

TO UNDERSTAND ADVERSE HEALTH EFFECTS OF ARTIFICIAL ELECTROMAGNETIC FIELDS... ...IS “ROCKET SCIENCE” NEEDED OR JUST COMMON SENSE?

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AS WE ARE ALL RAPIDLY BEING FORCED into the new generation of electronic gadgets and wireless services, sometimes referred to as the “Internet of Things” and primarily based on the 5th generation (5G) of wireless communication, to be followed soon by 6G and 7G, more and more people are asking themselves if the ever-increasing levels of artificial electromagnetic fields (EMFs), especially of the pulsed type, really are safe for living organisms; if their various equipments are there only for them to enjoy as private persons or for political, military, and commercial surveillance purposes – it is already obvious that it may easily develop into the “Internet of Totalitarian Control”, with unbelievably dark aspects of artificial intelligence, human brain control, and the Digital New World Order just around the corner; if some gadgets add fire risks; if they violate integrity considerations; if they pose an open door for advanced cyberattacks of homes, schools, and workplaces; if they generate

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profit for private companies but mere costs for the public health and welfare system; and if their EMFs pose a threat to their own and their families' health, as well as to the environment. Already at the end of the 1970s, I decided that this is an issue that needs to be looked at much more closely and perhaps even needs—for many serious reasons—to be stopped before it turns on us and other animals, plants, and bacteria as the *Idiocy of Things!*

Over the years, more and more people all over the world have become concerned citizens who realize that modern electronic devices produce electromagnetic fields that are not native to our Planet. These non-native EMFs are completely foreign to human, animal, and plant biology and may be wreaking havoc on the health and well-being of humanity and other life forms on our Planet.

In contrast to those with these fears, various opponents continue to insist that the majority of studies show no risk. But so does the majority of all car journeys, and still people die in car accidents! I am very happy that car manufacturers turn their backs on the nearly 100 percent of car journeys that end happily and instead concentrate on the trips that result in injury, disability, and death, with the intention to make their cars safer and safer!

I have wondered my whole professional life why certain persons—especially those with political and economic power—seem to be completely blind, while anyone in the street sees the problem and the solution right away. Investigative journalism has, of course, revealed that now and then, people who can't see the obvious have been blinded by profit and greed, power and money or led astray by ice-cold marketing, including RFID (radiofrequency identification) chipping of Belgians and Swedes (see <http://www.dailymail.co.uk/sciencetech/article-4203148/Company-offers-RFID-microchip-implants-replace-ID-cards.html> and <http://www.abc.net.au/news/2017-04-03/swedish-employees-agree-to-microchip-implants/8410018>).

Against this background, I decided a few years ago to inaugurate “*The Institute of Common Sense for Common Sense*” since I do not believe the question of possible health and environmental effects of all these artificial electromagnetic fields boils down to any type of advanced, “rocket science”-type thinking but is just a matter of using our brilliant brains to ponder the medical and biological impacts and how to easily and rapidly solve these problems. The number of scientific papers giving us the key elements of this knowledge is increasing rapidly by the day and has already far surpassed what we actually need to act with precision in the name of the Precautionary Principle and sound, sensible risk management (Dämvik and Johansson 2010).

The simplicity of this general issue — which in parallel also has resulted in, and is still resulting in, hundreds of fruitless meetings as well as in many expensive and downright harmful articles in world-famous journals being sponsored by the vested interests of industry and finance — is that modern, artificial electromagnetic fields must be regarded as a *highly toxic environmental exposure*, something I have pointed out in public a countless number of times. I wish I could say that there soon will be an end to this full-scale, 24/7 human, animal, plant, and bacteria experiment, the largest ever on this Planet, which every organism definitely has not been informed of or given any consent to, completely in contraposition to the Nuremberg Code of Ethics of 1947. But I can not, not even with the alarming results of the recent American National Toxicology Program (NTP) cancer study that has shown that rats exposed to mobile telephony for two years have an increased incidence of aggressive brain tumours (gliomas) and malignant heart tumours (schwannomas) (Wyde *et al* 2016, manuscript: Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposures). <http://biorxiv.org/content/biorxiv/early/2016/05/26/055699.full.pdf>). Oddly enough, the media in Scandinavia and in many other countries have barely covered this study. Is some form of ongoing, Planet-wide white- or green-washing happening?

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This NTP project has been underway for more than a decade and, with a \$25 million price tag, is the most expensive ever undertaken by the NTP. It involved more than 2,500 rodents exposed for nine hours every day for two years to the same type of radiation and frequencies found in cell phones.

In addition to these cancer-incidence data, the American National Toxicology Program has recently revealed that the same radiofrequency/microwave radiation that led male rats to develop brain tumours also caused DNA breaks in their brains (<http://microwavenews.com/news-center/ntp-comet-assay>). These findings are part of the same \$25 million NTP project. The NTP results provide “*strong evidence for the genotoxicity of cell phone radiation,*” professor Ron Melnick, who initiated the study, told *Microwave News*. This “*should put to rest the old argument that RF radiation cannot cause DNA damage,*” he said (see <http://microwavenews.com/news-center/ntp-comet-assay>).

Instead of intensifying research efforts with the above alarming ‘luggage in hand’, my own university, the famous Karolinska Institute, has chosen to go in the opposite direction. (My personal reflection on this is that with the above NTP results at hand, the need to move forward is much, much greater than ever!) Hopefully, their decision to back off will be, in the future, regarded as a wise and correct move. But the risk is that the current, very costly Paolo Macchiarini scandal—in which a visiting Professor at Karolinska Institute was performing trachea surgery that resulted in six out of the eight patients dying, ending in a misconduct scandal—will be followed by yet another one, affecting many more people (just the above-mentioned American National Toxicology Program cancer study outcome indicates that cell phone radiation could result, in the decades to come, in an additional 75–150 million (!) extra human cancer cases worldwide, or even many more. And with future huge numbers of unnecessary premature deaths not easily swept under the carpet. Thus, for academia and society to turn their backs on these new findings would be as daring as turning your back to an Egyptian cobra.

The NTP scientists must have regarded their results as highly important since they released them before the entire study was completed, a rather unusual decision. Their results have the potential to move a debate that has been locked in stalemate for almost as long as cell phones have been around. To say that the American NTP study is a paradigm-shifting one is to understate its importance.

In addition, very recently European investigators at the Ramazzini Institute in Italy arrived at similar conclusions. In their study they investigated radiofrequency effects in nearly 2,500 rats from the fetal stage until death (Falcioni *et al* 2018). As pointed out by Charles Schmidt in a Scientific American article early in 2018 (cf. <https://www.scientificamerican.com/article/new-studies-link-cell-phone-radiation-with-cancer>), it is also noteworthy that the two different studies, from the USA and from Italy, respectively, evaluated radiation exposures in different ways. The NTP looked at near-field exposures, which approximate how people are dosed while using their own cell phones. The Ramazzini researchers, however, looked at the far-field exposures, which approximate the wireless microwave radiation that hits us from sources all around us, including wireless devices such as Wi-Fi routers in schools, homes, workplaces and public spaces, smart meters, baby alarms, tablets and laptop computers. Yet the two studies generated comparable results with male rats in both studies developing Schwannomas of the heart at statistically higher rates than control animals that were not exposed.

Taken together, the findings “confirm that RF radiation exposure has biological effects” in rats, some of them “relevant to carcinogenesis,” says Jon Samet, a professor of preventive medicine and dean of the Colorado School of Public Health, who did not participate in either study, but where interviewed by Charles Schmidt in his Scientific American article (cf. <https://www.scientificamerican.com/article/new-studies-link-cell-phone-radiation-with-cancer>).

Since 2011 radiofrequency radiation has been classified as a Group 2B “possible” human carcinogen by the International Agency for Research on Cancer (IARC), an agency of the World Health

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Organization. Based on the new animal findings, and previous epidemiological evidence linking heavy and prolonged cell phone use with brain gliomas in humans (cf. Hardell *et al* 2007), professor Fiorella Belpoggi, director of research at the Ramazzini Institute and the Italian study's lead author, says IARC should consider changing the radiofrequency radiation designation to a "probable" human carcinogen (Group 2A). Even if the hazard is low, billions of people are exposed, she says, alluding to the estimated number of wireless subscriptions worldwide. According to Charles Schmidt, at Scientific American, Véronique Terrasse, an IARC spokesperson, says a reevaluation may occur after the NTP delivers its final report.

Already in 2001, researchers in Australia had reported one of the first scientific hypotheses that normal mobile phone use can lead to cancer (French *et al.* 2001). The research group, led by radiation and cell biology expert Dr. Peter French, at that time principal scientific officer at the Centre for Immunology Research at St Vincent's Hospital in Sydney, said that mobile phone frequencies well below current safety levels could stress cells in a way that has been shown to increase susceptibility to cancer. The paper, published in the June 2001 issue of the science journal *Differentiation*, concluded that repeated exposure to mobile phone radiation acts as a repetitive stress leading to continuous manufacture of heat shock proteins within cells. Their coauthors included Professor Ron Penny, then the director of the Centre and one of Australia's leading experts in the cellular effects of HIV, and Professor David McKenzie, the head of applied physics at Sydney University, all having genuinely good scientific reputations.

As recently pointed out to me by Dr. Lauraine Vivian who is an Honorary Research Associate at The Research Unit for General Practice and Section of General Practice, Department of Public Health, Faculty of Health and Medical Sciences, University of Copenhagen, in Denmark, we may soon run the risk of having few or even no one left to collect statistical data or to give treatment for tumours because national health systems are collapsing due to increases in cancer

rates and similar health and infrastructure problems. Shall we then have to trust future robot doctors to treat the numerous cancers with their controllers locked in EMF-free cages, or shall we start today to seriously discuss the questions in front of us? And since cancer is not at all the biggest and scariest result of this full-scale experiment, I say that we must sit down now!

It is to be hoped that this mind-boggling scenario is mere science fiction, but it is fascinating to compare my employer's recent statement that "*there is no need for your services, Olle,*" with the reality that I could employ many, many people just to deal with all the daily needs of, and questions from, people around the planet, and perform laboratory and field work, and many other important tasks. A pretty ironic difference, if you ask me...

It is now more important than ever that, hand-in-hand, we all jointly embark on a journey to change the current research and health-care paradigms so that everyone feels the utmost confidence in us and our altruistic aspirations. The clients of a governmental scientist or county council-employed medical professional can never be misunderstood—they are the citizens, no others. We should consider no wallets, no CVs, no political considerations or ambitions, no spin-off companies, no options, no private profits, no industrial economic gain—nothing other than public health. Personally, I – as also proclaimed by the eminent cancer specialist professor Lennart Hardell in Örebro, Sweden – very strongly believe in that scientists have ethical and moral obligations never to turn their backs to any given cobras, even if it means that commerce will loose ground. ...Or do you not agree ...?



My personal journey started in the late 1970es when the first cases of what eventually was going to be termed the functional impairment (formerly disability or handicap; cf. Johansson 2015) electrohypersensitivity appeared, first in Norway and the USA, and later in other countries around the world, today with Taiwan,

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Germany and Switzerland at the top, and with countries like Sweden at the bottom of the incidence scale. Often nowadays I look upon the electrohypersensitive persons as being the normal ones, with normal and natural biological avoidance behaviours, and the rest of the population (whom we today call “normal”) actually being electro*hypo*sensitive. By being it, one certainly risks to become *i.a.* a number in the cancer statistics or infertility column (cf. below). The addition of the NTP and Ramazzini studies outcome is – of course – of paramount importance for this reasoning.

When I recently gave the talk, at the 10th Biennial European Conference of the Society for Scientific Exploration – in collaboration with the Swedish Society for Psychical Research (SSPR) and the research center Agora for Biosystems at the Sigtuna Foundation – named “Life and Mind – Scientific Challenges”, Sigtuna, Sweden, Oct 13 – 15, 2016, which forms the basis for this book chapter, a person in the audience expressed a strong and angry disappointment that my lecture had not only contained science – since “the conference was supposed to be about science” – but I had also touched upon political arguments and references. I found it to be a surprisingly naive comment, especially from a scientist, since *politics is inherently present in everything and has proven to be the disguised hand that rocks the world*. There are no pure scientific projects any longer, and I say it has never been. Science is soaked in political and economical power struggle considerations, and to blind yourself to that fact will only lead you astray.

It is high time that we all, scientists, politicians, civil servants and citizens, finally realize how potentially dangerous man-made, artificial electromagnetic fields released from, and used by, our various electric and electronic gadgets – such as powerlines, transformers and wiring inside household items, cell phones, DECT phones, tablets, laptops, game centers, information tools, Bluetooth accessories, baby alarms and monitors, and gas, water and electricity wireless smart meters, may be for our health. If the opposite should be claimed with certainty, then all of the relevant published reports –now counting more than 26,000 in number according to EMF-Portal (<https://>

www.emf-portal.org/en) – all must be wrong at the same time, and the probability for that is – to say the least – infinitely small!

Some organizations that definitely, and to 100%, trust the current scientific results and our common knowledge about potential health effects of man-made, artificial electromagnetic fields, are the manufacturers, the operators, the radiation protection authorities and even the World Health Organization since they all (cf. below) have abandoned ship years ago. It is also, of course, no surprise that electromagnetic radiation no longer are covered by insurance as a result of health problems. The British insurance giant Lloyd's – together with other insurance and reinsurance companies – has launched a very vigilant move. Damage to health due to direct or indirect exposure to the electromagnetic radiation of our modern gadget-driven world are no longer covered by their insurance policies. So do not call the insurance companies in the future if you have become ill or sick due to mobile phone radiation, or if your child has come down with childhood leukemia due to powerfrequent magnetic field exposure, or an aggressive brain tumour or malignant heart cancer due to cell phone or Wi-Fi tablet radiation, since your health insurance does not cover it. You better look for the telephone number to your government and parliament since they allowed the public blanketing roll-out of these exposures. So you will have to – in the future – sue your government and parliament, meaning you will sue yourself since these administrative structures of society use *YOUR* tax money to cover their backs. In addition, critical whistleblowing scientists, casting long and large shadows of doubt on these so-called “safe” gadgets, have effectively been removed, instead of supported, so the roulette is right now spinning. But will it end as a Wheel of Fortune or will it end in disaster?

It would be highly suitable to follow the legally-based demands on the pharmaceutical industry and add an information leaflet to each wireless gadget sold telling the buyer that it has unwanted side-effects (and for which they have *i.a.* applied for technical patents based on cancer risks), some rare and some more common, but all potentially serious to your health. In the voice of democracy, we should also – like

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the tobacco industry has been forced to do – label each package with a warning informing the user that it may harm their health, that their insurance does not cover such damages, and that the manufacturers themselves tell you to keep it at least one inch from your body. Very early, I even suggested that it should be required by manufacturers, operators and radiation protection authorities that they would take on a personal responsibility – legally watertight – when they said that radiation is harmless. So far, no one has volunteered to sign such a personal responsibility legal contract. (I wonder why not...?) Instead they have gone to bizarre length to legally protect themselves from future liability claims and law suits over their “safe” products! This does not make sense to me; does it to you? No, it rather smells like quite another form of “precautionary principle”, aimed at protecting the ‘major players’, and not the consumers.



A Belgian-Swedish study by Cammaerts & Johansson (2013) on ants, that were made unable to leave their artificial laboratory home, revealed that when exposed to cell phone radiation, the adult ants displayed obvious behavioral disorders, with more disruption in their daily activities and an increasingly scanning of their local environment. It was clear that something concerned them. I immediately after our 2013 study wrote a commentary in 2014 (<https://takebackyourpower.net/experts-and-doctors-warn-pregnant-women-and-children-wireless/>) where I urged pregnant women and children not to expose themselves to wireless radiation, and concluded that *we humans are mostly just standing around talking about this, whereas ants and bees are fleeing the field!* In it I also pointed to that a survey carried out in 2011 in Lausanne, Switzerland, had shown that the signal from the cell phones may not only confuse bees, but also cause their death. When researchers exposed beehives to cell phone radiation, the bees occupying the hive simply choose to move away and never return. I concluded that this is exactly the behaviour that beekeepers worldwide call CCD, Colony Collapse Disorder, a phenomenon

that involves an abrupt disappearance of bees from their hives. Many other studies have in addition shown that bees are affected by and react to radiofrequency radiation. Scientists opine that exposure disrupts the hive, interferes with navigation, weakens the immune system (also cf. Johansson 2009a) and contributes to colony collapse (for references and further discussion, see Cammaerts 2017), so my idea above did find good ground for further exploration.

Thus, there is a real risk that democracy, nature, our habitat, garden ants, honey bees, etc., will be destroyed just because we are not watching them well enough... Instead we are giving away all our sex life secrets via various social media and universal ‘clouds’, in parallel to the authorities snooping around on the Internet (as part of the whole “social media” / Internet surveillance / stalking / troll-spreading / astroturfing / harassment / slander / bullying-bot carousel), we are watching our iPhones, updating our Facebook profiles, adding likes, checking Instagrams and YouTube channels. But can we really afford this constant ignorance? Can we allow ourselves to walk the Planet via our new VR glasses, instead of paying real attention? (Personally, I use my own eyes with ordinary spectacles – the world is then always in 3D, and with surround sound, surround smell, and a number of surround touch sensations. My personal slogan is “*Rather surround than surreal!*”. But am I enough numerous for Nature to survive the current toxic, man-made, electromagnetic field exposure; do I not have to depend on you too, dear Reader?)



Along these book pages, it will become clear that:

I want to discuss *something* which, in the form of Wi-Fi-enabled tablets and mobile phones, the educational authorities claim will revolutionize teaching and learning in spite of the fact that they have been used for years in Sweden parallel to an enormous drop in pedagogic quality and learning capacity, a fact brought up several

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times during the recent political party leader's debates in the Swedish public service TV and radio as well as in newspapers/tabloids.

I want to discuss *something* which in the form of smart meters and high-frequency, low-energy, light bulbs is said to cut the energy costs, while our electricity bills constantly increase. (Also always remember that smart meters – wired or wireless – would have been, of course, a wet dream for Gestapo and SS giving Anne Frank and her family on Prinsengracht 263 in Amsterdam definitely no place to hide during WWII. The moment they had put on a single light bulb, they immediately would have been spotted and caught.)

I want to discuss *something* which many Waldorf-Steiner schools and Waldorf-Steiner daycare centers have decided not to welcome in their premises, since they do not want to have the access to mobile phones interfering with the educational work. They want students to be 100% present – not just their bodies but also their full attention – at their activities in class, since presence is essential for their educational practices and ideas. They also respect the need to adapt the school environment for staff and pupils that are electrohypersensitive. In such a way everyone is saved from any long-term health effects, such as impact on the fertility or cancer progress. Therefore, they have also, for the same reason, chosen not to have wireless networks in classrooms.

I want to discuss *something* which the insurance companies around the world, including “Lloyds” in the UK and “Swiss Reinsurance Co. Ltd.” in Switzerland, refuse to take responsibility for. Among such items you find not only health effects of electromagnetic fields, but also health effects of GMO and nanotechnology. (...Is this not strange, they are all sold to us as 100% risk-free and completely safe. Then they should be safe to insure...!?)

I want to discuss *something* which the telecom manufacturers and operators completely and totally refuse liability for. Their products are safe, so they claim, but they do not – legally – touch them even with a barge pole or a pair of pliers. So, in a sense, these companies have their own precautionary principle (cf. above and below).

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I want to discuss *something* which the telecom manufacturers – for health safety reasons – tell you to keep at least one inch from your body.

I want to discuss *something* which the radiation protection authorities around the world say is completely and totally safe, but – for safety reasons – still suggest that we shall use as little as possible, and to use a hands free accessory. Again, odd. Either a gadget is safe ... or it is not.

I want to discuss *something* which the radiation protection authorities around the world say gives off “very weak electromagnetic fields,” in spite of the fact that a single mobile phone to your head has magnetic fields equal to lifting several electric train engines to the very same head.

I want to discuss *something* which the radiation protection authorities around the world say gives off “very weak radiation”, in spite of the fact that the current allowed public microwave exposure levels – compared to the natural background – are one quintillion (1,000,000,000,000,000,000) times stronger.

I want to discuss *something* which easily penetrates walls, floors, ceilings ... and you! And while penetrating you it feeds colossal levels of energy into your body, making molecules break, changing the behaviour and molecular machinery of your cells, damaging cells all the way to cell death, and feeding cell growth.

I want to discuss *something* which lacks any form of biologically-based exposure standards or hygienic safety levels. Instead the safety of these gadgets are determined using so-called technical recommendations based on acute heating of fluid-filled plastic dolls, and only allowing you to make one (!) single, 6-minute long, mobile phone call once in your life-time. Serious? Not! (Does that make you feel safe?)

In our modern world, we and our children are constantly flooded by various wireless devices, wherever we live, work, go to school or play. Many questions have arisen regarding whether the radiation is without harm, especially since the ‘major players’ clearly points out – through their complete refusal of liability – that wireless technology

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is NOT without risk. (So, as usual, the corporate industry conducts the classical tune: “Follow the money”. The only question for them is always who is going to pay for the damages in the future and, for health effects of electromagnetic fields, they will not do it. More telling than any test tube or laboratory rat experiment ever may be, I would say...)

Numerous studies and reports, expert statements and overviews correctly states that “there is a strong suspicion of harm”, and calls for the use of the Precautionary Principle as originally given by the 1992 Rio Declaration on Environment and Development. The World Health Organization (WHO) has thereafter classified powerfrequent magnetic fields (by 2001) as well as radiofrequency electromagnetic fields (by 2011) as possibly carcinogenic (2B), and recently, in 2012, the Italian Supreme Court ruled that mobiles can cause a brain tumour. Thus, we can immediately cross out the idea that these techniques would be safe, not even the WHO believes it - and they still have a category into which such proven safe exposures would fall (“Class 4 - proven human non-carcinogen”). The question now is instead how big the risk is and what we accept the risk to cost. Instead of avoiding the issue, it’s high time to be completely outspoken, blunt, even to the point of rudeness, and to call things by their proper names without any ‘beating about the bush’. To guarantee our and the Planet’s health this is the only way forward. *I say loudly: call a spade a spade, please!*

Recently, in addition, a bill to ban phones in schools was introduced in **France** in 2009, and further tightened in January 29, 2015. Bans came into effect in places like **Nigeria** in 2012, around the time that teachers in the **Solomon Islands** called for phones to be banned in their schools. **Uganda** banned phones in schools in 2013, one year after **Malaysia** reaffirmed its own similar ban. And it’s not only been in schools where young people have been prohibited from using their phones over the years. In one prefecture in **Japan** in 2014 children were not allowed to use phones after 9 pm, not long after the government in **Belgium** has announced measures to restrict the use of mobile phones by young

children, sales of mobile phones to children under 7 years will be banned in shops and also on the internet, and adverts for mobile phones during children's programmes on TV radio and the internet will also be banned. In 2015, bans on student use of phones inside and outside of schools were considered in **Indonesia**, and in 2013 in **South Korea** experts have noticed a surge in teenagers with poor memory. This new 'dementia' causes deterioration in cognitive abilities more commonly seen in people who have suffered a head injury or psychiatric illness. Experts blame game consoles and mobile phones for this worrying trend. Furthermore, a press release by February 27, 2017, has just been sent out about **Maryland** State's Children's Environmental Health And Protection Advisory Council being the first in USA to issue new recommendations to reduce Wi-Fi exposure of children, and a similar press release from March 6, 2017 tells us that "**Cyprus** Removes Wi-Fi from Kindergartens and Halts Wireless Deployment Into Public Elementary Schools". As a Swede I must, however, strongly wonder: in all these impressive statements and decisions ... where is my own country Sweden? We cover our children in strongly coloured overalls, reflective vests, safety helmets, and more, but allow them to walk 'naked' in relation to the ambient artificial electromagnetic fields which have been cancer-classified by the WHO for nearly two decades!

All of the above should also be viewed against the very important notion that EMFs and autism in children may very well be associated. The first scientist to point to this was dr. George Carlo and his coworker dr. Tamara J. Mariea who in their 2007 article (Mariea & Carlo 2007) concluded that "*These data also suggest that wireless device EMR is a synergen in the etiology of autism, acting in conjunction with environmental and genetic factors, and offer a mechanistic explanation for the correlation between concurrent increases in the incidence of autism and the use of wireless technology*". Their ideas were very elegantly picked up by professor Martha Herbert and dr. Cindy Sage in their two, already classic, parallel papers in 2013 (Herbert & Sage 2013a,b), and have also built the foundation for the excellent public appearances of the entrepreneur and philanthropist Mr. Peter Sullivan (see e.g. <http://>

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www.motherjones.com/environment/2016/12/silicon-valley-cellphones-wifi-sickness-emf-hypersensitivity), who has decided to use his economic means for the welfare of future generations.

All these gadgets are – from an evolutionary point-of-view – toys. Children who do not get tablets and smart phones still will mature to responsible and loving citizens – that you do not need to worry about! – but without the real life necessities such as clean water, clean air, food that can be eaten without risk, care, concern, love and respect, they will perish. As they also will if their sperm cell number is lowered beyond repair (cf. below).



As I pointed out in my recent article (Johansson 2016), 3.5–3.8 billion years ago the first unicellular organisms were formed and life was initiated on our Planet. During the coming thousands of million years cells divided to form multicellular plants and animals, and they grew more and more complicated and sophisticated. Soon our Planet was inhabited by insects, reptiles, fish, birds and finally mammals. During some 5,000,000 years mankind has made it's ascent, and our present subspecies, the *Homo sapiens*, has been around for about 200,000 years.

As stressed in the very same article, the recent massive roll-out of various wireless technologies should be critically viewed against this background. The last 100 years we have very suddenly been exposed to radio, TV, computers, cellular telephones, wireless internet, light ray tubes, compact fluorescent lamps, and house–hold appliances of various kind. And, as pointed out many times during the last four decades by myself, this is the actual central question: “*Can we really count on Darwinian evolution to ensure that our cells have developed an automatic protective shield against power-frequent electric and magnetic fields, pulsed and polarized radio and TV signals, microwaves, etc., i.e. environmental exposures that have never been around on our Planet, or – if they have – been less than one quintillionth in strength?*” And the answer is so simple (*i.e.* no “rocket science” needed!): Of course, we can not

count on any such protective shielding since it is just not present. We are more naked than any newborn baby when it comes to such presumed protection.

In that chapter, I also concluded that once upon a time we all believed that radioactivity from radium, uranium and plutonium, the X-rays in medicine, as well as the ultraviolet sunrays, all were safe, as were very dangerous habits like smoking. We did not realize that they can harm us, indeed even kill us. In the 1940s kids' shoe shops were equipped with shoefitting machines that used strong X-rays, and wristwatches in the 1950s glowed in the dark because they were painted with radioactive paint. At the same time, responsible scientists and doctors started to realize that the warm and beautiful sunshine could actually can harm our cells and their DNA, leading to the development of skin cancer. The same sort of experts that today tell you that cell phone and Wi-Fi radiation is harmless, once told you that strong radioactivity, strong X-rays and UV light were harmless. And smoking, they said, even was good for you! Most of these hazards were quickly removed and are now gone, but a new one has appeared: The wireless society with all it's EMF-based gadgets.

Very early on I coined the expression and question that we are all subjected to "*The largest full-scale experiment ever: What happens when we, 24-hours around the clock, wherever we are, allow ourselves and our children to be used as guinea-pigs, whole-body-irradiated by new, man-made electromagnetic fields for the rest of our lives?*" This question is now more valid and important than ever and it is not a matter of "rocket science", the obvious evolutionary consequences are easy to grasp, and *it is time to wake up and take strong action!* (*As the 'major players', including the insurance and reinsurance industry, already have done more than 15 years ago!*)



Down below, I will bring up a few recent reports and results from the peer review-based scientific literature, acknowledged by other scientists in the field. Even though all the gadgets in question

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represent highly attractive technological developments claimed to improve our life, ease our everyday work, and amuse us, they do expose us to a potent toxic environmental pollution. The power-frequent electromagnetic fields and the microwave radiation may affect prenatal development in both humans and animals, as well as the health for children, teenagers, and adults. Various studies have reported that different types of artificial EMFs may have serious, or very serious, adverse side-effects in various organs, tissues, cells, and molecular classes, and especially so in the young and very young. It is very important that the members of the general public *immediately* start to educate themselves and take precautionary actions of their own. I am constantly asking society to continue to build knowledge towards a safe future, built on what I have coined as «green, human- and environmental-friendly technology», a technology that should not be safer, but *safe!* For instance, the use of a wireless connection is not necessary for access to the Internet. Hardwired Internet access using shielded cables and computers predated the use of wireless connection, and will still serve us equally well; the information will be exactly the same, the pictures and movies too, and we can still “like” each other at a distance.

It has been a great honour for me to assist Dr. Dimitris Panagopoulos and Dr. George Carlo, revealing the ground-breaking biomedical and biological importance of the polarization of artificial fields *versus* the non-polarized character of natural fields; demonstrating the very limited use of the so-called SAR-values (=specific absorption rates) as dosimetric quantities for electromagnetic field bioeffects; and to point to the very basic, important and natural realization of always using real mobile phone exposures in experimental studies, instead of simulated ones (cf. Panagopoulos et al 2013, 2015a,b). Together we are now heading towards finding protective solutions, enabling consumers to continue using their various electronic gadgets, but in a safe way.

Among the most recent papers, several ought to attract strong attention, such as the one by Parsanezhad *et al* (2017) where the health effects of mobile phone jammers - preventing the mobile

phones from receiving signals from base stations by interfering with authorized mobile carriers' services – was studied. In spite of the fact that mobile jammer use most often is illegal, they are occasionally used in offices, shrines, conference rooms and cinemas. The purpose of this study was to investigate the biological effects of short-term exposure of human sperm to radiofrequency radiation emitted from a commercial mobile phone jammer.

Fresh semen samples were obtained by masturbation from 50 healthy donors who had been referred with their wives to the Infertility Treatment Center at the Mother and Child Hospital, Shiraz University of Medical Sciences, in Iran. Female problems were diagnosed as the reason for infertility in these couples. The semen sample of each participant was divided into 4 aliquots. The first aliquot was subjected to swim-up and exposed to jammer radiation. The second aliquot was not subjected to swim-up but was exposed to jammer radiation. The third and fourth aliquots were not exposed to jammer radiation but only the 3rd aliquot was subjected to swim-up.

The results revealed that the semen samples exposed to radiofrequency radiation showed a significant decrease in sperm motility and increase in DNA fragmentation, which lead to the authors' conclusion that electromagnetic radiation in the radiofrequency range emitted from mobile phone jammers may lead to decreased motility and increased DNA fragmentation in human semen. It can, thus, be concluded that – in addition to previous investigations using mobile phones only – also mobile phone jamming might exert adverse reproductive health effects.

Furthermore, Solek *et al* (2017) have investigated the effects of pulsed and continuous electromagnetic fields (PEMFs/CEMFs) on mouse spermatogenic cell lines (GC-1 spg and GC-2 spd) in terms of cellular and biochemical features *in vitro*. The authors evaluated the effect of EMFs on mitochondrial metabolism, morphology, proliferation rate, viability, cell cycle progression, oxidative stress balance and regulatory proteins. Their results strongly suggest that EMFs induce oxidative and nitrosative stress-mediated DNA damage, resulting in p53/p21-dependent cell cycle arrest and apoptosis.

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Therefore, spermatogenic cells, due to the lack of antioxidant enzymes, undergo oxidative and nitrosative stress-mediated cytotoxic and genotoxic events, which contribute to infertility by reduction in healthy sperm cells pool. In conclusion, electromagnetic field present in surrounding environment impairs male fertility by inducing p53/p21-mediated cell cycle arrest and apoptosis.

Naturally, one should not forget other life-style factors which may affect us, and maybe in concert with EMFs. For instance Radwan *et al* (2016) found evidence for a relationship between sperm DNA damage parameters and everyday life factors. High and medium level of occupational stress and age increase DNA fragmentation index ($p=0.03$, $p=0.004$ and $p=0.03$, respectively). Other lifestyle factors that were positively associated with percentage of immature sperms (high DNA stainability index) included: obesity and cell phone use for more than 10 years ($p=0.02$ and $p=0.04$, respectively). Thus, data from the present study showed a significant effect of age, obesity, mobile phone use and occupational stress on sperm DNA damage. As DNA fragmentation represents an extremely important parameter indicative of infertility and potential outcome of assisted reproduction treatment, and most of the lifestyle factors are easily modifiable, the information about factors that may affect DNA damage are important, and should be reflected in precautionary societal advice to the general public.

Some of the first observations on human sperm cells were done by Agarwal *et al* (2008) who showed that the use of cell phones decrease the semen quality in men by decreasing the sperm count, motility, viability, and normal morphology. The decrease in sperm parameters was dependent on the duration of daily exposure to cell phones and independent of the initial semen quality.

To investigate the potential combined influence of maternal restraint stress and 2.45 GHz Wi-Fi signal exposure on postnatal development and behavior in the offspring of exposed rats, Othman *et al* (2017) studied 24 pregnant albino Wistar rats who were randomly assigned to four groups: Control, Wi-Fi-exposed, restrained and both Wi-Fi-exposed and restrained groups. Each of Wi-Fi exposure

and restraint occurred 2 h/day along gestation till parturition. The pups were evaluated for physical development and neuromotor maturation. Moreover, elevated plus maze test, open field activity and stationary beam test were also determined on postnatal days 28, 30 and 31, respectively. After behavioral tests, the rats were anesthetized and their brains were removed for biochemical analysis. Their main findings showed no detrimental effects on gestation progress and outcomes at delivery in all groups. Subsequently, Wi-Fi and restraint, *per se* and mainly *in concert* altered physical development of pups with slight differences between genders. Behaviorally, the gestational Wi-Fi irradiation, restraint and especially the associated treatment affected the neuromotor maturation mainly in male progeny. At adult age, they noticed anxiety, motor deficit and exploratory behavior impairment in male offspring co-exposed to Wi-Fi radiation and restraint, and in female progeny subjected to three treatments. The biochemical investigation showed that, all three treatments produced global oxidative stress in brain of both sexes. As for serum biochemistry, phosphorus, magnesium, glucose, triglycerides and calcium levels were disrupted. Taken together, prenatal Wi-Fi radiation and restraint, alone and combined, provoked several behavioral and biochemical impairments at both juvenile and adult age of the offspring.

Hassanshahi *et al* (2017) aimed to investigate the effect of 2.4 GHz Wi-Fi radiation on multisensory integration in rats. This experimental study was done on 80 male Wistar rats that were allocated into exposure and sham groups. Wi-Fi exposure to 2.4 GHz microwaves [in Service Set Identifier mode (23.6 dBm and 3% for power and duty cycle, respectively)] was done for 30 days (12 h/day). Cross-modal visual-tactile object recognition (CMOR) task was performed by four variations of spontaneous object recognition (SOR) test including standard SOR, tactile SOR, visual SOR, and CMOR tests. A discrimination ratio was calculated to assess the preference of animal to the novel object. The expression levels of M1 and GAT1 mRNA in the hippocampus were assessed by quantitative real-time (RT) PCR. Results demonstrated that rats

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in Wi-Fi exposure groups could not discriminate significantly between the novel and familiar objects in any of the standard SOR, tactile SOR, visual SOR, and CMOR tests. The expression of M1 receptors increased following Wi-Fi exposure. In conclusion, results of this study showed that chronic exposure to Wi-Fi electromagnetic waves might impair both unimodal and cross-modal encoding of information.

Rezk *et al* (2008) provided evidence that exposure of pregnant women to mobile phone significantly increase fetal and neonatal heart rate, and significantly decreased the cardiac output, and Lai *et al* (1994) demonstrated that after 45 min of exposure to pulsed 2,450 MHz microwaves (2 microseconds pulses, 500 pps, 1 mW/cm², average whole body SAR 0.6 W/kg), rats showed retarded learning while performing in the radial-arm maze to obtain food rewards, indicating a deficit in spatial “working memory” function. Their data indicate that both cholinergic and endogenous opioid neurotransmitter systems in the brain are involved in the microwave-induced spatial memory deficit. Highly similar conclusions were reached by Papageorgiou *et al* (2011) through their findings in young men suggesting that Wi-Fi exposure may exert gender-related alterations on neural activity associated with the amount of attentional resources engaged during a linguistic test adjusted to induce working memory.

In a very interesting study, Cervellati *et al* (2009) were able to demonstrate a significant effect of high-frequency electromagnetic fields on connexins expression and localization in placental extravillous trophoblast cell line HTR-8/SVneo (trophoblasts are cells forming the outer layer of a blastocyst, which provide nutrients to the embryo and develop into a large part of the placenta). Connexins are membrane proteins able to influence trophoblast functions. Samples were exposed to pulse-modulated 1817 MHz sinusoidal waves (GSM-217 Hz; 1 h: SAR of 2 W/kg [=the maximal allowed public exposure level]). Connexin mRNA expression was assessed through semi-quantitative RT-PCR, protein expression by Western blotting, protein localization by indirect immunofluorescence, cell

ultrastructure using electron microscopy. The exposure significantly and selectively increased Cx40 and Cx43, without altering protein expression. Nevertheless, Cx40 and Cx43 lost their punctuate fluorescence within the cell membrane, becoming diffuse after HF-EMF exposure. Electron microscopy evidenced a sharp decrease in intercellular gap junction-like structures.

This study is the first to indicate that exposure of extravillous trophoblast to GSM signals can modify connexin gene expression, connexin protein localization and cellular ultrastructure, and they may also explain – together with the above-mentioned studies on sperm cells – why infertility was encountered in the Greek study by Magras & Xenos (1997), where a progressive decrease in the number of newborns per dam was observed, which ended in irreversible infertility, after in vivo exposures at several places around an antenna park outside of the city of Thessaloniki. At these locations, the radiofrequency power density was between 1,680 $\mu\text{W}/\text{m}^2$ and 10,530 $\mu\text{W}/\text{m}^2$, the latter being a typical exposure value 100 meters from a base station/antenna. The prenatal development of the newborns, however, evaluated by the crown-rump length, the body weight, and the number of the lumbar, sacral, and coccygeal vertebrae, was improved, something which may sound appetizing. But, remember, any abnormal pattern must always be regarded as just that: abnormal. To feed these fetuses with energy may have ‘developed’ them – just as feeding a body-builder with anabolic steroids, but the latter then will get a dramatic reduction in genital development and fertility scores, just as the mice outside of Thessaloniki did. (Ask any professional body-builder if you do not believe me. Or ask a professional gardener what happens if you feed blooming plants with way too much fertilizers (=energy); they will get huge green masses but very few and tiny flowers, if any. It is as simple as that, it is my working hypothesis, and you should quote it and demand research into this area of mechanistic approach.)

Cerón-Carrasco & Jacquemin (2017), in their elegant study, have pointed to the fact that nowadays, using e.g. mobile phones as electromagnetic ‘knives’, employing their pulsed electric fields

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to selectively rewrite the stored genetic information. However, for such modification to be effective, one needs, as a prerequisite, that the replication mechanism is not stopped by the field, so that the changes propagate over the following generations. Cerón-Carrasco & Jacquemin (2017) used theoretical calculations to demonstrate that while such fields lead to permanent noncanonical Watson-Crick guanine-cytosine (GC) base pairs, the G-quadruplex motifs present in telomeres can more effectively preserve their native forms. Indeed, G-quadruplexes “resist” the perturbations induced by field strengths going up to 60×10^{-4} a.u., a figure constituting the upper limit before the complete destruction of the double helix architecture. As the authors point out, since the induced errors in the DNA base pairs are not transcribed into the telomeres, electric fields can indeed be used as a source of selective mutations in the genetic code.

To protect their core machinery from the attack of exogenous agents, cells locate DNA in their nucleus (and in their mitochondria). Nevertheless, some reactive chemical species and physical agents might reach DNA and alter its natural double helix structure. Such interactions may be used in a laboratory setting to non-invasively alter the genetic make-up, but – if let loose in society! – may harm us all, something already shown several times over the last decades.

In addition to the above, Sun *et al* (2017) employed HL-60 cells, derived from human promyelocytic leukemia, and exposed them to continuous wave 900 MHz radiofrequency fields (RF) at $120 \mu\text{W}/\text{cm}^2$ power intensity for 4h/day for 5 consecutive days to examine whether such exposure is capable of damaging the mitochondrial DNA (mtDNA) mediated through the production of reactive oxygen species (ROS). In addition, the effect of RF exposure was examined on 8-hydroxy-2'-deoxyguanosine (8-OHdG) which is a biomarker for oxidative damage and on the mitochondrial synthesis of adenosine triphosphate (ATP) which is the energy required for cellular functions. The results indicated a significant increase in ROS and significant decreases in mitochondrial transcription factor A, mtDNA polymerase gamma, mtDNA transcripts and mtDNA copy number in RF-exposed cells compared with those in sham-exposed

control cells. In addition, there was a significant increase in 8-OHdG and a significant decrease in ATP in RF-exposed cells. The response in positive control cells exposed to gamma radiation (GR, which is also known to induce ROS) was similar to those in RF-exposed cells. Thus, the overall data indicated that RF exposure was capable of inducing mtDNA damage mediated through ROS pathway which also induced oxidative damage. Very interestingly, prior-treatment of RF- and GR-exposed the cells with melatonin, a well-known free radical scavenger, reversed the effects observed in RF-exposed cells.

Mounting evidence suggests that exposure to radiofrequency electromagnetic radiation (RF-EMR) can influence learning and memory in rodents, primarily reducing the concentration capacity and short-term memory. However, in a recent study by Wang *et al* (2017), they examined the supportive effects of single exposure to 1.8 GHz RF-EMR for 30 min on subsequent recognition memory in mice, using the novel object recognition task (NORT). RF-EMR exposure at an intensity of >2.2 W/kg specific absorption rate (SAR) induced a significant density-dependent increase in NORT index with no corresponding changes in spontaneous locomotor activity. RF-EMR exposure increased dendritic-spine density and length in hippocampal and prefrontal cortical neurons, as shown by Golgi staining. Whole-cell recordings in acute hippocampal and medial prefrontal cortical slices showed that RF-EMR exposure significantly altered the resting membrane potential and action potential frequency, and reduced the action potential half-width, threshold, and onset delay in pyramidal neurons. These results demonstrate that exposure to 1.8 GHz RF-EMR for only 30 min (!) can significantly increase recognition memory in mice, and can change dendritic-spine morphology and neuronal excitability in the hippocampus and prefrontal cortex. The SAR in this study (3.3 W/kg) was slightly outside the range mostly encountered in normal daily life, and its relevance as a potential therapeutic approach for disorders associated with recognition memory deficits naturally remains to be clarified (also see Panagopoulos *et al* 2013). As already stated above, according to my own experience, it should also be remembered that

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even if an effect might seem nice, positive, and tempting to employ for treatment, such effects should always be cautioned as abnormal, and it might be much more correct to deal with the underlying cause rather than artificially treat unwanted outcomes as they appear. In the above case it would seem very good to allow for a significant density-dependent increase in the NORT index, but such reasoning could easily then lead people to naively similarly believe in, and urge for, mind-altering drugs and other pharmaceutical agents. Our, and the rodents', learning and memory capacity is quite enough without any outside or inside manipulation.

In contrast to this seemingly positive effect, Erkut *et al* (2016) investigated the effects of exposure to an 1,800 MHz electromagnetic field on bone development during the prenatal period in rats, and found that increasing the duration of exposure during the prenatal period resulted in a significant reduction of resting cartilage levels and a significant increase in the number of apoptotic chondrocytes and myocytes. There was also a reduction in calcineurin activities in both bone and muscle tissues. They observed that the development of the femur, tibia, and ulna were negatively affected, especially with a daily EMF exposure of 24 hours. So, in essence, bone and muscle tissue development was negatively affected due to prenatal exposure to an 1,800 MHz radiofrequency electromagnetic field.

Taheri *et al* (2017) assessed if the exposure to 900 MHz GSM mobile phone radiation and 2.4 GHz radiofrequency radiation emitted from common Wi-Fi routers alters the susceptibility of microorganisms to different antibiotics. Pure cultures of *Listeria monocytogenes* and *Escherichia coli* were exposed to RF-EMFs generated either by a GSM 900 MHz mobile phone simulator or a common 2.4 GHz Wi-Fi router. It was shown that exposure to RF-EMFs within a narrow level of irradiation (an exposure window) makes microorganisms resistant to antibiotics. Altogether, the findings of this study showed that exposure to Wi-Fi and RF simulator radiation can significantly alter the inhibition zone diameters and growth rate for *L. monocytogenes* and *E. coli*. These findings may have implications for the management of serious infectious diseases. *With the on-going*

huge and highly frightening development into more and more antibiotics-resistant microorganisms around the world, this adaptive phenomenon and its potential threats to human health, according to my view, definitely and rapidly should be further investigated in future experiments! At this point in time, to instead disengage academic scientists from their workplaces due to “lack of money” will not sound well in the future.

There is also emerging evidence that wireless, non-ionizing radiation (from cell phones, Wi-Fi, and smart meters) harms wildlife and damages trees. There have been direct reports of such radiation affecting vital bee populations (cf. above), disturbing bird habitats, and interfering with avian navigational systems. French researchers, under the direction of Alain Vian at the Equipe de Recherche Transduction et Autosurveillance Cellulaire, Université Blaise Pascal in Aubière, have shown that even tomato plants react to the damage from the relatively weak 900 MHz radiation from cell towers (Roux *et al* 2008). The scientists believe they found an environmental factor that instantly impacts the genetic material in the tomato cells, which in turn resulted in the tomato plant cells reacting with a chemical damage sequence, involving the molecule calmodulin. The effect was described in public interviews as “exactly as if we had crushed them with a hammer,” by the scientists.

It was enough to expose a few leaves of the plant for the entire plant to react. The damage was lessened, however, on the parts of the plant that were shielded from the radiation.

The interesting thing about tomatoes is that they can not cheat or be swayed by emotions or expectations

They have no conscience.

They can not move.

They do not cheat the insurance company for money.

They are not imagining things.

The don't blame their workplace problems on alleged “electrical over-sensitivity.”

They don't read newspapers, listen to radio, or watch TV (so they can't fall victim for any massmedia-driven psychosis).

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They are instead very sensitive to their surrounding environment and are fussy when it comes to conditions for their survival.

Had the French tomato plants been able to escape, they obviously would have done so.

Finally, in a replication study, following the preliminary findings of five Danish schoolgirls, we studied the effect of mobile phone base station signals on common *Brassicaceae Lepidium sativum* (cress d'Alinois) seed germination (Cammaerts & Johansson 2015). Under high levels of radiation ($70-100 \mu\text{W}/\text{m}^2 = 175 \text{ mV}/\text{m}$), the seeds never germinated. In fact, the first step of the seeds' germination – the imbibitions of germinal cells – could not occur under radiation, while inside the humid compost such imbibitions occurred and roots slightly developed. When removed from the electromagnetic field, seeds germinated normally. The radiation was, thus, most likely the cause of the non-occurrence of the seeds' imbibitions and germination.

In conclusion, the present investigation – although preliminary in its character – indicates that the prodigious wireless technology may effectively and seriously impact nature and should urgently be used much more cautiously, or maybe even not at all. The present study also brings some new information on the subject – effect of electromagnetism on plants – but it must be replicated on several plants species, at different independent laboratories, as well as developed further at the cytological and physiological levels by botanists, histologists and physiologists. Finally, in essence, it clearly supports the initial findings of Lea Nielson, Mathilde Nielsen, Signe Nielsen, Sisse Coltau and Rikke Holm, at Hjallerup Skole, under the supervision of their biology teacher Mr. Kim Horsevad.



Society of today employs a variety of wireless technologies using transmitters that emit electromagnetic waves creating radiation and electromagnetic fields. The research covered above – together with a huge number of other reports – clearly demonstrate that, at the power

levels required for these wireless technologies to operate reliably, the radiofrequency radiation as well as the low-frequency fields have significant biological and biomedical effects, many of which – from a human perspective – must be considered as very serious and alarming. Thus, a rapidly accumulating body of scientific evidence of harm to health and well-being constitute early warnings that adverse health effects can occur with prolonged exposures to very “low-intensity” (remember again that the exposure levels that are regarded as “low-intensity” actually are astronomically high compared to natural background levels) electromagnetic fields at biologically active frequencies or frequency combinations/windows. The consequences of such exposures can be especially grave for electrohypersensitive individuals and children. The telecom industry uses inapplicable health safety standards, which I have pointed to above, and flawed reasoning to promote the safety of their products, eagerly backed by a naive and uninformed political establishment. However, in contrast to this, because the effects are reproducibly observed, and links to pathology can not be excluded, the Precautionary Principle – or a complete ban! – should be in force regarding the implementation of these new technologies within society.

From the current vast scientific literature, it is obvious we must proceed with caution before immersing the citizens in more and more artificial electromagnetic fields. We may, as a matter of fact, already be gravely endangering our current as well as coming generations. To not act today, may prove a disaster tomorrow, and such lack of action may again result in the classical “*late lessons from early warnings*”.

I, as a scientist, is not here to promote convenience or economic growth, but only “*to protect and serve*” human health and biological safety, as well as to protect other animals, plants, and bacteria. These aims must be our only target.

In November, 2009, a Scientific Panel comprised of international experts on the biological effects of electromagnetic fields met in Seletun, Norway, for three days of intensive discussion on existing scientific evidence and public health implications of the unprecedented global exposures to artificial electromagnetic fields

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from telecommunications and electric power technologies, and ending in The Seletun Scientific Statement (Fragopoulou *et al* 2010), which strongly recommends that lower limits ($<0.017 \mu\text{W}/\text{cm}^2$) be established for electromagnetic fields and wireless exposures. This meeting was a direct consequence of on-going discussions since the mid-nineties, when cellular communications infrastructure began to rapidly proliferate. At the beginning of the 21st century, many resolutions, like the Benevento (Belpoggi *et al* 2006), Venice (Avino *et al* 2008) and London (Johansson 2009b) Resolutions were created to protect health. Important conclusions were drawn from the 600-page Bioinitiative Report [<http://www.bioinitiative.org>] published August 31, 2007, which was a review of over 2,000 studies showing biological effects from electromagnetic radiation at non-thermal levels of exposure, and which later was partly published in the medical journal Pathophysiology (Volume 16, 2009). The Bioinitiative Report has since been updated (2012; 2014).

Many researchers now believe the existing safety limits are inadequate to protect public health because they do not consider prolonged exposure to lower emission levels that are now widespread and do not take into account non-thermal effects. It should be noted that only one hygienic safety value ever has been proposed: $0.0000000001-0.0000000000000001 \mu\text{W}/\text{cm}^2$ – this is the natural background during normal cosmic activities; proposed by myself at a trade union meeting in Stockholm, already in 1997, as a genuine hygienic safety value, and since then many times repeatedly presented. (Given the highly artificial nature of the current wireless communication signals, e.g. of their pulsations and modulations, it may actually boil down to 0 (zero) $\mu\text{W}/\text{cm}^2$ as the true safe level.) And do not ever believe it is possible to play it “safer” by only somewhat reducing the exposure levels!



The conversion to Wi-Fi, and similar wireless communication systems, is one of the largest technology rollouts in history, and yet

virtually no public consultation with citizens or local governments was carried out in advance. Parallel to this, the World Health Organization (WHO; May 31, 2011) has classified the radiofrequency radiation used as a possible carcinogen, and the world's insurance companies have abandoned ship by not insuring or reinsuring for health effects of electromagnetic fields. Around the world Wi-Fi companies continue to install their antennas, often without public awareness or consent, and now in an ever-accelerating roll-out pace with 5G and the "Internet of Things". According to my view, this is a genuine threat to our democracy and informed decision-making, and it is definitely fair to call for immediate and strong precautionary measures as well as much better monitoring of health parameters changes in our modern societies (cf. Hallberg & Johansson 2009).

I have many times written about the human and environmental rights aspects in various debate articles and commentaries*, and pointed to them in many of my public lectures, and in radio and TV interviews. As you already understand, they are very important for us and life on the Planet, and ought to be properly addressed. For such addresses to be successful, you do need the right advocates on your side, but also the right media, I would say. So much nowadays is fought both in courts of law as well as on the newspaper pages, and in radio and TV.

*It's last paragraph reads:

“I samband med rättegångarna i Nürnberg efter andra världskrigets slut formulerades för första gången en offentlig etisk kod för medicinska experiment som involverar människan, Nürnbergkodexen 1947. Här slogs bl.a. fast att informerat samtycke krävs och att riskerna för försökspersoner skall minimeras. Det framhölls att varje deltagare har rätt att när som helst avbryta sitt deltagande i ett experiment och att den som leder ett sådant skall avbryta det

* See e.g. Johansson O, Gullbrandsson A, Dämvik M, Hallberg Ö, Hellberg K, Lindkvist L, “Ohälsan ökar i takt med strålningen” (= “Ill health increases with radiation”, in Swedish), Borås Tidning 14/2 2011.

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om det verkar troligt att en deltagare skadas. När får vi avbryta vårt deltagande i det pågående strålningsexperimentet?”

English translation using Google Translator:

“In connection with the Nuremberg trials after the Second World War it was formulated for the first time a public code of ethics for medical experiments involving human beings, the Nuremberg Code of 1947. Among other things stated was that informed consent is required and that the risks to subjects are minimized. It was pointed out that each participant has the right at any time to cancel their participation in an experiment, and that whoever leads such should cancel it if it seems likely that a participant is injured. When may we suspend our participation in the ongoing radiation experiment?”

In Sweden we often say that “people are trying to invent the wheel again”. Don’t, I say. Use instead common sense, the knowledge and the tools that are already in front of you, and be precise. Demand only what you want, nothing more, nothing less. Be clear. Be bold. NEVER give up.

I just wish I could have done more for you, and for life on our Planet. Both in science as well as in politics (*sic!*).



In summary: Do not believe that mobile phones, iPads and Wi-Fi are safe; they are not! (And the major ‘players’ in our society know it.) They interfere with normal brain function, learning and memory, fertility, cancer risks and have been shown to shatter the DNA in cells. All of this can be found in peer-reviewed scientific journals but, until now, has not been in the public domain. But very few will try to protect you and very few want to speak the truth. (Does this sound good to you?) So maybe the only correct answer to my question above is: No more full-scale experimentation until all the ‘major players’ climb on board again to cover any form of future legal liability claims?!

With all the new data from different investigations appearing, some days with several publications being released, maybe I was not wrong when I called for safety measures already back in the early 1980ies; maybe it was morally-ethically 100% right to sound the

alarm? Along these lines I could not help smiling when I read, in June 2018, in Dagens Nyheter, one of the largest daily newspapers in Sweden, that a Karolinska Institute-based colleague of mine now indicated that human sperm reduction might be due to several factors, including cell phone and computer radiation (<https://www.dn.se/insidan/halvering-av-mannens-spermier-oroar/>). This very same professor refused to collaborate around this issue 20 years ago when I approached him with the very same hypothesis. So, as usual, time changes our perspectives.

Finally, I say, from a public health point-of-view no more research is needed, the proof in the form of thousands and thousands of peer review-based scientific publications is overwhelming – now society must dare to protect and to serve. Children can never be allowed to be victims of flimsy pedagogic tools, and absent adult responsibility, or to be exposed to a WHO-classified possible carcinogen. Our actions must solely aim for their needs, not for commercial greed.

Personally, I would hate to arrive at the Pearly Gates and hear Saint Peter say: *“Why did you not react and act, Olle, you understood, you knew, you saw; you could and should have done much more!”*. No, as a mental fire brigade soldier, I rather try my hardest and possibly be wrong – false alarms never make the ordinary fire fighters or citizens weep, and so it should not make anyone sad or angry if my concern is wrong. (...But if I am right, then what...?)

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