UW Scientist Henry Lai Makes Waves in the Cell Phone Industry

Naomi Ishisaka | January 2011 | FROM THE PRINT EDITION

A greeting card on bioengineering professor Henry Lai's office wall at the University of Washington contains this quotation from Ralph Waldo Emerson: "Do not go where the path may lead; go instead where there is no path and leave a trail."

This philosophy could well sum up Lai's work on the effects of low-level radiation on DNA, as well as what he believes should be the guiding principle of science: independent investigation and research leading to discovery for the public good. Yet the soft-spoken scientist's steadfast belief in that principle has placed his research at the center of a persistent global controversy and created powerful enemies that tried to get him fired and essentially succeeded in drying up the source of funding for the type of research he was doing.

Lai admits that he was naive. He came to the UW in 1972 and earned a doctorate in psychology. Two decades later, as a bioengineering researcher, he studied esoteric scientific topics in relative obscurity. He and a fellow researcher, Narendra "N.P." Singh, were looking at the effects of nonionizing microwave radiation—the same type of radiation emitted by cell phones—on the DNA of rats. They used a level of radiation considered safe by

government standards and found that the DNA in the brain cells of the rats was damaged—or broken—by exposure to the radiation. Ironically, cell phones weren't even on Lai's mind when he performed the initial studies. Funded initially by the Office of Naval Research, Lai was investigating how radar, which emits radio-frequency radiation, affects the health of operators. "We did not really pay attention to the importance of this thing," he recalls. But during his research, cell phone giant Motorola Inc. indicated that someone had told the company about Lai's unpublished results. Motorola asked to meet with him in his lab and at a meeting in Copenhagen.

After Lai and Singh's research finding an effect on DNA was published in 1995, Lai learned of a full-scale effort to discredit his work. In an internal company memo leaked to Microwave News, a publication that examines health and environmental effects of electromagnetic radiation, Motorola described its plan to "war-game" and undermine Lai's research. After initially accepting industry funding for continued research from the Wireless Technology Research (WTR) program (created to manage $25 million in research funds), Lai and Singh wrote an open letter to Microwave News questioning restrictions placed on their research by the funders. After that, the head of WTR sent a memo asking then-UW president Richard McCormick to fire Lai and Singh. McCormick refused, but the dustup sent a clear message to Lai and his colleagues.

"This shocked me," Lai says, "the letter trying to discredit me, the 'war games' memo. As a scientist doing research, I was not expecting to be involved in a political situation. It opened my eyes on how games are played in the world of business."

Thus was launched an epic battle over research and truth. If Lai and Singh were correct about the potential impact on brain cells from radio-frequency radiation, there could be billions of dollars on the line for the cell phone industry in potential liability, leading to significant design changes and lost market expansion.

To the layperson, the science behind Lai's work, which was largely funded by the National Institutes of Health, and industry-funded research to contradict it is mind-numbingly complex. Virtually every assertion of risk has a counterassertion of no risk. For every independent study showing damage to DNA and memory, there is a study showing the opposite.

Lai, 61, says this phenomenon could be a direct result of the way science is now funded around the world. "[The U.S. was on] the cutting edge of this whole area for the last 30 years. [But] right now, we're the Third World country. We're not doing research at all," Lai says. With government funding all but nonexistent, the bulk of scientific research is funded by private industry. "The mechanism is funding," Lai says. "You don't bite the hand that feeds you. The pressure is very impressive."
The massive Interphone study, coordinated by the International Agency for Research on Cancer and released in May 2010, exemplifies these challenges.

Purported to be the definitive word on cell phone radiation and brain tumors, Interphone involved 13 countries (all outside the U.S.), $25 million, and thousands of tumor patients and controls. Conducted over 10 years, the widely anticipated study was supposed to at last provide clarity on the risks of cell phone use. Yet, once again, the science was divided. The day after the study's release, headlines read, "No answer, just fuzz, from cell phone study," and, "One conclusion emerges from Interphone study: Controversy will continue."

Why, after so much money and time, were the data so mixed? Louis Slesin, editor of Microwave News, says there were a number of problems with Interphone. "When we started interviewing the protagonists," he says, "we realized there was a lot of conflict going on. It was a bitter struggle. It tells you the interpretation of the data is not clear cut in any way."

For the purposes of the Interphone study, a person who used a cell phone 30 minutes a day for more than 10

years was considered to be subjected to heavy exposure. Today, that level of cell phone use (900 minutes a month) is average. The people defined as the most heavily exposed in the Interphone study now represent the average user.

To illustrate that point, Elisabeth Cardis, head of the Interphone study, was quoted as saying, “In my personal opinion, I think we have a number of elements that suggest a possible increased risk among the heaviest users, and because the heaviest users in our study are considered the low users today, I think that’s something of concern. Until stronger conclusions can be drawn one way or another, it may be reasonable to reduce one’s exposure.”

Lai’s frustration with the increasing body of contradictory research led him to do an analysis in 2006 of the available studies on cell phone radiation between 1990 and 2006, and where their funding came from. What he found was that 50 percent of the 326 studies showed a biological effect from radio-frequency radiation and 50 percent did not. But when he filtered the studies into two stacks—those funded by the wireless industry and those funded independently—Lai discovered industry-funded studies were 30 percent likely to find an effect, as opposed to 70 percent of the independent studies.

Lai says that, while his findings highlight the crucial role industry funding plays in scientific research, the 50-50 split alone should be cause for concern. “Even if you accept all the industry studies, you still end up with 50-50,” he says. “How could 50 percent all be garbage? People always start with the statement ‘Hundreds of studies have been done on this topic, and no effect has been found,’ but this is a very misleading statement. [The statements] come out from the cell phone industry, and people just use it, like the American Cancer Society. People haven’t even gone in to look at the real studies and look at the effects that people have reported. This really worries me, because people come out and say things without the facts.”

Slesin agrees and says Lai’s work is important for the research that does show effects from radiation. “[Lai] is one of the most widely cited scientists in this field,” Slesin says.

The American Cancer Society did not reply to requests for an interview. Its official position on the risks of cell phone use states: “Radio frequency (RF) waves given off by cell phones don’t have enough energy to damage DNA directly. Because of this, many scientists believe that cell phones aren’t able to cause cancer. Most studies done in the lab have supported this theory, finding that RF waves do not cause DNA damage.”

CTIA-The Wireless Association, the cell phone industry trade organization, also declined to comment for this story, but its website states: “To date, global health organizations believe that the available scientific evidence does not show that any health problems are associated with using wireless phones. Many studies of low-level RF exposure, such as that which occurs with wireless devices, have not discovered any negative biological effects.”

Dr. Beth Mueller, an epidemiologist at the Fred Hutchinson Cancer Research Center in Seattle, acknowledges that there is not strong evidence linking cell phones to brain tumors. But Mueller warns that the research is difficult and that much more study is needed. “I think [cell phone radiation] would be important to study. There are no studies I know of on the possible impact on children and I think it’s something that many people–including some people here at the Hutch–want to see evaluated. I’m concerned because children are using [cell phones] a lot. It’s something that should be looked at, definitely.”

Katy Rock would agree. The Kirkland resident is an athletic 31-year-old who began having headaches in her late teens. “Headaches became an unwelcome fact of life for me in college,” she says, “at first always after running around on the soccer or lacrosse field. So I assumed for years that it was due to dehydration/nutrition problems or just being out of shape. Eventually, they got worse. I started having them with no explainable cause.”

It wasn't until a she had a seizure in 2007 that Rock discovered something was terribly wrong. The next day, she underwent an emergency double craniotomy to remove a tumor the size of a small lemon from her right frontal lobe and two tumors the size of large grapes from her right temporal lobe. A biopsy showed the cancerous tumors had been growing for about 10 years. A year of chemotherapy followed.

Rock was an early adopter of cell phones. Given a phone as a gift during college in 1997, she recalls using it about two to three hours a week (about 630 minutes a month). Her usage increased in later years with a job that required her to be on call. She is right-handed, and her tumors were on the right side.

Rock, who recently completed her first 5K run in support of Seattle Children's Hospital's Pediatric Brain Tumor Research Guild, would not be surprised to find a link between cell phones and brain tumors. "When I was in college, I used to charge my cell phone at night, and the charger cord ran over a leaf of my philodendron plant," she says. "Over time, the strip on the leaf where the cord touched turned brown. The small amount of power running through the cord was enough to kill some cells of the otherwise healthy plant."

While Rock's tale is merely metaphorical, its suggestive import is not lost on Devra Davis, Ph.D., a huge admirer of Lai's work to raise awareness about the potential hazards of cell phone radiation. Davis is a longtime toxicologist, public health expert and founder of the Wyoming-based Environmental Health Trust, a group that provides basic research and training on environmental health hazards. Davis' most recent book, released last October, is Disconnect: The Truth About Cell Phone Radiation. Davis calls Lai a "hero" for his groundbreaking work. "[Lai] has made a tremendous impact on the field in many aspects. Not just on the field of DNA, but on the brain, on receptors. In a fair and just world he would be a serious candidate for the Nobel Prize, because he did foundational research on the way the body responds to electromagnetic and radiofrequency radiation and because he persisted in the face of many challenges. He's been outstanding and indomitable in the face of opposition that would have overwhelmed most people."
In her book, Davis describes a disconnect between the general public's largely unquestioning acceptance of cell phone radiation and the large body of evidence suggesting cause for concern. With Lai's work as her foundation, Davis demonstrates a pattern of the cell phone industry's scientific manipulation spanning decades. Davis is particularly concerned because the rate of cell phone use by children is skyrocketing—with three out of four 12-year-olds and half of 10-years-olds in the U.S. now possessing a cell phone. Even more troubling: Lennart Hardell, Ph.D., a researcher in Sweden, found that those who began using cell phones in their teens (such as Rock) had four to five times the number of malignant tumors by their late 20s as those who did not use cell hones as teenagers.

While Davis would argue that there is a proven, causal link between cell phones and tumors, Lai does not. What he does say is that there is enough reason for concern, and that a "precautionary principle" should be embraced, as France has done in warning against cell phone use by children, and as San Francisco has done in mandating information on "specific absorption rates" of radiation on cell phone packaging.

"European countries generally believe you need some kind of precautionary approach," says Lai, who does not own—or use—a cell phone. "What else can we do? Obviously, we don't know the answer at all. But, then, there is a cause for concern. We need to take some kind of precautionary action." For now, however, Lai will continue to do research on the drug artemisinin—long used by Chinese herbalists—for applications in cancer treatment, because there is no longer any independent funding available for his research on the effects of nonionizing radiation.

Meanwhile, Davis, who uses a cell phone but only with a headset or as a speakerphone (she never keeps it close to her body), hopes that by the time the public realizes the importance of the path Lai has been on, it won't be too late. In Disconnect, she wonders how our grandchildren will answer these questions: "Did we do the right thing and act to protect them? Or did we harm them needlessly, irresponsibly and permanently, blinded by the

addictive delights of our technological age?”