



## The man behind the machine

Alan Turing is famous for many reasons. Andrew Hodges delves into why Turing's achievements took so long to be recognized.

Alan Turing is always in the news — for his place in science, but also for his 1952 conviction for having gay sex (illegal in Britain until 1967) and his suicide two years later. Former Prime Minister Gordon Brown issued an apology to Turing in 2009, and a campaign for a ‘pardon’ was rebuffed earlier this month.

Must you be a great figure to merit a ‘pardon’ for being gay? If so, how great? Is it enough to break the Enigma ciphers used by Nazi Germany in the Second World War? Or do you need to invent the computer as well, with artificial intelligence as a bonus? Is that great enough?

Turing's reputation has gone from zero to hero, but defining what he achieved is not simple. Is it correct to credit Turing with the computer? To historians who focus on the engineering of early machines, Turing is an also-ran. Today's scientists know the maxim ‘publish or perish’, and Turing just did not publish enough about computers. He quickly became perishable goods. His major published papers on computability (in 1936) and artificial intelligence (in 1950) are some of the most cited in the scientific literature, but they leave a yawning gap. His extensive computer plans of 1946, 1947 and 1948 were left as unpublished reports. He never put into scientific journals the simple claim that he had worked out how to turn his 1936 “universal machine” into the practical electronic computer of 1945. Turing missed those first opportunities to explain the theory and strategy of programming, and instead got trapped in the technicalities of primitive storage mechanisms.

He could have caught up after 1949, had he used his time at the University of Manchester, UK, to write a definitive account of the theory and practice of computing. Instead, he founded a new field in mathematical biology and left other people to record the landscape of computers. They painted him out of it. The first book on computers to be published in Britain, *Faster than Thought* (Pitman, 1953), offered this derivative definition of Turing's theoretical contribution:

“Türing machine. In 1936 Dr. Turing wrote a paper on the design and limitations of computing machines. For this reason they are sometimes known by his name. The umlaut is an unearned and undesirable addition, due, presumably, to an impression that anything so incomprehensible must be Teutonic.”

That a book on computers should describe the theory of computing as incomprehensible neatly illustrates the climate Turing had to endure. He did make a brief contribution to the book, buried in chapter 26, in which he summarized computability and the universal machine. However, his low-key account never conveyed that these central concepts were his own, or that he had planned the computer revolution.

The 1955 Royal Society's obituary of Turing, written by mathematician Max Newman, did him few favours when it claimed that computer designers were unaware of Turing's 1936 work. The Turing machines soon made a comeback, but Turing's image had become that of a pure mathematical logician, unrelated to practicality. It did not help that anyone looking into his story after his death would see dark hints that he had been *persona non grata* in an unmentionable manner — possibly excusable for a remote theorist from Cambridge University, but totally inappropriate for the founder of a mega-industry.

Yet the mid-1970s revealed Turing to have been highly practical: the chief scientific figure at code-breaking headquarters Bletchley Park, and in charge of methods and state-of-the-art machines for beating the German navy. Now it was clear why he had emerged as a computer builder in 1945 — he had gained experience he could never reveal. By the 1970s, there was also more room for his vision of computation. Software for “every known process”, as he foresaw in 1946, was on the way. Turing's vision of mind and machine, which drew from his personal consciousness and experience, also became more acceptable. When in 1977 I started to investigate Turing's life, I found that his code-breaking was the hidden bridge between the 1936 theory and the “universal practical computing machine” he described in his unpublished 1948 work.

On the question of individual reputation, in that 1948 report he wrote: “The isolated man does not develop any intellectual power. It is necessary for him to be immersed in an environment ... He may then perhaps do a little research of his own and make a very few discoveries ... the search for new techniques must be regarded as carried out by the human community as a whole, rather than by individuals.” Science is like that, and he effaced himself in that spirit. But he was a star nonetheless.

What would Turing have thought of the campaign for his ‘pardon’? When arrested, he was unrepentant and told police he expected a “Royal Commission to legalize it”. Sixty years later, British law has caught up, not for him as a special case, but as a matter of principle. That practical action speaks louder than symbolic words, and is truer to his vision. I see the question not as whether the government should have pardoned Turing, but how on Earth Turing could ever have pardoned the government. ■

ANYONE LOOKING  
INTO HIS  
STORY  
AFTER HIS DEATH  
WOULD SEE  
DARK HINTS  
THAT HE HAD BEEN  
PERSONA NON GRATA.



### TURING AT 100

A legacy that spans science:  
[nature.com/turing](http://nature.com/turing)

Andrew Hodges is a mathematician at the University of Oxford, UK, and author of *Alan Turing: the Enigma*.  
e-mail: [andrew.hodges@wadh.ox.ac.uk](mailto:andrew.hodges@wadh.ox.ac.uk)