Amateur Radio in the New Century

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The Lure of Ham Radio

To quote the 1970 *Radio Amateur's Handbook* (American Radio Relay League):

> *Amateur radio is a scientific hobby, a means of gaining personal skill in the fascinating art of electronics and an opportunity to communicate with fellow citizens by private short-wave radio.*

Times have changed, but how much of this definition has changed? Certainly a certain amount of scientific knowledge helps with Amateur ("Ham") Radio, though there are now many more opportunities to be an "appliance operator", one who only needs to know how to plug in a microphone and a BNC antenna connector. But many Hams are scientific. I know that the folks in my local club are. Each week I get solar propagation reports for news of possible band openings, others work to understand satellite orbits and one even has been making a new design for a HF (shortwave) antenna. So, at a variety of technical levels, Ham Radio is still a scientific hobby.

Is Ham Radio still a way of gaining skill in the "art of electronics"? Since the '70s, Single-SideBand (SSB) has largely replaced Amplitude Modulation (AM). Building an AM modulator wasn't a very complicated thing, but building an SSB exciter requires skill and test equipment. So the number of Hams who want to build their own rigs has gone down dramatically. Heathkit, in business in 1970, is now out of the picture. But all is not lost. The QRP[1] revival has produced such fascinating creations as a set of kits for transmitters, tuners[2] and receivers that each fits into an "Altoids Peppermint" tin. These can be found at your local QRP Club, or on the web. That's a sign that simple kits, and simple modulation methods, are alive and well.

Indeed, building a kit teaches an important "radio science" lesson: First, respect electronic circuits, but don't be afraid of them. And second, you can build real electronics systems yourself. The building of a kit is the gateway to understanding. The young Hams who built Heath HW-8 transceivers twenty years ago are now cell-phone system designers, broadcast chief engineers, and others "skilled in the art". To a great extent, the cell phone revolution happened because of lessons learned by amateur practice.

To return to the ARRL quote, is Ham Radio an opportunity to communicate with fellow citizens? Well, yes and no. Clearly, folks still rag-chew[3], though the word "citizens" now means citizen of the world. And communications has changed a bit. Since peace broke out, there are fewer MARS[4] nets, but disaster

[1] "QRP"= Low Power Radio (from the standard radio abbreviation QRP "Shall I decrease power? Decrease power"), QRP transmitters are typically five watts or less. QRP rigs often are Morse Code ("CW") only, since it is easy to make the modulator for CW (just turn the transmitter on-and-off)
[2] For example, the "rainbow bridge", a simple antenna tuner with LED readout.
[3] OK, so I'm supposed to define "rag-chew" here… um… well… just substitute "converse".
[4] Military Amateur Radio Service, very active during the Vietnam War for getting soldiers' non-essential messages home.

communications still comes in to play -- despite the false sense of security the cell phone gives. The 1970 Handbook limited itself to "shortwave", and that doesn't apply any more. In the past 30 years the VHF bands have gone from the old Gonset AM radios to cell phone, with more communications modes than were dreamed-of in 1970. So yes, many Hams enjoy communicating, only the bands have changed.

Indeed, at its fundamental core, Ham Radio hasn't changed much in the past 30 years -- Wow, what a statement! With a billion changes in licensing, and with technology moving at light speed, the challenge and enjoyment of the Amateur Radio Service has pretty much stayed the same.

Ham Radio on the Threshold?

So where are we now? What are people doing with Ham Radio at the end of one century and beginning of another? One new aspect of Ham Radio didn't really exist in 1970. Today thousands of Hams are gaining skill in computers, signal processing and computation science by applying them to Ham work. Here are a few examples of advances programmed by Hams:

- The design of systems based on the PIC microcontroller[5]. These simple devices can do all sorts of simple tasks, from a combination Morse code (CW) keyer and frequency counter (with readout in CW!), to smart remote sensing for repeaters.

- The use of personal computers in station operations. For years the PC was nothing but an overpriced terminal for an RTTY[6] Terminal Node Controller (TNC). Then it became a logging station, with automatic callsign lookup and contest dupe detection.

- Today Soundblaster® based decoding is rapidly replacing the TNC itself, as new modes like PSK 31[7] replace the wider bandwidth AFSK[8] modes. Suddenly, programming Digital Signal Processing (DSP) routines on your computer can be a "soft" form of kit building. The open source of WINPSK31 cries out for tinkerers to add new features, try new filters, and otherwise hack.

- Antenna design is quicker and less messy using various antenna design programs. Simpler shareware or freeware programs abound. Trying out an antenna design before you build reduces the number of surprises, and while pruning is always necessary, at least you know what you are trying to do. Indeed, Hams do research over the Internet as standard operating procedure. Usenet is a ready source of advice, often better than you get over-the-air (sorry guys).

- Satellite pass prediction has gone from something only the university mainframe could do, to a screen saver program! Hams have contributed dozens of innovative programs for "OSCAR" and SAREX projects[9].

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[5] A simple microcontroller (microprocessor with RAM, ROM, and I/O), costs less than $10/ unit. PICs are useful for low-speed, real-time applications.
[6] Radio TeleTYpe. This includes old Baudot, 110 baud units and also ASCII units. The TNC acts as a radio modem.
[7] PSK-31 (See John DeGood's talk) is a text-based communications method using phase shift keying. Half bandwidth is 31 Hz, making is narrower bandwidth than RTTY, as well as more reliable.
[8] AFSK and FSK: (Audio) Frequency Shift Keying. RTTY signals use a shift in transmitting frequency (180 Hz) to indicate "mark" and "space" in Baudot/RS-232 terminology.
[9] "Orbiting Satellite Carrying Amateur Radio"; "[Space] Shuttle Amateur Radio Experiment" and other communications projects that talk to (MIR, Space Shuttle) or via low-earth-orbit satellites.

- Computer control of radios is now available, and cheap to interface to! Control of radios via the Internet is a reality.

So what about the 21st Century?

What will happen to our hobby in the next fifty years? Will the concept of "hobby" still exist? Who will take up Amateur Radio as a hobby? What will people get out of Ham Radio?

Hobbies are very much a 20th century creation; born from the shorter workweek, smaller family sizes, better standard of living and general prosperity. Will hobbies persist, or can we expect the continued erosion of leisure time in the working classes, as the acceleration of change, and the loss of buying power continues? Retirement has helped the hobby too, and if retirement village covenants don't kill it, we can expect continued growth in that segment of the population. Questions remain: Will the retirement age rise so much that energetic retirement becomes a thing of the past? Will economic hard times force golden-agers back to work and off the air?

Ham radio is a great equalizer. One does not necessarily know the age, race or physical ability of the Ham at the other end of the QSO[10]. If the contact is CW, RTTY or PSK31, you may not even know the gender (NAME IS CHRIS…). Unless the mode is very expensive (say, 10 GHz satellite), you can't easily determine their economic status. This is a wonderful thing about the hobby; everyone who can follow rules is welcome. And if the institutions of hamfests and trading of used equipment continue, the hobby will stay accessible.

Ham Radio will stay fun because it will stay honest and self-policing. Radio law is fairly easy to understand, and Hams do a pretty good job of discovering transgressors, and turning them in. This self-policing will only survive if we can maintain an adequate density of Hams to monitor for violations and if the Federal Communications Commission keeps the laws clear and enforceable. If penalties become draconian, Hams will begin siding with the transgressors, and enforcement will suffer.

A danger exists if Ham Radio offers services that are unavailable elsewhere. In the days before cell phones, phone patch abuse was a major concern. Who hears about that now? Lower long-distance telephone rates may also reduce the number of pirates on the HF bands. If there is no money in dishonesty, why do it? The Internet is our friend specifically because it provides a cheap, reliable alternative to the Ham Radio bands for communications. I see no conflict between Ham Radio and the Internet, just as the phone system and Post Office were no threat in the past. If Ham Radio tries to become an appliance like the Internet, our hobby will die.

There is no guarantee that the Ham bands won't be auctioned off by Congress. But if we can keep Ham Radio a vital, broad-based hobby, we can make sure that such an idea is "politically incorrect". On the other hand, there is no guarantee that the economy will stay stable enough for leisure time. And there is no guarantee that we will stay at peace, for war was the ultimate enemy of Amateur Radio (at least that was the case in WWII).

[10] Conversation. Derived from operating abbreviation: "QSO: Can you communicate with . . . . direct or by relay? I can communicate with . . . . direct (or by relay through . . . .)." QSO is a more general term than "rag chew".

Predictions

So, assuming the world doesn't go lawless like some apocalyptic B-movie, what will people DO with Ham Radio in the next century? Here are some predictions.

- Disaster communications will always be a mainstay. Hams are good at improvisation, and that's what's needed in an emergency. The world is becoming more dependent on complex technology, which will break down in floods, hurricanes and earthquakes.

- Field Day will stay popular, despite higher QRN (static) and noise from computers, digital circuits and other man-made sources. Contests still provide the best source of improvisation training, and why should that change?

- Folks will still use Ham Radio to talk to total strangers. Friendships will still be made on the bands, even as the Internet becomes commercial and impersonal.

- Indeed, Ham Radio will see great crusades-- like 10-10, grid square collecting, or Straight Key Night. These will come and go, activity will wax and wane. Fortunately, Hams will forever be finding new ways to keep the hobby exciting.

- The same folks will be on 75 Meters 'phone, and still complain about the same things.

- FSK-RTTY will die. PSK-31 and other narrower band modes will catch on for digital ragchewing. Digital modes will continue to be popular with non-native speakers of English, since for them reading is easier than hearing.

- For the same reason, CW will survive. CW based kits will also keep the mode vital. The 5-WPM rule won't kill it, you'll see.

- While PACTOR[11] will die, the replacement will be narrower band and higher rate, and just as obnoxious for those listening to adjacent signals.

- 1296 MHz, 2.3 and 3.3 GHz bands will be populated with new modes, just in time to keep them from being auctioned off. This will happen sooner than you think.

- Folks will still build kits-- and more important-- folks will still buy kits and then let them sit for years, vowing to get to it "one of these days".

- Tinkerers will keep software "junk boxes" of old sound-blaster routines. They will use them to design new signal processing methods instead of new radio hardware.

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[11] A packet radio mode, somewhat related to TCP. It is characterized by short bursts of digital waveform and ACK/NACK responses. PACTOR signals consume 450 Hz of bandwidth. They differ from RTTY by being "connection based", that is, station A talks specifically to station B. The receiving station must send short bursts "ACKs", which plays havoc with communications on adjacent frequencies. A related mode is AMTOR.

A new mode, called PACTOR-II seems to be the next generation of these modes. I'm not a big fan of these "protocol related" modes, though I bet many of today's network wizards got their start in packet radio.

- Antenna science won't change much, but good antenna designs will be posted all over the Internet, so homebrew builders will have more to choose from.

- Just as blind amateurs have become commonplace and accommodated, Ham Radio for the deaf will take hold. Yep, with PSK-31 and DSP, both CW and RTTY-like modes are open to the deaf-- but read on…

- A new, improved narrow-band video mode, based on MPEG technologies and new digital-modem technologies, will appear. VHF repeaters will be converted to the new mode, and everyone will have to wear clothes when on the bands. American Sign Language will be seen on the new video modes.

- "Hand-Held Moonbounce[12]" will become possible, but never popular. New modes and signal processing methods, and better preamps and antennas will make this, and other remarkable communications feats reality.

- Satellite tracking FM repeaters will bring new opportunities to VHF, UHF or Microwave bands. Why haven't we done this already?

- A new, full-duplex mode will be invented. This will allow traffic nets to work more efficiently, and also allow for real-time break-in. Good bye to the 10 minute monologue!

- New modes that automatically minimize transmitter power will appear, and become popular. These will extend portable radio battery life while reducing QRM and EMF exposure.

- Hams will still buy kilowatt amplifiers, and use them to talk across town.

- Other Hams will buy expensive equipment (Will Japan stay #1 for Ham equipment?) and never transmit. Their widows (or widowers) will have Ham friends get rid of these rigs at hamfests.

- Hams will stay open minded, overweight and generally happy. The age demographics won't change much, and it will take some effort to dispel the "guy-hobby" image. (Wouldn't it be fun to have this change?) Still, no combination of Rogaine, Viagra or Liposuction will make you a better Ham Radio operator.

- Hams will still be motivated by the same things:
  - It must be fun,
  - It must teach something,
  - It must provide a sense of achievement, or
  - It must provide a sense of community.

  The most important prediction is still the saddest:

When the band is dead, the band will still be dead.

[12] Using the moon as a reflector (Yes, this really works!). Possible today by using 1 kiloWatt transmitters and large antenna arrays on VHF and UHF bands. Better receive equipment and coding gain from new modulation methods will reduce the equipment needed to a reasonable level, maybe all the way to "hand-held"?