31,000 male Ontario Hydro employees and retirees. Employment data were linked to a job-exposure matrix based on both job title and work site, with personal measurements from over 800 workers, and to incidence data from the Ontario Cancer Registry. These data were the basis of Miller's 1996 study, which was part of a three-utility study that included workers at Hydro-Québec (HQ) and Electricité de France (EDF) (see *MWN*, M/A94). The Ontario research used a more detailed exposure assessment—taking into account job location as well as title—than was used for the other utilities.

The NHL study was based on 51 cases and 203 controls from the same study population. It found that the one-third of workers who spent the most time in electric fields above 10 V/m had triple the risk of NHL. Those with the most time above 40 V/m were 3.6 times more likely to get the disease.

"Many of us, starting with Genevieve Matanoski around 1986, have long held that we need to look at alternative indices of exposure," Dr. Indira Nair of Carnegie Mellon University in Pittsburgh told *Microwave News.* Confirmation of this point is "the central importance of these papers," said Nair. "Until we are able to elucidate a mechanism, studies that include these alternate indices can provide us with understanding which may help us eventually to 'back into' the mechanisms."

A 1997 paper in *Bioelectromagnetics* by Nair and Dr. Jack Sahl, then of Southern California Edison and now a consultant based in Upland, CA, examined how using different indices of exposure influenced the exposure assessment of different job categories. While average field strength could be used for separating jobs into "high" or "low" exposure, they concluded, it "may be misleading" in ranking jobs which have significant exposure. For example, electricians were highest in average exposure, while substation operators were highest in time spent above certain magnetic field thresholds.

"We still don't know what is the biologically relevant exposure," commented Green. "Some of these exposures are very complex, and some of the effects are very subtle." While Ville-

RAPID Studies in "Radiation Research"

The National Institute of Environmental Health Sciences (NIEHS) has sponsored the publication of a collection of papers, many of which were carried out under the EMF RAPID program (see *MWN*, J/A99).

This collection of 14 papers and two reviews, which appears as Part 2 of the May 2000 issue of *Radiation Research*, is an effort to publish some of the as-yet-unavailable results of the EMF program, Dr. John Moulder, an associate editor of the journal, writes in his introduction.

Many of the papers are from studies carried out for the NIEHS at the IIT Research Institute in Chicago and at the regional labs set up to try and replicate other experimental findings. The papers report essentially no EMF-induced biological effects.

The two reviews, each written by a team headed by Dr. Gary Boorman, who led the RAPID program at the NIEHS in Research Triangle Park, NC, conclude that animal studies do not support leukemia, lymphoma or breast cancer risks.

neuve's studies are "very interesting and important," she said, they are certainly not the last word. She pointed out that while significant risks were observed, the numbers of cases are small and as a result the risk estimates are "unstable."

Miller noted that these latest findings cannot be directly extrapolated to work on childhood leukemia. "These studies involve occupational exposures, which of course are much higher than in a residential environment." Also, he noted, childhood leukemia is "a different disease from adult leukemia—it's a different histological type." Miller said that in a 1999 study of childhood leukemia in Toronto, which was led by Green, "We could find no effect at all of electric fields." When its findings were published, Green's team concluded that, "As exposure assessment is refined, the possible role of magnetic fields in the etiology of childhood leukemia becomes more evident" (see *MWN*, J/A99).

Villeneuve pointed to computer modeling work by Dr. Maria Stuchly and colleagues at Canada's University of Victoria, estimating the level of induced current in different organs of the body that might result from each type of exposure. Among other findings, they calculated that electric fields would be likely to produce especially high peak levels of induced current in the blood, while magnetic field exposure would produce higher currents in the brain and cerebrospinal fluid.

Villeneuve and colleagues conclude their leukemia paper by recommending that "similar analyses be pursued in other study populations." But it appears that few if any existing data sets would be suitable. Villeneuve said that the only studies he knew of that had the right electric field measurements were the EDF and HQ components of the tri-utility study. He noted, however, that the French researchers had not followed up with workers after retirement age and that the HQ data had fewer cases, both of which "would limit analyses."

"It's unfortunate that people haven't collected the data on electric field exposure," said Dr. David Agnew of Ontario Power Generation in Whitby, Ontario—a coauthor of the Villeneuve papers and of Miller's 1996 study. Agnew told *Microwave News* that any repetition of the Villeneuve studies would probably require completely new research.

"I somehow can't see this happening," commented Green, "which is a great disappointment." She noted that "funding is not coming forward to support follow-up studies in this area"—no matter how compelling the results. In the long run, though, Green thinks the issue will demand attention. Even if it is buried, she said, "I'm not sure it will stay adequately buried."

Paul Villeneuve, David Agnew, Anthony Miller, Paul Corey and James Purdham, "Leukemia in Electric Utility Workers: The Evaluation of Alternative Indices of Exposure to 60 Hz Electric and Magnetic Fields," *American Journal of Industrial Medicine, 37,* pp.607-617, June 2000.

Paul Villeneuve et al., "Non-Hodgkin's Lymphoma Among Electric Utility Workers in Ontario: The Evaluation of Alternative Indices of Exposure to 60 Hz Electric and Magnetic Fields," *Occupational and Environmental Medicine, 57,* pp.249-257, April 2000.

Jun Zhang, Indira Nair and Jack Sahl, "Effects Function Analysis of ELF Magnetic Field Exposure in the Electric Utility Work Environment," *Bioelectromagnetics, 18,* pp.365-375, 1997.

Trevor Dawson, Kris Caputa and Maria Stuchly, "A Comparison of 60 Hz Uniform Magnetic and Electric Induction in the Human Body," *Physics in Medicine and Biology, 42,* pp.2319-2329, December 1997.

Dutch Advisory Panel Limits Still in Line with ICNIRP

The Health Council of the Netherlands has again issued a report concluding that only acute exposures to power frequency EMFs present a known health risk and recommending exposure limits based on induced currents.

"It has not been demonstrated" that prolonged exposure to EMFs "at field strengths below the limits...for short-term effects induces any kind of disease or abnormality," a committee appointed by the council writes in the report, which was submitted to the government on March 7.

The panel did not favor an approach guided by the precautionary principle, such as is being taken in Switzerland and is being considered in Italy (see *MWN*, J/F00 and M/A00). The committee "did consider precautionary measures," said Dr. Eric van Rongen, a member of both the council and committee, and concluded that "there is no reason to take such measures."

In 1992, another panel assembled by the council recommended limits similar to those of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE) (see *MWN*, M/J92). At that time, the panel called for a reevaluation of research on health effects after five years.

The new report states that although "some epidemiological data point to a reasonably consistent association" between EMFs and increased risk of childhood leukemia, "experimental research has failed to produce any evidence of a causal relationship."

The eight-member committee based these conclusions on studies "of adequate quality" published in international peer-reviewed journals. Only reproducible, statistically significant effects explained by a plausible mechanism were considered in specifying exposure guidelines.

The panel recommends limits for public exposure to power frequency EMFs somewhat higher than those of ICNIRP: 1.2 G versus 1 G at 50 Hz. The corresponding proposal for occupational exposures at this frequency is 6 G, while ICNIRP calls for 5 G. Public and on-the-job guidelines are specified for frequencies up to 10 MHz.

According to the report, these limits are designed to protect against phosphenes, or perceived flashes of light, and nervous stimulation, which can lead to cardiac fibrillation.

The Netherlands currently has no mandatory limits for non-ionizing radiation exposures. The government will probably make either the council's or ICNIRP's limits legally binding, van Rongen told *Microwave News*, but has not yet decided which.

The committee, which was chaired by Dr. Eric Roubos of the University of Nijmegen, is calling for continued monitoring of health effects research.

The full text of the new report is available in Dutch (and may soon be available in English) on the Internet at: <www.gr.nl>.

Do Hands-Free Sets Triple Radiation Exposure? No Support for Claim by U.K. Consumer Group

The U.K. Consumers' Association (CA) caused an international sensation in early April when it published a warning that hands-free headsets actually triple radiation exposures.

Although the CA is a widely respected British institution, its claim was met with intense skepticism. This has grown into general disbelief as conflicting data have mounted.

Hands-free sets allow users to keep mobile phones at a distance, and have become increasingly popular among those concerned about the phones' potential health effects.

"If you are worried about levels of radiation from your mobile phone," said Graeme Jacobs, the editor of *Which?*, the CA's monthly magazine, "you shouldn't rely on a hands-free set."*

"They didn't know what they were doing," said Dr. Niels Kuster of the Foundation for Research on Information Technologies in Society, located in Zurich. "They used inappropriate methodology and instrumentation." Kuster has developed systems for measuring radiation exposures from hand-held phones that are used all over the world.

Kuster said that he had measured radiation from hands-free sets several times over the last few years and found that exposures were often reduced essentially to background levels. He is not alone. Tests carried out by or for Ericsson, Motorola, Nokia, Philips and Vodafone, among others, have all shown large reductions in specific absorption rates (SARs) with hands-free sets.

"I don't understand how the CA obtained its reported results. There must have been some misunderstanding somewhere," said Dr. Q. Balzano. Balzano is the director of Motorola's Electromagnetics Research Lab in Fort Lauderdale, FL.

Despite all these conflicting data, the CA is standing firm. "We are absolutely confident about the results," Antonia Chitty, a senior CA researcher in London, told *Microwave News.*

In an interview, Roy Brooker, a scientist at the CA research labs in Milton Keynes, said: "Whether we are right or wrong is not important, the point is that we have managed to raise the issue. In terms of future work, there are organizations that are far better equipped." Chitty noted that the CA would like to see more research in this area.

The radiation measurements were carried out for the CA by ERA Technology, which has offices in Leatherhead, U.K., and in Houston. ERA tested two phones, one from Ericsson and one from Philips. In one set of measurements, the phones were next to a model of a human head filled with gel, and in another the phone was placed one meter away, either horizontally or vertically, connected to a hands-free wire with the earphone placed in a rubber ear.

ERA did not measure SARs, defined as the amount of energy absorbed in a defined volume of tissue (usually 1g or 10g). Rather, it took a single set of readings of the electric and magnetic fields 4 cm inside the simulated skull at 902 MHz.

In response to the growing controversy over the measurements, CA Director Sheila McKechnie wrote to the *Guardian* (April 7) and noted that the CA had "never intended" to do SAR tests. Brooker explained that, "We decided not to do SARs because it would imply that there is a health problem."

Even without doing a full SAR test, many observers said that they were uncomfortable drawing conclusions from only one measurement for each phone and hands-free kit. "They should have done at least three measurements," said Dr. Alan Preece of the U.K.'s University of Bristol.

After repeated requests for the ERA test data, the CA released an abridged version of the report to *Microwave News.* Only one set of results was made available and these did not specify the levels associated with each type of phone. (Weeks later, however, just before *Microwave News* went to press, the CA offered to provide the full report.)

Delays in the availability of the ERA report irritated many industry representatives. Peter Harrison of Nokia in Camberley, Surrey, U.K., said it took him four weeks to get the test protocol.

The electric field was three times higher if the phone was connected to the earpiece compared to when it was next to the model head—but only when the phone was vertically below the head (as it is when strapped to the user's belt). If it was placed horizontally, the field was unchanged. In both configurations, the magnetic field was substantially reduced. ERA declined to

SAR Search

• The IEEE is getting close to a standard protocol for measuring SARs from cellular phones. "We now have a draft in rough form," said Howard Bassen, of the FDA's Center for Devices and Radiological Health in Rockville, MD. Bassen is the chair of SCC-34/SC-2, the IEEE group in charge of developing the testing procedures. He told *Microwave News* that section editors "still have a few things to clean up," but should be finished by May 15. The draft will be reviewed at the subcommittee's next meeting, June 1-2 at the FCC's offices in Washington, followed by a vote by e-mail, and the revised draft will then be considered by the full committee and finally by the IEEE Standards Board. Bassen expects the process to go smoothly: "At this point, I'm not aware of any significant controversies," he said. For over a year, the IEEE has been under pressure to finish the protocol. Both the FCC and the CTIA have urged the subcommittee to speed up its work (see *MWN*, J/F99 and N/D99).

• The Japanese government will soon require SAR testing of all new mobile phones, according to the May 16 *Financial Times (FT).* Once a standard test procedure is adopted, which is expected this fall, the Ministry of Posts and Telecommunications will require manufacturers to show that their phones meet the ICNIRP SAR limit of 2 W/Kg. The new rules are scheduled to be in place by the spring of 2001. DoCoMo, the largest Japanese mobile phone operator, told the *FT* that its phones would have no problem complying.

* The full text of the *Which?* report, which appeared in its April issue, is available on the Internet at <www.which.net>. Interestingly, the CA suggested that those worried about cell phone radiation use a hands-free set in the April 1998 issue of its magazine, *Health Which?*

comment on the tests and referred questions to the CA.

In contrast, tests carried out at Ericsson's EMF Research Lab in Stockholm, using the same model Ericsson phone and an "identical" earpiece, found SAR values which "were about 2-3% of the maximum SAR value with the phone in a normal usage position next to the ear," according to a company statement.

SARTest, a testing firm based in Newdigate, Surrey, outside London, reported results similar to Ericsson's, with both the same phone and a Philips unit.† These measurements were carried out for Vodafone. Dr. Camelia Gabriel of Microwave Consultants in London, a director of SARTest and a leading expert on dosimetry, said that she supported these results.

Measurements for ABC News' television magazine show, *20/20*, by the Institute for Mobile and Satellite Radio Technology (IMST) near Düsseldorf, Germany (see *MWN*, N/D99), also showed that headsets produced a marked reduction in radiation exposures. "In various positions, we found SARs of 1.84 to 2.16 W/Kg for a Nokia 6160 analog phone," said Brenda Breslauer, a producer at *20/20* in New York City. "But with an earpiece, the SAR fell to 0.02 W/Kg."

Dr. Uwe Kullnick of the IMST told *Microwave News* that the institute had also tested a Philips phone with a hands-free set like the one tested by the CA, and had found that the SAR dropped to 0.02 W/Kg.

The Stewart report (see p.1), issued a month after the *Which?* claims were publicized, specifically asks that the "government set in place a national system which enables independent testing of shielding devices and hands-free kits to be carried out, and which enables clear information to be given about the effectiveness of such devices."

The *Which?* report was front page news in Britain on April 4, generating headlines as far away as Australia and New Zealand. 'HANDS-FREE' PHONE SHOCK, blasted the U.K.'s *Daily Mail*; NEW MOBILE PHONE DANGER, warned the *Express* and the *Times* headlined PHONE KITS 'TRIPLE RADIATION.' U.S. coverage was spottier, with more attention from television than newspapers.

† The SARTest report is available on the Internet at <www.sartest.com>. For another set of measurements showing large field reductions with the use of headsets, see <www.orauk.com>.

Exposure Limits Based on the Precautionary Principle Stir Controversy in Europe

Battle lines are being drawn over whether to use the precautionary principle as the basis for tightening limits on exposures to non-ionizing radiation. The controversy was prompted by tough new rules in Italy and Switzerland.

Frequently cited in European environmental regulations, the precautionary principle holds that steps may be taken to protect people or the environment against potential hazards in the absence of scientific certainty.

"Can one justify using the principle to limit public exposure to RF energy to levels far below the threshold for established hazards to address public concerns on the basis of scientific data that major scientific review committees find unpersuasive of a hazard?" ask Drs. Kenneth Foster, Michael Repacholi and Paolo Vecchia in the May 12 issue of *Science*.

They do not offer a direct response in *Science*, but the answer is No, according to a "backgrounder"* posted on the Internet in March by the World Health Organization (WHO) in Geneva, where both Foster and Repacholi work. It argues that this is especially true if standards are "lowered to levels that bear no relationship to established hazards."

"You cannot invoke the precautionary principle on the basis of fears alone," said Foster, who is working at the WHO while on sabbatical from the University of Pennsylvania in Philadelphia. "Careful analysis" must be applied, he said in an interview, adding that this is also the view of the European Commission.†

But the head of the Swiss federal government's non-ionizing radiation unit countered that his team did precisely that in writing his country's new rules. Dr. Jürg Baumann told *Microwave News* that the limits are technologically and economically based. "What can reasonably be done to reduce exposure has to be done," he said, citing Swiss environmental law. Baumann is at the Federal Agency for Environment, Forests and Landscape in Bern.

The WHO document warns that "arbitrary cautionary approaches" risk undermining "science-based exposure limits." But Baumann pointed out that taking precautionary action should not be confused with taking protective action against proven hazards. The choice of specific precautionary measures is "not a scientific but a political" process, he said.

Repacholi, Foster and Vecchia, who is at Italy's National Institute of Health in Rome, favor the limits established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (see *MWN*, J/A98). The ICNIRP and ANSI/IEEE standards, they write in *Science*, are based on "painstaking evaluation of the relevant scientific literature" and "offer a high level of protection against established hazards."

Repacholi was the chair of ICNIRP from its inception until 1996. He now directs the WHO International EMF Project, which is promoting worldwide adoption of ICNIRP limits (see p.17 and *MWN*, M/A97, S/O99, N/D99 and J/F00).

Vecchia, the president of the European Bioelectromagnetics Association (EBEA), has also sought to secure EBEA backing for the ICNIRP limits. Last November, at an international standards harmonization meeting in Erice, Italy (see *MWN*, J/F00), he circulated a statement‡ noting that ICNIRP's guidelines have

**Electromagnetic Fields and Public Health Cautionary Policies* is at: <www.who.int/peh-emf/publications/facts_press/EMF-Precaution.htm>.

†On February 2, the European Commission (EC) in Brussels affirmed the principle as a "key tenet" of European Community policy and offered guidelines for its use. *Communication from the Commission on the Precautionary Principle* is available on the Internet in PDF form at: <europa.eu.int/comm/off/com/index_en.htm>.

‡The statement is on the EBEA Web site: <www.ebea.org/ebea/menu.html>.

been recommended by the European Union's Council of Ministers for adoption by member states (see *MWN,* J/A 99). Participants were invited to sign it and about 70 did, Vecchia said.

The Swiss and Italian ordinances contain precautionary limits for RF/MW radiation approximately 100 times stricter than ICNIRP's (see *MWN,* J/F00). But while the WHO backgrounder backs "low-cost measures to reduce exposure," it describes these as "framed in terms of voluntary recommendations rather than in terms of fixed limits or rules."

The WHO document allows that, "It is possible to introduce cautionary policies without undermining science-based standards." It cites with approval a draft "guidance" issued by the New Zealand government that suggests voluntary, "low- or no-cost interventions" to minimize RF/MW exposures and address public concerns (see *MWN,* S/O99).

Other measures to reduce exposure "may be appropriate," according to the backgrounder, including the use of an earpiece with a mobile phone, moving a clock radio away from the bedside and moving a child's bed.

But Repacholi, Foster and Vecchia have each criticized the advice of the U.K.'s Independent Expert Group on Mobile Phones that, as a precautionary measure, children be discouraged from using mobile phones (see p.1). Repacholi, a member of the group, told *Microwave News* that he had argued against this recommendation. Vecchia said in an interview that giving special advice for children "shows how precaution can be completely separate from science." He objected that this distinction is based "on *currently unrecognized* health effects" (his emphasis).

For his part, Baumann stressed that, "Precaution is a strategy that is chosen precisely because there is insufficient scientific knowledge about low-level, long-term effects." He added that, "Not all scientists agree with ICNIRP's evaluation of the scientific literature," pointing to the "Vienna Resolution," in which 16 researchers declared that biological effects from low-level exposures are "established" (see *MWN,* N/D98). Repacholi was in Vienna at the time but declined to sign the resolution.

"The claim that precautionary measures might 'undermine' science is a platitude," said Austria's Dr. Michael Kundi of the University of Vienna's Institute of Environmental Hygiene, who organized the conference that led to the resolution. "Any proposal for a guideline or limit value has to apply principles that are not purely scientific," he told *Microwave News.*

Health officials in Czechoslovakia share the view that current scientific knowledge justifies precautionary limits stricter than ICNIRP's, and have criticized the WHO's position (see p.14). While Eastern Europe and Russia have long had more stringent exposure limits (see *MWN,* N/D99), Western countries have generally favored looser limits based only on thermal effects.

In the U.S., the National Electrical Manufacturers Association (NEMA) has mounted its own "full-scale effort" backing the ICNIRP limits. Writing in the April 15 issue of *Electroindustry,* the association's newsletter, NEMA consultant Douglas Bannerman warned that without a common standard, governments may "enact legislation...which will be difficult and costly to meet."

According to Bannerman, who went on a fact-finding mission to Europe earlier this year, NEMA does not object to precautionary measures as long as they are voluntary. "Each individual has a right to take steps" to reduce exposure, he said in an interview.

At least one member of ANSI/IEEE's SCC-28 (see story below) does not see precautionary limits as a threat to prevailing standards. "I think the two can coexist very well," Arthur Varanelli told *Microwave News* from his office at Raytheon Co. in Lexington, MA. Precautionary measures, he said, "will give people a chance to have their concerns heard and may give the public a greater sense of protection."

ANSI/IEEE Group Favors a Single RF/MW Safety Standard

The subcommittee revising the American National Standards Institute (ANSI) safety limits for radiofrequency and microwave (RF/MW) radiation wants a single exposure standard that would apply to all members of the population, whether they are children, adults or workers.

A consensus for a one-tier standard was reached among members of Subcommittee 4 of Standards Coordinating Committee 28 (SCC-28/SC-4) attending a meeting held March 30-31 at Motorola's Fort Lauderdale offices. If approved—and the revision process still has a long way to go—the ANSI standard would revert to the way it was from 1966 until 1991, when two sets of limits were first adopted (see *MWN,* N/D91).

Most exposure standards make a distinction between the general public and workers, with stricter limits for the public in order to protect more vulnerable members of society, such as children, the elderly and the sick. The current ANSI/IEEE standard, designated C95.1, is structured somewhat differently, with separate limits for "controlled" and "uncontrolled" environments. Those in controlled environments are assumed to be aware that they are being exposed to radiation and therefore more knowledgeable about the potential health risks.

"All of us who attended the meeting at Motorola were in agreement that there should be a single-tier standard," said Dr. Eleanor Adair of the Air Force Research Lab at Brooks Air Force Base (AFB), TX. "I believe there is no real basis for a lower tier for a susceptible group," she added. Adair is the vice chair of SCC-28, which is a committee of the Institute of Electrical and Electronics Engineers (IEEE).

"We are trying to come up with a standard that is safe for everyone," commented Richard Tell, a consultant based in Las Vegas and a member of the subcommittee. "A two-tier standard is too complicated," he said.

When asked what the final standard might be, Adair responded that it was too early to tell. "It should be a science-based standard," she said.

Nineteen members of the subcommittee attended the March meeting. There were six representatives of the U.S. government—all from Brooks AFB. The remainder are either consultants or work for Motorola.

"There were not enough government health officials there," Dr. Mays Swicord acknowledged in an interview. Swicord, the director of biological research at Motorola, formerly represented the Food and Drug Administration on SCC-28/SC-4. "We have

to find a way around that," he said, pointing to the travel costs as a major barrier to participation.

Dr. C.K. Chou, also of Motorola and the cochair of SC-4, agreed with Swicord. "It is very important that other branches of the government, especially the regulators, participate in this revision process," Chou wrote in an e-mail to those SCC-28 members who are with government health agencies. "I am requesting your input [as to] where and when we should meet next time to ensure that you can participate."

Swicord said that he was "ambivalent" about a single-tier standard. And Dr. Gregory Lotz of the National Institute for Occupational Safety and Health in Cincinnati, one of those who did not attend the meeting, commented that, "You can talk about one level, but it is not clear what the level should be."

Chou stressed that the decision to have a one-tier standard "is not set in concrete—this was only the consensus of the people who were there."

Dr. Martin Meltz of the University of Texas Health Science Center in San Antonio, who is leading the literature review for the new standard, said that it is "still in progress."

Carlo's New $60 Million Program: Funding Sources Not Revealed

Dr. George Carlo formally announced the creation of his Radiation Protection Project on April 26. The project—which Carlo has talked about for months—has an ambitious agenda and a planned budget of over $60 million.

Among the project's goals are to collect reports of health problems among wireless phone users, to reevaluate current RF/MW standards, to sponsor studies on leukemia and on electromagnetic interference with defibrillators and to replicate past experiments by Carlo's Wireless Technology Research (WTR) that found genetic damage due to RF/MW exposure (see *MWN*, M/A99).

Only a small fraction of the planned budget has yet been raised. Carlo told *Microwave News* that he has $3 million in "definite commitments" for the next six months. He declined to say how much of this had actually been received or to identify any of the funders.

"I am unwilling to make the finances of the new project a public spectacle as they were with WTR," Carlo said, stating only that the funders include both individuals and foundations. "We have received money from the telecommunications industry—I will not reveal from who," he said. The press release indicates that the project will also seek government support. "I feel that, at this stage, I'm lucky to have anybody supporting me," Carlo added.

Carlo was the chair of WTR, which received over $25 million in funding from the Cellular Telecommunications Industry Association (CTIA). It closed down last year when the CTIA refused to renew its support (see *MWN*, J/A99).

The project is starting with "a skeleton staff," Carlo said. "My intention is to farm out almost all the work." He contrasted this with WTR, which he said "had a lot of infrastructure."

"Surveillance is the most important thing," Carlo said. "It's the industry that should be doing this, and it's not." Carlo has appealed to the public for help in this effort: "People who believe they are experiencing health effects from their phone use can help by sharing their experiences, confidentially."

So far the surveillance effort is the only part of the project's work program that has begun, and even that is still in its earliest stages. Its Web site, <www.HRMGroup.org>, states that an online questionnaire is "under development," and in the meantime urges mobile phone users to send in a form by regular mail.

WTR's finances have been a subject of controversy (see *MWN*, M/J96 and J/A98), but in mid-May Carlo defended WTR's record. He insisted that only "17% of the WTR money went to the infrastructure, people inside the program, but 83% went to outside labs and outside consultants." As in the past, however, Carlo declined to provide specific dollar amounts.

The formation of the Radiation Protection Project was announced in a press release from the nonprofit Science and Public Policy Institute, which has the same phone number, address and Web site as Carlo's consulting company, Health Risk Management Group Inc., in Washington. Carlo explained that "for the time being," the consulting group is "providing staff help to the project on a contract basis."

New Czech Study on Cell Phones and Brain Activity

Researchers in the Czech Republic are also reporting that mobile phone radiation can affect reaction time and electrical activity of the brain. This follows parallel findings in Britain, Finland and Germany (see p.16 and *MWN*, M/A99 and M/A00).

With a 900 MHz phone placed against the right ear, 17 volunteers were asked to press a key when a stripe appeared on a screen. In tests conducted when the phone was turned on, "Reaction time of the behavioral response was shortened on average by 20 ms"—a difference that was statistically significant.

Visual event-related potentials (ERP), a gauge of brain electrical activity, were measured during the behavioral test. ERPs showed some increase, but their timing was unchanged.

The study was mainly designed to investigate how mobile phone exposure might affect people with narcolepsy, a condition that causes repeated brief episodes of deep sleep. After 45 minutes of exposure at a specific absorption rate of 0.06 W/Kg, no episodes of narcolepsy occurred. In fact, the Czech researchers found "no effect on any parameter of the electroencephalogram" in measurements taken from 15 to 35 minutes after exposure.

The double-blind study was conducted by Dr. Robert Jech and colleagues at Charles University in Prague. It will be presented at the *10th European Congress of Clinical Neurology* in Lyon, France, this August.

Two previous Czech studies, conducted at the National Institute of Public Health in Prague, found no effect on brain activity from mobile phone exposure. These experiments were carried out by Drs. Pavel Urban *(Central European Journal of Public Health, 6,* pp.288-290, 1998) and Ales Hladký *(Central European Journal of Public Health, 7,* pp.165-167, 1999).

« Wireless Notes »

In the **U.K.**, journalists raced to be first to disclose the **Stewart report**'s findings—and in most cases guesswork and spin edged out accuracy. Some two weeks before the report's release, the ***Guardian*** (April 28) gave a positive slant that would later ring false: EXPERT REPORT GIVES MOBILE PHONES A CLEAN BILL OF HEALTH ran its headline. Rumors circulated in London that the story was leaked by the Blair government in an attempt to reassure telecom executives who had just given the treasury £22.5 billion (US$35 billion) for wireless licenses. The possible sources ranged from the Department of Trade and Industry (**DTI**) all the way up to the Prime Minister's office. On April 30, the ***Observer*** went in the opposite direction but was also off the mark: MOBILES TO CARRY HEALTH ALERT, it predicted. Finally, on May 3, Kathy Moran of the ***Express*** got it right (see p.1). Public attention and interest were also fueled by a British consumer group's claim that hands-free sets "triple radiation" (see p.4), and some editors may have decided that *any* story with the word "radiation" or "electromagnetic" was good enough. The April 16 ***Sunday Mirror*** grabbed readers' attention with the headline, BEWARE—USING A MOBILE CAN RUIN YOUR SEX LIFE. Even the more dignified ***Sunday Times*** ran major articles on "electro-crystal therapy" (March 19) and pendants said to "offer natural protection against harmful EMFs" (April 2).

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On May 25, California state Sen. **Tom Hayden**'s mobile phone safety bill was passed by the state senate by a vote of 23 to 12 and was forwarded to the assembly. The bill bears little resemblance to the one Hayden introduced in February, however (see *MWN*, M/A00). "It's like the fish in Hemingway's *The Old Man and the Sea*," said Hayden aide Rocky Rushing. "It's a lot closer to shore, but large chunks of meat have been torn off." Specifically, he told *Microwave News*, requirements that retailers post information about possible health hazards of phone use and that earpieces be offered for sale have been cut. In its current form, SB1699 instructs the state Department of Health Services to review health research. The text and legislative history of SB1699 are on the Internet at: <www.sen.ca.gov>.

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Dr. **Quirino Balzano**, better known as **Q**, is retiring from **Motorola**. At the end of this year or early in 2001—after 26 years with Motorola—he will step down as the director of the company's Electromagnetics Research Lab in Fort Lauderdale, FL. He will be replaced by Dr. **Larry Dworsky**, who is presently based in Phoenix. The senior management team at the lab will remain in place: Dr. **C.K. Chou** as director of the RF Dosimetry Lab, Dr. **Mays Swicord** as director of Biological Research and Dr. **Wei-Yean Howng** as director of the Portable Communications Lab. Balzano told *Microwave News* that his future plans are not yet finalized, but that he will remain a member of TEPRSSC, FDA's radiation safety advisory committee. In addition, he said that he looks forward to continuing to serve on the board of directors of IT'IS, the new lab set up by Dr. **Niels Kuster** in Zurich (see *MWN*, J/F00).

No Brain Tumor Risk Seen in WTR Epi Study

Joshua Muscat has found no increased risk of brain tumors from the use of cellular phones, he told *Microwave News* in May. His conclusion stands in sharp contrast to statements by Dr. George Carlo, whose group Wireless Technology Research (WTR) sponsored the study (see *MWN*, M/A99 and M/J99).

"The results are essentially negative," Muscat said. There was one "little finding" of an excess of neuromas, but Muscat explained that this was "an artifact." He also noted that he did not find any higher incidence of cancer on the side of the head a person used a phone. "It's a nonissue," he said.

Muscat has submitted a paper on his results to the *Journal of the American Medical Association.*

Carlo has often cited the excess of neuromas in the Muscat study in his campaign to gain new funding for mobile phone-health research (see p.7 and *MWN*, M/A99, J/A99 and N/D99). Last spring, preliminary reports of studies by Muscat and Dr. Lennart Hardell prompted renewed attention to brain tumor risks (see p.15 and *MWN*, M/J99)

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Citing "potential health risks as described by the national media and industry research," **Metrocall**, a major U.S. retailer of cellular phones and pagers, is urging its mobile phone customers to consider using a **headset**. A "health and safety bulletin" which Metrocall issued in January also suggested it may be better for **children** to use a pager instead of a wireless phone. "We're not trying to take a position on the research, because it's not clear yet," company spokesperson Mike Scanlon told *Microwave News.* "But we thought we'd err on the side of the angels here." He noted that notices have been put up in all the company stores. "We're kind of the Lone Ranger on this, in terms of the industry," he said. "We haven't gotten flak for it, but no one's praising us for it, either." About 90% of Metrocall's six million subscribers are paging customers, and the company has made the youth pager market a priority.

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Mobile Phones—Biological Effects, a symposium sponsored by the **French Academy of Sciences**, was held in Paris April 19-20. The approximately two dozen speakers included Jørgen Bach Anderson, Elisabeth Cardis, Om Gandhi, Jukka Juutilainen, Joshua Muscat (see box above), Joe Wiart and Zenon Sienkiewicz (see p.17). A communiqué issued at the meeting's close stated that wireless phone radiation poses no clear health risk and looked to ongoing and planned studies to clarify any remaining uncertainties. In October, the academy will hold a press conference and publish the proceedings of the meeting, according to Dr. **Bernard Veyret** of the University of Bordeaux, who helped organize the April symposium.

California Coastal Commission & Navy at Odds over Radar Facility

The California Coastal Commission has voted to oppose expansion of the U.S. Navy's electronic warfare test facility in Port Hueneme, CA. On May 24, the navy declared that it will go ahead with the project anyway, and the commission may file a lawsuit to stop it.

"We believe we are complying with all state and federal laws with this project, and that's as far as we had to go," Charles Giacchi, executive director of the navy's Surface Warfare Engineering Facility (SWEF), told the *Los Angeles Times* (May 25).

"The navy is operating in violation of the Coastal Zone Management Act," Coastal Commission chair Sara Wan told *Microwave News.* Technically, she said, the commission could have sued the navy long ago because a study of environmental effects was never submitted when SWEF was built (see *MWN,* N/D99).

The commission's April 14 vote against the expansion came in the wake of an expert panel's report on SWEF, released on March 23 (see box at right). While the panel did not cite SWEF's radars as an immediate danger to public health, four out of five members called on the navy to do more to protect people and wildlife. SWEF has 15 different radars, two of which have transmitters with a peak power of one million watts.

The commission and the navy reached agreement on several of the panelists' recommendations, but remained at odds over one: The navy rejected a request to include at least one person who is not a Department of Defense (DOD) employee in the planning and implementation of a radiation survey. This was first proposed by panel member Dr. Joe Elder, of the Environmental Protection Agency (EPA) in Research Triangle Park, NC.

In an April 13 letter to the commission, Captain J.W. Phillips said that while the navy had considered including a non-DOD expert, the law does not require it. The navy is "skeptical that this measure would further enhance public trust or confidence in the navy's RF safety program," Phillips wrote. "We do not believe that certain members of the public would be satisfied with any measure that the navy takes to better public relations."

"I'm at a loss as to why they won't agree to it," said Wan. "It would be such an easy thing for them to do." She noted that the navy has stated that its position is not based on any security concerns. Inclusion of a non-DOD expert is "essential to maintaining the objectivity of the survey panel," the commission told Phillips in an April 17 letter. Editorials in the *Los Angeles Times* and the *Ventura County Reporter* have supported the commission on this point. Local business leaders have backed the navy.

Lee Quaintance of the Beacon Foundation, a local environmental group based in Oxnard, CA, said the dispute was really about what kind of survey will be done. He said that the navy's existing RF/MW exposure surveys "are essentially focused on navy personnel—any measurements outside the base are incidental." A non-DOD expert must be involved in any public exposure study from the outset, Quaintance argued, because it will need a completely new design. He wondered why the navy is opposed to such a study: "Is it because they wouldn't pass it?"

"Safety is very important to the navy," declared a May 24 statement from the Port Hueneme base command. "The safety and well-being of all sailors is a top priority of this command." It added that navy studies show that SWEF is also safe "for our neighbors in the local community."

Wan said that the commission has tried to reach an agreement with the navy: "We've said we'll forgive their past sins if they take the necessary steps to assure the public that any expansion will not have negative effects." Without that guarantee, said Wan, the commission may have no choice but to file a lawsuit.

What Expert Panel Said About Navy's Port Hueneme Radars

The expert panel's report on the radars at SWEF in Port Hueneme was not a consensus document. Instead, each panelist was asked to come to his own conclusions. The five members expressed a wide range of views.

Dr. Ross Adey of the University of California, Riverside, concluded that SWEF is generally in compliance with DOD radiation limits. A "notable exception," he wrote, is that the limits could be exceeded on ships entering and leaving Port Hueneme harbor, which is open to civilian traffic.

Adey's sharpest criticism was directed at the military's RF/MW limits themselves. Like the ANSI/IEEE guidelines, they are based on thermal effects only and do not take modulation into account. This makes them "an increasingly inadequate and inappropriate guideline on issues of health risks" for "civilian residents in adjoining housing developments" and others in public areas, Adey declared. He recommended that "complete 360° rotation of any SWEF radar system should no longer be permitted," and that "antenna traverses across adjoining coastal zones" also be banned.

Dr. Robert Beason, an avian biologist at the State University of New York, Geneseo, concluded that there was a potential hazard to any birds nesting on the roofs of two of SWEF's buildings.

Dr. John D'Andrea of the Naval Health Research Center at Brooks Air Force Base, TX, expressed complete or substantial agreement with every point of the navy's position as submitted to the panel. D'Andrea did not recommend any changes in SWEF operating procedures.

EPA's Elder evaluated RF/MW exposure from SWEF in relation to Federal Communications Commission (FCC) limits, which are somewhat stricter than those of the ANSI/IEEE standard. Like Adey, Elder found that limits could be exceeded on ships that are entering Port Hueneme harbor. At a height of 100 feet above the water line, Elder observed, exposure could be 54 times the FCC standard.

Some of the strongest words came from the EPA's Edwin Mantiply, based in Montgomery, AL. "The SWEF facility is not intrinsically safe," Mantiply wrote. While safe if operated as directed, Mantiply wrote, failure to follow correct procedures could cause exposures in public areas 200 times higher than allowed by the National Council on Radiation Protection and Measurements. "Organ damage could occur before the exposure was recognized," Mantiply stated.

A summary of the report is available at SWEF's Web site: <www.phdnswc.navy.mil/SWEF/swef.htm>.

last spring (see *MWN*, M/A99 and S/O99), was quick to accept the panel's recommended precautionary approach.

In a statement posted on the Internet soon after the report was made public, the Department of Health said that it would make sure that parents are made aware of the panel's advice. It also stated that, "The government will expect SAR measurements to be displayed at all points of sale and with each mobile phone and on the World Wide Web."

The U.S. Federal Communications Commission (FCC) is also making SARs publicly available on its Web site (see p.11).

The expert group's report also calls for Britain to adopt the exposure standards of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which are stricter than the current limits developed by the U.K.'s National Radiological Protection Board (NRPB). This would mean an 80% reduction in allowable SARs for mobile phones sold in the U.K. A parliamentary committee made a similar recommendation last year (see *MWN*, S/O99).

The panel found that, "The balance of evidence to date suggests that exposures to RF radiation below NRPB and ICNIRP guidelines do not cause adverse health effects to the general population." But it also noted that, "There is now scientific evidence... which suggests that there may be biological effects occurring at exposures below these guidelines."

The Stewart group recommended that the government ensure that the public is exposed to "lowest practical levels" of RF radiation from mobile phone towers. It cautioned that while such radiation does not pose a health risk, there could be "indirect" effects such as anxiety prompted by the premature dismissal of nonthermal effects.

The panel asked for a radiation research program run by an independent group, to be funded on an equal basis by the industry and the government. The Department of Health agreed that there is an "urgent need for further research" and said that it will commission "a comprehensive program of research costing several million pounds," to be launched by this September.

The Federation of the Electronics Industry (FEI) "welcomed" the Stewart report on behalf of mobile phone companies. The FEI, which is based in London, accepted the recommendation that SAR information be made publicly available. With respect to the use of phones by children, the FEI stated that there is a "need to find a balance between appropriate precautionary measures and the personal safety benefits for children."

But there were also indications that some members of the industry are not pleased with the report. For instance, in a May 12 editorial, the *Financial Times* compared mobile phones to strawberries: "On the precautionary principle, therefore, children should not eat strawberries unless absolutely necessary and never with cream." The commentary went on: "Even if proved, [a mobile phone risk to children] would probably be far less than the danger from eating sweets or going to a disco." (For more on U.K. press coverage of the report, see p.8.)

Powerwatch, a citizens group based in Ely, north of London, applauded the call to publicize SARs. "I believe this will force manufacturers to compete on low SAR designs, which will result in much lower SAR phones, just like the MPR2 guidelines prompted low-radiation VDTs," said Alasdair Philips, the di-

Stewart Report's Conclusions and Recommendations

- Finds that "the balance of evidence to date suggests that exposures to RF radiation below NRPB and ICNIRP guidelines do not cause adverse health effects to the general population," but that there is now "scientific evidence" which "suggests that there may be biological effects occurring at exposures below these guidelines."
- Advocates a "precautionary approach" to the use of mobile phones, justified in part by "gaps in knowledge."
- Calls for the adoption of the ICNIRP exposure guidelines "for use in the U.K. rather than the NRPB guidelines."
- Discourages the "widespread use of mobile phones by children for nonessential calls," based on the precautionary principle, and asks industry to refrain from marketing phones to children.
- "SAR values for mobile phones must be readily accessible to consumers," with "information on the box"—based on an "international standard" for measuring SARs.
- The government should circulate "a leaflet to every household in the U.K. providing clearly understandable information" on the possible impacts of mobile phone technologies on health.
- "The balance of evidence indicates that there is no general risk to the health of people living near to base stations," but that, "there can be indirect adverse effects on their well-being in some cases."
- Recommends that the siting of "all new base stations should be subject to the normal planning process" and "the establishment of clearly defined physical exclusion zones around base station antennas."
- Wants planning authorities to have the "power to ensure that the RF fields to which the public will be exposed [from base stations] will be kept to the lowest practical levels."
- Recommends that the "beam of greatest intensity [of a base station] should not fall on any part of...school grounds or buildings [or playgrounds] without agreement from the school and parents."
- Seeks "a national database set up by the government giving details of all base stations and their emissions," together with "an independent, random, ongoing audit of all base stations...to ensure that exposure guidelines are not exceeded outside the marked exclusion zone." Also: "particular attention" should be paid to the auditing of base stations near schools and other sensitive sites.
- Seeks a "substantial research program [that] should operate under the aegis of a demonstrably independent panel." The program should be financed by mobile phone companies and the government on an equal basis.
- Calls for "a register of occupationally exposed workers" to allow the examination of cancer risks and mortality.
- Recommends the NRPB's work on non-ionizing radiation be "strengthened" and that the NRPB take "a more open approach" and be "more sensitive" to issues of public concern.

rector of Powerwatch. (MPR2 is a testing protocol with recommended emission limits for computer terminals which was prompted by pressure from TCO, the Swedish union for white-collar workers; see *MWN*, S/O90 and M/A95.)

The Stewart group was sharply critical of the NRPB. It urged the board to give a "greater priority" to being "more open" with the public and to be "more sensitive" to public concerns over risk. It also asked the NRPB to "strengthen" its program on non-ionizing radiation. In its own statement, the NRPB said it would provide a detailed response at a later date.

In the U.S., the reaction to the Stewart report was muted. Newspapers largely ignored the news, with only *USA Today* (May 12) giving the panel report prominent coverage. The Food and Drug Administration and the FCC, the two federal agencies with responsibilities for cellular phones, did not issue any formal response to the Stewart report.

The Cellular Telecommunications Industry Association (CTIA) in Washington commented that, "There is no scientific basis to restrict the use of a phone for children, but parents must make their own choice in this matter."

Norm Sandler, a spokesman for Motorola based in Washington, told *Wireless Week* (May 15) that SAR data, if made widely available, could cause consumer confusion.

The U.K. panel's report prompted ABC News to repeat a special report on cell phone safety on May 26. The extended segment of the news magazine show *20/20* was originally broadcast last fall (see *MWN*, N/D99).

The full text of the Stewart panel's report, *Mobile Phones and Health,* is available on the Internet at <www.iegmp.org.uk>. Copies are available for £20 each (approximately US$30), plus £2 postage per copy (up to a maximum of £5) from: IEGMP Secretariat, c/o Information Office, NRPB, Chilton, Didcot Oxon OX11 0RQ, U.K., (44+1235) 822742, Fax: (44+1235) 822746, E-mail: <information@nrpb.org.uk>. The Department of Health's response is posted at <www.doh.gov.uk/mobile.htm>.

The members of the panel were: Sir William Stewart (chair), Prof. Lawrence Challis (vice chair), Les Barclay, Marie-Noëlle Barton, Prof. Colin Blakemore, Prof. David Coggon, Prof. David Cox, John Fellows, Dr. Michael Repacholi, Prof. Michael Rugg, Prof. Anthony Swerdlow and T.R.K. Varma.

FCC To Make SAR Data Available on Its Web Site

The Federal Communications Commission (FCC) will soon post SARs for specific phones on its Web site.

"We plan to make SARs accessible in a user-friendly way," Dr. Robert Cleveland told *Microwave News.* He expects the system will be up and running by mid-summer. Cleveland is a senior scientist at the FCC's Office of Engineering and Technology in Washington.

Cleveland said that there is pressure from the highest levels of the FCC to make SARs available to the public.

At first, inquiries will have to be based on FCC equipment authorization numbers, but over time Cleveland hopes that the SARs will be available by the commonly used model numbers. The FCC's home page is <www.fcc.gov>.

Many consumers began asking the commission for SAR information last fall after *20/20,* ABC News' TV magazine show, commissioned its own measurements and reported wide variations in SARs from different phones. But the FCC had trouble responding because the staff could not easily access the SARs from the commission's own files (see *MWN,* N/D99).

Some industry representatives have resisted public disclosure of SARs. In theory, however, SAR numbers filed with the FCC are public information.

FROM THE FIELD

Across the Spectrum

Mobile phones have changed the way people work and communicate. But this independent group's report is right to recommend precautionary measures to encourage both manufacturers and users to limit microwave exposure until we can be more confident that the use of mobile phones is indubitably safe.

—Drs. Michael Maier, Imperial College School of Medicine, London, U.K., Colin Blakemore, University of Oxford, U.K., and Mika Koivisto, Center for Cognitive Neuroscience, University of Turku, Finland, in an editorial, "The Health Hazards of Mobile Phones," *British Medical Journal, 320,* p.1289, May 13, 2000 (see p.1 and also p.16)

Will mobiles be the next trigger for popular distrust of politicians' assurances?

—Photo caption, "Science 'Not Enough' To Allay Fears," *The Times,* (U.K.), April 14, 2000

No one seriously disputes whether cell phone radiation can and does rearrange brain tissue.

—Tom Hayden, California state senator, in a letter introducing his report, *Do Cell Phones Microwave the Brain?* April 10, 2000 (see also p.8 and *MWN,* M/A00)

It is obvious that a no-effect philosophy for the RF spectrum would be comparable to legislating human beings back to the pre-wireless society of the 19th century.

—Dr. James Lin, University of Illinois, Chicago, "Perspectives on Guidelines for Human Exposure to Radiofrequency Radiation" (in his regular column, "Telecommunications Health & Safety"), *IEEE Antennas & Propagation Magazine, 42,* p.148, February 2000

If people are opposed to EMFs they are more likely than not to be opposed to nuclear power and the use of pesticides. The nature of attitudes makes it extremely difficult (although not impossible) to change people's attitudes towards EMFs by explaining the science involved. It is my belief that we have to change people's *feelings.* But how? By publicizing their life-saving value in emergencies, showing that attractive people use them and, of course, by making them cheaper and more useful.

—Terence Lee, Environmental Psychology and Policy Research Unit, University of St. Andrews, U.K., "Concerns of Ordinary People About EMF Exposure," *Radiological Protection Bulletin* (published by the U.K. National Radiological Protection Board) p.9, April 2000

Hot New Papers

Shabnam Gangi and Olle Johansson, "A Theoretical Model Based Upon Mast Cells and Histamine To Explain the Recently Proclaimed Sensitivity to Electric and/or Magnetic Fields in Humans," *Medical Hypotheses, 54,* pp.663-671, April 2000.

"From the results of recent studies, it is clear that EMFs affect the [mast cells (MC)] and also the dendritic cell population, and may degranulate these cells. The release of inflammatory substances, such as histamine, from MCs in the skin results in a local erythema, edema and sensation of itch and pain, and the release of somatostatin from the dendritic cells may give rise to subjective sensations of ongoing inflammation and sensitivity to ordinary light. These are...the common symptoms reported from patients suffering from 'electrosupersensitivity'/ 'screen dermatitis'."

W. Kaune, T. Bracken et al., "Rate of Occurrence of Transient Magnetic Field Events in U.S. Residences," *Bioelectromagnetics, 21,* pp.197-213, April 2000.

"[T]he rate of occurrence of magnetic field events with 2-2000 kHz frequency content were measured over 24 h or longer periods in 156 U.S. residences. A dual-channel meter was developed for the study that, during 20 s contiguous intervals of time, counted the number of events with peak 2-2000 kHz magnetic fields exceeding thresholds of 3.3 nT and 33 nT. Transient activity exhibited a distinct diurnal rhythm similar to that followed by power frequency magnetic fields in residences. Homes that were electrically grounded to a conductive water system that extended into the street and beyond, had higher levels of 33 nT channel transient activity. Homes located in rural surroundings had less 33 nT transient activity than homes in suburban/urban areas. Finally, while transient activity was perhaps somewhat elevated in homes with OLCC, OHCC and VHCC wire codes relative to homes with underground (UG) and VLCC codes, the elevation was the smallest in VHCC and the largest in OLCC homes. This result does not provide much support for the hypothesis that transient magnetic fields are the underlying exposure that explains the associations, observed in several epidemiologic studies, between childhood cancer and residence in homes with VHCC, but not OLCC and OHCC, wire codes."

Ross Adey et al., "Spontaneous and Nitrosourea-Induced Primary Tumors of the Central Nervous System in Fischer 344 Rats Exposed to Frequency-Modulated Microwave Fields," *Cancer Research, 60,* pp.1857-1863, April 1, 2000.

"In a two-year bioassay, we exposed Fischer 344 rats to a frequency-modulated (FM) signal (836.55 MHz±12.5 kHz deviation) simulating radiofrequency exposures in the head of users of hand-held mobile phones. We tested for effects on spontaneous tumorigenicity of central nervous system (CNS) tumors in the offspring of pregnant rats and also for modified incidence of primary CNS tumors in rats treated with a single dose of the neurocarcinogen ethylnitrosourea (ENU) *in utero*.... Intermittent field exposures began on gestation day 19 and continued until weaning at 21 days, resuming thereafter at 31 days and continuing until experiment termination at 731-734 days. Energy absorption rates (SARs) in the rats' brains were similar to localized peak brain exposures of a phone user (female, 236 g, 1.0 W/Kg; male, 450 g, 1.2 W/Kg)....No FM field-mediated changes were observed in number, incidence or histological type of either spontaneous or ENU-induced brain tumors, nor were gender differences detected in tumor numbers. These negative findings with FM fields contrast with our study using standard digital phone fields pulsed on and off at 50/sec, where a trend was noted toward reduced incidence of both spontaneous and ENU-induced CNS tumors." (See also *MWN*, M/J96, J/A96 and S/O99.)

DNA Damage After Prolonged 50 Hz Exposures

Britt-Marie Svedenstål, Karl-Johan Johanson, Mats-Olof Mattsson and Lars-Erik Paulsson, "DNA Damage, Cell Kinetics and ODC Activities Studied in CBA Mice Exposed to Electromagnetic Fields Generated by Transmission Lines," *in vivo, 13,* pp.507-514, 1999.

"CBA mice were exposed outdoors to 50 Hz electromagnetic fields (EMFs), with a flux density of about 8 μT rms (root mean square), generated by a 220 kV transmission line. Assays were performed in order to investigate the possible genotoxic effects after 11, 20 and 32 days of exposure, as well as the effects on body weight, leukocytes, erythrocytes and the level of ornithine decarboxylase (ODC) activity in spleen and testis. DNA migration was studied on brain cells by single cell electrophoresis (comet assay). After 32 days of exposure a highly significant change of the tail/head ratio of the comets was observed ($p<0.001$), showing DNA damage. Further, a decreased number of mononuclear leukocytes ($0.02<p<0.05$) was observed in mice EMF-exposed for 20 days. In summary, our data indicate that transmission lines of this type may induce genotoxic effects in mice, seen as changes in the DNA migration. These results might have an important implication for health effects." (See *MWN*, N/D98.)

Britt-Marie Svedenstål, Karl-Johan Johanson and Kjell Hansson Mild, "DNA Damage Induced in Brain Cells of CBA Mice Exposed to Magnetic Fields," *in vivo, 13,* pp.551-552, 1999.

"DNA migration, using single cell gel electrophoresis (comet assay), was studied on brain cells of CBA mice exposed continuously to 50 Hz, 0.5 mT magnetic fields (MF) for two hours, 5 days or 14 days. No differences were observed in the groups MF-exposed for 2 hours and 5 days compared with controls. However, in the group exposed to MF for 14 days, a significantly extended cell DNA migration was observed ($0.02<p<0.05$). These changes together with results from previous studies indicate that magnetic fields may have genotoxic effects in brain cells."

Jacoba van der Zee et al. (for the Dutch Deep Hyperthermia Group), "Comparison of Radiotherapy Alone with Radiotherapy Plus Hyperthermia in Locally Advanced Pelvic Tumors: A Prospective, Randomized, Multicenter Trial," *The Lancet, 355,* pp.1119-1125, April 1, 2000.

"Complete-response rates were 39% after radiotherapy and 55% after radiotherapy plus hyperthermia ($p<0.001$). The duration of local control was significantly longer with radiotherapy plus hyperthermia than with radiotherapy alone ($p=0.04$). Treatment effect did not differ significantly by tumor site, but the addition of hyperthermia seemed to be most important for cervical cancer, for which the complete-response rate with radiotherapy plus hyperthermia was 83% compared with 57% after radiotherapy alone ($p=0.003$). Three-year overall survival was 27% in the radiotherapy group and 51% in the radiotherapy plus hyperthermia group. For bladder cancer, an initial difference in local control disappeared during follow-up."

Vijayalaxmi et al. (including Martin Meltz), "Primary DNA Damage in Human Blood Lymphocytes Exposed *in Vitro* to 2450 MHz Radiofrequency Radiation," *Radiation Research, 153,* pp.479-486, April 2000.

"Human peripheral blood samples collected from three healthy human volunteers were exposed *in vitro* to pulsed-wave 2450 MHz radiofrequency (RF) radiation for 2 hours....[T]he comet assay protocol used in this investigation...is very similar to that used by Lai and Singh. Contrary to the results reported by Lai and Singh, the results from this investigation, using three different comet slide-processing schedules to enhance the sensitivity of the comet assay, indicate that *in vitro* exposure of human blood lymphocytes to pulsed-wave 2450 MHz radiation did not induce primary DNA damage compared with sham-exposed cells." (See also *MWN*, N/D94, J/F98 and S/O99.)

Süleyman Daşdağ et al., "Do Cellular Phones Alter Blood Parameters and Birth Weight of Rats?" *Electro- and Magnetobiology, 19,* pp.107-113, 2000.

"[E]xposure of normal and pregnant rats to low-level [SAR=0.155 W/Kg] 915 MHz RFR did not cause detectable shifts of erythrocyte or leukocyte numbers in peripheral blood, nor did it influence the course and the outcome of pregnancy. The only consistent finding related to the RFR exposure was lowered birth weight, which was overcome in postnatal development during a three-month period. It is unclear whether this finding demonstrates a specific action of RFR or is the result of a nonspecific stress reaction."

Letters to the Editor

More On Measuring Polarization

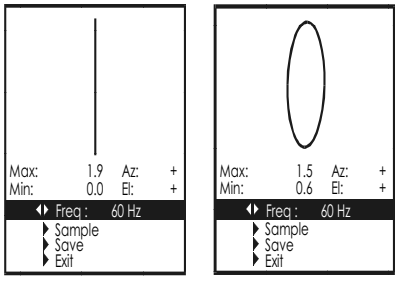
Enertech's WaveCorder

April 15, 2000

To the Editor:

The March/April 2000 issue of *Microwave News* featured an article on EMF polarization, including a sidebar on p.3 entitled "Measuring Polarization: Neither Easy, Nor Cheap." This sidebar stated that the Multiwave magnetic field meter is the only meter that can measure polarization of a magnetic field. However, we want to inform your readers that the EMDEX WaveCorder can also measure magnetic field polarization. The WaveCorder is a portable, state-of-the-art waveform capture instrument which has been used on many EMF studies, including the 1995-96 DOE EMF RAPID Project #3 (Non-Residential Environmental Fields Survey), the 1995-99 statewide survey of California schools for the California Public Health Foundation and other workplace environment surveys.

The EMDEX WaveCorder, manufactured by Enertech Consultants, can measure and display the polarization ellipse of the magnetic field. The polarization ellipse is displayed graphically on an LCD screen (see illustration at left). In addition, the minimum and maximum magnetic field ellipse values are displayed numerically. Using a scrolling list of frequency values, the user can view the graphical and numeric display of the magnetic field ellipse for the fundamental frequency (e.g., 60 Hz) and for its harmonics. Domestically priced at $7,000, the EMDEX WaveCorder also stores and records magnetic field waveshapes, downloads data to a personal computer and has custom software for magnetic field waveform display and analysis.



Samples of linear (left) and elliptical polarization magnetic field data as displayed on the EMDEX WaveCorder magnetic field meter LCD.

Contrary to what has been stated, it is both cheap and easy to make practical estimates of polarization. All it takes is a single-axis magnetic field meter ("Power Frequency Fields in the Home," *IEEE Transactions on Power Delivery, 4*, pp.465-478, January 1989). The user must measure the components (B_x, B_y, and B_z) of the magnetic field along three orthogonal axes. The resultant magnetic field, B_r, is equal to the square root of the sum of the squares of the three orthogonal components. Then, the user must adjust the orientation of the meter until the reading reaches a maximum (B_{max}). The field is linearly polarized when $B_r=B_{max}$ and is circularly polarized when $B_r=1.41B_{max}$. The degree of polarization, expressed by the axial ratio between the minimum and maximum axes of the field ellipse, is given by $[(B_r/B_{max})^2-1]^{0.5}$. Many three-axis meters, such as the EMDEX II, can record all three orthogonal axis values and also display a single axis value (to evaluate polarization). Although not exactly coincident in time, these three-axis measurements provide a practical and inexpensive evaluation of polarization.

Thank you for allowing us the opportunity to clarify this issue regarding our instrumentation and its capabilities.

Sincerely,

H. Christopher Hooper
Enertech Consultants
300 Orchard City Dr., Campbell, CA 95008
(408) 866-7266
E-mail: <chrishooper@enertech.net>

In preparing the article, Microwave News *contacted Enertech to see if the company had an instrument that measured polarization. We were told that the answer was no. In fact, a software upgrade does allow the WaveCorder to measure polarization.*

Monitor Industries' Analog Meter

May 1, 2000

To the Editor:

You reported that the impressive Electric Research Multiwave system is the only way to determine elliptical polarization of a 60 Hz magnetic field. Not so. While it is true that an ordinary three-axis meter can't do that task, any good single-axis meter can.

The major axis of the ellipse is simply the highest-reading field direction, while the minor axis is the highest-reading direction at right angles to that; and the two field strengths give the degree of elliptical polarization. This is not hard, but doing these maximizations accurately is quickest and easiest with a meter having a good *analog* readout (such as I sell for somewhat less than the ten kilobucks you mention). In addition, the directional capability of a single-axis meter is essential for various field-source tracking chores.

Sincerely,

Ed Leeper
Monitor Industries
6112 Fourmile Canyon, Boulder, CO 80302
(303) 442-3773

Czech Panel on the Precautionary Principle and Numerical Limits

This spring, Dr. Jan Musil, the chair of the National Institute of Public Health's Advisory Board on Non-Ionizing Radiation in the Czech Republic, sent Microwave News *the following statement on behalf of the ten-member board. He noted, however, that it does not represent an official position of the Czech Ministry of Health. Musil is the coauthor of* Electromagnetic Fields and the Life Environment *(San Francisco: San Francisco Press, 138pp., 1971), as well as many other publications.*

At their *3rd Ministerial Conference on Environment and Health* in June 1999, the World Health Organization's (WHO) European member states urged the WHO and other health agencies to take into account "the need to rigorously apply the precautionary principle in assessing risks and to adopt a more preventive, proactive approach to hazards." Unfortunately, in our view, this approach has not been consistently applied to the evaluation of EMFs.

Our perspective on the EMF problem was published by the Czech Republic's National Institute of Public Health (NIPH) in June 1999 as a supplement to the Czech translation of the WHO Regional Office for Europe's publication, *Electromagnetic Fields.*[1] We would now add the following to that statement:

We regret that the EU Council of Ministers' Recommendation of 12 July 1999, *On the Limitation of Exposure of the General Public to EMFs (0 Hz to 300 GHz)*,[2] ignored the opinion of the European Parliament. The parliament pointed out that the "basic restrictions" adopted by the council "include large safety factors only with respect to the thresholds for acute effects."[3]

Emphasis on the need for more caution in words only, without introducing more stringent limits for chronic exposure in numerical form, can be intended only for an ideal world with ideal people. The Italian and Swiss governments are taking a more practical approach to real-world situations, with stringent limits for long-term exposure.[4]

We also welcome the concerns expressed last year by the U.S. government's Radiofrequency Interagency Work Group on the revision of the ANSI/IEEE RF/MW exposure standard.[5] We refer particularly to the sections on acute and chronic exposures ("The past approach of basing the exposure limits on acute effects data with an extrapolation to unlimited chronic exposure durations is problematic"), on pulsed or frequency-modulated RF radiation ("Exposure guidelines based on thermal effects...and concepts...that mask any differences between intensity-modulated RF radiation exposure and CW exposure...may not adequately protect the public") and on time averaging ("The 0.1 hour approach historically used should be reassessed").

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1. *Electromagnetic Fields*, Local Authorities, Health and Environment Briefing Pamphlet Series: 32, Copenhagen, Denmark: World Health Organization Regional Office for Europe, 24pp., 1999.

2. *Official Journal of the European Communities, L199,* pp.59-70, July 30, 1999. [See *MWN,* S/O99.]

3. See Amendment 13 to "Proposal for a Council Recommendation on the Limitation of Exposure of the General Public to Electromagnetic Fields, 0 Hz-300 GHz," *Official Journal of the European Communities, C175,* p.132, June 21, 1999. [See *MWN,* J/A99.]

4. See, for example, "Switzerland Adopts Strict Limits for Cell Towers and Power Lines," pp.1,6-7, and "Italian Wireless Radiation Limits Enter Second Year," *Microwave News,* p.7, January/February 2000.

5. "U.S. Government Group Identifies 14 Issues To Be Addressed in Revision of ANSI/IEEE RF/MW Exposure Standard," *Microwave News,* pp.13-14, July/August 1999.

New Books: Short Reviews

Robert Park, ***Voodoo Science: The Road from Foolishness to Fraud,*** 234pp., $25.00, New York City: Oxford University Press, 2000.

Robert Park is a man on a mission. He has dedicated himself to debunking belief in UFOs, homeopathy, cold fusion, perpetual motion—and EMF health effects. Much of the book is clear-sighted, but Park goes astray when he enters the EMF debate, a controversy in which he has been personally involved. Readers get warm portraits of "Ellie" and "Bob" Adair and Allan Bromley, President Bush's science advisor. Park states flatly that nonthermal RF/MW bioeffects are impossible, but a large number of biologists disagree. Like physicist Park, these scientists also believe in the second law of thermodynamics and understand the difference between ionizing and non-ionizing radiation. Yet Park acts as if they were trying to sell him a perpetual motion machine. Much of what Park writes about EMF studies is simply wrong. He dismisses David Savitz's data on brain cancer among electric utility workers as a chance finding resulting from multiple comparisons. Park does not mention that an industry-sponsored analysis of 29 occupational studies found significant evidence for a brain tumor risk (see *MWN,* J/F96). Park states flatly that the NCI study "slammed shut" the possibility of an EMF–leukemia link—but does not mention that it found a significant risk for children with exposures over 3 mG (see *MWN,* J/A97). Park writes that too many people "judge science by how well it agrees with the way they want the world to be." To his credit, he acknowledges that scientists can fall prey to this as well.

Ferdinando Bersani, ed., ***Electricity and Magnetism in Biology and Medicine,*** 1,019pp., $199.00, New York City: Kluwer Academic/Plenum, 1999.

There is a lot here—some 250 papers first presented at the *2nd World Congress for Electricity and Magnetism in Biology and Medicine,* held June 1997, in Bologna, Italy (see *MWN,* J/A97). Although much has happened in the last three years and these papers are necessarily brief, this volume provides a useful snapshot of the research landscape for those interested in both hazards and medical applications. Bersani highlights papers on cellular phones and on EMF effects on melatonin, as well as the more general question of nonthermal bioeffects. But the greatest value of this book is in its breadth—there are few areas of bioelectromagnetic research that go unmentioned.

On the Internet

New from Hardell on Brain Tumors

Dr. Lennart Hardell has reported an even stronger link between mobile phone use and brain tumor location than the one he published last year (see *MWN*, M/J99). The new paper appears in the online journal *Medscape General Medicine*, at <**www.medscape.com/Medscape/GeneralMedicine/journal/public/mgm.journal.html**>. In a further analysis of the same 209 cases and 425 controls, Hardell found that those using cellular phones were 2.4 times more likely to develop a tumor in the brain lobes closest to the phone's antenna. When the effects of other risk factors such as ionizing radiation were taken into account, the risk from mobile phone exposure became stronger and was statistically significant. *Medscape General Medicine* is a peer-reviewed online journal, established last year. Its editor is Dr. George Lundberg, former editor of the *Journal of the American Medical Association.* Hardell is at Sweden's Örebro Medical Center.

Better BEMS Web Site

The Bioelectromagnetics Society (BEMS) has upgraded its Web site, <**www.bioelectromagnetics.org**>. The society's bimonthly newsletter is now available online, although members will continue to receive a copy by mail. BEMS members can also access the membership directory after completing a short registration form. The site is being run by Dr. Stefan Engström of the Neuromagnetics Institute at Vanderbilt University in Nashville, TN.

Andy Marino: Documenting the EMF Issue

Dr. Andrew Marino is putting his life's work on the Web. "My intention is to document the history and evolution of the whole issue of biological effects and health risks of electromagnetic fields," he told *Microwave News* in a recent interview. Marino, a professor in the Department of Orthopedic Surgery at the Louisiana State University Medical Center in Shreveport, has already put many of his research papers on his personal site, <**www. ortho.lsumc.edu/Faculty/Marino/Marino.html**>, and he is slowly catching up with the backlog. While most of the papers are linked to the abstracts in the National Library of Medicine database, there are complete PDF files of some of the more recent ones. Marino has also posted the full text of his 1982 book, *Electromagnetism & Life,* written with Dr. Robert Becker (see *MWN*, June82).

Cellphone Cyberpoll

"Are you afraid of getting brain cancer from using a cell phone?" That's the question posed in April by Etown.com, which bills itself as "the Web's most complete resource for consumer electronics." 53% of those who responded to the informal survey said Yes, while 41% said No. The other 6% said that they "don't need or want a cell phone, no matter what." Fear of developing a tumor had led 17% to reduce their phone use and 3% to stop using their phones altogether, while 16% had put off buying a phone and 4% had bought a shielding device. In addition to online shopping for tech toys, Etown.com offers what it describes as "behind-the-scenes, up-to-the-minute, no-holds-barred reportage and consumer advice." Go to: <**www.etown.com**>. An article in another part of the site describes hands-free devices as the "one solution short of chucking your Nokia into the trash" (see also p.4).

IEEE SCC-28 Standards Panel

Keeping track of the IEEE's Standards Coordinating Committee (SCC) 28 has gotten much easier. The committee develops guidelines on exposures to non-ionizing electromagnetic radiation, including the well-known C95.1 limits for RF/MW exposure. SCC-28's new site, <**grouper.ieee.org/groups/scc28**>, offers information on IEEE's standard-writing procedures and upcoming meetings, as well as capsule descriptions of the committee's ongoing projects. Also available, as a PDF file, is a 107-page list of papers reviewed in updating the C95.1 standard (see p.6).

"Microwave News" Flashback

Years 15 Ago

• A former radar technician sues the Federal Aviation Administration, claiming that his brain tumor was caused by exposure to microwave radiation. Two of his coworkers are also being treated for cancer.

• Researchers at Sweden's University of Göteborg find that radar workers exposed to microwave radiation develop abnormal protein patterns in their cerebrospinal fluids.

• The Soviet Union raises its standard for RF/MW (300 MHz-30 GHz) exposures of the general population from 5 $\mu W/cm^2$ to 10 $\mu W/cm^2$.

Years 10 Ago

• Two manufacturers announce they will introduce electric blankets that reduce magnetic field exposure by 95%.

• Environmental Protection Agency (EPA) staff recommend that ELF EMFs be classified as "probable human carcinogens," placing them in the same category as PCBs, DDT and dioxin, but senior managers later overrule this conclusion. Meanwhile, EPRI president Dr. Richard Balzhiser visits the White House; EMFs are on his agenda.

Years 5 Ago

• A Polish team finds that military personnel exposed to RF/MW radiation have significantly higher rates of leukemia and lymphoma. The ongoing study reports that younger soldiers are particularly at risk—with rates up to eight times higher than expected.

• EPA staff is concerned that an NCRP committee composed primarily of physicists and engineers may exceed its mandate and develop health standards for modulated RF/MW radiation.

• Separate studies at Mt. Sinai Medical Center in Miami Beach, FL, and the Mayo Clinic in Rochester, MN, conclude that cellular phones can interfere with cardiac pacemakers.

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UPDATES

CELL PHONES & THE BRAIN

More EEG Effects Observed... In a spoken-word memory test, mobile phone radiation produced significant changes in electroencephalogram (EEG) readings, according to a new study by researchers in Finland. "The effect which mobile phone signals seem to have on the EEG during cognitive processes might be one factor explaining our earlier behavioral findings," Dr. Christina Krause of the Helsinki University of Technology and the Center for Cognitive Neuroscience (CCN) in Turku told *Microwave News.* Krause was a member of a team led by Dr. Mika Koivisto, also of the CCN, which observed that volunteers exposed to mobile phone radiation performed faster on two types of tests of reaction time (see *MWN*, M/A00). In the latest experiment, published in the March issue of *NeuroReport (11*, pp.761-764, 2000), Krause, Koivisto and colleagues asked volunteers to listen to a list of four Finnish verbs. After a pause, a verb was read and volunteers indicated whether it had been part of the list of four. This test was repeated with different words for about an hour, with the phone turned on half of the time. Researchers knew whether the phone was on or off, but the subjects did not. The GSM signal caused no significant EEG changes while the initial list of verbs was being read—that is, during "memory encoding." But Krause found that during "memory retrieval"—when volunteers were deciding whether the fifth verb was part of the earlier list—RF/MW exposure significantly altered the shape and timing of the EEG response. Though the results were based on only 14 subjects, they were highly significant (with *p* values ranging from 0.0001 to 0.02). Exposure "appeared to decrease cortical activity during auditory information retrieval," the paper states, while accuracy was unchanged. Could mobile phone exposure be enabling the brain to achieve the same result with less work? "This might be the case, but we don't know yet," said Krause. She pointed out that in this study, "the subjects performed a very easy memory task." Repeating the experiment with more complex tasks, she suggested, will shed more light on the effects of mobile phone radiation on cognition. Krause added that her group has already done such a study. (She declined to discuss the results, since the study has been submitted for publication but not yet accepted.) "Of course," Krause and colleagues conclude, the "subtle effects" seen to date "do not allow any conclusions concerning the possible effects of long-term cellular phone use."

"JUNK SCIENCE"

Campaign "To Subvert the IARC Study":. The tobacco industry conducted an aggressive campaign "to stop, affect the wording of, delay and counteract" a study of secondhand tobacco smoke by the International Agency for Research on Cancer (IARC), according to an analysis in the April 8 issue of *The Lancet* by Elisa Ong and Dr. Stanton Glantz of the University of California, San Francisco. In a 1993 "Action Plan" on the IARC study, industry leader Philip Morris Inc. (PM) listed several goals, including: "Develop a program to generate support for [the concept of] 'junk science' and education on the use and abuse of epidemiology, possibly through a coalition on bad science." To that end, write Ong and Glantz, in 1993-1994 "PM and the public relations firm APCO Associates worked to launch the Ad-

vancement of Sound Science Coalition....PM wanted a similar organization in Europe at the end of 1994," and the apparent result was the European Science and Environmental Forum (ESEF). ESEF criticized IARC on secondhand smoke, argued against concerns over global warming and defended nuclear power. Ong and Glantz note that PM "expanded its 'sound science' discussion to issues beyond secondhand smoke, masking the industry's role as the initiator or sponsor of these programs." The tobacco industry not only tried to influence the public's view of the IARC study—it sought to affect the scientific process itself. Among the "IARC Objectives" listed in an internal PM memo in 1993 were: "Delay the progress and/or release of the study" and "Affect the wording of its conclusions and official statement of results." Industry consultants met with IARC researchers to influence the study's methodology and gain information—but Ong and Glantz note that in these meetings, "the consultants did not always disclose their industry affiliations." PM also commissioned two studies which it thought would have more favorable conclusions at a projected cost of $4 million, to be completed in advance of IARC's research. (The ten-year IARC study cost less than $3 million.) Ong and Glantz conclude that, "Scientists and policy makers need to understand that they function in an environment that is heavily influenced by covert tobacco industry efforts to subvert the normal decision-making process," in both research and regulation.

PEOPLE

Dr. **Thomas Tenforde** of the Battelle Pacific Northwest Labs in Richland, WA, has stepped down as vice president for non-ionizing radiation of the National Council on Radiation Protection and Measurements (NCRP) in Bethesda, MD. He has been replaced by **Ronald Petersen** of Lucent Technologies in Murray Hill, NJ. In April, Tenforde was elected an honorary member of the council. Among those newly named to six-year terms on the NCRP were Drs. **Kenneth Foster** of the University of Pennsylvania in Philadelphia (presently on sabbatical at the WHO in Geneva, see p.5), **John Moulder** of the Medical College of Wisconsin, Milwaukee, and **Daniel Wartenberg** of the Robert Wood Johnson Medical School in Piscataway, NJ. And Dr. **Larry Anderson**, also of the Battelle labs, was reelected to the NCRP.... **Jerry Ulcek**, who has long worked with Dr. **Robert Cleveland** at the FCC in Washington, is moving to Denver. Ulcek will continue to work on RF safety issues for the FCC, concentrating primarily on measurements and compliance matters. Meanwhile, the FCC is seeking to hire an RF policy analyst for its Washington headquarters....Dr. **Michael Repacholi** is usually identified in these pages as the director of the WHO's International EMF Project. But since last October he has also been the coordinator of Occupational and Environmental Health at the WHO. As a result, he is now leading another six programs....Catching up on two other Australians who have also moved to Europe: **Michael Dolan** left the Electricity Supply Association of Australia (ESAA) in Melbourne last year to join the Federation of the Electronics Industry in London, where he is with the mobile telecom advisory group; and Dr. **Jack Rowley**, formerly with Telstra, the Australian telephone company, has become the director of environmental affairs at the GSM Association in Dublin.... **John Ott**,

Microwave News Gets There First

Microwave News, July/August 1998

"Magnetic Fields Seen as Possible Treatment for Malaria: In the Lab, EMFs Can Be Toxic to Parasites"

"Outwitting Malaria: Magnetic Fields May Poison Parasites, Overcoming Drug Resistance"

Newsday (NY), May 2, 2000

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—Dr. Robert Park, Forbes, *May 15, 2000*

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the author of *Health and Light* (1973) and *Light, Radiation & You: How To Stay Healthy* (1982), died in April at the age of 90.

RF & ANIMAL BEHAVIOR

Weak GSM Signal Does Not Affect Mice... Pulsed RF/MW radiation did not alter learning or short-term memory among mice in a new U.K. study. Animals were exposed over a ten-day period for 45 minutes each day to 900 MHz fields, pulsed at 217 Hz to mimic a GSM digital phone signal and with whole-body SARs estimated to be about 0.05 W/Kg. Following each day's exposure, the mice were placed in a maze with food rewards at the end of each of eight arms. The exposed mice were, on average, just as able to remember which arms of the maze they had already visited as were the controls, Dr. Zenon Sienkiewicz of the U.K.'s NRPB and colleagues report in the April issue of *Bioelectromagnetics (21,* pp.151-158). In 1997, Dr. Henry Lai of the University of Washington, Seattle, caused a stir in the British press when he discussed his finding that exposure to pulsed 2450 MHz microwaves at an SAR of 0.6 W/Kg impaired the performance of rats in a similar radial arm maze (see *MWN,* S/O99). Lai's research was originally published in 1994 *(Bioelectromagnetics, 15,* pp.95-104). In an interview, Lai said that he "was not surprised" by the new study's results. "We found no effect at 0.3 W/Kg." He noted that the SARs that did produce an effect were an order of magnitude higher than those used by the NRPB team. Sienkiewicz explained to *Microwave News* that the 0.05 W/Kg SAR in his study "was the highest we could produce with the available equipment." Experiments with exposures of 0.005, 0.01 and 0.5 W/Kg are under way, he said.

Keeping Current: Follow-Up on the News

◆ The mayor of San Francisco and other city officials are the focus of an influence-peddling investigation by the FBI after TV broadcasters were given permission to place new antennas on Sutro Tower without holding public hearings, the *San Francisco Examiner* reported on April 30 (see also *MWN,* J/A97).

◆ The Australian Senate is seeking public comment for its inquiry into mobile phone safety (see *MWN,* J/F00). Sen. Lyn Allison, who is leading the probe, plans to hold hearings. Meanwhile, proposals for the second set of mobile phone health studies sponsored by Australia's National Health and Medical Research Council were due on May 26 (see *MWN,* S/O98).

◆ On April 10, the FCC asked for public comment on whether it should preempt a local decision blocking a proposed DTV tower on Lookout Mountain near Denver (see *MWN,* J/F00). Comments were due May 25, and the FCC has put them on the Internet at: <www.fcc.gov/Bureaus/Mass_Media/Filings/index.html>.

◆ The Ear Task Force of SCC-34/SC-2 has developed an engineering method for averaging SARs in various parts of the body, including extremities (see *MWN,* N/D99 and J/F00). The full SC-2 is voting on whether to forward the proposal to SCC-28/SC-4 to evaluate its biological merits. Ballots are due May 26.

◆ Some recently released statistics: In Japan, mobile phone subscribers now outnumber those using fixed-line phones; China with more than 35 million users is the third largest mobile phone market after the U.S. and Japan; and Nokia's CEO has predicted that the number of U.S. users will double by the end of 2002. In May, the U.S. had more than 92 million wireless subscribers.

Late-Breaking News

◆ Motorola told *Microwave News* in mid-May that an Illinois judge had dismissed the lawsuit by Robert Kane, a Motorola engineer who charged that his brain tumor was caused by radiation from a prototype cellular phone antenna that he tested for the company (see *MWN,* J/F94, M/A94 and J/A 94). Kane's lawyer, Robert Barnow of Barnow & Goldberg in Chicago, did not return calls requesting comment. At press time, Motorola had provided no further details.

◆ Roundworms produce stress-response proteins after nonthermal levels of RF/MW exposure, according to a report in the May 25 issue of *Nature* by a team led by Dr. David de Pomerai of the U.K.'s University of Nottingham. The changes were observed at an SAR of only 0.001 W/Kg, and de Pomerai suggests that "current exposure limits for microwave equipment may need to be reconsidered."

The Stewart Report's Call to Action

Wireless phones may present a danger to public health—or they may not. The facts are uncertain, but the phones are already used by hundreds of millions of people around the world.

Until there is a clear verdict on mobile phone safety, how should we respond? It is a difficult question, but someone has finally taken it on. The common-sense recommendations of the expert group headed by Sir William Stewart (see p.1) should be implemented without delay—and not only in Britain. They are a model that other countries should follow.

The mobile phone issue has had its share of expert panels in the past. At most, they have issued calls for more research.

More research is certainly needed, but in the meantime we have large numbers of people using a product of uncertain safety. The Stewart panel is the first official group to recognize that some action is needed now.

If we wait for the final study to be published, it may turn out to be too late. That is why the commission calls for a "precautionary approach" to the use of mobile phones, until our "gaps in knowledge" are filled. This is what unites the specific measures advocated in its report.

Critics have called the Stewart report alarmist—especially for its recommendation that children not use wireless phones. Just because mobile phones have not been conclusively proven safe, they argue, does not mean we should be worried about a potential hazard. According to the expert group's logic, wrote London's *Financial Times*, "children should not eat strawberries unless absolutely necessary," since strawberries could also carry unknown risks.

What these arguments miss is that we are not operating in a complete vacuum of knowledge. We *do* know something about mobile phone safety, and what we do know is enough to raise concerns.

For example, existing exposure limits are based on the assumption that RF/MW radiation cannot harm health except by heating. But the Stewart expert group—like the Royal Society of Canada panel before it—concludes that there is growing scientific evidence of biological effects below these levels (see *MWN*, M/J99).

Several recent European studies have shown that short-term exposures to cellular phone radiation can alter brain function (see p.7 and p.16 and *MWN*, M/A99 and M/A00). These effects have not been shown to be harmful, but they do raise the question of what might happen over the long-term.

And there are individual studies that point to RF-induced increases in genetic damage or cancer risk. A doubling of the risk of lymphoma was observed in RF/MW-exposed mice over two years ago in a classical toxicological study by Dr. Michael Repacholi, now with the World Health Organization (WHO) (see *MWN*, M/J97). Repacholi—who served on the Stewart panel—is one of those who believe that its precautionary emphasis went too far (see p.5). "It seems to me that the committee wanted to address public concerns more than the science," he told *Microwave News* in May.

It would be absurd to ban cellular phones on the basis of the scattered data that point to some health risks. But it is just as absurd to pretend that these data do not exist, or that they should not affect our actions. The ostrich-like approach of the WHO does not serve what should be its primary mission—the protection of public health.

How do we cope with uncertainty? Not by ignoring it, but by taking some elementary precautions. The Stewart expert group has outlined what must be done.

Burying a Still Warm Body

The pendulum appears to be swinging back to electric fields. For 15 years practically all EMF research has focused on magnetic fields, but the latest epidemiological studies from Canada point to large risks when exposures to electric fields are taken into account (see p.1).

When we reported initial results from this same group four years ago (see *MWN*, J/A96), Dr. David Agnew of what was then Ontario Hydro predicted that its provocative findings would prompt further research. With the exception of his own colleagues, he was wrong.

Will the latest results also be ignored? We wondered the same thing a couple of months ago when we reported on the potential importance of EMF polarization.

While too many electric utilities seem increasingly inclined to dismiss the EMF issue, we are happy to acknowledge that the new work was supported by a Canadian utility.

In fact, it is ironic that a utility is more interested in learning about possible EMF public health risks than are U.S. health agencies, which have basically abandoned the field since the end of the RAPID program.

Indeed, funding for EMF studies has been shut off just as new results on a number of fronts suggest possible explanations for the EMF–cancer connection observed in 20 years of epidemiological studies: polarization, electric fields, threshold effects and charged particles, to name a few. The body of evidence for an EMF–cancer link, both in occupational and residential studies, is stronger than ever.

In short, the issue is being buried alive.

But anyone who has ever watched a horror movie knows what happens when you bury a still warm body. Just when you least expect it, a hand pops out of the freshly turned earth.

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