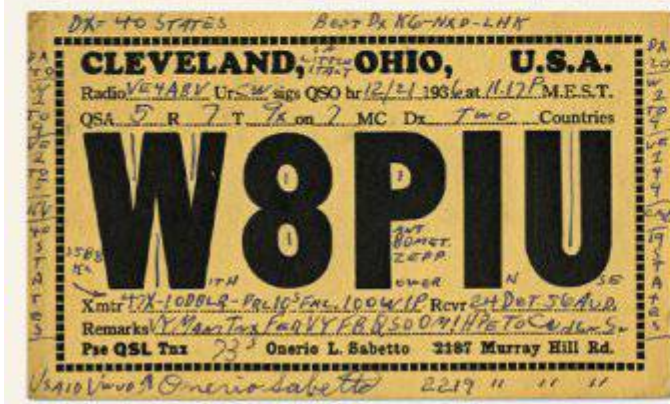
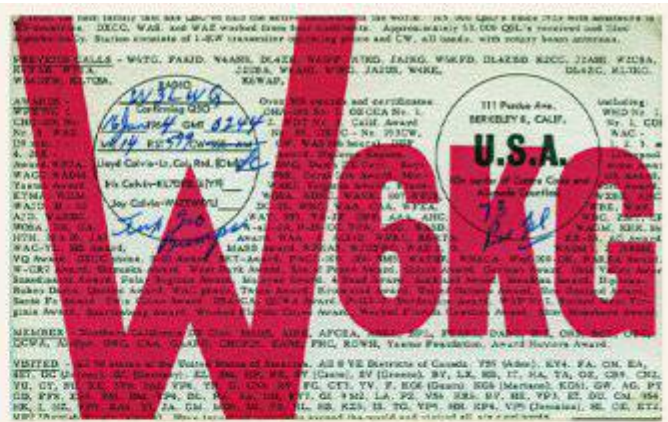


# The Rich History of Ham Radio Culture

Drawing on a wealth of personal accounts found in magazines, newsletters, and trade journals, historian Kristen Haring provides an inside look at ham radio culture and its impact on hobbyists' lives.



Source: [Flickr](#)

By: Kristen Haring

*Every night thousands of men retreat to radio stations elaborately outfitted in suburban basements or tucked into closets of city apartments to talk to local friends or to strangers on the other side of the world. They communicate by speaking into a microphone, tapping out Morse code on a telegraph key, or typing at the keyboard of a teletypewriter. In the Internet age, instantaneous, long-distance, person-to-person communication seems ordinary. But amateur radio operators have been completing such contacts since the 1910s. The hobbyists often called “hams” initially turned to radio for technical challenges and thrills. As the original form of wireless technology became more reliable and commonplace in the 1930s, ham radio continued as a leisure activity. Hams formed a community through the same general practices of other social groups. They set conditions for membership, established rules of conduct, taught values, and developed a specialized vocabulary known only to insiders. In her book “[Ham Radio’s Technical Culture](#),” excerpted below, historian of science and technology Kristen Haring draws on a wealth of personal accounts found in radio magazines and newsletters and from technical manuals, trade journals, and government documents to illustrate how ham radio culture rippled through hobbyists’ lives.*

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Learning the group culture was essential to becoming a ham, and ham radio publications taught behavioral expectations to new hobbyists right along with technical lessons. The “ABC’s of Ham Radio” welcomed readers to “the ranks of the grandest hobby in the world — the great international fraternity of radio hams!” then indicated in the very next sentence that “To really belong, you’re going to have to go along with the standard operating procedures universally accepted by radio amateurs.”

## *Ham Radio's Technical Culture*



Kristen Haring

This article is excerpted from Kristen Haring's book "[Ham Radio's Technical Culture](#)."

Most manuals devoted a chapter to operating a wireless station, including an overview of on-air etiquette. One author noted that "a sense of courtesy is important" and told hams not to transmit on frequencies already in use. With surprising regularity, handbooks also endorsed general personal "qualities of the true amateur" such as "inquisitiveness, persistence, improvisation, imagination and an open mind." The exchange of technical ideas through magazine columns was cited on one occasion as a testament to the fact that "The amateur spirit has always been characterized by friendliness, helpfulness and an eagerness to share one's knowledge, tricks and pet circuits with others." The constant stream of brief prescriptions of norms and values in hobby publications served as a powerful source of enculturation into the ham community.

## Code of Behavior

A concise, and the best known, list of good hobbyist conduct was the "Amateur's Code" distributed by the American Radio Relay League (ARRL). "The amateur" portrayed there is "gentlemanly," "loyal," "progressive," "friendly," "balanced," and "patriotic." The League has printed these six traits prominently in the front of its annual "Radio Amateur's Handbook" since the 1920s. Underscoring the instructional nature of the code, a didactic explanation followed each adjective. A ham's progressivism, for instance, meant that "He keeps his station abreast of science. It is built well and efficiently. His operating practice is clean and regular." The League's role as a lobbying agency shone through in deeming a hobbyist "gentlemanly" for abiding "by the pledges given by the ARRL in his behalf to the public and the Government." The ARRL's "Amateur's Code" provided a model for hams to live up to and presented a favorable image of hams to outsiders. Given how frequently the popular press reprinted the standards as if they offered a neutral description of hobbyists, the "Amateur's Code" succeeded as a form of public relations.

The social ties of the ham community exerted peer pressure to enforce the rules set for members' behavior. Praising the effectiveness of "self policing" within hobby radio, a *CQ* magazine article called "The weight and influence of amateur approval [ . . . ] a very strong element in forcing the amateur to abide by the rules." A handbook instructed, "At all times keep your conduct beyond reproach," and tried to win compliance by reminding the reader, "You represent the amateur fraternity — any action on your part, good or bad, will reflect on all other hams." When the "fraternity" roster had swelled to more than a quarter million in the United States alone, another manual stressed that the "number of stations in our crowded bands poses a serious threat to our enjoyment of ham radio if we do not all operate courteously and intelligently."

Hobbyists who did not meet community expectations were subject to criticism, punishment, and in extreme cases expulsion.

The strategic potential that set wireless communication apart from most hobbies subjected it to a level of state scrutiny unheard of for other leisure activities. The power of the federal government stood behind the only official barrier to entering the ham community: obtaining a license to operate two-way radio. Licensing of ham radio began under the Radio Act of 1912 and varied little over the next 80 years. The Federal Communications Commission (FCC) required prospective hobbyists to demonstrate knowledge of electronics theory and radio regulation in a written exam and the ability to send and receive Morse code in a test performed with wireless apparatus. The FCC contained amateur conversations to particular bands of the radio spectrum, restricted the power of transmitting equipment, required hobbyists to log all contacts, and monitored the airwaves for infractions. Because they regarded state control as a tribute to their strength, hams accepted federal licensing and communication

regulations as the first level of hobby radio rules.

In the early 1940s, wireless hobbyists trying to change their image from tinkering pranksters to upstanding citizens volunteered to help the FCC track down unlicensed operators. The American Radio Relay League (ARRL) spoke of lending assistance with enforcement as a tactic to keep hams on good terms with regulators. When the FCC caught a notorious “unlicensed punk” in 1941, the ARRL chided members for not having found him and called for improved “policing” within the hobby. The League reasoned that “our interests require that we show no tolerance either to bootleggers or to violators of the FCC’s special orders.” Defense of community boundaries further motivated hams to turn in illegal operators. Monthly club bulletins offered a timely format for calling attention to mischievous on-air behavior. The newsletter of the Northern California DX Club, for instance, exposed an operator suspected of using false credentials after confirmation cards a member sent to him had been returned marked “addressee unknown.” Joining together in this way to ostracize rule-breakers from the on-air community increased solidarity among upstanding wireless operators.



The confirmation postcard of W8CPC, a ham from Buffalo, New York, carried a drawing of a buffalo and the initials “WAC,” indicating he had “worked all continents.”

Ham radio licenses functioned as membership cards signaling inclusion in a technically elite club. Like station licenses for commercial radio and television broadcasters, all hobby licenses in the United States began with “W” or “K.” On amateur licenses, the initial letter was followed by a numeral — designating which of the nine FCC geographical districts the operator lived in — and two or three additional letters. The alphanumeric “call signs” lent hams legitimacy and, in some cases, reflected the duration of the holder’s radio activity. When the FCC first issued amateur licenses, all began with “W” and contained three letters total. The creation of calls that began with “K” and of calls containing four letters only occurred once the number of short “W” calls was exhausted. After the FCC introduced these new calls, a ham with a short “W” call like W3CT could be recognized immediately as a longtime license holder compared to a ham operating under W8JBH or K2MJW. Call signs became hobby community nicknames, and club newsletters frequently referred to members by license number instead of name. Even many outsiders learned to recognize the basic form of FCC licenses, so that a car with a call sign vanity license plate stood out as belonging to a ham radio operator.

Although hobbyists enjoyed being distinguished as more technically adept than average citizens, many objected to the technical hierarchy imposed within their ranks by the FCC’s “incentive licensing” program. Beginning in the 1920s, the FCC offered various amateur license grades. Hams who passed an advanced theory test and exhibited faster Morse code sending and receiving skills earned additional operating privileges and bragging rights in the form of “Extra” or “Technician” licenses. An editor at *CQ* magazine in 1966 blamed the internal division of hobbyists according to ability for provoking

“fierce in-fighting,” and the Commission’s expansion of the incentive program a few years later angered hams. Letters of protest poured in to *CQ*, accusing incentive licensing of undermining the “unity” of “the radio fraternity.” One writer argued that with “the old days of major electronic breakthroughs by amateurs” a distant memory, it made sense to “bring back the fun of amateur radio” and “junk the snob appeal of incentive licensing.” Based on the negative reaction, *CQ* estimated that if “a vote had been taken of *all* licensed amateurs” on whether to expand the incentive licensing program, “it would have been defeated by an almost three to one margin.”

## **Morse Code**

One way hams displayed their technical identity was by using Morse code. Their admiration for the code as the ideal form of communication stemmed from the importance granted to coding skills in the FCC licensing examination and from hobbyists’ appreciation of how the code transformed language. Tapping out sequences of short and long electrical pulses on a telegraph key required human synergy with machinery and gave words a technical feel. Still, the sender’s personality transmitted through the machine. “Code operators quickly learn one another’s ‘touch,’” wrote an Army radio specialist. “The way a person sends code is almost as distinctive as his voice.” Hams referred to this human accent detectable in code transmission as the sender’s “fist.”



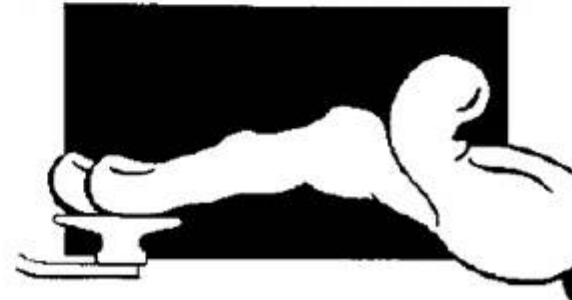
THE NIBBLER



THE TEA DRINKER



THE SLAPPER



THE HITCH HIKER



THE TAPPER



THE JITTER

An illustration in an article on “Proper Sending Techniques” caricatured several undesirable styles for tapping out Morse code on a telegraph key. From MARS Bulletin, March 1952.

In the early days of wireless, Morse code was the only way to transmit a message. Long after it became possible to speak over the airwaves, numerous articles in radio publications and speeches at club meetings extolled the virtues of Morse code. Hobbyists praised the code as reliable and versatile and also called attention to “a special beauty in perfectly sent code and a certain emotional rhythm” to some words. The further claim that Morse code was “a widely understood international language [ . . . ] that links hams together throughout the world regardless of their individual, indigenous languages” was a gross—but not uncommon—exaggeration because Morse code encoded the alphabet, not words or concepts.

Tales of getting a fellow ham’s attention across a crowded room by speaking his call sign in Morse code were frequently and fondly recalled.

The code set adept hams apart from confused outsiders. The written “key” that assigned a combination of dots and dashes (representing short and long electrical pulses) to each letter of the alphabet was widely available, but the challenge of applying Morse code kept it somewhat at the level of a cipher. Only with practice and, according to hams, patience, dedication, and attentiveness was it possible to transform thoughts fluidly into tapped electrical pulses or to hear phrases emerge from patterns of short and long tones. Communicating by Morse code created privacy in public. Tales of getting a fellow ham’s attention across a crowded room by speaking his call sign in Morse code—substituting the syllable “dit” for each short pulse and “dah” for each long pulse—were frequently and fondly recalled. One hobbyist described secret exchanges he had with his brother while double-dating as teenagers, Morse code giving them the freedom to discuss “the characteristics of our dates in their presence without their knowing it!”

## **Spoken Operations**

The main alternative to wireless communication by Morse code was voice or “phone” operations. In this case, hams with the proper equipment could just speak. Phone transmitters fell within financial reach of the average hobbyist after World War II. Surveys about operating habits conducted by radio magazines found that the typical postwar ham split his time between coded and spoken operations, spending about twice as much time using phone as code. A small portion of hams, about 5 percent in 1957, worked only in code. The simplicity of voice operations led to continuous, passionate debates that code better suited a technical hobby. When the FCC dropped knowledge of Morse code from the requirements for a basic amateur radio license in 1991, fierce opposition to “no code” licensing included a “know code” movement among Morse-loyal hams who insisted that the code remained vital to modern operations.

Preference for code over spoken communication reflected a desire to rationalize language. Transmitting by Morse code processed words through technical apparatus and removed the voice from communication. Advocates of the code claimed that translation into its binary system of electrical pulses eliminated vagueness. “Communicating by dot and dash,” Howard Pyle contended, was “far more accurate than the spoken word.” Since the complexity of Morse operation made it unlikely that the code would be perfectly sent and received, and in light of hams’ acknowledgment that the “fist” inflected Morse with the sender’s personality, arguments that the code assured clarity sounded like appeals to its pure technicality. Attempts in hobby publications to establish a beneficial association of hams with the military by pointing out that both used the code only made the code seem more disciplined. With encrypted, systematized language, hams also reduced the risk that radio conversations

would be associated with what they saw as women's idle chatter. The explanation by a female hobbyist in 1948 of her preference for Morse code suggests the existence of a gendered spectrum of wireless communication with women talking as the most feminine mode, men coding the most masculine, and men talking and women coding falling somewhere in between. The intrusion of what she called "too many \$%&'()\* unlicensed wimmin [*sic*] (wives, gal friends, etc.) cluttering up the phone bands with chin music," led Carol Witte to conclude, "any self-respectin' licensed gal wouldn't be caught dead blabbin' fer [*sic*] hours on a mike — nor a good OM [male] operator, either."

Morse loyalists battled phone loyalists for territory on the airwaves. It is difficult to document these feuds, which usually were limited to a heated exchange of words, but a few escalated to the point that regulators became involved and left a paper trail. The FCC counted Myron Premus among the "considerable number of amateurs in the Buffalo and upstate New York area" who fought to eliminate code operation from portions of the radio band in the early 1950s. After receiving "complaints regarding the manner in which he has operated his radio station," the Commission evaluated whether to renew Premus's license. The subsequent investigation found that Premus had "caused willful interference" to hams using Morse code by making "one-way communications consisting of disparaging remarks either about the operator or his manner of operations." Opposition by Premus and others to Morse code may have disturbed hams' conversations, but it did not threaten ham identity.

## Secret Language

The hobby radio community made language its own and clarified group membership by adopting jargon and abbreviations known only to insiders. In a few cases, jargon arose from the desire to convey non-words through Morse code, such as when hams indicated laughter or sarcasm by signaling "hi hi." Hobbyists used abbreviations to shorten Morse code transmissions and carried these into their regular writing. Substituting "vy fb" for "excellent" in a hobby publication reduced keystrokes. The symbolic efficiency of abbreviations further supported hobbyists' portrayal of radios as efficient devices and radio operators as efficient people. Even more significant, the abbreviation lent the text a bit of technicality by associating it with Morse code. Many of the abbreviations used by hams came from a system devised by telegrapher Walter P. Phillips in 1879. Hobbyists also took up telegraphers' "Q signals," three-letter combinations beginning with the letter "Q" that represented common phrases. "QTH" served as a quick way to ask a station location, for example, and even functioned across language barriers. Only the hobby community expected members to be fully conversant in jargon, with the FCC licensing examination merely testing the essential Q signals.

Annoyed with "hams who abuse the ears of their listeners," Don Fox wrote a guide to help hobbyists determine whether they suffered from "mumble-itis."

When hams peppered spoken and written language with abbreviations intended for efficient Morse code transmission, they gave all forms of group communication the flavor of ham radio. This propagation of hobby culture accounts for the persistence of awkward habits such as interrupting the flow of conversation with another ham by saying "hi hi" instead of simply laughing. A few sticklers insisted that the Phillips code and Q signals could be used "properly" only within the Morse system. During phone conversations, in person, or in print, this minority said, it was "more natural" to just say or write the complete phrase rather than the abbreviation. In response to "several years" of what it called "weak and withering attacks against that traditional amateur workhorse: The Q-Signal" by those who favored normal, full words, *CQ* magazine defended spoken codes as more than a linguistic convenience. The Q signals, according to the editorial, "catch the imagination of the newcomer" and formed part of "amateur radio's character." In the late 1960s, "the radio amateur's most individualistic jargon" also helped separate hams from Citizens' Band hobbyists, who the *CQ* editor described as



using “mundane and lackluster phrases.” Asking “What’s your QTH?” instead of “Where are you located?” indirectly inserted Morse code into plain English, signified membership in the ham community, and left outsiders scratching their heads.

Hobbyists valued clear, standardized speaking during phone operations. They gave the practical justification that distant communicators had trouble understanding each other’s accents, especially when reception was poor. Extreme language regimentation appeared to represent an attempt to strip away the individuality of human speech and replace it with a mechanical uniformity. Annoyed with “hams who abuse the ears of their listeners,” Don Fox wrote a guide to help hobbyists determine whether they suffered from “mumble-itis.” Fox described ham radio as focused on “getting a thought to somebody else by way of intelligently combined sounds.” He harped on “proper enunciation” and directed mumblers to “books on the subject of proper speech and the training of the speaking voice.” While calls for such broad corrections of speaking style were rare, all hobbyists agreed on the need for linguistic precision in certain situations.

Hams coped with the similar-sounding names of letters of the alphabet — crucial for conveying call signs — by associating distinctive words to each letter. “KB3DF” would read out his call as “kilowatt bravo three delta foxtrot,” for example. Several supposedly “standard” phonetic systems circulated among hobbyists, with none dominant and each freely varied in application. KB3DF’s preferred rendering of his call broke from the International Civil Aviation Organization’s phonetic list only in substituting “kilowatt” for “kilo.” This particular customization of an outside template to the hobby was quite common and related to the special meaning that a kilowatt held in ham radio as the maximum legal operating power. Disdainful of other “cute” alphabet-word pairings that “have no business being used on the air,” an ARRL handbook reminded readers that “there is a definite advantage in using a standard phonetic alphabet.”

## **Surveillance and Self-Policing**

Speaking habits, transmitting practices, and even the content of radio exchanges were disciplined through surveillance. The FCC monitored the airwaves mainly for operating violations. In 1946, *CQ* compelled readers to obey regulations with the threat that the Commission’s “mobile units are continually patrolling the country, stopping in cities to observe local activities, and listening from vantage points for unlicensed stations.” Hobbyists meanwhile handled the policing of the community’s internal communication rules. If they did not like what they heard in the course of scanning the amateur band, hams freely critiqued operators and occasionally passed matters on to federal authorities. It was the verbal reprimands Myron Premus had issued to fellow hams, for instance, that prompted his investigation by the FCC. When Premus “noticed off-frequency operation, over-modulation, or other operations not in accordance with the Commission’s rules,” he called the offenders “lid,” “louse,” “jerk,” and “hollow head.” One ham found Premus out of line for using such language on the air and alerted the FCC. In defense of Premus, other hobbyists expressed their own frustration with the “many dopes on that band that should not be on.” They sympathized that “We cannot take away their licenses” and that derisive name calling was the strongest punishment that could be meted out by the ham community. The FCC agreed with the assessment that Premus had been incited to speak out, though its report cited improper operating procedures as the provocation rather than a breach of hobby standards.

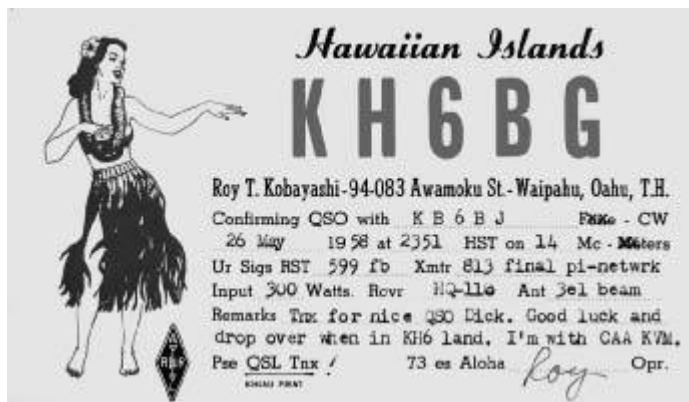
A gentlemen’s agreement protected wireless discussions exposed to all ears. Claiming that those who only listened to the radio lacked the discretion of two-way radio operators, a tale in *CQ* magazine directly linked the attributes of a technology with the character of its users. The author described his teenaged neighbor as fascinated by what hams revealed to anyone who might tune in with a shortwave receiver. On meeting a ham in person, the shortwave listener repeated embarrassing personal

information he had heard disclosed over the air. To stop this impolite behavior, the author helped the teenager study for a ham license because “no ham dares tell what he knows about another.” The community believed that two-way communication made hobbyists discreet through a control mechanism absent from shortwave listening. What kept hams from gossiping was the risk of retaliation, the fact that “the other knows as much about him.”

State control of the airwaves further disciplined radio operators by effectively squelching political conversations. Hams recognized they were “involved with, formed by, and regulated by politics.” Yet fear that ideological battles would result in tighter regulation by the federal government led hobbyists to pragmatically refrain from political activity “unless it is something for the good of amateur radio,” stipulated a 1935 club bulletin, “and then, only when it is absolutely necessary.” The ARRL hired professionals to lobby for radio rights, and many smaller organizations and individuals spoke with their representatives in Washington whenever competing forms of communication encroached upon amateur bands or when international tensions threatened to silence the hobby. Otherwise, ham radio culture dictated that there was to be no discussion of politics on the airwaves, at club meetings, or in hobby publications.

## Confirmation Postcards

The hobby community fostered a particular kind of sociability by endorsing selected forms and styles of off-air communication. The first non-radio contact between two hams usually was the exchange of postcards called “QSLs.” (“QSL” is a Q signal for “I acknowledge receipt.”) Through these cards, ethereal, fleeting, auditory conversations took on a material, enduring, visual reality. It was common for a ham to customize his confirmation cards with images and text that conveyed something about himself, his locale, or his relationship to the hobby and to create a card “truly representative of the sender.” One article offering design suggestions for QSLs instructed that the overall appearance should be “workmanlike” and warned against color combinations that “would lack strength” or “appear garish and cheap.”



A hobbyist in Hawaii included a drawing of a hula dancer on his radio contact confirmation card, along with a logo designating his membership in the American Radio Relay League.

To satisfy curiosity about “what kind of face goes with the voice or fist” heard over the radio, hobby publications often recommended putting photographs on confirmation cards. Traditionally such postcard photos showed a ham seated alone at the operating position in his radio shack. The subject matter of photographs hobbyists sent separately varied from this pattern. Amid dozens of snapshots, mostly from the 1940s and 1950s, that one ham received following on-air exchanges, just a few included radio equipment and shacks. The vast majority depicted only human subjects — the hobbyist, and sometimes his wife and children. Enclosing a family photo in a letter had the potential to broaden a

budding friendship from its initial focus on radio and at the same time confirmed the sender's heterosexuality, clarifying the limit of this new relationship between men.



K3UOC sent confirmation postcards in 1964 that showed what he looked like while operating his amateur radio station.

The space on confirmation postcards was largely reserved for technical data and limited hams' correspondence on QSLs. To make up for this, one handbook explained, many hobbyists sought "personalized and expanded communications." Another guide suggested that hobbyists include "letters describing their station in more detail and setting up schedules [for future conversations] with the other operator" when sending QSLs. "The desire to truly communicate with distant lands rather than merely logging countries and exchanging QSL cards" inspired some to send magazines and other small gifts to friends they knew only from talking by radio. This type of contact, according to one hobbyist, constituted "meaningful" communications and brought "additional pleasures" to ham radio.

### **"Eyeball Contacts"**

Meetings in person, which hams called "eyeball contacts," solidified friendships begun on the air and through correspondence. The Sandia Base Radio Club in Albuquerque, New Mexico, sponsored a "Friendship Award" that functioned much like an off-air analog of the ARRL's award for "rag chewers." To be eligible, a ham had to contact 25 local hobbyists and follow these on-air meetings with eyeball contacts, documented with the new friends' signatures. Handbooks encouraged visits between distant hams by pointing out that staying with a fellow hobbyist when traveling "cuts down on expenses, and the hospitality is always first rate."

Since mid century, hundreds of radio clubs have existed simultaneously in the United States, formalizing in-person gatherings between hams who lived near each other, worked together, or shared particular radio interests. The Los Angeles area alone had more than 30 clubs active in the 1950s. Clubs grounded hobbyist values in a visible social unit and provided vital mechanisms for enculturation. Hobby publications described clubs as offering the structure that individuals needed in order to feel connected to the ham community. Of the eight benefits of membership the Rochester Amateur Radio Association advertised in 1953, five focused on the pleasures of being part of a group. The club offered "Participation in club events open *only* to club members" and "Enjoyable monthly meetings." For \$3 a year, the hobbyist was told he could expect "Fraternity with fellow hams from all walks of life" and a sense of "Belonging, knowing you're associated, being a part of things." Should anyone question his inclusion in this community, the club member could answer the challenge by presenting his "Billfold-size membership card." Similar comforts of community could be found in looser affiliations, too. Specializing in a certain type of radio operation, according to one hobbyist, offered "a new sense of identity — a sense of belonging" by defining a smaller sphere of interaction.

In the relaxed atmosphere of clubs, hams were gradually socialized into the hobby community. *CQ* magazine called clubs “the seat of true democracy in amateur radio” and charged each to “keep ‘working on’ its new Novice licensees and help to make *good hams* out of them.” This process required “a lot more than [lessons in] technical and operating proficiency, and includes indoctrination into organized amateur activity [ . . . ] and in the traditions of our game.” As part of their cultural instruction, hobbyists learned and practiced radio jargon in clubs. A handbook for new hobbyists described the typical meeting as “mostly informal — much ‘rag chewing’ goes on, coffee and doughnut breaks are common, and ham jabber fills the air, much of which will rub off on you.” Once the “gibberish” of hams’ language began to “form a pattern,” a newcomer could become “an enthusiastic participant” in meetings and other hobby activities.

Newsletters captured the casual, friendly interaction of clubs. Typically these were monthly publications produced inexpensively by a volunteer editor. They were intended as “extremely personal publications in contrast to the commercial jobs,” according to one editor, and aimed to “deal directly and personally with each and every member of the club, in name as well as in activities.” Because hams took pleasure in “reading about themselves and about the folks they know,” the audience for club bulletins tolerated amateur publishing efforts. The ARRL reassured editors intimidated by literary responsibilities that it was all right to “know more about gamma than grammer [*sic*]” since newsletters were “just another means of communication among friends — like ham radio.” Club publications deliberately retained a local flavor and plain language. Every page, in style and content, displayed the culture of ham radio.

To explain the basis of that culture — from the expectations for behavior to the preferred manner of speaking — radio hobbyists always pointed back to their chosen leisure technology. Certainly many ham values derived pragmatically from wireless apparatus. Audible transmissions depended on precise operations, and open exchanges required discretion. Admonitions in ham publications against faults such as messiness had a more tenuous technical connection, though might still be plausibly justified with claims that, for instance, electronics performed more reliably when constructed tidily. But some characteristics of two-way radio operators came to be perceived as based in the technology only as a result of considerable effort expended by hobbyists.

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*Kristen Haring* is a historian of science and technology, and the author of “[Ham Radio’s Technical Culture](#),” from which this article is excerpted.