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Dennis Ritchie obituary

As co-inventor of Unix and the programming language C, he had a key role in shaping today's computing environment

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Dennis Ritchie in May 2011, when he was awarded the Japan prize. Photograph: Victoria Will/AP Images for the Japan Prize Foundation

The American computer scientist Dennis Ritchie, who has died aged 70 after suffering from cancer and heart disease, was one of the co-inventors of the Unix operating system and the C programming language. Unix and C provided the infrastructure software and tools that created much of today's computing environment – from the internet to smartphones – and so have played a central part in shaping the modern world.

The origins of Unix go back to the 1960s, long before the microchip and personal computers had been invented. The nearest thing to personal computing was the computer utility, a large mainframe machine that was used simultaneously, and at great expense, by a couple of dozen users sitting at typewriter terminals.

By the middle of the decade, the utility appeared to provide the way ahead, and a consortium of General Electric, Bell Labs and the Massachusetts Institute of Technology (MIT) embarked on a project called Multics (Multiplexed Information and Computing Service). Multics would be the world's largest computer utility, supporting several hundred simultaneous users. Bell Labs was responsible for the operating software.

Ritchie joined the programming division of Bell Labs in 1967. His father, Alistair, had spent a long career there and had co-authored an influential technical book, The Design of Switching Circuits (1951). Dennis was born to Alistair and and his wife, Jean, in the New York suburb of Bronxville and grew up in New Jersey, where Bell Labs had its Murray Hill site. He studied physics and applied maths for a bachelor's degree (1963) and computer science for a PhD (1968) at Harvard University.

Multics was in crisis when he arrived at the research organisation. Indeed, many big software projects were in crisis – people were just beginning to learn that writing large programs was horrendously difficult and costly. In 1969, after four years of development, Bell Labs pulled out of the project.

Ritchie and another lead programmer on Multics, Ken Thompson, were left somewhat bereft by the project's demise. Multics had promise, but the operating system was too complex to build. This led them to a rethink. They would build a simpler, smaller system that they would call Unix – the name was "a kind of treacherous pun on Multics", Ritchie once explained.

The idea was not immediately appreciated by their managers, and they had to cast around for an obsolete computer on which to develop Unix. The machine had just 16 kilobytes of memory, and this alone was an encouragement to keep things simple. If Multics was the victim of baroque software architecture, then Unix would be pure Bauhaus.

Unix was designed over a few months in 1969, and a prototype was running early in 1970. Their colleagues remained unconvinced. However, by offering to write some text-processing software, Ritchie and Thompson managed to persuade the Bell Labs patent department to acquire a full-size computer and run Unix on it.

They decided to rewrite the operating system entirely for the new machine. The first version of Unix had been written in the computers' native machine code, which was difficult and slow. For the next version, Ritchie invented a language called C, which bridged the gap between machine code and programming languages such as Fortran and Cobol.

C also had an interesting ancestry. The progenitor was jointly designed at Cambridge and London universities in 1964 and known as CPL (Combined Programming Language). CPL never survived, but one of the development team, Martin Richards, became a visitor at MIT. There he designed a simpler version of the language for systems implementation, BCPL (Basic CPL).

Thompson and Ritchie decided to use BCPL to write Unix. To do so they squeezed it into 8 kilobytes and renamed it B. Finally, a new and improved version was developed and named C, which, Ritchie mused, "left open the question whether the name represented a progression through the alphabet or through the letters BCPL". This made writing software immeasurably easier and it also made software portable – so that a program written in C could run on any machine. The new version of Unix was completed in 1973, and since it was written in C, it, too, was portable.

Because Bell Labs's parent, AT&T, was a regulated telephone monopoly, it was prohibited from competing in the computer industry, and so had no pecuniary interest in Unix. This allowed Ritchie and Thompson to distribute Unix free of charge to universities and research institutions, which loved its clean, economical design.

Universities began to train their students in Unix and C, and when they graduated they took the culture into industry, where it blossomed. In 1978 Ritchie and a colleague, Brian Kernighan, wrote a textbook, The C Programming Language, which became a bestselling primer for the next 15 years. Despite the title, it was equally a book about programming style, and it shaped programming practices worldwide.

Ritchie and Thompson got early recognition for their work when they received the 1983 Turing award of the Association of Computing Machinery, often dubbed the Nobel prize of computing. But the Unix story was just beginning. The Advanced Projects Research Agency of the US department of defence adopted Unix for the network research that eventually created the internet, and it remains the software glue that binds everything

together.

Steve Jobs was a Unix devotee. When he was ousted from Apple Computer in 1985, he used Unix as the basis for his NeXT workstation. After his return to Apple 10 years later, he brought Unix with him and it became the foundation for all of Apple's current products.

Unix is also at the heart of today's open-source software movement. In the 1980s, following deregulation, AT&T began to assert its intellectual property rights in Unix. Richard Stallman, a hacker at MIT, decided that the world needed a free version of Unix. In 1983 he announced that he would write one called GNU (Gnu's Not Unix). He wrote a free C compiler, and founded the Free Software Foundation to help. The system was eventually completed by hundreds of programmers, mostly steeped in the Unix and C culture, collaborating over the internet. In 1991 a Finnish computer science student, Linus Torvalds, contributed the operating system kernel, and today what we now call Linux powers billions of electronic devices, from smartphones to supercomputers.

Ritchie and Thompson – usually together – received many honours and awards, culminating with the National Medal of Science awarded by President Bill Clinton in 1998. The citation described their inventions as having "led to enormous advances in hardware, software, and networking systems and stimulated the growth of an entire industry". Earlier this year, the pair won a Japan prize. Ritchie spent all his career at Bell Labs, retiring as head of systems software research in 2007. He is survived by two brothers and a sister.

• Dennis MacAlistair Ritchie, computer scientist, born 9 September 1941; died 12 October 2011

• Dennis Ritchie's Bell Labs homepage

• This article was amended online on 14 October, before it appeared in print. Richard Stallman's development of GNU as a free form of Unix had not been mentioned. This has been corrected.

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