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Biography of a Software Engineer

CSU33012: Software Engineering

"Great problems were sitting there. All you had to do was jump on them."

Barbara Liskov

Barbara Liskov, one of the first woman in the United States to be awarded a doctorate in computer science. Currently, an Institute Professor and head of the Programming Methodology Group at MIT. She pioneered the modern approach to writing code (practical and theoretical foundations of programming language and system design, especially related to data abstraction, fault tolerance and distributed computing). In a recent interview, she warns that the challenges facing computer science today can't be overcome with good design alone.

A true inspiration, started an early career in computer science in the late 70s impacting the way we program today. Her motivation and dedication towards her work never deterred even though so many scientific fields have failed to recognize some foundational contributions by women.

Barbara was born in Los Angeles, California on November 7, 1939 to a Jewish family, the eldest of Jane (née Dickhoff) and Moses Huberman's four children. She was always interested in mathematics and science, even though it wasn't seen as an ideal field for women back then. Her parents were highly supportive of her choices and encouraged her to pursue her passion for studying mathematics and science.

In 1961, she earned her BA in mathematics with a minor in physics from University of California, Berkeley. In her classes she had one other female classmate, rest were male. After graduation she applied to graduate mathematics program at Berkeley and Princeton. At the time Princeton was not accepting female students in mathematics. She was accepted at Berkeley but instead of studying she decided to move to Boston and began working at Mitre Corporation. Her decision of not going to graduate school, rather to work as a computer programmer at Mitre Corporation, Boston despite her lack of knowledge of computers opened up new opportunities and interests. After a year of working at Mitre Corporation she took a programming job at Harvard, working on language translation.

She decided to go back to school in bay area to cover material quickly and earn her doctorate in computer science from Stanford University. At Stanford, she worked with John McCarthy on artificial intelligence. The topic of her Ph.D. thesis was a computer program to play chess endgames. After graduation, she was not recruited for academic faculty positions by Stanford and MIT like some of her men colleagues.

She moved back to Boston as a researcher at Mitre. While working on her thesis, she had realized that her real interest lied in the fundamentals of computer design-operating systems and programming languages. She wanted to work on the design and organization to implement an application. She looked at designing the application as a mathematical problem, informed and guided by logical principals and aesthetic beauty while controlling and making sense of the complexity. So, she worked on a project that became the Venus operating system, an experiment allowing several people to use the same computer at once. It was her work and produced research on the Venus operating system that got her first prize paper, after which she was invited by MIT and Berkeley to apply for faculty position.

At MIT, she focused on her idea of structuring code in a way it was easy to write, modify and maintain. Making it easier for others to understand, modify and use the big code being used, focusing on design process and modularity. She worked with her team of graduate students on organizing and managing of big programs rather than direct application in programs which was a hard concept to demonstrate to programmers. So they built a programming language, called CLU (short for "cluster") which didn't rely on goto statements and essential to every programming language used today like Java, C, C++. Data abstraction a technique invented by Liskov, to help programmers write good programs and design in a way that is adjustable to changes easily led to the crucial development of object oriented programming which seems normal for us to use today.

In the 1980s, Barbara Liskov got interested in in supporting applications that work on the internet. She worked with a graduate students on how a program could be split into parts that run on many interconnected machines(distributed programming and technique of promise pipelining), creating Argus language.

Her subsequent work focused on byzantine fault tolerance across networks, finding a new protocol that could take advantage of redundant hardware so that a distributed system could sustain damage–the inevitable failure of computers, communication links, and storage disks–without breaking down altogether. It helps account how search engines like Google can keep on working as people simultaneously add, modify and delete data all over the world.

She was even involved in the creation of an object-oriented database system, Thor. With Jeannette Wing she developed a new notion of subtyping, known as the Liskov substitution

principle(a semantic defining a notion for substitutability for objects). She is still working on consensus algorithms and on further advancements in distributed computing. Her contributions have influenced advanced system developments, setting a standard for good, adaptable and clear programming.

In an interview, Barbara Liskov shared her concern over the ethical and privacy issues on the internet and believes the ethical responsibility needs to be taken into consideration by computer programmers.

Barbara Liskov has been awarded several awards throughout her life for her tremendous contributions: IEEE John von Neumann Medal(2004), Programming Languages Achievement Award(2008), Turing Award(2008), National Inventors Hall of Fame(2012), and Computer Pioneer Award(2018). In 2008, when she was awarded the Turning Award from the Association for Computing Machinery, also called the "Nobel Prize of computing". John Guttag, a professor of computer science and engineering who has known Liskov for more than three decades, said that she could have won the Turning Award a decade ago. He said,"It's hard to imagine what today's programming and distributed systems would be like without Barbara's many seminal contributions." which is a testament to the breadth of her contributions.

Barbara Liskov has always encouraged and helped female students. She has devoted special attention to making computer science a more inclusive field. Barbara Liskov's story and achievement reflect on how she didn't let go of her passion, stood her ground and didn't hesitate in knocking the doors which weren't particularly welcoming women.She didn't let the societal conventions and self doubt stop her from pursuing her career. Her story is a shining example of how women in technology can have a true impact.

Reflection

Barbara Liskov's story is highly inspiring as it shows the importance of pursuing your interest and what you value. There will always be obstacles and barriers which you need to overcome without doubting your potential. Also, the field of computer science has become more inclusive over the years. On a final note, one shall not be apprehensive of their capabilities, be open to new opportunities, and remain determined and dedicated towards their interest.

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