



Gran Murray Hopper

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1906-1992

Written By Gordon R. Nagler

Submitted By The Nae Home Secretary

REAR ADMIRAL GRACE MURRAY HOPPER, USNR (retired), a legend in her own time, died January 1, 1992, at the age of eighty-five. She was buried at Arlington National Cemetery with full military honors, as befitted an individual who believed that having the privilege and responsibility to serve her country as a naval officer was the highest possible honor she could receive.

Grace Brewster Murray was born on December 9, 1906, in New York, New York. (She claimed as her second home town, Wolfeboro, New Hampshire, which she first visited in the summer of 1907.) Her parents always encouraged her insatiable curiosity. In 1928, a time when most young women who graduated from college became school teachers, Grace graduated from Vassar College, Phi Beta Kappa, with degrees in mathematics and physics and a Vassar College fellowship. In 1930 she married Vincent Foster Hopper. They had no children and were divorced in 1945.

From Yale University she received an M.A. in 1930 and a Ph.D. in 1934, together with election to Sigma Xi and two Sterling Scholarships. She returned to Vassar as a mathematics assistant in 1931, and she successively became an instructor, assistant professor, and associate professor. She received a Vassar faculty fellowship and studied at New York University in 1941-1942, and the following year became an assistant professor of mathematics at Barnard College.

In 1944 she started her long love affair with the United States Navy when she was commissioned a lieutenant (junior grade) in the U.S. Naval Reserve. She was ordered to the Bureau of Ordnance Computation Project at Harvard University. It was here that she met her "destiny" and commenced work on the first large digital computer, the Mark I. She was very proud of the fact that she was the world's third programmer, or "coder" as they were then called. In 1946 she left active duty in the U.S. Naval Reserve because she was "too old" to apply for the regular Navy, at age forty!

She joined the Harvard faculty as a research fellow in engineering sciences and applied physics in 1946, when the Computation Laboratory was working on the Mark II and Mark III computers.

In 1949 the fledgling corporation of Eckert-Mauchly Computers was involved with building the first UNIVAC, and Grace joined as a senior mathematician. She remained with that corporation and its successors, Remington Rand and Sperry Corporation, until she retired in 1971.

In 1966 Commander Hopper retired from the U.S. Naval Reserve, having reached the age of sixty. Within the year she was recalled from her company to active duty to help impose a standard on the U.S. Navy's many computer languages. Because of her retired reserve status, she was not eligible for promotion, and the chief of the Bureau of Naval Personnel could only extend her active duty one year at a time. On August 2, 1973, through a special act of Congress, she was promoted to captain, USNR (retired). When Admiral Rickover left active duty in 1982, she became the oldest naval officer serving on active duty. She constantly noted this distinction with pride. Through the intervention of John Lehman, then secretary of the navy, President Reagan made a special presidential appointment of Grace to commodore on November 8, 1983. (The rank of commodore was changed back to the title of rear admiral in 1985.) At the age of seventy-nine she retired from active duty for the last time on August 14, 1986, on board the USS *Constitution*—the oldest naval officer on active duty aboard the oldest warship in commission.

During her distinguished navy career she received numerous

honors, citations, and awards, including the Navy Distinguished Service Medal and the Legion of Merit.

Immediately upon her retirement from the U.S. Navy, she went to work for Digital Equipment Corporation as a senior consultant and was an active participant until she died.

Grace Hopper was known for many achievements. In fact, Charles H. Doersam, Jr., a member of an early small group of computer people, circa 1950, reported that Grace, the only woman in this group, once caused quite a stir when she rose to a podium and declared, "I've been coming to these meetings for some time now and listening to all of you men tell me about your fine hardware, and I think it's about time I tell you about my 'software.'" This was an early use of the term "software," now an integral part of our daily lexicon. This example typifies Grace Hopper—she told you what she believed, whether you were ready to hear it or not.

One of the few areas in which she would accept any credit was the work she did on the development of the first compiler. In May 1953 her paper "Compiling Routines" described some of the fundamental ideas of compiling, as contrasted with interpreting. A computer program known as a compiler translates instructions written in a programming language into machine language that the computer can understand and use. Without this concept computers never would have attained today's broad use.

This led to Grace's involvement with COBOL—Common Business-Oriented Language. As Jean Sammet has documented in her article "Farewell to Grace Hopper—End of an Era!" published in *Communications of the ACM*, April 1992, Grace was one of six people who recommended in April 1959 that the Department of Defense convene a meeting to consider the development of specifications for a common business language. From this meeting came the Committee on Data Systems Languages (CODASYL) executive committee. Grace was one of its two technical advisers. The committee that developed COBOL operated under the aegis of the CODASYL executive committee. Her main contribution, however, is the legacy of her initial work on FLOW-MATIC, which was a major input to COBOL.

An area where she truly excelled, and was most proud of, was

her interaction with young people, whether at work or giving speeches at symposia and colleges. Young people referred to her in a reverent way as "Amazing Grace." She was constantly telling them that the phrase she disliked the most was, "We have always done it that way." She would tell young people, "Go ahead and do it. You can always apologize later if need be." As she often said, the most important thing that she had accomplished in life was the training of young people. Another of her favorite sayings, and she had many, was "We manage things. We lead people." How fortunate we are that she dedicated so much of her time and energies to young people.

There were many things that set Grace apart from the average person. For example, many of us were lucky enough to receive one of her "nanoseconds," a piece of wire 11.38 inches long. In speeches and travels she would explain her early frustrations of not being able to comprehend a milli-, micro-, and nanosecond. Having never "seen one," she would explain that she did not know when it was over. Since electromagnetic radiation travels in space at the speed of light, one thousandth of a second represents just over 186 miles. Grace would then hand out her 11.38 inches of wire so you could "see" a nanosecond, one billionth of a second. Then she would explain the problem we faced in computers was the need to compute and operate faster. She was always effective in reaching her audience.

Most people who worked with Grace were familiar with some of the stories attributed to her. She used to start many of her out-of-town speeches with an account of how someone mistook her for an airport security guard as she walked through the local airport. Another story attributed to her was the origin of the phrase "computer bug." One night in 1945, supposedly, she and several others were having problems with the Mark I computer (which was fifty-one feet long). Someone looked inside and pulled out a two-inch moth that had become wedged inside. After that, whenever there was a problem with the computer, the group would say, "another bug has gotten inside."

Everyone who was ever associated with Grace knew about her famous office clock. To disprove that there was only one way to do things, she had a clock that ran counterclockwise-and kept perfect time.

In 1983 Grace was featured on the television show "60 Minutes." She once again proved that a "computer whiz" could be a normal, bright, interesting person, not a stodgy desk-bound individual who had no other interest than manipulating a computer. In fact, she was so popular on the show that her segment was repeated in 1986 after her navy retirement.

One facet of Grace's life that is not as well known was her generous support of the Navy Relief Society, which is dedicated to helping individuals in the Navy family who are in need. In 1982 the U.S. Navy magazine *All Hands* featured an article on Grace titled "Grace Hopper—A Living Legend." To the best of my knowledge, this article publicized this support for the first time, as follows: "Grace Hopper, an extraordinary woman, seeks no honors or awards for her work. She prefers to give freely of her tremendous energy and talents. As of June 1982, for example, she had contributed more than \$34,000 to the Navy Relief Society from honorariums she had received for numerous speaking engagements over the years." (From 1973 until her death, Grace donated \$114,295 to the Navy Relief Society.) The above excerpt from the *All Hands* article described Grace as well as anyone can. She was truly a remarkable woman.

Admiral Hopper was elected a member of the National Academy of Engineering in 1973. She also belonged to at least thirty-five other societies and associations. She was the author or coauthor of numerous reports, articles, and a book, *Understanding Computers*, with Steven L. Mandell, West Publishing Company, 1984.

Honors and awards ranged from Phi Beta Kappa in 1928 to the National Medal of Technology awarded to her by President Bush in 1991, the first woman individually recognized with this prestigious award. In between were more than thirty-five honorary doctoral degrees from various universities and numerous awards from organizations worldwide.

Admiral Grace Murray Hopper was truly an individual who will be remembered in history for her many accomplishments in the field of computers. Most important, she touched and influenced many lives. For this we are all thankful.

She managed things. She led people.