

# **Grace Hopper**

## **(1906 - 1922)**

Grace Hopper, nicknamed the “Queen of Software”, was a mathematician, rear admiral in the US Navy, and most notably a highly influential computer programmer whose impact on software engineering can be seen everywhere today. She is regarded by many as one of the first modern programmers. There are several reasons I have chosen to write about Hopper, not only was she a key figure involved in getting computer programming to where it is today, but her personality was described as fierce and unapologetic, characteristics that I look up to her for and find especially notable in a time when many people doubted her competence due to her gender.

### **Early Life and Education**

Hopper was born December 9, 1906 in New York City, and was a curious child. The story goes that when she was seven years old, she wanted to figure out how alarm clocks worked and ended up taking seven clocks apart before her mother caught her. Luckily, her parents nurtured her curiosity and left her one clock to examine. Hopper went on to get a bachelor’s degree in mathematics and physics from Vassar College and then later continued onto Yale University where she earned her master’s degree and PhD in mathematics. Nowadays, there’s nothing surprising about a female getting a PhD but it is worth noting that at that time, this was a huge achievement for Hopper. She then went on to teach mathematics at Vassar and eventually joined the Naval Reserve in 1943 and served in Women Accepted for Voluntary Emergency Service (WAVES).

### **Beginnings of Computing Career**

Hopper eventually went on to become a lieutenant in 1944 and joined the Bureau of Ordnance’s Computation Project at Harvard. One point that I find especially interesting here is that Hopper was 38 years old at this time. By no means was she old, but as someone finishing college worrying about what I am going to do with my life, it is inspiring to see that one of the most

influential modern programmers only started her computing career at this age. During this time, she worked on the Mark I, an electromechanical computer used during World War 2. Heading the team was Howard H. Aiken who apparently did not like the idea of having a woman on his team, but Hopper proved herself to be an invaluable asset. The rise in popularity of the term to “debug” is often credited to Hopper as during this time, while working on the Mark II, she discovered a moth stuck in its circuits which was affecting its performance.

## **Compilers and FLOW-MATIC**

Hopper continued to do great work in the field of computing during her time at Harvard but one of her biggest impacts on software development was the work she did in designing one of the first compilers. Hopper strongly believed that the future of programming was to develop a programming language that could be written entirely with English-like words. At the time, she was told this was ridiculous as there was no way that computers would be able to understand English and her idea was dismissed by many. It is hard to fully understand the magnitude of influence her persistence had on software development, but if you think about software development today practically no developers program in machine code anymore. Without Hopper, you could very well argue that computer science as we know it would be unrecognisable, or at the very least, nowhere near as accessible. Hopper continued to fight for the development of her idea and in 1957, Hopper and her team created FLOW-MATIC, the first ever English-like processing compiler. FLOW-MATIC went on to heavily influence the development of COBOL which was one of the first standardised programming languages and Hopper helped popularise it by promoting it for both private and military use. Kurt Beyer (who wrote Hopper’s biography) called her “the person most responsible for the success of COBOL during the 1960s” and by the 1970s COBOL was one of the most popular programming languages in the world. This quotation from an interview with Hopper in 1980 sums up her motivation and vision to make programming as accessible as possible, “What I was after in beginning English language [programming] was to bring another whole group of people able to use the computer easily ... I kept calling for more user-friendly languages. Most of the stuff we get from academicians, computer science people, is in no way adapted to people”.

## **Later Life**

Throughout her career Hopper remained close to the Naval Reserve and by 1966 she was awarded the rank of commander, later being promoted to captain (1973), commodore (1983), and eventually to rear admiral in 1985. She also was awarded the Defence Distinguished Service Medal which is the highest medal given to those who were not involved in combat. In 1991, Hopper was awarded the National Medal of Technology, the highest award for technology in the United States, becoming the first female recipient.

## Impact & Legacy

Hopper was recognised greatly during her life of her accomplishments, being awarded 40 honorary degrees. Teaching was one of her many talents and she famously said “If you ask me what accomplishment I’m most proud of, the answer would be all the young people I’ve trained over the years; that’s more important than writing the first compiler”<sup>1</sup>. There are many videos of her lectures on the Internet and from watching them you can see Hopper’s talent for communicating complex ideas in simple terms. One of the famous analogies she used was to describe nanoseconds in terms of a copper wire<sup>2</sup>. Following her retirement, she continued to lecture until her death on January 1, 1992. Even after her death her legacy and love for encouraging young people to learn programming lives on, with conferences like The Grace Hopper Celebration of Women in Computing Conference being held to honour her vision and many awards and bursaries being named in her honour.

There’s no doubt that Hopper’s contribution to computing was huge and her impact can be seen everywhere. Most notably was her contribution to developing the world’s first compiler and her theory of machine-independent programming languages. There is, however, one aspect to Hopper that really draws me to her on top of all this. Those who knew her described her as sharp-tongued and fierce, a woman who never doubted her talent, but also someone who knew how to joke around and not take herself too seriously. In my opinion, she is the perfect role model and is even more impressive when you take into consideration the time she grew up in. Not only was she incredibly successful in a male-dominated field (computing) but she was also highly influential within a male-dominated organisation (US Navy). Of course, the world of

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<sup>1</sup> Beyer K.W., “Grace Hopper and the Invention of the Information Age”, 11.

<sup>2</sup> See her explain a “nanosecond” to Letterman in this video <https://www.youtube.com/watch?v=IGTEUtS5H7I>

computing has come a huge way to promote inclusiveness in the last century but as a woman studying computer science, although a lot of the opportunities and resources are there, there is still more to do in terms of people's internal biases toward women. I have had countless experiences of classmates mansplaining concepts to me, and of course have had the all too familiar experience of being the token woman in group projects. Having a figure like Hopper to look up to serves as a reminder that, even if you feel as if you are constantly being doubted or judged based on something other than your abilities, if you stick to what you believe in you can invoke huge change. I also particularly like that Hopper breaks the nerdy stereotype associated with her field and interviews<sup>3</sup> with her highlight her witty humour and remind us all not to take ourselves too seriously.

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<sup>3</sup> If you have the chance, watch this interview of Hopper on Letterman  
<https://www.youtube.com/watch?v=IGTEUtS5H7I>

## References

- Biography.com Editors. (2021, May 10). Grace Hopper Biography. Retrieved from <https://www.biography.com/scientist/grace-hopper>
- YaleNews. (2017, February 10). Grace Murray Hopper (1906-1992): A legacy of innovation and service. Retrieved from <https://news.yale.edu/2017/02/10/grace-murray-hopper-1906-1992-legacy-innovation-and-service>
- Norwood, A. (2017). Grace Hopper. *National Women's History Museum*. Retrieved from <https://www.womenshistory.org/education-resources/biographies/grace-hopper>
- Britannica, The Editors of Encyclopaedia. (2021, April 11). Grace Hopper. *Encyclopaedia Britannica*. Retrieved from <https://www.britannica.com/biography/Grace-Hopper>
- Women's Stories. (2014, March 1). Who is Grace Hopper? [Video]. Retrieved from <https://www.youtube.com/watch?v=Fg82iV-L8ZY>
- Biography. (2018, March 22). Grace Hopper, Computer Scientist and Military Leader [Video]. Retrieved from <https://www.youtube.com/watch?v=meeCAFacrG0>
- HongPong. (2020, April 10). Grace Hopper on Letterman [Video]. Retrieved from <https://www.youtube.com/watch?v=lGTEUtS5H7I>
- Honeypot. (2021, April 8). Grace Hopper, The Queen of Code | Tech Pioneers #2 [Video]. Retrieved from <https://www.youtube.com/watch?v=5sNuPYJpSCI>