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Committee on Appropriations

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It is a distinct honor and great privilege to present information before this subcommittee on a matter of tremendous importance to this country and to the world—the relationship of cell phones to our health. This subcommittee is to be commended for bringing public attention to this issue through holding the first Senate hearing on cell phones in about there decades.

My remarks today will draw on my three decades of experience as a public health researcher, teacher and writer. I was the founding director of the Board on Environmental Studies and Toxicology of the U.S. National Research Council, National Academy of Sciences, where I also served as Scholar in Residence, from 1983-1993. I was confirmed by this body as presidential appointee to the U.S. Chemical Safety and Hazard Investigation Board from 1994-1999. More recently I founded and directed the Center for Environmental Oncology at the University of Pittsburgh Cancer Institute from 2005 until 2009. I am currently a Professor of Epidemiology in the Graduate School of Public Health. I have served on numerous governmental and international advisory boards, including the National Toxicology Program Board of Scientific Counselors and the World Health Organization, health indicators program. I have also advised governments in China, Mexico, Brazil, Israel, France, the European Union and local governments throughout the world.

Designated a National Book Award Finalist for my first popular book, When Smoke Ran Like Water, in 2002, my recent book The Secret History of the War on Cancer was a Newsweek must-read pick for the week and has just been released as a paperback. Both works have

been translated into Italian and Chinese and been the subjects of documentary television and public radio and television coverage.

I have held a number of academic appointments including Visiting Professor at Carnegie Mellon University's Heinz School, Honorary Professor, London's School of Hygiene and Tropical Medicine, and expert Advisor to the World Health Organization. I have authored more than 190 publications in books and journals ranging from Scientific American to the Journal of the American Medical Association and the Lancet, and the Annals of the New York Academy of Sciences, and have also written for the New York Times, the Los Angeles Times, and other mass media outlets. Recently, I have established the Environmental Health Trust, a nonprofit foundation dedicated to identifying and controlling environmental causes of illness (www.environmentalhealthtrust.org). Among the awards I have received are: The Lisa Zhang Environmental Award of the United Nations 2008, the Artemis Award from the Euro-American Women's Organization and the Greek Ministry of Foreign Affairs in 2009, the Women's Leadership Exchange Compass Award, presented by OPEN: The Small Business Network from American Express, for breaking the paradigms of how women are perceived and the first Rachel Carson Award from the Rachel Carson Homestead in 2008. I was also privileged to be part of the group receiving the Nobel Peace Prize with Al Gore in 2007 for serving as a Lead Author of the Inter-governmental Panel on Climate Change.

I speak to you today as a scientist, and as a citizen of this great democracy who is also a mother and a grandmother. I am deeply concerned about the absence of a major program of research on cell phones and our health. I want to know, as do the American people, why are other governments acting to warn about the need for safer cell phone use while ours is silent on the matter?

This hearing presents a welcome opportunity to address a subject little discussed in the United States. We know that cell phones have revolutionized our lives for the better. They have radically changed the nature of emergency response and warfare. They have improved our sense of security. But, we must admit that we don't know whether some of their uses place us and our children at risk in the long term and whether there are simple measures to take to reduce those risks. Certainly, we have heard today of growing concerns about the impact on our health from cell phone use from distinguished researchers and national leaders of efforts in Israeli and Finland —countries with great sophistication regarding radar and electronics. We are agreed that additional research is critically needed to clarify the potential hazard of cell phones, which are currently being used by more than half of the world—a great proportion of today's users are under age 30.

We have learned that Dariusz Leszcynski, PhD, DSc, who is a Research Professor at STUK – Radiation and Nuclear Safety Authority, Helsinki, Finland and Siegal Sadetzki, MD, MPH Head of the Radiation and Epidemiology Unit at Sheba Medical Center, Gertner Institute of Epidemiology, Tel Aviv Medical University and a key advisor to the Israel Radiation Protection Branch, are conducting important research on the question of what cell phones may mean for our health.

In Finland, Israel, China, and the European Union, governments are officially warning citizens about the safer use of cell phones even while that research is still underway. Similar advisories exist in England, France, and some of the states of India and Russia. We have to ask: What do these countries know that we do not?

There is much that we do not know. It will be expensive to resolve many of the issues that must be addressed. But, we do have some information, as the meeting I am

chairing in Washington, D.C. this week makes clear. We know that cell phone radiation, hereinafter referred to as RF, can cause biological impacts in experiments with cell cultures and with laboratory animals at levels that do not produce heat or thermal effects.

We must admit that there is another reason why we in the U.S. lag behind other nations in addressing these problems. As I have documented in my book, The Secret History of the War on Cancer, public discussion in the U.S. about potential cell phone risks remains obscure because of well-honed efforts by some in the cell phone industry to keep us confused.

The question before this body is what is direct evidence at this time on cell phones and health and what do we do while we wait for science to evolve?

That question is not merely a matter that can be answered by science, but will require leadership and a vision of basic public policy. We must ask what is the downside risk of doing nothing to reduce exposures at this point, compared to the risk of acting as other governments have to issue warnings. We must also consider what sorts of policy options should be used to convey information and whether it is appropriate for this government to take specific actions at this time that are in line with those taken by others..

Let me stress that the science on this issue is truly complex. It will be expensive to resolve many of the issues that must be addressed. The battleground has been drawn in the realm of

both experimental findings and with regard to public health research. Henry Lai has pointed out that if one examines the funding for studies, a simple pattern emerges—studies funded by industry directly are overwhelmingly negative and find no effect of RF in animals or humans. Those studies that are independently funded and have examined people for a decade or longer tend to be positive and find that RF is linked with a host of ailments, ranging from cardiac disturbances to fatal brain tumors. ,The challenge we face is enormous. While science continues to evolve in its understanding of RF signals and our health what do we do while we wait? That question is not merely a question of science, but of basic public policy.

Science is a complicated discipline. When it comes to evaluating potential hazards in the environment, we do not have the luxury of waiting several decades for scientific clarity. We are forced to take precautionary steps while scientific information becomes clearer. The existence of scientific uncertainty should not become an excuse for inaction. In this regard, the decision to take no action, to do nothing, must be understood as a decision to continue the status quo.

As you are well aware the history of regulatory interests makes it clear that in the matters of lead in gasoline and the control of tobacco had we acted sooner to reduce these hazards millions would have been spared damaged brains and lungs. This history tells us that we are obliged to make good sense of what is known at this time about cell phones and our health.

As this chamber knows full well from the sorry history of tobacco, those who do not like particular scientific findings have proven especially adept at treating science as nothing other than a public relations tool. Yet there is no one reading this testimony who doubts we should have acted sooner to address the hazards of smoking or those of lead in gasoline..

As this body itself determined, the reasons for delays in controlling tobacco had much to do with politics not with science. When President Nixon launched the “War on Cancer “in 1971, he ignored the Surgeon General’s 1964 declaration that tobacco was a cause of poor health. And President Jimmy Carter fired Secretary of HEW Joseph Califano in 1979, when Califano had the nerve to declare tobacco public enemy number one. At one point in the 1970s, the National Cancer Institute was led by a four pack a day smoker who spearheaded an effort to spend taxpayer dollars to develop a safe cigarette. The U.S. government actually spent millions of taxpayer dollars to develop a safe cigarette and continued to subsidize tobacco well into the 1990s. The government only began to try to restrain this dangerous habit about a decade ago, after the epidemic of smoking-related disease became undeniable and after incontrovertible evidence was revealed of the duplicity of the tobacco industry in manipulating science and regulatory policy on the issue..

As a result of these delays in addressing the dangers of tobacco, the world is now reeling from a massive global epidemic of lung cancer, with more than a million cases expected this year in China alone

What *about* cell phones? What do we really know about their safety? Consider these undisputed facts.

Fact: Brain tumor rates are increasing in young adults in several nations, including this one. Brain cancer deaths are now the leading cause of cancer deaths in children in this nation, Sweden and Australia among others. In truth we cannot attribute this or the puzzling and sad rise in autism to cell phones. But, clearly this is a matter that requires serious attention. .

Fact: The Federal Communications Commission sets standards for the amount of radio frequency that can be emitted by a cell phone is based on models of a man's head. And not just your average Joe, but also one who ranked at the top 90th percentile of all military personnel in 1988, weighing in at 200 pounds, and who held the phone to his ear for six minutes. Also, what few parents know is that radio-frequency signals reach much more deeply into children's thinner and smaller heads than ours-—a fact established through the pioneering work of professor Om P. Gandhi, the leader of the University of Utah's electrical engineering department and confirmed recently by studies developed by Niels Kuster and his colleagues in Austria. While these two engineers may differ on the details of their models of the brain, their work makes it clear that children's brains differ in important ways from those of adults. Their skulls are thinner. Their brains contain more fluid. As a result, even if exposures were identical in the depth of the skull that they reach, the potential for doing damage is much greater with the young brain. Whether the elderly face different risks is also an important question to explore.

Fact: The agency that offers recommendations on cell-phone emissions in the U.S. — the Federal Communications Commission doesn't employ a single health expert. The standards the FCC adopts are based on advice given by outside experts, many of whom work directly for the cell-phone industry. Unlike with drugs that are tested before being used, the Food and Drug Administration lacks the authority to set standards for cell phones and can only act if a phone is shown to release hazardous signals.

What's wrong with this picture? The award-winning Gandhi worries that all the standards used for phones apply to the "big guy" brain. In 2004, standards became looser as a result of a new approach that basically doubled the amount of radio frequency that could reach the brain of an adult and quadrupled that reaching a child's. The brain of a child doubles in the first two years of life and keeps on developing until their early 20s. Gandhi no longer works with the cell-phone industry and none of his grandchildren, or mine, uses a cell phone.

Fact: Many of the negative studies on cell phones and human health involve short period of exposure with much older phones. Thus, one of the most widely cited studies of cell phone safety is that of the Danish Cancer Society, which studied close to half a million-cell phone users as of the mid 1990s. They excluded all business users from their study—the group most likely to use the phone the most. They found no increased risk in all the others.

Surely, today's phones and the ways we use them are far different from what went on in Denmark a decade ago, when cell phones were as heavy as small briefcases.

Proving harm in science is not a simple matter, especially when it comes to a technology as powerful and widely used as cell phones are today. The science that is implicating cell phones today includes both experimental modeling like that developed by Gandhi and Kuster, as well as the ever-more perplexing studies of epidemiologists. Coming from two Greek words meaning epi, upon and demos, the people, epidemiologists look for patterns of disease in time and space to make sense of the real world. Studying brain cancer is one of the toughest jobs in epidemiology. What happens to moms and dads where they live and work and what they eat and drink can have an impact on whether children develop brain cancer. So, we know that men or women who work with some pesticides and solvents tend to have children with much higher rates of brain tumors.

But the disease can take forty years to develop in adults. Because most adults with brain cancer don't survive, and those who do are often left with problems of speech and recall—either from the disease itself or from the treatment—we often have to interview their remaining family members about their life histories and try to figure out what could have led to the disease. Few of us really know all the good and bad things we've dealt with in our lives, let alone those of our relatives.

When it comes to sorting through the risks of cell phones, we have been assured by widely publicized reports from what appear to be independent scientific reviewers that there is none. Researchers from the Danish Cancer Society reported in the Journal of the National Cancer Institute in 2007 that they found no evidence of risk in several hundred thousand persons who had used cell phones. Headlines around the world boasted of this latest finding from an impeccable source published in a first tier scientific journal.

The press coverage of this study tells us a great deal about what journalists and the rest of us who depend so heavily on these phones would like to believe. These headlines appeared within days of publication.

"Cell Phones Don't Cause Brain Cancer" – The Toronto Daily News, December 10, 2006
"Cell Phones Don't Raise Cancer Risk" – Reuters, December 6, 2006
"Big Study Finds No Link Between Cell Phones, Cancer" – San Jose Mercury News, December 6, 2006
"Study: Cell Phones Do Not Cause Cancer" – Albuquerque Tribune December 6, 2006
"Study: Cell Phones Safe" – Newsday December 7, 2006
"Cell Phones Do Not Cause Cancer" – Techtree.com, India, December 7, 2006

But let's look at what the Danish researchers actually studied.

They reviewed health records about brain tumors that occurred up to 2002 of about 421,000 people who had first signed up for private use of cell phones between 1982 and 1995. A "cell phone user" in the study was defined as anyone who made a single phone call a week for six months during the period 1981 to 1995. In fact, the study first started out with almost 700,000 people, but the researchers kicked out anyone who was part of a business that used cell

phones, including those who had used a cell phone for personal purposes for eight years. Think of those early clunker phones with their battery packs, cumbersome cords, and hefty monthly fees—those are the phones first examined in this study. Business users are certain to be those with lots of reasons to some lots of time on the phone. Because researchers could not be sure that only one person used a business phone, they threw out all business phones.

This research design raises a lot of questions. Why did the researchers not look at individual business users—those with far more frequent use of cell phones? Why lump all users together, putting those who might have made a single cell phone call a week with those who used the phones more often? Why stop collecting information on brain tumors that had occurred only as of 2002? Use of cell phones has grown more than fourfold since that time in many countries, including many parts of the U.S., U.K., France, and Israel.

When you are looking at a large population to find an effect, generally the more people you study, the better your chance of finding something. But if you include lots of people with little exposure along with those with very high exposure, you basically lower your chances of finding any effect at all. Lumping all these various users together is like looking all over a city for a stolen car when you know it's within a five-block radius. Perhaps you'll find what you're looking for, but the chances are greater that you won't.

If you want to find out whether cell phone use causes brain cancer, the higher the use or exposure of those you are examining, the better the odds that you will be able to find whether or not it's made a difference. It's clear that the early analogue phones must be different than the newer digital ones. We hope the difference is big and that those of us using phones today face

a lowered risk, but we have no way to know whether this is the case. Some of us believe (and hope) that using speakerphones or earpieces connected by wires—not the hands-free kinds—should reduce our direct exposures, but, again, direct evidence on this is not at hand.

In all circumstances, research works best when we have solid information on the nature of the use or exposure we are looking at. All of us have cell phone bills that provide detailed records of our use, and most of these can be accessed online. These were not used in this Danish study, nor in any study done for or by the industry to date. A gold mine of data lies untapped and so far untappable. Dr. David Servan-Schreiber, a distinguished psychiatrist and medical researcher, and author fo the best-selling book, Anti-Cancer, and I are working with cell phone companies in France and elsewhere to encourage the release of billing records so that epidemiologists can carry out much more sophisticated studies than have been possible thus far..

The Danish study, as the headlines made clear, found no increase in risk of brain cancer for private users of cell phones. The reason the researchers were looking for brain cancer is straightforward. As the authors noted, cell phone signals do penetrate the brain. "During operation, the antenna of a cellular telephone emits radio frequency electromagnetic fields that can penetrate 4-6 cm into the human brain."[i]

There is, however, a vibrant debate over what this absorption into the brain means biologically. We know that the body is electric and that electricity in medicine can be used to heal bones and restart or regularize heart beats. But what about RF signals themselves?

We know that cell phone signals can reach the side of the head where the auditory nerve is located. An earlier Swedish study, compared more than 1400 people with brain tumors to a similar number without the disease during the time 1997-2000. They found that tumors of the hearing nerve were three times more frequent in those who had used cell phones for more than a decade.[ii] This difference even passed the demanding scientific test of statistical significance, which essentially shows that the results are not likely to be just some random finding. In 2004, other Swedish researchers found that long-term users also had significantly more tumors on the hearing nerves than nonusers.[iii] My colleagues at the University of Pittsburgh Graduate School of Public Health and Medical Center have recently confirmed this result, in work that is attached to this testimony—persons using a cell phone for a decade or longer have significantly elevated risks of acoustic neuromas.

Of course, most of the published work in the field is negative, but it turns out that much of this is inconclusive by design. But, is that really the end of the matter? We know that tumors of the hearing nerve and malignant cancers of the brain can take decades to form. All of these widely publicized negative studies have several things in common. One study that was well publicized in 2000 found no increased risk of brain cancer in cell phone users. There's only one problem with this result-- the average cell phone users in this widely publicized study had a phone for less than three years.[iv] Still, even this limited study found that those who had used phones for this short period of time had twice the risk of a very rare brain tumor—neuroepitheliomatous cancers—the kind that wraps itself around the nerve cells of the lining of the brain—right at the locus that cell signals can reach.

One of biggest challenges to any study of cell phones and human health is that the problems they are trying to understand are inherently complex. Science works best to study one thing at a time, as we do with drugs in clinical trials carefully meting out specific doses and tracking

specific responses. But, the world we live in is much messier and more complicated than the elegant one of clinical research. The problems posed by cell phones in the real world are like huge simultaneous equations—mathematical formulas of relationships between multiple unknowns. How can you determine the role of one factor, such as cell phone exposure to the skull, when all others, like diet, workplace conditions, and local air pollution, are changing at the same time and at different rates? How do you take into account the fact that phones themselves have changed design and that peoples' habits in using phones may also change with reports of concerns growing?

Given how broadly cell signals now penetrate our worlds of the coffee shop, traveling discounted buses, airports, and many downtown areas of major cities, where do we find any truly unexposed groups to compare results against? Because cell phone use has grown so fast and technologies change every year, it is as if we are trying to study the car in which we are driving.

Some of the works done in laboratories at the Medical University of Vienna and elsewhere clearly showed that wireless signals could affect the ways cells talk to one another to stay under control—what is called gap-junction communication. Under healthy conditions, cells send messages through proteins and enzymes that keep things in order and tell badly behaving cells to get in line or die. Wireless signals were shown to throw a monkey wrench into this order. Like teenagers, cells that can't communicate well are prone to grow out of control. In essence, the wireless signals promoted a kind of social breakdown among cells.

As Dr. Sadetzki has told us, the human health component of the study of cell phones remains unfinished, and it may well be unfinishable. A major international study of brain cancer in

wireless phone users has been underway for nearly a decade, headquartered at the renowned International Agency for Research on Cancer (IARC) of the World Health Organization in Lyon, France. The large study was designed to combine more than three thousand cases of brain tumors from around the industrial world and was supposed to release its results in almost five years ago.

At the core of the IARC project is a major effort to learn from brain cancer patients whether they used cell phones more frequently than did others. The limits of the work are easy to grasp. The ways to overcome them are not. Still, some German findings published in 2006 are disquieting. Keep in mind that not a single one of these studies is actually using billing records of cell phone use. All of them require people to try to remember their habits over ten years or so.

The German study captured information about the daily lives of people in Mainz, Bielefeld and Heidelberg. What did they have for breakfast regularly? Where did they live? How often did they use the cell phone? For how long? On which ear? These are the sorts of things epidemiologists like me hope you remember. This work contrasted the life experiences and reported cell phone use of 366 people with deadly tumors of the brain called gliomas and 381 with slow-growing, usually benign tumors of the membranes that cover the spinal cord, against some 1500 people between the ages of 30 and 69 who had better luck and did not have brain tumors. When asking both groups about their past and current uses of cell phones, they did not find any increased risk in those who used phones for less than a decade. That was not the end of this work, however, but merely the start.

In this same study, those who reported having used cell phones for ten years or more had twice the risk of coming down with gliomas.[v] This is a tumor that begins in the glial cells of the brain, the non-conducting cells that support the neurons and hold them together. The growth of gliomas can be silent, with symptoms that mimic flu or a headache. But eventually, they

become undeniable. People lose speech, sight, movement or hearing, depending on where the tumor starts and where it ends up.

It should be obvious that looking at people with a fatal illness and asking them to try hard to remember what they did up to forty years ago in some cases is not easy. Doing this the day after brain surgery in the hospital is obviously not an ideal situation for obtaining records.

With all the highly automated information governments now assemble to combat terror, including library and cell phone records, what would it take for authorities to allow expert scientists access to privacy-protected, coded computerized records of cell phone use so that we could learn whether our use of cell phones places us at risk from a disease that could be averted through better design and technology?

That's not a question likely to get much attention at this moment, but it is well worth thinking about. The studies to date that have not found a general, clear and consistent risks from cell phones have tended to follow people for short periods of time. Brain tumors can take four decades to become evident. Of necessity, the older studies have for the most part have looked at older technologies over short periods of exposure. With one exception, no researcher has asked about the impact of cell phones on the brains of children and teenagers—one of the fastest growing groups of users in the world today.

Recently, several groups including the Collaborative on EMF Research and the Environmental Working Group and the European Union have issued reports concluding that cell phones cause or greatly increase the risk of brain tumors. What is this based on?

The Interphone study, as Dr. Sadetzki just told us, has not reached a clear conclusion. But every single study that is part of Interphone and has studied people who used phones heavily for a decade has found that where persons have used phones heavily for a decade or longer, there is evidence of a significantly increased risk—literally a doubled risk of malignant brain tumors.

The one researcher to have studied young people who began using cell phones as teenagers, Prof. Lennart Hardell of Sweden, has found that those who started to use cell phones heavily before age 20 have 4 to 6 times more brain tumors by the time they reach their 30s. This is deeply troubling.

What should we do now?

Representatives of the industry have recently been quoted as saying: "peer-reviewed scientific evidence has overwhelmingly indicated that wireless devices do not pose a public health risk." To me, the absence of definitive evidence on this issue is not proof there is no harm, but a reflection of two things. First, it is hard to conduct epidemiological studies on cell phone users for obvious reasons, as Dr. Sadetzki has explained. Second, there are powerful interests that have kept us from asking and answering important questions. We have also seen repeatedly that the chances a study will label cell phones safe depends chiefly on who pays for the study. (Lai and Roos.)

What does independent research really show? What do the FDA and ACS really say about the matter? On their website, The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration (FDA), states: “Available science does not allow us to conclude that mobile phones are absolutely safe, or that they are unsafe. However, the available scientific

evidence does not demonstrate any adverse health effects associated with the use of mobile phones."

The FDA and FCC jointly state that those who are concerned should take simple precautions such as using earpieces and speakerphones, while acknowledging that Quote, “The available scientific evidence does not show that any health problems are associated with using wireless phones. There is no proof, however, that wireless phones are absolutely safe.” End quote.

But, the FDA site goes on to say the following:

“The scientific evidence does not show a danger to any users of cell phones from RF exposure, including children and teenagers. The steps adults can take to reduce RF exposure apply to children and teenagers as well.

- Reduce the amount of time spent on the cell phone
- Use speaker mode or a headset to place more distance between the head and the cell phone.

Some groups sponsored by other national governments have advised that children be discouraged from using cell phones at all. For example, The Stewart Report from the United Kingdom made such a recommendation in December 2000. In this report a group of independent experts noted that no evidence exists that using a cell phone causes brain tumors or other ill effects. Their recommendation to limit cell phone use by children was strictly precautionary; it was not based on scientific evidence that any health hazard exists.”

http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/ucm116331.htm

In 2001 a review article in the American Cancer Society journal, Cancer written by Howard Frumkin and Michael Thun, a senior epidemiologist with the American Cancer Society in fact took a precautionary approach as well. Noting the absence of clear evidence of harm and the relatively short period of time that studies had been underway, they offered simple advice:

"It is impossible to prove that any product or exposure is absolutely safe, especially in the absence of very long-term follow-up. Accordingly, the following summary from the Food and Drug Administration Center for Devices and Radiological Health offers advice to people concerned about their risk:

If there is a risk from these products—and at this point we do not know that there is—it is probably very small. But if people are concerned about avoiding even potential risks, there are simple steps they can take to do so. People who must conduct extended conversations in their cars every day could switch to a type of mobile phone that places more distance between their bodies and the source of the RF, since the exposure level drops off dramatically with distance. For example, they could switch to: a mobile phone in which the antenna is located outside the vehicle, a hand-held phone with a built-in antenna connected to a different antenna mounted on the outside of the car or built into a separate package, or a headset with a remote antenna to a mobile phone carried at the waist. Again the scientific data do not demonstrate that mobile phones are harmful. But if people are concerned about the radiofrequency energy from these products, taking the simple precautions outlined above can reduce any possible risk.[4]"

http://www.cancer.org/docroot/pub/content/pub_3_8x_environmental_carcinogens-

cellular_phones_and_risk_of_brain_tumors.asp

In other recent public statements, Thun, who is a Vice President of ACS observed that:

"Cellular (cell) phones are a relatively new technology that became widely used in the United States only in the 1990s. Although they have been studied extensively, we don't yet have information on the potential health effects of very long-term use or usage by children. "

The good news is that manufacturers and beginning to incorporate this advice into information they provide to consumers. The challenge will be to get people to read and act on this information. How many people know that the directions for using Blackberries for the new 4G wireless devices also note that phones should not be kept on the body and that those concerned about children's exposures should take efforts to reduce that exposure. Those with pacemakers are urged to keep the device at least 20 centimeters, or about 8 inches away from the chest. Warnings with the new Blackberry smartphones and iPhones state that the phone should be kept .98 inch or 25 millimeters or 5/8 inch or 15 millimeters respectively away from the body and that failure to do so could result in excessive exposure. U.K advisors have urged caution with respect to children.

Recently a number of scientists have confirmed an observation reported by Hungarianj and Australian scientists in 2004 http://www.gettingpregnant.co.uk/use-of-cell-phones-and-sperm-count-motility.html and by the Cleveland Clinic last year. http://www.clevelandclinic.org/reproductiveresearchcenter/docs/agradoc239.pdf Regularly keeping a cell phone in the pocket produces defects in sperm form and sperm count. Experimental studies have produced similar results, yielding sperm with impeded motility and reduced numbers..

Unfortunately, scientists who have tried to conduct independent research in this area have often found themselves under the gun. Cell phone research became a kind of third rail for many scientists—touch it and you die.

Dr. Om Gandhi for years led studies at the University of Utah evaluating emissions from phones for Motorola and all the major cell phone companies. As a pioneer in modeling of cell phone absorption into the brain, he in 1996 published analyses, which showed that existing models did not protect children's brains. No surprise: he lost all his industry funding. Now, because he's a tenured professor of a certain age, he continues to do the work and has produced further analyses showing he's correct. Recently French Telecom and other industry supported groups have also confirmed what any mother knows--a child's head is much more sensitive thinner, less dense, more fluid, and therefore more vulnerable than that of an adult.

A study by Professors Henry Lai and Singh showed that low levels of RF signals could produce strange defects in DNA in 1994. The industry response? First, they went to the journal where the paper had been accepted and tried to get the paper un-accepted. Then, they hired a PR firm to try to discredit the findings. Then, they gave money to other researchers in an effort to disprove the findings. When this research confirmed their findings that RF could damage DNA,

that research was not published. The full story on this can be found at http://www.washington.edu/alumni/columns/march05/wakeupcall01.html and is also discussed in my new paperback.

A similar situation is still being resolved in Vienna, where a multi-million dollar multi-laboratory study of the damaging effect of DNA on RF led by Professor Rudigger and Adlkofer of the Medical University of Vienna was charged with fraud. These charges became headlines around the scientific world. An independent investigation by the university has recently reported that the charges of fraud were not correct. But, the damaging effect of the charges cannot easily be reversed.

I am fortunate that I worked for Ronald B. Herberman at the University of Pittsburgh. In reviewing the evidence provided by the Bioinitiative Report and the European Environment Agency last year, he recognized this issue for what it is—a major chance to promote research while in the meantime preventing harm. The Pittsburgh Advisory and his statement on this issue, along with other background documents can be found at www.environmentalhealthtrust.org

As we have heard today, scientific and policy leaders in Israel, France, Finland, Russia and China have since echoed Pittsburgh's precautionary advice.

I would urge the Senate to consider carefully the case for national action. I am encouraged by the fact that the new head of radiological and other devices at the FDA has indicated an interest in examining this issue.

My advice at this point is simple:

As a number of groups have recently urged, Cell phones should have warning labels stating: children's brains need special protection; phones should not be kept on the body, and should only be used with ear pieces or speakerphones. Children should be encouraged to text and not use phones next to their heads.

What about the much needed research? Who should do it and where should the money come from? Obviously, the history of cell phones and public relations tells us we must make this research independent. Creating a cabinet level inter-agency group on cell phone research, like that on climate change, seems a good start.

As to funding, I've got a simple idea that many of my colleagues in industry tell me makes sense. Let's put an extra research fee of $1.00 on every cell phone for three years and use these funds to support the conduct of a major independent research program to address the questions raised by this panel and by the National Academy of Sciences in its 2008 report on the subject.

Given the widespread and important role that cell phones play in our lives today and their invaluable use for many purposes, we can and must do better. Our children and grandchildren will thank us if years from now if they are using safer devices because we took the step at this moment in history to create the solid research program to create an improved technology. I am confident that with this hearing a new day of open dialogue has begun and I thank the Senators for making this possible.

[i] Joachim Schüz, et al., "Cellular Telephone Use and Cancer Risk: Update of a Nationwide Danish Cohort," *Journal of the National Cancer Institute* 98, no. 23 (2006): 1707-13.

[ii] L. Hardell, et al., "Case-control study on the use of cellular and cordless phones and the risk for malignant brain tumours," *International Journal of Radiation Biology* 78, no. 10 (2002): 931-936.
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