

*The exposure limits
supposed to protect people
from radio frequency radiation
are the results of
institutional corruption*

*Expanded version of a presentation at the
Edmond J. Safra Center for Ethics of the Harvard Law School*

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EDMOND J. SAFRA CENTER
2011-12 LECTURE SERIES



Protection Against Radiation is in Conflict with Science
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THURSDAY, NOVEMBER 3, 2011 5:30 P.M.
Austin Hall, 100 North, Harvard Law School • 1916 Massachusetts Ave., Cambridge, MA 02138
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UPCOMING LECTURES 2011-12

12.01.11 MALESH LANE Professor of Politics, Princeton University	02.06.12 CONFERENCE ON INSTITUTIONAL CORRUPTION	02.16.12 RENÉE Professor of Medicine, University of California, San Francisco	03.08.12 CHARLES FELISSON Founder and President, Representational Pictures, Inc.	03.22.12 JONAH OSAMOND Commonwealth Professor of Philosophy, Professor of Law, University of Virginia
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I would like to thank Dr. Lawrence Lessig, Roy L. Furman Professor of Law at the Harvard Law School and Director of the Edmond J. Safra Center for Ethics, for the invitation to give a lecture on institutional corruption at the Edmond J. Safra Center for Ethics. Based on my experience gathered in many years of research on health effects due to environment and behavior, I have come to the conviction that what cancer does to humans, institutional corruption is doing to society. This was the context of my presentation.

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Introduction

There is no technology that made its way as quickly and as extensively into people's daily life like wireless communication. In only 30 years, the number of cell phone users has increased world-wide from zero to about five billion. Since our knowledge on possible adverse effects of radiofrequency electromagnetic fields is still rather poor, it is obvious that at present the biggest biophysical experiment of mankind is under way – with an uncertain outcome.

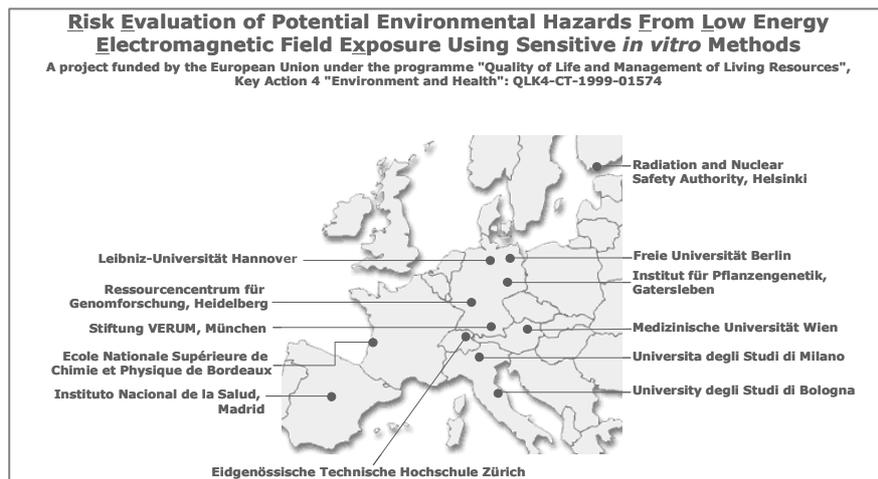
This assessment is based on the state of knowledge about biological effects of radiofrequency radiation to which I have contributed during the past 15 years. Before that time, I held a leading position in tobacco research in Germany for about 20 years. In both areas it did not escape me, how through violation of scientific principles, financial profit has been maximized at the expense of disease and premature death of people. Exactly the same as what happened with tobacco may now recur with the reckless application of radiofrequency electromagnetic fields for technical purposes. And as in the past with tobacco, truth about the increasing state of knowledge is again systematically suppressed.

My personal story within the history of research on electromagnetic fields is only a tiny, but certainly drastic episode that shows how far the industry is willing to go in order to defend its vested economic interests. Under “Research in Action” on the Safra Center for Ethics website, I read that institutional corruption tends to involve mostly legal practices that occur within social norms. I do not doubt this, however, I have to add, that institutional corruption may also involve illegal, even criminal practices if there is a good chance that their use can be concealed.

First, I will show on how the European Union (EU)-funded REFLEX study was treated when its results were in contrast to what the wireless communication industry expected. Then, I will look at the quality of research data when funding is provided jointly by industry together with governments. Finally, I will demonstrate that from the medical point of view the exposure limits for radiofrequency radiation are based on pseudo-science. These three examples may illustrate which role has been and still is assigned to science by the decision-makers in industry and politics. Science is obviously thought to pave the way for the assertion of economic-political interests through rendering health-political interventions unnecessary. The problem is that this goal can only be achieved with the practices of institutional corruption – at the cost of society.

I. Institutional corruption in action against the REFLEX study

The REFLEX study was organized by the Verum Foundation in Munich, Germany, when I was its executive director. It was carried out between 2000 and 2004 by 12 research groups from seven European countries. The funding of nearly 4 million dollar was provided almost completely by the EU. Two groups, from the Free University of Berlin and from the Medical University of Vienna, clearly demonstrated in human cells that extremely low-frequency as well as radiofrequency electromagnetic fields below the current exposure limits own a gene-damaging potential. Findings of this kind firmly contradict the reliability of the currently set exposure limits. They were, therefore, a special annoyance for the wireless communication industry and, strangely enough, for the radiation protection policy in Germany, too.



It was our intention from the beginning of the REFLEX study, to inform the wireless communication industry about the emerging findings. Our data were presented at all major international conferences on electromagnetic fields and also at special meetings organized by the industry itself. Of course, we met criticism which has always been the case in science when opinions deviate. But it was no problem for us to reject the attacks as unfounded. Additional information about the course of the REFLEX study may have been provided to the industry by two members of our research consortium based on their close cooperation for many years. At the end of our study I had to realize that both of them tried to disprove important parts of our findings with data generated parallel to our project obviously with the financial assistance from the industry. Finally, both of them objected the publication of the Final Report claiming that they would not believe in the correctness of the data.

Lerchl starts his campaign against the REFLEX study

One day in April 2008, four years after REFLEX had ended, something absolutely unexpected happened. Professor Hugo Rüdiger, former head of the Vienna research group, informed me by phone that we would be confronted with a severe allegation. Professor Alexander Lerchl from the private Jacobs University in Bremen and member of the Committee on Non-ionizing Radiation in the German Commission on Radiological Protection (SSK) would have claimed that the REFLEX data had been fabricated. Reason and purpose of this defamation were easily to recognize. Just at that time, the EU Commission was about to decide on the support of a REFLEX follow-up study which the Verum Foundation had submitted several months earlier. This study was to investigate the biological effects of radiofrequency radiation no longer in test tubes but directly in humans. Lerchl and his patrons in industry and politics saw obviously no other way than accusing the Vienna research group of fraud in order to prevent the support of the new study. Pointing to allegedly statistical discrepancies Lerchl went so far as to claim that the results of the REFLEX study, which of course played a role in the follow-up study, were faked. Obviously this was the reason why the new research proposal of the Verum Foundation was dismissed by the EU Commission, although it had received an excellent rating from the EU reviewers and was recommended for funding.

Lerchl, meanwhile promoted to head of the Committee on Non-ionizing Radiation of the German Commission on Radiological Protection (SSK), belatedly explained the reasons for his reckless attacks against the REFLEX study. He had come to the dramatic conclusion, and I quote: *The results published by Diem et al. were indeed worrying. Should they be confirmed, this would not be only an alarming signal, but also the beginning of the end of wireless communication, since damage to the DNA is the first step in the development of cancer.* Whether or not his unscrupulous aggression originated from his personal conviction or from a directive of the wireless communication industry is not known. While the Vodafone Foundation, established by the worldwide operating powerful Vodafone company, closely cooperates with the Jacobs University in Bremen, Lerchl's employer, Lerchl himself enjoyed for many years the financial support of the Forschungsgemeinschaft Funk (FGF), the industry-owned PR-organization for scientific affairs. It seems that within this network of commercial interests a major role was attributed to Lerchl.

The prevention of the REFLEX follow-up study may have been the decisive cause of Lerchl's late attack on the REFLEX study. Connected to this, he pursued an additional goal. He demanded that two papers from the Vienna group reporting on the gene-damaging potential of radiofrequency radiation should be retracted from the scientific literature. As I will show, Lerchl tried to reach his goal according to the slogan: the end justifies the means. With Prof. Wolfgang Schütz, rector of the Medical University of Vienna, and Manfred Dworschak, journalist from the German weekly *Der Spiegel*, he found the necessary support for a powerful campaign against the REFLEX study and its authors.

The rector of the Medical University Vienna supports Lerchl's campaign

In mid-2007, Rector Schütz had received a letter from Lerchl claiming that most probably data had been faked in the Division of Occupational Medicine of his university. This information fell obviously on open ears – probably because of the close cooperation typical for Austria between industry and science in mutual issues. He used the time until spring 2008 to recompose his Council for Scientific Ethics mandated to investigate the fraud accusation with persons of his choice. And indeed, the Council confirmed the fraud suspicion. Without checking the laboratory records, it demanded the retraction of two papers. The Council justified its decision on the allegation that a technical assistant had fabricated the data of the REFLEX study from the beginning.

As luck would have it, some days after the Council's decision was generally made known, it leaked out by accident that its chairman was a lawyer employed by the Austrian wireless communication industry. Unfortunately, Schütz had relied in vain on the university's statute that the identity of the Council's members remains secret. This unexpected development proved to be a serious setback for his obvious intention to declare the REFLEX data false in the fastest possible way. In the end, he reluctantly had to relent to Rüdiger's request to replace the chairman with a new one. After a few Council sessions under the new chair it became clear that the fraud allegations could no longer be maintained.

However, the rector had already informed the media about the fraud at his university. To save his face and in agreement with him, the Council for Scientific Ethics proposed to Rüdiger that he should retract at least one of the papers as a matter of form and in return the rector would not repeat his fraud accusations anymore. Quite reluctantly, Rüdiger accepted in order to limit the damage to his university, the rector, his former team, and himself. But the retraction failed due to the insistence of two co-authors, me being one of them, who were not under the authority of the rector, and also due to the editors' doubts about Lerchl's and the rector's true motives.

As if the exoneration of the Vienna research group by his Council did not exist and despite Rüdiger's concessions, the rector repeated immediately all the fraud allegations he had made before in a further press release. Later on, after a third and final press release in which he speaks of a 'quick and unambiguous' clarification of the case he terminated the joint activities with Lerchl. The latter had in the meantime accused the Vienna University and his rector via the German weekly *Der Spiegel* to have piteously failed to elucidate the case. From that point on Lerchl had to act on his own – and he did.

The less successful Lerchl's campaign turns out to be, the more it evolves into a smear campaign

Two articles in May and August 2008 in *Der Spiegel* – emerging from a close cooperation between the journalist Manfred Dworschak and Lerchl but apparently also in accord with the *Spiegel's* editorial department – help to get the desired public attention for the alleged fraud scandal at the Medical University of Vienna. The first one,

published under the heading *Caught at foul play* and making a mockery of objectivity, reports on the sensational turn the evaluation of the world-wide cited REFLEX study took after Lerchl had discovered fraud. I quote: *Two controversial studies on the risk of mobile phone radiation are obviously the work of a fraudster - what did the senior professors know? [...] It was one of the most horrific findings about the danger of cell phones. Cell phone radiation, so it said, would break the fragile strands of the DNA inside the cells. Possible effect: cancer. [...] The Medical University of Vienna became active after Lerchl insisted. Now, only the inglorious roles of the professors Adlkofer and Rüdiger wait for a clearing up. 'This will be investigated next', says Wolfgang Schütz.*

The second one under the heading *The professor's favorite* strikes at the outcome of the investigations of the Council for Scientific Ethics of the Medical University of Vienna that could not confirm Lerchl's fraud allegations. He accuses the university and its rector of failing to elucidate the case. The article, however, adds a new and especially malicious element built upon on the well known method to 'ridicule the enemy'. Illustration and text portray Rüdiger, head of the Division of Occupational Medicine at the Vienna University and leader of the defamed research group, as an old professor driven out of his mind by a young, nice looking woman, thus not noticing how she is fooling him.

Lerchl himself presents in a series of editorials in the online *Laborjournal* his point of view. He reports about the scandal at the Medical University of Vienna that contrary to others constantly grows over time, and I quote: *There are scandals which after a while do not interest anyone anymore and those which get worse. Things happening at the Medical University of Vienna clearly belong to the last category.* After realizing that the Vienna Council for Scientific Ethics would not act upon his allegation, he complains about the inability and unwillingness of science to purify itself from fraudsters, and I quote: *Seldom research results made such a whirl in public: magnetic fields and cell phone radiation damage the DNA – so the message of the EU-funded REFLEX project. But soon it became clear that the data of the Vienna team were faked. In my series of articles the background and the (non-) reactions of the publishers and their journals are described. It is clear that the self-purifying powers of science do not work.*

Not enough,

- in his booklet titled *Fraudsters in the lab and their helpers* Lerchl places the Vienna scientists at the same moral level that has to be attributed to the international research fraudsters whose misdeeds tremendously damaged science.
- in a public workshop in Vienna with the title *Serious research or 'junk science'?* apparently organized for Lerchl by German and Austrian industry-owned associations he tries to destroy the REFLEX results at the place of their origin.
- after their refusal to retract the REFLEX papers Lerchl accuses the editors of the two scientific journals of incompetence and irresponsibility and complains about them at the Committee on Publication Ethics in London.
- in an internet platform specialized in defaming mobile phone critics and not refraining from methods from the gutter Lerchl and his companions try to ruin the scientific reputation and the personal integrity especially of the senior authors of the papers.
- to back up and to justify his fraud allegation further, Lerchl invents the story that the EU would have asked the Vienna University to return REFLEX funds.
- taking the case – apparently with the help of the Austrian wireless communication industry – to the newly founded all-Austrian Agency for Research Integrity, Lerchl struggles to reverse the verdict of not guilty by the ethic council of the Vienna university through an additional investigation, again without reaching the desired outcome.

With reports in *Science* and in the *British Medical Journal*, two media with high scientific reputation and international circulation, Lerchl's fraud allegations became known worldwide. However, when he claims that the self-purifying powers in science do not work, he may indeed be right. This is the most convincing explanation why a man of his standing has been entrusted with the radiation protection of the people in Germany.

Lerchl justifies his campaign exclusively with economic reasons

In his already mentioned booklet about fraudsters in the lab, Lerchl complains bitterly that he is suspected of acting on behalf of the wireless communication industry. Indeed, there are many reasons for this suspicion. Most

convincing is certainly his replacement of knowledge through a strong belief in the harmlessness of the radio-frequency radiation that allows him to do what no scientist with a minimal qualification is able to do, i.e. to exclude a radiation-induced risk to the health of people nearly with certainty. And finally he himself confirms the suspicion, when he explains his actions against the REFLEX study solely with economic reasons, while not saying a word about his responsibility in the German Commission on Radiological Protection for people exposed to radiofrequency radiation. I quote: *If like in the actual case studies are published that bring into disrepute a whole technology – here: wireless communication – the damage is probably a large one because of very different reasons. When a new cell tower is to be erected, citizens who feel their health at risk quite regularly protest. Wireless communication providers are criticized, have to defend themselves at town meetings, and partly have to put up with strong criticism why a cell tower is to be established exactly at this site. Most often alternative places have to be looked for after an expert's opinion has been obtained, all this is connected with high costs. Finally there are people so nervous that they decide for themselves and their families to refrain vastly or completely from using cell phones. These damages (non-completion of contracts) are also difficult to quantify and in the end are not suitable as a basis for damage claims.*

New results from basic research contradict Lerchl

Progress made in the research of biological effects from radiofrequency radiation after the completion of the REFLEX study clearly shows how indeed unfounded Lerchl's charges against the REFLEX results are. However, he solves the problem by ignoring the many relevant publications in support of the REFLEX findings that are meanwhile available. This failure which is normally fatal for a scientist was in his case not to his disadvantage. At the end of 2010 Lerchl was re-appointed by the government for a second period in the German Commission on Radiological Protection. Despite of this, the authors of the Vienna papers notice with satisfaction that more and more international research groups publish results with the conclusions they themselves have drawn some years ago, namely that radiofrequency radiation has a gene-damaging potential. Here are a few examples:

- Franzellitti et al. publish in *Mutation Research* in January 2010 a paper in which they provide evidence that in isolated human trophoblasts DNA strand breaks significantly increased during a 16- respectively 24-hours GSM exposure at a SAR of 2 W/kg - just as observed in Vienna.
- Xu et al. follow also in 2010 with a paper in *Brain Research* in which they reported that DNA adducts caused by oxygen radicals in the mitochondria of primary cultured neurons (nerve cells) from newborn rats are significantly increased after a 24-hours GSM exposure at a SAR of 2 W/kg.
- Campisi et al. observed according to their paper in *Neuroscience Letters* in 2010 an increase in DNA strand breaks in primary rat glia cells after exposure to a high-frequency field (900 MHz, GSM-like modulated) below the exposure limits..
- Xu et al. report at the International Meeting of the Bioelectromagnetics Society (BEMS) in Seoul, South Korea, in 2010 a significant increase in DNA double strand breaks in Chinese hamster lung cells and human fibroblasts after a 24-hours GSM exposure slightly above the exposure limits.
- Karaca et al. show in their paper in the *Journal of Neuro-Oncology* in 2011 that in cultured brain cells from mice the number of micronuclei increased by the factor 11 after a three-day exposure (6 hrs/day) to radiofrequency radiation far below the exposure limits.
- Guler et al. present results in *General Physiology and Biophysics* in 2010 which demonstrate that New Zealand white rabbits react among others with an increase in DNA-adducts after GSM exposure below the exposure limits for 15 min/day over 7 days.
- Kesari et al. report in the *International Journal of Radiation Biology* in 2010 that radiofrequency electromagnetic fields significantly increased DNA strand breaks in brain cells of rats after their exposure for 2 hrs/day over 35 days below the exposure limits.

Altogether, the scientific publications that speak for a genotoxic potential of the radiofrequency radiation and that have been published before, during, and after the REFLEX study surely add up to more than 100. All these papers are declared unreliable or – or even a little more cynical – not “stressable” by the officials responsible for the radiation protection in Germany and are, therefore, ignored. It remains to be seen how long the truth about the effects of radiofrequency radiation on structure and function of genes and the possible consequences for human health can remain to be suppressed through the denial of reality.

II. Institutional corruption in action for the aims of the DMF

Between 2002 and 2008 a total of 54 studies have been carried out within the frame of the German Telecommunication Research Program (DMF), that was designed by the German Federal Office for Radiation Protection (BfS) and scientists working in close cooperation with the wireless communication industry. It was jointly funded with about 23 million dollars by government and telecommunication providers. There may have been special reason for the government's decision to involve the industry in the planning of the program. Just before the DMF started the government had collected more than 65 billion dollars from the industry for licenses allowing the exploitation and operation of the new UMTS standard. Already in those days government and industry seemed to have been aware of the risk that the results of the DMF may question this deal. Surely, a demonstrated human health risk from radiofrequency radiation within the DMF would either result in the economic ruin of the licensees or the government would have to return the money. How it looks like, such a development was already ruled out at the planning stage of the DMF.

Starting point of the DMF were first indications that biological effects of radiofrequency radiation had been observed below the valid exposure limits. Inevitably the question came up whether the exposure limits allow sufficient protection against possible health risks. And really, while the DMF was carried out, none of the fears could be confirmed. As stated in the DMF's final report evidence of possible non-thermal effects could not be consolidated. Also, no support was obtained in favor of the so-called melatonin hypothesis, which claims that the melatonin level is lowered by radiofrequency radiation. The outcome of long-term animal studies on cancer development triggered by radiofrequency radiation was likewise negative. The final conclusion was that the results of the DMF provide no reason to doubt the protection of people through the valid exposure limits. It is, however, admitted that long-term effects in children and adults have not been addressed in the studies.

Today the outcome of the DMF constitutes the main basis for the German radiation protection policy. Considering the state of knowledge derived from the results of international research, the conclusions from the DMF are surely untenable and sound even a bit cynical with regard to the admitted fact that – what really counts – long-term effects in children and adults cannot be excluded. The idea behind these conclusions is best demonstrated by the attempt of the wireless communication industry and their supporters in science to destroy the oppositional data of the REFLEX study. In contrast to this strange attitude is the high estimate of results that owe their existence to the pseudo-research jointly funded by governments and industry, amongst others obtained within the DMF. There are numerous examples that support this view. I will present two of them that have been provided by the DMF – under the responsibility of Alexander Lerchl.

Lerchl's research project on the melatonin hypothesis

It is always an awkward experience for the wireless communication industry when more and more people try to stop the erection of new cell phone towers in their vicinity. This is due to their fear of sleep and other health disorders including cancer that may be caused by the radiation from these towers. In their protest, they often refer amongst others to the so-called melatonin hypothesis according to which formation of melatonin and its release from the pineal gland are inhibited by the high frequency radiation. Since this hypothesis is considered to be an important cause of unpleasant confrontations with the public it needed to be rejected. Again, Lerchl was entrusted with this task within the DMF.

The neurohormone melatonin is synthesized in the pineal gland located in the diencephalon of mammals. It is formed and released during the night; both processes are inhibited during the day, thus steering the circadian rhythms in the human organism. In addition, a series of positive effects in the human body, especially the scavenging of free radicals for the prevention of cancer, is ascribed to melatonin. Altogether, melatonin seems to contribute decisively to the maintenance of health and with it to the general well-being of people. No doubt, evidence of the inhibition of its synthesis through radiofrequency radiation would create a considerable obstacle for the further expansion of the wireless communication technology.

Lerchl's conclusions

To study the melatonin hypothesis, Lerchl removed, according to his final report to the German government, the pineal glands from 500 dwarf hamsters and exposed the organs for seven hours to radiofrequency radiation of two different signal compositions (unpulsed vs pulsed) at four different specific absorption rates (SAR). From his results he concludes that the melatonin synthesis in the isolated glands is not inhibited through the radiation

but rather increased, that because of this there is neither a scientific basis for the melatonin hypothesis nor a reason to recommend a lowering of the valid exposure limits for the whole-body exposure.

My conclusions

- 1) Under physiological conditions, the melatonin synthesis in the pineal gland is controlled by several steering centers outside the location of its production. The study on isolated pineal glands ignores the dependence of the melatonin synthesis on these regulatory mechanisms. Without considering the entire regulatory system as a whole, the question as to whether electromagnetic fields affect melatonin synthesis and, thus, prove or disprove the melatonin hypothesis cannot be answered. This fact alone is sufficient to conclude that the design of Lerchl's study is flawed and that his results are, therefore, meaningless.

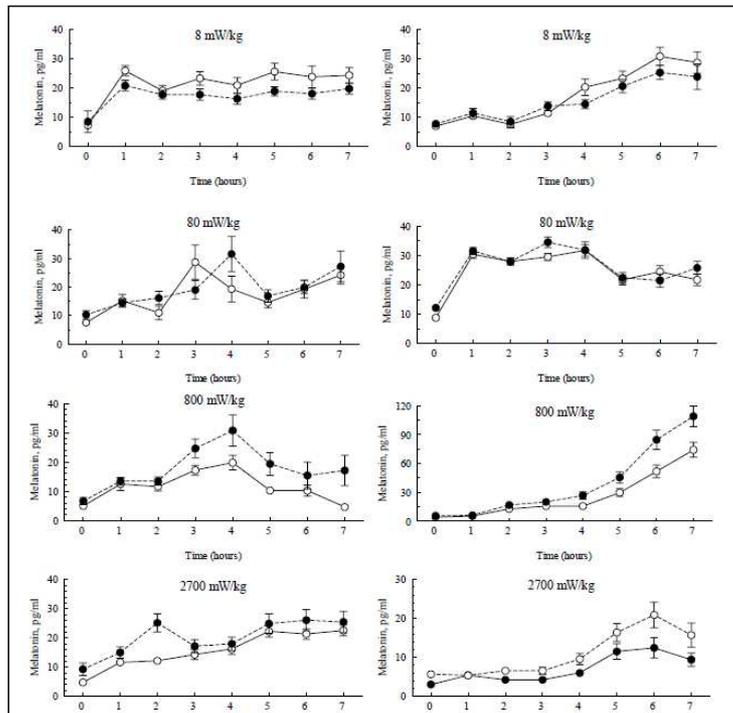


Figure 3: Effects of electromagnetic fields (1800 MHz, left unpulsed, right pulsed) on the melatonin synthesis in isolated pineal glands (number of glands: allegedly 500); ○---○ sham exposed, ●---● exposed

- 2) The data presented in Figure 3 of Lerchl's final report clearly show that the melatonin synthesis in the pineal glands after exposure to the unpulsed as well as to the pulsed radiation at a SAR of 8 mW/kg measured every hour after the start of the exposure is clearly inhibited. Lerchl ignored this fact because it would support the melatonin hypothesis and, too, the existence of non-thermal effects. We must note, that under real life conditions the intensity of the radiation from cell towers hardly reaches a SAR of 8 mW/kg at the surface of the human body, and not at all in the brain area where the pineal gland is located.
- 3) With regard to the effects observed at a SAR of 80 mW/kg and 800 mW/kg, Lerchl concludes that the data contradict the melatonin hypothesis since he did find either no influence or an increase of the melatonin synthesis. The latter may in his opinion even point to positive effects of the high frequency radiation. We must note that SARs of 80 and 800 mW/kg are radiation intensities that can be found at the head while using the mobile phone, but they are far above those caused by the radiation from cell phone towers and are, therefore, barely suitable to study the melatonin hypothesis.
- 4) Furthermore, Lerchl mentions the fact that with a SAR of 2700 mW/kg the melatonin synthesis was increased by the unpulsed radiation but inhibited by the pulsed one. However, he does not say anything about the serious consequences of his findings. Should the reversed effects of the different radiofrequency signals prove to be true, the present exposure limits had lost its scientific basis since different signal compositions were not at all taken into account when exposure limits were established. Also, the SAR of 2700 mW/kg is slightly above the exposure limit of 2000 mW/kg for the head while using a cell phone. This value is, however, irrelevant, if the melatonin hypothesis should be studied.

5) In Figure 4 of his final report Lerchl shows in addition to the melatonin synthesis in one-hour intervals the whole melatonin production in the pineal glands during the exposure time over seven hours. The percent increase or decrease of the melatonin synthesis is calculated from the values obtained during sham exposure that are set at 100%. While according to Figure 3, the melatonin synthesis after exposure to the pulsed radiation at a SAR of 8 mW/kg is inhibited, it is increased in Figure 4 although exposure details were identical. There is no explanation for this discrepancy.

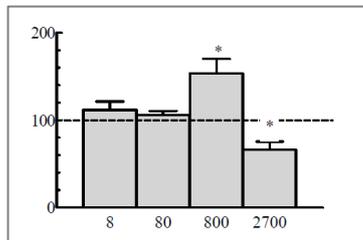


Figure 4: Presentation of the total melatonin production over 7 hours after exposure to the pulsed fields.
*, $p < 0.05$ vs control
(section of Figure 4)

6) A deeper insight in Lerchl’s research work is provided by the presentation of his data in the peer-reviewed *Journal of Pineal Research*. In Table 1 of this publication the hourly production of melatonin, calculated on the basis of the total production during the exposure time over seven hours, is given in pg/ml/hr. As already shown in Figure 4 of the final report the melatonin synthesis is again increased after exposure to the pulsed radiation (GSM) at 8 mW/kg. This is, however, opposite to what is to be expected from the data given in Figure 3 of the final report. Only one of the two contradicting findings can be correct.

Table 1: Melatonin production in pg/ml/hr during the exposure over 7 hours to unpulsed (CW) and pulsed (GSM) radiofrequency fields varying in intensity (mW/kg)

Melatonin production	Intensity (mW/kg)			
	8	80	800	2700
CW (unpulsed)				
Pineal glands - control groups	21.75 ± 0.29	17.24 ± 0.31	11.47 ± 0.28	15.65 ± 0.28
Pineal glands - exposed	17.22 ± 0.30	19.31 ± 0.31	17.54 ± 0.32	20.45 ± 0.29
Relative to control (%)	79.8	112.0	152.9*	130.7*
GSM (pulsed)				
Pineal glands - control groups	15.65 ± 0.30	24.62 ± 0.29	25.65 ± 0.38	10.44 ± 0.28
Pineal glands - exposed	17.49 ± 0.31	26.04 ± 0.30	39.75 ± 0.23	6.90 ± 0.24
Relative to control (%)	111.8	105.8	155.0*	66.1*

CW = continuous (unmodulated) exposure , GSM = modulated exposure according to GSM standard
Data represent melatonin synthesis in pg/ml/hr ± S.E.M.
* $P < 0,05$ versus control

7) The data in Table 1 provide, however, important additional information. The melatonin synthesis after sham-exposure (control), which constitutes the basis for its percent increase or decrease after radiation, varies in the unpulsed series between 11.47 and 21.75 pg/ml/hr and in the pulsed one between 10.44 and 25.65 pg/ml/hr. This enormous variation of the data allows the conclusion that the results obtained are (most probably) random. Either was the study design unsuited for answering the question asked or Lerchl’s laboratory did not have adequate knowledge of the applied methodology to correctly measure melatonin. The latter assumption is supported by the fact that no positive controls were documented in the final report or in publication although 180 dwarf hamsters were killed for this additional investigation than would have been absolutely necessary. There is no mention of what happened to them. Quite obviously, something must have gone wrong with them.

Lerchl's AKR/J mice study on carcinogenesis

The International Agency for Research on Cancer (IARC) of the WHO in Lyon, France, classified low-frequency electromagnetic fields as 'possibly carcinogenic' in 2002. The decision was based on the results of numerous epidemiological studies that all point to an increased risk of leukemia in children exposed to this radiation. And suspicion did arise that leukemia might possibly also be triggered through radiofrequency fields. This opinion, which could jeopardize the application of the radiofrequency technologies under the present conditions, required firm action. While the DMF provided the possibility for it, Alexander Lerchl offered the warranty that the interests of politics and industry are duly considered.

Because of a genetic modification, AKR/J mice show malign lymphomas starting with four month of age that kill nearly 100% of the animals during their first year. In two research projects Lerchl tried to investigate if exposure of mice over several months to GSM or UMTS signals influences the onset and the course of lymphoma development. In the GSM study, carried out between October 2002 and September 2004, 160 mice were exposed for 24 hours/day to fields with a frequency of 900 MHz at a SAR of 0.4 W/kg. Another 160 animals, the control, were sham-exposed in similar equipment. In the UMTS study, carried out between October 2003 and April 2005, the procedure was identical. One group with 160 mice was exposed to fields with a frequency of 1966 MHz at a SAR of 0.4 W/kg, while the other one with 160 mice served as sham-exposed control. Every one or two days the animals are inspected. Once a week the body weight is determined and on this occasion a thorough palpation was carried out to not miss the onset of lymphoma. As soon as first signs of disease appear (lymphoma, shortness of breath, weight loss, or ruffled fur) the animals were killed. At the end of the radiation period the few still living ones were also sacrificed.

Lerchl's conclusions

According to his final report to the German government Lerchl could not detect any harmful effects of the 900 MHz-GSM radiation to which the AKR/J mice were continuously exposed for several months. From this finding he concludes that the electromagnetic fields applied in the experiment do with a high degree of significance not influence the onset or the course of the lymphoma development, and that there is no reason to lower the valid exposure limits for whole-body exposure. In his peer-reviewed paper in *BioMed Central Cancer* this outcome is confirmed and complemented.

In his final report of the UMTS study Lerchl states that the exposed mice altogether were in a better state of health compared to the controls. Significantly more exposed than sham-exposed animals reached the end of the exposure period without showing detectable disease symptoms. The possibility that this positive effect might be due to the UMTS radiation is explicitly mentioned. Summarizing the findings Lerchl claims (a) that his results do not point to any harmful effect from month-long exposure to UMTS fields at a SAR five times higher than the whole-body exposure allowed for humans (80 mW/kg), (b) that the study provides no reason to lower the valid exposure limits for whole-body exposure, and (c) that the experiments carried out are a significant contribution to health care. The presentation of the results in the peer-reviewed journal *Radiation Research* differs from his final report only in so far as the health-promoting effect of UMTS radiation is not mentioned anymore.

My conclusions

The two studies do not nearly meet the claim to have contributed anything to the knowledge about the effect of radiofrequency radiation on the development of malign lymphomas in AKR/J mice. These are the main reasons why:

- 1) The research approach was designed in such a way that Lerchl had the opportunity to navigate the course of the study in the desired direction. In both, the GSM and the UMTS study, the majority of the animals were sacrificed during the exposure period. Killing was done when the mice showed first symptoms of disease. Since the symptoms develop slowly over a longer period, the date of the killing is dependent on the investigator's subjective impression about the animals' state of health. As from the very beginning, Lerchl had to take into account critical questions because of his unusual research plan, he obviously believed that he could counter with the statement that the experiments were 'blinded' and the related code was disclosed only after statistical evaluation had been completed. However, the simple test arrangement and the analysis of the results contradict the claim that a reliable blinding actually took place.
- 2) In the UMTS study, the number of mice supposed to have reached the end of the exposure period in a healthy state was in the exposed group with 28 animals considerably higher than in the sham-exposed one with 14

animals (see table below). While this difference was presented to the patrons of the study with $P < 0.01$ as being clearly significant, and then described in the UMTS final report to the government as being at least significant (without mentioning the level) and above all offered to the wireless communication industry as a possibly positive effect of the UMTS radiation, the published paper does not mention this finding anymore. Despite the same number of animals, the level of significance is given with $P = 0.055$ and – according to Lerchl's understanding of biology and statistics – not worth a further discussion. This phenomenon can, however, be explained in the most simple way. The investigator assessed the state of health of the exposed mice as being a better one than that of the sham-exposed ones, since this is in line with the prevailing view in Lerchl's laboratory that radiofrequency radiation does not have a biological effect. In his eagerness he did not notice that he went a little bit too far.

- 3) The assumption is almost confirmed by the figures listed in the publications. The subjectively determined median survival time of the exposed mice was in both studies (see table below) with 190 (GSM) and 172 days (UMTS) clearly higher than in the sham-exposed groups, where it only was 183 (GSM control) and 165 days (UMTS control). The supposed positive effect of the radiofrequency radiation is, however, not in line with the median time for the development of lymphomas that were diagnosed histopathologically after the animals had been sacrificed. In both studies the median time for tumor development was with 183 (GSM) and 141 days (UMTS) in the exposed groups clearly shorter than in the sham-exposed ones with 193 (GSM control) and 149 days (UMTS control). Therefore, the suspicion of a tumor promoting effect of the radiofrequency radiation is certainly justified. The observation, that from the exposed group the first mouse died of lymphoma after 60 days while from the sham-exposed one the first did so after 88 days, speaks also for this assumption. It is rather unlikely that the reverse course of the median survival time and of the lymphoma development time is pure coincidence. And in addition, it speaks in favor of the assumption that the data have been manipulated.

	Healthy animals at end of exposure period	Median survival (days)	Median tumor development (days)
	<i>Subjective assessment by the investigator</i>	<i>Subjective assessment by the investigator</i>	<i>Objective histological examination</i>
UMTS GSM	28 (17.5 %) -	172 190	141 183
UMTS control GSM control	14 (8.8 %) -	165 183	149 193

- 4) In both publications it is stated that the experiments carried out do neither allow a statement about the onset nor about the course of the tumor development since for such an investigation it would have been necessary to kill the animals at fixed time intervals regardless of clinical symptoms. As this statement is without any doubt true, the question has to be asked why Lerchl did not carry out the studies in compliance with good scientific practice but under a design unacceptable from a scientific point of view. The fact that nowhere an answer is given to this crucial question can only be seen as further evidence that Lerchl's studies do not even meet the minimal quality standard demanded in science. Therefore, both studies should not have been approved, funded or carried out in their present form.

Lerchl's slow withdrawal from his beloved idea that state of health and life expectancy of the mice are improved through the UMTS radiation throws a special light on his understanding of statistics. To finally depart from this untenable position he had to transform what he once considered statistically significant into statistically not significant, and he did so by misuse of statistics. Such a confession of personal failure would have caused any other scientist a nightmare. Not so Lerchl, whose results of the ARK/J mice study are still used by the federal government to support its view that a cancer risk due to radiofrequency radiation does not exist. In contrast to the REFLEX study the federal government does obviously not see any reason to distrust the results of Lerchl's pseudo-research.

III. Institutional corruption in action while implementing exposure limits

The discussion on possible adverse biological effects of the radiofrequency radiation started already before World War II. During the War when the application of radar for military purposes became increasingly decisive for its outcome consideration of possible risks to health of people was put on hold. After the war the implementation of exposure limits could no longer be avoided due to the experience made in-between with this technology. The decisive question whether or not besides the well known thermal effects of radiofrequency radiation also non-thermal ones exist was not decided with scientific data but *ex cathedra*. Opposite to the present state of knowledge the occurrence of non-thermal effect is ignored by politics and industry till today. Why and how this wrong conception made its way is the topic of my next section.

The exposure limits rest upon pseudo-science

Herman Paul Schwan, a German biophysicist who had started his research on biological effects of electromagnetic fields at the former *Kaiser-Wilhelm-Institut für Biophysik* in Frankfurt and continued after the War in the U.S., played a leading role in fixing the first exposure limits. In the early 1950s Schwan claimed quasi *ex cathedra* that there is no biological effect of radiofrequency radiation besides the one emerging from a temperature rise in organic tissues, since anything else would contradict the laws of physics. In 1953, Schwan proposed to the U.S. Navy a first exposure limit with a power density of 10 mW/cm² with which he was confident that a rise of temperature in the human body will be prevented.

Initially, exposure limits were necessary only for personnel in the armed forces and at certain workplaces where people were exposed to radar radiation. A noticeable exposure of the general public started only with the cell phone age in the 1990s. It was then assumed that people will reliably be protected, if the exposure limit valid for workplaces is lowered by a factor of 10 to 1 mW/cm². Schwan's later view that non-thermal effects cannot be excluded with sufficient certainty was ignored. In the meantime, the industrial-military complex had become fully acquainted with the potential of this technology and was determined to prevent that its application will be restricted because of concern related to the health of people.

The debate whether or not in addition to the undisputed thermal effects of radiofrequency radiation non-thermal effects exist as well overshadowed numerous scientific conferences between 1955 and 1990 in the U.S. and elsewhere. The problem was finally solved in the simplest possible way: scientists who claimed to have found evidence of non-thermal effects were ridiculed and funding of their research was suspended. Thus, the goal to expand the use of the radiofrequency radiation as far as technically feasible was achieved. This was, however, only possible, because scientists cooperating closely with the industry increasingly dominated the governmental advisory and decision-making bodies. Thus, economic principles determined installation and maintenance of the exposure standards, while aspects related to the wellbeing and health of people were largely ignored.

Current exposure limits for radiofrequency radiation in Europe (ICNIRP), US (IEEE) and Russia (Data given in power densities for far-field exposure (mW/cm²) from cell phone towers and in specific absorption rates (SAR) for near-field exposure (W/kg) from cell phones)

	ICNIRP Europe	IEEE U.S.	Russia
Far-field exposure	1 mW/cm ²	1 mW/cm ²	0.001 mW/cm ²
Near-field exposure - a) whole body	0.08 W/kg	0.08 W/kg	?
Near-field exposure - b) head	2.0 W/kg	1.6 W/kg	?

The U.S. guidelines constitute the model for the European guidelines

The exposure limits in the U.S. were developed by the Institute of Electrical and Electronics Engineers (IEEE) in the fourth quarter of the last century. Europe fixed its own exposure standards based on the same simple model of the exclusive temperature increase as in the U.S. A decisive milestone to promote economic interests was the foundation of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in 1992 by Dr. Michael Repacholi, head of the EMF Project of the WHO. ICNIRP is a private association for which Repacholi by virtue of his position provided official recognition from the WHO, the EU, and several of its member states including Germany. Repacholi, the first and till now honorary chairman of the ICNIRP, retired in 2006 after being accused of corruption by the WHO and joined a giant U.S. electric power company as consultant. The

scientist Andrew Marino claims in his book *Going Somewhere* that Repacholi would with the help of the industry have become a kind of EMF czar at one of the WHO agencies from where he purported to teach the world about electromagnetic fields. According to Marino he is just one of the numerous “experts” who replace professional knowledge by the strong belief in the intrinsic safety of electromagnetic fields. Of course, the strength of this belief is directly proportional to the rewarding effect.

The ICNIRP adopted Schwan’s pseudo-theorem that there are no effects of radiofrequency radiation but thermal ones, but it reacted to the increasing criticism with a slight modification of the exposure limits. It proposed a power density of 0.45 mW/cm² for 900-MHz fields, of 0.9 mW/cm² for 1800-MHz fields, and of 1.0 mW/cm² for 2100-MHz fields. These proposals that exclude only short-term and acute health effects through radiofrequency radiation based on temperature increase, but not at all possible long-term effects such as development of cancer and neurodegenerative disorders, were adopted by the WHO and the EU in 1998 and recommended to their member states.

Since the intensity of radiofrequency radiation from cell phones to which the human brain is exposed from the nearest possible distance is 1,000 to 10,000 times higher as compared to that of the radiation from cell towers, exposure limits had to be fixed also for near-field radiation. For this purpose, the specific absorption rate (SAR) – which can only be measured indirectly – was developed. A standardized phantom human head model made of plastic and filled with an electrolyte-enriched liquid to adjust its electric conductivity to that of the human brain is exposed to radiofrequency radiation from cell phones. A computer-driven field detector in the liquid provides the data required to determine the SAR. This absurd approach assumes that the human brain reacts to the radiofrequency radiation the same way as dead material does. It does not consider that the human brain contains hundred billions of living cells, which operate and communicate with each other on the basis of electrochemical mechanisms. That these mechanisms can be deranged quite easily by electromagnetic fields has been shown many times by now. For a medical doctor like me, this alone is reason enough to deeply doubt the protection promised through a SAR that is solely based on physical deliberations but totally neglects biological considerations.

The international harmonization of the exposure limits fails due to lack of credibility

At the end of the 1990s, the WHO with Repacholi started an attempt to harmonize the exposure limits (based on those) recommended by the ICNIRP. Yet, they did not have much success. The primary reason was the suspicion that the warranty of safety was far from being met and, even worse, that the exposure limits protect more the interests of the industry than those of the general public. This assumption was finally supported by organizations such as the U.S. Environmental Protection Agency (EPA) that called the American standards already in the 1990s ‘seriously flawed’ partly for failing to consider non-thermal effects. After that, the EPA was absolved from its responsibility to protect the U.S. citizen from electromagnetic fields radiation. And finally, the European Parliament stated in 2008 that the ICNIRP standards too are obsolete. But this did not change the mind of the decision makers in most of European countries including Germany.

Opposition against a harmonization based on the ICNIRP standards came primarily from China and especially from Russia where six decades of research on biological effects of radiofrequency radiation had produced a totally different state of knowledge. Professor Karl Hecht, elected member of the Russian Academy of Medical Sciences, stated in a report to a German governmental institution in 1996 that the Russian exposure limits would be much lower than the Western ones that are in his opinion based on pseudo-science. But applying today’s knowledge, even the Russian exposure limits did not offer a reliable protection of human health. Hecht, a retired medical doctor with great merits in space medicine, is convinced that the currently applied parameters to determine exposure limits are generally unsuited to guarantee the protection of the people from non-ionizing radiation because they disregard the inherent order of biological organisms, especially the highly organized functions of the human brain. I concur with his conclusions.

In this connection, I feel that I should let you know Hecht’s personal experience made in this area of research in the united Germany after the fall of the “Iron Curtain”. I quote: *As I know from the 50-years fight for a real protection against electromagnetic field radiation, the advocates of high exposure limits ... do not treat their opponents with affection, I am sure to suffer in the future, reprisals, slandering, and discrimination. Proudly I will fight these wheeling and dealing and I would be grateful to receive the support of the ones I intend to help.*

How aware – during the “Cold War” – the Russian administration was of the biological effects of radiofrequency radiation was shown by the nearly constant irradiation of the U.S. embassy between 1962 and 1979 with radio-frequency electromagnetic fields of different modulation, but low intensity. Out of the four ambassadors in those years two died of cancer. And one-third of the embassy staff showed leukocytosis and chromosome abnormalities. A costly, but secret research project in the U.S. called *Pandora* was carried out to study the effects caused by this radiation of the embassy staff and to understand the reasons why the Russians did it. As far as I know, the results of *Pandora* have never been published. U.S. protest was, however, feeble because evidence of fatal effects of the radiofrequency radiation would have had severe consequences for the economic and military use of the technology in their own sphere of influence.

Radiofrequency electromagnetic fields are "possibly carcinogenic for humans"

The worst that could happen so far to the supporters of the current exposure limits took place in Lyon, France, in May 2011. The International Agency for Research on Cancer (IARC) classified radiofrequency electromagnetic fields including cell phone radiation as ‘possibly carcinogenic to humans’. The decision was based on the vote of 30 scientists who had thoroughly discussed the matter during their one week meeting that preceded the vote. Alexander Lerchl applied for participation but was officially turned down because of his close ties with industry and his prejudice in regard to the state of knowledge. The same happened to Anders Ahlbom from the Swedish Karolinska Institute. Shortly before the meeting it was revealed that he had been internationally active in the interest of the wireless communication industry at least for one decade.

IARC-scheme for the stepwise classification of a carcinogenic risk:

Group 1	- the agent is carcinogenic to humans
Group 2A	- probably carcinogenic to humans
Group 2B	- possibly carcinogenic to humans
Group 3	- not classifiable as to its carcinogenicity
Group 4	- probably not carcinogenic to humans

According to the IARC panel the results of epidemiological studies had been decisive for the ‘possibly carcinogenic’ classification. These studies observed after long-term (>10 years) and intensive use of cell phones an increased risk for brain tumors exactly at the side of the head at which the cell phone was held. The results from animal experiments, although of minor significance, supported the decision. Yet, results from basic research like REFLEX that showed changes in structure and functions of genes in isolated human and animal cells as well as in living animals after exposure and that would have provided weight to the epidemiological observations were not taken into account. Had they been included, the classification would not have been ‘possibly carcinogenic’ but rather ‘probably carcinogenic’. However, it was obviously not the intention of the IARC, an organization of the WHO, to confront politics and industry that had expected a classification of ‘not classifiable’ with such a harsh decision.

The new classification is a warning shot for the wireless communication industry as well as for the many governments on its side. Quite obviously their strongholds, i.e. the national and international committees that they have filled with hired scientists in the course of decades in order to protect their interests have been heavily damaged. The counteroffensive, which meanwhile has been started by these “experts”, will probably not reverse the development to before May 2011. For example, Lerchl’s claim that the IARC with this decision has ruined its reputation as a scientific organization may provoke the opposite of what he intends. Hopefully this will open the eyes of those politicians who are responsible for public health. Now they are offered the chance to recognize that they have much too long followed the wrong advisors and the wrong path regarding the protection of the people from a potentially important environmental health risk.

Judge William Alsup from San Francisco stated at the end of 2011, and I quote: *The overall impression left is that cell phones are dangerous and that they have somehow escaped the regulatory processes.* No doubt time has come to adjust the wireless communication technology to the human organism, since the opposite way, which has been pursued much too long, might end in a catastrophe.

IV. Institutional corruption is the cancer of society

The Harvard's Edmond J. Safra Center has been studying the problems of institutional corruption for some years now. There is certainly agreement that it is of societal relevance, if mutual understanding between decision-making politicians and representatives of industries with economic potential is reached at the cost of the society. As stated on the website of the Safra Center, institutional corruption is generally based on legal practices that are applied within societal norms. They operate according to the saying "One knows one another, one helps one another". But a second view may reveal that such an amicable cooperation may at least partially be grounded on illegal practices. There is no doubt at all that the telecommunication industry in Germany is under the special protection of the federal government. The reasons for this are its remarkable socio-economic importance, its enormous financial power and certainly also its sustainability. The fact that the industry is held in such a high esteem by the government offers it the unique possibility to make the decision-makers aware of its ideas and visions about the harmlessness of the radiofrequency radiation in the fastest and most direct way. The scandal begins with the acquisition of the information these ideas and visions are based upon. They obviously include messages like this one that the results of the REFLEX study have been fabricated. Of course, this is the official position taken by politics.

The handling of the REFLEX study

Lerchl's and the rector's malicious campaign against the REFLEX study – I have to admit – reached its goals to a large extent despite its factual failure. Telecommunication industry and politics have certainly no reason to complain about the outcome of the campaign, even if the efforts failed to retract two papers from the scientific literature which had been accused of fraud. According to the saying *semper aliquid haeret* [something always sticks] the REFLEX study lost most of its scientific impact due to the world-wide dissemination of the fraud allegation. The single fact has certainly contributed to their satisfaction that two ethic committees exonerated the Vienna research group from fraud accusations, but, criticized the scientific quality of their publications. They did so although they were neither mandated to carry out a scientific review nor did they have the scientific expertise for this task. They obviously took into consideration more the interest of the institutions involved than the scientific reputation of the research group accused of fraud. Anyway, based on the incidences around the REFLEX study there cannot be much doubt that the practices of institutional corruption were used by the wireless communication industry with the approval of politics to eliminate results from the scientific literature that endangered the existence of the economically important exposure standards. Lerchl, the organizer of the campaign against REFLEX, is meanwhile internationally well known because of his aggression against scientists when their research results do not agree with his beliefs. It is not without pride that he points at his membership to the International Committee on Publication Ethics in London thus demonstrating that he is obliged to quality management of research as well as to ethic in science. The impact of this engagement on his own studies will be shown in the following.

Lerchl's contributions to the DMF

The critical analysis of Lerchl's research projects show that his results – to adopt Lerchl's wording when he criticizes research from scientists with deviating views – are indeed based on junk science. Since they owe their existence with the highest probability to pure chance or even manipulation, they are from the scientific point of view meaningless. Design and performance of both research projects and evaluation of the data contradict the rules of good scientific practice. The reason why this knowledge was not obtained much earlier can easily be seen in the fact that no effective quality control has been carried out within the DMF. There is considerable evidence that both research projects were from the beginning not at all directed at gaining new knowledge, but rather intended to serve the interest of industry and politics. According to the government's appraisal of the results this goal has obviously been achieved. Therefore, the radiation protection policy of the government rests solely upon scientific results that have been generated under the following conditions: (a) research projects that infringes upon the Protection of Animals Act by the ethic committee of a university, (b) partial funding of research projects, the design of which excludes from the beginning that the research goal will ever be achieved, through the German Federal Office for Radiation Protection (BfS) from tax revenues, (c) design, performance and evaluation of research projects by a lobbyist of the wireless communication industry whose prejudice has in the meantime officially been confirmed by the IARC, and (d) publication of research data in scientific journals

with a peer-review process obviously not based on science but complaisance. Since there is an intrinsic relationship between the management quality of research and ethic in science, the federal government should know that bad scientific practices such as deficiencies in design, performance and evaluation of studies are often associated with fraud. The fact that such an association can in no way be excluded with regard to Lerchl's scientific activities would certainly make him dispensable as a member of the Committee on Publication Ethics, but he could in no way be replaced in the German Radiation Protection Committee as long as politics and industry pursue their goals with the practices of institutional corruption without considering public concerns.

The battle for exposure limits

Lerchl's research gives the impression that it was aimed from the beginning at confirming the reliability of the current exposure limits. The history of research on biological effects of radiofrequency electromagnetic fields shows that the exposure limits, developed in the U.S. and transferred to Europe, are indeed based on pseudo-science. They rest upon the assumption that no other biological effects of radiofrequency radiation exist apart from thermal effects. Critical results from investigations of independent research groups have been ignored for decades in order to enable the almost unrestricted use of the potential of this technology. Of course, there is reason for this. Since these results clearly demonstrate that biological effects of relevance for the pathogenesis of diseases exist far below the exposure limits, they would have deprived the present radiation protection laws of its pretended scientific basis. The refusal by governmental institutions to acknowledge this fact till today was only possible, because the industry knew how to solve the problem - as shown e.g. with the handling of the REFLEX study and the pseudo-research within the DMF. It did obviously not have any problem in recruiting compliant scientists and journalists who became always active when the community needed to be appeased after new alarming papers had been published. Maintaining the exposure limits at the present level, which is much higher than actually needed and does certainly not provide any protection, may eventually have fatal consequences for the people. At present, the exposure limits provide the basis for the government to legally protect itself when it carelessly refuses precautionary measures asked for by a minority and when it unscrupulously supports the expansion of the telecommunication technology driven forward by the industry. Trusting that the government is obliged to protect its citizen from any environmental risk to their health the majority of the people are willing to accept the current exposure limits. Those who stand up because e.g. they feel that their health is endangered through the radiation from cell phone towers do hardly have any chance to be taken seriously when they bring their case to court. Courts in Germany do not accept health damages caused by radiation from cell phone towers, since in their opinion such damages do not exist because the exposure limits are always observed and, even better, a capacity of only 10% is reached. While the majority does not realize that it could be victim of institutional corruption, a minority – convinced about that for a long time – has to live with the perception that nobody can help them in their misery.

The attitude of industry and politics

The methods used by the wireless communication industry to defend its position vary from case to case. Usually the line of actions against scientific findings that may have a negative impact on the public discussion depends obviously on the expected effect. Results of minor importance are simply classified as *junk science* and, thus, neutralized for the future. Should their importance reach a higher level and, therefore, constitute a danger for the position taken by the industry, repetition is the means of choice to get rid of the results. Investigations generously financed by the industry and allegedly carried out with an improved methodology usually end with a negative outcome. If the results are threatening the safety concept by attacking the exposure limits as in the case of the REFLEX data the industry obviously does not shy away from public campaigns directed against the unwanted findings and their authors. The means are always the same: accusations of fraud and personal defamations of the authors. The U.S. wireless communication industry has coined the term *war gaming* for such exceptional cases. Lerchl has shown in the past that he is in command of all these technologies

The successful application of these methods through the wireless communication industry requires the assistance of suitable representatives from scientific organizations who are willing to provide such services. Professional qualification and character are rather bad requisites for such a job. The nomination of such persons as "experts" and their national and international engagement for the interests of politics and industry certainly belong to the most perfidious practices of institutional corruption. Lerchl's appointment as a member of the German

Commission on Radiological Protection and its renewal for another two years in 2010 is such a case. In this commission he is responsible to protect the people in Germany from potential health risks due to their exposure to electromagnetic fields. Based on his own conviction that people are reliably protected through the current exposure limits he does certainly not have any doubts that he fully lives up to his responsibility in this position. His opinion that radiation protection in Germany is of the highest possible standard and his trivialization of the potentially adverse effects of radiofrequency radiation are the basis of the close partnership between Lerchl and politics and industry. This resulted in a privileged funding of several more research projects in Lerchl's laboratory apart from those presented here, in a high esteem of his contributions to the DMF through the government and, finally, in his appointment for a second period to the Commission on Radiological Protection.

Final conclusion

The biggest dilemma is the fact that efforts by politics and industry of hiding the truth, even supported by most of the media, are successful. The general public has either no idea of the probably adverse effects of radiofrequency radiation or has full confidence in exposure limits that according to their governments reliably protect them. Of course, people understandably prefer to distrust those scientists who caution against probable risks to their health, especially when their professional and moral reputation has been damaged through institutional corruption. Smear campaigns like the ones by Lerchl have certainly left their marks. The results of basic research and epidemiological studies have widely been ignored by the public, although they jointly indicate a significantly increased brain tumor risk in users of cell phones for more than ten years. With at present 5 billion cell phone users worldwide a human catastrophe is probably already under way. In democracies, it is a basic principle that above power and their owners are laws, rules, and regulations to which the owners of the power have to bow. History teaches that early warnings are far too often followed by late insights for which many people have to pay with disease and premature death. As shown here, these rules and regulations are at present trampled underfoot by those responsible for radiation protection in Germany and certainly elsewhere. Instead of continuing to ride the wave of institutional corruption governments should enforce a reorientation of their radiation protection policy.

Therefore, governments are requested to take the following actions:

- 1) Get rid of the biased 'experts' in national and international committees on radiation protection.
- 2) Ensure qualified research in the area of electromagnetic fields by funding independent research.
- 3) Lower the present exposure limits to a minimum just high enough to guarantee the functioning of the technology.
- 4) Inform the public on the real state of knowledge and take precautionary measures that may indeed protect the people.

It is in the interest of a democratic society that it is fully informed about what is going on behind the political curtain, no matter what consequences they will draw. To dedicate oneself to this task which promises no glory or fame is best undertaken by a scientist at the end of his career whose goal is solely to protect the health and well-being of people worldwide endangered by the uncontrolled expansion of wireless technologies.

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