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Alan Turing

Alan Turing did more than crack the Enigma code. Holden Frith assesses Turing's impact on the technology we use today

Most corporate logos are bland, emotionless affairs. They are designed by committee, intended to do little more than identify the company and project a positive image to prospective consumers. A few carry a little more historical weight, but even the majority of these go unnoticed, dulled by familiarity and ignored by busy, unobservant users. One such image belongs to Apple computers, whose logo is a multicoloured apple with one bite missing.

Always a potent symbol, the apple speaks of Newton's discovery as well as biblical knowledge, prohibition and punishment. But Apple had a more specific mythology in mind. The key is the missing bite, a tribute to the death of Alan Turing, the man whose genius laid the foundations for the modern-day computer, pioneered research into artificial intelligence and, most famously, unlocked the German Enigma codes during the Second World War.

That fame, however, is relatively recent. Turing never lived to appreciate it – at a time when other war heroes were enjoying a comfortable and glorious retirement, he chose to take a bite from an apple he had laced with cyanide. He died on June 7, 1954, ten years and one day after D-Day, which many military analysts believe would not have happened were it not for Turing's work.

There are two main reasons that history passed him by. The first is that his code-breaking techniques were central to the new intelligence war with the Soviet Union and so the documents that would reveal his wartime record remained classified. The second was that Turing did not quite fit the mould of the regular hero. His homosexuality sat uncomfortably with the social atmosphere of the Fifties and his country did not want to acknowledge its debt to such a man. At the time of his suicide his security clearance had been revoked and he had been forced to submit to oestrogen injections, which caused him to grow breasts.

It was a sad end for a man whose ideas shaped our world to such a great extent. Beyond the military sphere, in which his work presaged the crucial role of intelligence within modern conflict, the principles of Turing's work

underpinned the most significant development of the post-war era – the computer.

Turing's great idea was that any mathematical problem, no matter how vast and esoteric, could be reduced to a long series of simple operations. The longer the series, the simpler the operations. The problem was that once the series grew to be hundreds or thousands of operations long, it would take too long to work through them, however simple they were. Thus, although it was not difficult to unlock the Enigma code by trying every possible solution, by the time any human had found the key amid the ten trillion wrong combinations, the encrypted message would be months or years out of date and the information it contained useless. Turing's machine automated and accelerated the process, trying combinations at such a rate that at its peak it was decoding 18,000 messages per day.

Today's computers work on the same principle, reducing complex tasks to a series of simple operations that can be represented as the long string of ones and zeros that makes up binary code. In the Enigma machine, the binary digits, or 'bits' for short, were stored as holes punched into a paper tape that ran through the computer at 30 mph. Now they have been liberated from their punch cards and live instead in hard disks, CDs, MP3 players, hard disks, mobile phones, bank cards and so on. One CD contains about 8 million bits.

However, despite their vastly increased power and speed, modern computers have yet to escape the limitations of their core, binary operations – they remain calculating machines rather than thinking machines. Turing was fascinated by the idea of artificial intelligence and in 1950 set what has come to be known as the Turing Test, which takes the form of a written conversation between a human being and a computer, on no fixed topic and with no guidance from the computer's operator. For the computer to pass, the human participant should be unaware that he or she is talking to a machine.

It sounds straightforward, but conversations follow complex rules not easily reduced to binary code, and anyone who has battled with a bank's automated telephone exchange will appreciate that interaction between man and machine is fraught with difficulty. The $100,000 prize for passing the Turing Test remains uncollected, although some computers are getting close.

Turing acknowledged that even a successful candidate would not truly be intelligent, merely an excellent mimic. To achieve intelligence in its broadest sense, a computer would not only have to depart from its programmers' instructions and think for itself, but would also have to engage with human emotions and desires. It would want to understand the thoughts that passed

through Turing's mind that day in June 1954 as he looked back on his life and picked up the piece of poisoned apple. Perhaps one day a distant descendant of the iPod or iMac will appreciate the symbolism of the badge it wears, and perhaps it will feel proud.