**Alan Turing and Enigma: the story of a genius**

**• Alan Mathison Turing was a genius of Mathematics and Logic**

**• Perhaps he was the man who really defeated Adolf Hitler**

**• He contributed to the early end of the Second World War**

**• He laid the foundations for the creation of the first Computer**

**• He proposed the first analysis systems regarding Artificial Intelligence**

**• He was convicted of Homosexuality in 1952**

**• He committed suicide in 1954 at only 42 years of age for ingesting Cyanide**

**• Elizabeth II pardoned him, posthumously, in 2013**

If the Allied army defeated Nazi Germany, it is also, and above all, thanks to Alan Turing: he was an expert in deciphering war messages processed by the “Enigma” machine used by the Germans to transmit their secret information.

The Normandy landings – Operation Overlord – were a success also thanks to his work. **Turing's work was made public only in the 1970s**. Great Britain feared, in the event of a new war, having to resort, once again, to the secrecy of the decryption systems discovered by Turing.

After the war, he also worked on one of the very first computers, then contributed to the debate on the possibilities of artificial intelligence, proposing the Turing test.

In short, the Test was based on the “blind” comparison between the Human Being and the Computer; when the Computer, not obvious during the test phase, had produced responses similar to a human thought, it could be defined as Intelligent.

***Alan Turing was born in London in 1912***

At a young age, young Turing showed signs of his genius. The story goes that Alan Turing taught himself to read in just three weeks and quickly developed a passion for numbers and puzzles.

As a teenager, he went to study at Marlborough College. At school, his teachers were all in agreement that the young student was talented. However, at Marlborough, Turing was not happy. He was a lonely and introverted child who was interacting with older peers for the first time. In fact, he quickly became one of their favorite laughing stocks, to the point of being bullied.

Later, at the age of 13, he entered Sherborne School. His first day at school did not go unnoticed. In fact, this day of the beginning of the school year was also the day of the great general strike of 1926. However, Alan Turing expressed the firm intention, against all odds, to return home normally. To do so, he bought a road map with 2 shillings and decided to set off alone on his bicycle to travel the 90 km that separate his home from his school, stopping for the night in a hotel.

Turing's passion for science did not earn him the respect of his professors or the members of the Sherborne administration. The true values ​​of this school were rather oriented towards classical disciplines such as literature, art or sport, although Turing was a top athlete who almost participated in the Olympics.

Despite this, **Turing continued to excel in the subjects he loved**, solving problems that were very difficult for his age. In fact, he was only 16 when he discovered the theories of Albert Einstein and questioned those of Galileo and Newton.

Due to his lack of enthusiasm for work, in both classics and science subjects, Turing repeatedly failed his exams. In fact, he was only accepted to King's College, Cambridge University, even though his first choice had been Trinity College. However, he soon became a bright and promising young mathematician. In late 1938, after the Munich Agreement, Britain realized the danger of Hitler and Nazism and developed its own weapons. **Turing was one of the young minds called to take courses in ciphering and cryptanalysis at the Government Code and Cypher School**. Turing was employed on a part-time contract by the British government and spent most of his time breaking secret codes.

***Alan Turing was the greatest mathematician of his generation***

A researcher at Cambridge, he was an eccentric and neurotic young man obsessed with childish things. For example, he had seen "Snow White and the Seven Dwarfs" forty times and knew every move and every line by heart. Despite his neuroses, he became famous in academic circles by imagining the principle of the computer. **He collaborated with a group composed mainly of mathematicians, linguists, code specialists and crossword puzzles**. They all met at Bletchley Castle, near London, with the mission of deciphering German communications, especially those coming from the Enigma machine. It took a long time before Alan Turing was accepted into the group. His very special character did not make him a valued colleague. He challenged the theories of other members, sometimes with extreme arrogance. As a result, he was alone when he began his quest to develop a machine that could automatically decipher German secret codes. Due to his complex personality, his direct superiors even went so far as to publicly disown him. However, Turing's intelligence and conviction in his research eventually convinced his colleagues to help him. This unlikely cohesion allowed him to continue his research.

***Alan Turing will be able to solve the mysteries of the "Enigma" machine***

This very complicated device resembled a typewriter. Its operation was based on the addition of metal rollers that rotated as soon as a letter was typed. This perpetual motion guaranteed secrecy, since the letters were never encoded in the same way. **Enigma made the messages indecipherable** for the English decoding specialists. The possible combinations were 10 Million Billion and the Encryption scheme was changed every 18 hours.

Turing participated in the research and managed to penetrate the army and air force networks. To achieve this goal, he devised mathematical methods and improved versions of the Polish “Bomb”. This electromechanical machine allowed for rapid testing of code sets on communications from Enigma.

Turing took command of the team tasked with finding the keys to penetrate the **Enigma** networks.

These breakthroughs gave Britain a temporary advantage in the battles of Britain, Libya, and the Atlantic. According to several historians, Turing's work in cracking the German transmission code shortened World War II by at least two years and prevented approximately 14 million deaths.

***The Birth of the First Computer***

Thanks to the military operations conducted by the commandos, the British secret services came into possession of a copy of the **Enigma**. During these missions, the military confiscates several programming manuals. Thanks to this, the cryptanalysts were able to detect some regularities in the encoding of messages. They also understood that Turing's ideas should be implemented immediately. As a result, they began the construction of one of the first computers in history.

Once completed, the construction was a nerve-wracking experience for the team and senior officers, as it took time and many adjustments to get the **Turing** machine up and running.

However, the group resisted and, once fine-tuned, the machine finally revealed its full potential, as it was capable of testing thousands of combinations in just a few minutes. It also allowed messages that would normally take weeks to understand to be deciphered in real time.

Until the mid-1970s, only a few former French and Polish cryptanalysts revealed information about the fight against Enigma. The decryption capabilities of Bletchley Park and Operation Ultra remained a top military secret in Britain. That was until the day the British authorities gradually declassified **Enigma's decryption techniques**. We had to wait until the year 2000 to learn the full story.

***Turing contributes to changing history***

From 1940 onwards, Turing's team transmitted the decrypted text of secret German communications to Winston Churchill every day, thus providing crucial support for the victory at the Battle of El Alamein and the Battle of the Atlantic**. It was thanks to Turing and his collaborators that most of the Nazi spies in Britain were discovered and arrested.**

During the preparation of Operation Overlord, they monitored the organization of the German army day by day. Finally, thanks to Turing, the British were able to verify the success of Operation Fortitude, which was intended to deceive Hitler about the location and date of the D-Day landings.

One of the most dramatic passages concerning the decryption of Enigma concerns the tragic decisions that, several times, were taken to hide the fact that they had managed to understand the algorithm. Several ships, several hundred passengers, were sacrificed to not “burn” the surprise, in view of the Normandy Landing.

***Private life and its tragic end***

From the beginning, Turing made no secret of his homosexuality. In 1952, his home in Manchester was burgled and Turing filed a complaint. The thief, arrested, reported his accomplice who turned out to be Turing's occasional ex-lover. As a result of this relationship, Turing was charged with "manifest indecency and sexual perversion". At the time, homosexuality was illegal in Britain. A few years later it would be just a news story. Despite his celebrity, Turing's life was turned upside down and due to his conviction, he was forced to choose chemical castration to avoid prison.

At the time, the hormonal treatment through which Chemical Castration was implemented was, obviously, far from today's standards and entailed serious side effects, both in the physical sphere (for example breast growth in males) and in the psychological sphere (major depression).

***The Legend of the Poisoned Apple***

**Two years later, in 1954, Turing was found dead from cyanide poisoning in the bedroom of his house in Wilmslow: a bitten apple was found on his bedside table.**

The autopsy revealed that Turing's death was due to suicide by ingesting cyanide. Desperate and humiliated, Turing is said to have killed himself by biting into this cyanide-soaked apple.

It was much later that the story of the bitten apple became a legend. In fact, the famous Apple brand logo is said to be a vibrant homage from the two creators of Apple to the mathematician. There are those who say that even the rainbow color of the first logo was not chosen at random, given that it is the symbol of the homosexual community.

Much later, through Queen Elizabeth II, England finally recognized him as a war hero. The Queen even pardoned him posthumously in 2013. It took more than sixty years for his country to do him justice.

The legacy of Alan Turing's life and work was not truly recognized until long after his death. Today, his impact on IT is finally being widely appreciated. There is even an “**Annual Turing Award"** which is the highest honor in the field since 1966.