Alan Turing

This British mathematician gave his name to the accepted test for machine intelligence. Much of his work, however, was for military intelligence during the war

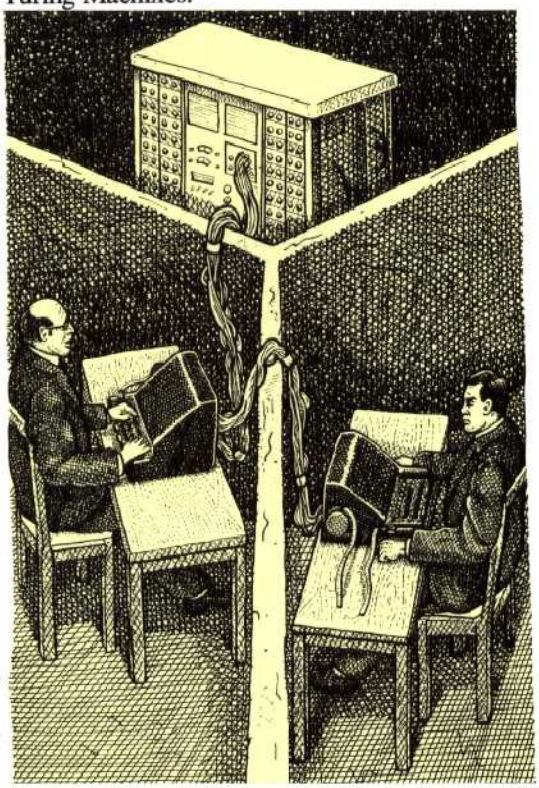
Mathematical Feat
Alan Turing (1912-1954) found inspiration and relaxation through long-distance running. He was intrigued by the effect of physical exertion on creativity and mental agility

The young Alan Turing showed a remarkable insight into science. He wrote to his mother from school 'I seem always to want to make things from the thing that is commonest in nature'. Mathematicians show their talent early and as soon as Turing could read and write he was factorising hymn numbers and designing amphibious bicycles.

While his father was away in Madras working in the Indian Civil Service, Turing was winning school prizes and then the scholarship that took him to King's College, Cambridge. It was at Cambridge, first as a student and then as a fellow of King's, that his interest began to focus on the problems of mathematical logic.

In 1931 the Czech mathematician Kurt Gödel astonished the scientific world with the discovery that there were mathematical theorems that were true yet could never be proved. Alan Turing set out to investigate those which could be proved.

He proposed a machine, the construction of which he left to the imagination, that could carry out mechanically the processes usually performed by a mathematician. For each process there was one machine — for example, a machine to add, another to divide, and a third to integrate and so forth. These machines later came to be known as Turing Machines.



BOB VENABLES

Can Machines Think?
To answer this question, Turing proposed his famous test, called the Imitation Game, but which has subsequently become known as the Turing Test. A man is put into a room that features a teleprinter (keyboard-cum-printer). This is linked to a teleprinter in another room, operated by another man; and also to the computer under test. The first man is allowed to ask any questions he likes of either. If he is unable consistently to determine when he is communicating with the man and when with the computer, then the machine may be deemed to be intelligent. After all, the argument goes, we have no way of telling for certain whether other people do think or are conscious, except by a comparison of their reactions to circumstances with our own

Turing investigated the workings of these imaginary machines and came to a remarkable conclusion. Rather than each mathematical process needing a separate machine, it was possible to design a 'universal' device that could be made to imitate any other of the specialist machines by being 'programmed'. Turing had stumbled upon the theory of the programmable computer.

When the Second World War broke out Turing was quickly recruited from the academic world to the Government School of Codes and Ciphers at Bletchley Park, Buckinghamshire. Had it not been for the war, his machines might have remained imaginary, but Bletchley Park was involved with the highly secret and urgent work of breaking German military codes.

Because these codes could be changed each day, machines were needed to crack the ciphers before new ones were introduced. Bletchley Park became a huge information processing centre. In the middle of the war Turing was sent to America to establish secure codes for transatlantic communications between the Allies.

The secret nature of his work at this time means that few records of his movements are available. However, it is widely supposed that he met Von Neumann while at Princeton, New Jersey. Towards the end of the war Turing was asked to draw up plans for an all-British computer for the National Physical Laboratory, to be called ACE.

The Automatic Computing Engine was named partly in honour of Babbage's Analytical Engine. Like this pioneering machine, ACE took a long time to be constructed, but in many ways it was far in advance of ENIAC (see page 46). Frustrated at the slow progress, Turing resigned and moved to Manchester where he joined the university's computer project. At the same time he became a consultant to the Ferranti company and subsequently became involved in the first computers to be built in Britain.

Turing was an eccentric who pursued what he knew to be important without regard for social conventions or legal constraints. A friend said he was 'divinely retarded' when it came to seeing faults in others, but his scientific genius was flawless. In 1952 he was convicted on charges relating to homosexuality, and committed suicide two years later. Who can tell what a contribution Turing might have made to artificial intelligence, had he still been alive today?