JOHN R. PIERCE
J J COUPLING

J. J. Coupling—glider pilot, science fiction writer, computer music composer, engineer, administrator, scientist, technical author, inventor, systems specialist, communications wizard, psychology buff, and pioneer satellite communicator—is back at Caltech. To stay.

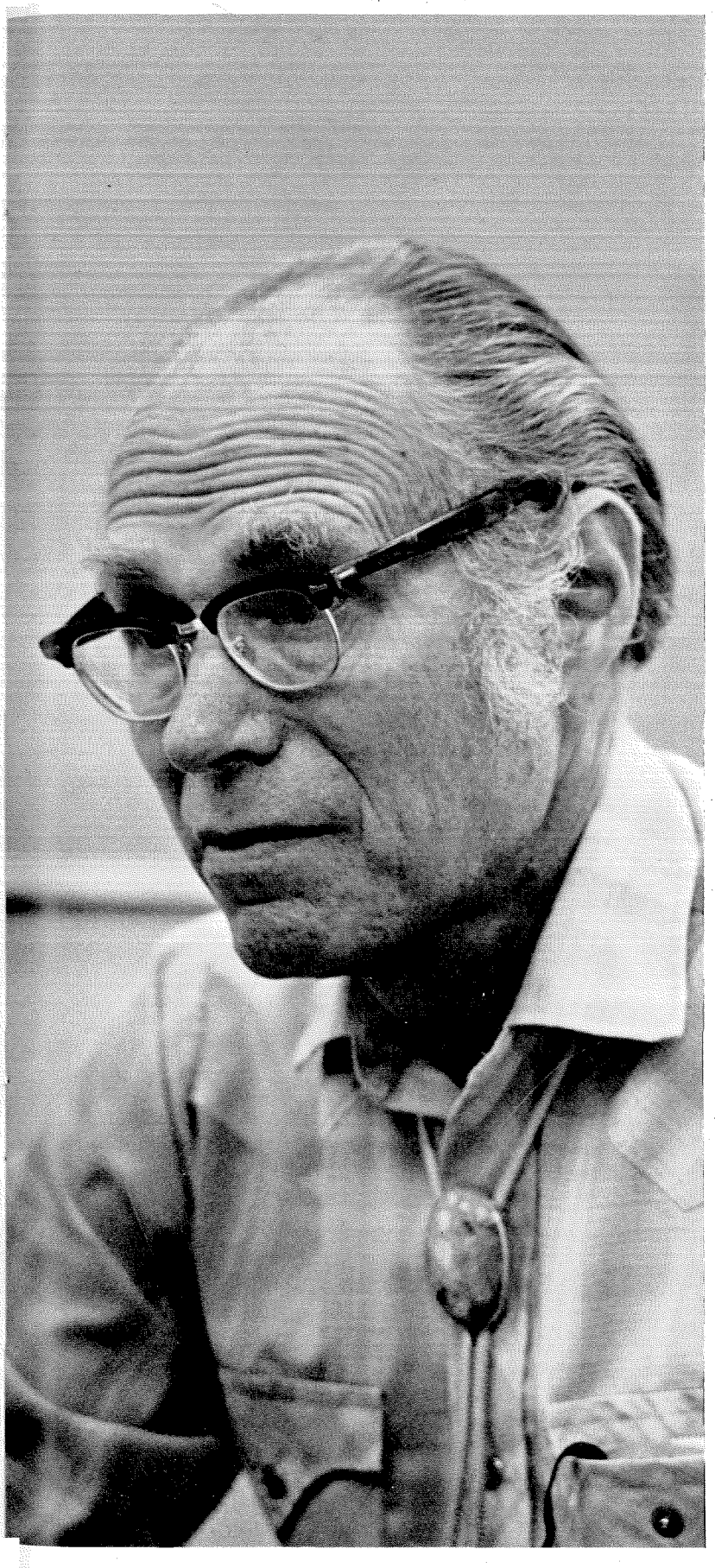
He has agreed to settle down in exchange for an office at 115 Steele Laboratory and a title: professor of engineering. The name on the door reads "J. R. Pierce," an alias Coupling has used off and on for more years than he likes to talk about and which he has distinguished considerably since 1936. That was the year he left Caltech with his shiny new PhD degree to begin a notable 35-year career at the Bell Telephone Laboratories.

At that time he was known simply as John R. Pierce. That's what he was christened back in 1910 in Des Moines, 17 years before his father—once a traveling salesman in ladies' hats and later a partner in a millinery chain—retired and settled in Long Beach. "John R. Pierce" also appears on his three Caltech diplomas, 84 patents, 13 books, scores of technical articles, two record albums, a marriage license (shared with his musician wife, Ellen), and assorted other personal documents, including his acceptance letter at Caltech.

Still, Coupling has been around too long to be intimidated by the competition from Pierce or to accept total eclipse gracefully. J. J. surfaced after Pierce went to Bell Laboratories and developed second thoughts about how his own name on stories and articles in science fiction magazines (he was already a veteran contributor) might affect his employers. He plucked the pseudonym "j-j coupling" from atomic physics (it describes certain reactions in atoms), and it has since appeared as the by-line on numerous articles and fantasies carried by such magazines as *Astounding Science Fiction.* It was this magazine that in 1952 published Coupling-Pierce's "Don't Write: Telegraph!" a pre-Sputnik treatise on space communications that foreshadowed much more concrete accomplishments in satellite technology by Pierce and His Bell Laboratories colleagues.

Pierce's first publisher, Hugo Gernsback, created the world's first science fiction magazine, *Amazing Stories,* and later edited *Science Wonder Stories,* which printed Pierce's first science fiction story—"Relics of the Earth in March 1930." Writing for Gernsback didn't seem to interfere with Pierce's other literary pursuits—stories, articles, and poems in campus publications. It didn't hurt his scholarship either; he graduated with honors in electrical engineering. William Smythe, professor of physics emeritus, taught Pierce for three terms of electromagnetic theory and recalls him as a fast-moving blur who was "very original and had a lot of sidelines" but through it all remained "one of the top students." This was no small accomplishment considering that his classmates included Simon Ramo, William Fowler, Dean Wooldridge, and the Clauser twins, Francis and Milton.

Francis, now chairman of the division of engineering and applied science, supplied the decisive blandishment, but the campaign to lure Pierce away from his comfortable Murray Hill, N. J., office onto the Caltech faculty began at least 10 years ago under Clauser's predecessor, Fred Lindvall. Pierce steadfastly refused to be wooed, so Clauser's shock was understandable last June when he answered his phone and heard Pierce matter-of-factly announce, "You know, I think I'd like to come to California." The act wasn't as precipitate as Pierce's account makes it seem, although he does admit that his habit of "acting quickly once I've made up my mind" is sometimes fused with impulsiveness by his associates. For the record, he has been a regular visitor to the campus since he joined Bell Laboratories, and he and his wife spent "a satisfying week" in Pasadena last April when Pierce gave



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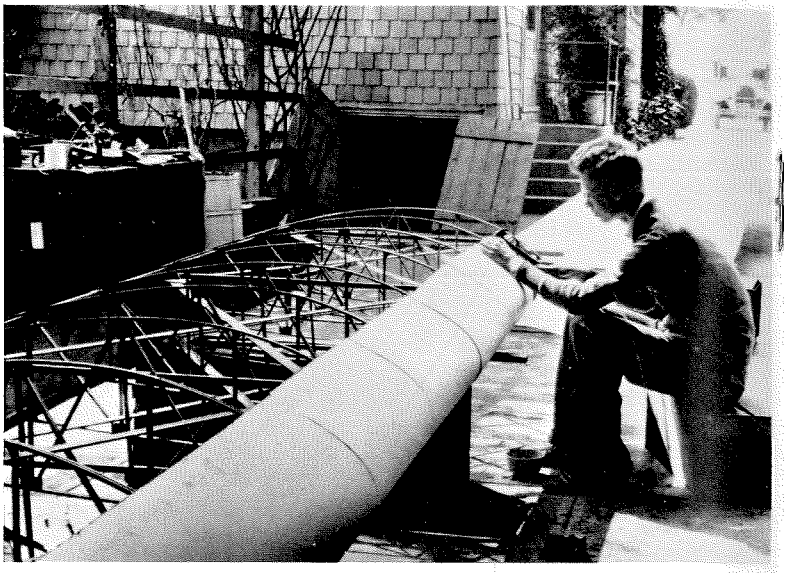
a talk on "20 Years of Computers and Music." They were back again in June "to look at houses" and decided for Caltech on the plane ride home.

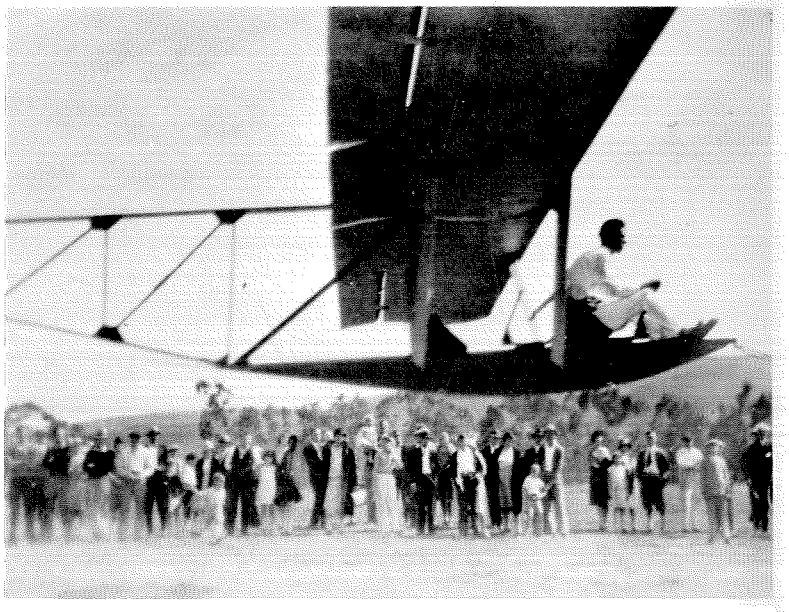
Pierce is a man of consuming intellectual curiosity and protean interests. As executive director of Bell Laboratories' Communications Sciences Division, he took advantage of the "unusual things dumped in his lap" to establish a reputation in areas pretty far afield from electrical engineering.

Working with composer James Tenney, he digested enough musicianship ("I can't carry a tune") to compose electronic ditties that appeared on two Decca recordings, "The Voice of the Computer" and "Music from Mathematics." Pierce has collaborated on a book on speech and hearing, and he has also published papers ("not major") in experimental psychology. Science, art and communication, and a history of science in New Jersey are other subjects that have had his literary attention—and contributed to his grand total of 13 books.

If this partial bibliography doesn't convey something of the essential eclecticism of John Pierce, then consider his house, a Japan-inspired creation, complete with formal garden, ornamental pool, and Japanese gardener. Pierce's romance with Japanese culture began many years ago when he admired some native prints in the rooms of Harvey Eagleson—one of Caltech's notable professors of English from 1928 until his death in 1967—who heightened the interest by suggesting that Pierce read the eleventh-century Japanese novel *The Tale of Genji.* The effect was profound. A few years ago Pierce converted his wife during a three-week visit to Japan which left them both "completely charmed."

Pierce's energy, his peripatetic curiosity, and his boundless appetite for knowledge bubbled up very soon after the Pierce family moved to St. Paul in 1911 when John was just a year old. It took a decided scientific bent. Before he could read himself, he listened by the hour as his mother, a milliner, read him technical books on all subjects, especially electricity. When young John learned to read for himself, he consumed all the scientific literature in sight, "good and bad." This included science fiction.





Back in 1929 gliders were hand-built, flimsy contraptions gotten aloft by being towed—preferably on a downhill slope—behind a bucketing tin lizzie. In spite of the problems, John Pierce built this craft, flew it, and produced a how-to handbook out of his experience.

Not surprisingly, scholarship came easy for Pierce. He graduated from Woodrow Wilson High School in Long Beach in 1928, compositely recollected by classmates as "wiry, serious, brilliant, thoughtful." The preferences that would forge his adult life were becoming pretty well established—a love for science, particularly the applied side, and certain knowledge that he was a gifted science scholar. Later, when pondering why he chose engineering over history or literature or one of the other areas he has since proved adept in, Pierce was prone to attribute it all to a background that from childhood was one of "gadgeteering." He did seriously consider writing but decided that since his "brains were more suited for engineering," he would choose the more "practical" route and retain writing as an avocation and safety valve when the equations began to close in on him. "I was right, you know," he says pensively.

Pierce hasn't always been that right, but he has never let discouragements stop him, either. Take the time he and two high school classmates decided to build their own glider, a prospect for which they were about as well prepared as Scrooge was for Marley's ghost. They turned to in the garage of Apollo Smith, later a classmate of Pierce's at Caltech, and manufactured a contraption of bicycle spokes, wagon wheels, and piano wire that crashed on its maiden flight. But they kept at it and eventually produced a version that not only got airborne, but also won a few silver cups at a San Diego glider meet in 1929. Pierce went aloft "more from pure ignorance than from courage." It was in this period of glider madness that he got his first literary commission from Gernsback. *How to Build and Fly Gliders* ($1 per copy) made its appearance late in 1929.

This debut coincided roughly with Pierce's matriculation at Caltech and the Black Tuesday collapse of the stock market, events which Pierce insists are unrelated. Some seven years later, Pierce, who says he had evolved into a young and cynical scholar, was packing to report to Bell Laboratories' main research facility at 463 West Street on New York City's waterfront. One of the last items to go into the suitcase was his PhD dissertation on what later became known as a sampling oscillograph. It came as something of a shock to Pierce when he recently examined the document and realized that he has been a physicist in engineer's clothing for the past 35 years. Electrical engineering was part of physics back in the 1930's.

Bell put him right to work on vacuum tubes, something he knew next to nothing about. After thoroughly grounding himself in the subject, he began—predictably—to emerge as one of the organization's most creative thinkers and imaginative inventors. Some of his results he remembers as "good for absolutely nothing." Others had significant practical value, particularly his electron gun (now the Pierce gun) which focuses and controls a high-current stream of electrons and has been a key technological link in the evolution of the traveling-wave tube. During this period, Pierce's personality was causing almost as much stir among his colleagues as his genius. His quick mind made him impatient with those who were slower on the uptake, and he got a reputation for abruptness if not rudeness ("considerably mellowed now," he believes). His

literary bent also reemerged in such aphoristic gems as "Nature abhors a vacuum tube." Later, as one of Bell's most successful and honored scientific administrators, he would growl, "Paperwork is all right if you hate it enough."

It's not easy to separate Pierce's personal scientific approach from the problem solving philosophy that Bell Laboratories has applied so successfully, perhaps because each had a lot to do with shaping the other. Both emphasize research on tractable problems where useful results can be anticipated. Both respect a step-by-step approach in which the previous step is thoroughly understood before the next is undertaken. Both have enjoyed brilliant results by bringing together small interdisciplinary groups of scientists and engineers and providing them an easy informal working atmosphere. It was in this kind of environment that a team headed by Pierce labored 10 years to produce traveling-wave tubes that would provide reliable amplification for microwaves. These have been of great worth to the Bell System in particular and the communications industry in general, and are used in communication satellites, one of Pierce's later interests.

Pierce met Austrian-born Rudolph Kompfner, the original inventor of the device, in England in 1945. Kompfner later came to Bell Laboratories and worked on the traveling-wave tube project. Though Pierce has become more widely associated with the breakthrough, the two are close friends whose mutual deference over credit sometimes puts one in mind of Alphonse and Gaston. Kompfner says that he invented the traveling-wave tube but that Pierce "discovered" it (that is, recognized its worth). Kompfner was also a key member of another Pierce team that recorded what may be his single greatest success as scientist-engineer-administrator. Working with scientists at NASA and JPL, Pierce's group proved conclusively that satellite transmission was both possible and practical, a point Pierce had championed for years before finally taking all the principals into a real test in 1960.

The star of the experiment was Echo I, a 100-foot mylar-skinned aluminum-coated balloon designed to inflate after launching and go hurtling around the earth at 16,000 miles per hour. It would be tracked by computer-driven antennas (a heresy at the time) and, it was hoped, would reflect a radio transmission from JPL's Goldstone station down to waiting receivers manned by Pierce's people atop Crawford Hill in New Jersey. With a staff that never exceeded 40 and a budget of about $7 million, the Bell scientists worked furiously to ready their computer programs and radio equipment. They grafted on new technology—a maser amplifier—and some that was all but forgotten—a frequency feedback modulator developed in 1933 by Bell's Joseph Chafee.

Next they tested the system with "moon bounces" and by tracking the small suborbital Tiros weather satellite. Then, on August 12, it was time. A perfect Thor launch sent Echo I into orbit, wheeling through space like a great bright star. Sweating and cursing, applying frequent manual corrections, the Crawford Hill group locked on its target and gave Goldstone the word to start broadcasting. Brief silence. Suddenly, with eerie clarity, the recorded voice of President Dwight D. Eisenhower filled the room with the sweet sound of success. Pierce told *The New York Times* that the effort was "something of practical value." It was indeed, and he put it to further use in the development of Telstar.

Echo was the kind of project Pierce dotes on: definable, useful ends, step-by-step problem solving, a small number of competent people brought together in relaxed shirt-sleeve camaraderie. Sheer magnitude is about as popular with him as "Mammon Worship" and "Organizational Ecstasy," both of which he views as dangerous heresies. The first holds that money can accomplish anything ("it cannot"), while the second says that simply creating an organization will cause something to happen ("it will not"). Pierce likes an environment where clever people are doing "particular and incisive things." He thinks Caltech is very good in this way. That is what attracted him here.

He doesn't expect to teach during this fall term; he will spend that time talking to faculty and students in an attempt to see where he can contribute "meaning and usefulness." Clauser thinks two probable areas are communications and systems engineering, where Pierce's credentials are impeccable. Pierce would seem an ideal choice to spearhead a move into such fields and raise the Institute's program to prominence.

If he runs true to form, Pierce will emerge from the turmoil of getting settled at Caltech and exceed everyone's expectations but his own. That seemed to be on his mind September 13 when he delivered the dedication address for the new Earle M. Jorgensen Laboratory of Information Science. He called his talk "The Challenge of the Doable" and ended by saying, "One must find challenging do-able things to do, and then one must do them." Not even J. J. Coupling could come up with a better phrase to describe the career of John Pierce.

—Harry Bain