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### VIEWS ON THE NEWS p.19

**Swedish Study Must Be Followed Up**

## Swedes Find GSM Radiation Causes Nerve Damage at Very Low Doses Leakage Through the Blood-Brain Barrier

In a new paper that is sure to reignite concerns over the safety of mobile phones, Drs. Leif Salford and Bertil Persson have shown that extremely low doses of GSM radiation can cause brain damage in rats.

Salford, a neurosurgeon, and Persson, a biophysicist, both at Sweden's University of Lund, report that they see nerve damage following a single two-hour exposure at a specific absorption rate (SAR) of 0.002 W/Kg. The effect becomes statistically significant at 0.02 W/Kg. These nonthermal levels are a hundred to a thousand times lower than the 2 W/Kg exposure standard recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Salford and Persson first showed that low-level microwave radiation can cause leakage through the blood-brain barrier (BBB) over ten years ago (see *MWN*, J/F92 and J/A92). In this latest work, they again show that microwave

(continued on p.19)

### 1993 FDA Memo

## Data "Strongly Suggest" Microwaves Can Promote Cancer

In the spring of 1993 at the height of public concern over cell phone-brain tumor risks, Food and Drug Administration (FDA) biologists concluded that the available data "strongly suggest" that microwaves can "accelerate the development of cancer." This assessment is in an internal agency memo recently obtained by *Microwave News* under the Freedom of Information Act.

"Of approximately eight chronic animal experiments known to us, five resulted in increased numbers of malignancies, accelerated progression of tumors, or both," wrote Drs. Mays Swicord and Larry Cress of FDA's Center for Devices and Radiological Health (CDRH) in Rockville, MD. They also pointed to other evidence from laboratory (*in vitro*) studies that supported a cancer risk.

Yet, in its public statements at that time, the agency played down these findings. For instance, in a Talk Paper issued in early February, the FDA stated that there was "limited evidence that suggests that lower levels [of microwaves] might cause adverse health effects."

"A few studies suggest that [microwave] levels [from cellular phones] can accelerate the development of cancer in laboratory animals," the FDA added, "but there is much uncertainty among scientists about whether these results apply to the use of cellular phones."

(continued on p.5)

## **Brillouin Precursors Round 2: Attacks on Albanese Intensify; Editors at “Radiation Research” Join Forces with Robert Adair**

Dr. Richard Albanese, a U.S. Air Force (USAF) medical doctor and a voice of concern about the safety of PAVE PAWS radar radiation, has once again been sharply criticized by Dr. Robert Adair—and this time the editor-in-chief of *Radiation Research*, Dr. Sara Rockwell, has joined the fray.

In an editorial\* appearing in the January issue of *Radiation Research*, Rockwell and Dr. John Moulder of the Medical College of Wisconsin, Milwaukee, denounce Albanese’s arguments as an “unpublished, non-standard” theory that is stirring up public controversy and delaying the modernization of the radar system. Moulder is a senior editor of the journal.

The editorial accompanies a commentary† by Adair, a Yale University physicist, who writes that Albanese suffers from “the mistaken belief that the PAVE PAWS radiation is quite different from the radiation from other scanning radar systems.” Adair insists that, “Real pulses used in radar technology seldom, if ever, generate significant Brillouin precursors. PAVE PAWS does not.”

Even if PAVE PAWS radiation could induce Brillouin precursors, Adair adds, such effects “are far too small to have any conceivable effect on physiology.” (See also *MWN*, M/J02.)

“The first reaction of most radiation scientists is to ignore such [non-standard] theories,” Moulder and Rockwell write. But it is “appropriate and necessary for the public good,” for “rigorously peer-reviewed journals such as *Radiation Research*” to step in when a theory influences public policy.

Albanese declined to comment.

“They are not playing fair,” objected Dr. Kurt Oughstun, who has long collaborated with Albanese. “Albanese hasn’t published anything about all this because the Air Force won’t let him,” Oughstun told *Microwave News*. “This is all politics.”

### **USAF Researcher at Center of Storm**

Dr. Richard Albanese has worked at Brooks Air Force Base in San Antonio since 1971 and has done research on Brillouin precursors for over 15 years. Albanese studied chemistry and mathematics as an undergraduate at Princeton University and received a degree in medicine from Columbia University. He has a top secret security clearance.

Albanese believes that the radiation from PAVE PAWS is qualitatively different from other types of radar and could cause harmful biological effects by inducing Brillouin precursors on entering the human body (see *MWN*, M/A02). In a May 2000 letter to the Massachusetts Department of Health, he warned that the potential effects of PAVE PAWS phased-array radiation are “completely unexplored” (see *MWN*, S/O00).

Albanese has also been an outspoken critic of an Air Force study that tried to downplay the health effects of Agent Orange, a herbicide used during the Vietnam War.

An abbreviated listing of Albanese’s publications is posted on the Web at: <[www.pavepaws.org](http://www.pavepaws.org)>.

Oughstun pointed out that he and others have published numerous papers on Brillouin precursors in the peer-reviewed literature, so it is “extremely misleading” to suggest that Albanese’s theories are based on unpublished data.

Albanese “does not appear to be acting as if there are any restrictions,” Moulder told *Microwave News*. “I’ve never heard that Albanese has made that claim.”

Oughstun is skeptical. “It’s common knowledge that Albanese is required to clear his papers with his superiors. If the editors didn’t know that, they should have,” he said.

At the opening meeting of the NAS–NRC inquiry on PAVE PAWS, held last March 15 in Washington, Albanese was clearly concerned about disclosing secret information. He interrupted his own presentation to say that any further discussion of biological effects of phased-array radiation would have to take place in “another setting.” After the meeting, he told *Microwave News* that the USAF can block the release of any paper that does not conform to official policy (see *MWN*, M/A02).

Rockwell, a physicist who is a professor of therapeutic radiation at Yale University’s medical school in New Haven, CT, said that she and Moulder “sought no information on the classified papers or any other aspect of Dr. Albanese’s classified research.” Rather, she said, they relied on Albanese’s unclassified papers and presentations—“most of which were not readily available.” These documents were collected by Adair and made available to the editors and reviewers during the peer review of his commentary. (In the interview, Rockwell noted that, earlier in her career, she had worked on classified projects for the military.)

Lt. Col. Bruce Ruscio, a public health advisor at the Cape Cod Air Force Station, did not respond to requests for comment.

### **Non-Standard Theories Defined**

According to Moulder and Rockwell, theories such as Albanese’s “tend to have certain elements in common”:

- No “formal statement...that contains enough information on the details...to allow rigorous analysis”
- They are based on data that are “not in the peer-reviewed literature” or not otherwise available to the public
- They “often include *ad hominem* attacks on the proponents of ‘standard’ theories”
- The authors’ training has “little or no relevance to the theory or even to the general area”
- The authors have “few or no relevant peer-reviewed publications.”

\*J. Moulder and S. Rockwell, “Critiquing Unpublished Theories,” *Radiation Research*, 159, pp.1-2, January 2003.

†R. Adair, “Environmental Objections to the PAVE PAWS Radar System: A Scientific Review,” *Radiation Research*, 159, pp.128-134, January 2003.

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They cite a number of other examples of non-standard theories, including the epidemiological studies of Poland's Dr. Stanislaw Szmigielski, which point to increased cancer risks among Polish military personnel exposed to RF/MW radiation, and the work of Dr. Denis Henshaw of the U.K.'s University of Bristol suggesting that electric fields play a role in the power line-cancer equation (see *MWN*, J/F98 and M/A96, respec-

tively). They also question the work of Dr. Neil Cherry of New Zealand's Lincoln University.

Henshaw is puzzled by the label. "I'm afraid I do not recognize our 1996 paper as in any way being a 'non-standard' theory," he said in an interview. The Advisory Group on Non-Ionizing Radiation of the U.K.'s National Radiological Protection Board is investigating Henshaw's hypothesis (see *MWN*, N/D01).

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## ***NAS-NRC Panel Says PAVE PAWS Data Inadequate To Judge Safety, But No Decision on Need for Epidemiological Study***

Midway through its planned two-year investigation, a panel of the National Academy of Sciences-National Research Council (NAS-NRC) finds that it does not have enough information to determine whether the USAF's PAVE PAWS missile defense radar on Cape Cod, MA, poses a health risk to those living nearby.

Currently available data "are not adequate for determining the biologic and potential health effects" of PAVE PAWS radiation, the panel's chair, Dr. Frank Barnes of the University of Colorado, Boulder, wrote in an interim report\* dated November 15.

The NAS-NRC panel is calling for more precise information on the type of signal—the waveform—to which nearby communities are exposed, as well as their levels of exposure.

The USAF is sponsoring the NAS-NRC inquiry at the urging of Sen. Edward Kennedy (D-MA) (see *MWN*, J/F01). Cape Cod residents have voiced concerns that radiation from the system—which has been operating since 1980 at 420-450 MHz with a peak power of 582 kW—is responsible for elevated cancer rates on the Cape (see *MWN*, J/F98).

While the new report states that "epidemiologic methods" are "important to the determination of possible health effects," it stops short of recommending an epidemiological study of those living near the radar. Dr. Susan Santos, a panel member, cautioned that it remains to be seen whether a study is warranted.

If the NAS-NRC panel were to recommend such a study, it would probably meet with resistance from the Armed Forces Epidemiological Board (AFEB). "There is no immediate indication to support either initiation of new, or further analysis of existing, epidemiologic investigations," the board stated in a December 10 memorandum† prepared at the request of the USAF Surgeon General.

According to the new report, waveform data would be used to determine "the comparability of the PAVE PAWS phased-array radiation with radiation emitted by non-phased-array systems," and, in turn, the "adequacy of the existing RF energy literature" for assessing potential effects.

The panel cites "issues related to the rise and fall portions"

of the waveform. Barnes explained that this is a reference to Brillouin precursors, which could cause harmful biological effects, according to Dr. Richard Albanese of the USAF in San Antonio (see p.2).

Dr. Kurt Oughstun of the University of Vermont, Burlington, who briefed the panel last September, said in an interview that he is "very pleased" by the request for more waveform data. "Until we find out what the pulses actually look like," he said, "no one can really say that it is impossible for PAVE PAWS to generate Brillouin precursors."

Dr. Robert Adair of Yale University has dismissed Albanese's concerns as unfounded (see p.2).

Additional power-density measurements are needed, the November 15 report states, because previous surveys by the USAF "were not designed to cover a wide range of census tracts for epidemiologic purposes" (see *MWN*, M/J87),

"You need to see some data on exposures in order to assess any health impacts," Santos, a consultant on risk analysis based in Medford, MA, told *Microwave News*. She explained that the panel would then try to combine that information with data on the incidence of various health problems—for example, from the Massachusetts cancer registry.

According to the report, the panel is eager to see the results of a measurement survey initiated by the PAVE PAWS Public Health Steering Group (PPPHSG), a committee of local health officials which receives financial and administrative support from the USAF. But this survey is not expected to be finished before September, when the panel's work is due to be completed. NRC's Dr. Rick Jostes told *Microwave News* that the panel may ask the USAF for an extension so that it can include the measurements in its final report.

Calculated exposure estimates have been prepared for the USAF by MITRE, an engineering firm with headquarters in Bedford, MA, that works closely with the U.S. military. But Barnes said that it is not clear whether the panel will be able to use these estimates—because of technical problems, not because of military secrecy. "They have been very cooperative in giving us everything we've asked for," Barnes said in an interview.

In a press release dated November 19, the USAF said that it was "very pleased" by the interim report, which "has validated the approach" it has taken in addressing health questions about PAVE PAWS. Requests for clarification were left unanswered.

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\*The November 15 NAS-NRC report is available at <[www.nap.edu/books/NI000483/html/](http://www.nap.edu/books/NI000483/html/)>.

† AFEB's recommendations are at <[www.ha.osd.mil/afeb/2003/2003-03.html](http://www.ha.osd.mil/afeb/2003/2003-03.html)>.

## Status of Research on Microwaves and Cancer—FDA's View in 1993

Reprinted below are excerpts from an April 7, 1993, memo prepared by Drs. Mays Swicord and Larry Cress of FDA's CDRH.

The literature contains reports of probably thousands of experiments relating to microwave [MW] bioeffects. Very few of these are relevant to the question of whether MWs can in some way accelerate the development of cancer in humans. This is because endpoints other than cancer were examined in most of the studies; many examined behavioral effects, cataract development or thermoregulation. In addition, many of these studies involved acute exposures to relatively high levels of MWs. For the types of exposures involved with devices such as cellular phones and police radar, long-term exposures to much lower power levels are of interest. The majority of the reported experiments also involved exposures at 2450 MHz, the "oven" frequency; higher and lower frequencies are employed in police radar and cellular phones, respectively. In spite of these caveats, there are a few reported experiments which bear directly on the question of cancer progression and chronic, low-level exposures. This small and incomplete database strongly suggests that under at least some circumstances these exposures do indeed accelerate the development of cancer by some unknown mechanism.

### In Vivo Experiments

Of approximately eight chronic animal experiments known to us, five resulted in increased numbers of malignancies, accelerated progression of tumors, or both. One of the experiments, conducted 30 years ago, involved relatively high-level exposures and suffered from a number of problems...

A much more disturbing study is that of Guy and Chou. Financed by the Air Force, this well-planned and executed study was intended to examine a number of biological, behavioral and biochemical endpoints. Two groups of 100 rats each were used; the exposed group was treated with pulsed-modulated waveform for 22 hours each day over a period of two years. Although no one type or anatomic site of tumor predominated, 18 of the exposed animals developed a malignancy of some type versus only 5 of the control animals, statistically significant at the  $p=0.001$  level. In addition, 7 of the exposed animals developed "benign" pheochromocytomas versus only one of the control animals, also highly significant ( $p=0.02$ ). Although this study has been discounted by some critics because no one tumor site or target organ predominated, this is precisely what one would expect for an agent which accelerates the progression of naturally occurring malignant cells. That is, any transformed neoplastic group of cells occurring in an organ will be promoted without reference as to site or type of tumor. These results are particularly disturbing because the rate of MW energy deposition in the rats' bodies is comparable to that of users of cellular phones and other portable communications equipment. The study's applicability to these devices may be questioned, however, on the grounds that the frequency is 3 times that used in cellular phones and the modulation is also different.

Szmigielski published reports of experiments using three different models of tumor progression. One group used a strain of mice with a high rate of spontaneous mammary tumors, a second group had the chemical carcinogen 3,4-benzopyrene applied to their skin and a third group was injected with sarcoma cells which resulted in pulmonary tumors. Animals were exposed to 2450 MHz unmodulated MW radiation two hours a day for several months....All groups showed earlier appearance and accelerated growth of tumors, suggesting a tumor-promoting activity. In addition, the mice exposed to higher levels developed tumors at a faster rate than the group receiving less radiation.

The only study reported in the peer-reviewed literature that did not

show accelerated tumor progression used mice with melanomas subcutaneously implanted under their skin. Exposure to 2450 MHz MWs (both unmodulated and pulsed) for 2.5 hours a day did not affect tumor progression or survival times. One reason that this study may have given a negative result is that the mice only lived about 6 weeks after implantation of the highly malignant melanoma cells. The Szmigielski data show that about 4 months of exposure is necessary before tumor progression is accelerated by MWs. The melanoma-implanted mice thus did not survive long enough for their disease to be accelerated by the MW exposure.

### In Vitro Experiments

Although the animal experiments described above offer the strongest evidence implicating the ability of MWs to promote cancer, other evidence exists in the form of *in vitro* data. A standard method for screening chemical agents for the ability to promote neoplastic transformation employs cells in culture. This technique has been applied to MW radiation by Balcer-Kubiczek and Harrison who found that although 2450 MHz MWs alone did not cause malignant transformation in their system, low-level MW irradiation did increase the amount of transformation caused by TPA, a phorbol ester tumor promoter. Furthermore, the magnitude of this effect increased with increasing MW power level, strongly suggesting that it is not an artifact. It must be noted that the MWs used in this study were modulated at 120 Hz, raising the question of whether the observed effect could actually be due to the lower frequency component.

A number of other *in vitro* experiments also suggest that low-level MW irradiation can interact with the cell's growth-control mechanisms in ways that could be harmful. Byus has demonstrated the ability of modulated MWs to increase cellular ornithine decarboxylase (ODC), an enzyme that is also induced by chemicals known to be cancer promoters. Czerska and colleagues have similarly found that MW exposure can induce the transformation of human lymphocytes, but pulsed MWs are more effective than unmodulated MWs. Dutta has found that very low-level irradiation can induce oncogene expression in cultured neuroblastoma cells, but this work has been published only in abstract form. Cleary has demonstrated that irradiation can induce the proliferation of cultured glioma cells, and that the effect persists for several days after irradiation, but the published experiments involved power levels greater than those likely to be encountered with cellular phones and similar devices. A number of other experiments have demonstrated genetic abnormalities, such as chromosome despiralization, but many of these studies used crude exposure systems and dosimetry, and some of the reported effects may have been due to heating and not MW exposure per se.

### Summary of Research Situation

Most of the published MW bioeffects literature describes experiments that are not relevant to the question of whether MWs can accelerate cancer progression. In particular, very few chronic, low-level animal exposure experiments have been done. It should be noted that most of the experiments described above have not been replicated, and most were conducted with frequencies and modulation different from cellular phones. The fact remains, however, that the data which exist strongly suggest that MWs can, under at least some conditions, accelerate the development of malignant tumors. These *in vivo* data are also supported by *in vitro* data which have demonstrated not only malignant transformation but other effects on the cell's growth-control mechanisms. Taken together, these two lines of evidence make a compelling case for further research to either confirm or refute previous work.

The cell phone scare became front-page news in early 1993 after CNN reported that David Reynard of St. Petersburg, FL, had filed a lawsuit charging that his wife had developed brain cancer after using a cell phone. The suit was originally filed in April 1992 (see *MWN*, M/J92).

The Talk Paper also stated that, "If there is a risk from these devices—and at this point we don't know if there is—it is probably small." This view was widely quoted in the press. In contrast, Swicord and Cress were silent on the magnitude of any possible risk in their memo.

In 1993, Swicord was the chief of the radiation biology branch at FDA's CDRH. He is now the director of electromagnetic energy programs at Motorola's Florida Research Labs in Plantation. Cress is still at the CDRH today.

"My view at the time was that the database certainly did not support very strongly that there is nothing there," Swicord told *Microwave News* this January.

And Cress said that, "It was our honest scientific evaluation of the existing, albeit inadequate, database."

At the time the Swicord-Cress memo was being prepared, the Cellular Telecommunications Industry Association (CTIA) was under great pressure to calm public fears and a jittery market in cell phone stocks. Its initial strategy, later abandoned, was to ask the FDA to supervise a research program on the possible health effects of microwave radiation.

Swicord and Cress wrote that there is "a compelling case for further research to either confirm or refute the previous work." (Extended excerpts of the Swicord-Cress memo are reprinted on p.4.)

At a February 2, 1993, Congressional briefing convened by Rep. Edward Markey (D-MA), Swicord, together with representatives of the Environmental Protection Agency (EPA) and the Federal Communications Commission—as well as Markey himself—all called for more research (see *MWN*, J/F93).

A number of former and current FDA staff members suggested that Swicord and Cress used strong language in their memo to help secure funding for their particular sphere of interest at the CDRH. Cress, however, rejected this explanation. "It was not a funding document," he said.

The FDA documents also reveal that:

- A document prepared to brief then CDRH Director Dr. Bruce Burlington stated that, "Evidence exists of nonthermal and cytotoxic effects at power levels produced by cellular phones." The briefing document was prepared by Dr. Elizabeth Jacobson, then CDRH's deputy director for science, and was largely based on the Swicord-Cress memo. Both Burlington and Jacobson have since left the agency.
- Dr. Richard Adamson of the National Cancer Institute (NCI) "adamantly opposed" a proposal to use industry funds to pay for a government-run research program, according to the Jacobson document. An interagency coordinating committee cochaired by



IN 1993, MOTOROLA'S MAYS SWICORD WAS AT THE FDA

Adamson reacted negatively to the proposal "because of the appearance of conflict of interest," Jacobson wrote.

- Jacobson told Burlington that, in her view, the NCI brain tumor study—which included questions on cell phones—was "flawed" because "it ignores the fact that widespread use of phones is a very recent phenomenon, and if there is any 'latent period' for development of tumors, a negative result will be hard to interpret." Adamson later left the NCI to run the Washington office of the National Soft Drink Association. The NCI study, which was released in December 2000, did not find a link between cell phones and brain cancer (see *MWN*, J/F01). An editorial in the *New England Journal of Medicine* by Drs. Dimitrios Trichopoulos of Harvard School of Public Health in Boston and Hans-Olov Adami of the Karolinska Institute in Stockholm that accompanied the NCI paper concluded that it is "highly unlikely" that cell phones increase the risk of brain tumors.

- Jacobson also advised Burlington that, "With a burgeoning wireless...industry, it is imperative to establish a clear scientific understanding of health effects from low-level microwave exposure."

- Swicord and Cress were disturbed by the results of the long-term microwave exposure study by Drs. Bill Guy and C.K. Chou at the University of Washington, Seattle (see *MWN*, J/A84). They wrote: "Although this study has been discounted by some critics because no one tumor site or target organ predominated, this is precisely what one would expect for an agent which accelerates the progression of naturally occurring malignant cells....These results are particularly disturbing because the rate of microwave energy deposition in the rats' bodies is comparable to that of users of cellular phones..." Guy later helped oversee the research program set up by Dr. George Carlo and paid for by the CTIA. Chou, who later received \$1.5 million from Carlo for a dosimetry study, now works with Swicord at Motorola's Florida labs.

- At about the same time that the cell phone industry was telling the American public that thousands of scientific studies proved the safety of hand-held phones, Swicord and Cress advised that, "Very few of these are relevant to the question of whether microwaves can in some way accelerate the development of cancer in humans."

Three years before the cell phone-brain tumor scare took center stage, the EPA drafted a report which concluded that microwave radiation should be classified as a possible human carcinogen (see *MWN*, M/J90). Like Swicord and Cress, the EPA analysts based their finding on the results of the Guy-Chou long-term exposure study and the experiments of Poland's Dr. Stanislaw Szmigielski (see *MWN*, My81).

This January, on the tenth anniversary of the cell phone flare-up, Jacobson told *Microwave News* that parts of the briefing document were a "little zingy." They "were designed to get the director's attention."

Both Swicord and Cress have had a major change in their outlook. "More than 300 studies have been done since then, including a number of animal studies, and there is no indication of a problem," Swicord said.

Cress agrees. "My evaluation has gone from being concerned to believing that there is a very small chance of health effects."

### **Australians Concede Error in Cell Phone Cancer Paper; Explanation Baffles Skeptics**

Drs. Tammy Utteridge and Tim Kuchel have admitted that they mistakenly published conflicting and confusing data in a widely cited paper that discounts cancer risks from mobile phones.

Their correction resolves many of the contradictions in the original paper. But critics say they cannot understand how the error could have been made and they continue to view the Australian paper with deep skepticism.

Writing in the February issue of *Radiation Research* in response to letters that challenge their work, the Australian researchers explain that they had presented data on the survival of their mice in terms of “days of exposure”—instead of absolute age. Because the mice were not exposed on weekends and national holidays, they appeared to die earlier than they actually did. This error muddled the interpretation of their results.

For instance, the original paper, published in *Radiation Research* last September, showed that all the transgenic mice had died at about 19 months of age, but were still being handled and weighed at the age of 28 months (see *MWN*, S/O02).

Many are not satisfied with the explanation offered by Utteridge and Kuchel. “This is the most ridiculous thing I have ever read,” said Dr. Alexander Lerchl of Germany’s International University Bremen. “If that happened in my lab, I would fire those responsible immediately.” Lerchl had pointed to the anomaly in the ages of the mice in one of three letters published in *Radiation Research*.

“A time axis that is computed by leaving out weekends and public holidays is not easily produced,” commented Dr. Michael Kundi of the University of Vienna. “The whole story about the mislabeled figures is incredible,” he told *Microwave News*. Kundi is the author of another of the published letters. Omitting the days without exposure is an unheard-of way of describing the survival age of the mice, he said.

Dr. Ron Melnick of the National Institute of Environmental Health Sciences (NIEHS) in Research Triangle Park, NC, said that he had never heard of anyone reporting survival data in terms of days of exposure instead of absolute age.

“I have not seen it before,” agreed Dr. Mays Swicord. “It’s a strange thing.” Swicord is the director of Motorola’s electromagnetic energy programs in Plantation, FL. (See also p.1.)

“This is a major correction to their paper,” said Melnick, who is leading the effort to design a set of animal experiments to test the carcinogenicity of wireless signals under the U.S. National Toxicology Program. “They should have published a formal correction in the journal.”

Lerchl also believes that the Australians’ indirect acknowledgment is insufficient: “If I was in the situation of Utteridge and coauthors, I would at least write an erratum.”

Neither Utteridge nor Kuchel responded to questions from *Microwave News* on why they counted exposure days instead of actual age. Kuchel, of the Institute of Medical and Veterinary Science in Gilles Plains, has consistently refused to be interviewed since the paper was published last summer.

Utteridge, who has now left the institute, exchanged numer-

ous e-mails with *Microwave News* last year. But at the time, despite repeated questions about the apparent inconsistencies in the published data, she never revealed that the axes had been mislabeled.

The third letter is from the World Health Organization’s EMF project in Geneva, headed by Dr. Michael Repacholi. Repacholi was the lead author on the original transgenic mouse study, which points to a cancer risk following exposure to GSM radiation (see *MWN*, M/J97). The new study sought to confirm or refute the Repacholi finding.

Repacholi and colleagues spell out a number of concerns they have with the Utteridge-Kuchel paper and suggest that the transgenic mice used in the follow-up study are different from the ones Repacholi had originally used because, among other reasons, they have a much higher rate of spontaneous cancer.

That concern has now been resolved with the corrected survival curves. “If what Utteridge and Kuchel say is correct, their study makes a lot more sense and one is left with the conclusion that the two studies—Repacholi’s and Utteridge’s—show different effects of RF radiation,” NIEHS’ Melnick said. “Some other factor may be involved. I am not sure how to reconcile the two sets of results.”

#### **Questions About Dosimetry Left Unanswered**

One of the objectives of the Utteridge-Kuchel experiment was to correct what they called a “shortcoming” of the original Repacholi study: the wide variation in the mice’s radiation exposures. The specific absorption rates (SARs) varied considerably because the animals were allowed to roam unrestrained in their cages.

The Australian team opted to use a setup in which the mice were exposed in a confined space in order to better regulate the dose. The system was designed, supplied and paid for by Motorola. In their paper, Utteridge and Kuchel report the SARs as single values (for instance, 0.25, 1, 2 or 4 W/Kg)—without allowing for variations in dose, as Lerchl points out in his letter.

In their published reply, the Australians note that, to their surprise, there was a large variation in the weight of the mice: Some were 26 g and others weighed 62 g “for most of the study.” But they do not go the next step and discuss the implications for the published SAR values. (As the weight of the animals goes up, the SARs go down.)

In fact, Utteridge and Kuchel are again totally silent on the question of SAR variability in their February response.

Motorola’s Swicord said that his group has completed a detailed analysis of the dosimetry in the Australian study. It has not yet been submitted for publication.

Another contentious issue is whether the control mice—the comparison group—developed cancer at an abnormally high rate, which would make it difficult, if not impossible, to see any cancer increase due to radiation exposure. In their letters, both Kundi and Lerchl speculate that the mice may have experienced stress while being restrained during the exposures.

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In their original paper, Utteridge and Kuchel did not present the cancer incidence among the mice not placed in the exposure apparatus. (These are called the cage controls; the shams were also not exposed but were placed in the restraining chambers.) These data, presented in their February letter, show that the sham and cage controls had similar cancer rates at the end of the experiment, which would argue against any problem caused by restraint stress.

The Australians do not, however, present data on the mortality of the cage controls over the life of the experiment. Such data are presented for the other exposed animals, including the shams.

“It’s perplexing that they do not give the time course for either the free-roaming controls or the positive (ENU) controls,” Dr. Lawrence Goldstein of WHO’s EMF project said in an interview. “Incidence data alone provide limited information.”

Kundi, Lerchl and Melnick would all like to see information

on the survival of the cage controls over time.

Swicord said that Utteridge told Motorola that they had not included the time course data for the cage controls because they fell on top of the other curves and would only have cluttered up the figures.

As to whether the Utteridge-Kuchel study could be considered a replication of the Repacholi study, Goldstein said that, “The two studies are different experiments.” For his part, Repacholi told *Microwave News* that he “would not go so far as to say that the experiments are totally different because they use the same animal model and similar methodology.”

In general, the Australian researchers discount their critics. In their published reply, they state, “We are particularly puzzled by the criticism of our study, the results of which are consistent with the remaining body of evidence worldwide, while the study of Repacholi *et al.* remains the anomaly.”

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## « Eye on Europe »

**COST281**’s advisory against carrying out an epidemiological study of health impacts of mobile phone base stations has itself become a target of criticism (see *MWN*, N/D02). The European cell phone health research committee believes that there is “insufficient basis” for such an effort and, even if a study were done, it could neither show small risks nor demonstrate the absence of risks. After COST issued its “scientific comment” on December 9, a Swiss official, who asked not to be identified, said that the COST position has not been well received throughout the government. This is significant because the COST commentary was originally requested by the Swiss Office of Public Health. Then, in a widely circulated e-mail to COST281 Chair Dr. **Norbert Leitgeb** of Austria’s University of Graz, Dr. **Elisabeth Cardis** disputed COST’s overly negative view of the limits of epidemiological analysis. Cardis of IARC in Lyon, France, is leading the international study of mobile phone use and cancer (see *MWN*, M/A00). These arguments and counterarguments will no doubt come up again at *Mobile Communication Base Stations and Health*, a COST281 workshop to be held in Dublin, May 15-16. For more information, contact Gerd Friedrich of FGF, the German mobile phone industry research group, at <info@fgf.de>; Friedrich serves as the secretary of COST281.

«« »»

In response to what it calls “controversial” laboratory studies, **COST281** has set up a new task force to organize an international project on possible **genotoxic** effects of mobile phone radiation. This new effort grew out of discussions held at a workshop on *Genetic and Cytogenetic Aspects of RF Field Interactions*, held in Löwenstein, Germany, in late November. That meeting was organized by **FGF** and **COST281**, as well as a German state environmental agency. Those participating in this project plan to meet at the May workshop in Dublin and devise ways to secure funding to set up simultaneous experiments in multiple laboratories. Abstracts of the papers—as well as some of the slide

presentations—from the Löwenstein meeting are available at the COST Web site, <www.cost281.org>. Earlier, the COST panel launched a “short-term mission” on mobile phones and children after its workshop in Rome last May (see *MWN*, M/J02).

«« »»

On December 9, as expected, health and labor officials of the **European Union’s Council of Ministers** received draft **occupational limits** for exposures to EMFs and RF/MW radiation based on **ICNIRP**’s guidelines (see *MWN*, N/D02). Discussions among the 15 member states will now probably continue “throughout 2003” before a final agreement is reached, a spokesperson for the council told *Microwave News*. An updated version of the draft is available in English at: <register.consilium.eu.int/pdf/en/02/st15/15400-r1en2.pdf>.

«« »»

Officials of **Germany’s** Federal Office for Radiation Protection (known as the BfS) have spelled out why they favor a **precautionary approach** to radiation from mobile telecommunications. In a new paper, Drs. **Anne Dehos** and **Wolfgang Weiss** argue that “indications of biological effects...at intensities below the currently applied limit values” require a policy response, because if an actual hazard were to emerge it “might affect a large number of people.” The two members of BfS’ Institute for Radiation Hygiene, outside Munich, advise that public exposures be kept “as low as possible.” For instance, they suggest keeping calls short and using a land-line phone when available. They do not cite BfS’ previous recommendation to limit use of mobile phones by children (see *MWN*, J/A01 and N/D01). Their paper, which is in German with an abstract in English, is in the December 2002 issue of *Gesundheitswesen—Public Health*—(64, pp.651-656). It is available free at: <www.thieme.de/gesu>.

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## HIGHLIGHTS

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The five mobile phone companies in the **U.K.** have set up the **Mobile Operators Association** (MOA). Previously, they were represented by a group within the Federation of the Electronic Industry (**FEI**), but decided to go off on their own after FEI merged with a computer association and changed its name to “Intellect.” **Mike Dolan**, who ran the FEI group, is the executive director of the MOA and continues to be based in London. For more information, go to <www.mobilemastinfo.com>.

«« »»

**Vodafone Portugal** has signed an agreement with the Institute of Telecommunications to tell the public more about radiation from mobile phone base stations. Under the new initiative, known as **ITEM**—Technical Information on Exposure to Electromagnetic Radiation in Mobile Communications—the institute will measure radiation levels around 400 Vodafone antenna sites, set up a network of remote monitoring stations in a medium-sized

city and maintain an Internet site so that all these data are easily accessible.

«« »»

German-speaking **high school students** can learn about the possible health effects of electromagnetic radiation with **interactive software** from Austria’s Technical University of Graz. Lectures, pictures and calculations show, for example, how magnetic fields around a power line or microwaves from a mobile phone base station decrease with distance. The university’s Andreas Abart, who led the CD development team, formerly wrote public information brochures for an electric utility and a wireless operator. The new software may be offered next year in English, French and Italian. *Electromagnetic Fields and Waves... Electrosmog?* is available for €45 (\$48) from DBV Verlag, (43+316) 383033, Fax: (43+316) 383043, E-mail: <office@dbv.at>, Web: <www.dbv.at>.

## EMF NEWS

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### **EMFs and Chemicals Together Increase Brain Cancer Risk**

Combined exposures to extremely-low-frequency electromagnetic fields (ELF EMFs) and certain types of toxic chemicals can act synergistically to increase brain cancer risks, according to a new study of Swedish workers led by Dr. Marina Pollán of Spain’s National Center for Epidemiology in Madrid.

But, interestingly, this finding holds only for gliomas—tumors that develop in the glial cells, or supportive tissue, of the brain—and not for meningiomas, which grow in the membrane that surrounds the brain. While gliomas are malignant, meningiomas are usually benign.

“Our study is the first to try to assess a possible interactive effect—that is, whether the effects of ELF EMFs vary when workers are also exposed to chemicals,” Pollán told *Microwave News*.

Pollán’s team, which includes Dr. Birgitta Floderus of the Karolinska Institute in Stockholm, analyzed cancer incidence among Swedish men who had held jobs between 1970 and 1989—a cohort of more than 1.5 million. Their results appear in the December 2002 issue of *Cancer Epidemiology, Biomarkers & Prevention* (11, pp.1678-1683).

In jobs likely to entail exposure to solvents, the glioma risk was more than 50% higher among those also exposed to EMFs above 2 mG. For men exposed to pesticides or herbicides, the risk was approximately doubled when combined with similar ELF EMF exposures, and for lead the combined risk was nearly four times greater.

All three associations are statistically significant. There was a trend of increasing risk with higher EMF exposure for both pesticides/herbicides and lead. The association for lead is based on only a handful of cases.

No increase in the risk of glioma or meningioma was seen for EMF exposures in the absence of chemical agents.

Although very few epidemiological studies have looked for synergies between EMFs and other agents linked to cancer, Pollán points out that such a combined analysis makes sense because “there is consensus” that if EMFs do play a role in cancer, they act as a promoter, requiring the presence of initiators such as chemical carcinogens.

Others—for instance, Dr. Susan Preston-Martin of the University of Southern California—have previously reported higher risks for gliomas than for meningiomas among those exposed to EMFs (see *MWN*, M/A90). And in a 1996 meta-analysis of brain tumors among EMF-exposed workers, Dr. Leeka Kheifets, then at EPRI and now at the WHO in Geneva, found that the risk increased about 25% when the analysis was narrowed from all brain tumors to only gliomas (see *MWN*, J/F96).

“You see a clearer picture when you exclude the non-gliomas,” said Dr. Samuel Milham, an epidemiologist and consultant based in Olympia, WA. “It’s basic epidemiology that you’re better off not lumping different types of tumors together if there are differences in etiology.”

Dr. David Savitz of the University of North Carolina, Chapel Hill, who in recent years has expressed a great deal of skepticism over the value for continuing to do EMF epidemiological studies (see p.14 and *MWN*, M/J01 and S/O01), agreed that distinguishing among cancer types “is a very logical thing to do when you have the data to do it.” But he noted that the link between brain cancer and chemicals “is just as murky” as the link with EMFs. “How promising is it to put together two murky areas of research?” he wondered in an interview.

In his own study of workers at five electric utilities, Savitz was unable to look at specific types of brain cancer because he used death certificates that lacked such information (see *MWN*, J/F95).



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## **IEEE Rebuffs Appeals On ELF Standard**

The IEEE has rejected challenges to its new ELF standard on procedural grounds, without addressing the substantive issues. Bob Ashley and David Fichtenberg filed formal appeals last October, shortly after the standard was approved by the IEEE Standards Board (see *MWN*, N/D02).

The standard, designated C95.6, "shall proceed without change through the publishing process," a three-member panel convened by the board recommended on January 8. The panel noted that IEEE rules require that it only consider procedural issues and that it therefore could not consider technical matters.

Fichtenberg, a resident of Seattle, contended that ICES (formerly SCC-28) Subcommittee 3 (SC-3) violated IEEE ethics guidelines in developing the standard by ignoring possible long-

term health effects, such as cancer, and that the 5 kV/m limit for electric fields specified by the standard would allow members of the public to receive painful shocks.

The panel responded that it does not have the authority to address ethics violations, and found Fichtenberg's other objections to the standard to be invalid because he raised them after SC-3's members had voted on it.

Ashley, who is at St. Cloud State University in St. Cloud, MN, disputed the validity of the standard's separate limits for "controlled" and "uncontrolled" environments. He also claims that SC-3 ignored his input. The appeals panel concluded that the SC-3 working group that drafted the standard, chaired by Kent Jaffa of PacifiCorp in Salt Lake City, UT, had given Ashley "an opportunity to express opinions" and "discussed [his] comments openly and at length."

Neither Ashley nor Fichtenberg responded to repeated requests for comment.

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## **Industry Lobby Glosses Over EMF Leukemia Risk**

The National Electrical Manufacturers Association (NEMA), an industry lobby group based in Washington, is discounting possible cancer risks from exposure to power-frequency EMFs.

The "available scientific evidence" indicates that EMF exposure "is not a cause" of long-term chronic health effects, including cancer, according to a statement adopted by NEMA's board of governors on November 10 (see box at right).

NEMA does not mention childhood leukemia—in contrast to a number of scientific review panels that have cited epidemiological evidence showing a doubling of risk with average exposures above 3-4 mG (see, for example, *MWN*, J/A01).

According to NEMA, its conclusions are based on reports from the NIEHS' RAPID program, the NAS-NRC and the U.K.'s NRPB, as well as the American Physical Society.

The statement does not cite the designation of EMFs as a "possible human carcinogen" by the RAPID working group or by IARC (see *MWN*, J/A98 and J/A01, respectively).

Dr. Steinar Dale, chair of NEMA's EMF task force, which wrote the statement, told *Microwave News* that it does not mention epidemiological evidence pointing to leukemia risks because "we did not want to go into that level of detail." He said that he sees "no inconsistency" between the statement and others that do note childhood cancer risks.

According to Dale, of ABB Power Systems in Raleigh, NC, NEMA decided that its previous statement on EMFs and health, adopted in 1996, should be updated to reflect the findings of the RAPID program. In 1996, NEMA found "no credible basis" for EMF health risks.

Douglas Bannerman, who has long monitored EMF health developments for NEMA, declined to comment.

NEMA represents more than 400 companies with total revenues exceeding \$100 billion.

At the end of January, Dale left ABB and resigned as chair of the NEMA EMF task force. No replacement has yet been named.

### **NEMA Statement on EMFs & Cancer**

*The board of the National Electrical Manufacturers Association (NEMA) adopted the following statement on November 10. It is available at: <[www.nema.org](http://www.nema.org)>.*

It is generally recognized that extra-low-frequency (50-60 Hz) electromagnetic fields (ELF EMF) are present in the environment as a result of the generation, transmission, distribution and use of electricity in modern society.

The available scientific evidence indicates that public exposure to ELF EMF is not a cause of long-term chronic adverse health effects, based on the multimillion dollar, 6-year National Institute of Environmental Health Sciences (NIEHS) RAPID research program. The RAPID program's findings, reported to the U.S. Congress in 1999, are supported by several highly respected and independent organizations including the National Research Council of the National Academy of Sciences (1996), the American Physical Society (1995), the World Health Organization (ongoing) and the British National Radiological Protection Board (2001).

NEMA believes that standards for human exposure to ELF EMF are only warranted if a credible scientific basis can be established for adverse effects. Such a basis has not been established for long-term chronic health effects, e.g., cancer, brain tumors, etc. At the same time, NEMA recognizes that exposure to low-frequency magnetic field strengths at levels much greater than typically encountered may cause short-term reactions. Standards that seek to minimize exposure to such field strengths may be warranted.

NEMA recognizes that there are global and political pressures to adopt ELF EMF regulations and standards. Where standards for exposure to ELF EMF are warranted, ELF EMF regulations and standards must comply with rules established by the World Trade Organization for international trade and should be harmonized globally so as to allow the free flow of goods and services across state and national borders.

## **Catholic School Seeks To Silence Opponent in Power Line Fight**

Catholic school officials in Edmonton, Canada, have threatened to sue EMF activist Lisa Amyotte for making “defamatory” statements about health risks at a school currently under construction 108 m from a 240 kV power line.

As a result, Amyotte told *Microwave News* that she will refrain from speaking out against the school—“for the moment.” She will instead press for more protective policies on the general issue of EMFs from power lines.

Last November 8, a local planning board rejected the school site because the EMFs—estimated to be 1-2 mG—could increase childhood cancer risks. But a month later, the city council overruled the board; the school is now expected to open in the fall.

In a December 31 letter, Teresa Haykowsky, an attorney for Edmonton Catholic Schools (ECS), warned Amyotte that she faced legal action “in the event that you do not cease and desist in your defamatory conduct.”

Haykowsky declined to be interviewed, referring questions to ECS spokesperson Lori Nagy. Nagy told *Microwave News* that Amyotte had made “inaccurate and misleading” statements that “go beyond freedom of expression.”

The letter cites a large number of Amyotte’s remarks to the press that ECS deems to be defamatory. These include:

“We believe a safe Catholic school for all children now and in the future is worth fighting for.”

“If we can prevent one child from going to that school that might have gotten leukemia it will have been worth it.”

At Amyotte’s request, several prominent public health scientists have written to the city advocating a policy of prudent avoidance and warning that building a school near a power line would entail health risks (see *MWN*, N/D02).

Officials of the city’s public health system, Capital Health, paved the way for the city council’s approval of the new school. In a December 4 memorandum, Capital Health concluded that the planning board’s decision “appears to be [an] improper application of the principle of prudent avoidance.”

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## **Former Head of IARC Backs the Precautionary Principle**

*Reprinted below are excerpts from a paper, “Primary Prevention Protects Public Health,” presented by Dr. Lorenzo Tomatis at Carcinogenesis Bioassays and Protecting Public Health, a conference organized in memory of Dr. Cesare Maltoni of the Ramazzini Foundation in Bologna, Italy (see MWN, M/J02). The proceedings have been published as Vol.982 of the Annals of the New York Academy of Sciences. Tomatis was the director of the International Agency for Research on Cancer (IARC) from 1982 to 1993. He now lives in Trieste, Italy. His e-mail address is: <ltomatis@hotmail.com>.*

Originally, Group 2B [of IARC’s classification of carcinogens] was conceived as a temporary grouping of agents for which further investigation was urgently needed. It has now become a huge parking lot, with over 200 agents or mixtures of agents, in which the available data are of variable quality and quantity. The possibility that new data will become available on these agents in the near future now appears remote....

EMFs provide another example of controversy. There is apparent consensus on the epidemiological evidence for an increased risk of childhood leukemia, with a far from negligible relative risk of 2.0 for postnatal exposure to 0.4  $\mu$ T [4 mG]. Although it has been stated authoritatively that the energy [of] EMFs is insufficient to damage DNA directly and that EMFs cannot therefore have tumor initiation activity, at the same time the need to identify possible mechanisms of action has been emphasized. A severe limitation of the experimental approach for studying the possible carcinogenic effect of EMFs is use of the same criteria traditionally applied to study the carcinogenicity of chemical agents. In the sequence of events that lead to malignant transformation, mechanisms other than direct interaction with or damage to DNA may be involved. Thus, experimental approaches should be used that can support or refute alternative mechanisms that could modify the risk of cancer. In the absence of a mechanism that can satisfactorily justify the increased risk, EMFs have joined the hundreds of agents in IARC Group 2B. However, in contrast to its companions in this large parking lot, EMF has actually stimulated the interest of epidemiologists and, im-

portantly, the release of funds for additional research.

Another relevant example of uncertainty...is non-Hodgkin’s lymphoma (NHL), whose incidence has continued to increase throughout the past quarter of a century...Several risk factors have been incriminated, including nitrites in drinking water, EMFs, hair colorants, dietary habits and (above all) occupational exposure to organic solvents, pesticides and herbicides. Whatever the role of each of these factors, none alone can clearly explain the continuous, widespread increase in the incidence of NHL....

We may find ourselves facing a choice between an active attitude, expressed as the adoption of measures of primary prevention in the absence of certainties, and a passive attitude that finds in the etiological uncertainties justification to disregard prudent primary prevention. In the case of NHL, the first attitude would involve drastic measures to reduce the use of pesticides, herbicides and organic solvents; evacuation, at least temporarily, of residences with high levels of EMFs; and orientation towards a utopic, but essential, reduction in consumption. Clearly, this first choice reflects the widely discussed precautionary principle, which indicates that urgent intervention is justified in the face of a potentially serious risk even in the absence of incontestable scientific evidence of a cause-effect relationship.

A cautious, prudent attitude is sometimes interpreted as antitechnological and antiscientific. In fact, those who champion an attitude of caution are simply recognizing that predictive knowledge in most instances is of lesser quality and remains at a lower level than technological knowledge. Recognition of our limited capacity to predict the long-term consequences of our knowledge can only lead to learning more, and thus it represents a stimulus, and certainly not an impediment, to research.

By adopting an attitude of responsible caution, we also accept that we have a duty to provide accurate information on possible or potential risks and to prevent relevant data from being ignored or concealed. Only with such an attitude can we avoid the entire human species being exposed to everything that technological progress can invent.

## Hot New Papers

S. Hadjiloucas, M.S. Chahal and J.W. Bowen, "Preliminary Results on the Nonthermal Effects of 200-350 GHz Radiation on the Growth Rate of *S. cerevisiae* Cells in Microcolonies," *Physics in Medicine and Biology*, 47, pp.3831-3839, November 7, 2002.

"Exponentially growing *Saccharomyces cerevisiae* yeast cells grown on dry media were exposed to EMFs in the 200-350 GHz frequency range at low power density to observe possible nonthermal effects on the microcolony growth. Exposure to the EMF was conducted over 2.5 h. ...A statistically significant difference (using a paired t-test at  $p < 0.01$ ) between control and exposed groups (enhanced growth) was observed for several small microcolonies which were exposed to 341 GHz radiation. For all other frequencies enhanced or stunted growth was not observed to a statistically significant level. The enhanced growth observed for the exposed microcolonies at 341 GHz suggests a 'window effect' at the earlier stages of growth....Based on these observations, a more detailed study was performed where the effects of exposure duration on the growth of microcolonies were investigated at 341 GHz. A much larger number of microcolonies was observed after sequentially exposing the same microcolonies to radiation over a period of 30, 60, 90, 120 and 150 min....A statistically significant difference (using a t-test) between control and exposed groups is apparent for all of the exposure times except for that at 150 min, but it is clear that the greatest difference occurs within the first 30 min of exposure....These results suggest that exposure to radiation has the greatest effect when the cells are at an early growth stage."

Reprints: Dr. Sillas Hadjiloucas, School of Systems Engineering, Reading University, Reading, U.K., E-mail: <cybsh@cyber.reading.ac.uk>.

Fung Hin Tat, Kam Chak Wah and Yau Hon Hung, "A Follow-Up Study of Electromagnetic Interference [EMI] of Cellular Phones on Electronic Medical Equipment in the Emergency Department [ED]," *Emergency Medicine*, 14, pp.315-319, September 2002.

"Compared with our study of GSM cellular phones in 1997, the current PCS cellular phones impose less EMI on electronic medical equipment found in the ED....Malfunction of electronic medical equipment is determined primarily by the EM shielding of the medical device, the distance between the cellular phone and that device and the EMI characteristics of the cellular phone. The phone's frequency is of greater importance than its power. A frequency of 900 MHz is more likely to cause EMI than 1800 MHz....Of interest is the fact that the hemoglucostix meter was still affected by cellular phone EMI despite being labelled with several EMI standard certificates (CE, GS & UL). This labelling reflects the current lack of a widely adopted specific standard for cellular phone EMI on electronic medical equipment....As a result of this study it is suggested that a separation distance of 1 m between a cellular phone and any electronic medical device provides adequate safety from EMI and should form the basis of policy which seeks to control the usage of cellular phones within a hospital. This policy would also take into account the situation in which two mobile phones ring simultaneously within a small confined area containing electronic medical equipment."

Reprints: Dr. Kam, Tuen Mun Hospital, Hong Kong, China, E-mail: <kamcw@ha.org.hk>.

Justin Bekelman, Yan Li and Cary Gross, "Scope and Impact of Financial Conflicts of Interest in Biomedical Research: A Systematic Review," *Journal of the American Medical Association*, 289, pp.454-465, January 22/29, 2003.

"This comprehensive review of the literature confirms that financial relationships among industry, scientific investigators and academic in-

### Nonthermal Cell Phone Radiation Leads to "Gross" Mutagenic Activity

Maya Mashevich et al. (including Rafi Korenstein), "Exposure of Human Peripheral Blood Lymphocytes to Electromagnetic Fields Associated with Cellular Phones Leads to Chromosomal Instability," *Bioelectromagnetics*, 24, pp.82-90, February 2003.

"We have examined whether *in vitro* exposure of human peripheral blood lymphocytes (PBL) to continuous 830 MHz EMFs causes losses and gains of chromosomes (aneuploidy), a major 'somatic mutation' leading to genomic instability and thereby to cancer. PBL were irradiated at different average absorption rates (SAR) in the range of 1.6-8.8 W/Kg for 72 hr in an exposure system based on a parallel plate resonator at temperatures ranging from 34.5-37.5°C....A linear increase in chromosome 17 aneuploidy was observed as a function of the SAR value, demonstrating that this radiation has a genotoxic effect. The SAR-dependent aneuploidy was accompanied by an abnormal mode of replication of the chromosome 17 region engaged in segregation...suggesting that epigenetic alterations are involved in the SAR-dependent genetic toxicity. Control experiments (i.e., without any RF radiation) carried out in the temperature range of 34.5-38.5°C showed that elevated temperature is not associated with either the genetic or epigenetic alterations observed following RF radiation...These findings indicate that the genotoxic effect of the EM radiation is elicited via a nonthermal pathway. Moreover, the fact that aneuploidy is a phenomenon known to increase the risk for cancer should be taken into consideration in future evaluation of exposure guidelines. ...These findings support the view that exposure to RF radiation of average SAR values of 2.6-8.8 W/Kg may lead, through a nonthermal pathway, to a carcinogenic activity. Our study does not elucidate the specific primary mechanism by which radiation interacts with the cell and alters its genetic material. However, it does demonstrate that exposure to RF radiation results in a gross somatic mutation leading to a major modulation in gene expression which may be amplified by epigenetic mechanism of gene expression..."

Reprints: Prof. Rafi Korenstein, Sackler School of Medicine, Tel-Aviv University, Israel, E-mail: <korens@post.tau.ac.il>.

Korenstein has also studied the genotoxic effects of ELF EMFs, see *MWN*, J/A00. (See also p.1.)

stitutions are pervasive. About one fourth of biomedical investigators at academic institutions receive research funding from industry....Despite the prevalence of these relationships and the broad concerns they have generated, a relative paucity of data has been published describing the impact of financial ties on biomedical research. Although only 37 articles met inclusion criteria, evidence suggests that the financial ties that intertwine industry, investigators and academic institutions can influence the research process. Strong and consistent evidence shows that industry-sponsored research tends to draw pro-industry conclusions. By combining data from articles examining 1,140 studies, we found

## FROM THE FIELD

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that industry-sponsored studies were significantly more likely to reach conclusions that were favorable to the sponsor than were nonindustry studies....Several studies found that industry-sponsored research appears to be of similar quality to other research....Consistent evidence also demonstrated that industry ties are associated with both publication delays and data withholding. These restrictions...serve to compound bias in biomedical research. Anecdotal reports suggest that industry may alter, obstruct or even stop publication of negative studies."

Reprints: Dr. Gross, Yale University School of Medicine, New Haven, CT, E-mail: <cary.gross@yale.edu>.

**Edwin van Wijngaarden, "An Exploratory Investigation of Suicide and Occupational Exposure," *Journal of Occupational and Environmental Medicine*, 45, pp.96-101, January 2003.**

"This exploratory study evaluated the association between suicide and occupational exposure to EMFs, pesticides and hydrocarbon solvents. The study population comprised 11,707 suicide deaths...from U.S. death certificate files for the years 1991 and 1992. Exposure assignment was based on job title reported on the death certificates. Exposure to EMFs and pesticides was weakly associated with suicide risk, while little evidence for an increased risk was seen for hydrocarbon solvents. The association for EMF exposure was highest for suicide between ages 20 and 35 (odds ratio: 1.5)...Interestingly, a pattern across age groups similar to the one reported here has been reported previously [Van Wijngaarden, 2000]. A difference in the nature of depression and suicide between age groups may account for the possibly increased vulnerability of younger people to the effects of EMFs."

Reprints: Dr. Wijngaarden, Applied Epidemiology Inc., Amherst, MA, E-mail: <evanwijngaarden@appliedepidemiology.com>.

See *MWN*, M/A00 for a discussion of the 2000 suicide paper.

**Chung-Yi Li and Fung-Chang Sung, "Association Between Occupational Exposure to Power-Frequency Electromagnetic Fields and Amyotrophic Lateral Sclerosis [ALS]: A Review," *American Journal of Industrial Medicine*, 43, pp.212-220, February 2003.**

"Although there is some consistency in the findings, a causal link between occupational exposure to EMF and ALS cannot be substantiated based on the existing data because of certain methodological limitations and the small number of publications. Our review shows that confounding is of greater concern than the potential exposure misclassification due to inadequate exposure assessment or selection bias in interpreting the results from the selected studies. Most studies did not consider work-related factors potentially associated with ALS in the analysis. Of particular interest was the role of electrical trauma in the possible link between EMF exposure and ALS. Trauma due to electric shock was frequently observed as a risk factor of ALS. As people employed in electric utilities are more likely than others to experience electric shock or trauma, the excess number of patients with ALS or deaths from it among electricity-related occupations may be due to repeated electric contusions rather than to exposure to high levels of EMF. The study by Gunnarsson et al. attempted to assess the separate effect of EMF exposure and electrical shocks on the risk for ALS. The results showed a substantially elevated risk for ALS for those that work with electricity (OR: 6.7), but reported null effects from either EMF exposure (OR: 0.6). Further studies should consider investigating the separate effect of EMF exposure and electrical shocks to make more specific causal interpretations. An alternative way of separating EMF exposure from electrical shocks is to conduct a residential study since there is no indication that people living near high-voltage power lines are prone to electrical shocks."

Reprints: Dr. Chung-Yi Li, College of Medicine, Fu Jen Catholic University, Hsinchuang, Taiwan, E-mail: <chungyi@mails.fju.edu.tw>.

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### Letter to the Editor

## **Unambiguous Confirmation of a Nonthermal Effect in the Inorganic World**

January 15, 2003

To the Editor:

In your last issue (*MWN*, N/D02), some argued that nonthermal microwave effects do not exist. With respect to the processing of inorganic materials we have conclusively demonstrated that nonthermal microwave radiation can influence the microstructures, phase transformations and sintering of materials.

We see startling differences when various materials are exposed separately to E- and H-fields in a microwave single-mode cavity. While the controversy over biological and human health effects—whether good or bad—goes on, our most extraordinary discovery merits everyone's attention because it shows that microwave magnetic fields can cause major phase changes in inorganic solids.

Working at Penn State's Materials Research Institute, we have found striking differences between the effects of magnetic and electric fields at 2.45 GHz on common high-tech, high-melting-point, inorganic materials. In a series of papers and patents (see below), we have shown that magnetic materials can be turned into glasses and that they lose their permanent power to stick to iron! And this occurs in 5-15 seconds!!

Confirmation that this is a field effect is simply stated: We have

repeated the experiment in our laboratory hundreds of times and each time the magnetic field transformed the material into an amorphous phase within a few seconds. But when we exposed the identical sample in the very same cavity to only an electric field, we saw the opposite effect: The material became even more crystalline.

While these exposures were at GHz frequencies, the fields involved were less than a gauss, and the temperatures measured at the surface were far below the melting point of the exposed material. Initial work on cell cultures confirmed that differences between E- and H-fields were also manifest in the biological world.

For more details on Penn State's Microwave Processing Center, please visit: <www.mri.psu.edu/centers/mpec>.

Prof. Rustum Roy, E-mail: <rroy@psu.edu>

Prof. Dinesh Agrawal, E-mail: <dxa4@psu.edu>

Microwave Processing and Engineering Center  
Materials Research Institute, Pennsylvania State University  
University Park, PA 16802

R. Roy, R. Peelamedu, L. Hurr, J. Cheng and D. Agrawal, "Definitive Experimental Evidence for Microwave Effects: Radically New Effects of Separated E- and H-Fields, such as Decrystallization of Oxides in Seconds," *Materials Research Innovations*, 6, pp.128-140, September 2002.

R. Roy, R. Peelamedu, C. Grimes, J. Cheng and D. Agrawal, "Major Phase Transformations and Magnetic Property Changes Caused by Electromagnetic Fields at Microwave Frequencies," *Journal of Materials Research* 17, pp.3008-3011, December 2002.

R. Roy, J. Cheng and D. Agrawal, "Microwave Processing in Pure H-Fields and Pure E-Fields," U.S. Patent No.6,365,885, April 2, 2002.

## 2003 Conference Calendar (Part II)

Part I appeared in our last issue.

January 24-25: **Non-Ionizing Electromagnetic Fields and Radiations and the Impacts of New Technologies on Health and Environment**, Porto Alegre, RS, Brazil. Contact: Brazilian Association for Defense of Concerned Dwellers and Users of Cellular Telecommunications Equipment, Tel & Fax: (55+11) 3666-8081, E-mail: <abradecel@hotmail.com>, Web: <www.abradecel.org.br>.

February 21: **National Toxicology Program (NTP) Workshop on Genetically Modified Rodent Models for Cancer Hazard Identification**, Hamilton Crowne Plaza Hotel, Washington, DC. Contact: Diane Spencer, Liaison & Scientific Review Office, NTP, (919) 541-2759, E-mail: <spencer2@niehs.nih.gov>.

March 11-14: **Mobile Health and the Environment**, Melia White House Hotel, London, U.K. Contact: Tamara James, IBC Conferences, 30-32 Mortimer St., London W1W 7RE, U.K., (44+1932) 893-853, Fax: (44+1932) 893-893, E-mail: <cust.serv@informa.com>, Web: <www.ibctelecoms.com>.

March 24-25: **ICNIRP/WHO International Workshop on Weak ELF Electric Field Effects in the Body** (attendance by invitation only), NRPB, Chilton, U.K. Contact: Rüdiger Matthes, ICNIRP, Germany, (49+89) 3160-3288, Fax: (49+89) 3160-3289, E-mail: <rmatthes@bfs.de>.

April 18-22: **3rd International EMF Seminar in China: EMFs and Biological Effects**, Guilin, China. Contact: Zeng Qunli, Bioelectromagnetics Lab, Zhejiang University School of Medicine, 353 Yan-an Rd., Hangzhou 310031, China, (86+571) 8721-7094, Fax: (86+571) 8721-7410, E-mail: <zengql@cmm.zju.edu.cn>.

June 8-11: **22nd Annual Scientific Conference of the Society for Physical Regulation in Biology and Medicine (SPRBM)**, San Antonio, TX. Contact: Gloria Parsley, 2412 Cobblestone Way, Frederick, MD 21702, (301) 663-4556, Fax: (301) 694-4948, E-mail: <gloriaparsley@aol.com>, Web: <www.sprbm.org>.

June 8-15: **IEEE Microwave Theory and Techniques Society (MTT-S) International Symposium**, Convention Center, Philadelphia, PA. Contact: Richard Snyder, (973) 492-1207, Fax: (973) 492-2471, E-mail: <r.snyder@ieee.org>, Web: <www.ims2003.org>.

June 11-13: **3rd International Symposium on Nonthermal Medical/Biological Treatments Using EMFs and Ionized Gas (ElectroMed 2003)**, San Antonio, TX. Contact: Dr. Michael Murphy, RFR Branch, 8315 Hawks Rd., Bldg. 1162, Brooks AFB, TX 78235, (210) 536-4833, Fax: (210) 536-3977, E-mail: <Michael.Murphy@brooks.af.mil>, Web: <www.electromed2003.com>.

June 12-14: **36th Annual Meeting of the Society for Epidemiologic Research (SER)**, Marriott Marquis Hotel, Atlanta, GA. Contact: SER, PO Box 990, Clearfield, UT 84098, (801) 525-0231, Fax: (801) 774-9211, E-mail: <membership@epiresearch.org>, Web: <www.epiresearch.org/meeting/index.html>.

June 19-24: **17th International Symposium on Bioelectrochemistry and Bioenergetics (BEB 2003)**, Florence, Italy. Contact: Prof. Maria Rosa Moncelli, Dept. of Chemistry, Universita di Firenze, via della Lastruccia 3, 50019 Sesto Fiorentino (Firenze), Italy, (39+55) 457-3100, Fax: (39+55) 457-3098, E-mail: <moncelli@beb2003.org>, Web: <www.beb2003.org>.

June 19-25: **13th Annual Conference of the International Society for the Study of Subtle Energies and Energy Medicine (ISSSEEM)**, Boulder, CO. Contact: ISSSEEM, 11005 Ralston Rd., Ste. 100-D, Arvada, CO 80004, (303) 425-4625, Fax: (303) 425-4685, E-mail: <issseem@cs.com>, Web: <www.issseem.org>.

June 22-26: **25th Annual Meeting of the Bioelectromagnetics Society (BEMS)**, Outrigger Wailea Resort, Maui, HI. Contact: Gloria Parsley, see June 8-11 above, Web: <www.bioelectromagnetics.org>.

June 22-27: **IEEE International Symposium on Antennas and Propagation and North American Radio Science Meeting**, Hyatt Regency Hotel, Columbus, OH. Contact: Ron Marhefka, ElectroScience Lab, Ohio State University, 1320 Kinnear Rd., Columbus, OH 43212, (614) 292-5752, Fax: (614) 292-7297, E-mail: <Marhefka.1@osu.edu>, Web: <aps2003.eng.ohio-state.edu>.

### Meeting Notes

• The **precautionary principle (PP)** is a hot topic on the conference circuit this winter. The **WHO** EMF project, the **NIEHS** and the **EC** are organizing a three-day meeting, February 24-26, at the **EC** in Luxembourg. Only the first day is open to the public—the other two are by invitation only. We asked **NIEHS'** Dr. **Chris Portier**, who will be there, if he would let us come. "Sorry," he replied, it's up to **WHO's** Dr. **Leeka Kheifets**, who is organizing the meeting. She also said no, pointing out that those invited to serve on the working groups would take up all the available space. Others, including all members of the press, had also been refused, she told us, closing with, "Of course, we will be happy to share with you materials as they become available." In late January, a seminar on the **PP** and **EMFs** was on the agenda at the **World Social Forum** in Porto Alegre, **Brazil**. The forum was held at the same time as the **World Economic Forum** was being held in Davos, Switzerland—the two meetings attracted very different attendees. And March 20-22, the **European Policy Center** in Brussels is organizing a conference on *The US, the EU and Precaution: Comparing Risk Management in a Complex World*. One of the case studies on the provisional agenda will be moderated by Dr. **Granger Morgan** of Carnegie Mellon University (CMU) in Pittsburgh; Dr. **Peter Wiedemann** of Germany's Jülich Research Center will give a presentation. Last January, the policy center worked with the **EC** to host a conference on risk management at which Dr. John Graham of the U.S. Office of Management and Budget spoke on the **PP** (see *MWN*, M/A02). Graham received his doctorate from CMU in 1983; Morgan was his advisor.

• Prof. **Zhaojin Cao** of the Chinese Center for Disease Control and Prevention in Beijing will present a paper on epidemiological studies in **China** at the April EMF seminar in **Guilin**.

July 13-18: **Power Engineering Society (PES) Summer Meeting**, Toronto, Canada. Contact: Joe Bailey, Toronto Hydro, (416) 542-2874, Fax: (416) 542-2833, E-mail: <jbailey@torontohydro.com>, Web: <www.ieee.org>.

July 20-24: **48th Annual Meeting of the Health Physics Society (HPS)**, Town & Country Hotel and Convention Center, San Diego, CA. Contact: HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101, Web: <www.hps.org>.

July 27-August 1: **International Conference on Magnetism**, Palazzo dei Congressi, Rome, Italy. Contact: Mrs. G. Ianni, ISM-CNR, Area della Ricerca di Roma, PO Box 10, 00016 Monterotondo Scalo (RM), Italy, (39+06) 9067-2285, Fax: (39+06) 9067-2470, E-mail: <icm2003@milib.cnr.it>, Web: <www.icm2003.milib.cnr.it>.

August 17-21: **6th International Symposium on Antennas, Propagation and EM Theory (ISAPE)**, Beijing, China. Contact: Dayong Liu, ISAPE 2003, PO Box 165, Beijing 100036, China, (86+10) 6828-3463, Fax: (86+10) 6828-3458, E-mail: <davidwd@btmail.net.cn>, Web: <www.cie-china.org/isape2003>.

## FROM THE FIELD

August 18-22: **IEEE Symposium on Electromagnetic Compatibility**, Hynes Convention Center, Boston, MA. Contact: Vita Feuerstein, IEEE Conference Services, 445 Hoes Ln., Piscataway, NJ 08855, (732) 562-6826, Fax: (732) 981-1203, E-mail: <emc2003info@ieee.org>, Web: <www.emc2003.org>.

September 7-12: **IEEE/PES Transmission & Distribution Conference & Exposition**, Convention Center, Dallas, TX. Contact: Al Dirnberger, TXU Electric, (817) 215-6363, E-mail: <al\_dirnberger@txu.com>, Web: <www.ieeed.org>.

September 17-21: **25th Annual International Conference of the IEEE Engineering in Medicine and Biology Society**, Cancun, Mexico. Contact: Universidad Autónoma Metropolitana-Iztapalapa, Dept. of Electrical Engineering, Av. San Rafael Atlixco 186, Col. Vicentina, Iztapalapa 09340, Mexico, (525) 804-4905, ext.204, Fax: (525) 804-4631, E-mail: <j.stock@ieee.org>, Web: <www.itzamna.uam.mx/cancun>.

September 18-21: **20th Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB)**, Rotterdam, The Netherlands. Contact: ESMRMB, Neutorgasse 9/2A, Vienna A-1010, Austria, (43+1) 535-1306, Fax: (43+1) 535-7041, E-mail: <office@esmrb.org>, Web: <www.esmrb.org>.

September 21-25: **13th Annual Conference of the International Society of Exposure Analysis (ISEA)**, Palazzo dei Congressi, Stresa, Italy. Contact: ISEA Secretariat, International Center for Pesticide Safety, via Magenta 25, 20020 Busto Garolfo (MI), Italy, Fax: (39+33) 156-8023, E-mail: <mail@icps.it>, Web: <www.ktl.fi/isea2003>.

September 24-26: **15th Annual Conference of the International Society for Environmental Epidemiology (ISEE)**, Perth, Australia. Contact: Andrea Hinwood, PO Box 749, Wembley, WA 6913, Australia, E-mail: <andrea.hinwood@environ.wa.gov.au>, Web: <eventedge.com.au/isee/index.html>.

November 6-12: **WHO/U.S. Air Force Asia Pacific EMF Conference**, Bangkok, Thailand. Contact: Dr. Michael Murphy, see June 11-13 above; Web: <www.who.int/peh-emf/meetings/thailand2002/en>.

November 13-15: **6th International Congress of the European Bioelectromagnetics Association (EBEA)**, Budapest, Hungary. Contact: Diamond Congress Ltd.-EBEA 2003, PO Box 48, H-1255 Budapest, Hungary, (36+1) 214-7701, Fax: (36+1) 201-2680, E-mail: <diamond@diamond-congress.hu>, Web: <www.diamond-congress.hu/ebea2003/entry.htm>. The meeting will be followed by a COST 281 workshop.

## Across the Spectrum

“There’s some snake oil out there.”

—David Heim, deputy editor, *Consumer Reports*, Yonkers, NY, referring to devices to reduce radiation exposures from mobile phones, quoted by Ellen Sheng, “Cell Phone Radiation Is Team’s Focus,” *Wall Street Journal*, p.B3A, December 18, 2002

It only needs the perception, let alone the reality, of financial conflicts and commercial pressures to destroy the credibility of important organizations such as IARC and its parent, WHO.

—Editorial, “Transparency at IARC,” *The Lancet*, 361, p.189, January 18, 2003

If it is not worth doing, it is not worth doing well.

—Dr. David Savitz, University of North Carolina School of Public Health, Chapel Hill, in a commentary, “Health Effects of Electric and Magnetic Fields: Are We Done Yet?” *Epidemiology*, 14, p.16, January 2003

“It’s preventive medicine. And it’s less expensive than medications and antidepressants.”

—Dr. Damien Léger, neurophysiologist, Paris, France, on using light to treat patients with seasonal affective disorder (SAD), quoted by Elaine Sciolino, “Paris Journal: Call It the City of Darkness, and Give It Vitamin D,” *New York Times*, p.A4, January 6, 2003

“The real world intervenes from time to time. And you reach in there and take something out that is still in a developmental stage, and you might use it.”

—Donald Rumsfeld, U.S. secretary of defense, on using high-power microwave weapons (HPM) in a war with Iraq, quoted by Mark Thompson, “Electrical Storm: America’s Ultra-Secret Weapon,” *Time*, p.27, January 27, 2003

## “MICROWAVE NEWS” FLASHBACK

### Years 20 Ago

- Budget cuts force the EPA to close its program on RF/MW radiation at its Health Effects Research Lab.
- Citing evidence of a possible risk to pregnant women who work with VDTs, the Canadian Center for Occupational Health and Safety recommends that radiation exposure standards be extended to include the VLF frequencies emitted by computer terminals.
- After a 25-year run, the U.S. government’s Electromagnetic Radiation Management Advisory Council (ERMAC) disbands when the NTIA decides against renewing the council’s charter.

### Years 10 Ago

- Responding to public concerns over a lawsuit linking cell phone use to brain cancer, the wireless industry promises to sponsor research on possible health risks.

- The Centers for Disease Control and Prevention find that ELF EMFs have no known role in inducing or promoting cancer in women living on Long Island, NY. Nevertheless, NIH Director Bernadine Healy favors more research on the question.

### Years 5 Ago

- A four-year-old, unpublished EPA draft obtained by *Microwave News* states that power-frequency EMFs “must be considered as one risk factor” for cancer.
- The FDA tells Rep. Edward Markey (D-MA) that more research is needed on cell phone safety. It points, with approval, to the congressionally mandated EMF RAPID program.
- The International Agency for Research on Cancer unveils plans for a multi-country, multimillion-dollar study of cancer among mobile phone users.

## CIRCADIAN RHYTHMS

**Cancer: A Matter of Timing...** Genes that regulate circadian cycles also play a role in preventing cancer. A team led by Dr. Cheng Chi Lee of Baylor College of Medicine in Houston reports that 71% of transgenic mice lacking one of the eight core circadian genes developed lymphoma within 16 months following a single dose of ionizing radiation, compared to 5% of wild-type mice—a highly significant difference ( $p < 0.00001$ ). In another experiment, all transgenic mice, even without initiation with radiation, were found to have abnormal cell growths (hyperplasias) in their salivary glands at 18 months, and all of the male mice developed teratomas or other types of tumors. No hyperplasias or teratomas were seen in any of the wild-type controls. These results were also highly significant. Lee found that, when exposed to gamma radiation, the mutant mice had a much smaller increase in cell death—cell death serves as a cancer-suppressing response—than wild-type controls. The absent gene “can be regarded as a tumor suppressor,” Lee concludes in a paper published in the October 4 issue of *Cell* (111, pp.41-50, 2002). He adds that “other circadian regulators may play a similar role in tumor suppression as well.” In a commentary on these new results appearing in *Nature* (420, pp.373-374, November 28, 2002), Drs. Michael Rosbash of Brandeis University in Waltham, MA, and Joseph Takahashi of Northwestern University in Evanston, IL, point out that health problems among shift workers have already been linked to “disruption of physiological systems that are under circadian control”—such as melatonin production. The new results, they write, suggest that “there might also be a direct connection” between interference with circadian mechanisms at the genetic level and illnesses linked to shift work.

## CONSUMER REPORTS

**Advice on Mobile Phones...** “Research hasn’t proved any hazards, but there may be cause for concern.” That is the view offered by *Consumer Reports* in this year’s survey of wireless phones and service providers. The influential publication, published by the Consumers Union in Yonkers, NY, devotes a full page to phone safety in its February issue. It notes “provocative findings,” including those of Sweden’s Dr. Lennart Hardell on brain tumor risks and Finland’s Dr. Dariusz Leszczynski on changes in gene expression (see *MWN*, S/O02 and J/A02, respectively). The article also advises readers that expert panels in France, Germany and the U.K. have discouraged the use of phones by children. Closer to home, it cites the FDA’s research agreement—or CRADA—with the CTIA, the wireless industry lobby group, and the agency’s “carefully worded but equivocal” position on the health issue: that although available evidence does not point to any health problems, there is “no proof” that phones are “absolutely safe.” Previously, *Consumer Reports* largely ignored health concerns in its coverage of mobile phones (see *MWN*, J/F00 and J/F02), though it suggested the use of hands-free sets for those wanting to reduce their radiation exposure. This year, it adds that those who are concerned should limit the use of phones by children and teenagers: “Encourage them to wear a headset or to send text messages.”

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**DOSIMETRY**

**Hot Pockets...** Using a hands-free set can result in higher radiation exposures if the phone is placed in a pocket: The 1g and 10g SARs are two-to-seven-times greater than those obtained for a model head (with a plastic ear), according to calculations and measurements by Drs. Om Gandhi and Gang Kang of the University of Utah, Salt Lake City. A phone could therefore meet U.S. and European SAR limits but still be “severely out of compliance if it were placed in the shirt pocket,” they warn in a paper published in the December issue of *Physics in Medicine and Biology* (47, pp.4301-4313, 2002). This is because when placed in the pocket, there is no separation between the phone and the human body—under the most widely used testing protocols, there is a stipulated separation of 6 mm between the skull and the phone. (The Australian Consumers’ Association issued a similar warning a few years ago based on a report by Chris Zombolas of EMC Technologies in Melbourne; see *MWN*, S/O00). Gandhi presented these results at the URSI meeting held in Maastricht, The Netherlands, last August. His paper prompted Dr. C.K. Chou, the director of Motorola’s RF dosimetry lab in Plantation, FL, to comment that, “You have to have a separation distance. We don’t recommend putting a phone in your pocket.” Chou, who plays a key role in the IEEE committees writing standards for radiation exposures and for devising test methods, said that holders are provided with Motorola phones and that, “If you carry the phone on the body, put it in the holder.”

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**DRIVING & PHONING**

**Inattention Blindness...** Tests by psychologists at the University of Utah in Salt Lake City show that using a cell phone disrupts a driver’s ability to process visual information. In the February/March issue of *Injury Insights*, published by the National Safety Council in Chicago, Dr. David Strayer and coworkers write that, “Legislative initiatives that restrict handheld devices but permit hands-free devices are not likely to eliminate the problems associated with using cell phones while driving. These problems are attributed in large part to the distracting effects of the phone conversations themselves.”

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**PEOPLE**

**Dr. Boris Pasche** has been appointed a contributing editor of the *Journal of the American Medical Association* with responsibilities for oncology, genetics and molecular medicine. Pasche, the director of the cancer genetics program at Northwestern University’s medical school in Chicago, has played a leading role in the development of low-energy-emission therapy (LEET) to treat chronic insomnia. LEET uses nonthermal RF radiation with very specific ELF-modulations to induce sleep (see *MWN*, M/J96)....  
**Dr. Brian Beard** of the FDA’s electrophysics branch in Rockville, MD, has taken over as the chair of IEEE SCC-34 Subcommittee 2’s working group on computational dosimetry for mobile phones. He replaces **Kwok Chan** of the FCC lab in Columbia, MD (see *MWN*, M/A97). Beard works with **Howard Bassen**, the branch chief, who chairs both Subcommittee 2 and the other



working group—on experimental dosimetry....Dr. **Edwin van Wijngaarden** has completed his doctoral studies at the University of North Carolina, Chapel Hill, and has joined Applied Epidemiology Inc. in Amherst, MA, a research and consulting firm specializing in environmental and occupational health. (See p.12 for his latest paper on the possible link between EMFs and suicides.)...The NCRP is moving to assure a smooth succession when **William Beckner**, its executive director, retires. The council has invited applications for the position of deputy executive director, who is expected to take over from Beckner when he steps down in about a year....Dr. **Tom Rozzell** has retired as the director of fellowship programs at the National Academy of Sciences in Washington. Rozzell, who was previously at the Office of Naval Research, was one of the founders of the Bioelectromagnetics Society and the first editor of its newsletter.

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### PRECAUTIONARY PRINCIPLE

**Common Sense or Environmental Extremism?...**Dr. Ken Foster poses this question in a paper on the precautionary principle (PP)—part of a collection of nine short papers on the PP and RF radiation that makes up the winter 2002/2003 issue of the *IEEE Technology and Society Magazine*. Foster of the University of Pennsylvania in Philadelphia and Dr. Paolo Vecchia of the National Institute of Health in Rome served as the guest editors of the special issue. In another paper, they offer a commentary on the continuing controversy over the Vatican's RF transmitters in Cesano, outside Rome. (This is not their first collaboration on the PP; see *MWN*, M/J00.) "The case of the Vatican radio shows that a misuse of the PP not only may cause mistrust in science by the public but lead to a misuse of data and methodology by scientists themselves." On the other hand, writing with his colleague Dr. Carlo Petrini in another paper in the same collection, Vecchia takes a softer approach, arguing that the PP "may be the most effective way to force society to address uncertainties about such problems and to avoid letting decision makers evade their responsibilities." (For another recent paper on the PP and RFR, see *MWN*, N/D02).

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### SAILING

**Room for Health Concerns...**Umpires will officiate aboard the competing sailboats during the final stage of this year's America's Cup off the coast of New Zealand, race officials announced January 9—even though the umpires will be close to the antennas that transmit telemetry and communication signals. Bryan Willis, chair of the international jury and chief umpire, told the *New Zealand Herald* (January 10) that referees are simply better able to call penalties when they are close to the action. A plan to put umpires on board was proposed during the last cup regatta, in 2000, but was rejected by the jury because referees would be one-and-a-half meters away from the antennas, and the panel was unwilling to take the health and insurance liability risks. Nevertheless, this year, umpires will be positioned only a half-meter away. Willis noted that insurance liability remains a significant concern for the jury. "[It] could kill the plan, but we're doing what we can to resolve the issue."

## Stay Ahead with Microwave News

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## SECONDHAND RADIATION

**Phones in Railway Cars...** Japan's Dr. Tsuyoshi Hondou caused quite a stir last year when he predicted that a railroad car full of mobile phone users could result in unhealthy exposures to RF/MW radiation (see *MWN*, M/J02 and J/A02). A number of observers immediately issued statements denouncing his model. Now, two research groups with ties to the wireless industry have published their criticisms. "It seems highly improbable that ICNIRP basic restrictions or even reference levels could be exceeded" in an enclosed space, Nokia's Dr. Anssi Toropainen concludes in the January 2003 issue of *Bioelectromagnetics* (24, pp.63-65). Toropainen contends that every passenger in a commuter rail car would need to have four or five 900 MHz GSM phones operating at full power (250 mW) to exceed the ICNIRP ambient limit of 450  $\mu\text{W}/\text{cm}^2$ , while each passenger would have to be using 16 phones in order to exceed the SAR limit of 0.08 W/Kg. Hondou's arguments are also the subject of an exchange in the December issue of the *Journal of the Physical Society of Japan*, (71, p.3100-3102, 2002), where he originally published his concerns. Drs. Axel Kramer, Jürg Fröhlich and Niels Kuster of IT'IS in Zurich contend that even in a worst-case scenario—with many people using phones at full power—"exposure can never reach 25% of the...SAR safety limits for environmental exposure." Closed spaces "do not impose safety issues other than those in any other location." Hondou, who is at Tohoku University in Sendai, responds that the IT'IS calculations are wrong because they assume that radiation will be absorbed equally by each passenger. The criticisms are "based on naïve implicit assumptions which are neither relevant nor valid," he writes.

## Keeping Current: Follow-Up on the News

◆ Half of all 14- to 20-year-olds in the U.S. will own a cellular phone by the end of the year, according to the Zelos Group, a research and consulting firm based in San Francisco. And Student Monitor, another data group, estimates that 70% of the 5.6 million full-time college students in the U.S. now own cell phones, the *New York Times* reports (January 20).

◆ As expected, the Australian Communications Authority (ACA) has released draft standards to regulate radiation emissions to protect the public and workers. The objective is to ensure that exposures are below the ICNIRP limits (see *MWN*, N/D02). The deadline for comments is February 20. The proposals are available at: <[www.aca.gov.au/standards/emr/draftemrstd.htm](http://www.aca.gov.au/standards/emr/draftemrstd.htm)>.

◆ Coming soon from ICNIRP: The report on health risks posed by radiation from anti-theft devices, funded by the EC's Fifth Framework research program (see *MWN*, M/A00), is now in press. And guidance on judging compliance of pulsed and complex non-sinusoidal waveforms below 100 kHz with ICNIRP's limits will appear in the March 2003 issue of *Health Physics* and soon afterwards at <[www.icnirp.org](http://www.icnirp.org)>.

◆ The appeal in the Newman cell phone-brain tumor case was filed by the Peter Angelos law firm on January 21 in the U.S. Court of Appeals for the Fourth Circuit in Richmond, VA (see *MWN*, S/O02 and N/D02). The reply from the defense team is due February 24.

◆ The first issue of *EHP Toxicogenomics*, dated January 2003, is out. The journal is a quarterly supplement to *Environmental Health Perspectives*, which is published by NIEHS. The print edition is free for the first year for qualified subscribers. For more information, go to: <[ehp.niehs.nih.gov/tgx](mailto:ehp.niehs.nih.gov/tgx)>. And the IEEE Power Engineering Society has inaugurated a new bimonthly magazine, *IEEE Power & Energy*.

◆ Two years ago, U.K. researchers argued that teenagers were substituting mobile phone use for smoking (see *MWN*, N/D00). Now, a group in Finland has found contrary evidence among 10,000 Finnish teenagers. In a letter to the *British Medical Journal* (January 18), the Finns allow that their results may not apply to other countries "where parents do not help pay for their children's mobile phone costs as much as they do in Finland."

radiation can impair the BBB, but they now add that the chemicals that leak through the BBB probably damage neurons in the cortex, the hippocampus and the basal ganglia of the brain. The cortex is close to the surface of the skull, while the basal ganglia are much deeper.

Salford and Persson write that the damaged neurons they observed may in fact be dead brain cells.

Perhaps their most surprising observation is that leakage through the BBB was still evident eight weeks after a single two-hour exposure—even at these low doses.

Salford and Persson close their paper with this warning:

[N]eural damage of the kind here described may not have immediately demonstrable consequences, even if repeated. It may, however, in the long run, result in reduced brain reserve capacity that might be unveiled by other later neuronal disease or even the wear and tear of aging. We cannot exclude that after some decades of (often) daily use, a whole generation of users may suffer negative effects may be already in their middle age.

Neither Salford nor Persson could be reached for comment.

The paper will appear in a future issue of *Environmental Health Perspectives*, a peer-reviewed journal published by the National Institute of Environmental Health Sciences (NIEHS). The editors posted a typescript copy of the paper on the journal's Web site\* on January 29.

Salford and Persson exposed three groups of eight rats to digital 915 MHz microwaves at 0.002, 0.02 and 0.2 W/Kg, and another eight served as controls. They note that, "We realize that our study comprises few animals, but the combined results are highly significant and exhibit a clear dose-response relationship."

"They used enough animals that it would be hard to say that what they saw is an artifact," said Dr. Henry Lai of the University of Washington, Seattle. Lai has previously reported that microwaves can cause DNA breaks in the brains of rats (see *MWN*, N/D94). "DNA breaks could lead to cell death, and this would look like what Salford is reporting," Lai said. (See also p.11.)

Salford and Persson exposed rats that were 12 to 26 weeks old in order to simulate the level of development of "human mobile-phone-addicted teenagers." The rats were allowed to live on for about 50 days after their exposures before they were sacrificed and their brains examined.

Dr. Yngve Hamnerius of Chalmers University of Technology in Göteborg, Sweden, had suggested this delay before examining the rats' brains. Some 20 years ago, he and other researchers at Chalmers found damage in the brains of rabbits that had been exposed to pulsed microwaves similar to those from radar for one hour a day for three days. The Chalmers team told the 1984 annual meeting of the Bioelectromagnetics Society that no acute effects were seen, but that morphological and biochemical changes became apparent three to four months later.

The implications of this observation were never pursued until now. "People very rarely wait before looking for an effect," Hamnerius told *Microwave News*. He believes that Salford and Persson's new work "should be taken seriously."

\*The paper is posted at: <[www.ehponline.org](http://www.ehponline.org)>; its tracking number is: doi:10.1289/ehp.6039.

## VIEWS ON THE NEWS

### **The Blood-Brain Barrier Work Must Be Followed Up—Now**

Salford and Persson's new results were announced as this issue was going to press. Because we have often run editorials on the need to address the long-festering issue of leakage through the BBB (see, for example, *MWN*, N/D99), we are devoting this page to their study and offering only a few brief comments.

First, we must admit that we are surprised by the low levels of radiation implicated by their experiment—a finding that only makes the need for a follow-up even more urgent.

Second, the over one billion users of mobile phones deserve to know—and without further delay—whether, as Salford and Persson speculate, long-term exposure to microwaves contributes to premature aging, and possibly worse.

The U.S. health agencies have given the cell phone industry a free ride for far too long. It's about time they began serving those who use the phones—and pay their salaries.

In the summer of 2001, Drs. Pierre Aubineau and Fatma Töre of the University of Bordeaux reported leakage from blood vessels in the brains of rats, including the BBB, exposed to non-thermal levels of microwaves (see *MWN*, N/D01).

The ability of microwaves to cause leakage through the BBB was first demonstrated by U.S. scientists in the mid-1970s, but research was later cut off by the U.S. military funding agencies. Over the years, sporadic reports have briefly rekindled interest in the area.

Salford and Persson's own reports of BBB leakage have not been followed up. For instance, not a single study was undertaken by the U.S. mobile phone industry's six-year research effort directed by Dr. George Carlo and its lobbying arm, the CTIA.

"This is yet another instance in which a long-standing observation has been ignored for too long," said Dr. Ross Adey, who has been doing brain research for more than 50 years. Adey is based in Redlands, CA.

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