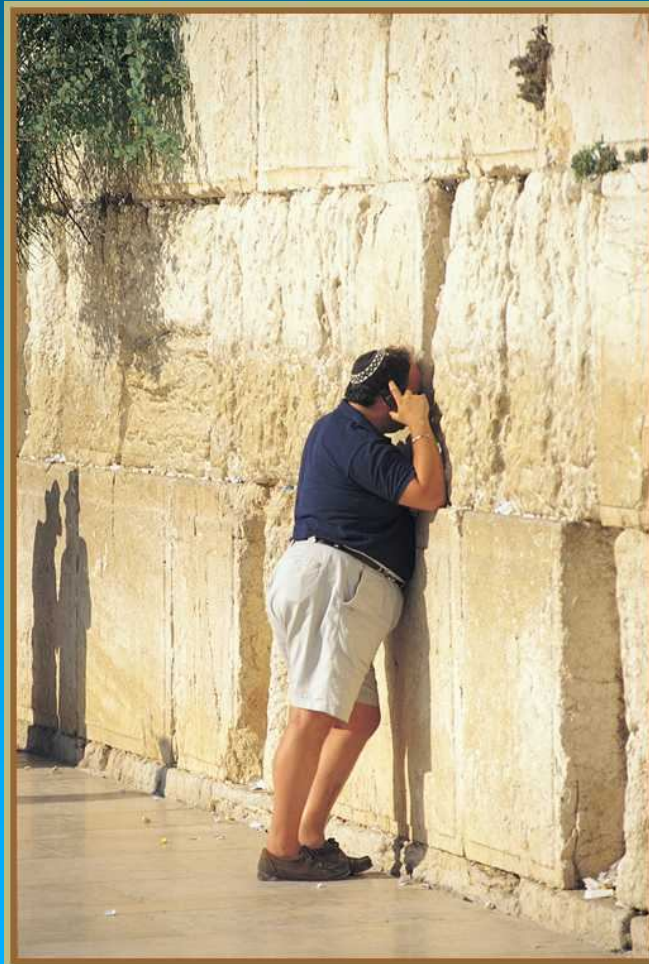


*"Electrophobia"  
Why are people  
scared of Electromagnetic Radiation  
from Cellular Towers?*

**Elya B. Joffe**  
**EMCS President-Elect**  
[eb.joffe@ieee.org](mailto:eb.joffe@ieee.org)

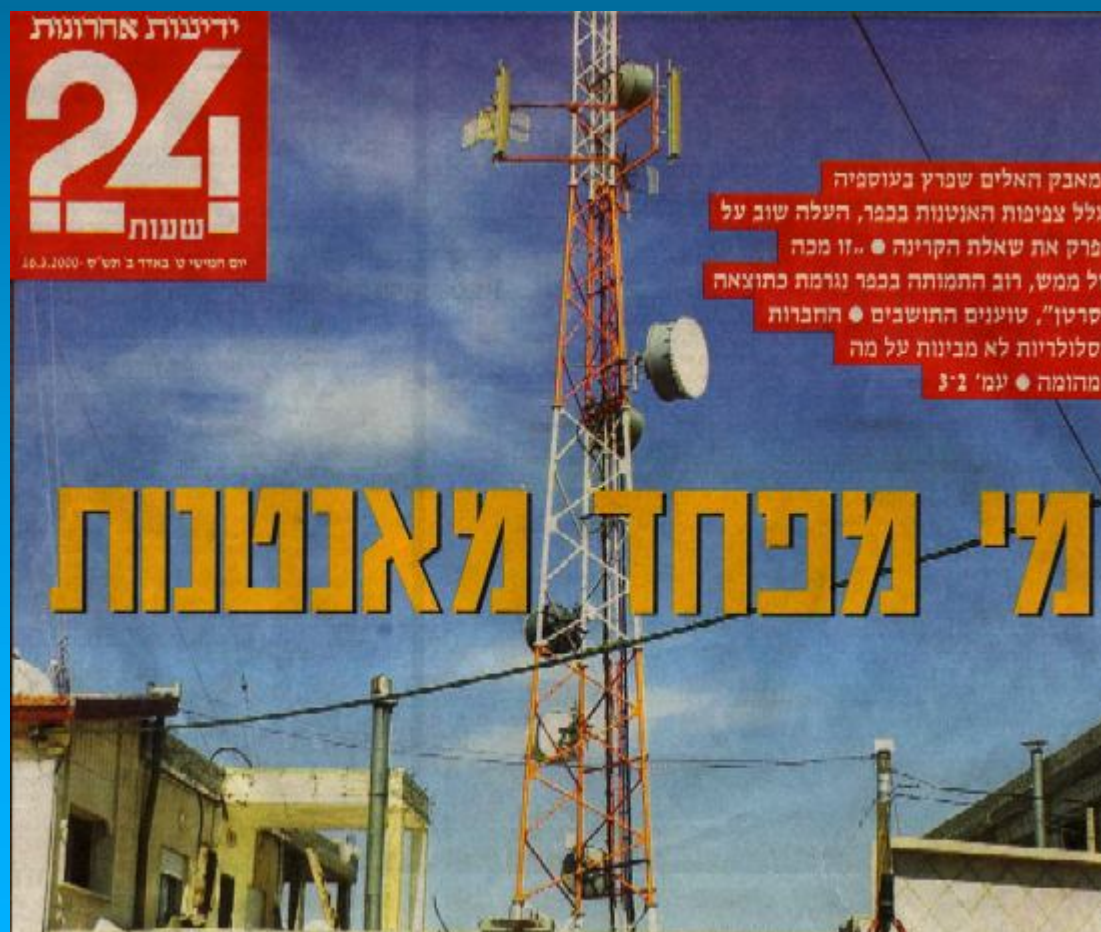


# *A Cellular Channel to Heaven...?*



• So, what's the problem...?

# Who's Afraid of the (Big Bad) Antennae?





# *Who's Afraid of the (Big Bad) Antennae?*



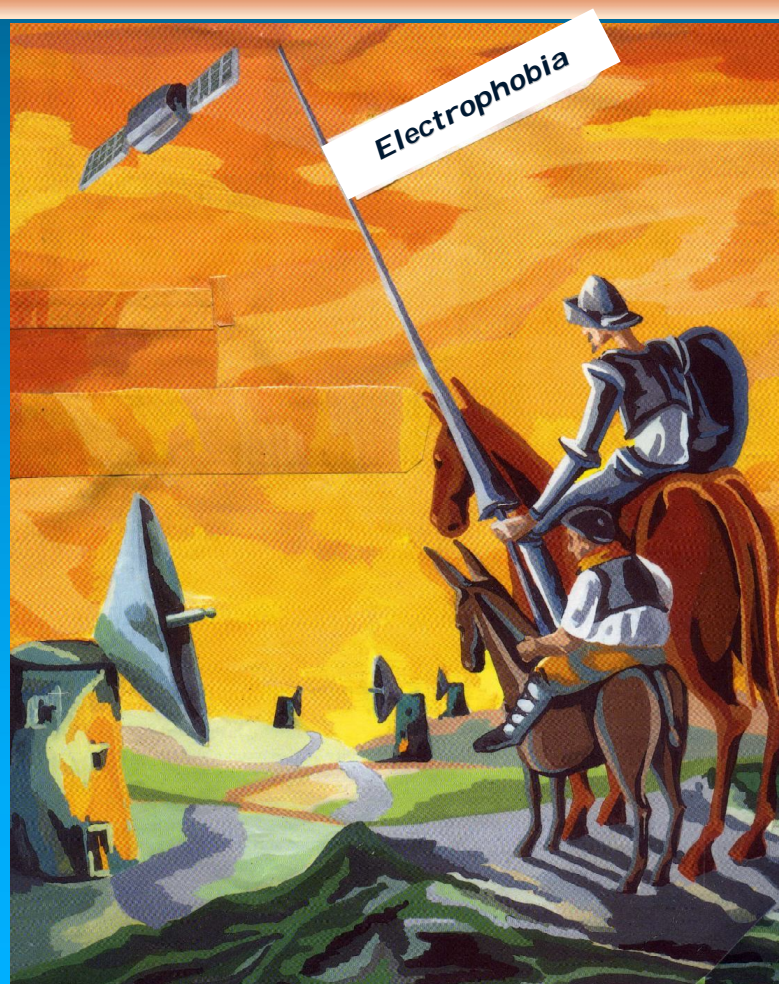
A Curtain HF antenna located in the center of residential area in Taipei, Taiwan

Transmitted power, could exceed 200kW





# *Let's Go Get'em*



## *So what's the problem?*



BBC January 19, 2003:

"Mobile phone mast is cut down in County Tyrone causing damage put at £20,000....."



BBC March 17, 2003:

"Vandals pull down a mobile phone mast in Devon causing £30,000....."

# *So what's the problem?...*

## *So say the BBC...*

- *04/10/04 Mast is relocated close to school. A fortnight after a successful protest to move a mobile phone mast it is erected just yards away near to a school*
- *03/10/04 Mobile phone masts to be removed. Three mobile phone masts are to be dismantled after planners rejected an appeal for them to remain*
- *9/09/04 Third mobile mast angers father. A man says it is unreasonable that a third mobile phone mast is to be located near the bottom of his garden*
- *28/09/04 Covenant could stop mobile mast. Campaigners are hoping a covenant could help stop a mobile phone mast being built next to homes in Bath*
- *22/09/04 Mast protesters claiming victory. A phone mast is to be relocated after a group of residents blockaded a field to stop it being erected*
- *21/09/04 Tighter rules on phone masts call. Rural campaigners say stricter planning controls are needed on mobile phone mast sites to reflect public concerns*
- *20/09/04 Phone mast vigil enters fifth day. A group of worried residents blockade a field to stop a mobile phone mast from being erected*

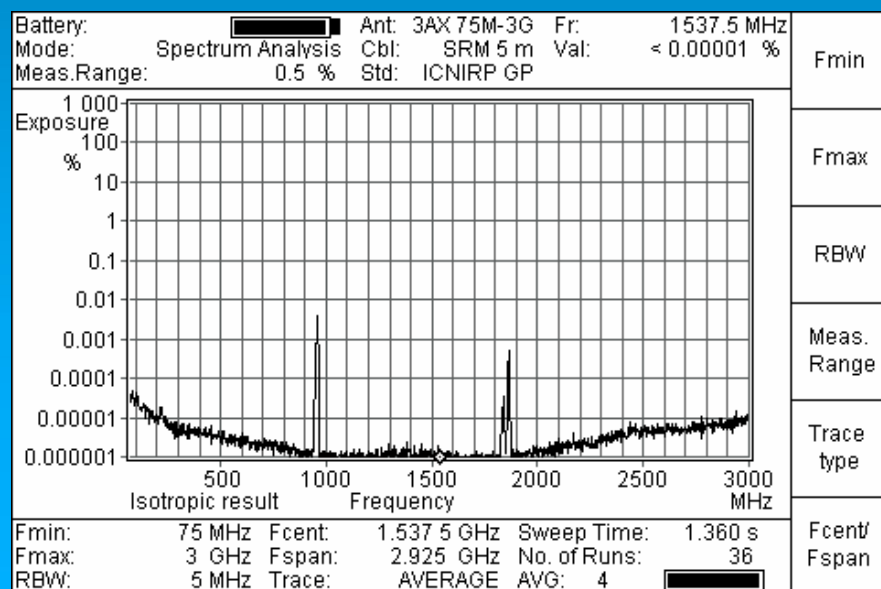


# WHO/IRPA/ICNIRP Guidelines

- 'Basic restrictions' should not be exceeded (current density & SAR). Whole body exposure based on 4 W/kg
- Field Levels published as 'reference levels' to enable comparison with measured values. Whole body exposure based on 0.4 W/kg
- If measured values are exceeded it does not necessarily follow that Basic Restrictions have been exceeded but a more detailed analysis is then required
- Time averaging set at 6 minutes over the range 100kHz to 10GHz ( $68/f^{1.05}$  for frequencies >10GHz)
- Spatial averaging can also be applied

# General Public Exposure

- In public areas field strengths from telecommunications are expected to meet ICNIRP general public guidelines
- Many detailed surveys have found field strengths to be **thousandths of permissible exposure levels**



# *Electrophobia Facts of Fallacies?*

*I'VE MADE MY MIND  
UP!!!*

*DON'T CONFUSE ME  
WITH THE FACTS!!!*





## *Some Reported Non-thermal Health Effects*

- Many have been postulated, but none have been proven, e.g.
  - Early studies suggested microwaves may alter the permeability of the 'blood-brain barrier'.
  - More recent studies found consistent changes only with significant heating ( $>7\text{W/kG}$ )
  - TETRA handsets under evaluation because of 17.6Hz amplitude modulation. Calcium efflux observed in early studies at 16Hz.
  - 'Current evidence suggests that it is unlikely that the special features of signals from TETRA hand portables and terminals mounted in vehicles pose a hazard to health'- NRPB July 2001.

## *Common Claims on EMF*

- ❁ "Science still does not know how dangerous the radiation is, but,... **within a year, a decade, a century, it will...**"
- ❁ "Standards for limiting dangerous exposure were prepared by **biased parties**"
- ❁ "Standards consider **thermal effects** only, whereas, **many a-thermal effects**, including cancer, are not considered"
- ❁ "Wait and see - EMR exposure will be similar to **asbestos and smoking...**" (and yet, they keep on smoking...) <sup>12</sup>



## *Common Claims on EMF*

- “Well known, **respectable scientists** do not exclude connection between EMR and cancer”
- “The **Internet** is flooded with overwhelming data on adverse health effects from ELF EMR”
- “The **ALARA** principle should be adopted”
- “**Prudent Avoidance - better be safe than sorry**”
- “**Epidemiological** studies exhibit **correlation** between chronic exposure to EMR and cancer”





# *An EMF Hazard???*

## **Judge Sees Through X-ray Vision**

A Public Utilities Commission judge in Harrisburg, PA, dismissed the case of a woman who testified that electromagnetic fields from a power line near her house allowed her to see through things.

As reported by the Associated Press, Dianna McPheat, 37, of Dauphin County, also claimed that the fields, known as EMFs, enhanced her hearing and made her plants grow in spiral shapes.

Administrative Law Judge George M. Kashi, who said the case was one of the strangest he has seen, found that the woman failed to present enough evidence to allow the case to go forward.

"I found her claims were incredible," Kashi said. "This dismissal had noth-

ing to do with EMFs. The dismissal was based solely on the lack of evidence. Her claims by and large were unsubstantiated."

McPheat filed a formal complaint against Pennsylvania Power & Light Co. last September, claiming the 500-kilovolt line about 350 feet from her house threatened her family's health.

When asked why such a strange case was heard, Kashi said he did not know about the woman's more unusual claims until she testified March 3.

# *Media Headlines*

- Demonizing "threats" sell papers, increase telecasts ratings, and promote "safety products"
- Public and media symbiotic relationship:
  - The public "likes to be fed with dreadful messages" and subsequently become scared
  - The media likes to promote itself through the media philosophy that a good story is a bad story
- Commercials fuel the "electrophobia fire"
  - Promotes sales of "radiation protection devices" and EMR surveillance & measurement services



# Media Headlines



**“A cellular phone may cook your brains”**

**“The reason: The Radiation emitted by the equipment accumulates in the brain”**





# Media Headlines

## חוקרים בעולם: טלפון סלולארי עלול לארום לסרטן, אסטמה ואליצה"מ

פולקסוואגן בבריטניה החלה להוסיף אזהרה לכל רכב חדש שנמכר מפני שימוש בטלפון סלולארי

דוברת סלאסון סרבה להגיב ואמרה שיש לפנות ליצרניות הצידור: ממוטורלה ישראל נמסר שכל המחקר רים מורים כי אין סכנה בשימוש בטלפונים סלולאריים. דוברת סליקם אורנה גוברניק, מסרה כי מחקרים שבוצעו בנושא בעולם בעשור האחרון, על ידי ארגונים כלתי תלויים כמו ארגון הכריאות העולמי, העלו כי השימוש בטלפון סלולארי אינו מניח לאדם. היא ציינה

מספר חברות טלפונים על נוקים בריאותיים. על פי הטיימס הבריטי, הרי שחברת פולקסוואגן בבריטניה אף החליטה להוסיף אזהרה לכל רכב חדש שנמכר לכל ישתמש בו בטלפון סלולארי. החברה מאמינה, כך נטען, כי השרות האלקטרוני מנגינים שיוצרים המכשירים גורמים לנזק בריאותי. שמי המכרות הנדלית בבריטניה. המכרות טלפונים

הטלפון הסלולארי, מסבירים החוקרים, הוא בעצם מיני רדיו, המשרר גלים קצרים לתחנות ממסר הנמצאות במרחק של קילומטרים. אותם גלים, נטען, עשויים לגרום סרטן או שורה של מחלות אחרות. אוסטרליה, ארה"ב ושכניה, הרי חות מרעיות לנזק שגורם הטלפון העיתונות הבריטית. חלה מה-

מאת אלי קמיר  
סופר מעריב בלונדון

השימוש בטלפונים סלולאריים לא רק שגורם נזק

**Researches in the World: "A Cellular Phone may cause Cancer, Asthma and Alzheimer Disease"**

**"A new study: Cellular phones improve the mental functioning"**

## מחקר חדש: טלפון נייד משפר התיפקוד העכלי

לאחר שורה של סירסומים על הנזק האפשרי הנגרם למוח בשל השימוש בטלפון נייד, פורסם אתמול בבריטניה מחקר רשמי, לפיו השימוש בטלפון סלולארי לא רק שאינו גורם נזק, אלא אף משפר את הביצועים המנטליים.

# The Earphones

## The Most Recent "Hysteria"



### השימוש באוזניות מסוכן

חשבתם שהאוזנייה מגינה עליכם מפני קרינה? כנראה שטעיתם • מחקר חדש בבריטניה טוען כי השימוש באוזניות דווקא מסכן את בריאותם של המשתמשים, אולם החברות הסלולריות טוענות כי „אין בסיס מדעי לפאניקה“ • בישראל, בה המפולריות של האוזנייה מרקיעה שחקים, מודאגים מהמצאים: „זה ממש מפחיד“, אומר שליח המחובר לאוזנייה • צפוף באוזן

“The use of earphones is **DANGEROUSE**”

... adding to the PANIC...

**BUT...**

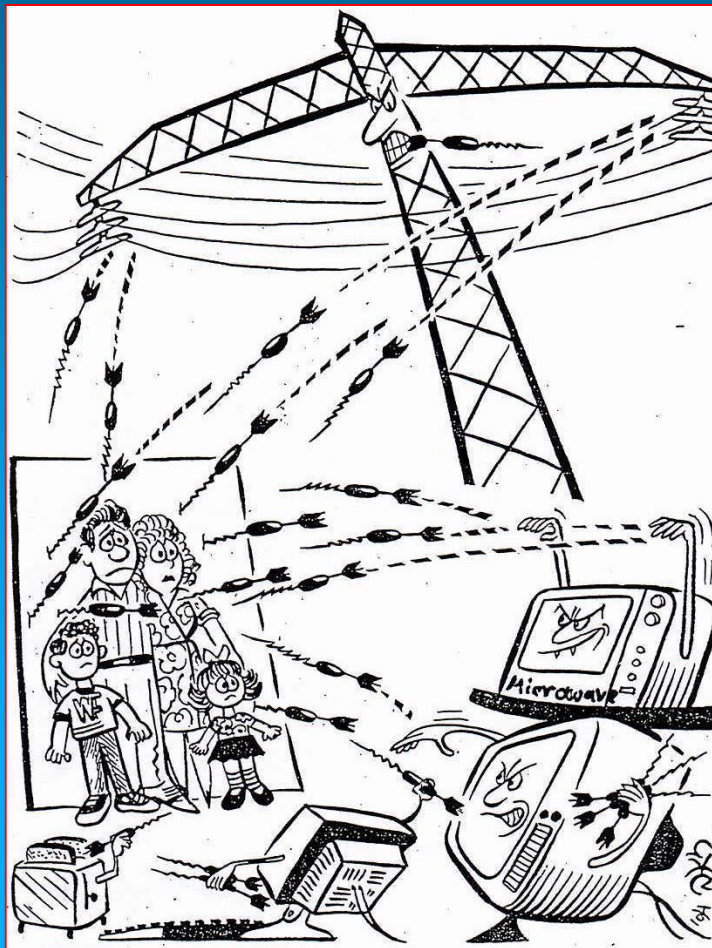
מחקר נגדי קובע: מותר לדבר בדיבורית אישית

“A counter study determines: Using Personal earphones is **OK**”

... adding to the CONFUSION...



## *Even in the 'toons...*



*The Public "likes" to be Scared*

# And in Commercials...

- Commercials fuel the “**electrophobia fire**”
  - Promotes sales of “radiation protection devices” and EMR surveillance & measurement services



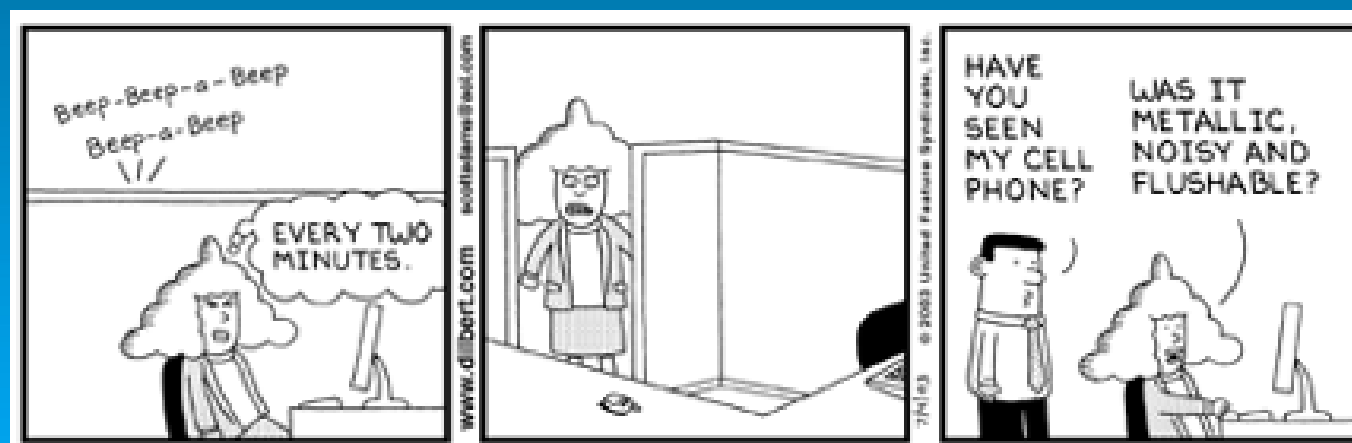
You owe it to yourself...  
You owe it to your Family!

“A protector from EMR”

“A protector from Cellular Phone EMR”



# *One Solution is...*





## *EMF Goes "Populitical"*

- From a discussion on EMR effects in a popular TV telecast, the viewer could be convinced that:
  - Public might suffer severe health effects , e.g. cancer
  - There is a worldwide conspiracy to hide from the public potential harmful effects of EMR
  - Safety guidelines (e.g. IRPA, IEEE,), based on a broad scientific database are intended to mislead the public
- "Theories" and Statements by "experts" on TV:
  - "... I observed with my own eyes how an irradiated (RF radiation) healthy human cell turns into a carcinogenic cell in less than 30 minutes..."

## *And what do "Scientists" have to say...?*

- Self-proclaimed "experts" gain publicity and research funds by manipulating public fears
- "Expert" statements are accepted by the public with little or no questioning
  - Even when conflicting, as long as they support the fear
- A frequent warning is that ..."in future, science **may discover** that low-level RF radiation exposure presently considered safe actually bears adverse effects. Therefore, **caution is warranted**"
  - A fictional vision, not a scientific outlook

# "The Devil in Disguise"

"Let's go Get'em... **Charge!!!**"



"OK, so we destroyed a few power stations and now, if I correctly understand what "infrastructure" is, we should also kind'a destroy a bridge **and sc--w their f--king Cellular Antennas!!!**"



# And Oh, yes, they did...

## Cellphone Antenna Riots, 14.3.2000

התושבים טוענים: "האנטנות מסרטנות אותנו"

### "אינתיפאדה" בעוספיה - נגד האנטנות הסלולריות

המפגינים השתמשו באלות וקרשים, השוטרים ירו כדורי גומי ■ נפצעו 7 שוטרים ויותר מעשרה אזרחים ■ מוטורולה: אין סכנה מהקרינה ■ סעיד בדראן ואמיר גילת, עמוד 7



"Mariv", 15.3.2000

"מרד סלולרי" בעוספיה;  
אלפי תושבים זעקו:  
"די לאנטנות המסרטנות"

במהומות הוצתה תחנת מיקסר ופורקו אנטנות מהגגות ■ נפצעו 10 שוטרים - ולפחות 10 תושבים ■ "פורום התברות הסלולריות": "מקווים שהאחראים יועמדו לדין. אנו מחוייבים לבריאות הציבור"

The citizens claim: "The Antennas are 'cancerous' us"

An Uprising ["Intifadah"] in Usfiya - Against the Cellular Antennas

The protestors were using clubs and logs, the policemen shot rubber bullets ■ 7 policemen wounded and more than 10 citizens ■ Motorola: There is no risk from the radiation

A cellular mutiny in Usfiya: Thousands of Citizens cried: "Enough with the 'cancerous' antennas"



# And Oh, yes, they did...

## Cellphone Antenna Riots, 14.3.2000

"Ha'Aretz" On-Line,  
15.3.2000



**HA'ARETZ News**

### Antenna controversy sparks rioting in north

*By David Ratner  
Ha'aretz Correspondent*

Violent rioting flared through late evening yesterday in Isfiya, a Druze village in the Carmel, as hundreds of residents clashed with policemen after a controversy concerning antenna use in the the village.

The skirmish ended with 10 policemen and an unknown number of village residents injured. Four local children are known to have been hurt when a police vehicle tried to get through an angry crowd. Pointing to a bullet-ridden car, local residents claimed that police used live fire to disperse crowds. Three wrecked police vans were left in the village's center.



"Jerusalem Post"  
On-Line, 15.3.2000



### 18 injured in Usfiya rioting over cellphone antennas

*By David Rudge*

USFIYA (March 15) - At least 18 people, including 10 policemen, were injured yesterday evening during riots in the predominantly Druze village of Usfiya, south of Haifa on Mount Carmel.

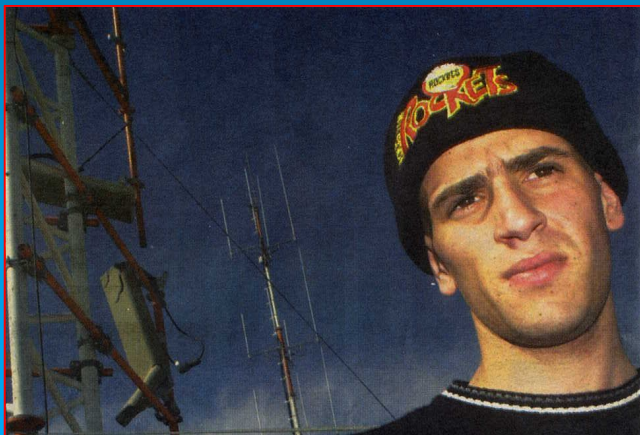
The disturbances erupted when several youths set fire to a Cellcom monitoring station in the village after a series of attempts to dismantle antennas of the Motorola and Cellcom firms. According to townspeople, the youths dismantled 16 antennas.

The incidents followed complaints of an increase in the number of cases of suspected cancer among residents, which some blame on radiation from the phone companies' broadcasting stations.

# And Oh, yes, they did...

## Cellphone Antenna Riots, 14.3.2000

"We Decided there will not be here any antennas, and so it will be"



# „החלטנו שלא יהיו פה אנטנות, וכך יהיה"

"Yedioth Aharonot"

16.3.2000

„אני מסתובב בתחושה שהגורם למחלה שלי הוא הקרינה מהאנטנות הסלולריות", אומר סומה אבו-זלף, תושב הכפר עוספיה, שחלה בסרטן • החברות הסלולריות טוענות, כי לא נשקפת לציבור כל סכנה בריאותית כתוצאה מהקרינה, אולם בכפר מתעקשים להיאבק וטוענים: „הציבו לנו אנטנות בכל מקום" • מחיר התקשורת

"I am walking around with the feeling that the **reason for my illness is the radiation from the cellular antennae**"

The cellular companies claim that there is no threat to the public from the radiation **but in the village they insist on fighting**

**The cost of Telecommunication**



## *And the Ministry of Environment's Response:*

### משרד איכות הסביבה: האנטנות עמדו בתקן

ועדת השרים לענייני אנטנות סלולריות תתכנס ביום ראשון בעקבות האירועים בעוספיה. לדיון זומן גם ראש מועצת עוספיה, שריף אבו רוקון. מהמשרד לאיכות הסביבה נמסר שמבריקות שנעשו בכפר עולה כי אין חריגה מהתקנים הבינלאומיים

אנטנות השייכות לצה"ל, למער-כת הביטחון, לחברת מקורות ולמ-שטרה. המדידות שוערכו כללו גם את המתקנים הפיראטיים. בעקבות האירועים בכפר עוספיה, שיגר אתמול נציג פורום החברות הסלולריות, אמיר זמורה, מכתב לראש מועצת עוספיה. הוא

שערך פורום החברות הסלולריות העלתה שעשרות אלפי תושבים ברחבי הארץ פנו לפורום בבקשה לקבל חומר הסברה, אולם אף אחד מהפונים לא היה מעוספיה, בני-גוד לפרסומים. "צר לנו שאתם יוצאים בהצהרות שאינן מבוססות על העובדות בשטח, וגורמים בכך

**"The antennae meet the Safety Standards"**  
(but who cares?)

# Due to Electrophobia National Security Put to Risk



## משרד הביטחון דוחה את המלצות מירום ומתעקש להציב סוללת טילי חץ בעין-שמר

האזורית מנשה שבשומרון המערב  
כי לבין משרד הביטחון נוגעת  
להצבת הסוללה השנייה, מבין 3  
סוללות של טילי חץ, שאמורות  
לטפס הגנה מטילים בליסטיים.  
סוללה אחת תוצב במרכז הארץ,  
הסוללה השנייה אמורה לקום  
בבסיס עין שמר, ומיקום הסוללה  
השלישית טרם הוחלט. בעין שמר  
אמורים להימצא 8 משגרים, שכל  
אחד מהם נושא 6 טילי חץ בכדי  
נגות מלאה. לצד המשגרים תמו  
קם מערכת מכ"ם.

התחייבנו לקבל את המלצותיו".  
גורם ביטחוני בכיר אומר כי  
הקמת הסוללה התעכבה כשנה,  
וכי "בגלל התעקשות התושבים  
נגד הצבת הטילים ומערכת  
המכ"ם, לא נוכל להגן על צפון  
המדינה מהתקפת טילים בליסטיים".  
ההחלטה לדחות את המלצה  
צוה הבורד התקבלה בדיון שקיימו  
ירון וראש מינהלת "חומה" במשרד  
רד הביטחון, אריה הרצוג.

מאת אמןון ברזילי

משרד הביטחון עומד על  
הקמת בסיס טילי חץ בבסיס עין  
שמר שבתחום המועצה האזורית  
מנשה, לאחר שדחה את הדרישה  
שהכין בנושא הח"כ לשעבר חגי  
מירום. מנכ"ל משרד הביטחון  
עמוס ירון אמר כי "מירום לא היה  
בדרך אובייקטיבי אלא נציג התר  
שבים. לדעתי המסקנות של  
מירום הן חד צדדיות ואנחנו לא

**The Ministry of Defence Insists on  
Placing the [Anti-BM Missile] in Ein-  
Shemer [as planned]**

The population protested against the deployment of  
the Anti-Ballistic Missiles Arrow Battery due to their  
concern from the RADAR's EMR



# *Electrophobia's Inevitable Consequences*

- Degraded Service of wireless communications
- Increased funds for non-ionizing EMR effects studies
  - Until 1995: about US\$23 Billion spent on studies
  - Estimated funds to be spent by 2010: US\$1 Trillion
  - Funds That could be better spent on urgently and badly needed therapies to real diseases...



# Electrophobia's Inevitable Consequences

## ישראל תשתתף במחקר בינ"ל על קרינה מטלפונים סלולריים

חוקרי בית החולים „שיבא“ יבדקו את השפעות על הקשר בין הקרינה הנפלטת ממכשירי הטלפון הללו לבין מחלות - ביניהן גם סרטן המוח • ישראל ממוקמת במקום הרביעי בעולם במספר הטלפונים הסלולריים לנפש

איטליה, צרפת, אנגליה, אוסטרליה וגרמניה. המחקר, שיחל בקרוב, יבדוק את השפעתם של שלפונים סלולריים על גידולי צוואר ומוח ועל גידולים של בלוטות הרוק. המחלקה לאפידמיולוגיה קלינית של „שיבא“, בראשותו של פרופ' כרוך מורן ובדיכזה של האפידמיולוגית ריר סיגל סרצקי, תקבל מכל בתי החולים בארץ ריכוזים על כל החולים החדשים שהתגלו בהם גידולים אלה. החוקרים יפנו לחולים ויבקשו מהם להשתתף במחקר ולמלא שאלון הבוחן גורמי סיכון שונים שאליהם נחשפו בעשור האחרון - בהם גם שימוש בטלפונים סלולריים.

המחקר יימשך כשלוש שנים, ותוצאות ביניים ראשונות שלו צפויות בעוד כשנתיים. כתבנו ד"ר אפרים מסיף: ועדת השרים לאנטנות סלולריות, בראשותה של השרה לאיכות הסביבה, רליה איציק, תרון בהצעת החוק של ח"כ אופיר פריינש וישראל אחת, לפיה יחויבו החברות הסלולריות להזהיר את הציבור מפני סכנת הקרינה הנפלטת מהמכשירים. הצעת החוק דורשת אזרה, בין היתר עלייה כיתוב בפירוט מזהירות מרבית על גבי המכשירים עצמם. מידום החברות הסלולריות מסר בתגובה כי הן מתנגדות להסכעת תור אזהרה. אשר אין בינם ובין הגנה על הציבור לא כלום.

מאת שרית רוזנבלום,  
כתבתנו לענייני בריאות

ישראל נבחרה כאחת מ-12 המדינות שבוחן יעיד אירגון הבריאות העולמי את המחקר המקיף הראשון בעולם שיבחן את הקשר בין שימוש בטלפונים סלולריים להופעת גידולים מרפניים.

בשנים האחרונות נירונה השפעתה של הקרינה האלקטרומגנטית הנפלטת ממכשירי הטלפון הסלולריים במספר פרומים רפואיים חשובים, אולם עד היום טרם הוסקו מסקנות חד משמעיות

Israel will participate in an  
International Study of  
Radiation from Cellular  
Phones

The Government Committee for Cellular Phones will discuss a proposed law to enforce the cellular companies to warn the public against the radiation hazards from cellular phones. The proposed law will require warning statements in commercials and labels on the phones

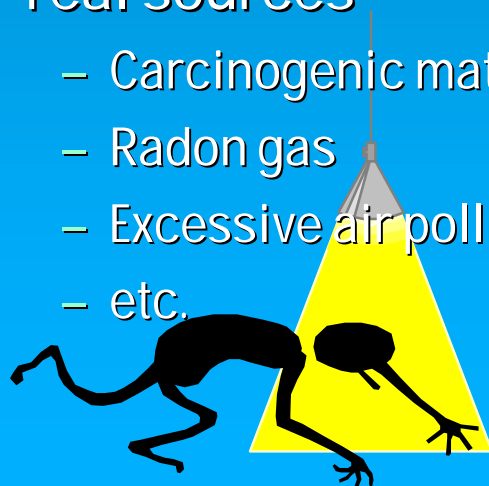
# *Electrophobia's Inevitable Consequences*

❁ The search for the coin continues... under the lamp, rather than where it was lost...



- Focusing on EMR as the sole cause for cancer clusters diverts the focus from real sources

- Carcinogenic materials
- Radon gas
- Excessive air pollution
- etc.



## ***EPA RF Survey in McFarland***

The Environmental Protection Agency (EPA) found only nanowatt levels of radiofrequency (RF) radiation in McFarland, CA, the site of a well-publicized childhood cancer cluster (see *MWN*, J/F88, J/A88 and M/A89).

The strongest fields, 3-19 nW/cm<sup>2</sup>, were associated with UHF television transmissions—levels “commonly found in most urban areas,” according to EPA. AM radio signals contributed 2-8 nW/cm<sup>2</sup>. Voice of America shortwave broadcasts from a facility in nearby Delano produced much lower levels—0.2-1.3 nW/cm<sup>2</sup>. FM radio fields were 0.001-0.006 nW/cm<sup>2</sup>. These data are consistent with informal measurements taken in 1988 (see *MWN*, S/O88).

The cause of the cluster remains unexplained. “Many of the avenues of investigation have been exhausted,” Dr. Rick Kreutzer of the Epidemiological Studies and Surveillance Branch of the California Department of Health Services told *Microwave News*. He said the state previously had failed to uncover anything unexpected in the air, water or soil—the same now holds true for the RF environment.





- 1820 Modern awareness of electromagnetism begins. Oersted deflects the needle of a compass using a magnetic field produced by an electric current flowing in a wire.
- 1831 Michael Faraday publishes famous treatise on electromagnetism.
- 1873 James Clerk Maxwell brings together ideas on electricity and magnetism into one complete theory.
- 1880s First power stations start to generate electricity.
- 1901 Birth of global radiocommunications. Guglielmo Marconi transmits radio signals from southwestern England to Newfoundland.
- 1920 Regular radio broadcasts begin in the Netherlands and USA. Other countries quickly follow.
- 1935 Radiolocation system (radar) built by Robert Watson-Watt in Britain. Similar systems under development in Italy and Germany.
- 1936 Birth of television. BBC begins transmissions in London.
- 1940 Radiotelegraph system covers the world.
- 1950s Growth in domestic electrical appliances.
- 1960s Commercial telecommunication satellites developed. Concerns regarding effects of electromagnetic fields on health.
- 1976 Start of clinical magnetic resonance imaging.
- 1979 First concerns about overhead power lines and cancer following publication of paper by Wertheimer and Leeper.
- 1980s Widespread use of computers in commerce and industry. Concerns about computer screens and miscarriage.
- 1990s Rapid expansion in personal mobile telecommunications. Concerns about cancer from mobile telephones.



# *But... A 100 Years of Radio Use...*



Marconi and his Radio



# A 100 Years of Radio(logical) hazard...?



*Inscription on the memorial to the victims of X-rays in the garden of the St Georg General Hospital in Hamburg.*

**TO THE ROENTGENOLOGISTS AND RADIOLOGISTS OF ALL NATIONS, DOCTORS, PHYSICISTS, CHEMISTS, TECHNICIANS, LABORATORY ASSISTANTS AND NURSES WHO SACRIFICED THEIR LIVES IN THE STRUGGLE AGAINST THE DISEASES OF THEIR FELLOW HUMAN BEINGS. THEY WERE THE HEROIC PIONEERS OF THE SUCCESSFUL AND SAFE APPLICATION OF X-RAYS AND RADIUM RAYS IN MEDICINE. THEIR NAME LIVETH FOR EVERMORE.**

Roentgen rays have brought me  
To happiness and fame  
Roentgen rays have hurt me  
And been my deadly bane  
Yet still will I praise them  
With all that's in my power  
The magic arts of Roentgen  
Until my final hour.

# 90 Years of EMF Awareness

- 1913: RF hyperthermia therapy Invented:
  - Therapy of deep biological tissues, detection of cancerous tumors, rapid healing of broken bones, etc.
- 1940s: HERP awareness among US Navy sailors
  - 1943 survey: "...*there has been no clinical evidence of damage to these personnel.*"
  - 1945 survey: "...*no evidence of abnormalities, therefore ... no cause for alarm*"
  - 1948: Link found between microwaves, cataracts and testicular degeneration in dogs
  - The need for a safety standard still ignored

# 90 Years of EMF Awareness

## • 1950s: First HERP Standards

- 1953: Based on thermal effects, suggested PELs by US Navy officials:  $0.1-10 \text{ mW/cm}^2$ 
  - PEL of  $10 \text{ mW/cm}^2$  forms the basis for the later ANSI/IEEE C95.1

## • 1970s: HERP Standards Formalized

- 1972: COmmittee MAin And RADIation established by IEEE
  - Prime objective to "*evaluate information published on the effects of non-ionizing radiation on biological systems*"
  - Mid-1970s: COMAR and FDA standard limiting radiation leakage from domestic microwave ovens



# 90 Years of EMF Awareness

## • 1980s: Public Electrophobia Increases

- Speculations on adverse health effects from chronic exposure to 50/60 Hz H-fields due to overhead power lines made frightening headlines
  - Concerns of childhood leukemia and manic-depression
- Some articles recommended “**prudent avoidance**” and “**as low as reasonable achievable (ALARA)**” principles
  - Predominate exposure to **ionizing radiation** (e.g., gamma rays)
  - “...most people *want to believe that electromagnetic fields are unhealthy*” and “... common people *do not differentiate between 50/60Hz fields, RF and microwave radiation, visible light, laser beams, X and gamma rays, etc.*”

# 90 Years of EMF Awareness

## • The 1990s: Further Research

- **1990 and 1992:** IEE Study (over 240 studies examined)
  - *"review all currently available evidence to the possible biological effects of low-level, low-frequency EM fields associated with overhead power distribution cables, house wiring, domestic appliances and VDUs..."*
- **1994:** *"about 99% of the reviewed papers failed to comply with required scientific criteria"*
- **1996:** US NRC Study (over 500 studies examined)
  - *"... no conclusive evidence that electromagnetic fields play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems"*

# *90 Years of EMF Awareness*

## • The 1990s: Further Research

- 1996: US NRC Study (over 500 studies examined)

After examining more than 500 studies  
spanning 17 years of research...

"The findings to date do not support claims that electromagnetic fields are harmful to a person's health. Research has not shown in any convincing way that electromagnetic fields common in homes can cause health problems, and extensive laboratory tests have not shown that EMFs can damage the cell in a way that is harmful to human health."

National Research Council, U.S.A.  
Released 31.10.96



# *90 Years of EMF Awareness*

- The **1990s**: Recent Studies
- **Ca. 1997**: Irish extensive review of recent studies resulted in:
  - "...It can never be said, regarding any human activity that it is totally safe
  - "We can never state that human exposure to base station EMR or any exposure to any other ecological agent is totally safe
  - "**However**, we can safely state that **at present**, no proof has been found regarding the increased risk of cancer due to exposure to base station EMR"

# *90 Years of EMF Awareness*

- **Ca. 2000: IEGMP 'Stewart Report'**
  - "The balance of evidence to date suggests that exposures to RF radiation below NRPB & ICNIRP guidelines **do not cause adverse health effects** to the general population"
  - There is scientific evidence , however, which suggests that **there may be biological effects occurring at exposures below these guidelines"**

# *90 Years of EMF Awareness*

- **Ca. 2003:** AGNIR (Documents of NRPB 14 2 2003)
  - "In aggregate the research published since the IEGMP report **does not give cause for concern**
  - "The weight of evidence now available **does not suggest** that there are adverse health effects from exposures to **RF fields below guideline levels**, but the published research on RF exposures and health has limitations, and mobile phones **have only been in widespread use for a relatively short time**
  - "The possibility therefore remains open that **there could be health effects** from exposure to RF fields below guideline levels; hence **continued research is needed**" <sup>42</sup>



# *Misconception of the Cellular Phone "Risk"*

At the present time there is no convincing evidence that EMFs from cellular phones are harmful. Indeed, as suggested by a recent study reported in the *New England Journal of Medicine*, if there is any significant danger from cellular phones, it is from trying to drive while talking on one. The study showed that drivers who use cellular phones have four times the risk of accidents as drivers who do not

"Facts versus Fear" Special Report

The American Council of Science and Health, 3rd Ed., 1999

# *And Yet, Electrophobia Exists, Why?*

Misconception of a "risk" stems from known  
psychological factors that influence  
apprehension of risk associated with a given  
threat



# *Perceived vs Actual Risk*

## *General Public Exposure*

- ⦿ IEGMP 'Stewart Report' – May 2000
  - "Exposure to members of the public from macrocell base stations is very much less than current guidelines
  - "In giving special attention to schools, the Expert Group was responding very largely to public concern rather than any proven health hazard"
- ⦿ Increased risk perception stems from a number of factors including:
  - Confusion over technical issues
  - Lack of control
  - Lack of trust
- ⦿ Here are a few examples...



# *Natural vs. Industrial Risk*

## ☼ Sun-Tanning

- Exposure of the human skin to excessive **dangerous ionizing UV radiation** might promote skin cancer
- However, as this comes from a **natural source** - the sun, people are willing to take the risk or ignore it



## ☼ EMF

- **Low level non-ionizing EMF** from a radio base station in a residential area is perceived as an **"industrial" risk**
  - Causing fears & health concerns among residences

# *Voluntary vs. Imposed Risk*

## • Traffic Accidents

- Dreadful statistics of fatalities and injuries
- Nevertheless, we are willing to **voluntarily accept the risk** and continue using motorized transportation and thus **we less fear** it

## • EMF

- Residents near broadcast station are usually **not asked for their consent** to its operation
- Cases often challenged in court but overruled, as exposure is usually well below safety regulations PELs
- We **fear less** a sever risk that is **not imposed on us**



# *Familiar vs. Exotic Risk*

## • Familiar Daily Risks

- Most people are **willing to accept familiar risks**
  - Inhaling cigarette smoke, or consuming Alcoholic Beverages
  - Driving above the legal speed limit

## • EMF

- **Exotic risks** generate **fears**
  - Getting hit by a falling meteor
  - Getting caught at a volcanic eruption
- To many people **exposure to EMF** is an **exotic risk**
- **Generates fears** far out of proportion compared to familiar risks



# *The Roots of Electrophobia*

- ⦿ Frightening headlines attract attention: **The public "likes" to be fed with dreadful "news"**
- ⦿ It is easy to create fear on an issue **the public does not fully comprehend**
- ⦿ Interested parties and self-proclaimed "experts" **manipulate the public's fears** to their advantage
- ⦿ **Electrophobia is self sustaining** due to rumors...
- ⦿ The conflict between the **need for technology** and the **fear from it** leads to **investing funds in studies** the result of which is known a-priori



# *The Roots of Electrophobia*

- Reports on scientific efforts do not calm the public, on the contrary: "*no smoke without fire*"
- Rumors on "*conspiracies*" and lack of researchers' neutrality, particularly when results are: "*no risk*"
- Research funding by telecomm companies is interpreted as "*bribery*"
- The public is certain the *authorities stand by the powerful telecomm companies...* in conflict with "public interest"

# 1999 NIEHS EMF Report

*(Nat'l Inst. of Envi. Health Sciences)*

- "The results of the research ... provide substantial evidence that **there is not a robust biological effect of EMF exposure at environmentally relevant levels.**"
- "It is our opinion that based on evidence to date, ELF-EMF exposure **would not be listed in the 'Report on Carcinogens' as an agent 'reasonably anticipated to be a human carcinogen'**"

# *1999 NIEHS EMF Report*

- ⦿ "In science, it is virtually impossible to prove a negative. That is the cross-roads to which this research brings us"
- ⦿ "We hope that the interagency committee ... will consider the science conducted by the program and **serve the public** by reflecting **that science in its recommendations.** "

## *1999 NIEHS EMF Report*

- ⦿ "We also urge that in its subsequent efforts to **educate the public**, the federal government will **provide a balanced picture** of the risks the public incurs by exposure to EMF. "
- ⦿ "The research released today indicates there is no significant risk and that no extraordinary means need be taken to control for negligible risk."



# Misconception of "Risk" Research

The absolute safety of EMR can be demonstrated only by the absence of even the smallest increased risk. This is impossible to demonstrate, however. A hazard can be shown to exist; the absence of a hazard cannot. In 1965, well before the current computer age began, the noted English industrialist Sir Leon Bagrit stated, "*In putting automation into practice, its very novelty, its unfamiliarity is likely to arouse instinctive caution on the part . . . of organised labor*" This remark may best sum up the hysteria and uncertainty that occurred with the increasingly widespread use of RF Energy

"Facts versus Fear" Special Report

The American Council of Science and Health, 3rd Ed., 1999

## *The Risks of Risk Research...*

Granted, society must search for hazards of its technologies. But how to cope with the scientific noise that these studies produce?

Such searches for hazards can go on too long, and guidelines for ending them must be established.

NATURE, VOL. 330 10 DEC. 1967

# *The Risks of Risk Research...*

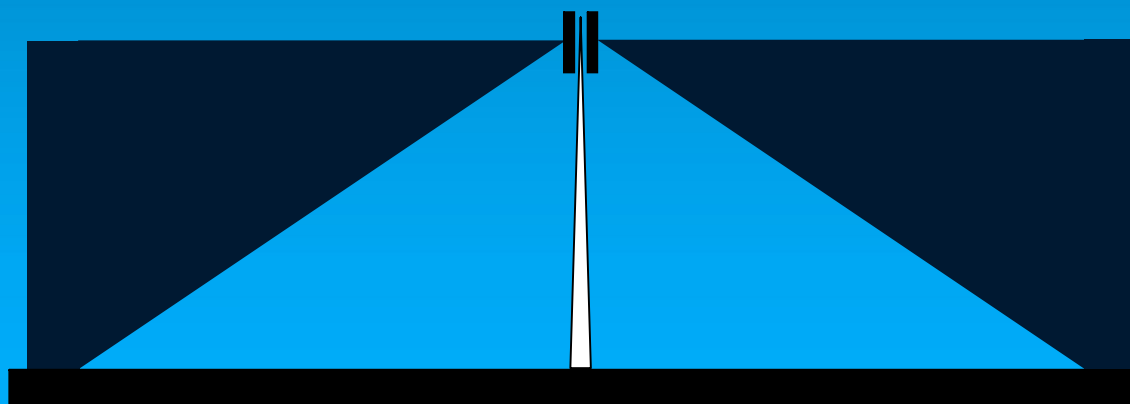


"I started out in creative writing, began dabbling a bit in creative accounting, and before I knew it, wound up here!"

*One way of  
handling  
"creative" risk  
research...*

# *Solutions to Improve General Public Understanding*

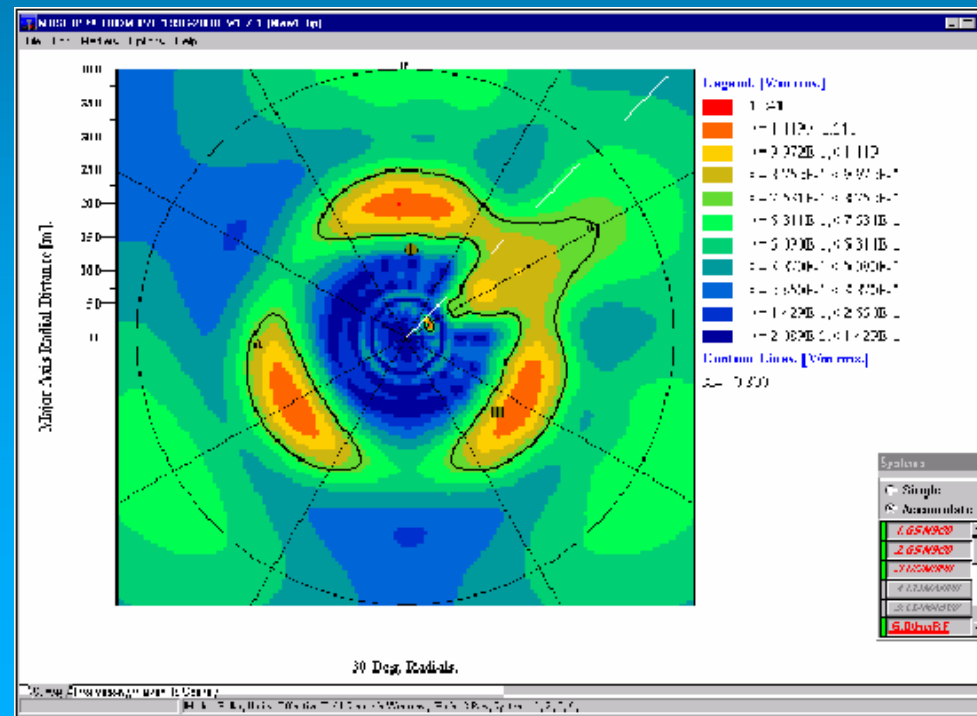
- ❁ **Simple easy to understand** information should be provided
- ❁ Issues such as antenna patterns and how power levels fall off rapidly with distance should be addressed





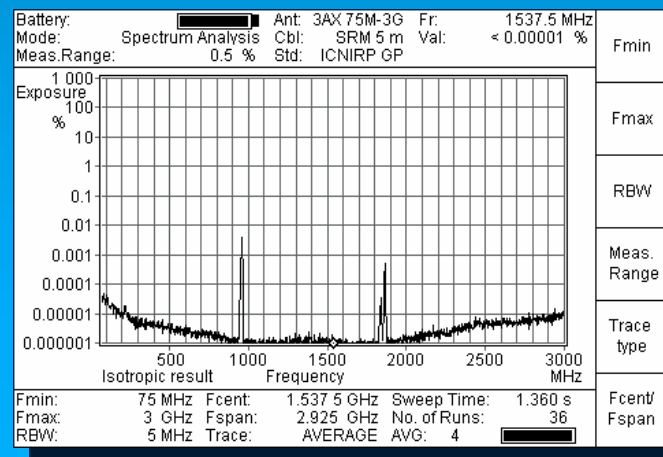
# Solutions to Improve General Public Understanding

- Software calculates field strength in any location around base station site



# Solutions to Improve General Public Understanding

- ❖ **RF safety surveys** can easily determine ICNIRP compliance. It is important to explain results in an easily understood manner
- ⦿ Measurement equipment needs to be well specified
- ⦿ Non-standard methods can lead to confusion



# *Solutions to Improve General Public Understanding*

- **Area Monitor** Provides constant monitoring
- Results can be displayed on local authority website



# *Solutions to Improve Occupational Understanding*

- Do not necessarily need measurement or monitoring equipment
- Exposure issues invariably arise because of co-located equipment
- Companies or organisations with RF workers should have a RF safety policy
- Measurement or monitoring equipment should be backed up with appropriate training





# *Solutions to Improve Occupational Understanding*

- Many telecoms and broadcast companies utilise personal monitors as part of a RF safety program
- Personal monitors;
  - simple to use
  - have a wide operating frequency range (100 kHz to 100 GHz)
  - shaped alarm threshold
  - expensive
  - not accurate enough to be used for precise readings



# *Solutions to Improve Occupational Understanding*

## • Survey Equipment

- Provides a relatively accurate assessment of field strength and can be used to determine the level of compliance to a particular standard
- Requires some training before it can be used with confidence.
- Does not provide continuous monitoring



# *What Lessons Should we Learn?*

First, that many scares are fueled by the "precautionary principle". "Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent degradation"

Thus, even in the face of incomplete or negative scientific information, action is taken to be on the "safe side". The cellular phone issue is a good example of this

But the problem with applying the "precautionary principle" is that as in the cases of many fears ... next to no evidence can be considered "lack of scientific certainty."

# *What Lessons Should we Learn?*

We must not let the distraction of purely hypothetical threats make us lose sight of known or highly probable dangers. In a rational, technologically advanced society such as ours, **we should be making decisions on the basis of what we know - not on the basis of what we fear**



# *What Lessons Should we Learn?*

Finally, there is little consideration given to whether the measures taken to address a given scare are truly cost effective; by focusing money and effort on a trivial or even nonexistent problem, we run the risk of diverting finite resources away from problems that pose real, significant risks to public health.

Thus it is pertinent that we do not act immediately and reflexively on every hypothetical scare that comes along

"Facts versus Fear" Special Report

The American Council of Science and Health, 3rd Ed., 1999

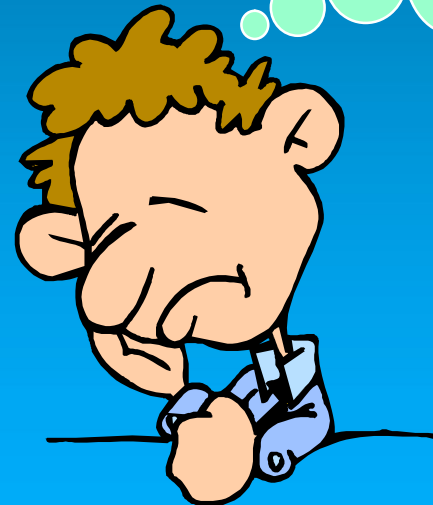
## *Conclusions*

- The public does not need the patronage of “**raging oracles**” to warn it against exposure to EMR
- The public should be protected through enforcement of regulations based on **solid scientific data**
- Scientists’ responsibility and codes of ethics require that the public receive **updated objective information**
- Presenting technical data in terms **understood by laypersons** can help to **diminish public electrophobia**

*Presenting technical data in terms  
understood by laypersons can help  
to diminish public electrophobia*

***Hz diode dBm  
blah  $\lambda$  V<sup>2</sup>/m<sup>2</sup> %\*~!!***

***Safe?  
Unsafe?***



Technical data explained in an easy to understand manner  
provide valuable information to a concerned public



# *And now, Entering the 3<sup>rd</sup> Millenium...*

*In the beginning of this - the third millenium, shouldn't Society regain its sanity, and based on the knowledge we acquired in the last 100 years of radio usage, put the EMF question into its proper proportions?*





# *And now, Entering the 3<sup>rd</sup> Millenium...*

*Let's hope that today's public is more aware of the hallmarks of hypothetical "scares";  
that people are capable of considering the facts rather than falling for media hype;  
and that they will place the facts and the hype into proper perspective the next time a scare appears on the horizon.*

"Facts versus Fear" Special Report

The American Council of Science and Health, 3rd Ed., 1999

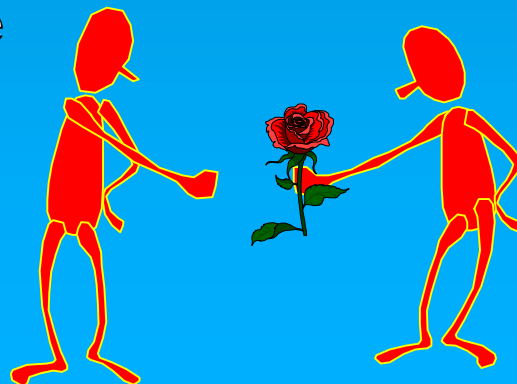
# *Acknowledgements to:*

- My sincere gratitude and appreciation to:

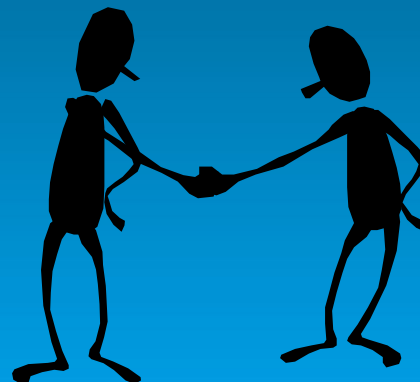
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*Thank you!*



*Thank you for the opportunity to  
address you in your Chapter  
Meeting*