Women in IT – Background

Life is an unfoldment, and the further we travel the more truth we can comprehend. To understand the things that are at our door is the best preparation for understanding those that lie beyond. – Hypatia of Alexandria, 4th Century AD (attributed)

Throughout history there have been women in technology (and its ancestors philosophy and mathematics) who have made key contributions (Alic, 1986). They have not been in abundance, but they have been there. But what has history captured, and what is really known? There was a time when women could only be published under male pseudonyms. There was a time when girls were not educated or not allowed to enter the halls of higher learning. The pervading social and cultural contexts hindered and practically suppressed female involvement in these key fields. However, some enterprising, resilient females managed: some masquerading as men, some using male names or having work published via a male colleague; a few managing to become known in their own right. Reflecting our modern concerns where the issue is much broader than just IT, similar issues were faced by pioneering women in science as well. In both cases it took exceptionally resilient, strong individuals to know their interest areas, to pursue them and to achieve in the face of the prevailing cultural and social conditions.

The history of early computing is peppered with tales of the early computers and the pioneers behind them. Generally, the first names people associate with them are Colossus (Alan Turing), ENIAC (John Mauchly and Presper Eckert), UNIVAC (Eckert and Mauchly), ILLIAC (John von Neumann) and CSIRAC (Trevor Pearcey). But as the information below demonstrates, women were involved as programmers and analysts across all of those early computers; though their involvement was relatively unreported and "below the line", it was there.

INFORMATION CUT re FOCUS OF THIS EXTRACT IS ON SPACE RACE…

SPACE RACE CODERS - KATHERINE JOHNSON

The Facts

Born: August 26, 1918; White Sulphur Springs, West Virginia, United States
Died:

Born Katherine Coleman, Katherine, a mathematician, is mostly known for her spacecraft calculations and flight path analysis, and more specifically for her work on trajectory calculations that resulted in the successful launch of the first Americans to travel into space (Alan Shepard in May 1961, Freedom 7 and John Glenn in 1962, Friendship 7) (Sittig, 2017; Britannica, 2018), as well as for her work that helped with the Apollo 11 mission.

Katherine's mathematics interest, skill and general intelligence became apparent from an early age and she was fast tracked through her schooling. In 1953 she started work at the National Advisory Committee for Aeronautics (NACA) where the women were known as 'West Computers' Computers' for the work they did analyzing test data and providing mathematical computations for space flights. NACA later transitioned to become the newly formed National Aeronautics and Space Administration (NASA).

In 1962, second generation transistorized electronic computers began to be used to calculate an astronaut's orbit. Johnson's co-worker Dorothy Vaughan rose to the challenge of the IBM 7090 computer purchased for the Mercury and Gemini space missions and taught herself and her team FORTRAN

(Harris, 2017). However, as the astronauts were 'wary of putting their lives in the care of electronic calculating machines' (Shetterly, 2017), John Glenn asked Katherine to verify that the computer calculations had planned the flight path correctly (Britannica, 2018).

Katherine co-authored 26 scientific papers, received 11 prominent awards and wrote the first books on space flight (Sittig, 2017). In 2016, in recognition of her contributions to computations and early computing, NASA named a building the Katherine G. Johnson Computational Research Facility (Britannica, 2018).

The Rumours

Katherine's life and those of her co-workers Dorothy Vaughan and Mary Jackson were 'partially fictionalized' in the Hollywood movie Hidden Figures (2016), however the core elements of their 'computational' work at NASA was captured.

SPACE RACE CODERS - MARGARET HAMILTON

The Facts

Born: August 17, 1936; Paoli, Indiana, United States
Died:

Born Margaret Heafield, her father (a philosopher and poet) and her grandfather encouraged her love of maths and science. She earned her BA in mathematics with a minor in philosophy from Earlham College in 1956.

Margaret was a computer scientist and systems engineer, who as a result of computer science courses being uncommon, mostly learnt on the job via hands on experience.

Margaret is generally known for leading a team credited with developing the in-flight software for the Apollo command module, lunar lander and subsequent Skylab. Margaret and her team also developed the Apollo project error detection and recovery software and the display interface routines (Computer History Museum, 2017; Hoag, 1976; Wikipedia, 2018).

It was the error detection and recovery software that played the critical role in the Apollo 11 go/nogo land decision. Just before the lunar landing was scheduled, the computer triggered alarms indicating that the computer was overloaded, and the landing software could not work effectively. The software then automatically adjusted the displays from normal displays to priority displays, thus warning the Astronauts of the emergency situation (Rothman, 2005).

Ultimately it was found that a radar was sending unnecessary data to the computer and overloading it with information. In Margaret's own words "If the computer hadn't recognised this problem and taken recovery action, I doubt if Apollo 11 would have been the successful moon landing it was" (Hamilton, 1971; Wikipedia, 2018).

Margaret made other significant contributions to the technology industry, for example she designed Universal Systems Language (USL), a modelling language and method for the specification and design of software for complex systems, that is still in use today (Hamilton & Hackler, 2008). Additionally, she introduced extreme rigor and testing into the software development processes that help define software reliability. A testament to this is that no bugs/code errors were ever reported on Apollo missions (Hoag, 1976).

The Rumours

Hamilton made up the term ‘software engineering’ (Rayl, 2008). It is rumored that she did this to legitimize software development to be like other engineering disciplines. "When I first came up with the term, no one had heard of it before, at least in our world. It was an ongoing joke for a long time. They liked to kid me about my radical ideas. It was a memorable day when one of the most respected hardware gurus explained to everyone in a meeting that he agreed with me that the process of building software should also be considered an engineering discipline, just like with hardware. Not because of his acceptance of the new 'term' per se, but because we had earned his and the acceptance of the others in the room as being in an engineering field in its own right." (Snyder & Henry 2017).

Other possible sources for coining this term are Anthony Oettinger, Fredrich L. Bauer or the fist cited appearance of the word at a 1968 NATO sponsored conference in Brussels.

When commencing on the Apollo program Margaret was given a very low priority task related to software to run in the event of a mission abort. Due to its low priority Margaret nicknamed it “forget it”. She mastered the code and was then considered an expert.

While working extreme hours Margaret would bring her daughter Lauren into the office. One evening Lauren accidentally crashed the guidance computer during a test run. This led Margaret to discover that if the P01 pre-launch program was run while in flight, all navigation data would be lost. This was reported to NASA, but permission to fix it was not obtained until the Apollo 8 mission, when an Astronaut made the identical error on the 5th day of the mission (Fabio, 2018).

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