

# *The Amazing*



*A biography by:  
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Professor Tim Bergin  
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Grace Hopper has many nicknames, and various fields claim her as their own. Many say she was a brilliant mathematician, programmers say that she was the “Mother of Cobol,” or the “grandmother of compilers.” Others talk about her great service to the Navy as a computer pioneer. The truth is, she is (most) of the above. While she alone did not invent Cobol, she was instrumental in its development, and she was a superior mathematician and computer pioneer.

Captain Grace M. Hopper was born with the name Grace Brewster Murray on December 9, 1906 in New York City, NY.<sup>1</sup> She was born into a family of five. Her parents, Mary and Walter Murray had three children, Grace, Mary, and Roger. Grace Hopper has said that as a child, she was different from other girls. She preferred building structures over playing with dolls.<sup>2</sup> Her father was an insurance broker who had both legs amputated while Grace was in high school.<sup>3</sup> He was able to return to work after being fitted with two wooden legs and canes. As a result, Grace said that she got her perseverance from her father.<sup>4</sup> She also said that her mother “loved mathematics.”<sup>5</sup> Grace’s grandfather on her mother’s side was a senior civil engineer for New York City and he was one of the men who “laid out all the streets.” Grace Hopper said that she and her mother inherited their math skills from Grace’s grandfather.<sup>6</sup>

As a child, she attended private schools, which she considered very strict, and much stricter than today’s school standards. She stated, “You were educated and had some background when you were through then [with school], not like today.”<sup>7</sup> Grace was a smart girl and was able to skip some grades during

grade school. Consequently, she graduated from high school at only 16 years of age!<sup>8</sup>

At 17, Grace started her undergraduate studies at Vassar College. She graduated from Vassar College in 1928. Because of her high academic standing, she was a member of Phi Beta Kappa and received a Vassar College Fellowship.<sup>9</sup> After completing her undergraduate studies she went on to earn her Master's degree at Yale. In 1930, she finished the Masters program and she received her Masters of the Arts.

Besides receiving her master's, another important event occurred in her life during 1930. She had met her husband, Vincent Foster Hopper, on one of her family's annual summer vacations to Wolfeboro, New Hampshire. The same year that Grace received her M.A. from Yale, she also married Vincent Hopper and she changed her name to Grace Murray Hopper.<sup>10</sup>

After getting married, she started her Ph.D. program. While working on

her Ph.D. at Yale, Hopper taught in the Math Department at

Vassar University. In return, they gave her a Vassar Faculty

Fellowship. In 1934, she graduated with a Ph.D. from Yale

where she also received two Sterling Scholarships.<sup>11</sup> Women

rarely received Ph.D.s in the 1930's, especially in fields such

as mathematics! Grace was a revolutionary for women as well

as a computer pioneer. In 1941, while still teaching at Vassar,



**A photo of a young Grace Hopper**

Dr. Hopper began two *more* years of study at New York University! After NYU and teaching at Vassar, she became an assistant professor of math at Barnard College.<sup>12</sup>

World War II prompted her to quit her teaching and join the Navy. She was accepted into the military section of the Women Accepted for Voluntary



Emergency Service (WAVES) as a Lieutenant.<sup>13</sup> Entering the Navy was not easy for Grace; first, she was 35 years old, and second she did not weigh enough. Despite these obstacles, her persistence caused the Navy to give her an exemption on the age and weight restrictions!<sup>14</sup> When asked later on why she wanted to join the Navy, she exclaimed, “There was a war on! It was not unusual for a woman at that time to join the Navy; there were 30,000 to 40,00 women there at the time.”<sup>15</sup>

Perhaps also influencing her decision was the fact that Grace’s family was a patriotic one. She had ancestors in the Revolutionary war and the Civil War. Her husband Vincent and her brother Roger joined the U.S. army during World War II and her mother and sister both contributed to the war effort on the home front. Her father, with his wooden legs and canes, worked for the Selective Service Board.<sup>16</sup>

She divorced her husband, Vincent Hopper, in 1945.<sup>17</sup> Hence, she did not go home to raise a family as many other women did after the war. By that point in time, she claimed that she was “all tangled up with computers and the Navy,”

so she finished her Naval studies at the US Naval Reserve Midshipman's School.<sup>18</sup>

After graduating from the Midshipman's school in 1945, she became Lieutenant Grace Hopper and the Navy ordered her to work on the Bureau of Ordnance Computation Project at Harvard University. Here is where Hopper



**Grace Hopper upon graduation  
from midshipman's school,  
June 27, 1944.**

worked on programming Howard Aiken's Mark series computers.<sup>19</sup> She has spoken of programming for the Mark I as "taming the beast."<sup>20</sup> Oftentimes she worked 24 hours a day programming and running programs to provide the government with calculations needed to win the war.<sup>21</sup> The Mark I was the first automatically sequenced digital computer but Hopper always referred to it as a calculator!<sup>22</sup> One can only wonder how Howard Aiken felt about her constant reference to the Mark I as a "calculator."

One year after she started to work with Aiken, she was so much a part of the Mark team at Harvard that she joined the Harvard faculty as a research fellow in engineering sciences and applied physics at the Computation Laboratory. By this time, she had worked on programming applications for the Mark I, Mark II, and Mark III. The term "debug" was coined during Hopper's time working on the Mark I because of a small moth that caused the Mark I to stop running. While the

term “debug” is not substantially important to the evolution of computing, the story is one that she has told many times to the joy of her audience.<sup>23</sup>

In 1949, Hopper joined the Eckert-Mauchly Computer Corporation in Philadelphia as a senior mathematician.<sup>24</sup> Hopper’s timing at Eckert-Mauchly was perfect. She joined their team just as they were building the famous Univac-1. She became the head of Univac’s Programming effort.<sup>25</sup> In 1952, she published the first paper ever written on compilers.<sup>26</sup> Since writing that first compiler paper, she has written more than fifty papers on software and programming languages. While at Eckert-Mauchly, she also developed the concept of automatic programming.<sup>27</sup> Her efforts and support for sub-routines helped to get them widely accepted in the field. She knew that technology could advance more quickly if groups of programmers, who used the same small programs repeatedly, established permanent sub-routine libraries. Because of Hopper’s efforts, Univac had the first automatic coding system in the United States.<sup>28</sup>

Hopper did not just stick to one job. While she worked for Sperry Rand Corporation, (formerly Eckert-Mauchly) she also joined the Committee on Data Systems Languages (Codasyl).<sup>29</sup> The Defense Department sponsored the Codasyl meetings that were held at the Pentagon to discuss the establishment of a programming language for business data processing activities. Hopper became one of the main individuals responsible for developing the Common Business-Oriented Language (Cobol.) Although Hopper has been called the “Mother of Cobol” she cannot take all the credit for there were many other great

minds on her team.<sup>30</sup> Hopper however did work “tirelessly” to test various Cobol compilers and stayed with the project for its full duration while Cobol was perfected. Cobol was the first English language compiler that could be used and understood by different machines. Without her earlier work on compilers and her persistence, some say that a universal computer language would not have been developed until much later.<sup>31</sup>

Because of her dedication to computing and completing the perfect compiler, she became a Fellow of the Institute of Electrical and Electronic Engineers (IEEE.) She was one of only two women and one of five elected to the National Academy of Engineers.<sup>32</sup>



Despite Hopper’s writings that contributed to the evolution of modern programming languages, she feels that her *most* important contribution was teaching and training younger people on how to follow in her footsteps, and her speeches that helped non-technical people understand computers.<sup>33</sup> She wrote a comprehensive book called “Understanding Computers” which helped gain interest in computing.<sup>34</sup> She also stated that one of her greatest accomplishments was having the “privilege and honor of serving proudly in the United States Navy.”<sup>35</sup>

She died in January of 1992 in Arlington Virginia at the age of 85.<sup>36</sup> During her lifetime, she received countless honors, fellowships, and awards. Among these honors were the “Man-of-the-Year” Award by the Data Processing

Management Association, and the National Medal of Technology by President George Bush.<sup>37</sup> The U.S. Navy gave her the utmost tribute of naming a ship after her! The Amazing Grace Hopper, a Navy Destroyer Ship, was launched on January 6, 1996 in her honor.<sup>38</sup> Many who worked with her remember how much she hated the words “It has always been done this way...” and how she loved to challenge old ideas and told children that they could always “apologize later.”<sup>39</sup> One of her favorite “maxims” was “A ship in port is safe, but that’s not what ships are built for.”<sup>40</sup> She clearly was an inspiration to many who met her, and the youth who she believed would take on the new challenges of the next generation.

## Endnotes

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