Mary Berners-Lee

Pioneering computer programmer whose son invented the world wide web

Mary Berners-Lee could justifiably call herself "the grandmother of the web". Not only did her son Tim invent the world wide web, but she also played a significant role in the development of British computing. She was a champion of women's rights, leading the march for equal pay at Ferranti.

Berners-Lee joined the electronics company in 1951 and her role, based in a prefabricated building known as the "tin hut" at Moston in Manchester, involved programming the company's Mark 1 and Mark 1* computers, which had been spun out of work on the "Baby" computer at the University of Manchester. "One of the things I did was to [program] simultaneous equations... 40 in fact, which was then unthinkable," she recalled. These were used to support aircraft design, "working out the stresses along the wings, and things like this".

The work could be frustrating. "It was so difficult — making it fit the space, because there was so little storage, you had to be so careful," she told the British Library's oral history project. "I mean nowadays, when you've got megabytes and gigabytes and goodness knows how many bytes, you can't imagine what it was like when you've only got 64 twenty-bit numbers... you have to be very careful." Yet her work was fun. "It's problem-solving, keeping in your head what's actually going on in the machine, and being very, very accurate, because the machine does exactly what you tell it to do, even if it's not what you meant. And that's quite a discipline," she said.

She always worked with a pencil. "We had to write... the program out in alphabetical characters, the teleprinter code, on sheets, forms, which represented the machine store. And of course if you were making corrections, you needed a rubber." Alterations and corrections were made to the teleprinter tape with tiny bits of sticky tape.

When the women at Ferranti discovered that their male colleagues were being paid more than they were for the same work, Berners-Lee was selected to make the case for equal pay to management. The personnel officer, a Miss Graham, was "shocked we'd even discussed our wages", but Berners-Lee was successful. "The principle was accepted that the young graduates coming in should have the same [salary], whatever the sex; and with promotion, the same raises," she recalled with pride.

As the programs became more complex, so demand for computer time increased. In particular, Berners-Lee's simultaneous equations were demanding more of the machine than most programs did, so she became caught in the middle of a "tremendous row" between engineers and programmers. This led to another equality battle. Increasingly the programmers were working late, taking turns to use the computer, but the company decreed it morally improper for young women to work at night alongside men. This created an unfair advantage for the men. Once again Berners-Lee took on management and won. "We used to get through the night on black coffee," she recalled of her triumph.

She was born Mary Lee Woods in Hall Green, Birmingham, in 1924, the daughter of Bertie Woods and his wife, Ida (née Burrows), and was brought up a Christian Scientist. Both parents were teachers, although her mother had given up work when she married. Mary attended College Road infant and junior schools before going on to Yardley Grammar School. "It wasn't particularly academic, but it did emphasise making people good citizens," she said.

In 1939 her school was evacuated to Lydney, in Gloucestershire. "That first autumn of the war was an incredible autumn, and I have never seen trees like that before," she said. "After a year many people were complaining about the 'phoney war', so they returned to Birmingham, where "one of the first things that happened was that the school was hit [by a bomb]".

Her parents, who had met at a "votes for women" meeting, encouraged her education. She won a bursary to study engineering at Manchester university, but gradually realised that mathematics was more to her taste and pursued it back in Birmingham. That was

Mary Berners-Lee in 1954

followed by military service at the Telecommunications Research Establishment in Malvern, where she enjoyed the off-duty amateur dramatics, but not the work on radar. Her older brother, Peter, was killed while on service with the RAF.

After the war Berners-Lee came across an article on astronomy, thought it romantic, and wrote to the Mount Stromlo observatory in Canberra, Australia, inquiring about work. She was invited by its director, Richard van der Riet Woolley, who later became astronomer royal, to take part in a fellowship helping to classify stars that are visible in the southern hemisphere. She sailed in September 1947 on the RMS *Orion*, the first postwar all-immigrant ship. When Woolley left Australia for a six-month trip to Europe, he lent Mary his horse, which she rode in the outback.

Alas astronomy, like engineering, did not suit her, "because I am singularly bad at pattern recognition", she said. It was also dull. "I discovered afterwards that it was decided to give it to me because no man would have the patience — and that was appalling," she recalled of the sexism behind her appointment. Back in Britain she spotted an advertisement in the journal *Nature* that read: "Mathematicians wanted to work on a digital computer." She spent two days in Birmingham reference library finding out what a digital computer was and then applied for the post, which was with Ferranti in Manchester.

At the company's Christmas party in 1953 she met Conway Berners-Lee, who was working at Ferranti's computer centre in London. She soon joined him and was confirmed into the Church of England. They were married at St Saviour's Church, Hampstead, in July 1954, and lived in the same house in East Sheen for 63 years. Conway survives her with their four children: Tim, Peter and Helen, who all work in computing, and Mike, an environmental consultant and author, who "had to be the rebel", she said with a laugh. Another son, Martin, died shortly after birth.

Family holidays were spent camping or at a cottage in the Black Mountains. Nothing was wasted. For several decades a discarded washing machine door was pressed into service as a fruit bowl, while her extensive filing system was made from old washing-powder boxes. She had a system for everything.

The formula for the children's bedtime was 6+y/4 (where y = the age of the child in years), while rates of pay for household chores were based on a series of quadratic equations. The importance of honesty was impressed on her offspring. "There was no such thing as a white lie," her son Mike recalled her saying. Even Santa's visit was qualified. "The story goes that Father Christmas puts a stocking at the end of your bed," was the most she would allow.

Berners-Lee had given up full-time work after the birth of Tim, but continued to take on occasional contracts. "I did do some cottage-industry programming," she said. "If somebody had a nice, neat little project, I could program at home and then go to a computer somewhere to test it. That was good fun." One involved "bus-bunching", helping London Transport to plan its services. "They had a simulation of the bus route and the hold-ups — the random hold-ups that can happen in the bus route — and they were trying to work out what conditions would stop the buses from bunching; and I helped them program it."

As her children became older Berners-Lee returned to work, teaching maths at a secondary school. "I found myself marking in the small hours of the morning and that was very difficult," she recalled. Despite having a maths degree, she sometimes struggled to keep ahead of her sixth-formers. "Tim was the same sort of age as my students, and knew, and he could help me," she said. Later she returned to programming, but she found there was a lot of catching up to do.

Despite being a member of one of the most web-savvy families in the world, Berners-Lee fell victim at the age of 90 to online scammers, telling *Watchdog* on BBC One how she lost £3,000 to a fraud. She continued to encourage girls and young women to go into computing. "When I was teaching I did think the girls got put off because girls are less likely than boys to press the buttons to see what happens," she said. "And that really is the way to learn... you have to learn by experiment."

Mary Berners-Lee, computer programmer, was born on March 12, 1924. She died on November 29, 2017, aged 93