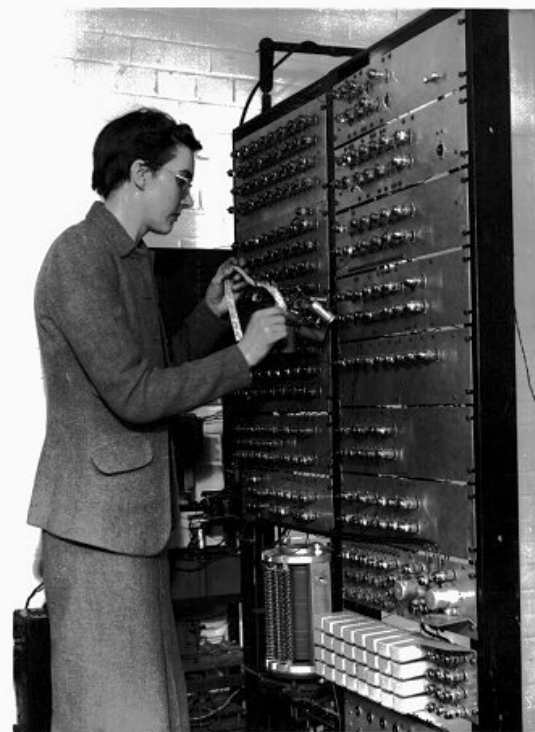


Kathleen Booth:

Writer of the first assembly language

By **Merlin Prasad**

19333557



Kathleen Booth is a name that not many would be familiar with though her impact on the field of software engineering persists to this day . She created the first assembly language, designed the assembler and the autocode for the first ARC computers at Birkbeck College, University of London. She also wrote one of the first books on programming , published multiple papers on computing alongside her husband and taught computer science at a university. As a computer science pioneer she can be credited with many contributions to early computing .

As a woman of color studying in a male dominated field it was exciting to find out that the person who wrote assembly first was also a woman. Assembly was actually one of the first languages I learned as I studied computer science at college with no prior coding experience . It's amazing that something designed so many years ago is still in use.

That's why it's quite disappointing Kathleen doesn't get enough credit for her work. Oftentimes the most well known software engineers are men and women like Kathleen are forgotten in history. That is why I decided to write my essay on Kathleen Booth as she deserves more recognition for her contributions to software engineering .

Kathleen H.V Booth(née Britten) was born in 1922 at Stourbridge,Worcestershire, England . During World War 2 she studied at Royal Holloway University of London where she obtained her bachelor's in Maths .She would later in 1950 earn her PhD in Applied Maths here.

In 1946 she began working at Birkbeck College as a research assistant .She worked with Xenia Sweeting, a fellow assistant and Andrew Booth who in the future would become her husband. They worked on the Automatic Relay Computer (ARC) which was an early computer prototype.



Andrew and Kathleen travelled to the USA in 1946 where they met computer scientist John Von Neumann who talked to them about the von Neuman architecture. When she came back to the UK she co-authored a paper on ARC2 called [“General Considerations in the Design of an All Purpose Electronic Digital Computer ”](#) which redesigned the ARC using the von Neumann architecture.

Kathleen Booth, Xenia Sweeting and Andrew Booth working on ARC

In this report she explains the term “contracted notation” which was where she thought about programming without writing the 1s and 0s or machine code instructions. She can be considered as one of the first people to begin using the concept of software by moving away from the need to use machine code .

She also wrote the paper [Coding for A.R.C](#) . It was then she created the ARC assembly language which is considered the first assembly language. She also created an assembler to translate the assembly code into machine code, reducing human error.

I am in awe of how she created a language from scratch because of how arduous using machine language was. It shows how even back then software engineering was always about innovating, efficiency and finding the optimum way to solve problems. Computer science is a field that is constantly evolving with new and better ways to do things are always being found so it's important to keep adapting just like Kathleen did .

The team went on to build two more computers which was a significant accomplishment given their small size and the amount of funds they could access . The Simple Electronic Computer (SEC) which was a further redesign on the ARC2. Secondly they created the All-purpose Electronic (Rayon) Computer (APE(X)C).

The X in the name was for their first sponsor which was the British Rayon Research Association. Andrew would mostly construct the machines while Kathleen did all the programming cementing her as one of the earliest computer programmers.

She also published a book with her husband called [Automatic Digital Calculators](#) in 1953 which outlines how to design a computer and also techniques on how to program them . It is one of the oldest programming books . It illustrates the “Planning and Coding “ programming style .The theory discussed in the book is actually quite ahead of its time . They even suggest using computers for games, describe how to create Tic-Tac-Toe and the possibility of more complex games like chess. The book really highlights the highly creative minds of the Booth’s and that they were true innovators. The ARC was one of the first three computers in existence so you can see how valuable a resource this was and how much of an impact it had on the world of software engineering.

In 1957 the Booth’s went on to found the School of Computer Science and Information System at Birkbeck College with J.C Jennings. She taught a course on programming here and even a book on how to program the APE(X)C computer. Her contributions to the field of computer science are vast and truly remarkable. I find her an inspirational role model.

She moved to Canada in 1962 and worked at the University of Saskatchewan for 10 years. However even after her retirement she published a paper in 1993 with her son named [Using neural nets to identify marine mammals](#) showing her impressive work ethic. Surprisingly enough Kathleen Booth is still alive and is currently 99 years old.

Given the scale of Kathleen Booths achievements it is a pity she is a mostly unknown figure to most programmers. Her influence on software engineering cannot be underestimated. Without Kathleen programming as we know it would be quite different and modern day programmers should be grateful for her contributions to the computing field. As the writer of the first assembly language she has revolutionized the way we code and use computers to this day . She changed the tedious process of entering machine code (which was a sequence of 1s and 0s which needed to be memorized) into a much simpler assembly language . This made programming much more easier, reliable and efficient.

Even though she wrote assembly about 80 years ago, I even used her language in my intro to computing class . Her innovations are something that has influenced mine and millions of others' experience of computer science

References :

Booth, Andrew D and Britten, Kathleen H.V. General considerations in the design of an all purpose electronic digital computer. 1947

Available from :

https://albert.ias.edu/bitstream/handle/20.500.12111/7942/Booth_Britten_General_Considerations_design_all_purpose_electronic_digital_computer.pdf?sequence=1&isAllowed=y

Booth, Andrew D and Britten, Kathleen H.V. Coding for the ARC

Available from :

https://albert.ias.edu/bitstream/handle/20.500.12111/7941/Booth_Britten_Coding_for_ARC_1947.pdf?sequence=1&isAllowed=y

Booth, Andrew D and Booth, Kathleen H.V. Automatic Digital Calculators

Available from : <https://rdcu.be/cz02N>

I. J. Booth and K. H. V. Booth, "Using neural nets to identify marine mammals," Proceedings of OCEANS '93, 1993, pp. III112-III115 vol.3, doi: 10.1109/OCEANS.1993.326169.

Available from : <https://ieeexplore.ieee.org/document/326169>

Jason Priddy. *Kathleen Booth*

Available from : <https://medium.com/@BatmanPriddy/kathleen-booth-7bb303fb15be>

League of Coder. *Kathleen Booth*

Available from : <http://wit.library.cornell.edu/show.html?id=38>

Alvaro Videla. *Kathleen Booth Machine Learning Pioneer*

Available from:

<https://medium.com/a-computer-of-ones-own/kathleen-booth-machine-learning-pioneer-7cb8b2ed70c8>

Nina C Baker . *Kathleen Booth*

Available from : <https://www.magnificentwomen.co.uk/engineer-of-the-week/39-kathleen-booth>