The Business & Scientific Case for Precautions with Microwave Radiation:

Why & How to Ensure Safer Technology

Devra Davis, PhD MPH *President*, Environmental Health Trust September 21, 2015 Wireless Communication 2015 Conference Baltimore, Maryland



Career Highlights

- Danforth Foundation Fellow, University of Chicago, 1967-71, PhD in Science Studies
- National Cancer Institute Senior Post-Doctoral Fellow in Epidemiology, Johns Hopkins University, 1981-82, MPH
- Founding Director Board on Environmental Studies and Toxicology, National Research Council, National Academy of Sciences 1983-93 (group advising bans on indoor smoking)
- Clinton Presidential Appointee 1994-99 National Chemical Safety & Hazard Investigation Board, with bi-partisan Senate approval
- Visiting Professor, Hebrew University, Hadassah Medical Center and Ondokuz Mayis Medical School, Samsun, 2015-16
- More than 200 technical publications, 11 edited monographs, 3 popular books, currrently Visiting Professor Hebrew University/ Hadassah Medical Center and Ondokuz Mayis Medical School

Presentation Overview

- Regulatory Context & Secondary Insurance
- Modeling Exposures
 - Brains Child/Adult
 - Pregnancy
- Demonstrated Health Impacts
 - Sperm Damage
 - Pregnancy
 - Genotoxicity
 - Brain & Head Cancers

- Breast Cancer Case Series
- Honey Bee Impacts
- Safety & Policy responses
- R & D
- Marketing opportunities



The Big Question

Is microwave radiation from mobile devices dangerous?





FCC standards for cell phones unchanged for 19 years

1997 typical user was military, medical, or business

Average call took less than 6 minutes

Employs the head of a 220 lb male at the 98% of military recruits in 1989

Designed to avoid heating after short period of time Does not consider growing evidence of nonthermal impacts from chronic exposures

Secondary Insurers do not cover health damages from wireless

Since 1997 Lloyds of London denies coverage

Swiss Re 2014 rates electromagnetic fields as one of the 6 top risks businesses face today, above things like Mad Cow Disease.

"Risk from dangers linked to EMF can be classified as an emergent risk—" the same category once occupied by asbestos"

General Insurance Exclusions: Electromagnetic fields directly or indirectly arising out of, resulting from or contributed to by electromagnetic fields, electromagnetic radiation, electromagnetism, radio waves or noise.

Typical Warning Signage for Antennas Not Uniformly Used



this point may exceed the FGC general public exposure limit.

Obey all posted signs and site guidelines for working in radio frequency environments.

Neutronente non colte l'actore d'envenere devenere l'accettantes i den cel matte. Nanamente una relació VI GPN 1, 1262(b)



Boyond this point: Radio frequency fields at this site may exceed FCC rules for human exposure.

For your safety, obey all posted signs and site guidelines for working in radio frequency environments.

F. S. Saraka, K. S. Maraka, Constant and S. Saraka, Society Sciences and the Second state of the State of Cont., 2007 201



Beyond this point: Radio frequency fields at this site exceed the FGC rules for human exposure.

Failure to obey all posted signs and site guidelines for working in radio frequency environments could result in serious injury.

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Sign at entrance to next exposure Category.



Warning Sign: "Beyond this point: Radio Frequency Exposure May Exceed Controlled Exposure Limits"

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Radiation Electromagnetic Spectrum





The impact of any form of radiation depends on the nature of the waves



- Frequency
- Amplitude
- Pulse
- Wavelength/ Form
- Information





Gandhi 1996 scaled relative absorption in child/adult, questioning whether the adult model adequately predicted child exposure



ENVIRONMENTAL HEALTH TRUST

Sophisticated modeling shows anatomically based differences in radiation exposure from cell phones in 8 & 34 year old heads(Fernandez,



900 MHz

2400 MHz

Greatest exposure occurs to 9 month fetus occurs when head is at the surface of the abdomen Normalized SAR for the mother and the fetus exposed to a dipole antenna in front of the abdomen



(courtesy Andreas Christ, IT'IS, 2013)

Claims that children/adults absorb the same amount of radiation

- Foundation of current test system
- Based on flawed modeling of total head absorption and inaccurate analyses (Morris et al, 2015, in press)
- Does not take into account
 - Dose at the target tissue of brain
 - Developmental immaturity of young brain
 - Non-thermal biological impacts

No long term studies on infants, toddlers or young children





https://www.youtube.com/watch?v=tzea37niEV0







Brain grows rapidly throughout embryonic & early life so that child brain differs qualitative from adult



Hugh Taylor, 2013

Microwave Radiation



Positive Impacts

- Treats liver cancer
- Stops bleeding
- Enhances uptake of drugs to brain
- Detects cancer

Negative Impacts

- Damages DNA
- Disrupts blood brain barrier
- Weakens & damages sperm
- Changes brain metabolism



Breakthrough Applications

 100 nanosecond pulsed non-thermal RF induces apoptosis in otherwise inoperable tumors (Nuccitelli et al 2015)

– Slated for human trials 2015

- Electro-chemotherapy
- Electro-immunology of vagus nerve (New Yorker, May 18, 2015)
- Scientific American, 2015, clinical trials to treat rheumatoid arthritis with EMF/RF

Melanoma Apoptosis induced by nanosecond electroporation, Nucitelli et al., 2015







Fetal Radiofrequency Radiation Exposure From 800-1900 Mhz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice

- Tamir S. Aldad
- Geliang Gan

- Xiao-Bing Gao
- Hugh S. Taylor

Scientific Reports, published March 2012 from Yale University Medical School

Fetal Brain Programming

Radiation-exposed 33 pregnant mice

42 pregnant controls



Study Design

- A muted and silenced 800–1900Mhz cellular phones with a SAR of 1.6W/kg was used.
- The phones were positioned above each cage over the feeding bottle area at a distance of 4.5–22.3 cm from each pregnant mouse.
- Mice exposed as fetuses were tested as adults.

Prenatally RF-Exposed Adults Evidence Significant Behavioral Impacts



Women should be advised NOT to use cell phones near their abdomens

Cell Phone Use During Pregnancy May Be Harmful to the Fetus

Hugh Taylor MD PhD Yale University www.babysafeproject.org Prenatal 900 MHz EMF Exposure Decreased Hippocampal Granular Cell Number in the Dentate Gyrus of Newborn Rats

The research question: Do prenatal electromagnetic fields (EMFs) affect adult brains

Adult Cell phone exposure kills brain cells tied to balance and other integrative functions

RESULTS:



Mean Purkinje cell number in female cerebellum



Prenatal 900 MHz EMF Exposure Decreased Hippocampal Granular Cell Number in the Dentate Gyrus of Newborn Rats

The research question: Do prenatal electromagnetic fields (EMFs) affect adult brains Prenatal 900 MHz EMF exposure decreased hippocampal granular cell number in the dentate gyrus of newborn rats

Controls



Exposed



Prenatal 900 MHz EMF exposure decreased hippocampal granular cell number in the dentate gyrus of newborn rats

CONTROLS



EXPOSED



Kesari et al, 2014, rat brain comet assay

Cage Control









Kesari et al; 2014 – Micronucleated polychromatic erythrocytes rat



Fig. 4 Micronucleated polychromatic erythrocytes (MNPCE) cells of 3G mobile phone exposed, sham exposed, and cage control stained with Acridine orange. The *graph* indicates number of MNPCE among all three groups. Asterisks indicates statistically significant result with statistical variation of mean \pm SD

Genetic Damage in Non-users vs. Mobile Phone Users (Gandhi, 2005)

MN I	est
Mnd c	ells/
2000 c	ells
scorea	(%)

SGCE assay Damaged Cells average DNA (%) SGCE assay Migration length (µm)

Control 0.0005 10.40 8.1±0.028

Exposed 0.25± 39.75 26.76± 0.0006 0.054
Ranges of Cytogenetic Damage in non-users compared to heavy users of mobile phones (Gandhi & Singh 2005)

> %Micro- %Aberrant nucleated cells Metaphases

Control	0.00-0.12%	6.00-15.00%
Exposed	0.59-1.10%	20.00-52.50%

Experiments with Human Sperm show effects not tied with heating





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Danielle please get newer data & pictures of results from newer sperm studies

Cell Phone Exposed Sperm Significantly Reduced & Damaged

Laureate Professor John Aitken

ΕN



Heavier Cell Phone Users Have Reduced Sperm Count



Ashok Agarwal MD PhD, Cleveland Clinic, 2008; and seven other studies



Mobile Phone Radiation Causes Testicular Dysfunction



(Agarwal et al., 2011)

Mobile Phone Use and Cancer Risk: Research on a Group 2B Carcinogen

Joel M. Moskowitz, Ph.D., Director

Center for Family and Community Health UC Berkeley Prevention Research Center School of Public Health University of California, Berkeley

> CDC Webinar October 29, 2014

SaferEMR.com





IARC RF Working Group, 2011 found experimental and human evidence of carcinogenic mechanisms

- Weak evidence in humans
- Evidence for genotoxicity: effects on immune function, gene and protein expression, cell signaling, oxidative stress, apoptosis, & bloodbrain barrier.

Cell Phone Radiation a "Human Carcinogen"

International Agency for Research on Cancer of the World Health Organization, 2011: declared cell phone and other wireless radiation:

"Possible Human Carcinogen"

EHT Experts, 2013,

"Probable Human Carcinogen"

International Journal of Oncology

IARC RF working group: Press conference May 30, 2011, Lyon, France

- Committee Chair Jonathan Samet: "the evidence, while still accumulating, is strong enough to support a conclusion and the 2B classification. The conclusion means that there could be some risk, and therefore we need to keep a close watch for a link between cell phones and cancer risk."
- **IARC Director Christopher Wild:** "it is important that additional research be conducted into the long-term, heavy use of mobile phones. Pending the availability of such information, it is important to take pragmatic measures to reduce exposure such as hands-free devices or texting."

Journal of Pathophysiology, 2013

 Mobile phone radiation should be classified as a "probable human carcinogen," based on new evidence since the IARC 2011 review

Hardell & Interphone studies: ipsilateral results

	Hardell (2013)	Interphone (2010)	Combined
Glioma: overall	1.78*	0.84	1.22
Glioma: ≥1640 hours	2.94*	1.96*	2.29*
Acoustic neuroma: overall	1.78*	0.77	1.16
Acoustic neuroma: ≥1640 hours	3.10*	2.33*	2.55*

Hardell Research Group: New case-control studies (2013)

- Wireless phone use ≥ 25 years (2007-2009).
 Glioma: OR = 3.3 (95% CI: 1.6 6.9).
- Wireless phone use ≥ 20 yrs (1997-2003, 2007-2009).
 Acoustic neuroma: OR = 4.4 (95% CI: 2.2 9.0).

CERENAT French National case-control study, 2014

- France: 4 areas (2004-2006).
- 253 gliomas, 194 meningiomas, 892 matched controls.
- Cumulative call time \geq 896 hours.
 - glioma OR = 2.89 (1.41, 5.93).
 - meningioma OR = 2.57 (1.02, 6.44).

Coureau et al. Occup. Environ. Med. 7:514-522. 2014.

Glioma risk consistency: 3 recent case-control studies

	Interphone (2010)	Interphone (App. 2) (2010)	Hardell (2013)	CERENAT (2014)
1640+ hours	1.40*	1.82*	1.75*	2.89* (896+ hrs)
10+ years	0.98	2.18*	1.79*	1.61

Greatest Risk of Acoustic Neuroma for Longest and Heaviest Users

Hardell et al 2013

Odds ratio (OR) for dose-response between use of wireless phones and acoustic neuroma



Parotid or Salivary Gland Tumors Tripled in Israel: 1 in 5 under age 20





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Increase in Parotid Gland Tumors in Israel Over the Last 30 Years



FIGURE. For trend analyses, we added regression lines and calculated R^2 values. Parotid gland cancer: $R^2 = 0.83$; Submandibular gland cancer: $R^2 = 0.36$; Sublingual gland cancer: $R^2 = 0.02$.

Source: Epidemiology, 22, p.130, January 2011

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2007 Israeli case control finding: Association Between Tumors and Cell Phone Use

"Based on the largest number of benign [parotid gland tumors] patients reported to date, our results suggest an association between cellular phone use and PGTs."

Recommend continued research and implementation of precautionary measures by governments until further evidence becomes available.

Sadetzki et al. Am. J. Epidemiol. (2008) 167 (4): 457-467.

Israeli Dental Association Warning

- One in every five rare malignant tumors of the cheek occurs in someone under age 20
- Young people should limit direct exposure of the head to microwave radiation from cell phones



Lerchl German Government Sponsored Findings on Tumor Promotion 2015



Confirmed and extended others' findings that radiofrequency radiation amplifies effect of a carcinogen to cause liver and lung cancers. (0.04 and 0.4 W/kg SAR)

Unusual Breast Cancers in Women Keeping Cellphones in their bras—a preliminary case series

John West, Lisa Bailey, Robert Nagourney, & other leading breast cancer specialists

Fat and fluid cook in microwave oven Breast = chiefly adipose and fluid



Caveat - first case report, 2009



Invasive multiple primary tumors in 34 year old, avid runner Chinese-American woman who used cell phone 4 hours a day in her bra for 10 years

-reported by Robert Nagourney, MD, PhD

Case Reports - 21 yr old multi-focal tumors tied with cellphones kept in bra



John West et al

Summary of 38+ Cases

- Negative for BRCA1/2
- No family history or other risk factors
- Unusual location of multi-focal tumors where phones were kept with mix of tubular/solid patterns of identical nuclear morphology & grade
- No significant histology in ductal and lobular units away from the areas of cellular phone use
- Two with metastases

Latinas put phones in bras



Dominican Republic, Credit Thos Robinson, 2010

Marketing for Cell Phones and Gear in Bras



Brazilian Examples



Atomic Bombs in Japan, 1945





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Radio Frequency Radiation and Human Health: Technical Studies from India



Dr. R. S. Sharma Sr. Deputy Director General & Scientist-G Division of RCH Indian Council of Medical Research New Delhi –110 029

Impacts of RF on Honey Bees



If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, nor more animals, no more man.

Decoding the language of the Honey Bees

Nobel Lecture, December 12, 1973 Karl Von Frisch University of Munich, Federal Republic of Germany







Waggle Dance

Shacking Dance

Tremble Dance

Exposure to cell phone radiation produces biochemical changes in worker Honey Bees, Neelima et al., 2011



- During initial quiet period rise in concentration of biomolecules due to stimulation of body mechanism to fight stressful condition.
- At later stages there was decline in the concentration of biomolecules because the body had adapted to the stimulus.

Electromagnetic radiation (EMR) damages Honey Bees (Sainudeen, 2011)


Why inconsistent results in vitro

- wrong cells studied, i.e., adult lymphocytes compared to neuronal stem cells
- Wrong exposures used (CW/Digital)
- Publication bias



Fine Print Warnings

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READING THE FINE PRINT

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Reading the Fine Print

who focunt created the tools that eventually allowed people to undestand out how to predict the occurrence of natural or humanand deasters, whether from smoke and fires or floods. I wrote abut him ten years ago and his relevance still hits me about once week. Graunt was a master of assembling and making sense of cedinary information. He laid the foundation for the ways of cateorinitic counting, and rendering facts and figures that would later dampt the way people thought about the connections between bath and the surrounding world. In 1682, Graunt published a abort book, Natural and Political Observations Made Upon the Bills of Minality, that summed up his years of sorting and analyzing who ided, where, when, and how.

t to provide the government and church ring policy, whether that required count

ting men or new surviving babies, organized people by sex, state, age, reliand how and where they died and what ern, deaths by "cancer, dog bynes, drownerth, feaver, head-mould, rupture, scurvy, opping of the stomach, stangury, teeth, sox (the British term for syphilis), small "were recorded weekly. He reported on of osales and females.

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Fine Print Warnings (iPhone 4)

For optimal mobile device performance and to be sure that human exposure to RF energy does not exceed the FCC, IC, and European Union guidelines, always follow these instructions and precautions: When on a call using the built-in audio receiver in iPhone, hold iPhone with the dock connector pointed down toward your shoulder to increase separation from the antenna. When using iPhone near your body for voice calls or for wireless data transmission over a cellular network, keep iPhone at least 15 mm (5/8 inch) away from the body, and only use carrying cases, belt clips, or holders that do not have metal parts and that maintain at least 15 mm (5/8 inch) separation between iPhone and the body.

iPhone's SAR measurement may exceed the FCC exposure guidelines for body-worn operation if positioned less than 15 mm (5/8 inch) from the body (e.g., when carrying iPhone in your pocket).

Showthefineprint.org

Blackberry and Pacemakers

- Always keep the BlackBerry device more than 7.88 inches (20 cm) from the pacemaker when the BlackBerry device is turned on.
- Do not carry the BlackBerry device in your breast pocket.

American Academy of Pediatrics Recommends Children Under Age Two Have Limited to no Screen Time



Demise of the Landline



US Households* (Jul-Dec 2013

- 41.0% wirelessonly
- 16.1% wirelessmostly

NHIS. NCHS, CDC. Jul., 2014. http://bit.ly/wireless0714

We lack uniform standards for measuring Electromagnetic Fields (EMF)

- 1. Radio frequency spectrum is a limited (though instantly renewable) natural resource essential to modern civilization, yet there is no common language to describe it!
- 2. Many domains need to record and process data about real world EMF emissions and measurements.

Wireless	Bioelectro-	Defense &	Government	Remote sensing	Others?
provider	magnetics		regulation of	operations and	Future
operations	research		EMF use	R&D	uses?

- 3. Data *communication* requires standards.
 - Open standards maximize opportunities for communication between systems. A standard data model provides a basis for standard interfaces and/or Semantic Web best practices.
 - A standard data model supports efficient publishing, discovery, assessment, access, aggregation and use of data.
- 4. A standard data model provides a template for rigorous and useful data collection and aggregation. In research, this enables comparison, verification, averaging of results, longitudinal studies, cross-disciplinary studies etc.
- 5. Open standards create opportunities for innovation and new markets. Convergence of digital and wireless is still new, still ripe for innovation.

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An open standard would open up opportunities for cloud analytics and apps



Interoperability now!

Time to agree on a commonly used and widely *blessed* vocabulary and grammar for EMF!



"Now! ... That should clear up a few things around here!" © 2015 Open Geospatial Consortiu Make slides on Indian bee studies put in two hives with cordless phones dropping into them and bees not returning to one with phone turned on



IARC/WHO, EHT & other Groups Advise How to Protect Your Family

France, Finland, Israel, and the European Environment Agency advise cellphone precautions

- Use speakerphone
- Use earpieces
- Do not keep phone on body/in pocket
- Avoid use in areas of weak signals
- Protect abdomens—pregnant, adolescent and men wishing to become fathers



R & D fruit on the ground

- Wired is faster, safer, & more secure
- Program devices to power down when not in use
- Develop software that automatically extends battery life, reduces power & exposures
- Create on-off switches for routers as successful Chinese model does
- Design phones that only work with headsets or speakers
- Improve antenna and router design
 - Directional vs. symmetrical
 - Standby mode as default

What is to be done? Would you give two cents?

Monthly fee* on all devices, users, IP providers to support:

- Cross-disciplinary training programs in bioelectromagnetics for engineers, docs & computer scientists
- Identify data gaps and R & D needs re hardware/software reconfigs & mods & research priorities
- *for eight years

 Monitoring of special populations similar to drug surveillance for biological impacts of wireless, such on hearing, reaction time, insomnia, & other behavioral endpoints TBD

What is to be done?

- Standardized metrics for evaluating personal exposures (OGC)
- Opportunistic crosssectional surveys of re
 - Memory
 - Reaction time/accuracy
 - Reproductive health
- Promoting wired school programs with mobile

tablet banks

- Public educational programs sharing 'fine print' advisories
 - Parents
 - Teachers
 - Health professionals

The world is not dangerous because of those who do harm but because of those who look at it without doing anything. - Albert Einstein

www.ehtrust.org

Thank you!

- Frank Clegg, former President Microsoft Canada
- Joel Moskowitz, PhD, UCBerkeley
- Suleyman Kaplan, Ondokuz Mayis University
- Ashok Agarwal MD PhD, Cleveland Clinic
- Robert Nagourney MD PhD, Rational Therapeutics
- John West MD, Orange County Breast Center
- Lisa Bailey MD, former President American Cancer Society/California, breast surgeon
- Lloyd Morgan, Robert Morris, Environmental Health Trust
- Igor Belyaev, PhD, DSc, Cancer Institute Moscow/ Bratislava
- Hugh Taylor MD PhD, Yale University

Social Media

- @saferphones
- @DevraLeeDavis
- Ehtrust.org
- Facebook/CampaignforSaferPhones
- Facebook/EnvironmentalHealthTrust

For discussion slides

EHT Senior Advisors

- Frank Clegg, former President Microsoft Canada/North America
- **R Blank,** *CEO VideoRx, technologist*
- Anthony B. Miller MD, Prof Emeritus University of Toronto, IARC Senior Advisor
- Annie Sasco MD PhD, former chief of cancer epid WHO, IARC
- Robert D. Morris MD PhD, EHT
- **Om Gandhi, PhD,** *Prof. Emeritus E.E.*
- Radhey Shyam Sharma, Indian Council of Medical Research
- Suleyman Kaplan, PhD, Dean, Ondokuz Mayis University, Turkey

Digital Dementia Diagnosed in South Korean Children



Dr. Byun Gi-Won a cognitive expert from the **Balance Brain Center in** Seoul, South Korea states, "Young People who are heavy technology users are likely to have a properly developed left hemisphere of the brain while the right hemisphere will be unused and underdeveloped."

Korean government studies on digital addiction and dementia



Source: Ministry of Science, ICT and Future Planning

Source: National Health Insurance Services

Open Geospatial Consortium



- Not-for-profit, international consortium of 500+ industry, government, and university members, including Google
- Founded in 1994
- Work based on collaboration and consensus
- Members set policies and procedures.
- Many alliance partners: W3C, OASIS, ITU, ISO, Smart Grid Interoperability Panel, buildingSMART International, etc.

OGC Mission

Deliver geospatial data encodings, interface standards and best practices that are openly and freely available for global use.

Abstract models and implementation models



Implementation models model how features, phenomena and relationships are to be encoded for a particular software implementation platform.

Abstract and/or conceptual model models what needs to be described/modeled in software (location, orientation, time, signal type, frequency, pulsing characteristics, energy intensity max/min, etc.). Includes relationships and units of measurement.

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Example OGC standard: OGC WaterML 2.0

SITUATION: Nations seek to provide integrated national and cross-border views of fresh water resources. Also, there is increased need for the exchange of hydrologic data to improve our understanding of complex environmental processes, such as climate change.

PROBLEM: 2005 Global Climate Observing System (GCOS) report: "*There are no established international standards on the acquisition of river data, the set of required metadata, data formats, and transmission modes.*"...

APPROACH

WMO

(World Meterological Organization , an International team of hydrologic organizations came together to form the OGC WaterML 2.0 Standards Working Group. They used OGC's rapid prototyping process to develop the WaterML 2.0 standard.

SOLUTION: WaterML2.0 is a standard information model for the representation of water observations data, with the intent of allowing the exchange of such data sets across information systems. Based on existing OGC standards, it is used to address a range of exchange requirements.

CSIRO (Australia) San Diego Supercomputer Center (US)

Australian Bureau of Meteorology Geological Survey of Canada, Nat. Resources Canada USGS (US)



German Federal Institute of

Collaboration is needed to address complexity.

Complexity makes data integration and communication difficult. Collaboration make integration and communication possible.

EMF are complex:

_Frequency or frequencies
_Modulation type & other pulse details (waveform parameters)
_Polarization
_Energy intensity max/min.
_Energy intensity ave.
_Location & orientation
_Time
_Unique source ID?
_Sensor or emitter specs
_Etc.

OGC members who are EMF domain experts will bring this expertise to working group meetings.

Spatial data are complex:

_Vector, raster, point clouds and other types data _Diverse Earth coordinate reference systems & Earth shape models (geodesy) _ 2D, 3D, 4D and nD _Conflating semanticly different data _Conflating precise and imprecise data _Harmonizing with other standards for spatial features and phenomena _Navigating IT trends, e.g. database > services > linked data etc.

OGC staff and OGC members who are spatial technology experts will bring this expertise.

Why the Open Geospatial Consortium (OGC)?

- 1. EMF instances are inherently spatial. All
 - have a point or region of origin. All EMF instances that we observe have one or more points at which observations are collected.
 - are affected by the media they travel through.
 - are absorbed, reflected, and refracted by the objects and phenomena they impinge upon.
 - have effects on the objects and phenomena they impinge on.
- 2. The OGC focuses on spatial and temporal encoding and interface standards.
 - Historically, OGC's focus was solely *geo*spatial.
 - Recently, OGC members are working with other standards organizations on convergence of geospatial data & technology with data & technologies used to model the built environment.
 - Basic principles of modeling macrospatial and mesospatial features and phenomena can be extended to microspatial and nanospatial (and nanotemporal) features and phenomena.
- 3. The OGC's standards portfolio includes a comprehensive portfolio of standards for description and management of sensors and sensor data.
- 4. The OGC's membership includes a broad range of companies and organizations that might participate in developing an EMF standard.

Worldwide Cell Phone Advisories



Belgium 2013:

The Public Health Minister bans cell phone sales both in shops and online to children under 7 years old. Cell phone advertisements are also banned during children's TV programs.



Australia 2013:

The federal government's Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has created a fact sheet providing citizens ways to reduce exposure from wireless devices. The agency advises that parents limit children's exposure to cell phones.

Worldwide Cell Phone Advisories



Italy 2012:

On October 12th, 2012 the Italian Supreme Court ruled in favor of an Italian business man who claimed that his brain tumor developed from using cell phone 5-6 hours a day



France 2013:

The French National Assembly bans Wi-Fi in schools until it is proven to be safe for human consumption and in nurseries.

Worldwide Cell Phone Advisories



Turkey 2013:

Governor Aksoy Huseyin, of the Samsun province is launching a cell phone campaign using EHT's pamphlets and health/science materials.



A mobile phone before they're 12 NO WAY!

Let's keep them healthy, away from mobile phones!

A - Mobile phone use: the city of Lyon teaches a lesson

"For the first time in France, a major city is launching a campaign to discourage the use of mobile phones among children." "The really new, in fact unusual, factor is that this action is not being promoted by the city itself but by a political group, the Green Party, of which Mireille Roy, the council officer in charge, is a member. It's taking place in an interesting context. If the question focuses on a matter of public health, the real issue is a political one."

"Neither the body of law authorised by the Council of State nor any other legal or regulatory directives allow local authorities any real freedom of action in this domain. But in the face of mounting pressure, something had to be done. Thus the moment was ripe for this campaign, even though it would be possible for those who are concerned to bring a group action in court."

Save the girls

Doctors warn that unusual breast cancers are occurring in women who stored cell phones in their bras.



2013 Information Time

Your future is in your hands

Medical experts are warning men not to keep their mobile phones in their pockets as this can have a direct effect on their fertility.



SAVE MALE

Melatonin Protects Against 1800 MHz RF Radiation Damage

- Xu et al
- Brain Research, 2010



Precautions Noted by the FCC, FDA, and ACS as of September, 2010

- Use an earpiece or headset.
- Avoid continually wearing a wireless earpiece
- Keep wireless devices away from your body when they are on
- Use speakerphone
- or purchase a low SAR phone to reduce exposure to the head.
- Consider texting rather than talking, but don't text while you are driving.
- Can limit talk time

We protect children in car seats

- Different carseats and distances at different ages
- Am Acad.
 Pediatrics
 recommends


Radiation Risks of CT Scans

Exam Type	Machine Setting	Relevant Organ	Approximate Equivalent Dose to Relevant Organ (mSv)	Equivalency in chest x-rays* .1501 mSV
Pediatric Head CT Scan	Unadjusted ¹	Brain	60	400-6000
Pediatric Head CT Scan	Adjusted ²	Brain	30	200-3000
Pediatric Abdominal CT Scan	Unadjusted	Stomach	25	166-2500
Pediatric Abdominal CT Scan	Adjusted	Stomach	6	40-600
Chest X-ray (PA/ lateral)	n/a	Lung	0.01/0.15	1



As Low as Reasonably Acceptable in Pediatric CT Scans

- Children ten times more vulnerable than adults to radiation (*Int'l Com Radiol Prot*, 1991)
- Quality of CT image better with higher radiation
- Many unnecessary tests ordered in children and adults

Slovis, Pediatric Radiology, April 2002

Recommendations



1. Avoid carrying your cell phone on your body (e.g. in a pocket or bra).

2. Avoid holding any wireless device against your body when in use.

3. Use your cell phone on speaker setting or with an "air tube" headset.

4. Avoid using your wireless device in cars, trains or elevators.

5. Avoid cordless phones, especially where you sleep.



How to Practice Safe Tech #PracticeSafeTech

6. Whenever possible, connect to the internet with wired cables.

- 7. When using Wi-Fi, connect only to download, then disconnect and disable Wi-Fi.
- 8. Avoid prolonged or direct exposure to nearby Wi-Fi routers.
- 9. Unplug your home Wi-Fi router when not in use (e.g. at bedtime).

10. Sleep as far away from wireless utility meters (i.e. "smart" meters) as possible.



