January 2001

FEEDBACK

The **OFFICIAL** Newsletter

of the

Georgian Bay Amateur Radio Club Inc.

P.O. Box 113, Owen Sound, Ontario N4K 5P1

GBARC Meetingsare held on the 4th Tuesday of every month except July and August in our CLUBHOUSE, Unit 6 Rockford Plaza, Rockford On. 5km S of Owen Sound.7:30 p.m.

Breakfast Anyone?
Any Saturday 9:00 a.m., at the Rockford Esso.

Nets
80 metre net on Sunday at 9:30 a.m. on 3.783 Mhz. Two metre net on Thursday at 9 p.m. on VE3OSR 146.94- Mhz.

Submissions
are always welcome. Send them to Tom ve3tsa@rac.ca

This Month

President
Bernie
VE3BQM

Vise-President
Bob
VE3XOX

Secretary
Susan
VE3TLK

Treasurer
Bob
VE3LKD

Message from the President

Millennium

I'm pleased that we have seen great things happen to get us into the new Millennium, our goals and challenges facing many issues were dealt with great pride and efforts by all. My thanks to every Amateur that helped me and the executive in making GBARC a great club to be part of in Grey and Bruce and area. In the reminder stage, Dues are due, and the next meeting will be January 23, 2001 at the club house. All members in good standing will remain on the newsletter list and this mailing list.

Here are some of the goals for this year, project building, contesting, training, emergency planning, increase membership, frequent social, and to have fun together . I can think of many more items to put on this list, and will once we get together to find out what you would want the club to do for you and with the help of our collective we can do it for all of us.

As your president I am calling you all to send me what you would like us the executive to deliver to you in this new Millennium. Your comments and suggestion will be appreciated.

December's Christmas dinner was a great time, enjoyed by all that attended, presentation of the Amateur of the year was awarded to Jim VA3CJM, thanks Jim for all the hard work you have given for all to enjoy and the members awarded you with this great gift. Other awards were handed out to acknowledge members of their special contributions over the year. The meal was great.

Each one of us, in our region share a great interest, Amateur radio, regardless of your licence privilege the fun never ends. With this in mind I will strive to make GBARC, a club to be proud of and keep working to meet all your expectations into this new year.

73 Bernie ve3bqm

GEORGIAN BAY AMATEUR RADIO CLUB

Minutes of meeting, November 28th, 2000

Since we had our Christmas dinner instead of a meeting last month, there are no minutes. Look for Susan's report in the Februray issue of FEEDBACK...*editor*

Electromagnetic Fields and Your Health

Are the electromagnetic fields generated by power lines, TVs ham radio gear and hundreds of other devices bathing us in damaging radiation? The jury is still out, but you can take steps to protect yourself from danger--real and potential.

By Wayne Overbeck, N6NB

There is a growing public debate about the safety of electric power lines and the electrical equipment that we use every day in our homes and workplaces. Not long ago, a lawsuit was filed alleging that a Florida woman's brain cancer was caused by electromagnetic radiation from a hand-held cellular telephone. Although the filing of a lawsuit proves nothing (thousands are filed every week, and this one was promptly dismissed by a court), the lawsuit made national headlines for weeks and caused cellular telephone industry stock prices to decline on Wall Street.

The news media regularly cover many facets of the controversy over the possible health effects of electromagnetic fields (EMFs). In addition to stories about lawsuits, there have been numerous media accounts of medical research concerning EMFs--some of them confusing and seemingly contradictory. And there have been news stories about activist groups fighting the construction of new power lines or cellular telephone towers in their neighborhoods.

This intense publicity has alarmed many people, prompting them to worry about the safety of their homes, neighborhoods, schools and workplaces. There is a growing concern that the electromagnetic fields produced by power lines and everyday household appliances may be hazardous. As the tension mounts, more and more hams are faced with this difficult question: *Is your Amateur Radio station hazardous to our health?*

Fortunately, enough research has now been done that we know most Amateur Radio activities are quite safe. In fact, scientists from the Federal Communications Commission and the Environmental Protection Agency conducted a field survey of EMFs at typical Amateur Radio stations in 1990. They concluded that most amateur operations do not produce EMFs strong enough to pose any health hazard. And for many years, the American Radio Relay League's Board of Directors has also been monitoring the ongoing research about EMFs and health through a board-appointed Committee on the Biological Effects of RF Energy.[1] There is extensive coverage of

the issue of EMFs and health in both *The ARRL Handbook* and *The ARRL Antenna Book*--with recommendations for safe Amateur Radio operating practices.

Amateur Radio is a hobby that can be pursued safely, provided everyone observes a few simple precautions. This article was written to summarize what we know about EMFs and health, and to suggest safe operating practices.

Scientific Background

When scientists talk about electromagnetic fields, they're talking about several very different forms of energy. Low frequency or "power-line frequency" fields are produced by electric power lines and appliances, typically operating at a frequency of 60 Hz. Much research is now underway concerning the health effects of 60-Hz fields--the kind of EMFs found in virtually every home and workplace. Additional research is being done to investigate the possible health effects of *radio frequency* (RF) energy, which is much higher in frequency than the electric energy in power lines. RF energy is produced by radio and television transmitters, radar installations, cellular and cordless telephones, microwave ovens and even remote controls for garage door openers.

Low-frequency and RF energy are forms of *nonionizing radiation*: The frequency is too low to produce enough photon energy to ionize atoms. In contrast, *ionizing radiation*--which is *not* produced by power lines or radio transmitters--can cause severe and well-documented health hazards. Nuclear weapons produce enormous amounts of ionizing radiation, while small, carefully controlled doses of ionizing radiation are used in medical X-ray equipment, for example.

The present controversy concerns nonionizing radiation, including power-line frequency and RF energy. Much is now known about the biological effects of this kind of energy, but there is much more that we do not yet know. Before World War II, scientists knew that non-ionizing radiation could produce thermal (heating) effects. At sufficiently high power levels, EMFs can cause body heating, which may result in health hazards such as blindness or sterility. Most ordinary household appliances and transmitted radio signals produce EMFs far weaker than those required to produce thermal effects. On the other hand, microwave ovens *do* generate EMFs strong enough to produce thermal effects: That's precisely why they can heat and cook food. The trick is to keep the EMFs safely inside the oven--away from people. For obvious reasons, microwave ovens must meet strict safety standards.

In recent years, a new element in the debate over EMFs and health has been the finding that even at *athermal levels*--energy levels too low to cause body heating--electromagnetic energy appears to have various effects on the human body. The first scientists whose work in this area gained widespread media publicity were *epidemiologists*--medical researchers who look at the health patterns of large groups of people, using statistical methods.

Over the last two decades, a number of epidemiological studies have found that electrical workers have higher-than-normal death rates from certain cancers, including leukemia, lymphatic cancer and brain cancer. Other epidemiological studies have shown that children living near some types of power lines have higher-than-normal rates of leukemia. Still other studies have concluded that persons exposed to certain chemical agents such as solder fumes in addition to high EMFs have up to 10 times the normal rate of certain cancers.

All of these studies involved groups of people who were not ordinarily exposed to EMFs strong enough to cause body heating. Thus, their health patterns suggested that low-level EMFs may pose health hazards.

There have been other epidemiological studies, however, that did not confirm some of these findings. And still other researchers have concluded that environmental factors such as the alignment of the earth's natural magnetic field may interact with man-made EMFs to alter these health effects. (The earth's magnetic field is

stronger than many man-made fields, but it is a *static, direct-current field*. Most man-made EMFs are *alternating-current fields* operating at a variety of frequencies and power levels.)

There are other dimensions to this problem, too. Some of the research that failed to confirm a correlation between EMF exposure and health was funded by industry groups that have a financial stake in the outcome of the research. Critics have challenged the credibility of some of the research for that reason. Moreover, epidemiological research only reveals health patterns; it does not prove what caused those health patterns. If electrical workers have an abnormally high rate of certain cancers, that may result from their occupation--or it could result from something else. In short, the work of epidemiologists shows *correlations* without proving *causation*. That raises troubling questions without providing definitive answers.

Responding to the questions raised by epidemiologists, a number of medical researchers have launched laboratory based studies of the effects of EMFs on living tissue. There has been an explosion of knowledge about molecular biology and the related field of genetics in recent years, and one of the focal points of this research has been the role of electromagnetic signals at the molecular level. Among other things, there have been studies suggesting that certain types of electromagnetic fields may alter the body's genetic makeup, causing chromosome damage.

It is also known now that some EMFs may disrupt the flow of vital chemical and electrical signals between cells in the human body. EMFs appear to alter the passage of chemical and electrical signals through the cell membrane (the thin layer of material that covers each cell). This has caused some scientists to conclude that EMFs may sometimes affect the work of the body's immune system in fighting cancer.

If the body's cancer-fighting T-cells fail to detect that a particular cell has become cancerous because cell-to-cell communication is disrupted by EMFs, that would increase the risk of a tumor developing. There is also laboratory research indicating that EMFs may inhibit the body's cancer-fighting ability in other ways.

Researchers have found that certain EMFs reduce the activity of messenger enzymes called *protein kinases* and also affect the way cell growth is regulated. There is also evidence, now confirmed through research in several countries, that EMFs sometimes work together with cancer-promoting chemicals to increase the risk of cancer beyond that associated with either the chemicals or EMFs alone.

EMFs also appear to change the body's rate of production of certain hormones that have cancer-inhibiting effects, such as melatonin. Some studies have found that persons sleeping under electric blankets have lower-than-normal levels of melatonin production *when the blanket is operating*, but their melatonin production returns to normal when the blanket is switched off. Some scientists think the effect of EMFs on melatonin production may explain many of the apparent health effects of exposure to low-level fields.

As with the epidemiological studies, laboratory research has raised questions and stirred controversy. Some laboratory studies have been difficult to *replicate*: Other researchers have not always observed the same results when they attempted to repeat some experiments. There appear to be other variables that affect the outcome of research on the biological effects of EMFs.

For example, there is evidence that low-level EMFs have significant biological effects only at certain frequencies and intensities--and not at other frequencies or intensities. There is a general rule about toxic and cancer-causing chemicals: If some is bad, more is worse. That rule may not necessarily apply to EMFs, however: Some studies have detected biological effects of low-level EMFs--but not when the field is stronger.

There are also studies showing health effects at certain frequencies but not at adjacent frequencies. And there are studies suggesting that a radio signal modulated by certain low frequencies, or a signal that is keyed or pulsed, has more harmful effects than an unmodulated, steady carrier. Scientists call these kinds of phenomena

window effects, and they greatly complicate any attempt to understand the relationship between EMFs and health.

There is an unfortunate footnote to this research on window effects: Much research seems to indicate that there is a window at 50 or 60 Hz--the exact frequency of the electric energy traveling through millions of miles of in-home wiring in the US and many other countries: EMFs at higher and lower frequencies may not have the same health effects as 60-Hz fields. And yet, the financial and technical obstacles that would stand in the way of changing the frequency of ordinary household ac current--should that prove to be desirable--are staggering.

Safe Operating Practices

After reading this far, if you are uncertain about the possible health effects of EMFs, you're not alone: The scientific community itself does not agree about this issue. In fact, medical doctors, biologists, physicists and other scientific researchers are engaged in an intense, sometimes-emotional debate about the health effects of EMFs. There is a computer bulletin board system for scientists concerned about this issue; messages posted there range from esoteric discussions of these complex issues to personal attacks on some scientists who espouse views not shared by others!

If the experts don't always agree, how can the rest of us know what is safe and what isn't? The American National Standards Institute (ANSI), a private body that sets voluntary standards for industry, has had guidelines for exposure to EMFs for many years. In fact, the ANSI guidelines have been revised downward repeatedly to reduce the recommended safe levels of EMF exposure.

ANSI adopted its latest guidelines in 1992, *but many health scientists have questioned whether even the newest guidelines are adequate to protect public health*. Recently, the Environmental Protection Agency publicly questioned the adequacy of the 1992 ANSI standards in an official statement to the Federal Communications Commission.

Some scientists challenge the newest ANSI standard on several grounds. For one thing, it's primarily intended to prevent exposure to EMFs strong enough to cause thermal effects, not exposure to weaker EMFs that may cause athermal effects. Nor does the ANSI standard take into account the effects of modulation. And the ANSI standard applies only to RF energy, not to low-frequency EMFs that are so central to public debate these days.

There is no generally accepted standard in America for exposure to the low-frequency fields produced by power lines or home appliances. And in general, there is considerable uncertainty about what level of electromagnetic energy should be considered safe.

Another problem is that RF fields are difficult to measure. The price of a professional quality RF power density meter runs well into four figures, and low-cost meters for home use are often grossly inaccurate. Even the best meters may not be accurate in the *near field*, the area close to an antenna where the potential for hazardous RF energy levels is greatest.

Field strengths can be calculated using mathematical formulas, but that, too, fails to take into account the random hot spots that often exist in the near field. Fortunately, the low-frequency fields from power lines and appliances are easier to measure than RF power densities.

If there is no consensus about safe energy levels, and if EMFs are difficult to measure, what can we do to minimize the potential health hazards of EMFs?

Several years ago, Professor M. Granger Morgan of Carnegie Mellon University offered a simple proposal: practice *prudent avoidance*. Dr Morgan said we should avoid unnecessary exposure to EMFs as a common-sense response to potential--but not yet proven--health hazards. He didn't suggest that we all abandon our

electric appliances and go off to live in the woods in cabins without electricity, but he did suggest that we minimize exposure to EMFs when it's practical to do so.

He said, in essence, to avoid electromagnetic fields strong enough that they *may have* adverse health effects. The League has adopted Dr Morgan's approach: The RF safety sections of major ARRL publications urge radio amateurs to practice prudent avoidance wherever possible.

Which amateur operating practices are clearly safe, and which ones might be hazardous? Here are some suggestions based on guidelines developed by the League's Bio-Effects Committee:

- Transmitting antennas should be mounted well away from living areas. If medium or high transmitter power (100 watts or more) is to be used, antennas should be mounted on a mast or tower at least 35 feet above any populated area if possible. The FCC/EPA study indicated that with an antenna that high, there is little RF energy where people are.
- Because feed lines can radiate in some cases, when installing open-wire line (or even coaxial cable if the SWR on the line is high), it's best to route it away from areas where people will be spending a lot of time.
- When using a ground-mounted or mobile antenna, be careful not to transmit when anyone is near the antenna. A good rule of thumb is to avoid transmitting when anyone is within three feet of a car-mounted 2-meter FM whip if you're using a typical 25-watt transceiver. With a 100-watt amplifier, don't transmit when anyone is within five or six feet of a whip antenna. If you're using a beam antenna and 100 watts or more, follow the 35-foot rule: Don't transmit when anyone is within 35 feet of the *front* of the antenna (the direction where the antenna is pointed). It may be safe to transmit when people are a little closer to the antenna if everyone is below it or behind it, not in front of it.
- Exercise particular care when using indoor antennas, including those mounted in attics, because in some situations they can generate substantial RF fields. As much as possible, try to locate indoor antennas as far from people as possible. Use low power (10 watts output or less), and keep your transmissions short when someone might be near the antenna.
- Never use a power amplifier that has its metal cover removed. The cover provides shielding, keeping the RF energy inside the unit--not out in the room.
- If you're going to experiment with UHF or microwave equipment, or do moonbounce communications, discuss your installation with experienced operators before getting on the air. UHF and microwave antennas and waveguides--as well as high-gain moonbounce antennas--may produce hazardous levels of RF energy and must be installed carefully so that no person is in the line of fire. Never look into an activated waveguide or stand in front of a high-gain VHF-UHF antenna when the transmitter is on.
- When using a hand-held transceiver, use the lowest power possible and keep the antenna as far from your head as possible. Within the scientific community, there is disagreement about the safety of "handy talkies." Most hand-helds have been exempt from the ANSI standard because their power output is too low to produce significant whole-body heating. However, there is growing evidence that even one- or two-watt hand-held radios may produce significant EMFs within the user's head, with possible health effects that are not yet fully understood. (The potential for a health hazard is greatly reduced when a hand-held radio is used in its low-power position, with only a fraction of a watt of output power.)
- Be aware that low-frequency fields exist in your home. If possible, avoid being within 24 inches of any electric motor or power transformer while it is turned on. Hair dryers, ac-operated hand drills and other electric devices that are held close to the body when in use often expose users to stronger EMFs than those produced by Amateur Radio equipment. Nevertheless, it is a good idea to stay about 24 inches away from the fans and power transformers found in high-power amplifiers and 12-volt power supplies, for example.

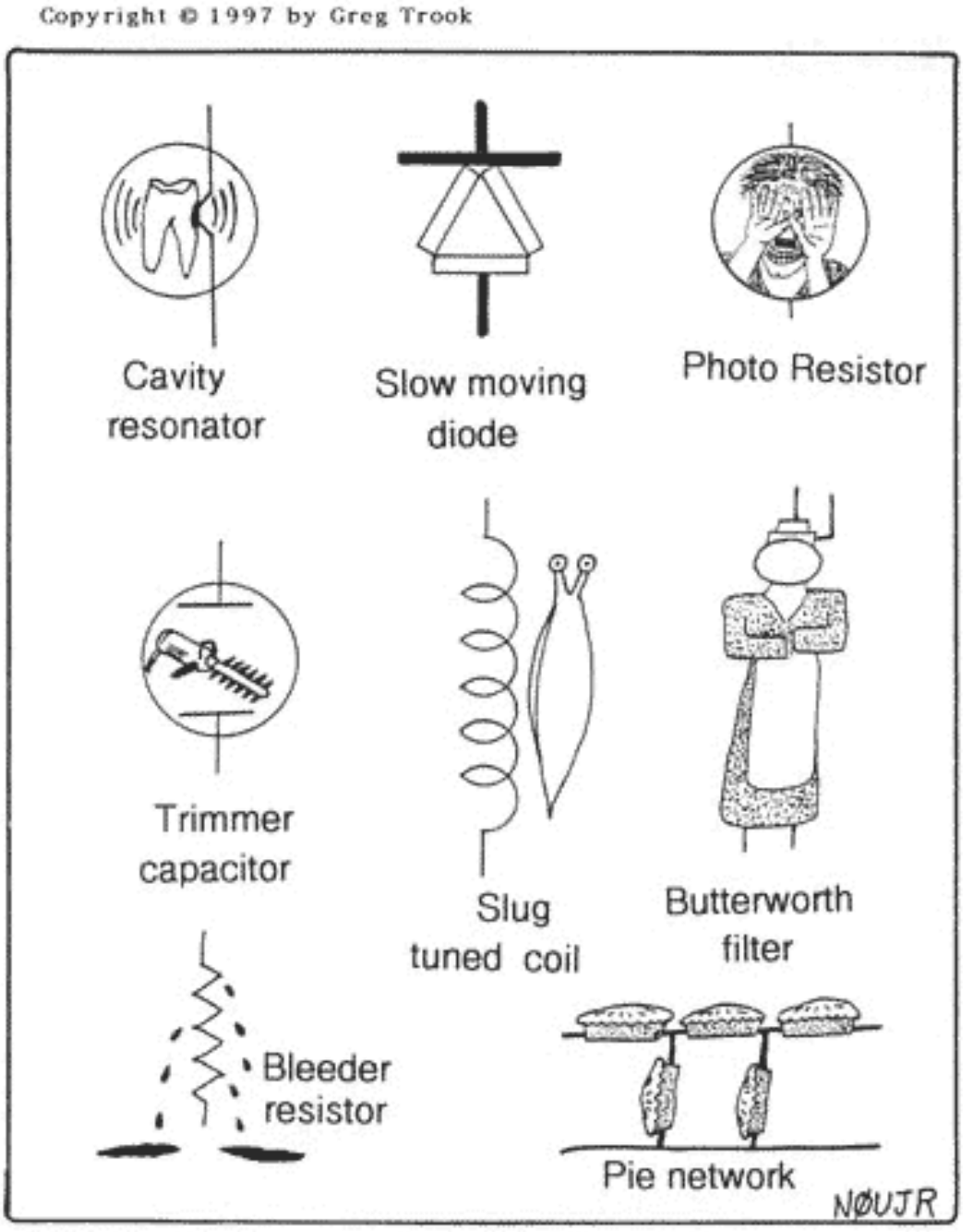
Further Information

The issue of electromagnetic fields and health is as complex as it is controversial. It isn't possible to cover this topic fully in a short article such as this one. A more detailed and technically-oriented treatment of the subject appears in the **RF Safety** sections of current editions of *The ARRL Handbook* and *The ARRL Antenna Book*. The bibliography there lists some of the major scientific works in this field.

[1]As *ARRLWeb* reprints this article in 1996, the ARRL Board's RF Safety Committee is the direct descendant of this body.

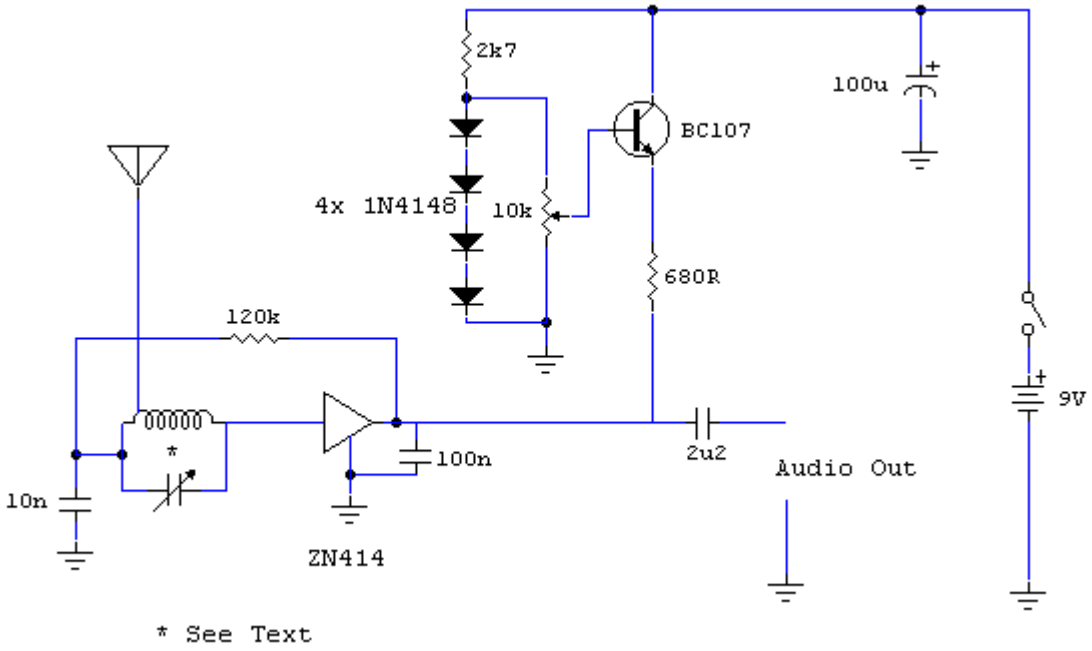
Wayne Overbeck, N6NB, holds PhD and JD degrees and is a Professor of Communications at California State University, Fullerton. He first became interested in this subject because his own operating activities--VHF DXing and contesting with high power portable stations on mountaintops--require special precautions to minimize EMF exposure.

http://www.rac.ca/rfe.htm



Little known standard electronic symbols.

Short Wave Receiver you can Build Using the ZN414



Notes:

The original data sheet for the ZN414 states that the maximum working frequency is around 4 MHz. That may be true, but SW broadcasts are so powerful that this receiver will work well with signals up to around 6 or 7 mhz. The 10k resistor controls the operating voltage for the ic which is critical for good performance.

The tuned circuit consists of a variable capacitor and fixed air spaced coil. For the inductor, I wound 10 -20 turns of wire on an empty tube of around 1.5 inches diameter. The turns were spaced so that the overall length was around 3 inches. The variable capacitor tuned 0 - 300 pF but there is plenty of scope for experiment here. One final point, you will need an external antenna to receive broadcasts. I have an outside wire that is about 7 meters long and this was quite effective. The antenna can be connected at either end of the coil or via a series capacitor value between 10pF and 100 pF.

http://www.mitedu.freeserve.co.uk/Circuits/RF/ZN414SW.htm

From The Mailbox

THE **BRUCE AMATEUR RADIO CLUB NEWSLETTER**

IS NOW POSTED 73 DE JIM COVERLEY VE3OVV

http://www.brucearc.on.ca

Personal Communications Pioneer Al Gross, W8PAL, SK

From Carl VE3BY

The man who brought the world such indispensable wireless communications concepts and devices as the walkie-talkie, pager and cordless telephone has died. Al Gross, W8PAL, of Sun City, Arizona, passed away on December 21. He was 82.

Gross obtained his Amateur Radio license in 1934 at the age of 16. His early interest in Amateur Radio helped set his career choice while he was still a teenager.

Gross pioneered the development of devices that operated in the relatively unexplored VHF and UHF spectrum above 100 MHz. His first invention was a portable hand-held radio transmitter-receiver. Developed in 1938 while he was still in high school in Cleveland, he christened it the "walkie-talkie." The device caught the attention of the US Office of Strategic Services--the forerunner of the Central Intelligence Agency. The OSS recruited Gross, and this led to the invention of a two-way air-to-ground communications system used by the military behind enemy lines during the World War II. The
system allowed OSS agents to communicate with high-flying aircraft.

After World War II, Gross set up Gross Electronics Inc to design and build various communications products, some of them under government contracts. He also launched Citizens Radio Corporation to design, develop and manufacture personal wireless transceivers.

Cartoonist Chester Gould asked if he could use Gross' concept of a miniaturized two-way radio in his Dick Tracy comic strip. The result was the Dick Tracy two-way wrist radio.

During the 1950s and 1960s, Gross secured several patents for various portable and cordless telephone devices. In September 1958 Gross Electronics received FCC type approval for mobile and hand-held transceivers for use on the new Class D 27-MHz Citizens Band.

"If you have a cordless telephone or a cellular telephone or a walkie talkie or beeper, you've got one of my patents," Gross once said. He added that if his patents on those technologies hadn't run out in 1971, he'd have been a millionaire several times over.

Over the years, Gross worked as a communications specialist for several large companies. Since 1990, he had worked as a senior engineer for Orbital Sciences Corporation and was still on the payroll there when he died.

Gross received numerous awards and honors during his distinguished career, including the 1992 Fred B. Link Award from the Radio Club of America, the 1997 Marconi Memorial Gold Medal of Achievement from the Veteran Wireless Operators Association, and the 1999 Edwin Howard Armstrong Achievement Award from the Institute of Electrical and Electronics Engineers. In 1998, he received Eta Kappa Nu's Vladimir Karapetoff Eminent Members' Award in recognition of his
pioneering contributions to the engineering of personal wireless communications.

Earlier this year he won the Lemelson-MIT Lifetime Achievement Award for invention and innovation and for playing a major role in the wireless personal communications field.

As his IEEE biography put it: "It is clear that Mr. Gross was a true pioneer and helped lead the way to today's wireless personal communications revolution."

Al Gross is survived by his wife, Ethel. A burial mass was held December 27 in Sun City.
thanks to The W5YI Report and the IEEE for this information.

Gender?

A language instructor was explaining to her class that in French nouns, unlike their English counterparts, are grammatically designated as masculine or feminine. 'House' in French is feminine: 'la maison'; 'pencil' is masculine: 'le crayon'. One puzzled student asked: "What gender is 'computer'?" The teacher did not know, and the word wasn't in her dictionary. So for fun she divided her class into two groups, appropriately enough by gender, and asked them to decide whether 'computer' should be a masculine or feminine noun. Both groups were required to give four reasons for their recommendation.

The men's group decided that computers should definitely be feminine: 'la computer', because
1. No one but their creator understands their internal logic.
2. The native language they use to communicate with other computers is incomprehensible to everyone else.
3. Even the smallest mistakes are stored in long-term memory for possible later retrieval.
4. As soon as you make a commitment to one, you find yourself spending half your paycheck on accessories for it.

The women's group concluded that computers should be masculine: 'le computer', because
1. In order to get their attention you have to turn them on.
2. They have a lot of data but they are still clueless.
3. They are supposed to help you solve problems, but half the time they ARE the problem.
4. As soon as you commit to one, you realize that if you'd waited a little longer you could have gotten a better model."
