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1982: Cand. Scient, Informatics, University of Oslo

1982-1990: Researcher / senior researcher, SI (now SINTEF in Oslo)

1990-1999: PhD student, Informatics, University of Oslo

1997-2007: Entrepreneur in mobile phones, apps and services

2007-2011: Researcher / senior researcher, Telenor's research department

Presentation for Halden District Court

19-21 May 2021

With updates and English translation from April 2024

Contents

- My background
- Living organisms are electromagnetic systems
- Two different paradigms for the effect of weak EMF
- The paradigms' different evaluation criteria and their different conclusions
- Who is behind the scientific publications our radiation protection is based on
- Explanation of why dirty electricity and electromagnetic radiation are two sides of the same coin
- Conclusions

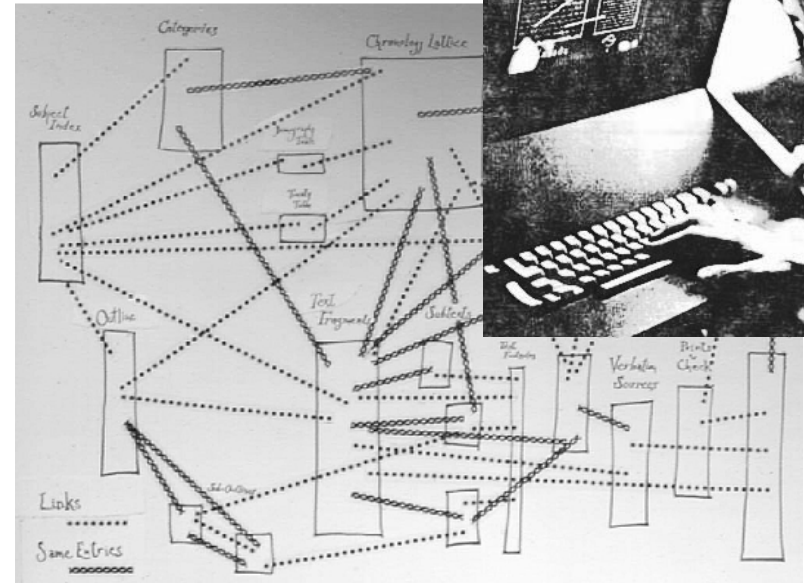
Central to my choice of education and jobs:

My two dreams from the 70s...



The cardboard version of “Dynabook” from Xerox PARC, California.

Always online, easy to use.
The ideas behind Mac, Windows,
iPhone, iPad and Apps.



Xanadu Hypertext, figure 1962, picture 1972

Hyperconnected documents
The idea behind World Wide Web

1979-90: Centre for Industrial Research (now SINTEF in Oslo)

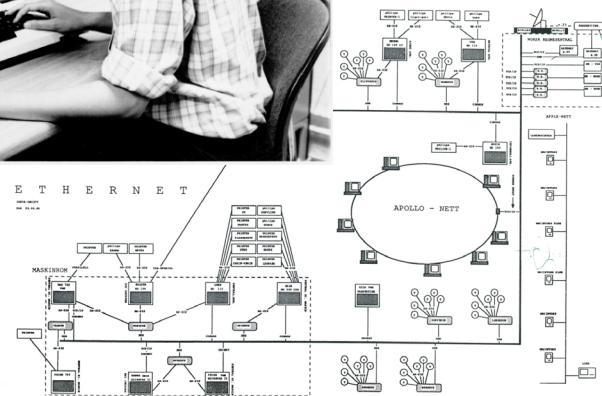
Cooperation with Xerox PARC,
about research on simple user dialogue
and data network.

Novel words: mouse, window, menu,
cursor, client-server applications (Apps)



1990-97 PhD. stud. and teacher, Informatics,
University of Oslo

1993: WORLD WIDE WEB!



Olympics 1994 in Norway.
First «live results» event.
Made in office next door.

IN105 : Grunnkurs i Programmering

Våren 1994

Institutt for Informatikk (Ifi), Universitetet i Oslo

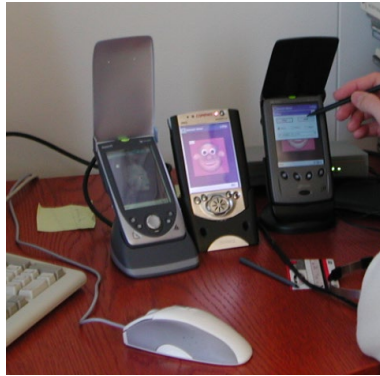
- Våren 1994:
- Forelesere...: Olav Lysne og Else Nordhagen
- Tidspunkt...: onsdag 14.15-16.00, torsdag 14.15-16.00
- Sted.....: Sophus Lies auditorium

Fileer, dokumentasjon og annen inform

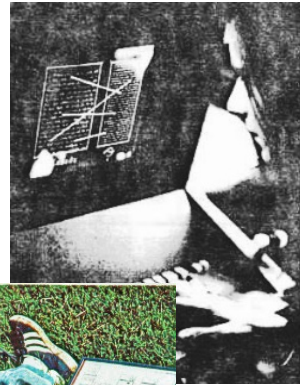
- Hvordan etteranmelde seg til IN105 - for sent. Fristen var 1.3.94
- Ukeoppgaver til gruppene

First course using web-pages

1999-2007 Entrepreneur of mobile phone services

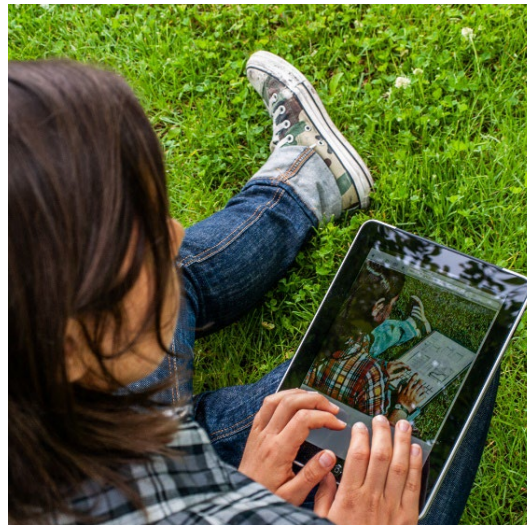


- Developed apps with video streaming
- Too early for phones and telecom
- Had to give up ...



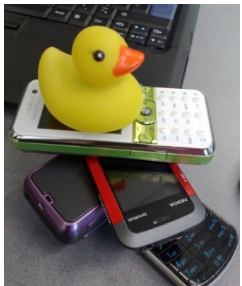
From 2007 Telenor's research department

Showing to Telenor's top managers possibilities with mobile internet.



2010, my dreams fulfilled after 42 years:

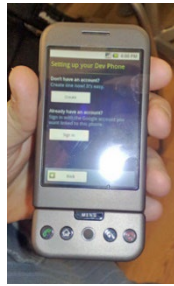
iPad with mobile net and browser, in the grass outside Telenor.



Mobile phones
– before iPhone



iPhone Christmas
2007



Google phone
January 2009

Smart meter 2017:



I took for granted: No qualms.

After all, I had always lived with everything wireless.

After installation: I did not sleep at night and faired poorly during the day. WHY?

I thought: It can't be the meter! I set up a "systematic testing regime" and unexpected "blind trials" arose.

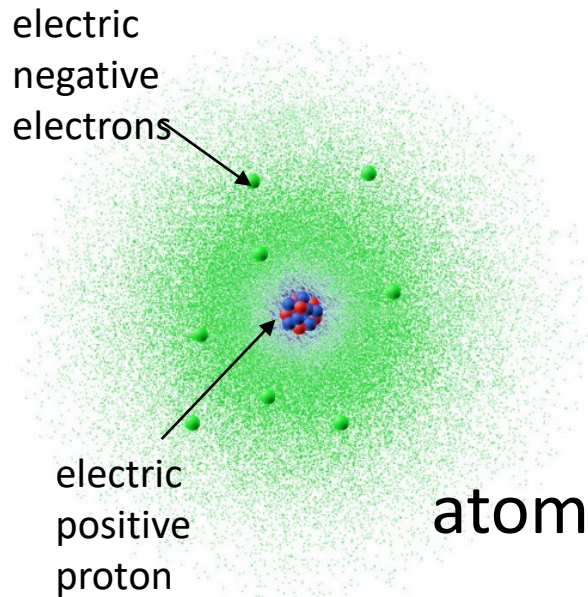
Conclusion: It MUST be the gauge.

I got the transmitter part removed: OK! But I became more sensitive to other radiations...

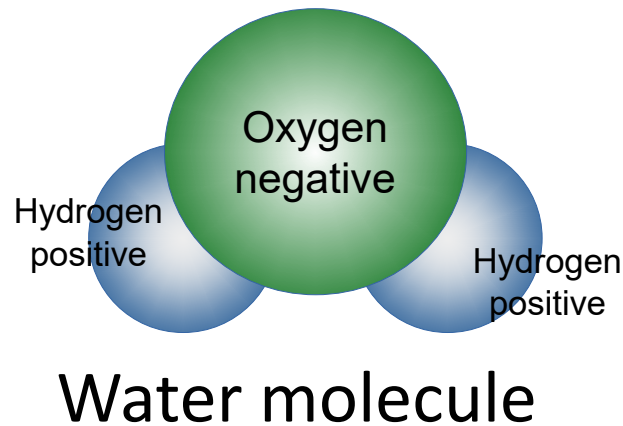
My thought:
If it is possible to get sick from
smart meters,
it must be possible to understand
WHY!

I started investigating...

Everything is electric - from the ground up



Atoms are composed of small *electrical particles* held together by *electrical forces*.

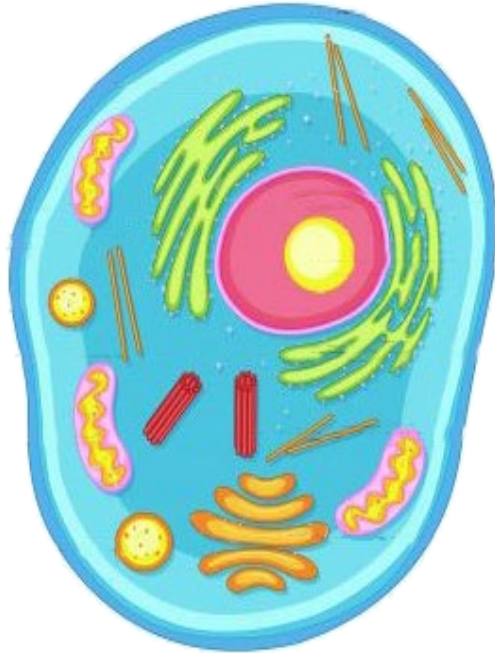


Atoms stick together to form *molecules* using *electrical forces*.

Chemical reactions occur due to *electrical forces*.

Also: important chemical reactions are impacted by small changes in magnetic forces due to electrons being magnets.

"Life" is self-organizing molecules



Animal cell

The molecules are organized and controlled by

- chemical signals for slow communication
- electrical pulse signals for fast communication

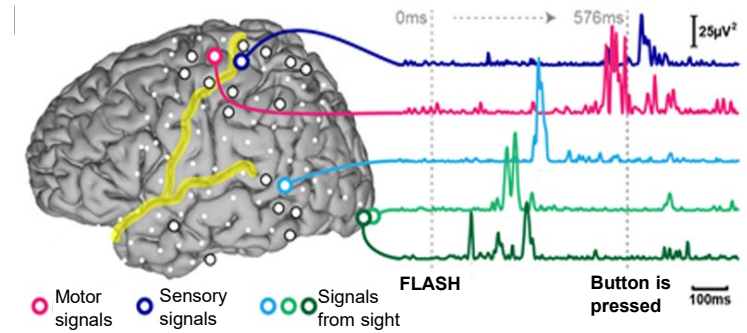
Together they form:

Advanced, systematic and self-organizing constructions called "life".

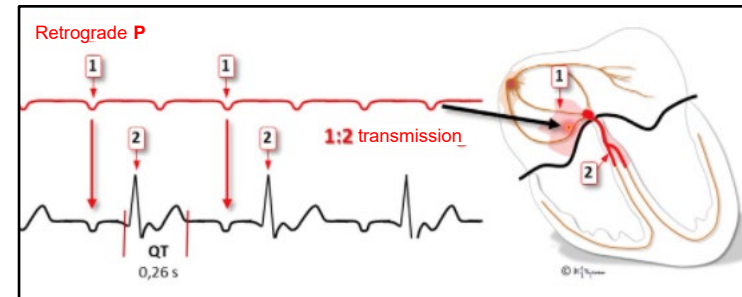
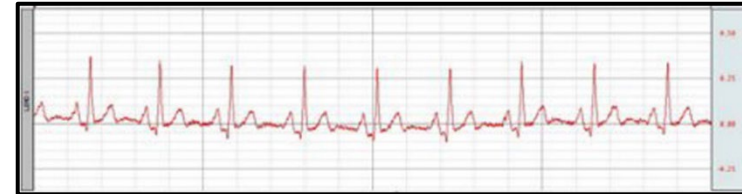
Life is only possible because the molecules can communicate with electrical pulses. I.e. molecules must be detectors of changes in electrical forces.

Electrical pulses are sure signs of life:

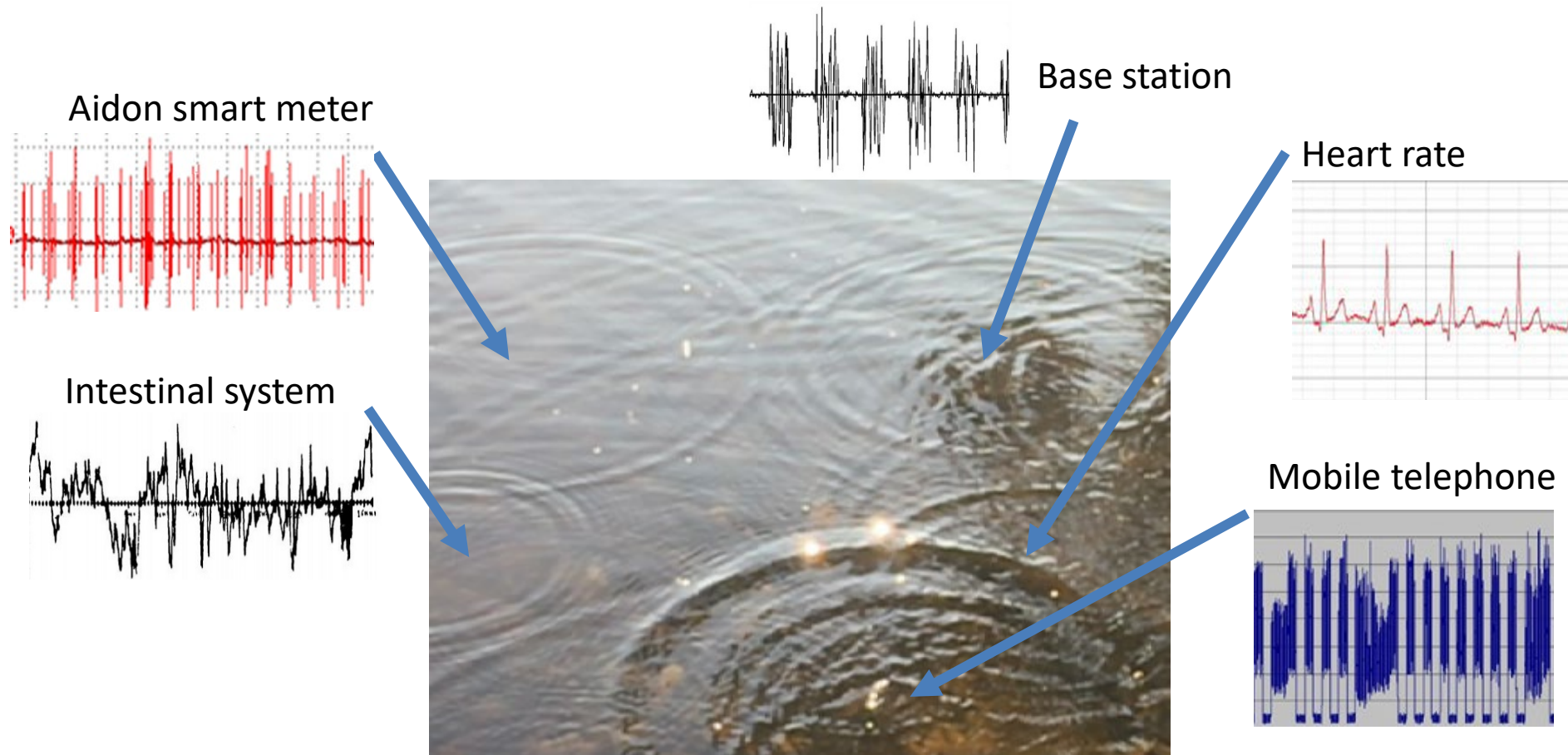
- Death criterion in Norway:
Cessation of electrical pulses
- Electrical pulses control and coordinate the heart, brain, muscles, digestion etc.
- ECG and EEG measure such *electrical pulses*
- Deviations in the pulses are signs of illness



ECG:



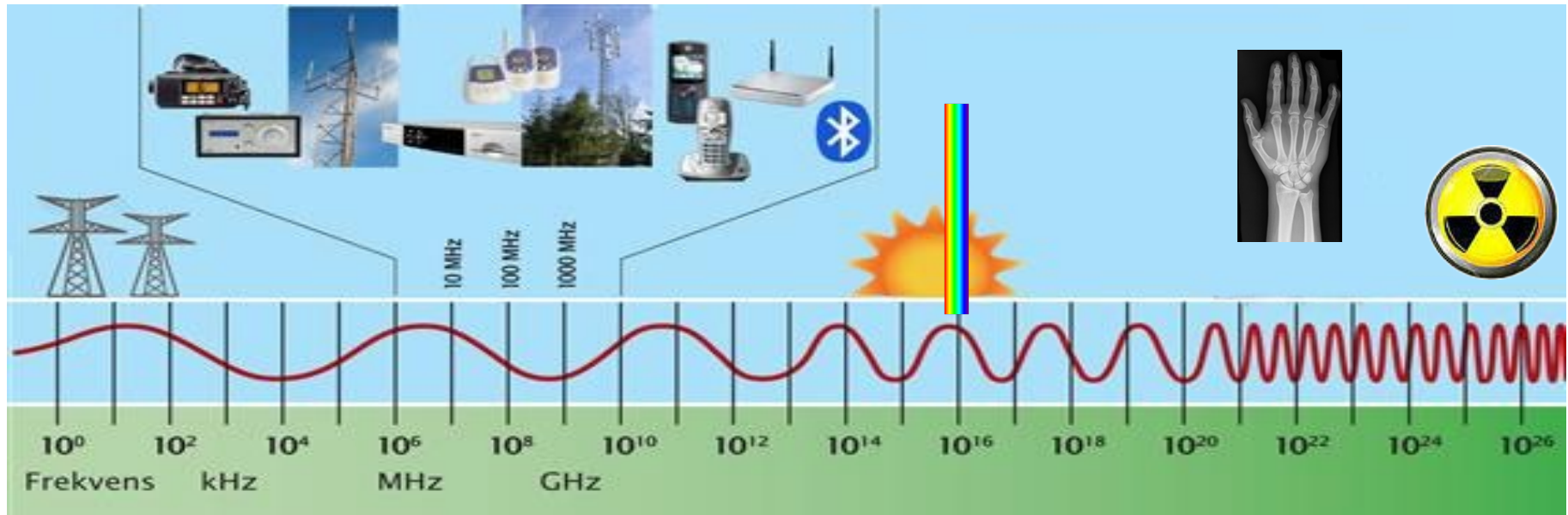
The pulses of life and man-made pulses are physically the same thing



Several electromagnetic pulses at the same place will mix and add up like waves in water – even more complicated due to more properties of RF-EMF mixes together.

The electromagnetic fields can have different frequencies

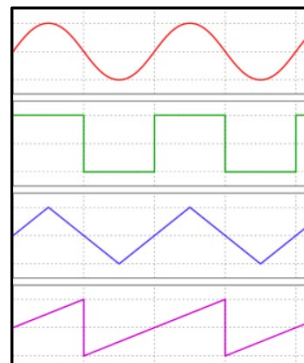
The frequencies of life are in this area



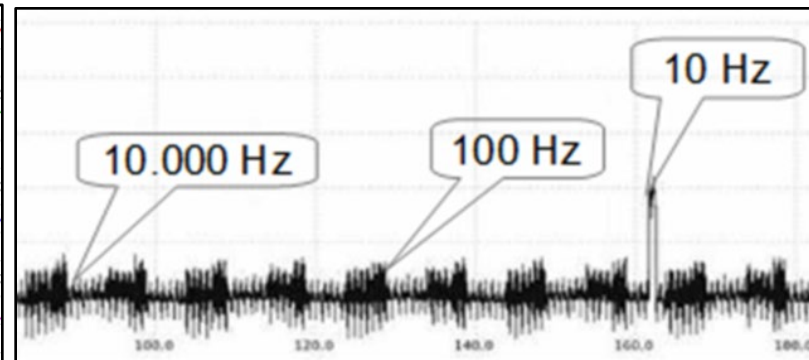
Important properties of electromagnetic fields:

- The frequency of the waves
- Strength/intensity
- The wave form
- Pulsation and pulse frequencies
- Both waves and pulses mix and create new properties of the EM field

Wave forms



Pulse frequencies





My scientific conclusion:

In any case, *it is likely* that life's *pulsed, electromagnetic signals* can be affected by wireless technology's since:

- frequencies in the same range
- pulses of the same type
- Also, other common properties of biologically created EMF and human made EMGs

BUT WHAT DO THE RESEARCHERS FIND?

I discovered great professional disagreement!

Academic disagreement is normal in research

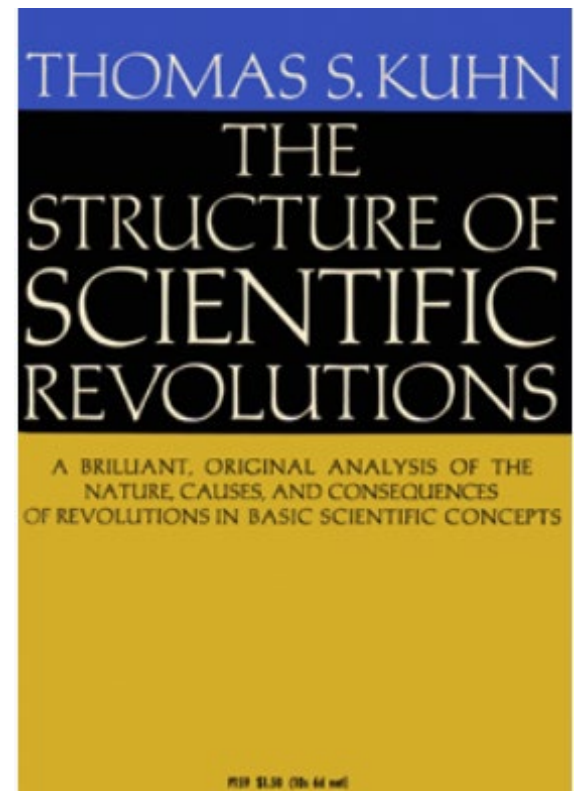
- usually one or more explanations
- preferences according to professional traditions and the research community one belongs to

Kuhn defined «paradigm»:

Different thought patterns to understand and think about the world.

It is difficult to «switch paradigm». Kuhn quotes Max Planck, the famous physicist, who sadly remarked in his old age:

"The followers of the old paradigm cannot be convinced of the new. Instead, they become extinct, and a new generation takes over."



from 1962

Two prevailing paradigms for EMF and health

The thermal paradigm

Health damaged from EMF is only possible when the energy level is high enough to create tissue heating. Heating is the only cause that has been proven with enough certainty that we need to take it into account.

Studying EMFs heating potential on molecules and heating effect on organisms.



The biomedical paradigm

Health damage from EMF may well occur without heating occurring because life's EMF and human made MEF are physically one and the same and therefore affect the same life processes.

Studying EMF's effect on living organisms.



The paradigms are rooted in different traditions

The thermal paradigm

Rooted in **radiation physics**, which calculates damage from more powerful matters: UV rays, X-rays and radioactive gamma rays.



The biomedical paradigm

Rooted in **biology and medicine's** research into substances harmful to health:

Toxicology



Different approach to exposure limits

The thermal paradigm



Using formulas and lab. methods from **physics**, calculating and measuring heating effects in liquids.

- Calculated in the 50'ies:
- Intensities above 100 W/m^2 gives detrimental heating for a large male (10% largest soldiers)
- Safety margin 1/10 - for all
- Unchanged since then:

10 W/m^2 on average measured over 30 minutes from one single source of EMF

The biomedical paradigm

Based on biological effects, acute and over time.



Example from EUROPAEM 2016, table 3:

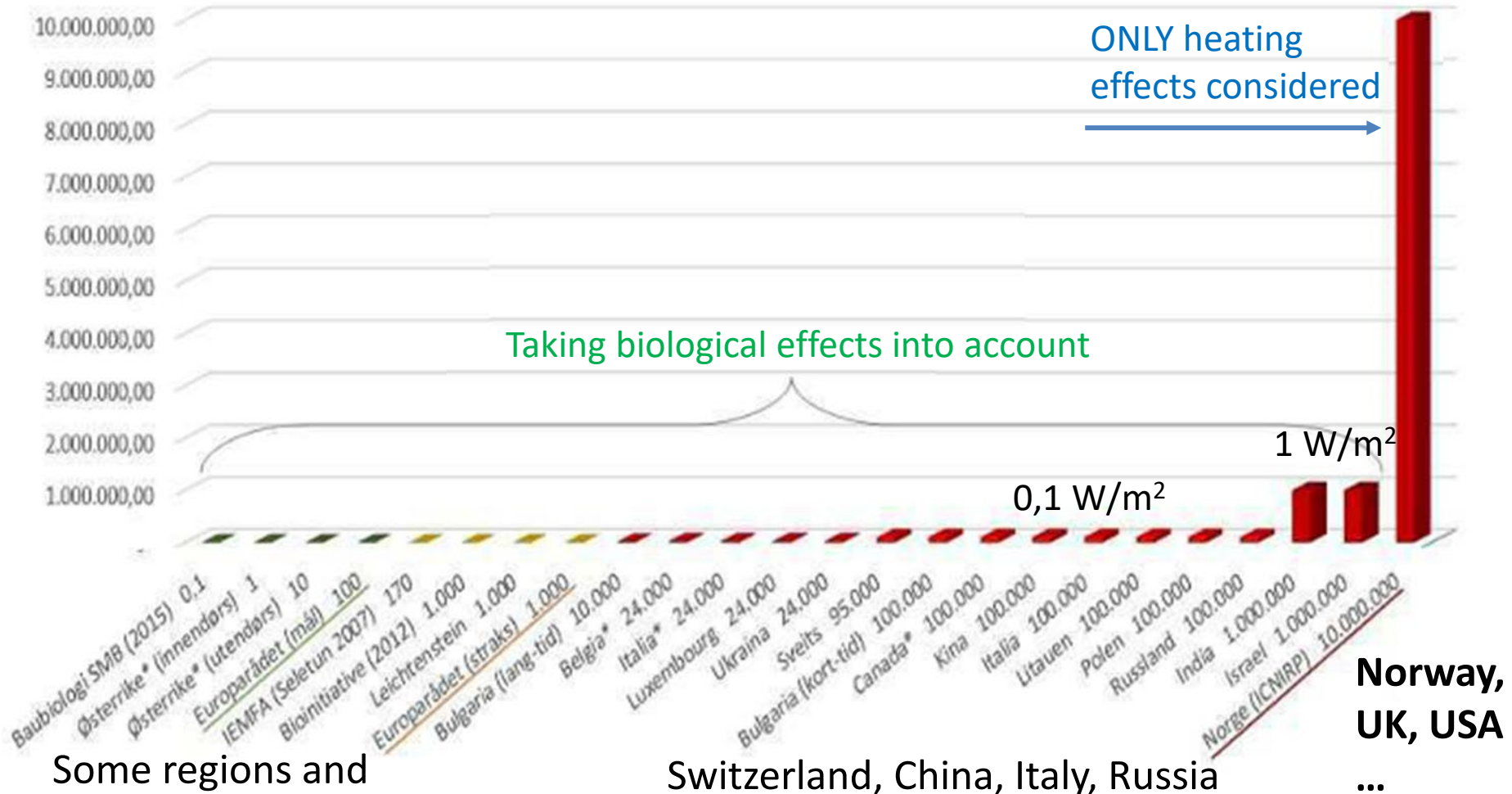
Exposure limits set to $0,1 \text{ W/m}^2$ with time limits depending on pulse type, and reduction for vulnerable individuals, hospitals, schools, for long term stay, during sleep etc.

This is why there are differences in exposure limits

Amount of energy absorbed in an average of 6 minutes
 $\mu\text{W}/\text{m}^2$



10 W/m²



Some regions and suggested exposure limits

Switzerland, China, Italy, Russia

Norway, UK, USA ...

Different experiment setup have consequences

The thermal paradigm

1. Good control over the experimental situation as simple molecules and radiation are easy to keep track of
2. What happens can be described with formulas
3. Possible to exactly repeat experiments and get the same results

Strict evaluation criteria:

Strict criteria apply in basic research within physics and chemistry.

The biomedical paradigm

1. Poor control over the experimental situation as living organisms are complex, disorderly and no two are alike
2. Difficult to describe using equations
3. Impossible to know whether one repeats the experiment exactly due to the complexity of the experimental situation, often giving heterogeneous results

Dilemma regarding evaluation criteria:

With too strict assessment criteria, findings that are valuable are discarded .
With too loose assessment criteria, findings that are false are accepted.

Criteria for evaluating biological research results



Sir Austin Bradford Hill
"The Environment and Disease:
Association or Causation?"
Proceedings of the Royal Society of Medicine
January 14, 1965

For example, the well-known **Bradford-Hill criteria** from 1965 used in toxicology and other medical research.

What happens when evaluation criteria following the physics tradition is used for evaluating biomedical research results:

Examples from the foundational documents of Norwegian radiation protection.

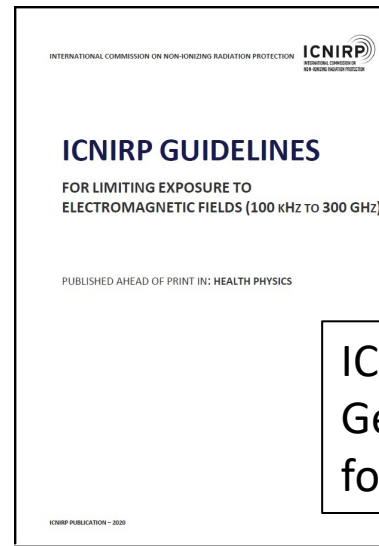


Two documents relevant for Norwegian radiation protection:

FHI-2012:3



Assessment report, published by FHI, The Norwegian Institute of Health, government body.




ICNIRP 2020

ICNIRP: a small, closed, German, self-recruiting foundation

ICNIRP 2020 and FHI-2012:3 - their requirements for evidence both following the thermal tradition:

- For an effect to be taken into account when calculating limit values, it must be a “**substantiated effect**”, defined in ICNIRP 2020 as an effect proven using their evaluation criteria rooted in the physics tradition.
- If not, there is a risk of setting too strict limits so that the potential benefits for society, industry and the population are not achieved.
- The same type of evaluation criteria are used in FHI-2012:3



Rejecting findings because exact description of radiation dose is required:

FHI-2012:3 page 100:

The researchers have tried to create an exposure situation that resembles reality, with ... a mobile phone ... and at different distances from base stations.

Some health damage was observed.

The lack of control of the exposure still means that the conclusions in these studies are very uncertain.



Rejecting findings due to unknown mechanism:

Requires detailed chemical/physical description of the reactions involved in creating the effect

FHI-2012:3

p. 69:

Apart from heating ... all other proposed **mechanisms** are hypothetical and unsettled.

p. 71:

Knowledge of **mechanisms** is often absolutely necessary for health risk assessment.



Effects rejected because they are only considered "a biological effect" and not a health hazard

FHI-2012:3, page 118 and 131:

The observed biological effects and functional changes ... do not necessarily have consequences for performance or health damage or disease.

Conclusions based on "overall"

Refers to research that finds harmful effects and others that do not, and concludes:

FHI-2012:3 page 120:

Overall, there is no evidence that exposure to weak RF fields affects performance or behaviour.

This means that "non-findings" outweighs "findings"!

THAT IS NOT ACCEPTABLE SCIENCE!

"overall" is used 78 times in FHI-2012:3.




Reputable scientists make reservations

So also the authors of FHI-2012:3 and ICNIRP's reports.

4.12.3 Overall Conclusion

There are a number of studies that have investigated the possible effects of exposure to weak RF fields (i.e. exposure below the ICNIRP reference values). The studies have been conducted with cells and tissues, animals and humans. The effects studied include changes in organ systems, functions and other effects. There are also a starting number of population studies with an emphasis on studies of cardiovascular risk. Overall, the large number of studies do not provide evidence that exposure to weak RF fields leads to harmful health effects. Some physiological effects cannot be ruled out.





Comprehensive caveats in ICNIRP 2020:

People with metal and electronic implants fall outside the scope that ICNIRP 2020 assesses

Page 2

6-300 GHz has not been investigated as there is a lack of research on this

Page 6/7

Biological effects have not been assessed for the skeleton, muscles, respiratory tract, digestion and urinary tract/kidneys/sweat glands as there has not been sufficient research on this.

Page 37



Many countries advise because of this uncertainty:



EU report from 2017, page 11:

These countries provide official advice to reduce exposure:

Australia, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, India, Italy, Luxemburg, Netherlands, Spain, Sweden, Switzerland, United Kingdom and USA

ADVICE, among other things:

- Limit the call time
- Use headphones or speaker
- Use SMS instead of calling.

echoed 2002 from Norwegian Radiation Protection Agency:

The screenshot shows a webpage from StrålevernInfo, the Norwegian Radiation Protection Agency. The page title is "Mobile phones and health". It features a red logo with a radiation symbol and the text "Statens strålevern". Below the title is a photograph of a hand holding a mobile phone next to a woman's face. The page lists three pieces of advice:

- **Shorter conversations**
- **Only necessary calls**
- **Use "hands-free" sets**

Reports that use biomedical assessment criteria conclude differently

Weak electromagnetic radiation causes biological effects that harm living organisms.

Example:

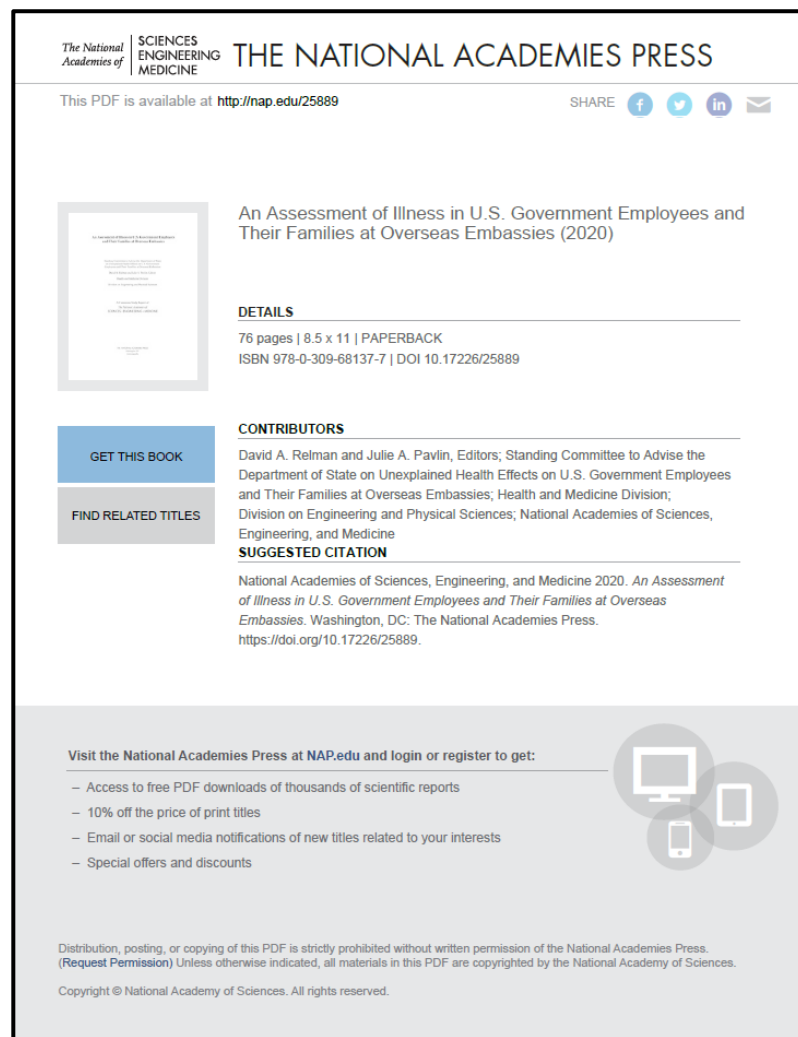
Report from 2020 commissioned by the US State Department from National Academies of Sciences, Engineering, and Medicine, USA

An investigation into why diplomats and their families in the US embassies in Cuba and China fell ill.





Ref: Flydal & Nordhagen, 2020, 5G and our wireless reality


Ref: Flydal & Nordhagen, 2021, Smart meters, dirty electricity, pulses and health.

and : <https://einarflydal.com/2020/12/11/rapporten-om-bestralingen-av-usa-diplomatene-viser-bloffen-om-5g/>



The National Academies of Sciences, Engineering, and Medicine THE NATIONAL ACADEMIES PRESS

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DETAILS

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NRK's mentioned report on 6 December 2020

United States Academy of Sciences: Microwaves made US diplomats in Cuba sick

USAs vitenskapsakademi: Mikrobølger gjør amerikanske diplomater på Cuba syke

Direkte rettet mikrobølgestråling var den sannsynlige årsaken til sykdom hos amerikanske diplomater på Cuba og Kina, konkluderer en ny rapport.



Gro Holm
Journalist

Kilde: NTB/NRK

Publisert 6. des. 2020 kl. 11:57
Oppdatert 6. des. 2020 kl. 16:02

De fleste av dem som ble syke jobbet her, i den amerikanske ambassaden på Cuba. Men angrepene skjedde i hjemmene og på hotellrommene til medarbeiderne.

FOTO: YAMIL LAGE / AFP

Directly directed microwave radiation was the likely cause of illness in US diplomats in Cuba and China, a new report concludes.

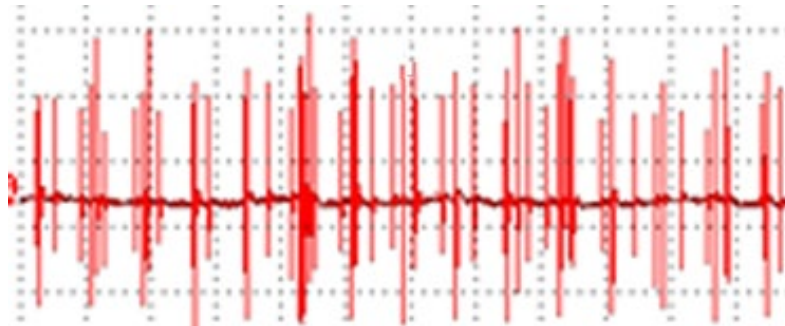
...

The study believes that "directional, **pulsed** radio frequency energy" appears to be the most likely cause of the symptoms.

Pulsation is an important bioactive property

From NRK (Norwegian Public Radio and Television Corporation) about the report:

The pulsing of low-intensity microwaves may be the most important factor in explaining the biological effects of such radiation.



Pulses are bioactive even at low intensities.

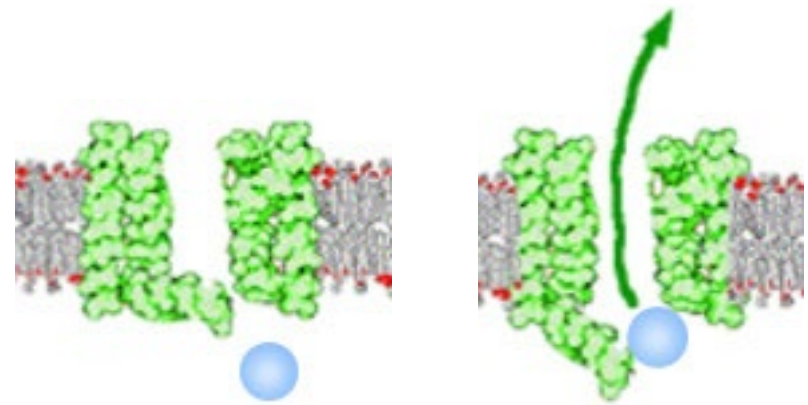
The exposure strength therefore becomes of secondary importance compared to the pulses.

Obviously radiation, but many possible mechanisms

The embassy report's chapter **DIRECTED RADIO FREQUENCY ENERGY Assessment and Findings, s. 17/18**

- There are many possible mechanisms for biological effects without heating. It mentions, among other things:
 - **apoptosis** (cell death)
 - **oxidative stress**
 - malfunctions in the **cell membranes**, by the influence on the **voltage-gated calcium channels**

The calcium channels are electrically controlled “doors” in the membrane around cells. The doors react to changes in the electrical changes in its surroundings.



Lukket kanal

Åpen kanal

The report emphasizes the whole picture

Observing the symptoms individually is misleading.

No one had all the symptoms, but they all had several of them.

Acute effects:

- Ringing in the ears
- Pressure and vibrations
- Tinnitus/ear ringing
- Ear pain
- Hearing loss
- Dizziness, unsteady gait
- Visual disturbances
- Fatigue/ME
- Headache
- Migraines
- Impaired concentration
- Insomnia

Long-term effects:

- Dizziness
- Exhaustion (fatigue)
- Impaired balance
- Headache
- Impaired concentration
- Depression
- Insomnia

This picture of symptoms agrees with what is reported by the parties in the present court case

Person:	1	2	3	4	5	6	7	8	9	10
Symptoms from USA reports:										
Pressure and vibrations			x	x	x					x
Tinnitus/Ringing in the ears	x	x	x		x	x	x		x	x
Ear pain										
Hearing loss		x								
Dizziness/balance problems					x					x
Visual disturbances			x		x	x	x			x
Fatigue/ME					x		x			x
Headache	x		x		x	x	x			x
Migraine	x				x	x				x
Impaired concentration					x	x	x			x
Insomnia			x	x	x	x	x	x		x

Consistent with the symptoms reported for electrical sensitivity

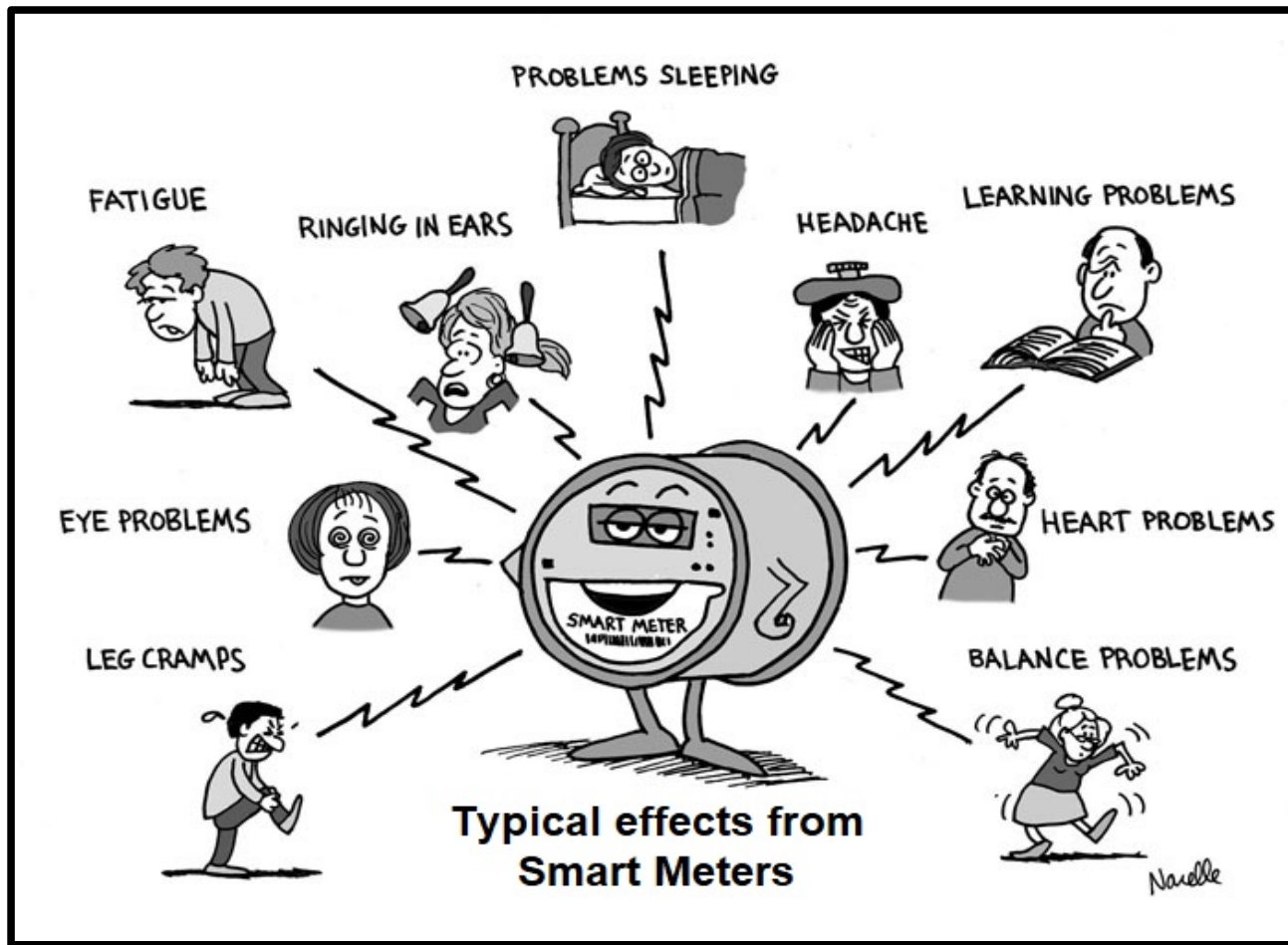
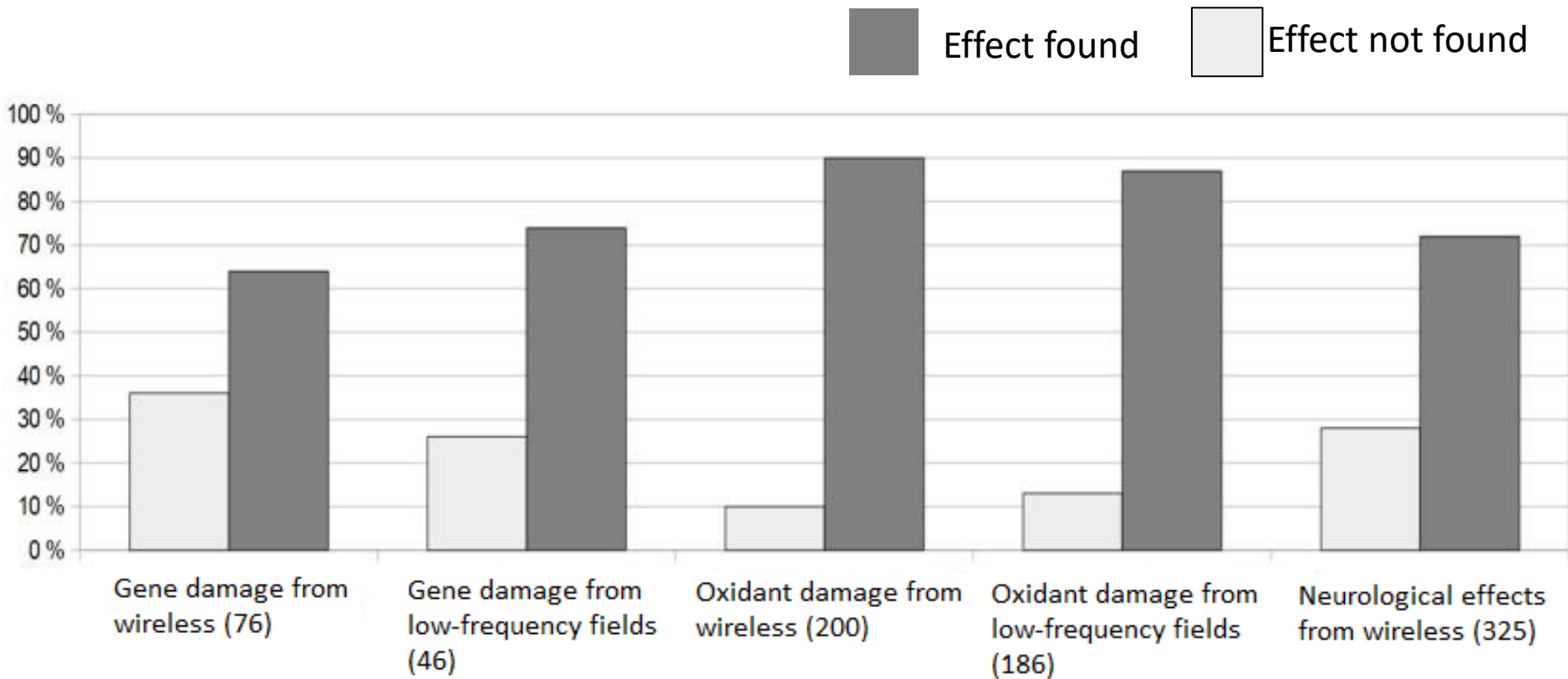


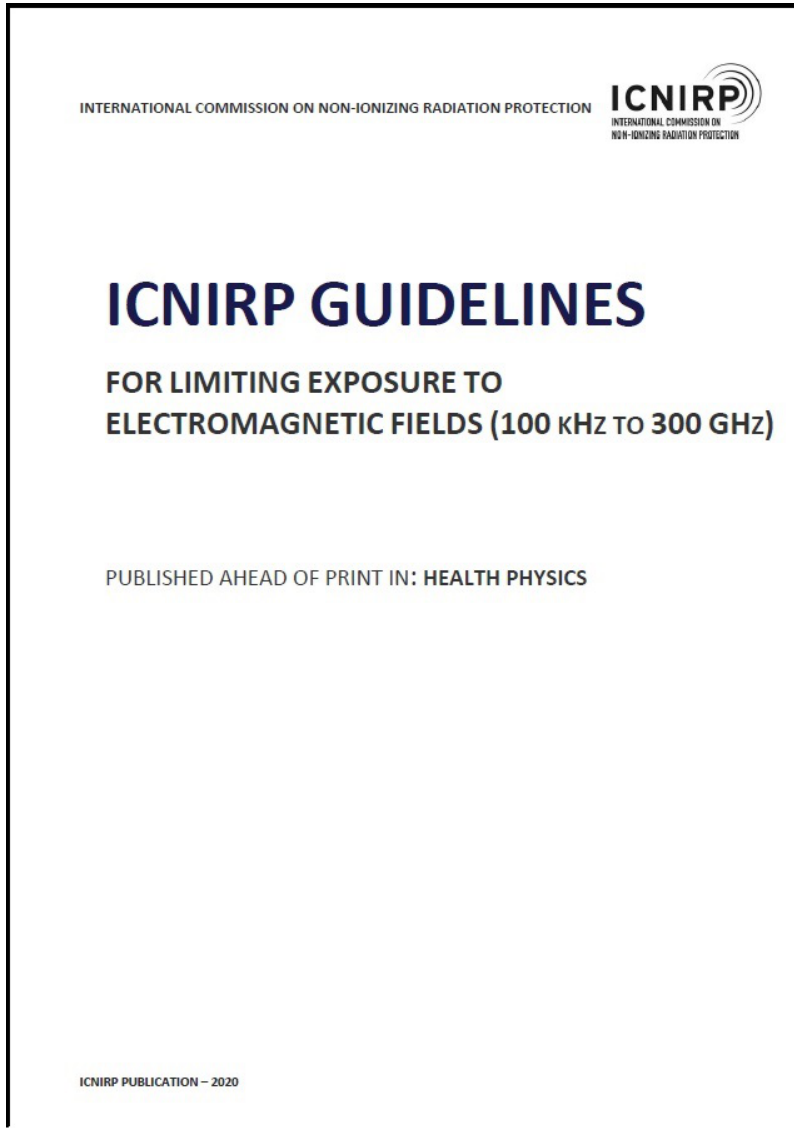
Figure from 2015

Consistent with the majority of research

Peer-reviewed articles on low-level radiation and health in Medline 1990 - 2017, broken down by type of injury and findings vs. no findings. A total of 833 such articles were found.



The references show how ICNIRP 2020 fails



Our analysis shows that articles and reports used as proof is written by the ICNIRP network itself.

Other researches' work presenting findings of biological effects are consistently rejected.

Reports and research summaries referenced in ICNIRP-2020:

Official reports ICNIRP-2020 refers to:

- SCENIHR 2015 (by an EU committee)
- SSM (2015, 2016, 2018) – Sweden's DSA
- National Health Council of the Netherlands (HCN 2014 and 2016)

Created by committees with several ICNIRP members.

Uses the same assessment criteria as ICNIRP.



Also use their own report that had to be re-drawn

ICNIRP 2020, page 26:

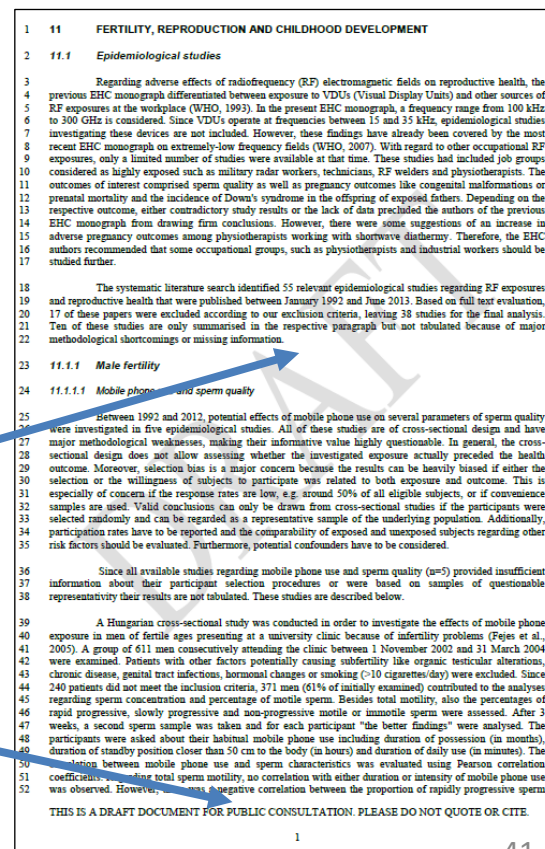
The World Health Organization (**WHO**) has undertaken an in-depth review of the literature on radiofrequency electromagnetic fields (EMFs) and health ... This **independent** review is the most comprehensive and thorough appraisal of the adverse effects of radiofrequency EMFs on health.

WHO? Independent? The review from 2014 has many ICNIRP members in the author group. Uses ICNIRP's assessment criteria.

The draft was soon withdrawn after massive, international critique from radiation protection agencies and a row of researchers, among them researchers associated with WHO's cancer institute IARC.

All pages are marked **DRAFT** and **THIS IS A DRAFT DOCUMENT FOR PUBLIC CONSULTATION. PLEASE DO NOT QUOTE OR CITE**

This draft which shall not be cited or quoted, uses ICNIRP-2020 for its weight of evidence.



Who are the authors behind the ICNIRP-2020 references?

61% of studies from
10 ICNIRP members.
7 are also authors of
ICNIRP-2020

and a few studies from their
co-authors in many other
papers

**28% not on health
outcomes of EMF:**
Heating calculations,
general heating
damage, pain

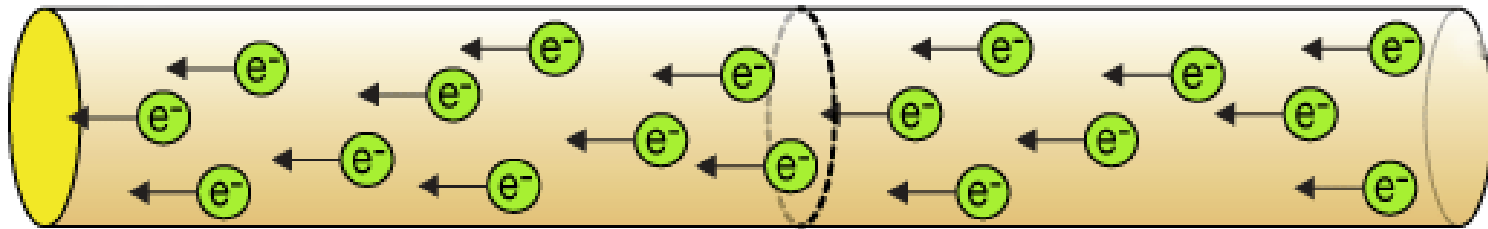
10% Rejected
Findings of
biological effects,
not authored by
the ICNIRP
network.

With the caveat that this is made manually and may therefore contain small inaccuracies

Finally, an important technical point:

What is the link between “dirty electricity” and pulsed electromagnetic radiation?

In both wires and antennas, electrons move along a metal wire.

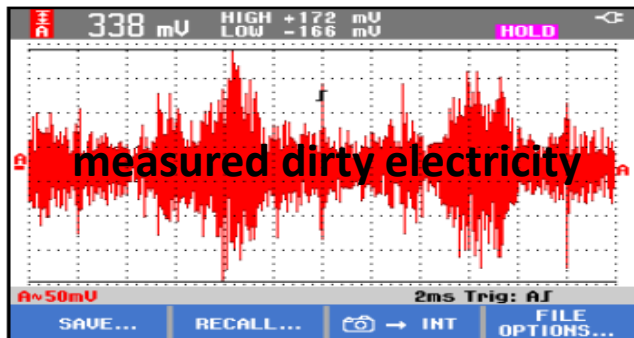
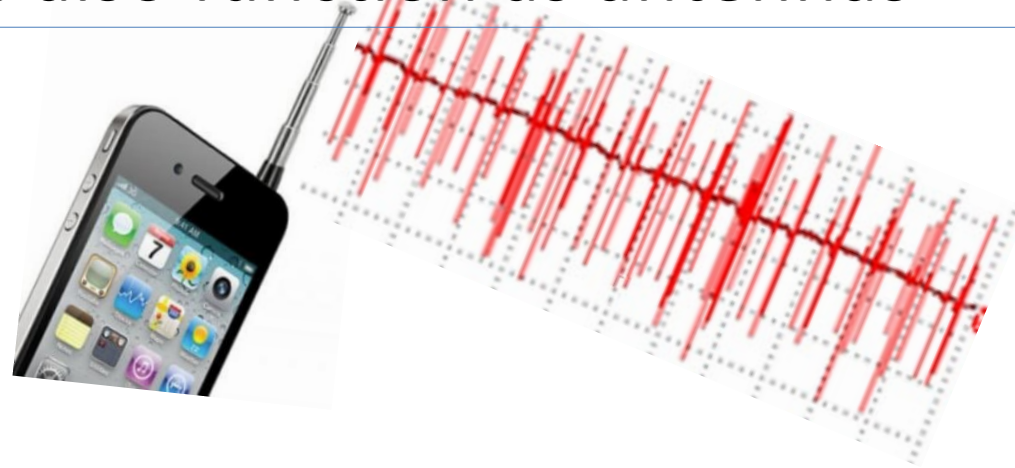


When the electrons change speed, an electromagnetic pulse is created.

This is how radio signals are generated: signalling is done by changing the speed of the electrons.

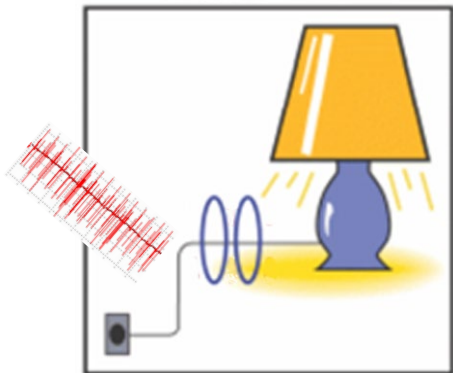
Ordinary electricity wires also function as antennas

In wireless communication, the speed of the electrons is controlled so that intentional pulses are generated and sent out from the antenna.



Dirty electricity is sudden changes in the speed of the electrons.

The wires become antennas that send out pulses.



Dirty electricity produces weak pulses. The pulses are what give the biological effect, not the strength/intensity.



My Conclusions 1

The thermal paradigm is supported by a small community of researchers.

By using assessment criteria from the physics tradition, all biological, medical and epidemiological research is rejected.

However, even this small community see that there is uncertainty and limitations in their assessments, therefore they take reservations:

"Some physiological effects cannot be excluded."

Because of this caveat, many countries advise the public on how to limit their exposure to electromagnetic radiation – even if the countries follows ICNIRP's recommendations.



My Conclusions 2

- How living organisms can be affected by man-made electromagnetic fields [from exposures not creating heat] can be understood based on the laws of physics.
- With the perspective of biologist and physician: many mechanisms are well understood.
- Half the world's population lives in countries that have significantly lower limit values, based on the biological paradigm.
- The majority of peer-reviewed articles report findings of biological effects [i.e., from exposures not creating heat].
- Many thorough scientific reports find biological effects.

Biological effects have been proven