KATHLEEN MCNULTY

12th February 1921 – 20th April 2006

I first came across the history of early computer development when reading a book titled "From Gutenberg to Google: The History of Our Future" by Tom Wheeler. This book prompted me to dive a little deeper into what early computers looked like, from Charles Babbage's "Analytical Engine" all the way up to the development of the ENIAC (Electronic Numerical Integrator and Computer) during World War II. In selecting a subject to write about, I wanted to revisit the ENIAC and go a little further into it. In doing so, I encountered texts and interviews of a woman by the name of Kathleen McNulty. This is her story.

EARLY LIFE AND EDUCATION

Kathleen McNulty Mauchly Antonelli, more affectionately known as Kay, was born in a Gaeltacht region of Co. Donegal on the 12th of February 1921. Raised entirely through Irish, she could neither speak nor understand English when she and her family moved to the United States of America in October 1924. However, it was in the US that her future began to take shape. At a time when "only 37 per cent of all Irish girls aged 14-16 were enrolled in school" (Byrne, 2020), the decision of the McNulty family to emigrate had a profound impact on the education available to their children.

McNulty attended school in Philadelphia and excelled in her years as a student at Chestnut Hill Elementary School, and subsequently Hallahan Catholic Girls High School. She secured a scholarship to attend Chestnut Hill College for Women before graduating in June of 1942 as "one of three math majors in a class of 92 graduates" (Fritz, 1996). With a passion for mathematics, McNulty began searching for jobs that would allow her to put all that she had learned into practice and was swift in finding what would be her first position.

EARLY CAREER AND THE FIRST 'COMPUTERS'

When McNulty graduated, World War II had already begun, and the US Army was in dire need of computers. However, "computers" had a different meaning to what we may think of nowadays. Back then, it was used to describe groups of mathematicians, predominantly women, who were tasked with calculating the trajectory of ballistic missiles. These mathematicians would go through the calculations by hand before gathering to compare their answers, which proved to be not only extremely laborious, but also time-consuming.

McNulty was hired as a computer in the University of Pennsylvania, a position in which she excelled. She was hired alongside one of her fellow mathematics majors, Frances Bilas. While the work required a knowledge of topics that was beyond the college curriculum, McNulty was quick to learn and to distinguish herself as a talented computer. Not only was McNulty contributing to the field of computer science, but also to society at a time in which "the job of computer was critical to the war effort" (Fritz, 1996). In 1945, she was invited to be part of a team working on Project X, which was later revealed to be the ENIAC, or the "Electronic Numerical Integrator and Computer" (Da Cruz, 2021), designed by John Mauchly and J. Presper Eckert.

PROJECT X, THE ENIAC AND MODERN COMPUTING

The ENIAC became the world's first programmable, "general-purpose digital computer" (Da Cruz, 2021). However, with this came the requirement for programmers. McNulty joined a team of six "computers" tasked with working as programmers for the ENIAC at Aberdeen Military Base in Maryland. This made McNulty one of the world's first electrical digital computer programmers. This was highly confidential work, and as such the programmers were not allowed to be in the same room as the ENIAC. They were supplied with the logical diagrams which were the only tools that they had in figuring out how to program the ENIAC. In time and following security clearances, the programmers were permitted access to the colossus that was the ENIAC, consisting of "17,500 vacuum tubes, linked by 500,000 soldered connections… and weighed 30 tons" (Averys, 2021).

The ENIAC was revealed to the world in 1946 following the end of World War II. In 1947, "the ENIAC was turned into a "'stored program' computer" (Women in Technology International, 2021), the first of its kind. McNulty continued working in paid employment until she married in 1948 at the age of 26.

PERSONAL LIFE

Following the tragic death of John Mauchly's first wife in 1946, McNulty married Mauchly, co-inventor of the ENIAC, in February 1948. This brought an abrupt halt to her career. At a time where women were forced to leave behind bright futures in the workforce following marriage, McNulty took on the role of mother and housewife. However, she remained supportive of her husband's endeavours, including the founding of Mauchly Associates, one of the first commercial computing companies. She also played a significant part in his designs for software and programming languages, including UNIVAC Short Code, "the first example of a high level programming language actually intended to be used with an electronic computer" (Schmitt, 1988).

McNulty raised the two children from Mauchly's previous marriage, and the couple went on to have five children of their own, residing in the Pennsylvanian countryside. Despite her continued work

programming the computers designed by her husband, she did so without any form of credit or recognition.

Mauchly died on the 8th of January 1980 after a long-term illness. McNulty continued to deliver talks about the ENIAC following on from the death of her husband, but only as his widow despite being an expert on the topic after years spent working on the ENIAC. McNulty went on to marry an Italian photographer, Severo Antonelli, in 1985. They were married for 10 years until his death in December 1995. She continued to live in Pennsylvania up until she died on the 20th of April 2006, following a short battle with cancer.

WORK OF SIGNIFICANCE

When the ENIAC was unveiled to the public in 1946, the women who had spent months working to program it with very limited access to the hardware were not credited for their achievements. Rather, they were "to greet all the big shots and show them around" (Byrne, 2018) instead of attending in a professional capacity.

Without McNulty and the five other women who worked tirelessly to program the ENIAC, there would not have been a machine that accomplished the task it was designed for. What would have resulted is a 30-tonne mass of steel, vacuum tubes, and connections laying idle indefinitely. The programmers are fundamentally and intrinsically tied to the progression and development of modern electronic computing and must be recognised as such.

McNulty also must be remembered for the role she played in Mauchly's designs, including the UNIVAC Short Code (Schmitt, 1988) which was a huge advancement in writing computer programs. The programming languages we use nowadays are the somewhat distant relatives of UNIVAC Short Code, but nevertheless this must be remembered as part of the rich tapestry of the history of computing and software engineering.

FINAL THOUGHTS

Undoubtedly, Kathleen McNulty was a remarkable mathematician and programmer. She lived in a time where women were hushed and not treated the same as their male counterparts. They were not given the same opportunities as men, but this only serves to make her more remarkable. I cannot help but wonder what she could have achieved if only she lived today.

McNulty was inducted into the Women in Technology International Hall of Fame in 1997 in recognition of her pioneering work, that which she had conducted in the absence of acknowledgement and praise. After all this time, she was finally receiving recognition for the work she had completed as a programmer in her own right.

I find the story of Kathleen McNulty to be truly inspiring. In a sense, it almost seems to be such an unlikely tale; a child who emigrates to a distant country where they cannot speak the language, only to progress in their education and form part of the backbone of modern computing. Even more so because had her family not left Ireland when she was young, she would not have had the same educational experience that she had in the US. In the words of the British writer Doris Lessing, "any

human anywhere will blossom in a hundred unexpected talents and capacities simply by being given the opportunity to do so".

I wish to dedicate this essay to the memory of Kathleen McNulty. May she rest in peace.

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