Sam Milham: An Appreciation

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John Snow is known as the father of modern epidemiology, best remembered for helping end the 1854 cholera epidemic in London. At the time no one yet knew that cholera is caused by bacteria, but Snow had long suspected that it was transmitted by food or water. In the hard-hit neighborhood of Soho where hundreds had died, Snow mapped the location of the homes of the victims and could see that most lived near the Broad Street water pump (see image below). Snow was able to persuade local officials to remove the handle of the pump and soon the epidemic subsided.



The black bars indicate cholera cases. The blue circles show the location of neighborhood water pumps; the one in the middle is the Broad Street pump. There is an alternative view: Snow's map was not what convinced him that drinking polluted water from the pump caused cholera but rather that it confirmed his earlier insight that the agent entered through the mouth —an idea that was at odds with then-dominant theories. See: "Map-Making and Myth-Making in Broad Street," *Lancet,* 2000. *Source:* Map adapted from Wikipedia.

Sam Milham is a world-class epidemiologist who follows in Snow's footsteps. After a long, productive career —detailed in his new autobiography, *Dirty Electricity*— Sam is now on the trail of another invisible agent that he believes is causing an epidemic of many different diseases, most especially cancer. (Sam calls them the "diseases of civilization.") He is convinced that they are caused, at least in part, by EMFs and especially by high-frequency transients (little bursts of electromagnetic energy) or what he calls dirty electricity.

Like Snow, Sam's top priority has always been public health. And Sam has never been afraid to say what's on his mind. If that means speaking out and taking action before every "t" is crossed and every "i" is dotted, so be it. But that's as far as the parallels with Snow and cholera go. Sam's ideas about transients and cancer are not getting any traction.

This is nothing new for Sam. He's been ahead of the pack on EMFs for 30 years. Time and time again, Sam has come up with original and provocative ideas that have opened —or should have opened —new avenues of research, only to see them fall by the wayside. Sam has run up against the same brick walls that stymied Ross Adey, Robert Becker, Abe Liboff and Nancy Wertheimer and other EMF pioneers. Low-level effects are simply impossible, according to the prevailing dogma, so anyone, including Sam, who believes that EMFs can lead to cancer, must be wrong.

We pause to acknowledge that Sam is a friend of ours, a good friend. We've known him for close to 30 years and written news stories on just about every one of his EMF papers. Most of all, we think what Sam has to say makes a lot of sense.

A Letter to the *New England Journal of Medicine* Makes Waves

Sam has published papers in the world's most prestigious journals for 50 years, including *Science, Lancet, Nature* and the *American Journal of Epidemiology* (here's a complete list of publications). Some have had a major impact.

Consider the association between EMFs and occupational cancer. We long ago lost count of the number of papers that have linked workplace exposures to various types of cancer —Sam says there are now more than 100. He started this entire branch of environmental epidemiology back in the summer of 1982 with a letter to the *New England Journal of Medicine.* Using a database of occupational mortality in Washington state he spent years developing and fine-tuning, Sam discovered that more EMF-exposed workers died from leukemia than would otherwise be expected. (Sam spent most of his career at the Washington State Department of Health.)

The letter sparked many others to look at their own data sets and, when they too saw a similar increase, larger and more expensive studies got under way. It soon became apparent that leukemia wasn't the only cancer in play: notably, EMFs have also been linked to brain, breast and lung cancer. By 1990, at least a dozen papers

linked EMFs to brain cancer alone. “There are far too many positive studies to dismiss an EMF-brain tumor connection,” Sam told us at the time.

Five years later, a group at the University of North Carolina (UNC) completed a large study of electric utility workers with money from EPRI, the industry’s research arm. It showed higher rates of mortality from brain cancer but not leukemia. The industry interpreted this to mean that all cancer risks could be discounted. The logic, though bizarre, goes like this: Because some studies point to leukemia and others point to brain cancer, there’s no consistency and therefore they must all be wrong. No one at EPRI even paid lip service to the idea that we should sort out what the EMFs could actually do. Here’s how Jack Sahl, a long-time industry operative, pushed the party line after the release of the UNC study: “One of the hallmarks of what we look for … is consistency in studies, the same outcome from the same kind of exposure. We haven’t been able to achieve that to date” (see *MWN,* J/F95, p.10).

In the years that followed, other studies came out with conflicting results and further muddied the waters. By cherry picking those papers that best fit your particular point of view, you could reach any desired conclusion. Even though a large body of work pointed to a cancer risk, most everyone took the path of least resistance and accepted the industry argument that it was time to move on. Gilles Thériault, the former head of the Department of Occupational Health at McGill University was one of the few who resisted taking the easy way out. “We keep seeing smoke,” he told us long ago, “but we have not identified the fire. And there is fire out there. One day, we will put our finger on it” (see *MWN,* J/F95, p.8).

So far, no one has. Today these associations continue to be treated as statistical oddities that are best ignored. All the while, industry keeps steamrolling towards its ultimate objective: Discrediting any and all concerns over EMF health effects —with no shame as to the consequences to worker health.

Earlier this year Leeka Kheifets, another industry operative, proposed shutting down a major branch of occupational health research —on electric fields, a very promising area, but one that has gone out of favor over the last decade (see the “Real Junk Science of EMFs”). How her misbegotten plan got into a peer-reviewed journal is a mystery that remains unresolved. On reading what Kheifets and her industry pals were trying to get away with, Sam was close to speechless.

Even Those At Risk Don’t Want To Know

Industry interests are not the only ones throwing up roadblocks. It may sound strange but even those who are at risk don’t want to find out what’s going on.

When Sam first saw his Washington State data —before his letter appeared in the *New England Journal*— he wrote to the safety director of the International Brotherhood of Electrical Workers (IBEW) asking for help to “confirm or refute” the leukemia risk. It would seem to be a no-brainer. The workers would find what they

needed to know and it wouldn't cost the union a dime. The IBEW turned him down flat. Five years later, Sam tried again and the IBEW refused again. Sam then went to the president of the IBEW. He got nowhere. The study never happened.

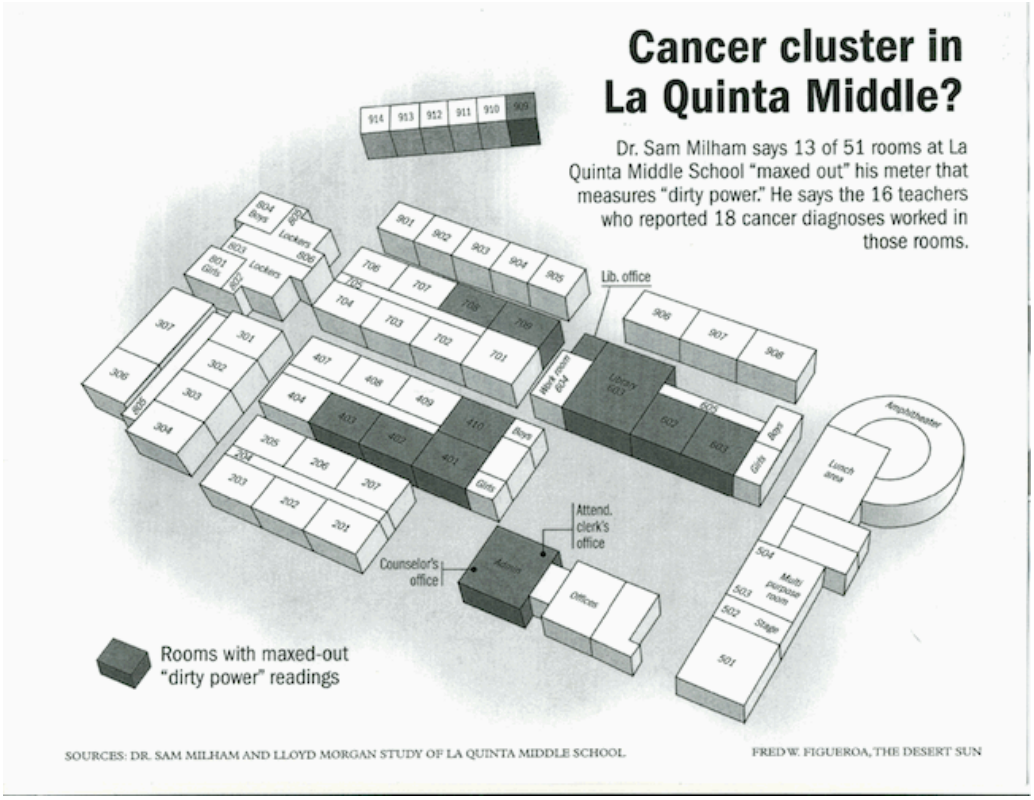
Sam didn't give up. He identified another EMF-exposed population, amateur radio operators, and he had a clever idea about how to study them. Sam collected the death notices published in *QST,* the monthly magazine of the American Radio Relay League (its membership runs over 150,000), and matched them with death certificates. Once again, Sam found an increase in leukemia. He wrote up the results in a letter to *The Lancet*, published in 1985. He concluded that there was now "further support for the hypothesis that electromagnetic fields are carcinogenic."

Sam wanted to do a bigger study. He contacted the ARRL directly and asked for access to its records. The ARRL blew him off just like the IBEW had done. The league's motives are as perplexing as the union's, but its position was crystal clear. In its own letter to *Lancet,* the ARRL called Sam's EMF-cancer hypothesis "purely speculative." It wanted nothing to do with him. The negotiations went on for close to a year, but the ARRL never budged.

Luckily, Sam found another way. Amateur radio operators are licensed by the Federal Communication Commission, and so a lot of what Sam needed was available on a government computer tape. You just had to know to ask for it. When the analysis was done, Sam had fresh support for the cancer link. His critics had complained that the *QST* study was too rough to be trusted. Now, Sam had shown the same results with a different, more reliable data set. In 1988, they were published in the *American Journal of Epidemiology,* the leading journal in the profession.

Despite all Sam's ingenuity in getting the studies done at all and then showing a consistent effect, the ARRL still won the war because no one followed up. Today the ARRL continues to deny there might be a problem and Sam's work is treated as little more than a footnote in the EMF literature.

Sam retired in 1992, but he never let go. Tired of the rainy Washington weather, he now winters in the southern California desert. One February morning in 2004, he read about a cluster of cancer cases among teachers at a local school in La Quinta and decided to investigate. Just as John Snow had done in London, Sam mapped out where the teachers who had cancer worked and then he determined which rooms were believed to have the highest EMFs and became convinced that the cancers were due to high-frequency transients, or dirty electricity (see diagram below).



Note: Disregard the second sentence of the text in the graphic above, which begins "He says…"

The correct statistic, according to Sam MIlham, is that teachers who *ever* worked in a classroom with a maxed-out dirty power reading over a ten-year-or-longer stint at the La Quinta school had seven times more cancer than would be expected by chance. A highly significant risk. See Table IV of Sam Milham and Lloyd Morgan's paper, "A New Electromagnetic Exposure Metric: High-Frequency Voltage Transients Associated with Increased Cancer Incidence in Teachers in a California School" in the August 2008 *American Journal of Industrial Medicine. Source: Desert Sun* (CA), April 27, 2007.

Hydro-Québec Suppresses Work on Transients

Sam first came across electromagnetic transients in 1994 at a conference in Albuquerque where McGill's Gilles Thériault presented some of the most important epidemiological findings in the history of EMF occupational studies. The cancer risks reported by Thériault were large by any standard (up to a tenfold increase) and unprecedented in the EMF literature. He could also see a classic dose-response. *Microwave News* was at the meeting too. "Clearly, there is something different about high-frequency-transient exposures that needs to be followed up," Sam told us in Albuquerque (see *MWN,* N/D94, p.5).

As will come to no surprise by now, there was no follow-up. This time the industry set a new low in bad behavior. Hydro-Québec, the Canadian electric utility that helped pay for the study, got so angry that Thériault had dared publish and discuss his findings in public that it stopped all further work on transients. Hydro-Québec confiscated the data and walked away. Sadly no one other than Thériault and Sam protested. No one else dared alienate industry executives who were the only ones that might pay for future epi

studies. They need not have worried. Even with their silence, there were no more studies of transients —until Sam started talking to the teachers at the La Quinta Middle School about their high cancer rates. Sam recounts the discouraging La Quinta story in *Dirty Electricity.*

Sam's book is chock-full of interesting stories and anecdotes. An especially important one —another that has been ignored too long — is Sam's hypothesis about how electrification caused a marked increase in leukemia among two-to-four year olds over the course of the 20th century.

Will Anyone Speak Up?

Sam is an epidemiologist and has epidemiological data to support his indictment of transients. But many questions about biology and engineering remain unanswered. The most important are: What types of transients (frequencies, waveforms, etc.) are biologically active? At what intensities? Who is exposed? And where? Yet again, no one has come forward to fill in the blanks. Some activists are on Sam's side, but the problem appears to be too difficult for them to resolve on their own.

No one knows how this story will end, nor which parts Sam has gotten right and which he might have gotten wrong. If the past is any indication, we should fear the worst: Sam's work will yet again be buried in doubt and uncertainty. Take a look at the travesties that some call EMF science and see if you think Sam's work got a fair shake. At the very least, read his book and celebrate a man of ideas, a man who has never stopped fighting for what he believes in.

Sam closes *Dirty Electricity* with this proposition: "Good science alone is never enough to force sensible public policy. Only citizens can do that." So if you find Sam's ideas compelling, do what he would do: Speak up.

Sam Milham, Dirty Electricity, ELF EMFs, John Snow, Hydro-Québec, Michel Plante,

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