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INSIDE...

Swiss To Adopt Strict RF/MW Rules Based on Precautionary Principle

Swiss health and environmental officials have proposed strict rules for public exposures from new sources of radiofrequency and microwave (RF/MW) radiation. If the ordinance is adopted, which appears likely, Switzerland will have the most stringent exposure guidelines in the world—requiring power levels effectively a hundred times lower than those of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the American National Standards Institute (ANSI).

"The rules are designed to be reasonable and pragmatic," Dr. Mirjana Moser told *Microwave News*. Moser is with the Radiation Protection Office of the Swiss Agency for Public Health in Bern. She attributed the tough new rules to public concern over possible health effects.

The guidelines are based on the precautionary principle, according to a commentary accompanying the proposed ordinance. Moser emphasized that "a very large population is being exposed to non-ionizing radiation, so very subtle effects can become very important from a public health standpoint."

"In all likelihood, the ordinance will be adopted with only minor changes," predicted Dr. Stefan Joss of the Non-Ionizing Radiation Unit at the Swiss Agency for Environment, Forests and Landscape, which is known as BUWAL.

BUWAL released its proposed ordinance, which covers exposures of the general population from both power frequency and RF/MW radiation, for public comment on February 16. After the comment period closes on May 15, BUWAL will circulate a revised draft among federal agencies. Once a consensus is reached,

(continued on p.4)

U.K. Study: Mobile Phones Can Make the Brain Work Faster

Cellular phone radiation can make the mind function more quickly, according to a new study by a British research team. Volunteers exposed to continuous and pulsed microwaves showed faster reaction times in tests of their attention. Memory was unchanged.

The effect "appears to be robust," according to Dr. Alan Preece of the Medical Physics Research Center at the U.K.'s University of Bristol. In a paper published in the *International Journal of Radiation Biology (75,* pp.447-456, 1999), Preece and colleagues note that although average reaction time decreased by only 14 milliseconds or less, the finding is statistically significant ($p=0.007$). "Although the change is within normal variation," Preece said in an interview, "the indication of any change at all is what is significant."

The study is Britain's first government-funded research on mobile phones and human health to be published. When it was made public on April 8, the

(continued on p.11)

« Power Line Talk »

The **German Research Foundation** has awarded Dr. **Wolfgang Löscher** a two-year grant of 300,000 DM (approximately US$170,000) for an animal study designed to investigate possible mechanisms by which EMFs could promote cancer. Löscher, of the School of Veterinary Medicine in Hannover, will study melatonin and polyamine levels and ornithine decarboxylase (ODC) activity in the mammary tissue of rats exposed to 50 Hz magnetic fields. In another experiment, Löscher will test whether exposure to 50 Hz EMFs affects mutation rates of oncogenes in rat breast tissue treated with the chemical carcinogen DMBA. Work is already under way, Löscher told *Microwave News*. Depending on the outcome of the studies, he added, the grant could be extended up to four more years. Known by its German abbreviation, DFG, the German Research Foundation is one of Germany's largest sources of research grants. Most of its budget comes from the government, but its decisions are independent. Grants are prestigious and highly competitive. Working with Dr. **Meike Mevissen**, now at the University of Bern in Switzerland, Löscher previously completed a series of experiments in which power frequency EMFs were found to increase mammary tumor growth in rodents (see *MWN,* J/A93 and J/F95). In the U.S., this research has been the focus of spirited debate. Last year, after researchers at the Battelle Pacific Northwest labs in Richland, WA, were unable to reproduce Löscher's results, his findings were challenged by Dr. Gary Boorman, the head of the EMF RAPID program at the NIEHS, among others. But Dr. Larry Anderson, who led the Battelle studies, pointed out that high tumor rates among the control animals in two of Anderson's three experiments left little room for contrast with the EMF-exposed rats (see *MWN,* M/A98, M/J98 and J/A98).

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Dr. **Eugene Sobel** of the **University of Southern California** in Los Angeles has received a $75,000 grant from the California Alzheimer's Program for a large-scale study of occupational EMF exposure and Alzheimer's disease. The study will draw on the 9,000-patient database of California's nine **Alzheimer's Disease Diagnosis and Treatment Centers** (ADDTC). Sobel examined 478 patients from one of these centers in a previous study, and found that those with no family history of Alzheimer's were more likely to get the disease if they had worked in jobs with significant EMF exposures (see *MWN,* J/F97). "Using data from the ADDTC centers is a big advantage," Sobel told *Microwave News*. He explained that other dementias are often misdiagnosed as Alzheimer's, but the ADDTC's rigorous protocols keep that problem to a minimum.

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EPRI canceled its biennial **EMF Science Seminar**, which had been scheduled for March 28-31 in Denver. **Robert Banks**, the publisher of the *EMF Health & Safety Digest,* who was organizing the meeting for EPRI, explained that the decision to cancel was made when it became clear that two of the star attractions would prove to be disappointing. Dr. **Kenneth Olden**, the director of the NIEHS, indicated that he would remain silent on his final report to Congress on the EMF RAPID program (see p.3). And Canada's **Mary McBride** decided not to reveal the results of her childhood cancer epidemiological study prior to its publication later this spring (see box above). "Frankly, it was our recommendation to cancel when the two big draws were not going to talk about what we had hoped," Banks said. Will there be a meeting next year? "It's up to EPRI," Banks replied. Jackie Turner, an EPRI spokesperson in Palo Alto, CA, said that plans for future seminars are "still under discussion." There is also a possibility that EPRI might take over the annual EMF research review, sponsored by the DOE each fall for many years. At the close of the final DOE review last year in Tucson, AZ, Dr. **Charles Rafferty** of EPRI's EMF program told the attendees that, "Our program is continuing. There is extraordinary value in the review and we would like to see it continue."

Canadian Childhood Cancer Epidemiological Study Due May 1

Mary McBride's epidemiological study of childhood leukemia and exposures to power frequency EMFs will be published in the May 1 issue of the *American Journal of Epidemiology.* McBride, of the British Columbia Cancer Agency in Vancouver, Canada, has declined to reveal her findings prior to their official release.

McBride and coworkers—including Dr. Gilles Thériault of McGill University in Montreal—enrolled 399 patients diagnosed with cancer between 1990 and 1995 and 399 controls, all from five Canadian provinces. EMF exposure assessment included 48-hour personal and residential measurements, as well as wire codes.

The paper was originally slated to appear in the June 15 issue of the journal, but the editors later agreed to expedite its publication.

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HealthGuard Inc., of Warwick, RI, has a new product that it claims can "alter the structure of EMFs and render them harmless" throughout the home. The **EMF Defender System 2000™** consists of a control box and two 3/4-inch diameter cables: one buried in the ground around the building and the other installed along the edges of the rafters. The theory behind the system, as HealthGuard explains, is that, "It is the *message* (60 Hz common household current), rather than the *energy* of the signal that determines if a biologic cell responds to an EMF." By generating random electromagnetic noise, the EMF Defender is supposed to "convert the EMFs into incoherent signals which cannot be detected by living tissue." This approach was developed by Dr. **Ted Litovitz** of the Catholic University of America in Washington, who was granted a patent on it in 1995 (see *MWN,* J/F 96). Litovitz licensed the concept to New York City-based **EMX**

Corp., which in turn sold HealthGuard the rights to use it for a home protection system. But some scientists question the idea of exposing consumers to an additional field (see *MWN,* J/F94; also J/A94). Others believe that EMF bioeffects may not even be caused by the basic sine-wave pattern of 60 Hz current, but by another aspect of exposure—for example, high frequency transients (see *MWN,* M/A98). In an interview, HealthGuard President **Harry Harootunian** responded that, "Dr. Litovitz's experiments have shown that it takes a coherent field to produce an effect." Harootunian estimated that the price of the EMF Defender System 2000 for a single-story, 2,000-square-foot building would be about $4,000. The EMF Defender is HealthGuard's only product; EMX has retained the rights to applications for specific appliances such as hair dryers and computer keyboards (see *MWN,* J/A93 and J/F94). Promotional materials for the EMF Defender prominently cite the **NIEHS EMF Working Group**'s conclusion that EMFs should be considered "a possible human carcinogen"—though that conclusion is incorrectly attributed to the **National Institutes of Health**. HealthGuard can be reached at (800) 556-0077, or (401) 781-7500.

RAPID Report Okayed by NIEHS, Release Expected in May

In late March, the National Institute of Environmental Health Sciences (NIEHS) completed its final report on the five-year EMF RAPID research program. The report must now be approved by Secretary Donna Shalala of the Department of Health and Human Services (HHS) before it can be sent to Congress and released to the public.

Dalton Paxman, a senior environmental advisor in the office of the secretary of HHS, told *Microwave News* that he expects the report to be sent to Congress in May. "It is under review, following the normal clearance process for all HHS documents," he said. "I don't see a problem with it."

Dr. Kenneth Olden, the director of the NIEHS, forwarded the report to his immediate superior, Dr. Harold Varmus, the head of the National Institutes of Health (NIH), on March 22. Varmus signed off on Olden's report on April 7 and passed it on to the office of Secretary Shalala, his bureaucratic superior.

NIEHS officials declined to reveal Olden's conclusions on EMF health risks. Dr. Sheila Newton, the director of NIEHS' Office of Program Planning and Evaluation in Research Triangle Park, NC, would only say that the report is 67 pages long, including 26 pages of references.

"The fact that Dr. Varmus had no scientific problems with the report would imply that the NIH does not disagree with our findings," Dr. Christopher Portier, chief of the NIEHS Laboratory of Computational Biology and Risk Analysis, said in an interview.

Last December, the NIEHS released a draft staff report on RAPID program research which indicated that the NIEHS was ready to discount EMF health risks (see *MWN,* J/F99). While this was a separate document from Olden's report to Congress, the board of directors of the Bioelectromagnetics Society (BEMS) wrote to Olden to express its concerns. "Many scientists working on the issues of EMF health effects question the impartiality and scientific judgment of the writers of the RAPID program report," warned BEMS President Dr. Betty Sisken of the University of Kentucky, Lexington, in the February 5 letter.

Sisken followed up with a second letter in early March. "I requested that Dr. Olden ensure that his final report to Congress be a fair assessment of EMF health risks, which includes all the relevant scientific studies," she told *Microwave News.*

The Energy Policy Act of 1992, which mandated the EMF RAPID program, requires two different final reports: one from NIEHS' Olden and one from an interagency advisory committee established under the law. Dr. Michael Marron of the Office of Naval Research in Arlington, VA, is leading the effort to write the committee report.

"We are waiting for the NIEHS report and will then file our own report with Congress," Marron said.

Reiter's New Hypothesis: EMFs May Deplete Melatonin

Dr. Russel Reiter has put forward a new variation on the melatonin hypothesis. He proposes that power frequency magnetic fields may reduce the level of melatonin in the bloodstream, rather than simply suppress the production of melatonin by the pineal gland (see *MWN,* M/J88).

Reiter advances this hypothesis in the November 1998 *Bioelectrochemistry and Bioenergetics (47,* pp.135-142) in a paper he first presented last May at a conference in Denmark.

While conceding that results are inconsistent, Reiter concludes that both human and animal studies provide some evidence linking EMFs to lower serum melatonin levels. But Reiter notes that data linking EMFs to reduced synthesis or secretion of the hormone "seem to be becoming progressively weaker overall."

Reiter, who is at the University of Texas Health Science Center in San Antonio and is editor in chief of the *Journal of Pineal Research,* offers two explanations for this apparent contradiction. As others have suggested, the pure sinusoidal waves used in lab studies may not have the same effect as real-world EMFs. Suppression of melatonin, Reiter states, "may require complex, 'dirty' fields," such as those produced by electric power in daily life.

Alternatively, the level of melatonin may fall "because it is being taken up by cells to defend against free radicals." The hormone is a powerful free radical scavenger, which promotes its depletion.

"Theoretically at least," Reiter explains, EMFs are "capable of prolonging the half-life of free radicals," leading to higher concentrations within cells. If this is true, more melatonin "will be required to neutralize the extra radicals" and the level of melatonin in the blood could fall "with no change in its production or its secretion from the pineal gland."

Reiter notes that in studies which found serum melatonin levels to be reduced, the changes were "not necessarily accom-

panied by any measurable reduction in melatonin synthesis."

Dr. Antonio Sastre of the Midwest Research Institute (MRI) in Kansas City, MO, shares Reiter's view that the clean 60 Hz fields used in lab studies "may be missing the mark." And Sastre agrees that EMFs could increase the lifetime of free radicals, although only at the high field strengths found in occupational settings.

(In a new paper, Dr. Robert Adair of Yale University in New Haven, CT, argues that magnetic fields of less than 50 mG will not increase the lifetime of free radicals; see p.14.)

But Sastre told *Microwave News* that the depletion hypothesis "doesn't help me reconcile what I see as a fairly consistent picture from human research," referring to studies with volunteers—including those by his MRI colleague Dr. Charles Graham—that have found no change in serum melatonin from EMF exposure. He also noted that melatonin is only one of several antioxidants that the body might use to neutralize free radicals.

Reiter concedes that, "The evidence for any one theory is weak," but he wants to see the issue resolved. More research is "imperative," he writes, to identify "the coupling mechanisms of the fields to the organism."

Richardson: DOE Not Interested in Doing More EMF Research

Secretary of Energy Bill Richardson has made it clear that the Department of Energy (DOE) does not intend to sponsor any more EMF research.

In a March 3 letter to Shirley Linde, the chair of the now disbanded National EMF Advisory Committee, Richardson stated that the National Institute of Environmental Health Sciences (NIEHS) is the appropriate federal agency to lead any future EMF research. Last year, Linde, among others, waged a campaign to change the DOE's decision to abandon its long-standing EMF program (see *MWN,* M/J98).

In his letter, Richardson wrote:

> Regarding the need for further EMF research, our position has been that specific research needs should be based on the results of the risk assessment performed by the NIEHS, and that further research should be directed by the NIEHS. In addition, the NIEHS is the appropriate federal agency to continue the public dissemination of information concerning EMF exposures and potential health effects.

Swiss Propose Strict RF/MW Exposure Rules *(continued from p.1)*

the proposal will go to the Swiss Cabinet for approval.

The environmental agency plans to adopt the ICNIRP limits—but with the added stipulation that levels are to be further reduced in "areas with sensitive uses," including homes, workplaces and playgrounds, where people could be subject to chronic exposures.

In essence, the BUWAL proposal is an attempt to draft exposure guidelines based on the precautionary principle, also known as prudent avoidance. Though it does not replace ICNIRP's numbers with a fully developed new standard, it does aim to give the public more protection against possible low-level effects.

Rather than specifying lower numerical limits on radiation exposure, BUWAL would establish minimum distances between new sources and sensitive locations. And for existing sources, BUWAL proposes to "minimize" exposures in sensitive areas.

The proposed ordinance does, however, allow regional officials some discretion to grant exceptions in cases where compliance with the minimum distance is not "technically or operationally feasible" or not achievable at "reasonable" cost.

For new sources of RF/MW radiation, the minimum distances must be sufficient to ensure that exposures do not exceed 10% of the ICNIRP electric and magnetic field limits. A tenfold tightening of the limit on these fields translates into a hundredfold lowering of the allowable power density. For example, since ICNIRP's power density limit in the 10-400 MHz frequency range is 200 $\mu W/cm^2$, the corresponding maximum exposure level under the Swiss ordinance would be 2 $\mu W/cm^2$. At 900 MHz, the Swiss guideline would be 4.5 $\mu W/cm^2$, and at 1800 MHz it would be 9 $\mu W/cm^2$.

The minimum distances are based on an antenna's maximum power output, not the six-minute averages used by ICNIRP, BUWAL's Joss pointed out. In actual practice, power densities would therefore be even less than 1% of the ICNIRP limits.

Mobile telephone base stations would be most immediately affected as the proliferation of wireless antennas continues. Moser estimated that, on average, the proposed ordinance would require a minimum distance of 17 meters (approximately 55 feet) between antennas and locations where people spend time.

Moser noted that wireless companies had voiced concerns over the new limits but that the industry now concedes that it could live with them. "For marketing reasons, the wireless carriers don't want to be seen as opposing precautionary measures," she said.

In a letter to regional environmental officials, Moritz Leuenberger, a member of the Swiss Cabinet, advised "caution" in issuing permits for new antennas so that the ordinance is not undermined before it takes effect.

The minimum distance provision also applies to new TV and radio transmitters, as well as radar. Moser believes these sources could comply with the new requirement: "I don't know of any cases where the rules would cause a problem." She noted that a large TV tower is being built near Bern, and said that, to her knowledge, this antenna would meet the proposed minimum distance requirements.

BUWAL would also establish minimum distances to protect against chronic EMF exposures. At these frequencies, however, BUWAL would use a more complex—and less restrictive—formula to calculate the exclusion zone.

The proposed regulations do not addresss exposures from hand-held mobile phones or from household electrical appliances.

The draft ordinance, *Verordnung über den Schutz vor nichtionisierender Strahlung,* and an accompanying commentary, *Erläuternder Bericht,* are posted in German and in French on the Internet at: <www.admin.ch/buwal/presse/aktuell.htm>.

European Parliament Calls for Caution on EMF–EMR Exposure

On March 10, the European Parliament endorsed the idea of prudent avoidance of electromagnetic fields and radiation (EMF–EMR). In an advisory vote, it called for changes to a proposal from the European Commission (EC), which would establish a common standard for public exposure in the 15 member states of the European Union (EU).

The fate of the EC proposal will be decided by the EU's Council of Ministers when it meets in June.

The parliament backed all amendments passed by its Committee on the Environment, Public Health and Consumer Protection on February 18, including those supporting the "precautionary principle" and the "ALARA" approach to non-ionizing radiation—that exposure should be kept "as low as reasonably achievable" (see *MWN,* J/F99).

The amendments passed by the full parliament go beyond the environment committee's recommendations on one important point: They address the potential health risks associated with long-term, chronic exposures. The parliament noted that the EC's proposed safety standard was drafted "only with respect to the thresholds for acute effects." Declaring that the public must also be protected against "potentially harmful long-term effects," it urged the EC to "keep the matter...under review" and revise its standard by 2001.

Green Party representatives failed to win passage of a set of numerical limits far stricter than those put forward by the EC, whose proposal is based on the guidelines adopted by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The Greens' proposed limits had been defeated in the environment committee, and lost again in the full parliament by a vote of 443 to 82.

But Gianni Tamino, a member of the European Parliament (MEP) from Italy and vice chair of the parliament's Green group, said he was happy with the results. "Three Green amendments were approved," he told *Microwave News.* "Considering the whole situation, it is a success. This vote of the European Parliament helps to put pressure on the EC, member states and the Council of Ministers" before the council makes its decision in June.

Tamino said that there are indications that the council wants changes in the EC proposal. Even if the ICNIRP-based limits remain the same, Tamino said, he is hopeful that the proposal's language will be improved. In any case, the vote by the parliament means that, "We have opened up the debate," Tamino said. "Many members of parliament are now saying that we need more research, more information."

"Everything I have heard indicates that the EC will accept most of what Parliament has put forward," said Philip Whitehead, MEP from Staffordshire East and Derby, U.K., and a member of the Labor Party. "The most important thing is the principle of continuous review, since there is such disagreement at the moment about what a minimum safety standard should be." Rather than close off the discussion, Whitehead said in an interview, "We're trying to establish that full information about this issue should go to member states on a continuing basis."

Focusing on the issue of cellular phones, Whitehead argued that there has not been nearly enough research. "Countries like Finland, where mobile phones are extremely widespread, are

Warning Labels on European Cell Phones? Not Quite

When the European Parliament passed a resolution that mentioned putting labels on mobile phones, it caused a buzz on the Internet and in the world press.

Last November, British courts had dismissed a lawsuit demanding that all mobile phones bear labels warning of harmful health effects (see *MWN,* N/D98), and many observers seemed to think that the European Parliament was now backing the same requirement. But, in fact, the parliament's proposal was far milder, and its March 10 vote was only an advisory one.

The parliament urged that consumer products "capable of producing electromagnetic fields"—especially mobile phones—include information "on the fields generated...as a function of distance and the type of use." While this would be useful information for individuals who wish to practice prudent avoidance, no warning or cautionary language would be required.

In any case, the European Parliament's vote does not require anything of anybody: It is only a suggestion. Mandatory labeling would require action by national governments or by the EU's Council of Ministers.

But exaggerated reports soon rippled through the media. The U.K.'s Sunday *Observer* (March 14) claimed that the European Parliament wanted "all mobile phones in Europe to carry health warnings." The story spread to South Africa, where the *Cape Times* (March 22) incorrectly asserted that, "Cellular phone users in Europe will soon be faced with a warning message every time they dial." Inaccurate stories like these soon snowballed on the Internet. By April 13, *Wired* magazine's on-line edition (at <www.wired. com>) was quoting former *Dynasty* star Linda Evans in support of the European Parliament's supposed demand for "warning labels" on wireless phones.

When MEP Philip Whitehead spoke to *Microwave News,* he tried to set the record straight. "What we have not done, and do not have the power to do, is compel the manufacturers to put a notice on mobile phones saying that they will fry your brain," said Whitehead, who is from the U.K. "There's no legal basis to say that they are definitely harmful."

Personally, Whitehead said, he would favor labels that go a bit beyond anything that the European Parliament has endorsed—for example, "saying that if you want to be cautious, use an earpiece; or avoid using the phone in confined spaces [such as a car], where the level of waves will be higher."

Whitehead seems to practice what he preaches. He spoke with *Microwave News* on his cellular phone, but used an earphone to increase his distance from its antenna. "As wonderful as they are," he remarked, "I think people would be unwise to use these devices for too long a period."

engaged in a gigantic experiment," he argued. If evidence in the future shows "cause for concern," Whitehead said, then it would be appropriate to consider stronger measures.

In the past, the European Parliament has been largely an advisory body, but it has recently begun to assert itself and demand a greater share of the power presently vested in the EU's bureaucracy, the EC. This tension was made clear in the EMF–EMR vote, with the parliament demanding more accountability. For example, the EC proposed that future research on EMF–EMR exposure be evaluated by the EC with "guidance by competent international organizations such as ICNIRP"—with no mention of any parliamentary role. The parliament voted to remove this reference to ICNIRP, and replace it with a call for the EC to report to parliament on future findings about health effects. Other references to ICNIRP were also removed, though a few remained.

Some sections of European industry have criticized the EC's proposal from the opposite direction, arguing that the ICNIRP guidelines are too strict. The U.K.'s Electricity Association (EA) protested that the EC proposal would impose unnecessary burdens on power providers, particularly in rural areas with sparse populations (see *MWN,* J/F99). In a concession to the EA's complaints, the parliament urged that a European standard for public exposure should focus on areas where people "live and spend significant [amounts of] time."

« Wireless Notes »

Lloyd's of London, the leading **U.K. insurance** underwriter, is refusing to cover manufacturers of wireless phones against health risks to users of their phones, the *Guardian* and its sister publication, the Sunday *Observer,* both leading British newspapers, reported on April 10 and April 11, respectively. The announcement follows the release of the University of Bristol findings of changes in cognitive function following exposure to signals from a mobile phone (see p.1).

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Wireless carriers often use church steeples to conceal their cellular antennas (see *MWN,* S/O97 and J/A98). But in **Austria**, some officials of the **Roman Catholic Church** have moved to put religious structures out of the companies' reach. On January 15, Vienna's *Der Standard* reported that Bishop Alois Kothgasser of Innsbruck had prohibited cellular equipment on churches and chapels in his diocese. Kothgasser described the ban as appropriate "in view of the specific character of places of worship." The decree will also cover other buildings owned by the church, the diocese stated, "as long as the question of adverse health effects from radio antennas remains the subject of controversy." The archdiocese of Salzburg has also banned the placement of antennas on its property, according to *Der Standard,* citing possible exposure to lawsuits related to health effects.

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On April 10, tower opponents joined forces with breast cancer activists and environmentalists at a public forum on health concerns associated with wireless telecommunications in Tiburon, CA, near San Francisco. "Despite assurances from industry that these phones and towers are safe, the public remains concerned," said Libby Kelley of the California Council on Wireless Technology Impacts (see also p.8). ***Cell Phones, Antennas & Radio/TV Towers: The Health Risks of Going Wireless,*** which attracted close to 100 attendees, was organized by the council, the **Breast Cancer Fund** and a number of local grassroots citizens groups. Dr. **Neil Cherry** flew in from **New Zealand** to speak at the forum—his second visit to the San Francisco area in two years. Cherry, of Lincoln University in Canterbury, New Zealand, has long advocated strict RF/MW exposure standards (see *MWN,* M/A97 and M/A98). "The more I learn about research findings outside the U.S. that go unreported in our mainstream media, the more concerned I am that industry and the media are jamming the danger signal," said **Nancy Evans** of the Breast Cancer Fund in San Francisco, who moderated the forum. **Linda Evans**, the star of *Dynasty,* came from Washington state where she is challenging a cell phone tower. "I am committed to letting my voice stand in support of those who might suffer the health effects or financial losses due to such towers," she said. The Coalition for San Francisco Neighborhoods (CSFN), an alliance of more than 30 groups, urged Congress in February to repeal the clause of the 1996 Telecommunications Act that preempts local rules on radiation hazards from wireless facilities. The CSFN has also endorsed the "**Vienna Resolution**" calling for further research on possible RF/MW health effects (see *MWN,* N/D98). Nancy Evans decried the "media blackout" on the Vienna Resolution.

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Jerald Busse's lawsuit against the cellular phone industry was dismissed by Cook County, IL, Circuit Court **Judge Ellis Reid** on March 15. When Busse originally filed his suit in 1995, he charged that **Ameritech**, **Motorola**, the **CTIA, WTR** and **Epidemiology Resources Inc.** (ERI) were conducting illegal human testing (see *MWN,* J/F96). Busse argued that by examining billing records to see if customers were at increased risk for cancer, the industry was using them as research subjects—without their having been asked for their consent or informed that any such risk might exist. Busse also claimed that the examination of billing records constituted an invasion of privacy. But in 1997 Judge Reid dismissed the charge of human testing, and the suit went forward on the privacy claim alone (see *MWN,* N/D 97). "We are pleased with the judge's decision," CTIA spokesperson **Tim Ayers** in Washington told *Microwave News*. Busse's attorneys, Ben Barnow and Alan Goldberg of Barnow & Goldberg in Chicago, have filed a motion to reconsider, but a ruling is not expected for a couple of months. Barnow & Goldberg also represent Robert Kane, the only other cellular phone plaintiff in the United States. Kane is the former Motorola engineer who brought suit against the company in December 1993, charging that his brain tumor was caused by exposure to radiation from cellular phone prototypes (see *MWN,* J/F94).

WTR Reports Genetic Damage from Cell Phone Radiation

Cellular phone radiation can triple the number of chromosome abnormalities in human blood, according to a study sponsored by Wireless Technology Research (WTR), an industry group.

"This is a very important finding," stated WTR chair Dr. George Carlo. "These results are frankly quite positive—there's a dose-response and it's across all technologies," Carlo said in an interview. "This clearly points to the need for continued research and especially for post-market surveillance."

The study was conducted at Integrated Laboratory Systems (ILS) in Research Triangle Park, NC. "The results showed an effect with all four cellular phone technologies that we tested—analog, CDMA, TDMA and PCS," Dr. Ray Tice of ILS told *Microwave News*. The findings are all statistically significant, all but one of them highly so.

Tice, collaborating with Drs. Graham Hook and Don McRee of WTR, observed the increase in genetic damage at exposures of 5 W/Kg and 10 W/Kg using a test called the micronucleus assay. The increase was "only observed following extended (24-hour) exposures," the researchers told the *30th Annual Meeting of the Environmental Mutagen Society* (EMS) in Washington on March 29. Three-hour exposures had no effect.

No damage from 24-hour exposures was seen when the blood cells were examined by single cell gel electrophoresis, also known as the comet assay. The comet assay was used by Drs. Henry Lai and N.P. Singh of the University of Washington, Seattle, in several experiments in which they observed an increase in DNA breaks after microwave exposure (see *MWN,* N/D94).

Dr. Joseph Roti Roti of Washington University in St. Louis was unable to repeat the results of the Lai-Singh studies (see *MWN,* J/F98; also p.8). But Roti Roti used a different version of the assay, and the sensitivity and procedures of the comet assay have remained a subject of controversy.

Tice, Hook and McRee described the comet assay as "a very sensitive method for directly detecting DNA damage." But Carlo suggested that it may be a less effective tool than other tests. "The comet assay is not a validated assay," he argued. "There are numerous questions about the methodology, and questions about its interpretation" (see also pp.12-13).

Tice said that there are several possible explanations for the apparent conflict in results from the comet and micronucleus assays. One, he said, has to do with the two different mechanisms for formation of micronuclei. "If they're caused by chromosome breakage," Tice explained, "then it's a matter of structural damage to the DNA," which could be expected to show up in the comet assay. Alternatively, he said, micronuclei can be produced by interfering with the way that chromosomes segregate during cell division, resulting in an abnormality called a "lagging chromosome." Experiments are currently under way at ILS to determine the nature of the mechanism in this case.

Tice and colleagues also saw no effect in several other tests for genetic damage that use bacteria or cultured cells from rodents and humans. While most of these tests involved only three-hour exposures, one with a 21-hour exposure still revealed no effect.

Nonetheless, Tice said he is confident that the micronucleus results represent something real. He noted that the findings were the same when the experiment was repeated: "There's no way you're going to get positive results twice over for four different technologies as a chance result." He added that, "If it's an artifact, it's a consistent one."

"The biological relevance is being investigated," stated Tice. "One issue is whether this might be due to heat." Although the experiment was designed to proceed at a constant temperature, Tice acknowledged, "There could be some localized heating in the medium, and hyperthermia is known to cause micronuclei."

WTR disclosed the results from ILS to representatives of various federal agencies in a meeting on February 9, but, at WTR's request, the participants refused to disclose what Tice had found. The results were kept under wraps until the EMS meeting at the end of March.

Not all the micronucleus results were disclosed at the EMS meeting. Repeat exposures for CDMA and PCS signals were presented to federal agencies at a second meeting, on March 31, and these data have not yet been made public. Carlo said that all results will be presented at a WTR symposium in June.

"We're on the same page with the Food and Drug Administration and the interagency working group," Carlo told *Microwave News* in April. All are in agreement, he said, that while the ILS results "do not rise to the level that would require a public health intervention," more research is needed. "It's a bit early to say" what types of studies are required, Carlo added. "There is not yet any consensus on what the next steps should be."

WTR Epidemiological Study Nears Completion

There are "positive results" in a new study of cellular phone use and brain tumors, WTR's Dr. George Carlo told *Microwave News*. But Joshua Muscat, the researcher leading the study, said, "I would definitely not say that it's a positive finding."

"The findings are not straightforward, and they require a lot of interpretation," Muscat said in an interview. "Inevitably, if you chop up the data many different ways, you will find some positive associations." He added that, "There are two findings that are interesting, or suggestive, but it's really not the bulk of the data" (see also p.19). Muscat said that he plans to submit the study to a peer-reviewed journal after WTR's internal peer review is completed. Neither Muscat nor Carlo would detail the results of the study.

With colleagues at the American Health Foundation in New York City, Muscat examined 466 people with glioma, a type of brain cancer, and 420 controls. The study also included 90 people with acoustic neuroma, a benign tumor of a nerve that connects the brain stem to the inner ear, and another 86 controls. Several variables were examined, including the spatial distribution of tumors within the brain. WTR funded the study in 1996 (see *MWN,* J/A96).

Cell Phone Radiation Alters Gene Expression in Motorola Study

"The expression of specific genes could be affected by RF exposure," according to a new paper from Dr. Joseph Roti Roti and coworkers at the Radiation Oncology Center of the Washington University School of Medicine in St. Louis.

The changes were observed after exposure to mobile phone radiation at an SAR of 0.6 W/Kg—below the limit currently deemed safe by the FCC. Roti Roti called the results "a surprise," and told *Microwave News* that they occurred at nonthermal levels. The findings appear in the March issue of *Radiation Research (151,* pp.300-309, 1999).

Dr. Prabhat Goswami, along with Roti Roti and others, exposed cultures of mouse embryo cells to RF/MW radiation at cellular phone frequencies for a period of four days. They then looked for changes during cell growth in the activity of three proto-oncogenes—genes that can lead to cancer with only a small change.

"We want to see what RF fields at nonthermal levels do to cells, if anything," Roti Roti said. "We are looking for a response." He emphasized that cancer risk was not the only focus of the study: When functioning normally, the three genes examined in the study are part of a common response to stress. "If we'd seen all three genes change in the proper sequence, we would have concluded that these fields are sensed by the cell and trigger a stress response," Roti Roti explained. "But we only found the first step."

The proto-oncogene that did change, *fos,* doubled its activity after exposure to an analog signal (continuous wave radiation at 836 MHz). This was a statistically significant increase ($p=0.001$). The activity of *fos* rose 40% after exposure to a digital CDMA signal (848 MHz pulsed microwaves)—an increase that was also significant ($p=0.04$). There were no changes in activity in the two other genes in the study.

"The consequence of such an increase in the *fos* [activity] is unknown and may be insignificant," the paper states—especially in the context of the exponential growth that is a normal part of the cell cycle.

"Maybe these fields sort of tickle the cell," said Roti Roti, and produce only the beginning of a normal stress reaction. But, he noted, "It's possible that this is just a chance finding."

The study was funded by Motorola and the National Institutes of Health. A replication study, funded by Motorola alone, is already under way. Roti Roti said that any new results would probably not be announced for about a year. "We have an agreement that we don't talk about it until the study is done," he said.

EMR Network Advocates ALARA, "National Research Effort"

The statement excerpted below was adopted in late February and issued in March by the EMR Network, an umbrella organization of grassroots citizens groups established last November by 20 activists from across the U.S. (see MWN, *N/D98 and also p.15). The full text will soon appear on the network's Web site, <www.emrnetwork.org>. Janet Newton of Marshfield, VT, has recently replaced Libby Kelley of Novato, CA, as the head of the network.*

Mission Statement:

We believe that electromagnetic radiation (EMR), which includes the extremely low frequencies, the radio frequencies and microwave radiation, may be hazardous to life and may constitute a significant threat to public health. This belief is based on credible research spanning decades of scientific inquiry.

Our mission is to enhance local, regional, national and international efforts to reduce, mitigate and, where possible, eliminate hazardous exposure to EMR.

We are committed to fostering the appropriate scientific research. Our charge is to educate the public, government officials and those in other scientific disciplines about the biological effects and environmental concerns associated with EMR.

The EMR Network was created to provide a forum for effective and balanced information for citizen action groups, the media, municipal agents, government officials and scientists alike.

The Purpose of the EMR Network Is:

To foster intelligent laws at the state and federal levels to adequately protect the public regarding exposures from low-intensity non-ionizing radiation (NIR).

To reduce exposure levels of NIR to the public and EMR professionals to levels as low as reasonably achievable—the ALARA principle.

Research:

The EMR Network recognizes what some scientists have said for decades—that the military and allied RF industries have a stranglehold on the research. This creates conflicts of interest that do not always parallel the best interests of EMR professionals, independent research scientists or citizens/consumers.

The EMR Network supports:

A national research effort into the long-term, low-level, continuous exposures to RF/MW simulating real-life, real-time exposures;

Research that is unbiased and focused at the U.S. EPA and at the National Institutes of Health. It should not be allocated to the Department of Defense or [its] research laboratories, nor housed at the Department of Energy;

...that has access to the U.S. military's large database on EMR/RF/MW research, established over the last five decades at taxpayer expense;

...that is spread among independent researchers in public universities and other programs where disclosure of findings is in the public domain;

...that is not dependent on matching funds from industry;

...whose protocol formation and review committees have at least one representative with voting rights from citizens groups such as the EMR Network and one from the medical community representing public health.

Couple Wins $1 Million in Suit Over Cell Tower near Home

A jury has ordered GTE Wireless to pay more than $1 million to a suburban Houston couple for the intrusive noise and disturbing light associated with a cellular tower installation near their home. The case is believed to be the first in the U.S. to be based on the "nuisance" caused by a mobile telephone base station.

The February 22 decision awarded $720,000 in compensation to Adrien and Chantal Pascouet for the nuisance and invasion of their privacy caused by GTE Wireless. They also won $225,000 for mental anguish and $28,000 for the loss in value of their home. Including legal fees of $230,000 and interest, the Pascouets stand to receive as much as $1.5 million.

GTE Wireless, which is based in Atlanta, stated that it will file an appeal "if necessary." Judge Tracy Christopher of the Texas State District Court in Harris County, who presided over the jury trial, has asked the Pascouets and GTE Wireless to try to reach a settlement through nonbinding mediation.

The Pascouets live in Bunker Hill Village, an affluent community near Houston. They filed suit in late 1994, shortly after GTE Wireless finished building the 100-foot tower, which stands just over 20 feet from the property line behind their house. The facility is located on a three-acre lot owned by the city of Bunker Hill Village, which will receive $500,000 from the company over the course of a 50-year lease, as well as free space on the tower for a police radio antenna.

The suit contended that the installation is a nuisance—that is, it "causes an unreasonable interference with the use and enjoyment" of the Pascouets' home. Security lighting and mechanical noise from an equipment building next to the tower keep the Pascouets awake at night, they said. They also maintained that their privacy has been invaded because maintenance workers on the roof of the equipment building can see into their backyard.

An appraiser determined that the tower reduced the value of the Pascouets' home by about 10%.

"I asked several of GTE's witnesses whether they had ever considered the impact their tower would have on people living nearby," Thomas Sankey, the Pascouets' attorney, said in an interview. "Their answer was, 'No.'" Sankey is with Sankey & Luck in Houston.

GTE Wireless spokesperson Joann Riner in Atlanta told *Microwave News* that the company built a higher fence around its building and moved air conditioning equipment in response to the Pascouets' complaints.

Dean Hunt, an attorney at the Houston office of Weil, Gotshal & Manges, which is representing GTE Wireless, would not comment on the case. By Sankey's estimate, the company has spent about $400,000 to date on the lawsuit.

In addition to the compensatory damages awarded by the jury, the Pascouets had sought punitive damages, but Judge Christopher did not allow the jury to consider this claim. In recent years, Sankey explained, Texas judges have limited punitive awards.

The Pascouets also want GTE Wireless to take down the tower, which they contend violates local zoning ordinances and never received a valid permit. The jury trial did not consider that request. This spring, Judge Christopher will decide whether the tower must be moved.

The Pascouets contend that the 20-foot distance between the tower and their property line is well short of the 50-foot minimum setback required by local zoning ordinances. They believe that the tower violates rules stipulating that such structures be no taller than 35 feet and prohibiting commerical uses.

GTE Wireless' Riner said that the city of Bunker Hill Village chose the site for the tower. "We always follow local zoning regulations," she added. In a statement, GTE Wireless maintained that "the facility is consistent with the preexisting police and public works uses on the city property."

Initially, the Pascouets also sued the city of Bunker Hill Village, but this action was settled out of court last fall. The terms of the settlement are confidential, Sankey said.

The Pascouets' success raises the possibility that other plaintiffs will seek damages from tower owners, even when their sites comply with local zoning laws. Sankey is "looking at about 50 other potential cases in Texas," he said, adding that, "In Texas, a lawful business can still be found to be a nuisance." He has also received inquiries from other states in the U.S., as well as from Canada and Sweden.

RF/MW radiation is not at issue in the Pascouets' case. Their petition originally included fear of electromagnetic radiation, but that argument was dropped after GTE Wireless' lawyers disclosed that they had commissioned a voluminous report concluding that the installation did not exceed Federal Communications Commission (FCC) emissions limits. The report was writ-

Illinois Tower Suit Focuses on Property Values

Another lawsuit over a cellular tower and property values is expected to go to trial this spring, in Illinois state court.

In 1997, 21 residents of North Barrington, IL, sued the Village of North Barrington and Ameritech Mobile Communications after the village amended its zoning law to allow cellular towers on a 10-acre municipal lot near their homes. Ameritech paid the village a lump sum of $300,000 for a 25-year lease.

Like the Pascouets in Texas (see story above), the Illinois plaintiffs contend that the village failed to consider the impact a tower would have on the value of their homes. They are asking the state's Circuit Court in Lake County to declare the zoning amendment illegal and to force Ameritech to take down its tower.

Last fall, following completion of the tower, the plaintiffs asked for an official review of their tax assessments. As with the Pascouets, the assessor concluded that the tower reduced the value of their homes by about 10%, according to their lawyer, Daniel Shapiro of Moss & Bloomberg in Bolingbrook, IL.

The town challenged the valuations, but they were upheld by the Lake County Board of Review. North Barrington is appealing that ruling. Under the terms of its site lease, Ameritech is paying half the town's legal expenses.

ten by Dr. Jerrold Bushberg of Sacramento, CA, a frequent consultant to the cellular phone industry.

Sankey predicted that his clients' case would hold up if mediation fails and there is an appeal. He added that the Pascouets might appeal Judge Christopher's ruling on punitive damages.

Canada Health Agency: Need for Cell Phone-Drug Reaction Data

Canada's federal radiation health agency has urged that the government monitor whether cellular telephone use is linked to reports of adverse drug reactions. Health Canada's Radiation Protection Bureau (RPB) also called for study of whether mobile phone use is associated with cancer or headaches.

In a paper titled *Potential for Interaction Between Specific Classes of Prescription Drugs and RF Fields from Hand-Held Portable Telephones,* RPB scientists noted that RF/MW radiation can "increase the permeability of the blood-brain barrier and modulate the action of some psychoactive drugs."

The RPB urged that questions about the use of mobile phones be included in Canada's next National Population Health Survey. The biennial assessment is administered by another agency, Statistics Canada, which rejected the RPB's request on the grounds that the year 2000 survey is already quite long.

The RPB's Dr. Jack McLean, lead author of the paper, told the *Ottawa Citizen* (February 1) that his agency will try again when the survey for 2002 is prepared. "I think that eventually [the questions] will get on there," said McLean. "I don't think this issue will go away." Larry Swain of Statistics Canada, manager of the survey, told *Microwave News*, "Certainly it could be considered for the future."

Dated September 10, 1998, the drug interaction paper is stamped "Confidential" on every page. Though labeled "Draft," government sources confirmed that the copy obtained by *Microwave News* is in fact the final version of this internal memo.

The RPB paper argues that if the health survey included questions on cellular phone use, it would also help evaluate possible links to cancer or to neurological problems such as headaches, fatigue and depression. But the paper's main emphasis is on the drug interaction issue, which in the past has received far less attention. The RPB cites a wide range of studies "published in the 1970s and 1980s that imply RF fields, such as emitted by cellular telephones, have the potential to perturb some of the biochemical pathways involved in drug action."

These include studies by Dr. Allan Frey and by Drs. Kenneth Oscar and Daryl Hawkins on RF/MW exposure and the "breakdown of the blood-brain barrier"; Henry Kues's research on RF/MW exposure and the eye, including drug interactions (see box); and Dr. Henry Lai's studies of RF/MW effects on the dopamine-opiate and cholinergic systems in the brains of rats.

Kues's studies found that a common antiglaucoma drug caused eye damage in primates from RF/MW exposure at one-tenth the level of radiation that would otherwise be required. This finding has played a prominent role in internal Canadian government debates over whether cellular phones should have to meet a separate limit for exposure of the eyes (see *MWN,* S/O98).

The RPB paper summarizes evidence of RF/MW interaction with various other drugs, including amphetamines and various barbiturates. When these studies were done, few people were likely to have significant exposure to RF/MW radiation. Today, the RPB points out, "Widespread public exposure to RF fields from cellular telephones [is] a certainty."

Frey's work on the "microwave hearing effect" is also discussed by the RPB scientists (see *MWN,* M/J98). "Many human subjects, in addition to hearing microwave-induced 'clicks,' 'chirps' and 'buzzing,' also reported headaches," they write. "The interesting point is that the cellular telephones in use today have operating characteristics (in terms of frequencies and pulse modulation) very close to [this] experimental setup." The paper notes that headaches may be related to the dopamine-opiate system, or to breakdown of the blood-brain barrier.

There are 5 million cellular phone users in Canada, and the RPB expects this number to grow to 13 million by the year 2006. The paper ends by arguing that, "Failure to resolve the issue of cellular telephone use and health effects would have a serious economic impact on the telecommunications industry in Canada."

Radiation Protection Bureau on the Brain, the Eye and the Mobile

Below is an excerpt from the RPB paper, taken from a section titled, "The Effect of RF Fields on the Blood-Brain Barrier and Blood-Ocular Barriers."

...There is significant evidence, gathered long before cellular telephones came into widespread use, that the blood-brain barrier breaks down with exposure to low intensity microwave energy at frequencies similar to those used by the cellular telephones of today....Pulse-modulated RF energy (similar to the output from digital "PCS-type" cell phones) was more effective than continuous wave RF energy (similar to the output from analog cell phones)....The degree to which the blood-brain barrier was permeabilized was partly dependent on the pulsing pattern....

Experimental work on the eye found that the blood-aqueous and blood-vitreous humor barriers were also permeabilized by low-intensity RF fields. This work was later extended in nonhuman primates by H. Kues, who showed that microwaves, at frequencies close to those used today by cellular telephones, produced irreversible damage to the endothelial layer of the cornea. Subsequent work by this author showed that *pretreatment* of nonhuman primate eyes *with 0.5% timolol maleate* [a common antiglaucoma drug] significantly reduced, by tenfold, the power density threshold needed to induce corneal endothelial lesions and increase vascular permeability of the iris.

In the early days, interest in further study of low intensity RF field bioeffects waned because the possibility of widespread public exposure was extremely limited. Today, with widespread public exposure to RF fields from cellular telephones a certainty, the issue of blood-brain barrier effects will once again become a hotly debated issue....

government responded by announcing the formation of an expert group on mobile phone safety. "As a champion of the public health, I believe we need a definitive and rigorous assessment of existing research, and clear identification of areas where further research may be needed," declared Tessa Jowell, Minister for Public Health. She said the panel would evaluate "the implications of new developments," including the Preece study. At press time, the members of the group had not been named.

"My hunch is that it will turn out to be a very mild thermal effect," said Preece. He explained that localized heating in the brain could cause "expansion of the blood vessels and improved oxygenation" in the region of the brain closest to the phone's antenna.

That region is called the angular gyrus, and is known to serve as a link between the parts of the brain that handle vision and speech. "Damage to this part of the brain produces a condition known as alexia: an inability to read, although the understanding of spoken language remains intact," the researchers note.

This is important because the faster reaction times occurred mainly in the test that was most reliant on interpreting written words—a test known as "choice reaction time," in which volunteers must choose between a "yes" or "no" answer on a computer screen. Other tests relied more on matching nonverbal patterns, or on memory. Preece said that, "When my colleague Stuart Butler, who is a neurophysiologist, saw the results, he said immediately: 'You're getting this effect because the antenna is right above the angular gyrus.'"

Preece added that microwave exposure below thermal levels cannot be ruled out as an explanation. He noted that certain types of proteins (known as "heat shock proteins") can increase blood flow. If production of these proteins is affected by nonthermal exposure, he said, this would be an alternative mechanism for increased blood flow. If a nonthermal effect is at work, Preece stated, "Urgent further investigation will be needed." But he said there is no reason to favor "a more complex mechanism than temperature rise" unless the temperature increase is shown to be insignificant.

Preece's research received widespread coverage in the British press, much of it wildly inaccurate. Before the study was released, for example, the February 28 *Sunday Times* reported that Preece had found that, "Mobile phones can cause short-term memory loss." In fact, Preece had found no effect on memory one way or the other. "I told the reporters absolutely outright that they were wrong, wrong, wrong," Preece told *Microwave News*. "But they seem to prefer bad news."

"Effects on memory are not to be expected" with the type of exposures in his study, Preece's paper concludes. "The memory-associated areas of the brain are either too deep or too far away from the antenna to be affected" by either thermal or nonthermal means.

Using simulated analog and GSM digital mobile phone signals, both 1 W at 915 MHz, Preece's team found that the effect on cognitive function was strongest for the analog-style exposure. They write that it is "interesting...that the reaction times seem to decrease with increasing [average] field strengths." (Since the digital-style signal was pulsed, it had a lower average power: The full power of 1 W was "on" only 12.5% of the time, and, as a result, its average power level was only 0.125 W.)

All 35 volunteers were subjected to each of the three test conditions (analog, digital and sham exposures), with 48 hours between each test. The tests were double-blind, with both volunteers and the technicians administering the tests unaware of the order of exposure, which was selected at random in each case.

The exposures lasted about 25-30 minutes—the time needed to complete 10 separate cognitive tests. The data were grouped into four different categories for analysis: 1) accuracy on memory tests; 2) speed on memory tests; 3) accuracy on reaction/attention tests; 4) speed on reaction/attention tests. Only the last of these was affected by microwave exposure.

The results were not biased by alcohol or caffeine consumption, or by the amount of sleep that volunteers got the previous night. Speed, but not accuracy, declined the older the volunteer, and Preece said this tends to support the validity of the results.

Preece said that while some in the cellular phone industry have argued that power levels of mobile phones are too low to cause any significant heating, "actually the heating effect may be somewhat more than existing models suggest." Members of his lab are currently evaluating this hypothesis by conducting measurements of the specific absorption rates (SARs) of the radiation. They are also studying whether there is in fact any localized increase in brain blood flow.

The expert group announced by the Ministry of Public Health is being organized by the National Radiological Protection Board (NRPB) in Didcot, Oxon. "It is the current view of the NRPB that there is no firm evidence of serious adverse health effects from the use of mobile phones," the NRPB declared in a March 2 statement, responding to early press reports on Preece's research.

BT Engineer Plans, Then Drops, Lawsuit Over Memory Loss

Stephen Corney, a former British Telecom (BT) engineer, has dropped plans to sue BT over severe memory problems allegedly caused by his use of mobile phones. On March 14, Corney had announced that he would sue BT for more than £100,000 in damages (over US$160,000), but in mid-April, as the court's deadline drew near, his lawyers concluded that there was insufficient evidence to win the case.

Corney, who lives in Bedfordshire, U.K., worked for BT from 1986 to 1996, when he went on sick leave. In his job installing telecommunications equipment and testing cellular phone signal strength, he used a mobile phone for hours a day. After BT switched to digital phones for its employees, Corney said he started suffering from headaches, "like a steel band round my head."

Corney then began to have short-term memory problems so severe that he has been unable to do simple daily tasks. For example, Corney told London's *Express* (March 15), after going shopping and putting his groceries in the trunk of his car, he would see the shopping list and not remember that he had already done the shopping. Corney would then reenter the store and buy everything all over again.

Corney is represented by Tom Jones, a solicitor with the law firm Thompsons in London.

FROM THE FIELD

Letter to the Editor

Inside the WTR Research Program: "A Very Strange Experience"

March 19, 1999

To the Editor:

Unpleasant and intolerable circumstances have compelled us to write this letter. We are writing to tell you and your readers of our experiences with Wireless Technology Research LLC (WTR) since it was established over five years ago.

* * *

Our first interaction with WTR came after its December 1993 request for proposals. In February 1994, we sent in a joint proposal with Dr. C.K. Chou, then of the City of Hope National Medical Center in Duarte, CA, to study the effects of radiofrequency radiation (RFR) on the DNA of live rats.

The following June at the Bioelectromagnetics Society Meeting in Copenhagen, Denmark, Chou arranged a meeting with WTR Chairman Dr. George Carlo and Dr. Q. Balzano and others from Motorola, at which we presented our experimental data on RFR–DNA damage. For reasons unknown to us, the meeting was conducted in such great secrecy that Balzano sent one of his Motorola colleagues to stand by the door to prevent people from coming into the room.

WTR made two site visits to our laboratory, in June and July of 1994. During one visit, Carlo said that he was really interested in our data and a check would be sent to us the following week so that we could continue our research.

The check never came.

We did receive comments on our proposal and we revised it. In November, we were invited to discuss it at a meeting in Toronto, Canada. There we were told that a WTR panel had reviewed our data and found that they were flawed, mainly because of the version of the "comet assay" we had used in our experiment to determine the extent of DNA damage.

Interestingly, WTR also asked us to review a proposal by Dr. Martin Meltz of the University of Texas Health Science Center in San Antonio to study RFR-induced DNA damage in cells using the same assay. We understand that Meltz eventually received some money from WTR, apparently without a formal review of his proposal.

When we returned from Toronto, we sent Carlo a letter withdrawing our proposal. We wrote that we "strongly urge that this important series of experiments be replicated by Dr. Chou."

We then did not hear from WTR for several months. In April of 1995, WTR issued another request for proposals and in May we submitted a second joint proposal with Chou. Six months later, in October, Carlo wrote that we were one of three groups chosen to carry out genotoxic research, but without the participation of Chou. The other teams were led by Dr. Ray Tice of Integrated Laboratory Systems (ILS) in Research Triangle Park, NC, and Dr. Luc Verschaeve of VITO in Brussels, Belgium. In December 1995, members of the three groups met in Miami to plan the research.

After that, we heard nothing more from WTR for close to two years.

In August 1997, WTR's Dr. Don McRee wrote to tell us that we would be given a contract. It called for a series of experiments between March and August of 1998 on the possible effects of RFR on brain cell DNA of rats. The total amount of the contract was $86,260.

We soon found that the design of our experiments was being dictated by WTR staff members who, in our opinion, were and are completely ignorant about RFR research. We sent a letter to Carlo expressing our concerns, stating that, "The protocol [of the research] should be set up by the researchers involved in the experiments and not be interfered with by the administrator of the funding institute. Independence of the investigators is absolutely important in securing the trust of the public on the data." Carlo's reply was vague and basically discounted our concerns. From then on, there were constant confrontations between us and the WTR staff on how the experiments should be carried out.

The choice of the three research teams, as far as we know, was not based on a peer-review process. Verschaeve's team was dropped after the initial planning meeting, and we understand that WTR has never offered any explanation. This decision seems strange since Verschaeve's team had substantial experience in research on the effects of RFR on DNA, whereas the ILS group had none.

The two remaining teams were expected to perform an independent experiment, using the comet assay, in a central research facility at the City of Hope National Medical Center. To our surprise, the ILS team did not seem to know the experimental methodology—from obtaining brain cells from rats to the basic technique of electrophoresis. For example, the electrophoresis apparatus used by ILS did not provide for recirculation of the buffer, which is essential to the assay. When we pointed this out, the ILS group brought a pump to circulate the buffer. However, this pump was so powerful that, we were told, the samples from the first set of experiments were completely ruined. Eventually, the ILS team had to borrow our apparatus to do the experiment.

Later, some microscope slides from the ILS experiment were sent to us from North Carolina for evaluation. To our surprise, we could see from the labels on the slides that several of them were from the earlier experiment in which the samples were supposed to have been ruined. The slides used to prepare these samples were a different brand from those available in the research laboratory at the City of Hope. Where, then, did these slides come from? We asked WTR this question many times over a period of months, and we have never received a satisfactory response.

When we examined some of the ILS slides, we found that most of them were poorly prepared, which indicated that the ILS team did not know how to do the comet assay according to the set protocol. Several times we expressed our concern about ILS' performance to WTR, but we were completely ignored. WTR staff monitored the progress of the research and should have detected the deficiency of their North Carolina researchers. Why did they allow this poor-quality research to continue?

Our personal dealings with WTR were also distressing. One member of the WTR staff was belligerent, unprofessional and abusive throughout the experiments. On one occasion in the City of Hope laboratory, he yelled and shouted at one of us (NPS), saying that our methodology was completely no good. He also yelled and shouted when he visited our lab at the University of Washington.

On that occasion, our next-door neighbors later came over and asked what had happened: They thought there had been a physical fight.

The experiments were run blind; that is, we did not know the treatment the animals received, so that the sample slides could be evaluated in an unbiased fashion. At the end of the experiment, after we had turned in the data, we were sent a code sheet. After decoding our data, we had reason to believe that there could have been some mistakes in the code given to us.

In fact, we were surprised to find that the code sheet was prepared by WTR and not by the staff at the City of Hope who exposed the animals. (Chou, who originally was supposed to keep the record on the experimental animals, left the City of Hope to work for Motorola in the middle of the experiment. The code was apparently passed to WTR after he left.) We found this highly irregular and asked for the original hand-written record of the experiment by the City of Hope staff.

WTR stonewalled our requests over and over again. The reasons given, in sequence, were: (1) The record would be given to us after a quality check by WTR; (2) The hand-written record contained secrets of the experiment and could not be shown to us; and (3) Our contract and the contract with City of Hope were separate, and documents from one WTR contractor could not be shown to another. This behavior is highly irregular and suspicious. In the 20 or so years that we have conducted experiments, for a variety of funding agencies, we have never encountered anything like this in the management of a scientific contract.

At the end of the contract period, we sent WTR a final report. But WTR notified us that they would consider this a "draft" and would not send us the last installment of payment—more than $11,000—until there was agreement on a "final report." After getting some feedback from WTR in late September, we revised the report and sent it back on October 14, 1998.

At the same time, WTR asked us to attend a meeting in Washington, DC, on November 13 to present our data to the government's RF Interagency Work Group. We agreed, on the condition that the final report had to be finished before our presentation. WTR said this would be done by the end of October.

A week before the meeting, WTR informed us that the report was still not ready, and would not be completed until after the November 13 meeting. WTR demanded that we attend the meeting anyway. They claimed that it was required as part of WTR's general procedure to finalize research reports, though such a meeting does not appear to have been required of other researchers.

As the date drew closer, we found out that it was not really a meeting of the RF Interagency Work Group: The members of the working group did not consider it an official meeting, and one member had not heard until November 11 that it was going to take place.

At that point, we told WTR that, under such dubious circumstances, we refused to attend. On November 12, the meeting was canceled. We later heard that the reason given to those invited was that Lai and Singh had not had enough time to prepare their presentation.

In December, WTR gave us some more comments on the report: They wanted us to delete almost everything in the discussion section. We have made it clear to WTR that we will not change the interpretation of data or the conclusions of our report. Nevertheless, we have recently completed a third version of the report and have submitted it to WTR.

* * *

This has been a very strange experience for us. The WTR program is a disgrace to the American research establishment. It has shown a consistent pattern of chaotic corruption and deception. Much money and time have been wasted while the public and millions of cellular phone customers continue to wait for an answer to the possible health effects of wireless communication. Until we have an independent and reliable research program free from any control from the industry, the global impacts of cellular phone use will be assessed by "post-market surveillance"—in other words, by whatever effects may occur among users of these devices.

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Letter to the Editor

Washington State Electric Utility Workers Also Show EMF–Cardiac Risk

March 5, 1999

To the Editor:

The recently published study by Savitz et al.[1] shows a positive dose-reponse relationship between magnetic field exposure in electric utility workers and deaths due to arrhythmia-related conditions and myocardial infarction [see *MWN,* J/A98 and S/O98].

Interestingly, this may be corroborated in my occupational mortality analysis of Washington state deaths.[2] Electronics technicians and power station operators were first and second of 219 occupational titles for total cardiovascular disease mortality. Since about half of all deaths are due to cardiovascular diseases, a small increase in risk of deaths related to electromagnetic fields will translate to a large number of deaths.

In the near future, I will look more specifically at the cardiovascular disease causes of death to see exactly which causes are elevated in power station operators and electronics technicians, and to see whether other electrical workers have this excess.

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<smilham@halcyon.com>

1. *American Journal of Epidemiology, 149,* pp.135-142, 1999.

2. S. Milham, *Occupational Mortality in Washington State 1950-1989,* Department of Health and Human Services (National Institute for Occupational Safety and Health) Publication No.96-133, 1997.

Hot New Papers

Tom Sorahan et al., "Maternal Occupational Exposure to Electromagnetic Fields Before, During and After Pregnancy in Relation to Risks of Childhood Cancers: Findings from the Oxford [U.K.] Survey of Childhood Cancers, 1953-1981 Deaths," ***American Journal of Industrial Medicine, 35,*** **pp.348-357, April 1999.**

"The study findings do not suggest that maternal occupational exposure to electromagnetic fields (EMFs) during pregnancy is a risk factor for childhood leukemias, childhood brain cancers or the generality of all childhood cancers. There were some statistically significant associations (excesses and deficits) with work categories held before the pregnancy, but on the basis of the stated ranking of EMF exposures across the work categories, the findings for this time period were not strongly suggestive of an EMF effect....In conclusion, earlier findings that suggested that working during pregnancy as a sewing machinist and working during pregnancy in the textile industry were risk factors for childhood leukemia are given no support from this investigation." (See *MWN,* J/A95 and M/J98.)

Samuel Cos et al., "Influence of Melatonin on Invasive and Metastatic Properties of MCF–7 Human Breast Cancer Cells," ***Cancer Research, 58,*** **pp.4,383-4,390, October 1, 1998.**

"Taken together, our results suggest that melatonin shifts MCF–7 human breast cancer cells to a lower invasive status by increasing the β_1 integrin subunit and E–cadherin expression and promoting the differentiation of tumor cells. Finally, our study points out the existence of the anti-invasive actions of melatonin as a part of the oncostatic action of melatonin."

Leeka Kheifets and Chantal Matkin, "Industrialization, Electromagnetic Fields and Breast Cancer Risk," ***Environmental Health Perspectives, 107, Supplement 1,*** **pp.145-154, February 1999.**

"Although most of the epidemiologic data do not provide strong support for an association between EMFs and breast cancer, because of the limited statistical power as well as the possibility of misclassification and bias present in much of the existing data, it is not possible to rule out a relationship between EMFs and breast cancer....Future study designs should have sufficient statistical power to detect small to moderate associations; include comprehensive exposure assessments that estimate residential and occupational exposures, including shift work; focus on a relevant time period; control for known breast cancer risks; and pay careful attention to menopausal and estrogen receptor status."

Risk of Low Blood Pressure from UWB Pulses

Shin-Tsu Lu et al., "Ultrawide-Band [UWB] Electromagnetic Pulses Induced Hypotension in Rats," ***Physiology & Behavior, 65,*** **pp.753-761, January 1-15, 1999.**

"The estimated threshold SAR (0.002 W/kg, high UWB pulse) for UWB-induced hypotension in rats was 200 times less than 0.4 W/kg, the basis for the IEEE C95.1-1991 safety standard in a controlled environment. The threshold peak electric field of the UWB was less than the allowable peak electric field (100 kV/m) used in this standard. Hypotension is known to possess adverse health implications. The UWB-induced hypotension is a recent finding that has not been addressed during the promulgation of personnel protection guidelines." (See also *MWN,* J/A92.)

EMI from ESUs

Robert Martin Nelson and Howard Ji, "Electric and Magnetic Fields Created by Electrosurgical Units [ESUs]," ***IEEE Transactions on Electromagnetic Compatibility, 41,*** **pp.55-64, February 1999.**

"Electric and magnetic field strengths created by a typical electrosurgical unit were measured in operating rooms at the Department of Veterans Affairs Medical Center in Fargo, ND....With the center of the antenna placed 1.0 m from the floor and 1.0 m from both the ESU and the specimen being operated on, all three components of the electric and magnetic fields were measured as a function of frequency. The maximum values of the total electric field were approximately 153 dBμV/m for the CUT mode (at a frequency of 750 kHz), 138 dBμV/m for the COAG mode (at a frequency of 250 kHz) and 147 dBμV/m for the BLEND mode (at a frequency of 750 kHz). The maximum values of the total magnetic field were approximately 76 dBμA/m for the CUT mode (at a frequency of 750 kHz), 59 dBμA/m for the COAG mode (at a frequency of 1.625 MHz) and 71 dBμA/m for the BLEND mode (at a frequency of 750 kHz). Interference was observed on monitoring equipment in the operating room during operation of the electrosurgical unit." (See also *MWN,* N/D85, S/O87 and N/D93.)

M.R. Scarfi et al., "Micronucleus Frequency and Cell Proliferation in Human Lymphocytes Exposed to 50 Hz Sinusoidal Magnetic Fields," ***Health Physics, 76,*** **pp.244-250, March 1999.**

"In the present study, micronucleus induction and cell proliferation in human peripheral blood lymphocytes cultured *in vitro* and exposed to 50 Hz sinusoidal magnetic fields for 72 hours at different intensities (1.0, 0.75, 0.5, 0.25 and 0.05 mT rms [10 G-500 mG]) were investigated. The results obtained from 42 healthy donors aged between 26 and 54 years indicate that, for the field intensities tested, no genotoxic effects were found, as assessed by the cytokinesis-block micronucleus assay. On the contrary, cell proliferation, evaluated by the cytokinesis-block proliferation index, was slightly affected by the field at the intensities tested....The mechanism(s) by which the magnetic fields we used in the present investigation are able to modulate lymphocyte proliferation is (are) unknown."

Robert Adair, "Effects of Very Weak Magnetic Fields on Radical Pair Reformation," ***Bioelectromagnetics, 20,*** **pp.255-263, 1999.**

"[E]ven under...singularly favorable conditions, fields as small as 5.0 μT (50 mG) cannot change the recombination rate by as much as 1%. Hence, we conclude that environmental magnetic fields much weaker than the Earth's field cannot be expected to affect biology significantly by modifying radical pair recombination probabilities." (See also p.3.)

C. Fanelli et al., "Magnetic Fields Increase Cell Survival by Inhibiting Apoptosis via Modulation of Ca^{2+} Influx," ***FASEB Journal, 13,*** **pp.95-102, January 1999.**

"Static magnetic fields with intensities starting from 6.0 G [0.6 mT] were found to decrease in an intensity-dependent fashion, reaching a

plateau at [60.0 G], the extent of cell death by apoptosis induced by several agents in different human cell systems. This is not due to a change in the mode of cell death (i.e., to necrosis) or to a delay of the process itself; rather, the presence of magnetic fields allows the indefinite survival and replication of the cells hit by apoptogenic agents. The protective effect was found to be mediated by the ability of the fields to enhance Ca^{2+} influx from the extracellular medium; accordingly, it was limited to those cell systems where Ca^{2+} influx was shown to have an antiapoptotic effect. Magnetic fields thus might interfere with human health by altering/restoring the equilibrium between cell death and proliferation; indeed, the rescue of damaged cells may be the mechanism explaining why magnetic fields that are not mutagenic *per se* are often able to increase mutation and tumor frequencies."

Om Gandhi et al., "Comparison of Numerical and Experimental Methods for Determination of SAR and Radiation Patterns of Hand-Held Wireless Telephones," *Bioelectromagnetics, 20,* pp.93-101, 1999.

"One of the important observations is that for AMPS telephones with maximum power of 600 mW at 800/900 MHz, the peak 1 g SARs would generally exceed the FCC-mandated limit of 1.6 W/Kg unless antennas are carefully designed."

Päivi Heikkinen et al., "Chronic Exposure to 50 Hz Magnetic Fields or 900 MHz Electromagnetic Fields Does Not Alter Nocturnal 6-Hydroxymelatonin Sulfate Secretion in CBA/S Mice," *Electro- and Magnetobiology, 18,* pp.33-42, 1999.

"[W]e investigated whether chronic (over 17 months) exposure to vertical 50 Hz magnetic fields with regularly varying intensity (1.3, 13 and 130 μT [13-1,300 mG]; 24 h/day) affects nocturnal 6-hydroxymelatonin sulfate (6-OHMS) production in female CBA/S mice. The effects of 900 MHz radiofrequency radiation (90 min/day) were also studied, using either continuous radiation with a specific absorption rate (SAR) of 1.5 W/Kg or pulsed radiation with a pulse repetition rate of 217 MHz and an SAR (average) of 0.35 W/Kg....Neither the extremely low frequency magnetic field nor the radiofrequency radiation affected excretion of 6-OHMS in nocturnal urine....To our knowledge, this is the first report on the effects of chronic RF radiation on melatonin metabolism in mice."

Clippings from All Over

Unrecognized risks are still risks; uncertain risks are still risks; denied risks are still risks! The precautionary principle embodies the belief that it is prudent to attempt to diminish risks with particularly severe consequences, even if the probability of occurrence is moderate or the uncertainty high. Excessive confidence in our own ability to solve problems after harm has been done could result in awkwardness or tragedy.

—Dr. John Cairns Jr., Virginia Polytechnic Institute and State University, Blacksburg, VA, in an editorial, "Absence of Certainty Is Not Synonymous with Absence of Risk," *Environmental Health Perspectives* (published by the National Institute of Environmental Health Sciences, Research Triangle Park, NC), p.57, February 1999

Someday there will be a glut of wireless towers.

—Michelle Conlin in "Tower Power," *Forbes,* p.56, March 22, 1999

"The Telecom Act of 1996 unleashed a low-level form of terrorism on citizens and zoning commissions throughout the U.S."

—Blake Levitt, EMR Network, quoted by Jeffrey Silva in "Vermont Delegation Aims To Return Tower-Siting Power to Locals Again," *RCR,* p.2, March 15, 1999 (see p.8)

"Cell phones have become the cigarettes of the 1990s."

—Danny Meyer, owner, Union Square Cafe and other restaurants, New York City, explaining why he favors the use of wireless phone jamming devices, quoted by David Wallis in "Noises Off: A Muzzle for Cell Phones," *New York Times,* Money & Business, p.4, April 11, 1999

We believe that fears about possible links [of power line fields] to cancer have been adequately addressed and see no reason to recommend further studies on this subject.

—Dr. John Moulder, Medical College of Wisconsin, Milwaukee, and Dr. Kenneth Foster, University of Pennsylvania, Philadelphia, in "Is There a Link Between Exposure to Power Frequency Electric Fields and Cancer?" *IEEE Engineering in Medicine and Biology Magazine,* p.115, March/April 1999

"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

• The Occupational Safety and Health Administration decides to keep its voluntary 10 mW/cm^2 RF/MW exposure standard, eliminating the possibility of enforcing it in the workplace.

• Poland's Dr. Stanislaw Szmigielski reports that 2450 MHz radiation at 10 mW/cm^2 "enhances the teratogenic potency of other compounds and thus acts as co-teratogen."

• Miscarriage clusters are identified among VDT operators in San Francisco and in Atlanta, the ninth and tenth to be reported.

Years 10 Ago

• The state of Florida adopts the first power frequency magnetic field exposure standards in the United States. The limits are set on the basis of available technology, not possible health effects.

• Shore-to-ship communications signals from a Navy transmitter jam garage door openers in the San Francisco Bay area for two weeks.

• An American Medical Association panel concludes that pulsed EMF stimulation is safe, but not necessarily effective, for the treatment of nonunion fractures.

Years 5 Ago

• A Canadian-French utility-sponsored study finds that workers with greater-than-average magnetic field exposures are three times more likely than others to develop acute myeloid leukemia. No dose-response relationship is observed, however.

• The Tennessee Valley Authority releases guidelines stating that it "will not site transmission lines near schools and densely populated areas."

• Responding to a question from a child with leukemia, President Bill Clinton announces that he has asked the Environmental Protection Agency to prepare a report on the possible EMF–cancer link. He adds that Swedish studies supporting the link have "somewhat impressed" him.

Jerry L. Phillips, PhD

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UPDATES

BROADCAST RADIATION

Protests Over DTV on Lookout Mountain...A report from Colorado's Department of Public Health and Environment has added fuel to the fire in the controversy over the Lookout Mountain antenna farm in the Denver suburbs. Lookout Mountain is home to a dozen high-power radio and TV towers and more than 400 other antennas. Several Denver-area TV stations want to build another tower—over 800 feet tall—on the mountain for their digital TV (DTV) antennas. On February 17, the state health department released a study of brain tumors from 1985 through 1997 in each of the seven "block groups" in the census tract around Lookout Mountain. Last summer, a study of the entire census tract, without this breakdown, found a brain cancer rate 50% higher than expected, but that increase was not statistically significant (see *MWN,* J/A98). The new study found that the two block groups closest to the antenna farm had significantly more cases of brain cancer than expected: In one, three women had benign brain tumors, while in the other, five men developed malignant brain cancer. In each group, this was four to five times as many cases as expected. At the time of diagnosis, all of these people were living in homes with an unobstructed view of the towers. But four of the five men had worked in jobs with higher risks for cancer of the central nervous system, and two had lived near Lookout Mountain for less than five years. The state health department concluded that the evidence is contradictory. It pledged to monitor cancer statistics in the area, but noted that the state "does not recommend that existing antennas cease operation or be removed." This left open the question of whether new antennas should be built. "We do not wish to be unwilling subjects in a potentially tragic experiment," read a statement from the Jefferson County citizens group Canyon Area Residents for the Environment. Since then, the controversy has featured an exchange of letters between Colorado politicians and FCC head William Kennard, a mothers' and children's march against the proposed new tower and opposition from the Jefferson County school board. A Jefferson County health official voiced his support for an ALARA approach, investigating alternatives "before increasing the amount of EMR that is present on Lookout Mountain." An editorial in the April 14 *Denver Post* argued that a new DTV tower would be good for Jefferson County. In the *Denver Business Journal* (March 18), local resident Paul Stephen Dempsey expressed a different view: "Do we really want to risk the health of children so we can enjoy somewhat crisper TV?"

EMF CELL BIOLOGY

JB-6 Replication Fails...A team at NIOSH led by Dr. John Snawder has failed to repeat *in vitro* studies showing that magnetic fields can amplify the growth of JB-6 cells, act as tumor promoters or transform noncancerous cells into tumor cells. In 1994, Dr. Robert West of the National Center for Toxicological Research in Jefferson, AR, published a paper in *Bioelectrochemistry and Bioenergetics (34,* pp.39-43) indicating that JB-6 cells formed significantly more colonies when exposed to an 11 G, 60 Hz magnetic field than did controls. Importantly, West also suggested that he had seen similar effects at levels as low as 100 mG (see *MWN,* J/F95). At about the same time, Dr. Jeffrey Saffer of the Battelle Pacific Northwest Labs in Richland, WA, pointed to

some preliminary evidence showing that magnetic fields could induce enhanced JB-6 cell growth. The EMF RAPID program awarded Saffer a grant of more than $1 million to pursue this lead (see *MWN,* S/O94). But all efforts to repeat the JB-6 work independently have failed. In 1997, Saffer published a paper in *Carcinogenesis (18,* pp.1,365-1,370) announcing that he could not show that magnetic fields affected JB-6 cell growth or enhanced the transformation of the cells into a cancerous state. "Our data were very clean, convincing and in our lab very reproducible," Saffer told *Microwave News.* And now the NIOSH team appears to have closed the book on the JB-6 story. Writing in the March issue of *Environmental Health Perspectives (107,* pp.195-198, 1999), Snawder and coworkers conclude that neither a 1 G, nor a 9.6 G, 60 Hz magnetic field acts as a promoter or a copromoter in JB-6 cells. "This is a case in which we think we know why the two labs got different results," Dr. Gregory Lotz, the chief of NIOSH's Physical Agents Effects Branch in Cincinnati, told *Microwave News.* "We don't believe the cells are actually responsive to the magnetic fields." As the NIOSH paper explains, the differences in the two sets of results "could result from plating order"—that is, the cells were not well-randomized and the timing of the experiment could have led West to the wrong conclusion. West, who is now retired, could not be reached for comment. The Battelle and NIOSH labs have both given up this line of research. "We are not pursuing the JB-6 research anymore," Lotz said.

MEDICAL DEVICE EMI

Resource Manual... The Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma, Norman, has released *Managing Wireless Electromagnetic Compatibility Issues in Healthcare: A Resource Manual.* Dr. Bernard Segal of McGill University in Montreal, Canada, who edited the manual with the center's Dr. Hank Grant, writes that, "Education is the single most cost-effective means of minimizing EMI occurrences." The target audience is made up of those who run, or work in, hospitals. To make best use of each reader's time, Segal and Grant have assembled more than 75 articles and abstracted them, rating each as "must read," "should read" or "can read." In addition, there are some 30 Internet resources, which are also available on the center's Web pages, <www.ou.edu/engineering/emc>. The manual was sponsored by the CTIA in Washington. It costs $50.00 plus shipping; to order or for more information, contact Glenn Kuriger at the center, (405) 325-2429, Fax: (405) 325-2556, E-mail: <kuriger@ou.edu>.

MELATONIN

A Warning from Dr. Weil... Dr. Andrew Weil, America's leading advocate of alternative medicine and the author of *8 Weeks to Optimum Health* and other best-sellers, does not think it is safe to take melatonin even "on a short-term basis to ward off jet lag." Writing in *Self-Healing,* his monthly newsletter, he particularly recommends against the long-term use of hormone supplements such as melatonin "because of their effects on hormonally driven diseases such as prostate cancer and breast cancer." (For others who have expressed concerns, see *MWN,* M/A96, M/J96 and J/F98).

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"*Microwave News* has become required reading for anyone interested in the topic."

—Dr. Peter Polson, consultant on biological effects of RF/MW radiation, in the wireless industry trade magazine RCR, *February 8, 1999*

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1999 Conference Calendar (Part III)

Parts I and II appeared in our last two issues.

May 11-13: **9th High-Power Microwave and Radiofrequency Electromagnetics Symposium,** Kirtland Air Force Base Conference Facility, Albuquerque, NM. Contact: Association of Old Crows, 1000 N. Payne St., Alexandria, VA, 22314, (888) 653-2769, Fax: (800) 678-3324, Web: <www.aochq.org>. Attendees must have a Secret/U.S.-Only security clearance.

August 19-21: **6th Nordic Workshop on Biological Effects of Electromagnetic Fields,** Skejby Sygehus, Aarhus, Denmark. Contact: Dr. Sianette Kwee, Dept. of Medical Biochemistry, University of Aarhus, Bldg. No.170, DK 8000 Aarhus C, Denmark, (45) 8942-2869, Fax: (45) 8613-1160, E-mail: <skwee@biokemi. au.dk>, Web: <www/biokemi.au.dk/nemf99/home.htm>.

September 20-25: **2nd International Conference on Problems of Electromagnetic Safety of the Human Being,** Moscow, Russia. Contact: Prof. Yu. Grigoriev, 46 Zhivopisnaya St., Moscow 123182, Russia, (7+95) 1930187, Fax: (7+95) 1903590, E-mail: <CEMS.1@g23.relcom.ru>, Web: <www.chat.ru/~cems/emf/2conf.htm>.

September 21-23: **2nd IEEE Russia Conference: 1999 High-Power Microwave Electronics: Measurements, Identification, Applications (MIA–ME '99),** Novosibirsk State Technical University, Novosibirsk, Russia. Contact: V. Snournitsin, NSTU, 20 K. Marx Ave., 630092 Novosibirsk, Russia, (7+3832) 462598, Fax: (7+3832) 462598, E-mail: <crra@ref.nstu.ru>, Web: <www.ieee.org/society/eds> and <www.nstu.ru/miame99>.

September 27-October 1: **31st Annual Meeting of the Society for Radiation Protection, Non-Ionizing Radiation—Living with It at Work and in the Environment,** Gürzenich Auditorium, Köln, Germany. Contact: Norbert Krause, Berufsgenossenschaft Feinmechanik und Elektrotechnik, Gustav-Heinemann-Ufer 130, 50968 Köln, Germany, (49+221) 3778-444, Fax: (49+221) 3778-723, E-mail: <pollmann@bgfue.de>, Web: <www.bgfue.de>.

December 2-8: **6th International Conference and Workshop on Electromagnetic Interference and Compatibility,** New Delhi, India. Contact: Dr. T.K. Sarkar, Dept. of Electronics, Room No.2006, Electronics Niketan, 6 CGO Complex, New Delhi 110 003, India, (91+11) 436-0582, Fax: (91+11) 436-3106, E-mail: <tks@xm.doe.ernet.in>.

December 13-17: **7th International Symposium on Recent Advances in Microwave Technology (ISRAMT '99),** Malaga, Spain. Contact: Banmali Rawat, Dept. of Electrical Engineering/260, University of Nevada, Reno, NV 89557, (702) 784-6927, Fax: (702) 784-6627, E-mail: <rawat@munrcdu>, Web: <www.isramt99.ic.umaes>.

Keeping Current: Follow-Up on the News

◆ In the U.K., the BBC's *Panorama* news program is preparing a detailed documentary on the cellular phone health debate, to be aired in mid- or late May. Among those who have been interviewed are: Drs. Ross Adey, George Carlo, Henry Lai, Jerry Phillips and Louis Slesin.

◆ In Australia, test broadcasts of digital television (DTV) "almost wiped out" the medical telemetry system used by Melbourne's Epworth Hospital to monitor patients' heart function, *The Age* reported on February 26 (see *MWN,* M/A98). The Australian government has ordered the introduction of DTV by 2001.

◆ The International Microwave Power Institute will celebrate the 50th anniversary of the microwave oven at its annual meeting to be held July 18-21 in Washington. For more information, go to <www.impi.org>.

◆ In our last issue, we featured a short excerpt from the Canadian Broadcasting Corp.'s February 9 program *The Fifth Estate,* on cell phone health risks. Don Maisch, a consultant based in Tasmania, Australia, has now placed the entire transcript on his Web site, <www.tassie.net.au/emfacts>.

◆ Ten years after a similar event in the San Francisco area (see p.15), Hobart, Tasmania, was startled by garage-door EMI. Signals from two Australian navy ships caused "hundreds" of motorized door openers in that city to malfunction, according to the April 12 *Washington Post*.

◆ The April/May issue of *City and Mountain Views,* published in Golden, CO, reports that EMI from the Lookout Mountain antenna farm has caused electric gates at Buffalo Bill's grave site to "open and shut uncontrollably" (see also p.16).

◆ EPRI has awarded a contract to E^{x}ponent of Menlo Park, CA, for a study on EMF exposures and female breast cancer. Drs. Michael Kelsh and Jack Sahl will assess field levels to which women are exposed at work.

VIEWS ON THE NEWS

Translating the Precautionary Principle into Action

The Swiss government is about to adopt the toughest safety guidelines in the world for non-ionizing radiation (NIR). A decade or two from now, people may look back on this as a turning point.

For years, the evidence has been growing that current NIR safety standards allow exposures that cause biological effects. Last October, scientists at a conference in Vienna, Austria, declared that, "Biological effects from low-intensity exposures are scientifically established" (see *MWN,* N/D98).

But, as the Vienna Resolution acknowledges, "The current state of scientific consensus is inadequate to derive reliable exposure standards." Which frequencies, power levels or modulations produce biological effects? Which of these are harmful? For the most part, we just don't know. We have bits and pieces of evidence, not anything close to a comprehensive picture.

How do you protect public health under uncertainty? It's a knotty problem, and some people's instinct is to stick with the status quo. For example, the European Commission (EC) acknowledged last year that there might be some epidemiological evidence for an EMF–cancer link. But the EC argued that "epidemiological data are insufficient to allow the recommendation of an exposure limit" and left it at that (see *MWN,* J/F99). In other words, current standards may be inadequate—but we don't know enough to come up with anything better.

An alternative is prudent avoidance, also known as the precautionary principle. This policy was endorsed by the European Parliament in March, when it backed the ALARA approach: keeping exposure "as low as reasonably achievable," that is, without substantial extra costs.

Unfortunately, this support for pragmatic caution was left mostly at the level of good intentions. In principle, the European Parliament backed ALARA. But when it got down to specific limits on public exposure, the parliament threw up its hands and simply adopted the ICNIRP guidelines, which assume that low-level exposures are safe (see p.5).

Now Switzerland is taking the next step. Swiss public health and environmental officials have put flesh on the bones of the precautionary principle, by establishing exclusion zones around new sources of NIR. These measures to limit public exposure are not as radical as those proposed by the Greens in the European Parliament, but are far stricter than existing international guidelines.

The old guidelines are based on an old paradigm, the view that non-ionizing radiation can't possibly affect living things unless it causes heating. That view gets less credible every year, as evidence of nonthermal effects continues to grow (see, for example, p.8).

Now, for the first time, a government has said that guidelines based on thermal effects are not enough to protect the public. The old paradigm is crumbling, and more changes lie ahead.

"Positive Results" in WTR Brain Tumor Epi Study?

WTR has found links between cellular phone use and brain cancer, Dr. George Carlo told *Microwave News.*

"We have some positive results that will require further study," Carlo said. "It's clear that these findings will rattle some cages." The new study...

That's the article that we might have run if we weren't more skeptical. Carlo made the statements quoted above in an April interview, dangling the "positive results" in front of us the way you might tease a dog with a juicy bone.

Carlo made it clear that he wanted us to do a major story. And we nearly did—until we talked with the study's principal investigator, Joshua Muscat. "To say that I have positive findings is really not correct," Muscat told us. "When George Carlo says that I have positive findings, it really is in terms of a couple of isolated ways of analyzing the data. I would not say it is indicative of what we found" (see p.7).

What's going on?

Just as WTR's bank account starts to run dry, Carlo has started to say there might be something to cell phone health worries after all. Pardon our cynicism, but we've wondered if the two might be connected.

Carlo has also hailed WTR's genotoxicity results as "a very important finding." But concerns about RF/MW exposure and genetic damage have been around for a long time, and WTR never seemed too worried before. Five years ago, Lai and Singh announced that RF/MW exposure could produce breaks in DNA. Read the Lai-Singh letter on pp.12-13 to see how WTR follows up on interesting results.

In fact, WTR destroyed its own credibility long ago. It still won't say how much of its $25 million went to research grants. It can't cover up years of inaction by hyping ambiguous results.

We don't mean that there's nothing of interest in WTR's gene tox findings, or in the Muscat study. There is an urgent need for more research on wireless safety, and it's only right that industry should fund it. But that research should be run by a government health agency—not by WTR.

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