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“WE CAN ONLY SEE A SHORT DISTANCE AHEAD, BUT WE CAN SEE  
PLENTY THERE THAT NEEDS TO BE DONE.”

— ALAN TURING

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## WHO WAS ALAN TURING?

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Alan Turing was an English mathematician and pioneer of theoretical computer science and artificial intelligence. During WW2, he was instrumental in breaking the German Enigma code, leading to Allied victory over Nazi Germany. He lived a tragic yet meaningful life in which he drew the blueprints for the future of software engineering. He was a man before his time in many ways, with an exceptional understanding of software development with him writing ‘code’ 50 years prior to the building of a computer with the ability to run his code.



He is the original software engineer.

(<https://www.biography.com/>)

## EARLY LIFE

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Alan Turing is arguably the most influential computer scientist of the 20<sup>th</sup> century. He is known by many to be the father of modern computer science, a truly extraordinary man who lived a remarkable life. Born to Parents Julius & Ethal Turing on the 23 June 1912, Turing showed signs of great intelligence almost immediately after birth. He would spend hours playing chess alone, understanding and creating complex strategies far beyond his years. At just 9 years of age his headmistress from St Michael's Primary School in Hastings reported: ‘I have had clever boys and hard-working boys, but Alan is a genius’. (British Library, 2013). Studying in the well-respected independent Sherbourne School at the age of 13 he became particularly interested in math and science. His determination to expand the territories of his knowledge knew no bounds, Turing’s first day of Sherborne School coincided with the 1926 General Strike but he was so determined to make it in that he cycled 60 miles, he made it to his first class on time. Although Turing was a genius he often annoyed his peers and teachers by receiving high marks in class despite him paying little attention during lessons. He had one friend, Christopher Morcom, however who would play a larger role in Turing’s future than anyone could anticipate. Morcom was the first person to introduce Turing to cryptography, the science of code breaking, only to tragically die shortly after at the hands of the disease tuberculosis. After this incident Turing dedicated his life to academia in an effort to fulfil the potential of his friend who was also regarded as a genius in his own right. This motivation in memory of Morcom never truly left Turing and only fuelled his genius throughout his career.

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## UNIVERSITY LIFE

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After graduating from Sherborne School Turing attended King's College in the University of Cambridge where he studied mathematics. Cambridge fostered Turing's abilities and was the perfect environment for him to develop his dissertation which proved the central limit theorem, a wildly famous and widely used theorem in statistics. Turing would eventually graduate with a first class honours degree in 1934 and was elected a Fellow of King's College at the age of 22. It was not until Turing began studying for his Ph.D in 1936 did he entertain the notion of a 'universal computing machine' a machine which could compute complex calculations. Nobody could have predicted the impact this idea would have once it began to germinate. This notion grew in Turing's mind and eventually blossomed into what is now known as the 'Turing Machine', this foreshadowed the emergence of the first digital computer. It was with his aptitude in the scientific fields of cryptography mathematics that Turing would go on to not only build three out of four stages of an electro-mechanical binary multiplier but would also famously crack the German 'Enigma Machine' and win the Second World War for the British allies.

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## LEADING THE BRITISH ALLIES TO VICTORY IN WWII

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In 1939, Turing was asked to join the Government Codes and Cypher School, a British code-breaking organisation (now GCHQ), which was moved to Bletchley Park when war was declared on 3rd September 1942. The historian and wartime codebreaker Asa Briggs has said, "You needed exceptional talent, you needed genius at Bletchley and Turing's was that genius."

Turing's most notable achievement working in Hut 8 at Bletchley was cracking the *impossible* Enigma code. The Enigma was an enciphering machine used by the German armed forces to send messages securely without the interception of the allies. It was believed to be an unbreakable code. Turing then developed the 'Bombe' a machine based on a Polish design that would soon decode all the messages sent by this *unbreakable* German Enigma machine.

Turing may be most famous for his high IQ but he was equally renowned for his eccentricities. Interestingly, Turing would cycle to work in Bletchley wearing a wartime gas mask as to avoid pollen. An odd fashion choice in any era but during War Time Britain it was particularly macabre. Turing also never wore a watch and would tell the time while travelling by listening to the rotations of his bicycle chain (which he kept note of in his head). He was known affectionately as 'prof' by his peers in Hut 8 but despite having many friends Turing was not an entirely trusting man and would chain his favourite mug to a radiator to deter thieves from attempting to steal it despite working inside the entirely secret, maximum security space of Bletchley Park.

Throughout his time in Bletchley Turing would produce a number of scientific breakthroughs in the field of cryptology clearly seen in software that we use today. He developed a complex code-breaking technique he named 'Turingery' for use against Lorenz cipher messages produced by the Germans. Turing also developed 'Delilah' a software which encoded and decoded voice communications this software was never commissioned during the war effort.

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## LIFE AFTER BLETCHLEY PARK

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Between 1945 and 1947 Turing lived in London where he worked tirelessly on a design for the ACE (automated computing Engine). He presented a paper on February 19, 1946 which would change the world of computer science forever and plant the seeds of software engineering. In this paper he presented the first detailed design of a stored-program computer, the first ever medium to develop software.

Possibly his most infamous and important work was around his idea of a Turing Test in which he introduced the idea of AI to the world years before anybody in the scientific community thought it possible to program a computer let alone to create artificial consciousness. The idea was that a machine could be thought of as intelligent if it could pass as a human in conversation. His sentiments were:

"I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted." – Alan Turing.

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## MODERN INFLUENCE

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Today it is possible to see Turing's influence in many software engineering processes. Turing understood the possible applications of machine learning and software engineering years before his theories could even be tested. There is evidence of him writing a chess program, considered the first piece of 'code', 50 years before computers were capable of handling such things.

Today AI is arguably the most topical subject in the world of computer science going forward into the future and as such so is the ethics surrounding machines and the question of what rights do we allow 'conscious' machines. AI is an incredibly exciting and a cutting edge field of research however Turing and his paper outlining the 'Imitation Game' have been cited time and time again in arguments surrounding the capabilities of AI and its 'intelligence', despite this paper being written 70 years ago. The modern CAPTCHA tests are based on this 'Turing Test' and are used frequently to test the validity of a user's 'human-ness' and weed out bots.

Turing's influence is pervasive and inescapable, with almost all facets of modern computer science having some link to the work of Turing.

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## SUICIDE, PREJUDICE AND A ROYAL PARDON.

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Despite being hailed as one of the greatest minds in modern history Turing was subjected to prejudice throughout his entire life. Turing was a gay man during a time where being gay was not only looked down upon but was a criminal offence and punishable by law. Due to the highly secretive nature of his work at Bletchley Turing was granted no pardons for his homosexuality when it was discovered in 1952. He was subsequently charged with 'Gross Indecency'. After this Turing's

entire career was put under intense scrutiny. His security clearance was revoked and he was forbidden from continuing his cryptographic consultancy for the GCHQ, despite being the brightest young man of his time. In one of the final letters before his death Turing wrote:

*"I'm afraid that the following syllogism may be used by some in the future.*

*Turing believes machines think*

*Turing lies with men*

*Therefore machines do not think*

*Yours in distress,*

*Alan"*

— Alan Turing.

The opinions of the prejudiced silenced those of a genius.

Turing was chemically castrated for his 'affliction' in 1952 and was found dead by suicide in his apartment by his maid on 8 June 1954. His post-mortem revealed he died of asphyxiation from poisoning. It is a widely believed tale that his death was a result of him biting into an apple filled with cyanide, however, this story has never been proven to be true and some conspiracists say his death may have been the result of foul play due to his large role in the allies victory during WWII.

It wasn't until decades after his death that Turing would receive a Royal Pardon for his 'crimes'. In 2013, Queen Elizabeth II posthumously granted Turing a rare royal pardon almost 60 years after he committed suicide. Three years later, on October 20, 2016, the British government announced "Turing's Law" to posthumously pardon thousands of gay and bisexual men who were convicted for homosexual acts when it was considered a crime. According to a statement issued by Justice Minister Sam Gyimah, the law also automatically pardons living people who were "convicted of historical sexual offenses who would be innocent of any crime today."

## LEGACY

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To think of Turing only for his academic influence would be a disservice to his memory. Not only did Turing change the way the world thought about machines but he also changed the way people think about each other. Turing's brilliance cast a doubt surrounding the prejudices held against gay men during his life time. His influence and abilities led many to see gay men in a new light for the first time ever. His impact is very personal to many and felt daily in and outside of a software engineering environment. He made it clear that there was no academic roof for the LGBTQ+ community and that any typically straight-male dominated industry could be infiltrated by anyone independent of prejudice and public opinion. The only shameful aspect of Turing's life was his conviction. His legacy casts a tall shadow but pertained to a bright future for not just computer scientists but humanity at large.

*"The fact remains that everyone who taps at a keyboard, opening a spreadsheet or a word-processing program, is working on an incarnation of a Turing machine." — TIME Magazine.*

Turing may have only been named Time Magazine's 32<sup>nd</sup> most important person of the 21<sup>st</sup> century but in my opinion, he is number 1.

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