

HAM RADIO BIOGRAPHICAL SUMMARY BY W6JL

My operating style:

I am strictly a CW operator, ragchewer only and homebrew only. So my interests lie in a fairly narrow range of possible ham radio activities. I've never had much interest in hunting DX, or awards, phone operation, or competitive ham radio or organizational things such as public service. I am a daytime-only op, as I have always been a day person I guess. The only other mode besides CW which has held my interest is Amtor. I'm afraid I've found the other so-called 'digital' modes to be rather boring. Real time one-on-one QSO's are what I enjoy. I get no fun out of making 'contacts'. I fill a log page very three days or so, with QSO's on 40 through 17 meters. Usually, I call CQ simultaneously on two bands, often 40 and 20 meters. I use a homebrew station which includes a homebrew wireless paddle, and wireless cans, because I am up and about during QSO's, and not captive to the rig. I work on things during QSO's. This is easy to do with a traveling paddle.

The early years:

I was born in Fitchburg, Massachusetts and I grew up in small towns surrounding it.

At about age 11, I suddenly became very interested in radio and electronics. I do not know from where this interest sprang up, or how I initially became aware of it. Prior to that time I had been building Erector Sets, playing with chemistry sets and electric trains and such, and building flying model airplanes, like most boys my age. Our small-town library had a few very old books (1920's mostly) on radio. I discovered them one day, and started to read them even though I did not understand most of what they contained. Somehow my internal interest kept me coming back to look through them. I then built a crystal set with cat-whisker probe and oatmeal box tuning inductor (which I painted with shellac). I recall spending days poking at the galena crystal before I suddenly found a hot spot. I was ecstatic when I first heard the radio announcer's voice clear and loud in the headphones. But shortly later, my brother walked by and bumped the table, and I lost my hot spot for a while. For weeks and months later, I would lay in bed at night, listening on that crystal set to the mystery shows like

Suspense, and the Green Hornet. And the adventure shows like Straight Arrow, The Adventures of Tom Mix (starring Curly Bradley and brought to you by the makers of Instant Ralston cereal). The radio was terrific entertainment because you could use your imagination to picture what was happening. With TV, you lose all of that extra dimension and are stuck with just what is being shown on the screen; little or no imagination of the viewer is involved. (It is similar to the difference in what you get out of buying something ready-made, vs making it yourself).

Later on I found, while poking around in our basement, a box of stuff which included a series of pamphlets from the National Radio Institute, bound into two volumes. It was a radio correspondence course that my dad had taken in the 1930's, but he had never mentioned it and seemed to have forgotten completely about it. I still have these two volumes. That was where I first saw relatively modern concepts like circuit diagrams and Ohm's Law, and a little bit about radio circuits, but I could not understand anything but the simplest pictorial diagrams of how to physically place parts on a breadboard. Following blindly one such layout (on a real board of course), I managed to construct what I later learned was a grid-leak detector triode receiver. I cannot recall how I obtained the tube, but I suspect it was from a defunct radio somewhere. I think that some of the components might have also been in the box in the basement. A neighbor man worked for the telephone company as a lineman and he supplied me with a 1.5-volt "A" battery for the filament of the tube. I obtained two 45-volt "B" batteries from the Montgomery Ward catalog, using my paper route proceeds. That receiver worked like gangbusters, and I later figured out how to make it more easily tunable, with a variable capacitor I obtained from a junked radio. Then I was able to listen to many stations far and wide, at night in my bed: "This is WBZ, WBZA, Boston, Springfield" said the announcer's resonant voice, which I can recall vividly today, 63 years later.

I remember while listening at night and looking into the tube at its tiny v-shaped filament glowing orange, and trying to figure out: just how the heck did it work? I could not hear any sound or music coming from the tube, nor could I see anything moving inside to indicate it was *doing* something. Yet, it was producing sound from the air, from nothing. This was all very mysterious and fascinating to me.

In one of the ancient books from the library, I saw a pictorial diagram of how to lay out a spark transmitter on a table. I obtained a Ford Model T spark coil, also from Montgomery Ward's catalog, using my meager paper route earnings. I connected that up to four dry cell "A" batteries in series (I had a good steady supply thanks to New England Telephone and Telegraph Co). The coil's built-in buzzer/interrupter vibrated, and sang its weak little song, and lo and behold, sparks jumped across wires connected to the two output contacts on the coil. I had a spark gap! Next, I used two nails to make a pointed gap, connected to the coil output terminals. (This made the spark hot and crackly; this must be better, right?). I connected one terminal to a water pipe, and the other went out to a long wire I had stripped out of some TV twin-lead, which ran from the 2nd floor window of my bedroom out to a nearby tree. (Twin-lead was new then, as was TV, and I got a supply of twin-lead from another neighbor man who was a Radio/TV repairman).

When I connected the antenna to the spark gap and connected the "A" batteries, I heard a loud sound coming from the table radio downstairs that my mom was listening to. After a few more minutes of fooling around, the phone rang. It was a neighbor, complaining about something in their radio, and was my mom hearing it also? Learning this, I jumped for joy! I knew that I had transmitted a signal through the "ether", and I guess I was never the same since. I was hooked on the idea of transmitting my own signal over the radio. From then on I continued to try to learn as much as I could about this stuff. I knew no one with any information of this kind, certainly no one who was a mentor, so I quietly sought out whatever book or magazine I could find about radio. I never met anyone with any interest or knowledge about radio or electronics until after I much later got on the air for the first time, as a Novice.

In 1953, when I was 13 years old, my family pulled up deep roots in New England (my family tree goes back through William Bradford, who came with the Pilgrims on the Mayflower in 1620, landing at Plymouth, Mass). We moved to the Los Angeles area. It could not have been a more complete culture shock for myself and my brother and sister. We moved from a New England small town environment to a big city in a subtropical climate. My brother and I hated it.

At the time, I also had become very interested in photography, and soon after arriving in California I was developing film in

the bathroom sink and making contact prints with a window glass printing frame I saw described in a book. Photography remains one of my hobbies, 62 years later.

Discovering ham radio:

Within a year, we had moved again, into a new house, in nearby Torrance, California. It was there that I discovered, in the Montgomery Ward Catalog, a series of three little booklets, published by an organization called the American Radio Relay League. Yes, books on ham radio were in the Wards catalogs in those days.

I obtained those three books, priced at about 50 cents each, using my paper route money. Those three books were "How to become a Radio Amateur", "Building an amateur radio station", and "Learning the Radiotelegraph Code ". These booklets opened up the whole new world of Ham Radio to me.

The last one was the key to a whole new world within ham radio: CW. Working alone and using a key I had obtained from a classmate at Torrance High School and obtaining a door bell buzzer and dry cell battery, and following the book's instructions carefully, I first put in lots of practice and learned to send consistent equal-length, equal-spaced dits and dahs with the key. As the book admonished, I did not go further until I was able to send smooth strings of dits and dahs. Then, following the book, I practiced sending characters in the order given by the book. Five characters at a time constituted a single lesson. I did not proceed until I had these five letters down pat, and could recognize them immediately by sound. I began to practice sounding out CW when reading road signs, license plates, newspaper or magazine articles, etc. I sounded out the letters aloud if I was alone. I did this while delivering papers on my route on my bicycle. The book was very clear in insisting on learning by sound only, and there were no printed dots and dashes anywhere in it. All of it was by sound, such as "dit", a single dit, "di", a dit within a character, and "dah", a dash. Thus, A was "di-dah", S was "dididit", etc. I was diligent in my practicing and learning new letters only when I had committed the ones learned so far to memory. I followed the syllabus of the book closely. If my memory is correct, it was not more than two weeks later that I had memorized all of the letters and punctuation and numerals.

I was also studying the booklets for the taking of the FCC examination via mail, which I knew I had to take in order to obtain the Novice License. I knew no hams. I knew no one who had any interest in radio or electronics. I was alone. All of my motivation came from within. I had no mentor*.

*The term "Elmer" was not known until many years after I became a ham. That term came from a story in QST about a fictional helper or mentor, whose name was Elmer. The story was written by Rod Newkirk, W9BRD. The popular term "Elmer" used so widely by hams today, comes from that story, so it is not an old term in ham radio.

To this day I cannot recall who it was that was found to administer my Novice code test. Any adult could supervise the taking of the written exam, but only a General Class or higher ham could administer the code test. It must have been some neighbor that perhaps my folks knew of, but I never got to know him. But I passed both the written exam and the code proficiency test easily and it seemed an eternity before I received the coveted Novice ticket in the mail. It took about 4-6 weeks in those days, as I recall.

While waiting for my Novice license, I was scrounging around trying to find a receiver that I might be able to afford with my paper route money. Finally one day my dad and I drove into downtown Los Angeles, and we found a very badly beat-up Hallicrafters S20R receiver in a pawn shop. Someone had cut a large hole in the front panel, where the metal had been bent out after many holes had been drilled around it, in order to install an S meter in place of the vernier band-spread dial. Bad as it was, it worked, and I learned to get the most from this receiver over the next year or two, until we moved up to North Hollywood, California in 1957 (where I then obtained three paper routes).

My Novice transmitter was built from an article in one of the three ARRL booklets. I later learned it came from an article in December 1946 QST, and it was called "The Simplest Transmitter". I built it exactly as described. It consisted of a tube socket, tuning capacitor, hand-wound tank and coupling coils, and two octal sockets (one for the tube and the other for the crystal) mounted on two spaced strips of wood. For a power supply, I acquired a derelict radio chassis, and I hack-sawed the end off that contained the power transformer and rectifier and audio output tube. That tube was a 6V6, so I also got the tube for my transmitter. I do not recall having any problem identifying

what part of the radio chassis to saw off, or how to connect the high voltage and filament leads to my transmitter. I still have the original transmitter and its cable I made up of scrap bell wire. The connector is the bottom of an octal tube with its 8 pins. I had broken this part away from the tube's glass envelope and used it for an 8-pin octal plug which plugged into the former 6V6 socket in the sawed-off radio chassis. The tank and antenna coupling coils were wound using a board with 7 equally spaced nails driven on the circumference of a 2.5 inch circle marked on the wood. The wire was then oven basket-weave style between the nails as the turns were wound. It was an effective way to make a low stray capacitance inductor. The turns were fastened together with string before being lifted off from the nails. I remember clearly the winding of these coils. There was a separate pair for 80 and 40 meters.

For an antenna, I found some scrap lamp cord somewhere, spliced it and stripped it into two wires each as long as I could manage, leaving the remaining lamp cord as a two-conductor transmission line. I am sure it was less than a half wave long on 80 meters. I laid the antenna on the roof of the house and ran the cord into my little transmitter in my bedroom and connected it to the output coupling coil. I found in one of the booklets how to make a three-turn coupling coil connected to a flashlight bulb. This I used for a tuning indicator to find resonance.

But I had no crystal. One day (while still waiting for my Novice to arrive), my dad drove me to a nearby electronics store and I purchased an FT243 crystal with the frequency 3738 marked on it. (The novice band limit in those days on 80 meters was 3700-3750 KHz).

I was later able to turn on the transmitter, and adjust the tuning capacitor to make the lamp light up without the antenna connected. Now I was in business, I thought.

Finally the great day arrived when my Novice ticket came in the mail. This was late in March, 1955. I had just turned 15 that February. Wow, I was excited. I had been listening a little on the S20R with it connected to my new antenna. I had heard CW signals on the 80 and 40 meter bands, and I wrote down every word (I still have these written notes, real relics from my earliest time as a ham). So I quickly became familiar with the CW operating procedures I heard on the air, such as giving signal reports, how to call CQ and sign your call, and of course

use of the Q signals. As soon as I got home from school that day I fired up my new station. I rigged up an old knife switch to serve to switch from transmit to receive. The key, of course, was hot with high voltage, since it was keying the cathode of the 6V6 directly. This I was aware of, but more than once I got zapped from that key. I got on the air and proceeded to call CQ. For days. No one answered. I could not understand what was wrong. Then one day I changed my tuning procedure, and adjusted the variable capacitor (which was also hot with high voltage, but I had a plastic knob on the shaft). This time I left the antenna connected while I had the light bulb also coupled closely to the output tank circuit. It turned out the antenna detuned the tank circuit, so that if I adjusted the capacitor without any antenna connected, it would then detune when it was connected, and I had very little output. I eventually used the bulb in series with the transmission line, tuned it for peak brilliance, and then removed it. Now I was in business, and I soon made my very first contact, and met my first ham on the air. He was Ross Conner, KN6KAX, who lived in nearby Compton. One day Ross called me on the phone, and asked if I was interested in taking a ride with him in the big semi-trailer rig he drove, delivering huge loads of bags of cement. My folks said OK as long as they could meet him first. On the arranged day he drove to my house, met my folks, and I went on a trip with him some 45+ miles all day trip to the east of Los Angeles, hauling a load of cement out to San Bernardino. (It is interesting to reflect now that my folks apparently had no problem with me taking off with this stranger ham I met on the air, who dropped by to take me for a ride. They never stood in the way of me spending time, even at night in their homes, with hams about my father's age).

I later met another older ham, Carl Winter, W6OAW, and I would ride my bike to his shack at night where several other older hams would congregate to talk on 75 meter AM. The atmosphere was classic: a smoky room with lots of chatter, red hot plates blushing in rack mounted transmitters, "talking" modulation transformers, high voltage everywhere, the blue glow of 866A rectifier tubes, and clattering teletype machines. I loved it all!

I also met on the air on one of my earliest QSOs what turned out to be a lifelong friend. Bob Friess, KN6HMO (now N6CM), lived in nearby Palos Verdes at that time. Bob was about 3 years younger than I, so he was about age 12 then. But he was ahead of me, as

his call was issued before mine. As time went by we got together on many occasions, building rigs, modifying ARC 5's, etc. Years later, after I was driving, we also had Field Day up on the top of Palos Verdes, with tents, generator, and all the usual paraphernalia. Our Field Day site was a WWII gun emplacement site across the road from Don Wallace, W6AM, and his 13 rhombic antennas). I also met other hams in the Torrance area. All of us boys were doing similar things, building crude rigs, scrounging for parts, and talking on the phone and on the air. And visiting each other's homes, if possible.

Thus, I went from knowing no hams at all, to several ham acquaintances ranging from kids to adults, who became friends, all solely because I got on the air on 80M CW. I still have my logbooks from that time, and they make for interesting reading.

About 3 months after receiving my Novice ticket, I had studied up and I went to downtown Los Angeles to the Federal Building to sit before the FCC Examiner and I took the exam for General Class. It included demonstrating 13 WPM code proficiency, sending and receiving (one minute of totally error-free copy, minimum, out of five minutes total, was required). It also included the written exam on theory and FCC regulations. Incidentally, we had to draw schematics of amplifiers such as Class B modulators and Class C RF amplifiers. The written exam was a real "written" exam, not the multiple-choice type that is used today. You were expected to be able to write your answers out intelligently (and intelligibly), using narrative answers. I recall none of this was particularly difficult for this motivated 15 year old. Most of my early ham friends were of similar age as me, and none of them had found the exam particularly difficult. Today, I am amazed (and a bit saddened) to encounter *adult* hams who have difficulty wiring a connector, and who do not know Ohm's Law (even though it is on the FCC exams). How far we have come?

When I obtained my driver's license at age 17, I purchased my dad's 1938 Willys sedan for the princely sum of \$50. But that was meager indeed, compared to the cost of a 17-year old driver's six months' liability insurance, which was \$250! And that was 1957 dollars. I sold some teletype equipment I had acquired to help pay for the first six months' insurance bill. But I was able to deliver three large paper routes using my car, and still have some money left over. (I had to get up at 4AM

every day, including Christmas and holidays, to service that route, before I went off to school each school day).

Now, flush with regular income, I got my (trusting) dad to sign one-year payment contracts with Heath Company, and Henry Radio in Santa Monica. From them I purchased, on time payments, a DX-100B transmitter kit and a brand new National NC-300 receiver, complete with speaker and two-meter converter. WOW, I now had a first-class station. I recall well how enjoyable it was to build that DX-100B. (I still have one today, which I found *un-built* in a surplus store in San Diego in the 1970s). I continued building amplifiers and other gear, including a pair of two meter 8 element yagis, which I stacked horizontally into a 16 element array. I found a used Gonset Communicator I for two meter AM. This was before FM was used by hams on 2M. (Years later, I went to work for a time at Gonset in nearby Burbank, California, and tested ham gear on the production line, including the Communicator IV). I also became interested in RTTY in 1957, and built the famous "W2PAT" T.U. (Terminal Unit) for receiving FSK RTTY, and modified my DX-100B to transmit FSK. (A switching diode in the grid circuit of the VFO did the trick). RTTY was to remain a fascination for me for many years hence, but I remained primarily a CW op. Photos of my ham shack in the garage from that time show many other homebrew projects in partial completion, lying on the bench and on shelves. There are more there than I remember, so I have forgotten about some.

I must have spent most of my spare time in those years with ham radio-related stuff. I had no real girlfriends, no dates, no social interests or activities, belonged to no clubs. Once in a while one of my ham buddies and I would go to a drive-in movie. I was what we later would call a Nerd, and I definitely had "The Knack" :o). I had four or five friends in the North Hollywood area, all of whom were fellow hams and nerds like me. All but one of them, I had met for the first time on the air. I am still am in contact with some of them.

I do know that even in high school that I never knew what an 'engineer' was, or what kind of work they did. I had met only one engineer, who was W6TU, Hal Leighton, the father of my high school friend Steve Leighton, K6MHR. Hal literally built everything himself. He needed a drill press, so he cast his own iron in a sand casting for the arbor piece of the drill! A real hands-on guy. I was vaguely aware of electronics technicians and TV repair people and what they did for a living. The

concept of electronic design engineering did not enter my mind at that time. I took a math-science-language study program in high school, but that was only due to a recommendation by my counselors. I thought of it as a safe approach. (It was a good decision). I had no idea what I might do for my life's work. I had no particular interest in, or parental support or guidance, for going on to college. But I do recall a couple of my ham radio friend's dads had mentioned to me the possibility of going to college, even without much money, via scholarships. This stuck in the back of my mind I guess, but I did nothing about it.

When I was a senior in high school, I got a job working nights, for a man who did contract assembly work for Athearn HO gauge model trains. He had a drafty metal building in an industrial area of North Hollywood not far from where I lived. I assembled tiny springs into tiny trucks in tiny box cars, tested electric motors and ran them in electric locomotives on a test track. I had a good friend, K6VKO, Dick, who also worked there with me. We are still good friends today.

A Career in Electronics:

The man who owned the small contract company we were working for was named Harry Weiss. Harry's wife, Eloise, was a supervisor on the production line in a small transformer company around the corner from the HO gauge train workplace. After I graduated from high school in June of 1958, Harry told me that they were looking for a technician that could test transformers at this company, which was named Calmag (California Magnetics Corp). I thought that might be interesting. I had of course played with transformers, and had a general knowledge of how they were made and how they worked, turns ratios, and so forth, but I knew nothing of magnetics design of course.

After interviewing there, I was offered a full time job testing prototype and production transformers in their small lab area at Calmag. I was delighted. As expected, the job was easy, and I could crank out transformers quickly. Most of the transformers were intended for military aeronautical use and ran at high frequencies, such as 2400 Hz. So they were very different from the stacked-lamination cored type that I was familiar with in 60-cycle equipment. But they worked similarly.

I was to meet other individuals at CalMag who helped open up other areas of interest in my life outside of electronics, but that is outside the scope of this narrative.

Now, for the first time, I was working 40 hours per week, making the princely sum of 90 cents an hour! What to do with all this sudden influx of wealth? I paid my mom five dollars a week for room and board (and laundry). I would haunt the many surplus electronics yards that dotted the San Fernando Valley in those days. I had a job I enjoyed, a car, a place to live, and spending money. What more could I ask? I felt I had arrived at adulthood, and I had no further goals. Little did I know that things were to change in a very profound and productive way for me, all because I went to work at Calmag.

At Calmag, I found that there were three engineers. One was Beverly Friedendahl (odd first name for a man, but we all called him Bev) who was the senior design engineer; Ken Zener, another designer, and the third was Ted Diolosa, who was the Quality Assurance Engineer. I worked in close proximity to all three of these men, since the test lab was adjacent to their common office area. These were the first engineers I ever knew. And, Bev and Ken were electrical engineers.

Even though I never had a mentor for ham radio, in retrospect I was very fortunate to run into one when I got my first job in electronics, at CalMag. With just a few words of encouragement, it was enough to suddenly make me decide to go on to college and study electrical engineering. This resulted in my long (48 year) career in electronics which also greatly enhanced my enjoyment of ham radio. Here is how that happened to me:

One day, not long after I had started working at Calmag, Bev Friedendahl stopped by the Freed inductance bridge where I was testing transformers for primary inductance. He asked me if I liked working with transformers. I told him that I very much did, especially with such a wide variety of transformers. We used McIntosh tube type high fidelity amplifiers to test the high frequency transformers for exciting current, and I had figured out how to turn a variac backwards to make it step up the voltage from the McIntosh amplifiers. Bev asked me if I thought I could figure out how many turns of wire might fit in the window area of one of the magnetic cores we were using, if he told me the wire size. I said yes, I think so, just figure out the cross section of the stack of turns in the window based on the wire diameter, etc. So he gave me a sample problem and

told me to bring it by whenever I thought I had it done. I worked on it as time permitted, and the next day gave him my result. He looked at it and smiled and said, "very good"; you forgot this one small thing here, let me show you, but you are close to the right answer". I felt great about this, of course. This was all totally new to me. Over the next few weeks, he occasionally asked me to try some slightly more complicated things, such as if I knew what the maximum current was in a winding, could I figure out what wire size was necessary? This I managed to do correctly, using my well-worn copy of the Radio Amateur's Handbook, with its wire tables in the back. I was totally unaware of exactly what Bev was up to in giving me these little problems. I was rather naïve I guess, and slow to recognize the import of what he was doing. But I soon realized what he was up to.

In early September, after Labor Day, Bev casually strolled by and said, "Hey, isn't it about time for school to start in the fall?" He asked me what courses I had signed up for at the local community college! By then, I already had so much respect for this man that, knowing he was thinking of my best interest (and asking a very pointed question), I did not have the nerve to tell him that I had, in fact, no such plans about going to school. Heck, I felt I was fixed for life already with such a good job. So I told him I was registering tomorrow. The next morning first thing I hot-footed it down to Valley College, just barely in time to register for fall classes. I registered for Surveying 101, Chemistry I and Calculus I, the start of an engineering major program. I had all the prerequisite courses from my math-science-language major in high school (I had followed good advice there, too). A week or two later, Bev casually stopped by my test bench and asked me about my classes, and oh, by the way, did I need to adjust my work schedule to fit my class times? Amazingly, (it did not sink in until much later), I did not realize at the time that in fact I was being offered a chance to have a flexible work schedule while going to school to study electronic engineering! In Bev Friedendahl I had stumbled upon a man who gave me some needed prodding, at my impressionable age, to help me make a decision to go on to school. It came at the right time in my young life. And, being so "old" (he was probably in his early 50's), as I think back on it after so many years have passed, Bev represented a kind of educated Father Figure, who probably knew what my potentials were, even if I did not. He gave me very good advice and

encouragement in retrospect. Fortunately, I had the good sense to act on it.

I started at Valley College, and never looked back. I worked at Calmag for two more years. I then transferred to California State Polytechnic College (CalPoly) in Pomona, California. I had met my future wife Linda at Calmag when she had come to work at Calmag, in the transformer test lab, winding toroidal cores. She had come direct out of high school, as I had some two years earlier. After we were married we worked together to put me through school. Five years after starting at Cal Poly, I graduated with my BSEE degree. I got hired by Hewlett Packard in Loveland, Colorado and started my engineering career which was to last 39 wonderful years at HP, with a total of 48 great years working in electronics for a living. While in Colorado working for HP, I attended Colorado State University (CSU) in nearby Fort Collins, obtaining my MSEE degree in 1969. Later that year we moved to San Diego County and built our own house.

I have always been active on the air, even during ten years of college. In Colorado I spent some years handling traffic daily on NTS CW nets at the Section, Area, and TCC levels. Some of the best CW ops I have ever encountered I met in NTS, handling traffic. For this I ran a pair of 813's in grounded-grid on NTS traffic nets, with a high voltage power supply on the floor consisting of four 866A's in a full-wave bridge. I remember snowy nights in my heated basement, handling traffic and basking in the glow of those mercury vapor rectifiers.

Over the years, I have built many different kinds of rigs and antennas and used them on the air. I dabbled in VHF/UHF, and built an Oscar station, but that kind of operating has just never held my interest like HF CW; just not enough different stations to talk with on VHF/UHF. Phone operation has never really held my interest, either. Today, it seems to me that what I hear on HF SSB resembles CB radio more than ham radio. I think, generally speaking, there is a higher class of operator on CW than on phone, but I am no doubt biased. CW requires a commitment and effort to become proficient at it, whereas most anyone can pick up a microphone and talk on the air. Perhaps that is the main difference, and it is nothing new.

As for the future of ham radio, I am not a believer in lowering technical or knowledge standards so as to attract more participants (misguided 'inclusiveness'), which is exactly the path that has been chosen in recent years. More hams means more

sales for manufacturers and more advertising in ham magazines. Quantity vs Quality. The result seems obvious to me today when I listen on the bands, especially on SSB. (FM is so far from the ham radio that I know as to be almost unrecognizable to me. I have read somewhere that 70% of all USA hams know *only* 2M FM, which speaks volumes). This dumbing-down never works; all you end up with is less knowledgeable and less skilled participants in my opinion. The non-renewable one-year Novice license was an excellent idea, and served to promote acquiring skills in order to upgrade to the permanent General Class or higher license. Upgrade, or you are out. This seemed reasonable to me then, and does now. Those who find electronics and ham radio interesting, will find it and pursue it on their own (they cannot help but do it!), with no hand-holding or "Elmering" required (although if available it might help, depending on the individuals involved). The initiative, effort and perseverance required to learn things on your own, in and of itself, tests your resolve, and is very educational, developmental, and rewarding. This is why homework is so important in school; doing your homework is where you do most of your real learning, not in lectures. My own experience (and that of many others) tells me that this is so. I think there will always be those who will discover ham radio of their own volition and jump in with excitement. I have talked on the air in recent years with teenaged hams who are excellent CW ops, some with less than one year's experience. One or two were even using simple homebrew rigs that they built. Some said that they had no one to guide them into being a CW op. But they nevertheless became interested in it. I hear daily from most hams today that "no one homebrews any more", and "you can't get parts", etc etc. Poppycock. They have not even tried, and so know nothing about it. Let us not confuse "Can't" with "Won't".

As for my ham radio activities today, I have been using homebrew gear exclusively, mostly using modern devices and methods, for many years now. The availability of free circuit simulation software has greatly expanded the enjoyment and results of my homebrew efforts. I highly recommend that any ham interested in electronics or homebrewing, learn to use this very useful and insightful tool, a good example being Linear Technologies' LTSpice. You can simulate most any circuit before you build it, and learn how it does and does not work, see all waveforms at all points in a circuit, measure its frequency response, experiment with different component values, everything you would do with the physical circuit on the bench, without lifting a

soldering iron. Changes can be made in seconds that might require minutes in a physical bread-boarded circuit. When you decide it is what you want, you can then build it with much more confidence that not only will it work, but much more importantly, you will understand *why*. I often make up circuits without any reason except for the fun of playing around with them in LTSpice. It is very educational and it provides insight into circuits that you may have found, someplace but do not understand how (or IF) they will work. You certainly do not need to be an electronics engineer to do most any of this stuff; little or no real design work is required.

A similar very useful computer program (that would save many hams lots of money spent on very low efficiency commercially made ham antennas with high prices), is Roy Lewellen's EZNEC program. A few minutes spent with this fun and easy to use program can prove informative for many hams considering what antenna to use. It tells you the *real-world* performance to be expected from most any antenna design, before you build or buy it.

I discovered, years ago, the beautiful audio and excellent performance possible using phasing techniques in homebrew receivers, particularly the amazing Tayloe Detector circuit, or Quadrature Sampling Detector (Q.S.D.) if you will. I've never gone back to superhet architectures. There has been a real Renaissance in the building of homebrew receivers using modern phasing techniques. Most hams are unaware of this.

Easy to use direct digital synthesis (DDS) devices have made possible very simple and stable VFO's requiring no tuning capacitors, dial drives, inductors or bandswitching, with DC-to-30 MHz frequency range capability with 1 Hz resolution, and nearly zero drift. Thus, I built my last LC VFO over 20 years ago. For several years, Analog Devices made DDS chips available free to *anyone* who asked, postage-paid! I took advantage of this, to build three DDS VFO's over the years.

Another newer device to come along is the integrated Numerical Controlled Oscillator (NCO), such as the Silicon Labs Si570 device. This generates a short rise and fall time square wave output, and covers from low HF to UHF frequencies. It makes an ideal local oscillator for Tayloe input phasing receivers, and I use one in my receiver. Like the DDS VFO, it too requires nothing more than an inexpensive rotary encoder for tuning, and low cost LCD for readout. It has crystal oscillator stability

and low phase noise, since it has a phase-locked loop internal architecture. I can also cover frequencies that current DDS devices cannot. There are many other devices available just perfect for ham radio applications, due to the explosion of wireless technology in recent years.

Homebrewing has never been easier, or cheaper, or more exciting than it is today! Using your own gear on the air, built for you only, is very rewarding and satisfying. It is something that no one can buy. The main reason I use homebrew equipment is that I can obtain features and performance that are important to me, but not available in commercially made ham gear. Many hams I talk with raise their eyebrows at this, but I have found it to be true, at least for the things that I consider essential in my rig. Others may be more easily satisfied, and commercial gear meets their needs. I am not one of those. I have had hams contact me via email and ask me to build my rig for them! They miss the entire point. They would likely never be happy with my rig; they would need to build a rig that meets their needs, not mine. Homebrew means just that: you build it, for yourself.

Being a CW op, I naturally use QSK (I can hear the other guy between my own signal elements, at full receiver sensitivity). This means I never send blind. It amazes me that so many CW ops today send blind, unable to hear even between words, or if the frequency is clear or not, or if the other station is attempting to break for a repeat or to advise QRM or suggest QSY, etc. Without QSK, the receiving operator is unable to stop the other station, who continues sending, perhaps to no one. Archaic, and such an unnecessary waste of time! I've built QSK systems using 10-cent rectifier diodes as PIN diodes at up to 1KW RF power level with good success. My current QSK system enables keeping the receiver running full time (no receiver muting and no inserted sidetone), and I hear my own 600W signal in the receiver, at the same level as the other guy's signal, down to S2 or so. There is 137 dB of insertion loss between the transmitter output and the receiver input whenever the key is down. That makes 600W at the transmitter output into *10 microvolts* at the receiver's input. Thus, the receiver runs at full input gain always, but is never overloaded by my own 600-watt signal from the transmitter located inches away. I call this "transparent QSK". No commercial ham gear I am aware of offers this very nice feature, which is relatively easily done. You can only get this if you homebrew it, as is so often the case. The very low cost is a bonus. This system is a joy to

use. Whenever I try out modern ham transceivers, I am immediately struck by how much I would miss my own rig. For this and several other reasons, I am never a buyer.

Although I am not a competitive person by nature, I did enter a 50W multiband homebrew amplifier I built, into the 2010 ARRL Homebrew Contest. I did this really because my old friend Bob N6CM told me about it, and we both thought the ARRL cost limit of \$125 was ridiculously high. I told him that 1/10 of that cost seemed a more reasonable goal. He suggested I put my money where my mouth was, so to speak. So for this reason I designed and built a very low cost 50 watt amplifier, and entered my resulting amplifier in the contest. I won the contest, which then required me to write a QST article about it, which I did. My out-of-pocket cost for that amplifier, which can be used on 160-10 meters with up to 70W output, using two 90 cent mosfets, was about \$10. (All parts bought new would be about \$32). I have had hams contact me and want me to build one for them. (They miss the entire point of homebrewing!). Much more interesting to me are the hams I have run into on the air on CW who are using these amplifiers which they built from my article. Hats off to them; homebrewing is still very much alive. The article also won the ARRL QST Cover Award as the most popular article, which says there must be a few homebrew enthusiasts out there. I personally think that there are many who see it done, and admire it, but much fewer are those who see it done and actually *do* something about it themselves.

Today, some 60+ years after first discovering ham radio, my abiding interest in ham radio as a technical hobby has never waned. In fact, it seems stronger now than ever. With unending interest in learning new things, plus so many wonderful new devices and even free software tools out there just ideal for homebrewing, I continue to greatly enjoy building my own ham gear and using it on the air every day. Sometimes all day. On CW only, of course.

"There is an obvious truth that people who build things are happier than those who buy them" - Anonymous

Don Huff, W6JL September 20, 2015