Computer programmer credited with the invention of the GPS

Dr Gladys West (1930 – Present)

"I had to be the best that I could be, [...] always doing things just right, to set an example for other people who were coming behind



Born in 1930's Virginia, West felt certain she would follow in the footsteps of her parents, a work in the farms and tobacco plants, however her determination and aptitude for maths allowed for her to pursue a career in computer programming and modelling.

from Virginia Graduating University in State 1955, following a stint as a teacher in segregated schools, West was hired by the U.S Navy, where she was one of four black employees. Her work here involved: determining the movements of Pluto in relation to Neptune, project manager of SESAT (a satellite used to provide data on oceanographic conditions. and then eventually the development of the mapping of the Geoid.





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me."

The work of Gladys West enabled the creation of the GPS. This was done through her analysis of satellite altimeter data from the NASA Geodetic Earth Orbiting Programme. This was the foundation of her work to programme an accurate geopotential model of the earth, a Geoid. This model then served as the basis of the GPS. Her complex algorithms were able to account for all factors impacting the shape of the Earth and its irregularities.

West did not receive recognition for her work until the early 2000's and receiving her first award for her work in 2018. In more recent times being known as a *'Hidden Figure'* in history. However, she did not aim for recognition only for academic excellence. Notably earning her PhD in public administration and policy affairs at the age of 70, two years after her retirement.

"I have realised my dreams and reached a height beyond what I anticipated. I encourage young women to believe in yourself, find your passion, work hard [...] and most of all – follow your dreams"



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Awards:

2018 – Inducted into the United States Air Force Hall of Fame

2018 – Female Alumna of the Year at the Historically Black Colleges and Universities Awards

2018 – Featured in the BBC's list of '100 Women'

2021 – The first female to be awarded the Prince Philip Medal by the Royal Academy of Engineering (the highest individual honour) Mary Somerville (1780 - 1872)



Brought continental calculus to Britain, known as the 'Queen of Science'

"Whatever difficulty we might experience [...] in choosing a King of Science, there could be no question whatever as to the Queen of Science." – The Morning Post 1872



A Scottish writer and Polymath who is dubbed as the worlds 'first ever scientist' as well as one of the first female members of the Royal Astronomical Society. Awarded a silver medal in 1811 for solving the Diophantine problem, which included 'Fermat's Last Theorem', thought to have been unsolvable for 400 years. In addition to this, she can be credited with being one of the first people to suggest Neptune's existence and mentoring Ada Lovelace.

Somerville grew up as one of six children, and unlike her brothers, did not receive formal schooling as a young child, only being taught to read by her mother, but not to write. Her first interaction with science came from her art teacher who introduced her to 'Euclid's Elements'. In 1817 she was introduced to the works of Laplace, Poisson and Poinsot whilst visiting Paris. Following this visit, Somerville used her connections in Paris to bring these concepts to Britain.

Scientist (noun):

First used in print in 1834 in William Whewell's anonymous review of Somerville's work, 'The Connexion of the Physical Sciences'

Somerville was the first person to be dubbed a 'scientist' in print, as her work was becoming so separate to the standard terminology at the time of 'philosopher'. She was a revolutionary in her field.

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"Age has not abated my zeal for the emancipation of my sex from the unreasonable prejudice too prevalent in Great Britain against a literary and scientific education for women".

Somerville had to work hard to gain acceptance for her work, and at the start of her career, even publishing under the pseudonym, 'A Lady' to avoid scrutiny. She even described her husband as having 'a very low opinion of the capacity of [her] sex'

Always keen liberal ,she was the first supporter of Mill's petition to Parliament to grant female suffrage as well as advocating for abolition of slavery.

Katherine Johnson (1918 – 2020)



"I wasn't going to let the fear of not being able to do something dominate the rest of my thoughts and my plans."



Showing exceptional an mathematical talent from a young age, Johnson attended high school by the age of 10. Going on to graduate summa cum laude from West Virginia State College at 18, earning degrees in mathematics and French. one of the first She became African American women to attend graduate school at West Virginia University in 1939, where she was chosen as one of three Black students to integrate the graduate program. Her strong foundation in mathematics and her determination set the stage for her groundbreaking career at NASA.

"Some say, 'I don't bother anybody, and nobody bothers me.' But that's not a quote from a leader. We have to accept challenges, be open and honest."



Scan for a short video Katherine Johnson was a trailblazing mathematician whose groundbreaking work at NASA was crucial to the success of the U.S. space program. Despite facing racial and gender discrimination, she made significant contributions to projects such as John Glenn's orbital flight, the Apollo missions, and the Lunar Orbiter Program, performing complex calculations that ensured the safety and success of these missions. Johnson's expertise was so respected that Glenn specifically requested her to verify computergenerated calculations for his mission. Her career broke barriers for women and African Americans in STEM, inspiring generations and cementing her legacy as one of the most influential figures in space exploration history.

Jueen Mary

Katherine Johnson began her career at the National Advisory Committee for Aeronautics (NACA), the precursor to NASA, in 1953, after hearing about job openings for African American women with strong mathematics skills. She was hired as a "human computer". Her exceptional talent quickly stood out, and within weeks, she was reassigned to the Flight Research Division, where she worked on critical aerospace projects. At NASA, she calculated flight trajectories, launch windows, and emergency return paths for missions such as Alan Shepard's first American manned flight and John Glenn's historic orbital mission. Johnson's expertise in celestial navigation was instrumental to the success of later missions, including the Apollo moon landings, where she helped ensure safe paths for astronauts to and from the Moon.

The 2016 film 'Hidden **Figures'** brought Johnson's story to global а audience, highlighting her and her colleagues' often overlooked contributions to NASA during the recognition of space race. In her groundbreaking work and impact on space exploration, Johnson was awarded the Presidential Medal of Freedom in 2015

Nira Chamberlain (1969 – Present) 💆 Queen Mary

OBE recipient for services to mathematics

"My name is Prof. Nira Chamberlain, and I am proud to be a mathematician."



"Mathematics is indisputably the greatest subject in the world! Why? Because it is the language of the world. Mathematics crosses racial, geographical and cultural boundaries."

A regular speaker for the charity 'Speaker for Schools', which focuses on inspiring stateschool students to maximise their potential, Chamberlain is a champion for diversity within the mathematical sciences.

His lecture entitled: 'The Black Heroes of Mathematics' is a part of his mission to highlight the lack of black role models in mathematics and as proof that anyone can make it in the field. As a child, Chamberlain was discouraged from pursuing mathematics and was a victim of bullying via his peers. He used this to spur him on, and when his son experienced the same treatment, Chamberlain pushed harder to fight the stereotypes being forced onto him.





video

Chamberlains career spans over several industries, from aerospace, energy, defence and finance. His use of modelling has provided solutions to real world issues, one of the most notable being his cost capability trade-off for HMS Queen Elizabeth, modelling the lifetime running costs of aircraft carriers versus operating budgets. This was later included in the Encyclopaedia of Mathematics, making him one of the few British mathematicians included.

Chamberlain studied mathematics at Coventry Polytechnic, graduating in 1991, followed by a Masters in Industrial Mathematical Modelling from Loughborough University. He then rounded off his initial academic career with a PhD from Portsmouth University writing a thesis titled *'Extension of the Gamblers Ruin Problem Played Over Networks'*.

Achievements:

2018 - Powerlist's 5th Most Influential Black Person in the U.K

2018 – named the 'World's Most Interesting Mathematician'

2019 – Top 100 'Most Influential BAME Leaders' in U.K Tech Sector

2020 – Honorary member of the Mathematical Association

2022 – OBE for services to Mathematics

2023 – First Black President of The Mathematical Association

Peter Landin (1930 - 2009)

LGBTQ computer scientist and activisi



"Most papers in computer science describe how their author learned what someone else already knew."



Aside from his work as a computer programmer, Landin was also an active campaigner for LGBT rights and was a member of the Gay Liberation Front during the 1970's, following the separation from his wife in 1973. Landin's distancing from computer science was triggered by his belief that computer science has become a capitalist idea focused on profit taking and was ashamed by its from move away innovation.

"There's a good part of computer science that's like Magic"



Scan to read an article Peter Landin was a pioneering British computer scientist whose work in the 1960s laid critical foundations for the development of programming languages. Known for his contributions to the theory of programming languages, Landin introduced key concepts such as the SECD machine, the first abstract machine for lambda calculus, and coined the term "syntactic sugar." His innovative ideas greatly influenced the design and implementation of many modern programming languages, cementing his legacy as a visionary in the field of computer science.

Peter Landin aimed to create a programming language that was not limited to a single machine but could be used across various machines and manufacturers. To achieve this, he employed lambda calculus as the foundation for a new language. By utilizing lambda calculus, he integrated it into his own language, ISWIM, which higher-order functions, featured automatic storage management, and abstract syntax notation. ISWIM influenced the development of languages like LISP, ML, and Haskell. Landin's work also led to the introduction of 'Landin's Offside Rule', an indentation rule commonly used in Python. This rule was detailed in his paper, 'The Next 700 Programming Languages', and is crucial for maintaining code structure and scope.

Landin's legacy is contained in the archives in the Bodleian Library in the University of Oxford. There is also an annual seminar entitled the 'Annual Peter Landin Semantics. Seminar' as well as the Peter Landin building. home to the computer science department at Queen Mary University of London where he worked.

Landin's groundbreaking work in programming languages and semantics revolutionised how code is executed and structured, laying the foundation for modern programming practices.

The ENIAC Six

Successfully programmed the world's first modern computer



"We were making history, though we didn't realize it at the time." - Frances Bilas Spence



"None of us had any idea that what we were doing was pioneering anything. We were just doing a job." – Kathleen McNulty



Until it was decommissioned in 1955, ENIAC was used in the nuclear fission calculations and weather simulations required to create the hydrogen bomb.

During an era when the term "computer" referred to a job title rather than a machine, six women: Jean Jennings Bartik, Frances "Betty" Snyder Holberton, Kathleen "Kay" McNulty Mauchly Antonelli, Marilyn Wescoff Meltzer, Ruth Lichterman Teitelbaum, and Frances Bilas Spence —transcended societal expectations to become the first programmers of the world's first modern computer, the ENIAC. They mastered the complex circuitry of ENIAC but also laid the the groundwork for modern programming. A testament to their determination and intellect. Their legacy continues inspire to generations of women in showcasing technology, the transformative power of diversity and inclusion driving in technological progress.

What was the ENIAC?

Electronic Numerical Integrator and Computer, the world's first generalpurpose, digital computer. It was developed during World War II by the United States Army to compute artillery firing tables with speed and accuracy. The programming of this computer involved manual setting switches and adjusting cables on a switchboard.

'Hidden Figures' - individuals whose significant contributions to a field were not widely recognised or acknowledged at the time, due to societal biases. These individuals played crucial roles in important milestones but remained invisible in historical narratives





The credit for programming the ENIAC initially went to its male creators, John W. Mauchly and J. Presper Eckert, and their associates. In photos, members of the group were labelled as models opposed to their actual job role, i.e. programmers.