The life of alan turing

Business

When studying history there are many notable figures that most will never forget. From Winston Churchill to Adolf Hitler, some figures are never forgotten, while others are lost throughout the seams of history. Alan Turing is not a household name but is credited with not only creating computer science and artificial intelligence but ending World War II due to his brilliant invention that broke the impossible German machine enigma and saving millions of lives. Although Turing was a genius throughout his lifetime being a mathematician, codebreaker, philosopher, and visionary he did not escape personal tragedy.

Without accounts of people who have knowledge of Bletchley Park and Hut 8 Turing's work would have gone unnoticed by the public eye. Alan Mathison Turing was born in Maida Vale, London on the 23rd of June in 1912. His talents and high intelligence were recognized early in his childhood, focusing on science and math, which were not well respected at the time especially due to a high focus on English (The Biography Editors). While at Sherborne School Turing met a young boy named Christopher Morcom, who Turing had an intellectual companionship with, where Christopher introduced Turing to the wisdom of Einstein. Unfortunately, he died suddenly from bovine tuberculosis, a disease Christopher contracted from infected cow's milk in a previous year. His death led to Turing believing he must do what his friend could not, which led him to studying the human mind, especially Christopher's, and how minds are surrounded by matter and if minds are released from matter by death.

He continued this area of study in twentieth century physics when he furthered his education (Bos). After finishing school at the prestigious

Sherborne School, Turing continued his studies at King’s College, also known as the University of Cambridge, and studied mathematics with top scores, along with reading a work on quantum mechanics and its logical foundations. By reading this work it helped him transition to rigorous intellectual enquiry from emotional, when studying the problem of matter and mind (Bos). Once Turing graduated he pursued a fellowship at King’s College where he published his paper ‘ On Computable Numbers, with an Application to the Entscheidungsproblem’ (meaning decision problem). This paper lead him to Princeton University where he studied mathematics and cryptology, under the direction of Alonzo Church, another man who published a work on the Entscheidungsproblem (Copeland).

The work done on the topic between the two would make history in mathematics and cryptanalysis. The Entscheidungsproblem was used as a method to solving the fundamental mathematical problem to conclude which mathematical statements are provable with a formal mathematical system and which are not. It was independently concluded by Turing and Church that the problem has no resolution, which showed no formal system of arithmetic has an essential decision method. This study gave mathematicians doubt that a formal system would ever be discovered that could reduce the whole of mathematics that human computers could figure out (Copeland). This is where Turing introduced his “ Universal Turing Machine” that he believed would be capable of computing anything computable, this claim is now known as the Church-Turing thesis. Turing made the thesis that human-computable functions are duplicate to functions

that he labeled as lambda-definable, which are positive integers that can be calculated by repeated substitution.

Unlike Turing’s work, Church did not mention computing machinery and admitted that Turing’s work was superior over his own due to this, Church even said the computability of a Turing machine “ has the advantage of making the identification with effectiveness…evident immediately” (Copeland). After Turing’s education he started a part-time job at a British code-breaking organization called the Government and Cypher School. Once war broke out with Germany in 1939 Turing was transferred to Bletchley Park, the organization’s war-time headquarters and to Hut 8 were he was the leader (Biography Editors). The Germans used an enciphering machine named Enigma to securely send messages to German U-Boats in the Atlantic Ocean, which said when they were going to attack. Enigma would turn messages, letter-by-letter, into unintelligible gibberish only being decrypted by another Enigma machine (“ How Alan Turing Cracked The Enigma Code”; Ferndale).

The Polish Mathematicians Marian Rejewski, Jerzy Rozycki, and Henryk Zygalski created the Bomba, which found a flaw in German encryption. The flaw found was the beginning first three letters were double-encrypted in each message, which allowed the Polish to look for patterns (Smith). At the time Polish mathematicians worked out how to read the messages but due to the war Germans heightened the security, which lead to the cipher system being altered daily making the task much more difficult. With lettered rotors that were reset everyday Enigma had 150 trillion different configurations, Germans never expected their code to be cracked. Along with colleague

Gordon Welchman, Turing invented a machine called the Bombe, which was a followed up work first created by the Poles (“ How Alan Turing Cracked The Enigma Code”) (Farndale) (Smith). This turned slow hand processes to an operation that resembled an industrial production unit.

Over the course of the war 200 bombes were made which lead to four thousand messages being broken every day at its peak (Carter). By speeding up the rate of decryption the Allies were able to react to German forces in hours instead of weeks. Turing and his colleague Gordon Welchman were joined by various studious minds at Hut 8 who helped break the code such as Joan Clarke, Shaun Wylie, Hugh Alexander, Jack Good, Stewart Menzies, and PeterHilton. At the time all of these people were Britain’s brightest mathematicians along with 10, 000 other bright minds who specialized in various fields in many different huts (Bos; Farndale).

At hut 8 Turing had his most valuable minds working with him, even though he had his differences with them. Britain’s chess champion and international Master, Alexander Hugh, was transferred from hut 6 to hut 8 and became Turing’s deputy. Turing saw Alexander as his intellectual equal but would tease him for only being almost equal (Farndale). At hut 8 the workers had a never-ending three-shift basis, but no one favored the night shift, except Alexander. He would work nights for weeks on end along with working in the day at the same capacity with inadequate sleep. Alexander had conditional admiration towards Turing, seeing him as annoying which lead to him creating a friendly coup to make himself the head of hut 8 (Farndale).

He did not do this out of spite though, he believed Turing's talents were being wasted because he was too busy controlling everything and wanted him to have thinking space. Together Turing and Alexander saw the lack of professionalism at hut 8 so they broke protocol, without M16's knowledge, and appealed Prime Minister Winston Churchill directly to get more equipment and personnel (Farndale). When Germans created the " super enciphered" method that transmitted the day's setting to the operators of Enigma, Turing received help from Alexander to create a technique that broke the codes, calling it Banburismus since it involved " punching holes on long sheets of paper printed in Bunbury" (Farndale). The only woman who was with Turing's team at hut 8 was Joan Clarke, a codebreaker and Turing's fiance. Like the men, she achieved a first in mathematics at King's but was told when she was hired her labor would not involve mathematics. After doing clerical work she was promoted to work with the Banburists, due to her mathematical skills (Ferndale).

Unfortunately, due to sexism at the time Clarke had to be labeled as a linguist, since protocols were not established for senior female cryptanalysts, to get her promotion. Clarke and her colleagues would decrypt navy ciphers, which were more difficult to break than German ciphers, and were used to attack allied ships holding supplies and troops (Miller). She was also labeled one of the best Banburists in the section by her boss Hugh Alexander. Clarke was even known to hold back her workings to do a few more calculations to see if they would deliver information. By the spring of 1941, Turing and Clarke established a tight friendship while working together at hut 8 (Farndale).

The two would become inseparable, Turing even arranged their shifts together so they could be together while working and on their days off. Later, Turing would awkwardly propose to Clarke and she even accepted that it might not work out due to his “ homosexual tendencies” (Farndale). Their engagement lasted a year but it ended with mutual consent and the two remained close friends and colleagues. Later Clarke would become deputy head in 1944 at hut 8 but due to such secrecy that shrouded Bletchley Park, the full scope of achievements made by Clarke are unknown (Miller; Farndale). It is argued that the second most important figure at Bletchley Park was Stewart Menzies. Coming from a wealthy family who were close with Edward VII, Menzies was athletic but by no means academic.

He even skipped going to University and decided to join the Life Guards (Farndale). When the war started Menzies was labeled as “ C”, the leader of M16 where he supervised the work of Alan Turing. Although unsure of Menzies skills, Churchill made him part of his close circle and Menzies would report to him daily. Menzies was in charge of Bletchley Park and he even introduced Ultra, which only let a certain amount of information be sent to the British navy, army, and RAF because Germans would get suspicious about the Enigma codes being broken (Farndale). Unlike the other codebreakers in hut 8 Peter Hilton studied at Oxford instead of King’s.

When he was 18 years old he was employed at hut 8 for self-teaching himself German and worked alongside Turing (Farndale). On his second day Hilton started working with Turing on breaking German naval codes made by Enigma. Hilton had the astonishing skill to take characters from two separate teleprinters and pick them apart. This proved to be a vital part of the

deciphering process because it allowed messages to be sent out so quickly to the Allied forces that they would know German troop actions before the German generals (Childs). Each one of Turing's colleagues played vital roles in breaking enigma, but none as distinct as the way mathematician Jack Good.

While working closely with Turing, Good would take frequent cat naps on hut 8's floor once he finished a long day of work. During one of Good's naps he had a dream which supplied him with a solution to a crucial code (Farndale). In his dream he questioned if certain false letters placed in messages by telegraphists were preconceptions towards certain letters or random. From this he figured out the tendency to use some letters was higher than others. With this discovery, Good instructed codebreakers to take the beginning indicators and work back from followed by applying each bigram table (code material) in turn (Farndale). This was done by taking the bigram table that produced a popular imitation letter and assuming it was the right one.

When introducing his findings to Turing he responded by saying, " I could have sworn I tried that already" then rapidly making Good's idea to the Banburismus procedure. Once the war was finished Good found out about Turing's homosexuality and stated if Bletchley Park authorities found out earlier, " Turing may have been driven to kill himself earlier, and we might have lost the war (Farndale). While working in America, Turing met fellow mathematician Shaun Wylie, and in 1940 asked Wylie to join him at hut 8. After two months he arrived at Bletchley Park to work on breaking German naval codes alongside Turing. Eventually, Wylie became a leader of the subsection labeled " crib", where he searched for repeated phases, rightfully

named cribs, in the codes (“ Shaun Wylie”). This is when he began to work closely with the bombe machine, which depended greatly on Wylie and his teams “ cribs”.

Although Alexander admitted that Turing made a larger impact on the success of hut 8, Wylie was the best in his section and significant in breaking German encryptions (“ Shaun Wylie”). Unfortunately, Turing was not able to escape tragedy among all of his success and contributions to the war effort. In 1952 Turing was convicted of gross indecency, for maintaining a homosexual relationship. At the time Turing had two options, being put in jail or being chemically castrated with injections to cure him of his illness (Farndale). Unsurprisingly, Turing choose to take injections because he did not want to be separated from his work.

Due to his conviction Turing was barred from continuing his work GCCS. On June 7th, 1954 Turing was found in his bed with the remains of anApplebeside him, his death was thought to be a suicide (Biography Editors). This was concluded after a postmortem exam, which determined he died by being poisoned with cyanide. This exam found a fluid that smelled of cyanide and bitter almonds in his stomach, along with vital organs having a bitter almond scent.

Even though doctors ruled his death a suicide, some experts speculate that his death was accidental (Biography Editors). Experts back up their claims by using evidence such as the apple not being tested for cyanide, no suggestions of suicidal tendencies in previous days, and Turing conducting many experiments in his home using cyanide (Biography Editors). Despite

Turing’s appalling treatment by the British government his work was not left unnoticed. After World War II ended, Turing was given an Order of the British Empire for the work he did to help the war effort. Later, a blue English Heritage plaque was placed at Turing’s childhood home, by Turing biographer Andrew Hodges (Biography Editors). By the 21st century two statues were created to honor his work, one at the University of Surrey for the 50th anniversary of his passing, and another at Bletchley Park to commemorate his work doe there.

Along with his statues and awards, Turing was also named Princeton University’s second most important alumni, runner up to James Madison (Biography. com Editors). Turing was also featured in Time magazine as one of the most important figures of the 20th century in 1999, along with being polled at number twenty-one in 2002, in BBC’s nationwide poll of the “ 100 Greatest Britons”. Time stated that computer related functions, such as spreadsheets and word-processing programs, are the Turing machine reincarnated and Turing has been greatly recognized for his contributions in computer science, so much so he is credited as the “ founder” by many people (Biography. com Editors). Over a half century after Turing’s death, the Prime Minister at the time Gordon Brown, released a statement, following a petition started by John Graham-Cumming.

In this he addressed the sympathy he had towards Turing and how the British government treated him, along with recognizing the amount of people demanding justice for Turing. Brown also gave Turing credit for his contributions to humankind and his fight efforts in the war is the reason the holocaust is in Europe’s past, not present (Biography Editors). Turing was

finally granted a posthumous pardon in 2013 by Queen Elizabeth II. Later on, the British government created “ Turing’s Law”, which posthumously pardon all homosexual men that were convicted of gross acts, when still seen as a crime. Turing’s contributions towards science and math fields to the war has changed history, more than most people know.

From creating the field of computer science to saving millions of lives and cutting two years off World War II, Turing has inspired so much of what society has today(Farndale). Even though Turing’s life was cut short his work lives on and will continue to be an inspiration to all bright across the planet. Works Cited Biography Editors. “ Alan Turing” Biography. A&E Television Network, 12 October 2016.

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