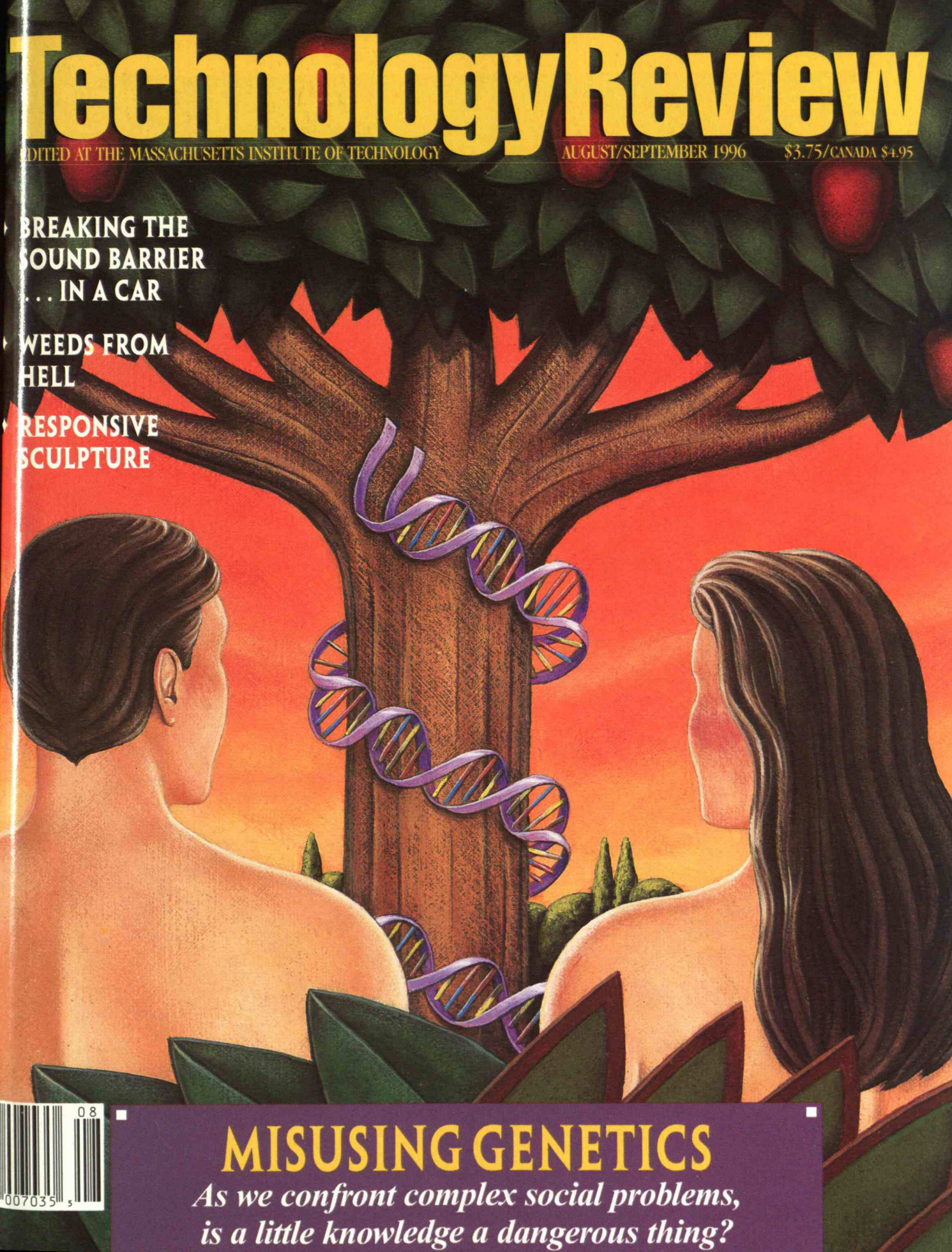


# Technology Review

The cover features a stylized illustration of a large tree with a thick brown trunk and dense green foliage. A purple DNA double helix is wrapped around the trunk. In the foreground, the backs of two people are shown: a man on the left with short dark hair and a woman on the right with long dark hair. They are looking towards the tree against a warm, orange-red background. The title 'Technology Review' is at the top in large yellow letters. Below it, smaller text indicates the publication details. On the left, a list of articles is provided. At the bottom, a purple banner contains the main article title and a subtitle.

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BREAKING THE  
SOUND BARRIER  
... IN A CAR

WEEDS FROM  
HELL

RESPONSIVE  
SCULPTURE

## MISUSING GENETICS

*As we confront complex social problems,  
is a little knowledge a dangerous thing?*







Matt Ryan and design staff on roof of Red Oak House, Dublin, Ireland.

In 1995, LG's annual sales grew 40% to over US\$64 billion.



**It's nice to meet you.**

It's Matt Ryan's job to listen.

As a Senior Designer at LG Electronics Design-Tech, Matt must intimately understand the different aesthetics of each European country. And then translate that understanding into intelligently designed TVs, VCRs, microwaves and other products. (Matt and his colleagues even helped design their company's Red Oak House headquarters.)

At LG, we listen a lot to our customers. We think that habit explains why our sales grew 40% last year. And why we're already leaders in advanced electronic applications like thin-film transistor liquid crystal displays, high-definition TV, and exciting multimedia areas like computers and video-on-demand.

We're also active in fast-growing areas of business such as DRAM memory chips, genetic engineering, pharmaceuticals, satellite communications, and much more.

But we don't believe our size makes us interesting. We think people like Matt Ryan and his fellow designers make us interesting, because the same dedication and customer focus they bring to their work, our 126,000 other employees bring to our other areas of expertise.

Now, how can we help you?





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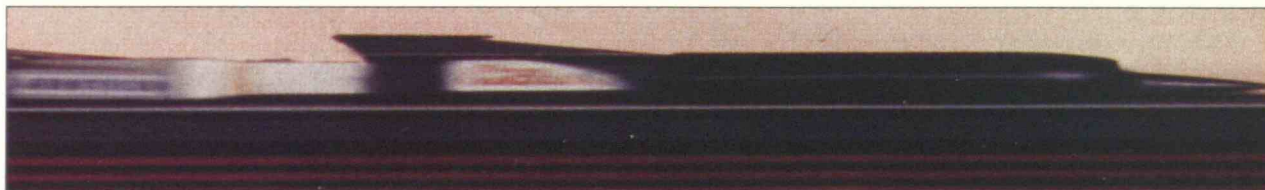
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Two of the world's foremost race drivers—London's Richard Noble and California's Craig Breedlove—will face off this September in an audacious attempt not only to break Noble's land speed record of 633 mph but also to surpass the speed of sound. Noble is relying on sophisticated computer-aided techniques to design his jet-powered vehicle, while Breedlove's approach is seat-of-the-pants. Which of the markedly different cars will carry the day?

COVER: MARC BURCKHARDT



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**Y**ou have to take the good with the bad. Or, the Lord giveth and the Lord taketh away. Or, it's the best of times and the worst of times. Whatever homily one chooses, the irony is still terrible, and painful: just as we at *Technology Review* were rejoicing the arrival of R. Bruce Journey, our new publisher, we began mourning the loss of Peter D. Gellatly, our longtime, esteemed, and beloved associate publisher.

Peter died on May 18, 1996, just a few weeks after his lung cancer

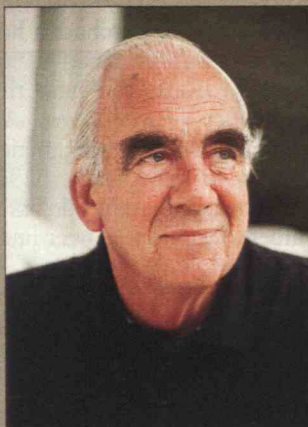
was diagnosed. And while we were shocked by the rapid succession of events and staggered by the trauma of it all, we try to console ourselves in that his suffering was brief and his passing peaceful.

Peter devoted his career to the business side of magazines. With years of experience as an advertising executive for *Newsweek* and the *Saturday Evening Post*, and later as an independent marketing consultant in magazine publishing, Peter brought a business professionalism and commercial savvy to *Technology Review* in 1978 that the magazine previously lacked. Over the next 18 years his sophistication in financial matters and coolness under fire were major factors in the magazine's

## First Line

### A BUSINESS MAN AND A GENTLEMAN

*Peter D. Gellatly*  
1928–1996



growth. The put-up-the-money confidence in the magazine's marketplace potential recently expressed by our owners is due in great part to Peter's quietly competent efforts to keep the enterprise on track and aimed at the big leagues.

But Peter was an enormous asset to *Technology Review* not only as a professional; his decency, thoughtfulness, and easygoing style helped create a collegial atmosphere we've all come to cherish. He was warm and compassionate, charming and dignified, a gentleman to the core.

His practical, down-to-earth ap-

proach instilled immediate and enduring trust. And his fatherly authority and nurturing was a source of security to each of us in a notoriously insecure business.

We at *Technology Review* like to think of the group as a family. But there was also a large and delightful family to whom Peter was literally father, grandfather, and husband. He is survived by his wife, Constance (Wigmore) Gellatly, five children, six stepchildren, and sixteen grandchildren.

We will all miss Peter very much. But we will treasure the legacies of his wonderful contributions at work and at home, in matters both professional and personal.

—THE TECHNOLOGY REVIEW STAFF



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# Letters

## FIELDS OF DREAMS

Thank you for not only providing an excellent overview of the research conducted on electric power lines and their effect on human health in "Apocalypse Not" (*TR April 1996*) by Jon Palfreman, but also for featuring the article on the cover.

While seeking to purchase a home in Arizona, a realtor warned us against moving to a house too near the Salt River Project power lines. After I informed her that electromagnetic fields (EMFs) pose no known risk, she said her customers believe that they do and property values around the power lines subsequently are lower!

The real shame is that other environmental factors have adverse health effects. But as the article's conclusion pointed out, the safe political position will be to fund more pointless studies on electromagnetic radiation and thus soak up the precious little funding available for more worthwhile studies.

GREGORY OLSEN

Tempe, Ariz.

I just turned 70. One great thing about living longer is the perspective it provides on history. In the 1930s, I remember reading claims that EMFs had special healing and curative powers. Decades later, EMFs were blamed for causing cancer. What a difference half a century can make!

Today we know that both views are wrong. The interesting thing is what these episodes tell us about ourselves: generally upbeat on technology then, downbeat now.

HOMER B. TILTON

Pima Community College

Tucson, Ariz.

As an engineer working on electric power, I enjoyed Palfreman's research into magnetic fields and was reminded that everything in life has tradeoffs. Palfreman discusses the actuarial statistics of busing students away from power lines. Just getting on and off the bus—leaving aside the risks of traveling in it—is more dangerous than living near power lines.

In 1991, I represented the Institute of Electrical and Electronics Engineers Energy Policy Committee on a cable TV panel discussion entitled "Cheap, Clean Energy—Are You Kidding?" My copanelists included a representative from the local electric utility and two representatives from the Pennsylvania Energy Commission. When asked about the dangers of electric blankets, I observed that the alleged danger from magnetic fields was less than the mental anguish of worrying about the fields. If the blanket's warmth lets you sleep, turn on the blanket. If you are concerned enough about the blanket that you can't sleep, turn it off.

MARK LIVELY

Gaithersburg, Md.

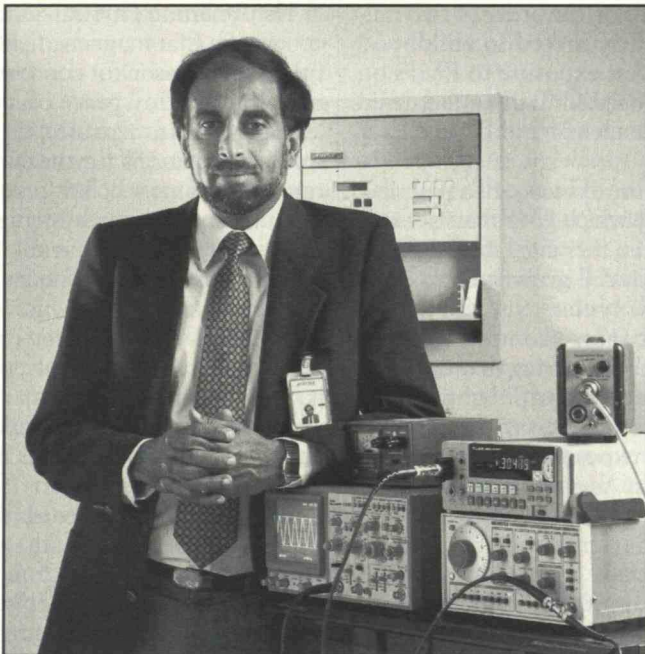
Palfreman claims that scientific research has yielded "no convincing evidence that magnetic fields produced by electric power lines cause adverse health effects." In so stating, he dismisses 50 epidemiological studies of the power-line health hazard that have appeared in peer-reviewed medical literature without accurately reporting their findings.

Readers who tap into the database of the National Library of Medicine in Bethesda, Md., will find that nine of the eleven childhood residential studies of the power-line hazard that have been conducted since 1979 show that children who live in homes close to high-voltage or high-current power lines giving off strong magnetic fields develop leukemia more often than children who do not live in such homes. Six of the eleven studies show that children living near power lines develop brain cancer more often than other children. The cancer ratios in the nine positive studies show that the risk of malignancy among children more heavily exposed to power lines is two to three times greater than that of less-exposed children. The *American Journal of Epidemiology* published five of these studies while the *British Medical Journal* printed two.

Thirty of the forty occupational studies available in the National Library of



# Engineering Reflections:



Shiraz Daya in one of Bose's ten listening rooms.

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*"There are no set limits. If you see a new challenge, or you want to do something new, you have the freedom to try."*

**The Engineer:** Shiraz Daya, Program Manager, System Products Development, BSEE, Massachusetts Institute of Technology

**Date Hired:** February, 1974  
(rehired, August, 1986)

**Last Position:** "I actually began my career at Bose. After six years, I wanted to become involved with state of the art electronics outside the audio field. So, I went to an instrumentation company. Eventually, I began a business with a few other people. While things did not work out as I would have liked, it did give me experience in all the aspects of business. That I enjoyed greatly."

**The Goal:** "As my business began to lose momentum, I talked to friends who were still at Bose. They asked me to consult here, which gave me a chance to see how things had changed. Having helped to run a business, I wanted to keep working in all areas of the business process. As I consulted, I saw such opportunities were available at Bose."

**The Result:** "Since I was rehired, I've been involved in new product development, working with everyone from engineers to marketing staff. Even now, I'm encouraged to stretch, grow, accept new responsibilities, even if they're outside my job description. In fact, that's how all engineers are treated here. Innovation is actively supported. There's little formality, no rigid hierarchy or pecking order. It's very entrepreneurial. Plus, there's an incredible breadth and depth of knowledge, so I'm always learning. My mind stays open."

For more information on opportunities at Bose, please write, in confidence, to Paul McKinley, Director, Engineering Operations, Bose Corporation, The Mountain, Framingham, MA 01701-9168.

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Medicine show that workers exposed to electromagnetic fields (EMFs) on the job—power and telephone line repairers, cable splicers, electricians, electrical engineers, and electric railway workers—experience a statistically significant increased risk of developing leukemia, brain cancer, and other malignancies compared with less-exposed workers. Almost all these studies have been published in leading medical journals, including the *American Journal of Epidemiology*, the *New England Journal of Medicine*, the *Lancet*, and the *American Journal of Industrial Medicine*. Thus, a clear preponderance of the peer-reviewed epidemiological evidence indicts EMFs as a cause or promoter of cancer.

Palfreman declares that a 1994 study of Canadian workers “found a small association with leukemia.” In fact, this study of 223,000 electric-utility workers showed that those with greater-than-average cumulative exposure to EMFs were more than three times more likely to develop acute myeloid leukemia than their less-exposed colleagues. Moreover, in a group of 31,503 Ontario Hydro workers who were followed after retirement, those workers with greater-than-average cumulative exposure were found to develop acute myeloid leukemia at a rate almost 38 times greater than their less-exposed colleagues.

The author then refers to “another study by David Savitz and his colleagues at the University of North Carolina [that] found no link with leukemia but a small association with brain cancer.” Actually, a Savitz study of 138,905 men employed by five U.S. power companies found more than twice the risk of leukemia in electricians with more than 20 years’ work and nearly twice the risk of brain cancer among all workers with 5–20 years of employment.

Palfreman fails to provide the findings of an 11-member committee of the National Council on Radiation Protection (NCRP), whose unanimous con-

clusions received prominent attention in the August 18, 1995, issue of *Science*. Upon examining the same studies that Palfreman did, the committee declared that exposure to power-line magnetic fields on the order of two milligauss is clearly linked to childhood cancer, and that exposure to EMFs on the job is associated with an increased incidence of leukemia and brain cancer in adults.

Regarding the existence of a plausible mechanism by which EMFs can cause or promote cancer, they cited studies showing changes in cell growth-related enzymes that are “consistent with actions of chemical cancer promoters.” They also cited studies showing that the natural defense response of T-lymphocytes taken from the immune systems of mice is reduced by exposure to extra-low frequency EMFs. As a result, they recommended that:

“1. New day-care centers, schools, and playgrounds should not be built where ambient 60 Hz magnetic fields exceed two milligauss.

“2. New housing should not be built under existing high-voltage transmission lines or in such close proximity to these lines that measured ambient field levels would exceed two milligauss for periods longer than two hours daily.

“3. New transmission and distribution lines should not be built in locations where they would produce fields exceeding two milligauss in existing housing.”

PAUL BRODEUR  
North Truro, Mass.

*Brodeur, a staff writer for the New Yorker, is the author of two books—Currents of Death and The Great Power Line Cover Up—on the alleged effects of EMFs.*

The correlations between elevated exposure to EMFs and adverse health effects may be just “statistical noise.” However, the links might also be screams barely discernible in a cacophony of multifaceted epidemics of degenerative diseases. Thus, it is absurd—no, irresponsible—for Palfreman to suggest that we close the book on this matter.

The American Physical Society’s 1995 conclusion that magnetic fields pose no risk is scant reason for comfort. It would be helpful for my peace of mind, or at least grudging acceptance, if there were solid explanations for the current high rates of ailments like cancers and immune and nervous system disorders. The honest admit much is unknown, and something is amiss. Technocrats typically claim such patterns are in no way related to pollution, be it magnetic or chemical or synergistic. Unfortunately, their denial is rarely accompanied by an alternative explanation. So they have failed to convince me that technology has no remaining hidden edges.

While the 1992 Swedish study that linked power lines with childhood leukemia was accused of “multiple comparisons fallacy,” I do not believe this renders the study invalid. In light of the study’s conclusion, Sweden has implemented major reductions in exposure guidelines for workplaces involving specific products such as computers.

If Palfreman were to decide policy, all such “phantom” risks would be discounted. Technology must remain on trial to ensure its safest and most judicial use.

LEIF JOSLYN  
Arcata, Calif.

As an architect, I counsel planners, designers, and administrators to consider and compensate for the possible risk of exposure to EMFs. In the future, it may be acceptably proven that a causal EMF-cancer link does not exist. I would then most happily apologize to those prudent plan-

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E-mail: <technology-review-letters@mit.edu>. Please include your address, telephone number, and e-mail address.  
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