

Grace Brewster Murray Hopper

1906 - 1992

Biography and Influences



("Grace Hopper," n.d.)

- Grace Brewster Murray was born on December 9, 1906 in New York City to father Walter Fletcher Murray, an insurance broker, and mother Mary Campbell van Horne Murray, a lover of mathematics (Pate, 2007; Rajaraman, 2001).
- Hopper's parents were a large influence as they emphasized the importance of education and worked to ensure that all of their kids were given the same opportunities, prepping them to be independent individuals (Bellis, 2019; Pate, 2007).
- As a kid, Hopper enjoyed reading and was very curious. At the age of seven, she took apart an alarm clock and when she was not able to piece it back together, she took apart six more to use as models (Pate, 2007).
- Hopper attended private girls' schools, the Schoonmakers School and Graham School, in New York City, where the coursework was academically rigorous and focused on prepping young girls to be ladies, yet still allowed them to play sports (Bellis, 2019; Pate, 2007).
- Hopper graduated from Vassar College in 1928 with a Bachelor of Arts in physics and mathematics and joined the mathematics faculty. She also earned a Masters in 1930 and a PhD in 1934 from the Department of Mathematics at Yale University (Pate, 2007; Rajaraman, 2001).
- She married Vincent Foster Hopper in 1930 but they divorced in 1945 (Pate, 2007).

- Hopper's great grandfather was her personal hero. Following Pearl Harbour, Hopper wanted to support her country by following in her great-grandfather's footsteps and joining the Navy. She was initially rejected as she was found too old to enlist at her age of 35, was under the required weight for her height, and was found too crucial as a mathematics professor to leave. Hopper persisted though and was eventually allowed to join in 1943 (Jacobs, 2015; Pate, 2007; Rajaraman, 2001).
- In June of 1944, she was commissioned as a lieutenant and was assigned to the Bureau of Ships Computation Project at Harvard University where she began working on the IBM Automatic Sequence Controlled Calculator, better known as the Mark I (Pate, 2007; Strawn & Strawn, 2015).
- From 1946 to 1949, Hopper went on to work on both the Mark II and Mark III computers under Navy contracts after she was forced to leave active service due to her age (40) (Yale University, 2021).
- In 1949, Hopper joined the Eckert-Mauchly Computer Corporation as a senior mathematician and became part of the team developing the first electric computer, ENIAC, and the first commercial electronic computer, UNIVAC I (Strawn & Strawn, 2015; Yale University, 2021).
- Throughout her career, Hopper remained a Navy reservist, however, in 1966 she was forced to retire due to age restrictions. In 1967, though, she was recalled to active duty where she remained for 19 years, earning the promotions of lieutenant in 1973 and Commodore in 1983 (known as Rear Admiral as of 1985). Additionally, due to her age (60), Congress had to pass an annual law permitting her to stay on active duty (Sammet, 1992; Yale University, 2021).
- She retired from the Navy for the final time on August 14, 1986 at the age of 79, the oldest serving officer in the U.S. armed forces (Sammet, 1992; Yale University, 2021).
- Hopper went on to work as a senior consultant at Digital Equipment Corporation until she died at the age of 85 on January 1, 1992. She was buried with full military honours at the Arlington National Cemetery (Sammet, 1992; Yale University, 2021)



("Grace Hopper coined the phrase 'bug in the system,'" n.d.)



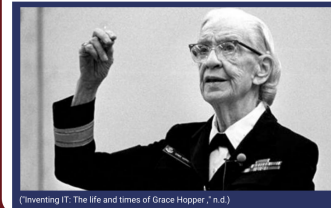
("Grace Hopper, Rear Admiral," n.d.)

Major Contributions and Legacy

- Hopper was part of the team that developed the Mark I, the first electromechanical computer in the United States and the world's first programmable computer that could automatically execute long computations. She also wrote out the entire manual on how to use it (Headrick, 2017; Kopplin, 2002; Strawn & Strawn, 2015).
- Hopper has been credited with coining the term "debugging" for a computer system after a moth fell on the Mark I's wires (Rajaraman, 2001; Strawn & Strawn, 2005).
- Hopper was one of the first people to believe that computer programming should be more like human languages (English, in her case), comprehensible and simple; and she advocated strongly for that. This belief brought her to develop the A-0, A-1, and A-2 compilers (Arithmetic Language, versions 0, 1, and 2) which were able to translate symbolic mathematical code into machine language. Notably, the A-2 was the first example of software being free and open-source, due to customers being given the source code and the ability to send in suggestions for improvements. These compilers would set the stage for the development of programming languages to become more user-friendly (Kopplin, 2002; Strawn & Strawn, 2005; Yale University, 1994).
- Hopper's team also developed Math-Matic (the A-3) and Flow-Matic, originally called B-0 for Business Language, version 0. These were two of the first compiler-based programming languages and the Flow-Matic was one of the earliest to be in wide-spread use. These made computers more accessible to people without a math or engineering background (Pate, 2007; Strawn & Strawn, 2005; Yale University, 2021).
- Her work on the Flow-Matic was also crucial to the development of COBOL (Common Business-Oriented Language for programming), one of the most widely-used programs that is still in use today in business, finance, and government (Headrick, 2017; Pate, 2007; Sammet, 1992).
- During her last 19 years of Navy service, she became known as "Amazing Grace," the "Mother of Computing," and the "the Mother of Programming" (Yale University, 2021)
- Late in her career, Hopper had also become a frequent lecturer, inspiring young people to get into engineering and programming. She was specifically well-known for using a 30 cm length of wire to illustrate the distance light travels in a nanosecond ("Grace murray hopper," 2015; Headrick, 2017; Konkol, 2020).
- Hopper has received many awards as well. To name a few, in 1969, she became the first 'Computer Science Man-of-the-Year'; in 1979, she was awarded the 'National Medal of Technology' by President Bush and was the first individual to receive it; and in 2016, she received the 'Presidential Medal of Freedom' from President Obama (Rajaraman, 2001; Office of the Press Secretary, 2016).
- Both the world of computing and the Navy have honoured her through naming things after her. For example, the Navy named a highly computerized missile destroyer the 'USS Hopper' and the Association of Computing Machinery annually awards an outstanding young computer professional with the 'Grace Murray Hopper Award.' Additionally, in 1994, the first 'Grace Hopper Celebration of Women in Computing' conference was held and it continues to this day (Naval History and Heritage Command, 2019; Pate, 2007).



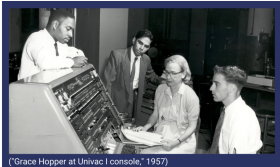
("Grace Hopper with UNIVAC," 1961)



("Inventing IT: The life and times of Grace Hopper," n.d.)

Stance on Gender and the Environment

- Hopper's father wanted her to be able to support herself, instilling in her the drive and ambition to get the same opportunities as men (Bellis, 2019; Pate, 2007).
- Grace Hopper Biographer, Kathleen Williams, stated that Hopper "didn't identify with the new generation of feminists. Even though she was a trailblazer, she never admitted that a trail needed to be blazed. She always thought women had an equal opportunity with men, they didn't need special guidance or special mentoring, as long as they worked hard and were capable, they would be recognized just the same as men" (Jacobs, 2015).
- In 1969, she wasn't bothered when she was named the Data Processing Management Association's first-ever Computer Science "Man of the Year." In fact, in response to a question about the award, she responded "all this hoopla... All this silly women this and that stuff," and she explicitly denied being a feminist" (Pate, 2007, p.225; Jacobs, 2015).
- When asked what she thought about the growth of the women's liberation movement, Hopper replied "I don't know much about it because I didn't have to worry about it, I was in the Navy" (Jacobs, 2015).
- Hopper did spend a lot of time in nature as a kid, however, her growing involvement in and focus on the many benefits of technology throughout her life meant that she likely didn't have a strong connection with the natural world or consider the impacts she or her work were having on it. Given her views on women's liberation and feminism, it is also likely that Hopper did not consider intersections between gender and the environment (Bellis, 2019).



("Grace Hopper at UNIVAC console," 1957)



("Commo. Grace M. Hopper," 1985)

Canadian Context

- Do you own a computer? How about a smartphone? In Canada, we often take for granted our ability to purchase a piece of technology and use it with relative ease. Many modern programming languages were developed from Hopper's work and without her ideas, technology's software would be significantly less accessible to the common populace and there might not be smartphones, computers, apps, video games, or even the internet as we know it today.
- Hopper's tenacity to invent new ideas for technology was truly extraordinary. She refused to accept that just because we've always done it that way, that we need to continue doing so and as result, she changed technology for ever.
- Despite her notable influence on our lives today, most Canadians aren't likely to know about Grace Hopper or her contributions.
- While this was said by the Chief Technology Officer of the United States, the following quote is relevant to the Canadian context too and sums it up pretty well: "She's like an Edison of our day, like a Turing. Yet, Hopper isn't in those names in the history books and it needs to be" (Jacobs, 2015). Today, we recognize the names and contributions of people in STEM like Thomas Edison, Bill Gates, and Steve Jobs with ease, yet we fail to recognize the Mother of Programming herself, without whom we would not be where we are today. Our history books don't acknowledge Hopper and she isn't celebrated in the media when we discuss how far we've come in terms of technology. It is clear that we value the men who have made significant contributions in STEM fields but we lack consideration for the women in STEM who helped get us here.

"The one phrase I've always disliked is that awful one: 'But we've always done it that way.'"
- Grace Hopper
(Jacobs, 2015)



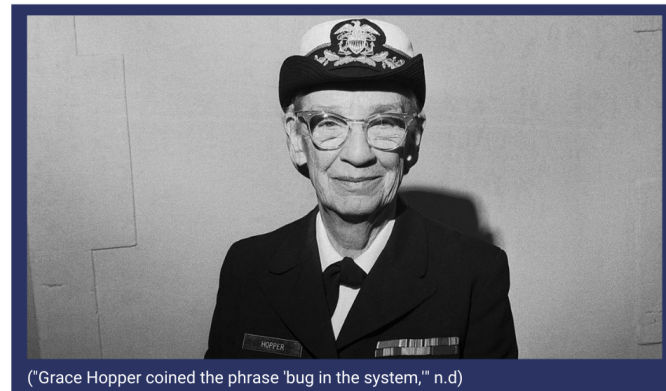
("Commodore Grace Hopper speaking," 1984)

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("Grace Hopper at Univac I console," 1957)

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