Biography of a key software engineer, Discussing the work and impact of the individual

Alan Turing's achievements throughout his life paved the way for the evolution of the field of computer science. His unprecedented work in fields such as cryptanalysis, logic and mathematics created a groundbreaking blueprint for modern computer technology. While he received little recognition during his life, today he is considered a catalyst that foresaw the potential of technology prior to the digital age. The aim of this essay is to outline the progression of his life and achievements and discuss the compelling impact of his contributions.

Born in London, England in 1912, Turing exhibited a strong interest in mathematics and science as well as displaying prominently high levels of intelligence from a young age. He attended King's College, Cambridge from 1931-1934 where he gained a first class honors degree in mathematics. Upon his graduation, he was made a fellow of the university.

Following this, he published a paper titled "On computable numbers with an application to the entscheidungsproblem" in which he projects his views on the limits of proof and computation. Throughout his writing, he refers to "universal computing machines" that would be capable of performing any conceivable mathematical task. These later became known as Turing machines. From this esoteric idea, grew the central concept of the modern computer.
He provided the fundamental operations of computing upon which all computers now operate and thus envisioned the digital computer that we see in modern day. He described a machine that would operate on a basic computational level of reading one's and zero's and interpreting them to carry out a number of steps which will in turn lead to a solution to a problem or a particular task.

His gift for problem solving would lead him to one of his most important accomplishments in his career. After receiving his PhD in mathematics and Cryptology at Princeton, he was invited to work at the Government Code and Cipher School, a British Code Breaking Organisation. When the War was declared in 1939, he specialized in cryptanalysis of the Enigma. This was an electro-mechanical ciphering machine used by the Germans primarily during World War II. The encrypted messages allowed the Germans to communicate with their troops through radio transmitted code. He contributed to the design of the Colossus computer, which is regarded as the first programmable digital computer. The computer was used to intercept ciphered messages

from the Germans. As well as this, Turing designed the British Bombe, an electromechanical device that was ultimately used to solve the German ciphers. The breaking of the Enigma enabled the Allies to defeat the Nazi's in many crucial battles and subsequently assisted them in winning the war. It has been estimated that, due to Turing's method and approach used in his design of the Bombe, that the war was shortened by two years, saving over fourteen million lives and making this his most heroic accomplishment.

His involvement in the design of the Colossus computer led him into further research and design of digital computers. He began working for the National Physical Laboratory, where he would produce his most seminal work. Leading the design for the Automatic Computing Engine, Turing and his team made an attempt at creating the world's first programmable digital computer that, unlike the Colossus, had the ability to store data in memory. While leading a project of such an unprecedented field, he delved further into unique areas of research, exploring the relationship between computers and nature. This inspired his paper, titled "Intelligent Machinery", whereby he described the similarities between humans and computers. From the subject of this paper, sprouted an entirely new field of research in computer science now known as Artificial Intelligence.

He argued that as human minds operate by carrying out a series of simultaneous steps in order to produce a result, computers could thus be programmed to operate using the same process. A computer contrived of this mechanism would have a potentially limitless amount of intelligence. He envisioned a computer that could perform any task a human could perform, but in a superior and more efficient manner, thus eliminating all of the flaws of the human mind. Turing grasped such an esoteric concept that has only begun to be implemented in society in the last number of years.

His next paper, "Computing Machinery and Intelligence", which was published in 1950, focused on the concept of machine intelligence and its potential. Since the human-mind is essentially just running through many simultaneous steps that eventually produce some form of result and computers run using the same mechanism, it raises the question 'Can machines think?'. 'Turing Test' was devised as a way of testing the machines ability to exhibit intelligent behaviour. A person would ask questions using a typewriter to both another person using a computer and a computer itself. If the person could not decipher which response is that of the computer, it is

then accepted as an intelligent machine. The Turing test has been described as the 'holy-grail' test in determining the approval of any Artificially Intelligent device. This has been deemed one of Turing's greatest contributions to computer science and is heavily relied upon today.

Turing's successive flow of projects were impeded when he came into conflict with the British law. 1952 saw his arrest and dismissal from the Government Communications Headquarters for homosexuality, a crime in Britain. Rejected from society, he concluded his contribution to computer science and carried out his own research at his home. On June 8th 1954, he died of a self-administered dose of cyanide, a poisonous chemical.

Alan Turing was a man whose mind was ahead of all those around him. His work today has finally received true recognition. Sadly, it has taken the rest of society many years to embrace his perspective and recognise the unjust hardship that he experienced in his last few years. The ingenuity and accuracy of his predictions are so remarkable and ahead of time that we have not yet even fully achieved what he predicted. His work continues to influence and inspire Computer scientists to incorporate and build on Artificial Intelligence, making computer devices more and more human-like. In a world with a dizzying rate of change in technological improvements, it is almost beyond our comprehension to imagine what further advancements would be in place today had Alan Turing lived a full life.

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