

Alan Mathison Turing [OBE FRS](#) (/ˈtʃʊərɪn/; 23 June 1912 – 7 June 1954) was an English^[6] mathematician, [computer scientist](#), [logician](#), [cryptanalyst](#), philosopher, and [theoretical biologist](#).^[7] Turing was highly influential in the development of [theoretical computer science](#), providing a formalisation of the concepts of [algorithm](#) and [computation](#) with the [Turing machine](#), which can be considered a model of a [general-purpose computer](#).^{[8][9][10]} Turing is widely considered to be the father of theoretical computer science and [artificial intelligence](#).^[11] Despite these accomplishments, he was not fully recognised in his home country during his lifetime, due to his homosexuality, and because much of his work was covered by the [Official Secrets Act](#).

During the [Second World War](#), Turing worked for the [Government Code and Cypher School](#) (GC&CS) at [Bletchley Park](#), Britain's [codebreaking](#) centre that produced [Ultra](#) intelligence. For a time he led [Hut 8](#), the section that was responsible for German naval cryptanalysis. Here, he devised a number of techniques for speeding the breaking of German [ciphers](#), including improvements to the pre-war Polish [bombe](#) method, an [electromechanical](#) machine that could find settings for the [Enigma machine](#).

Turing played a crucial role in cracking intercepted coded messages that enabled the Allies to defeat the Nazis in many crucial engagements, including the [Battle of the Atlantic](#), and in so doing helped win the war.^{[12][13]} Due to the problems of [counterfactual history](#), it is hard to estimate the precise effect Ultra intelligence had on the war,^[14] but at the upper end it has been estimated that this work shortened the war in Europe by more than two years and saved over 14 million lives.^[12]

After the war Turing worked at the [National Physical Laboratory](#), where he designed the [Automatic Computing Engine](#). The Automatic Computing Engine was one of the first designs for a stored-program computer. In 1948 Turing joined [Max Newman's](#) [Computing Machine Laboratory](#), at the [Victoria University of Manchester](#), where he helped develop the [Manchester computers](#)^[15] and became interested in [mathematical biology](#). He wrote a paper on the chemical basis of [morphogenesis](#)^[1] and predicted [oscillating chemical reactions](#) such as the [Belousov–Zhabotinsky reaction](#), first observed in the 1960s.

Turing was prosecuted in 1952 for homosexual acts; the [Labouchere Amendment](#) of 1885 had mandated that "gross indecency" was a criminal offence in the UK. He accepted [chemical castration](#) treatment, with [DES](#), as an alternative to prison. Turing died in 1954, 16 days before his 42nd birthday, from [cyanide poisoning](#). An inquest determined his death as a suicide, but it has been noted that the known evidence is also consistent with accidental poisoning.

In 2009, following an [Internet campaign](#), British Prime Minister [Gordon Brown](#) made an [official public apology](#) on behalf of the British government for "the appalling way he was treated". [Queen Elizabeth II](#) granted Turing a posthumous pardon in 2013. The "[Alan Turing law](#)" is now an informal term for a 2017 law in the United Kingdom that retroactively pardoned men cautioned or convicted under historical legislation that outlawed homosexual acts.^[16]