a number of findings at less than 0.1 mW/g. Two such findings occur at about nine hundred MHz while three others occur at about fifteen hundred MHz. That cluster of behavioral effects data is certainly at a much lower level than the IEEE/ANSI committee reports to be the "lowest" level of observed effects.

If the data cluster at 0.1 mW/g had been considered, the IEEE/ANSI level would be revised downward to 0.01 mW/g, which is strikingly close to what the Russian scientists have been advising—and using-for all of these years. But to do so would be to eliminate the portable cellular telephone industry and maybe some military programs. Certainly many high-power broadcast towers would need to be modified or moved. Instead, the standard setting committee determined that

many of the effects reported at lower levels were not considered indicative of a hazard (see footnote 138).

Very informative.

Now we learn that the IEEE/ANSI committee decided which behavioral or biological effects they wanted to include and which they didn't. Earlier we were told that the standard was based on a level below which no behavioral or biological effects were observed. Something in their subtle change of guidelines doesn't sound just right. Of course, more disturbing is that the general public still hears the older version of the safe exposure setting method.

How is it that the general public is expected to rely on the representations of the IEEE/ANSI radiofrequency exposure standards when we also learn that the committee that establishes those standards dismisses the research findings that don't suit them? It has already been

established that they will not consider any research that has not been replicated, now we also learn that the committee applies other subjective grounds for excluding research findings.

6

As the industry continues to wage its public relations battle it must do so even with the growing reports of dangerous radiofrequency radiation exposure. Industry researchers who attempt to counter the unfavorable reports—the industry's "damage control" researchers—have been known to resort to questionable models in an effort to provide results less damaging to the industry. For example, we have already learned that seemingly identical experiments performed by two groups of independent researchers have tended to provide two distinctly different results. One research team, not supported by the industry, employed a representative, although simplified, human head model to obtain radiation absorption results. Other researchers, employed or funded by the cellular telephone industry, have found a completely different level of radiation being absorbed within simulated human brains. Not surprisingly, the industry researchers reported a level much lower than the nonindustry-funded researchers.

Upon closer examination and spirited discussions at technical conferences at which the research findings were reported, it has come out that the industry-sponsored researchers have taken the liberty to modify the features of the human head and the placement of the portable telephone in an unrealistic manner. When presented to the audience the depiction was so ridiculous as to incite

laughter by the attending researchers. For one example, experimental results proudly reported at a technical conference relied on a laboratory human head model that had extremely protruding ears. The ear, projecting outward about 2 cm from the head, provided the "advantage" the experiment needed to yield favorable results. The scientists reported that the portable cellular telephone was placed against the ear of the model. Never mind that the "ear" had no basis in reality. And never mind that virtually no one would operate a phone in the positions depicted and tested. What does matter is that research findings of this nature form a significant part of the data base from which the safety standards are formed.

However, during these same conferences the nonindustry-funded researchers who provide findings of dangerous radiation absorption levels are typically met with silence by industry representatives and with concern by the others. There's nothing funny about the hazardous findings of the nonindustry research reports.

It is very clear that the stepping-stones of the published research results lead toward a conclusion of harmful effects from exposure to radiofrequency and microwave energy. The industry, instead of referring to the research base, prefers to draw from its own limited file of research results.

However, it matters not how much time or money is expended performing research and arriving at favorable results if the research is performed with the objective of steering clear of potentially disfavorable conclusions. Just as if one were searching purposely for a man lost in the woods but with the intent not to find the man, research that yields negative results can be performed repeatedly and for all time if the research is designed not

to yield the unwanted result., It takes but a single repeatable research study, performed by competent researchers, that indicates a harmful effect to render obsolete and invalid an entire storehouse of contrived research reports to the contrary.

By 1987 researchers were reporting that measurements showed actual radiation absorption is from two to five times higher than computer modeling predicted, and they were also warning that higher energy absorption could be expected in very sensitive tissues such as a human brain.

Also, it was again reported that local peak values of energy absorption vary over several orders of magnitude the "hot spot" effect. The response: some researchers suggested that a cost/benefit consideration be included when deciding safety issues. This last point is sometimes referred to as "risk management" or "acceptable risk." The problem is that the industry manages the risk and determines what is acceptable. In this case, the decision is based on profits. The industry managers, executives, and sales representatives perceived such an enormous untapped gold mine that there was just no way that these products were going to be held back. The industry, even in 1987, was charging ahead at full steam to capture the markets while prominent university researchers were cautioning that much more research needed to be performed.

A paper by M. Stuchly[139] brings out the inconsistency of thinking among those who would establish safe exposure levels for humans. First we were educated repeatedly that safety levels were set by using laboratory

[139] M. Stuchly, "Proposed Revision of the Canadian Recommendations on Radiofrequency-Exposure Protection," Health Physics 53, no.6 (December 1987):649-65.

animals. Then we learn that, adverse effects or not, a cost/benefit consideration may be more important than real dangers from radiation exposure.

There should be a sufficient data base of adverse effects on human beings and their mechanisms, which permit a quantitative analysis of health risks related to any proposed protection limit. Additionally, it may be desirable to consider a cost/benefit analysis. RF exposure standards are almost exclusively based on experimental evidence from animals . . . (see footnote 139).

With the exception of the comment about a "cost/benefit analysis" nothing is new in that statement.

However, it is indeed striking, if not alarming, to witness supposedly independent scientific researchers speaking of cost/benefit analysis. Perhaps these researchers propose to determine if the harmful effects of the technology are outweighed by the benefit to society. If so then we must assume that the industry, government, and their researchers have determined for us just what will be an "acceptable risk." Again, as in the past, we find the clear picture of no informed consent. Government and industry have made these decisions for the population in the past. Their track record is decidedly negative and self-serving.

We have already reviewed research findings that indicate short-term biological effects at about 1 mW/g. We have also reviewed research findings that indicate that energy absorption of from 5 to 10 mW/g will result in a significant temperature rise of about 1°C in brain tissue. Stuchly, in her 1987 report, reconfirmed those findings. She continues on to clarify that the ANSI standards are

violated "even for the transmitters with relatively low RF output power" (see footnote 139).

The U.S. Environmental Protection Agency supports those findings. In the summary, Stuchly quotes the EPA as stating:

> ***The data currently available on the relationship of SAR to biological effects show evidence for biological effects at an SAR of about 1W/kg . . . (see footnote 139).***

That is, the EPA has found biological effects at 1 mW/g. Yet the IEEE/ANSI standard—setting committee ignores the 1 mW/g findings.

The U.S. EPA has recommended exposure guidelines and provided four options for consideration.

- Option #1 limits SAR due to radiofrequency radiation exposure to 0.04 mW per gram—that is, 0.00004 watts per gram. This safety level is thought to protect against all thermally related health effects. That would be a tenfold decrease compared to the current 0.4 mW/g limit.
- Option #2 would lower the existing exposure limit by a factor of 5 to 0.08 mW/g, instead of the factor of 10 proposed in option #1. Option #2 is proposed as less costly than Option #1. Why would the safety standard setting options be based on cost? Should they not be based on safety?
- Option #3 is a proposal to maintain the current exposure level limits.
- Option #4, is to provide no regulation at all but only information and technical assistance. This is not really an option but an unacceptable alternative to any regulation.

Comparing the IEEE/ANSI radiofrequency exposure limits to limits established elsewhere provides some interesting information. The IEEE/ANSI protection guide limits exposure at 845 MHz to 2.8 milliwatts per square centimeter of surface (2.8 mW/cm^2). Germany limits that same frequency to 2.5 mW/cm^2. Great Britain limits exposure to 1.1 mW/cm^2. The International Radiation Protection Association limits exposure to 0.4 mW/cm^2. The former USSR limited exposure to 0.01 mw/cm^2.

If one single piece of information becomes clear from this litany of exposure limits, it should be that the IEEE/ANSI safety limits are the least restrictive, least "safe,"of the standards. That is, compliance with ANSI exposure standards still means violation of all the other standards. The USSR standard was stricter by a factor of 280. With a history of conscious disregard for their population, does it not seem peculiar that the former USSR should establish a radiofrequency exposure standard so much lower (more safe) than our ANSI safety standard? Even without consideration of the former USSR standard we observe that virtually all other countries noted have stricter standards than the IEEE/ANSI limits.

The original safe exposure recommendation was established at 100 mW/cm2. Today every bioeffects scientist would quickly admit that such an exposure level is, without any doubt, dangerous. Nevertheless, that level was established because no "reliable" evidence existed at that time that any biologically hazardous effects occurred at radiation exposure levels lower than 100 mW/cm^2. During the early 1950s Schwan proposed that the safe exposure level be set at 10 mW/cm^2. More recently, the safe exposure to radiofrequency radiation has been lowered to about 2.8 mW/cm^2 at cellular telephone frequencies. Today we know that it is difficult, if not impossible, to

use the power density as a measure of safety or hazard. We cannot prescribe a level of radiation at the surface of the head, for example, to specify a safe exposure. The current method of determining the presence of danger or a hazardous exposure is to measure the absorption of energy within the tissue that is being irradiated. But remember, the standards have set allowable absorption levels that are based solely on behavioral effects.[140] Some safety standards now prescribe that the maximum absorption of radiofrequency energy into any one gram of tissue should be no greater than 1.6 mW/g. Over the last forty years the "safe" exposure levels have been consistently reduced. Presently the standards propose levels that are about fifty times lower than was first thought to be "safe." This trend has continued for about forty years, and there is no reason to expect that revisions won't continue for some time into the future.

It will come as a surprise to most to learn that the IEEE/ ANSI committee is not an IEEE or ANSI committee at all. The process that leads to a designation as IEEE/ANSI safety standard is not rooted in any activity within either of those organizations. The "committee" process begins when a group of interested scientists and researchers get together and form a committee on their own. It could be a mutual interest that brings them together; but most likely it will be an industry interest. This independently formed committee acts on its own to establish any standard.

Only after it is completed is the final product presented to the IEEE for publication. In order to publish, the standard must pass the approval of the Standards

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[140] *H. P. Schwan, "Nonionizing Radiation Hazards," Journal of the Franklin Institute, December 1973, pp. 485-97.*

Board of the IEEE. The board votes on whether the standard should be published under the IEEE label or logo. Interestingly, in the case of the radiofrequency radiation safe exposure standard many of the committee members were also IEEE Standards Board voting members.

After publication by the IEEE, but not necessarily any endorsement by the IEEE, the American National Standards Institute is free to review and adopt the standard, reject it, or ignore it. In any case, neither the IEEE nor the ANSI performs the technical or scientific research. Instead they rely on the original independent committee to have done the right thing.

7

Only since the Bioelectromagnetics Society Conference of 1994, which provided a forum for presentation of the overwhelming and multiple reverification of the energy penetration from exposure to radiofrequency radiation, did the industry researchers finally modify their posture and concede the point. As a result the cellular telephone industry quietly began a broad program to redesign its products to reduce the amount of radiation that is absorbed by the users of the portable cellular telephones. The redesign program is not widely known but includes the most significant manufacturers working in concert with some of the most prominent researchers who have confirmed the excessive energy absorption.

However, any newly designed portable phones may prove pointless, as newer research results have moved the issues to a broader front with additional revelation since 1993 and 1994 of DNA modifications and chromosome damage from radiofrequency radiation. Even before

the most recent bioeffects studies showing DNA and chromosome damage were known the extent of industry and government complicity became evident through a private conversation with a representative of the Federal Communications Commission (FCC) when he confided that

the FCC doesn't want to regulate portable cellular telephones because it doesn't want to create a panic.[141]

Yet another government agency, the EPA, reports:

In the past few years, there has been a marked increase in epidemiological studies reporting an association between cancer and electric and magnetic fields.

The U.S. Environmental Protection Agency has some fundamental problems with the way that the ANSI/IEEE committee, which produced the safe exposure document, handles the research results that it supposedly uses to establish safe exposure levels. The EPA has never adopted the IEEE/ANSI standard. Their reluctance is due in part to the committee's refusal to consider all available research data when setting the levels. Marty Halper of the EPA is quoted as saying:

The group did not deal with all the data—specifically the nonthermal effects. As long as the public sees the ANSI/IEEE committee as being biased, its usefulness is limited. [142]

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[141] *R. Cleveland, unpublished communication.*

[142] *"The RF Problem," Microwave News 13, no. 3 (May/June 1993).*

And the bias of which Halper speaks is obvious. We've seen it not only among the safety standard committee members but also concertedly by the military and industry. So long as the military and industry are so heavily represented on the committee they will be successful in pressing their own agenda. That agenda is to continue the production and use of radiofrequency-radiating products unhampered by restrictions and guidelines.

Those groups have been successful at using their "trump card" over and over again. That is, research funding. They control the research purse strings. They determine which programs will be funded. They determine which research studies will be replicated and which will not.

On another point the FDA's Centerfor Devices and Radiological Health strongly objected to the categorical exclusion clause even when it was reduced to 0.7 watts from 7 watts. At 0.7 watts the exclusion still exempted all the portable cell phones. They stated that

the concept of limiting the SAR induced in the body appears to be disregarded. '[The] low-power exclusion clause . . . exempts certain RF devices from the provisions of the standard only because they emit less than a specified amount of power. Recent data from technical publications and other sources indicate that certain lower-powered RF devices, such as hand-held, portable, two-way radios, cellular phones, and other personal communication devices can introduce relatively high SARs in portions of the body [the head and brain] of nearby persons. Indeed, some devices that meet the requirements of the low-powered exclusion clause can induce SARs that exceed the local-SAR limits specified elsewhere in the same standard-making the standard appear self contradictory.

Exempting hand-held portable cellular telephones on the basis of dubious conclusions published nearly twenty years earlier by a single industry research team no longer makes sense. The EPA states that it makes no sense. The FDA states that it makes no sense. The unbiased research community doesn't think it makes sense. And by now you might also think it makes no sense.

The industry has relied on its ability to forestall any new exposure level decisions based on harmful effects because researchers have been sidetracked for years trying to isolate a specific mechanism that would prove that tumors or cancer are a result of nonthermal, low-level exposures. However, the unique and critical circumstances of exposure of the human head and brain to radiofrequency radiation seem now to be recognized even by some industry proponents.

M. A. Stuchly points out the sensitivity of the brain to radiofrequency radiation:

> ***Even cursory consideration of physiology would suggest that high SARs in such tissues as brain or other vital organs are likely to be more critical in producing biological effects which may be potentially hazardous.***[143]

And she made it quite clear that the safe exposure levels recommended by C95.1 had been set too high when she repeated the earlier observations of the U.S. EPA.

> ***The data . . . show evidence for biological effects at an SAR of about 1 W/kg.***

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[143] *M. A. Stuchly, Canadian and Other National RF Protection Guides, Electromagnetic Interaction with Biological Systems, ed. J. C. Lin (New York: Plenum, 1989), pp. 257-70.*

8

Exposure to radiofrequency radiation for the typical consumer now is greatest when that consumer picks up the portable telephone and places it against his head during a call. The select part of the body that absorbs that radiation is none other than the user's brain. And the selective temperature rise is in a small portion of that brain closest to the radiating antenna.

What researchers confirmed nearly forty years ago has been only grudgingly, quietly, and reluctantly admitted to by the cellular telephone industry; radiation absorbed from portable cellular telephone antennas selectively heats specific parts of the brain of the user.

In fact, in presenting research data at various scientific conferences it is typical to show the profile of absorbed energy within human head structures by plotting measured temperature rises. Two-dimensional views are used to represent cross-sections taken through various regions of a human head. Then the calculated absorbed energy or measured temperature increase is shown via color coding. These temperature profiles invariably show that the temperature rise, and therefore the radiation absorption, is concentrated in the part of the brain nearest the antenna.

But, with all of this research data in hand, some of which has been available for twenty or more years, and with the research now out of the industry's control, the battle over the safe exposure level continues. In the typical style of self-interested corporate executives, the managers are digging in their heels to protect their little empires—their stock options, bonuses, and other benefits. For them it's not a matter of doing the right thing for the industry, their companies, or their customers.

A good example of their outdated efforts is the continued industry attempts to convince regulators and standards committee members that a human head does not absorb energy from a transmitting antenna if the antenna is placed very close to the head. This is analogous to saying that if you sit around a campfire, a few feet away, on a cool autumn evening you will be warmed, but if you move right next to the fire, perhaps an inch or two away, you will not be warmed or burned.

But even when the unscientific arguments are exposed, the cellular industry, in concert with the military interests, can still apparently muster enough support, or muscle, to sway the outcome of the standards setting committee deliberations.

During a 1989 meeting of the ANSI committee, held in Tucson, the "interested parties" attended in force. Microwave News reported that

> ***Of the approximately 50 people at the Tucson meeting, there were eight representatives from the U.S. Navy and two each from the U.S. Army and the U.S. Air Force. In addition there were representatives from companies with major military contracts. The broadcasting and communications industries were also in evidence. 144***

This certainly appears to be a show of force by government and industry. We can judge the impact that such a gathering would have on the nonindustry committee members. Keep in mind that some of the committee members are university researchers. They must rely on government and industry for research funding.

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144 "Revising ANSI RF—MW Limits: Debate Often Contentious," Microwave News 9, no. 5 (September/October 1989).

In spite of, or perhaps because of, the watchful eyes of government and industry, the meeting was marked by disagreement among members. With respect to the seven-watt exclusion clause, some wanted the clause eliminated. Industry representatives indicated that the clause was justified because millions of people use the products. Still others argued that because of those millions of users the clause should be abandoned.

This provides a prime example of how the industry interests view the safety of humans. They don't argue that their devices should be proven safe. They argue that their products should be exempt because millions of people are already using them. If we extend their thinking to other products, then, in effect, the industry people are saying that the drug thalidamide should not have been regulated and removed from the market, because a lot of is women were already using it. Never mind the horrendous effects the drug produced; just leave the manufacturer alone.

Eventually the exclusion clause was deleted from the radiofrequency exposure standard. It seemed that the committee had finally realized that the exclusion was based on unfounded scientific conclusions that just couldn't pass the common sense test. It also seemed as if, finally, the industry would be forced into compliance with the safe exposure provisions of the safety standard. But a short time after that meeting, at another quietly held committee meeting attended by a select, smaller group of committee members, the exclusion clause was replaced into the standard.

Other issues of serious disagreement bring to light the manner of establishing safe exposure levels for hundreds of millions of people. At the same meeting during which the exclusion clause was thrown out, even if only

for a short time, Dr. Elder and Dr. Adair argued whether or not environmental conditions affected the level at which radiofrequency radiation becomes hazardous.

They could not even agree as to whether the ambient conditions of temperature and humidity are factors. The committee could not even agree on the most fundamental aspects of the statement of risk for humans. The entire civilized world thinks that these committee members are dedicated to scientific-based interpretation of research data. Instead they squabble amongst themselves on fundamental issues and use artful dialogue to disarm their opponents.

The ANSI C95.1 committee is outwardly represented as a group of distinguished researchers and scientists who independently and without prejudice establish the guidelines for safe exposure of the population to potentially hazardous radiofrequency radiation. We have learned that they are instead a group with divisive self-interests that employs the art of debate rather than research data to decide the issues. We have also learned that this is a group with strong industry and government ties and that during their deliberations representatives of those government and industry interests are in prominent attendance to monitor committee actions. Is there any chance that we can believe that the ANSI C95.1 committee is acting in the best interest of any except their "sponsors"?

9

Early research has established solid evidence of: (1) excessive energy absorption conditions; (2) situations where