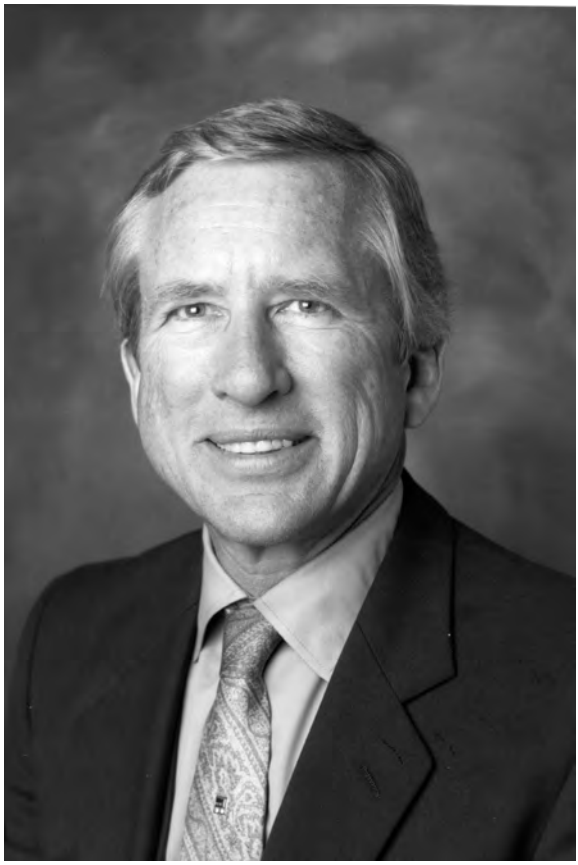

H R Johnson

H. RICHARD JOHNSON

1926–2012

Elected in 1973

"Contributions to the development of microwave tubes and to engineering management."

BY TERRY O'LAUGHLIN
SUBMITTED BY THE NAE HOME SECRETARY

HORACE RICHARD JOHNSON, cofounder, president, and chief executive officer of Watkins-Johnson Company and a member of the National Academy of Engineering for 39 years, passed away on December 9, 2012, at the age of 86.

Johnson was born in Jersey City, New Jersey, on April 26, 1926. His family moved to Teaneck, NJ, when he was one. He attended public schools and was a member of Boy Scout Troop 107, rising to the rank of Eagle. In summers, he worked at the Camp No-Be-Bo-Sco near the Delaware Gap National Recreation Area as a counselor and telephone repairman when he was 15 and 16. He passed the amateur radio license exam with coaching by his father, who was licensed as W2DOZ, and received the call sign W2SZX while in high school. An early affinity for science led him to declare his desire to be an electrical engineer while still a teenager.

Admitted to Cornell University at 16, Johnson entered the US Navy V-12 officer training program while still a freshman. He enlisted as an apprentice seaman in July 1943. He graduated with a bachelor of electrical engineering with distinction in February 1946. Briefly assigned to the *USS Montpelier* as an ensign after the war ended, he transferred to inactive reserve one month before becoming a graduate assistant in physics at Cornell.

In fall 1947, at the age of 21, he was awarded an all-expenses-paid electronics research laboratory fellowship at the Massachusetts Institute of Technology based on his record at Cornell and recommendations from professors like Richard P. Feynman. On an American Youth Hostel bicycle trip with his MIT roommate Franco Bosinelli in 1949, he met his future wife Mary Louise Kleckner. They were married the following summer. He published six papers in *Physics Review* and completed his PhD in physics at MIT with a thesis in microwave spectroscopy in 1952.

After graduation, Johnson turned down a Fullbright fellowship and borrowed money from his parents to move his young family to the West Coast. They settled in Westchester, California, as Johnson became a member of the technical staff at Hughes Aircraft in Culver City. Within four years he had published ten more papers, received honorable mention in the 1955 Eta Kappa Nu outstanding young engineer competition, and was appointed manager of the microwave tube department. While working on a problem with traveling wave tubes he was befriended by fellow Hughes engineer Dean Watkins who left shortly after they met to join the faculty of Stanford University.

In August 1957, Johnson attended a conference at Stanford and met Watkins for lunch. Watkins proposed starting a traveling wave tube company to capitalize on innovations he was developing in the labs at Stanford. In October, Watkins called Johnson to inform him that he had raised $1 million from the Kern County Land Trust to start the company. The Watkins-Johnson Company was incorporated on December 6, 1957.

Starting small with Watkins as president and Johnson as vice president, they hired three employees and settled into a cramped two-room, 400-square-foot office at 535 Ramona Street in Palo Alto. Johnson initially shouldered most of the burden for getting the new company on its feet, working six days per week while Watkins retained his appointment at Stanford and worked for Watkins-Johnson on Tuesdays, Thursdays, and Saturdays. After a short while, Stanford invoked its limits on outside consulting and Watkins chose to step down to adjunct professor.

The initial Watkins-Johnson board of directors included titans of engineering such as William Hewlett and Frederick Terman. Terman remained on the board most of his life and was a major stockholder. David Packard served as a mentor helping the fledgling Watkins-Johnson develop a corporate culture that inspired innovation, productivity, and loyalty in a manner similar to methods developed at Hewlett-Packard. Judging from the annual employee reunions that continue more than a decade since Watkins-Johnson ceased to exist, they succeeded.

The company's first income came from Hewlett-Packard as an $80,000 contract to build six Helitrons, an octave bandwidth tunable microwave oscillator invented by Watkins. A Navy contract to develop a 100,000-watt pulsed traveling wave tube soon followed. Johnson worked long hours generating contracts, writing proposals, recruiting people, and managing the expansion of the business.

The company's initial products were backward wave tubes, which were a crucial component in radar systems, test equipment, and other applications requiring frequency agile microwave power, and traveling wave tubes, which were used primarily in microwave receivers, especially for military applications such as reconnaissance, surveillance, and jamming.

Watkins-Johnson was profitable from the start, netting $80,000 on sales of $500,000 in its first year of operation. In August 1958, the young company moved into a 13,000-square-foot building at 3333 Hillview Avenue as the first tenant in the new Stanford Research Park. Johnson recalled the new building was cavernous for the ten or so employees who moved over from Ramona Street.

Watkins-Johnson's first acquisition started when Watkins heard that Ray Stewart, who had learned microwave tube construction as a technician at Stanford under Watkins, was looking to sell his business and retire. Watkins-Johnson purchased Stewart Engineering by floating an IPO through Hayden Stone in 1963.

Stewart was the first of a series of shrewd acquisitions that moved Watkins-Johnson to the forefront of the industry. Both

Watkins and Johnson saw the potential of the furnaces Stewart had designed for tube manufacture and restructured the facility. The new Stewart Division made steady improvements to furnace design and maximized the efficiency of tube production. The profitability of Watkins-Johnson expanded dramatically, netting a profit of $3.2 million on sales of $31.3 million four years after this acquisition and just ten years after the company was founded.

Watkins-Johnson produced many remarkable microwave devices. Perhaps the most notable today are the WJ-1280 and WJ-1290 traveling wave tubes which power the radio transmissions from Voyager 1 and are still functioning perfectly 38 years after launching from Earth, now sending data back from outside our solar system.

As technologies evolved, Watkins-Johnson continued as an industry leader in the development and production of microwave devices. It expanded into yttrium-iron-garnet (YIG), gallium arsenide (GaAs), thin-film, and thick-film radio frequency devices, and it designed, built, and sold the equipment necessary to manufacture these components.

Watkins-Johnson's preeminence in the field was largely due to its recruiting and mentoring programs. Unlike most companies, which sent human resources or recruiting specialists, Watkins, Johnson, and other top management returned to their alma maters and visited a few other elite colleges to personally interview degree candidates. Those that passed muster were invited to spend a day in the plants shadowing other engineers and managers and being seduced by the attractive climate of what would later be called Silicon Valley with its close proximity to the mountains and the ocean. In this way both sides of the recruiting effort knew what they were getting.

Once hired, new engineers were partnered with experienced hands and bestowed responsibility early in their careers. Engineers who moved up to management were required to attend training seminars conducted by experts from the American Management Association. This hiring, placement, and promotion structure served to nurture generations of talented engineers. Many former engineers refer

to the company as WJ University because of this emphasis on developing young talent. Work experience at Watkins-Johnson was a valued entry on the curriculum vitae of many young engineers.

The academic tone was enhanced by several publications popular in the industry beginning with the *WJ Technical Bulletin* in 1959, through the *WJ Tech Notes* published from 1974 to 1991 and finally the *WJ Technical Times*. The company hosted open houses and symposia, with attendant presentations and publications on their technological innovations.

Johnson's greatest accomplishments are likely to go unheralded because of his firm's deep connections and service to national security. The most visible aspect was Johnson's ten years of service to the National Security Agency as a member of the Scientific Advisory Board. He was also a member of the Association of Old Crows. Beyond this, only bits and pieces of the scope and value of his service and that of the Watkins-Johnson Company to the intelligence community have become public.

In addition to producing microwave devices and manufacturing equipment, Watkins-Johnson gathered enough resources and divisions to begin developing systems. The successful development of the lowest-noise traveling wave tubes enabled them to build sensitive microwave receiving equipment that led the industry in performance. The name Watkins-Johnson became all but synonymous with the highest-quality radio receivers and receiving systems, products much in demand throughout the Cold War.

Watkins-Johnson electronic intelligence receivers became integral to the efforts of American intelligence agencies to understand and map the progress and extent of missile, space, and radar development behind the Iron Curtain. These systems were installed on ships and planes and in secret listening posts ringing the Soviet Union. The electronics were tweaked and upgraded constantly so that as much information could be gleaned as technologically possible.

Another important part of Watkins-Johnson's reputation in national security work stems from the 1967 acquisition

of Communication Electronics, Inc., then a small surveillance equipment company in Rockville, Maryland. Founded in 1960 by Ralph E. Grimm and independently owned, Communication Electronics had been growing rapidly. The demand for its sensitive and dependable nonmicrowave equipment mushroomed during the early days of the Cold War and was outstripping the company's ability to raise capital for further expansion.

Johnson courted and befriended Grimm and adroitly handled the acquisition of Communication Electronics. With the infusion of resources and blending of their previously separate areas of radio frequency expertise, this new division of Watkins-Johnson quickly began to dominate the design and production of radios and systems for vital signals intelligence and communications intelligence national security work. This equipment sold in large quantities to allied countries all over the world, creating an international reputation for Watkins-Johnson.

One of the first jointly developed projects was the once deeply classified QRC-259, a wideband militarized receiver system designed to intercept and unpack signals from a range of sources. This system successfully integrated the microwave expertise of the parent company with the extensive lower-frequency experience of this new subsidiary.

Watkins-Johnson's value to national security also stems from facilities it operated first on the East Coast and later on the West Coast much like Lockheed's fabled Skunk Works. These plants developed special projects in cooperation with various intelligence agencies. Much of the work done in these facilities remains classified because the equipment produced is too closely linked to specific national security activities.

The majority of the company's business until the late 1980s was for the Department of Defense and related agencies. As the Cold War wound down, Watkins-Johnson's defense work stalled and expansion of the semiconductor division, particularly chemical-vapor-deposition systems, came to dominate the portfolio. The company expanded to become the third largest producer of this equipment in the world. A significant

portion of its remaining defense income came from components and radar subsystems produced for the advanced medium-range air-to-air missile and from the Communication Electronics Division through its work for intelligence agencies.

Competition in the semiconductor equipment industry proved too fierce for the company to continue expanding in this area. This, in close combination with an ill-fated attempt to transition the engineering staff and expertise from surveillance radios into the nascent wireless telecommunications business, left the company vulnerable by the mid-1990s. Johnson was pleased that when rumors of a hostile takeover surfaced, the company was able to maximize its value to shareholders and keep most of its employees working as divisions were spun off and the Watkins-Johnson Company ceased to exist.

Dick Johnson is widely remembered by his former employees as an affable and dynamic boss, especially in comparison to his reticent but equally brilliant partner Dean Watkins. Johnson's employees recount numerous anecdotes of his personal interest in their lives and their well-being. The company created and supported employee recreational and social activities that were avidly attended and employee reunions that have outlasted the company and now the founders.

Over the years Johnson served the engineering community in many capacities: as a lecturer at Stanford and UCLA, on the board of the American Electronics Association, and on the Advisory Council for the engineering programs at Cornell University. He was named a fellow of the Institute of Electrical and Electronics Engineers in 1962. He became a member of the National Academy of Engineering in 1973. He was at various times a member of the Electron Devices Society, American Physical Society, Research Society of North America, Volunteers for International Technical Assistance, as well as Gamma Alpha, Sigma Xi, Phi Kappa Phi, and Tau Beta Pi.

In the community, Johnson was well known for his service. He maintained his boyhood connection to the Boy Scouts, participating with his sons and serving ten years on the board for the Stanford Area Council with three as president. He was a board member of United Way and a member of the

Commonwealth Club of California. He worked toward establishing a hands-on science museum in Silicon Valley and continued to be active with science fairs long after amazing and aiding his children with science demonstrations. He worked to improve housing, transportation, and educational opportunities in the area through the Santa Clara County Manufacturing Group.

An active man favoring tennis and downhill skiing throughout his life, Johnson also enjoyed the serenity of his Bow Bay vacation home on Lake Tahoe. He personally maintained woodlands around the house, cutting and splitting his own firewood. He loved to sail the lake and explore the surrounding High Sierras. He remained an active amateur radio operator after his move to California, becoming K6BZA and conversing across the continent with his father in New Jersey on mornings when ionospheric conditions were favorable. He is survived by his wife Mary Louise, 2 daughters, 3 sons, 15 grandchildren, and 6 great-grandchildren and the many employees who revered working for the company he cofounded.