A PIONEER IN COMPUTERS: ALAN TURING

Alan Turing was one of the greatest mathematicians and scientists in British history. He was one of the fathers of computer science and he helped defeat Germany in World War II by breaking the German codes. But he died in mysterious circumstances and is hardly remembered now by the general public.

In 1936 Turing did some of the basic work on today's computers. Machines were then becoming increasingly important in British industrial life, such as those in mass production factories or calculators or typewriters. But they were operating separately from each other.

Turing said it would be possible to have (in today's language) a system to "programme" machines so that one machine (a computer) could do a variety of different tasks, such as write documents, calculate numbers or play games. This was the "Universal Turing Machine" because one machine could do a variety of tasks. He was describing a computer well before the technology of his day could build one.

We now take that for granted but that type of thinking was far too imaginative for most academics. His 1936 paper did not receive full academic recognition until 1951, when he was made a Fellow of the Royal Society. By this time he was already working in another area: understanding the mathematics governing the role of genes in a person's growth.

He also wrote about artificial intelligence – the way that computers could "think". Would it possible to create a computer that could be as smart as humans? He predicted that such a machine could exist by the year 2000.

His "Turing Test" will assess when a machine has become as smart as a human. A human being is one room and communicates with a machine in another room, such as by playing chess or asking questions. If the human cannot tell from the responses whether the other room contains a human or a machine, then the machine is as smart as a human.

Turing was too optimistic about the rate of computer progress. The world's best chess player is now a computer ("Big Blue" created by IBM) but in many other respects humans are still smarter than computers. The "Matrix" movies are based on the era when the computers are much closer to Turing's prediction of closing the gap.

Alan Mathison Turing is a fine example of a genius who is educated despite the British educational system rather than because of it. He was born in London on June 23 1921. His father, Julius Mathison Turing, was a British member of the Indian Civil Service. His mother Ethel Sara (nee Stoney) was the daughter of the chief engineer of the Madras railways. The parents had met and married in India.

His mother wanted him to have a British private school education. Unfortunately he had a taste for mathematics and science, while the schools at that time preferred to teach history, literature, Greek and Latin. He largely taught himself and was better informed on such matters as Einstein's Theories of Relativity than his teachers. He also loved conducting his own scientific experiments. The Cambridge University entrance examinations were also biased against mathematics and science and so he had difficulty entering the university.

However once inside Cambridge he shone at mathematics. In 1935 he was elected a Fellow at King's College, Cambridge. His first major achievement came within a year (even though its importance was not recognized for 15 years).

In 1936 he went to Princeton University in the United States to do his doctorate, which he obtained in 1938. He was given the chance of staying in the US but he preferred to return to Cambridge because he could see the country getting ready for war and he wanted to play his role in defeating Germany.

His role in helping to defeat Germany was not made public until two decades after his death. Not even his closest friends knew about it.

Warfare in the 20th Century meant the deployment of larger numbers personnel, ships and aircraft over larger and larger distances. Communications became even more important. The Germans were among the pioneers of modern secret communications. Their basic equipment was the Enigma machine, which looked like a typewriter, encoding and decoding messages.

They thought that the codes could not be cracked – even if the Allies captured an Enigma machine. They went throughout the entire war not knowing that their codes had been cracked – and the rest of the world did not find out about the Enigma code-breaking operation until 1972.

It was one of the best kept secrets of the war. Many thousands of people worked on cracking the code and they never revealed their knowledge. All the people who used it (such as Churchill and Montgomery) never let on in their memoirs that the code had been broken.

The British created the Government Code and Cypher School at Bletchley Park near London. With the outbreak of war on September 3 1939, Turing began full-time work at Bletchley Park. He achieved his first code-breaking successes within a few months.

But the Germans were taking no chances. Even though they were confident that their codes could be broken, they constantly sought better ways of making their codes even more difficult to crack. As they improved, so Turing and his team had to keep on matching them.

Speed was vital. The code-breakers sought to understand the message in "real time": as fast as the Germans themselves were de-coding the messages. Turing also assisted the telephone engineers who worked to achieve higher speeds of mechanical working. The computer era was being born under the sound of gunfire.

The Americans entered the war on December 7 1941 and they were drawn into the Enigma work. Between 1943 and 1945, Turning was the chief Anglo-American crypto consultant on electronic intelligence.

An important part of the US's campaign in today's "War on Terrorism" is listening in to the telephone conversations of Osama bin Laden speaking to his lieutenants. This is a direct descendant of Turing's pioneering work.

Turing was also the first "geek". He had a reputation for being the absent-minded professor absorbed in his work, arriving in shabby clothes, with awkward manners who was more brilliant at mathematics than in conversation with ordinary people.

The war was the highpoint of Turing's life. The energy and enthusiasm that enabled the Allies to win the war soon got lost in the bureaucratic red tape when government departments and universities returned to their peacetime setting.

Turning struggled to find the right role for himself. He was with the National Physical Laboratory in London that pioneered Britain's role in the computer industry. The world's first working modern computer ran at Manchester, England, on June 21 1948 – and this was based on Turing's computer research.

Meanwhile Turning was also a keen runner. The Olympics were held in London in 1948 he was almost selected for the British team. He often ran to scientific meetings and he would amaze his colleagues by getting there ahead of those who travelled by public transport.

But behind all the achievements, he was haunted by the fact that he was a homosexual at time when such acts were illegal. He was arrested after an incident in 1952 and lost his security clearance for his top secret work breaking the Soviet Union's codes.

He died, aged 41, by eating an apple laced with cyanide. He left no suicide note. Some people thought that it was a suicide; his mother thought it was an accident because he loved conducting experiments; others have suggested assassination.

We will never know what further inventions he would have created had he lived. Perhaps Manchester could have become Britain's "Silicon Valley" ahead of the US?

Alan Turning – who helped break the German Enigma code – remains an enigma.

Keith Suter