

CLOSE READING

Alan Turing: Codebreaker

(Genre: Biography/Historical Nonfiction)

- 1 Invisible ink, cipher wheels, and hidden messages—these are the spy gadgets of the past. Modern spy devices include unmanned aircraft and other spy planes. But between these times, people used decoding machines to crack the codes of their enemies. During World War II, intelligence information was encoded. This means that a code was used to transfer information. If someone could crack the code, he could understand what the enemy was saying. This feat had far-reaching implications. One of the most famous codebreakers of the WWII era is Alan Turing.
- 2 Alan Turing worked hard to help his country during World War II. He did not, however, serve on the front lines. Turing, a British man, worked at his country's crypt-analytic department called Bletchley Park. It was there that he cracked the code called the German Enigma. Turing used advanced computing to aid in his work. He is considered by many to be one of the founding fathers of the field of computer science.
- 3 Turing was born in London in 1912. At the time, his father worked in the Indian Civil Service. India was a British colony then, so many Britons lived and worked there. Turing's parents lived in India until his father retired in 1926, but Turing and his brother remained in the United Kingdom for their childhoods. They lived with friends and relatives until their parents returned.
- 4 Turing studied mathematics at Cambridge University. When he taught there after he was finished with school, he worked in the field of quantum mechanics. During his time working at Cambridge University, Turing devised a proof that is considered fundamental to the field of computing today. The proof states that automatic computation cannot solve all mathematical problems. What this means is that there are problems that are so complex, a computer, no matter how fast it works, cannot solve them.
- 5 In 1936, Turing went to Princeton University in America. When he returned to London in 1938, he began working secretly for the Government Code and Cypher School. This was an arm of the British government that was focused on spying and cracking codes. When World War II broke out in 1939, Turing began working in the center for deciphering codes at Bletchley Park full time.
- 6 During wartime, countries usually go to great lengths to maintain secrecy of their military plans. The element of surprise is a huge factor in gaining the upper hand. For this reason, armies develop and use code languages. If someone from the opposition were to intercept a coded message, he would not be able to understand it—that is, if the code is good enough.



KEY IDEAS AND DETAILS

- 7 The Germans used a machine they called Enigma to make their code. If the British could decipher the code, they could listen in on German messages and anticipate what the German army was going to do. This would be a huge advantage for the British and their allies.
- 8 Enigma looked roughly like a typewriter. Its only use was to encode and decode messages. But it was not a computer. A human cipher used it to create and read messages; Enigma could not type messages, transmit them, or receive them. Enigma was, however, very complex. It had 17,576 ring settings for each of 60 possible wheel orders. Wheels were changed every day based on instructions. When clerks typed a letter, a different letter would appear. If they typed the same letter again, another different letter would appear. Though it was complex because of the wheel orders and ring settings, Enigma worked using the essentially simple idea of substituting letters for each other.
- 9 Using his knowledge of computation, Turing, with the help of other cryptologists, designed a machine to help decipher German messages.

Bletchley Park

- 10 In 1938, a group of men dubbed “Captain Ridley’s Shooting Party” arrived at an estate in the Buckinghamshire countryside for the weekend. They might have appeared to be friends on vacation. In fact, the men were all agents of MI6, Britain’s secret intelligence service, or the Government Code and Cypher School. They were there to determine whether the estate, Bletchley Park, would be

a good location for their codebreaking and other intelligence activities if war were to break out.

- 11 When war did break out the next year, Bletchley Park became their headquarters and the men moved in to the mansion to do their work. In addition to the Enigma, there were various other smaller codes to break, as well as the codes of Germany’s allies.



A German Enigma code machine

CLOSE READING

Alan Turing: Codebreaker *continued*

- 12 As stated, the Enigma was a code-generating machine for German military information. In the early 1930s, the Poles had cracked it when it was still in development. Once it was fully operational and sending messages every day, however, the number of possible settings for the machine became huge. The Poles could no longer break the codes. With Germany about to invade Poland, the Poles turned to the British for help.
- 13 The men at Bletchley were divided into groups to do their work. In the winter of 1939–40, the team with Turing made the first break into Enigma. They first discovered how to break into the administrative key. Later, they were able to crack the key used by officers to coordinate air-support for army units. Once the messages were deciphered, they were turned into intelligence reports. This was done in the hut just next to where the codebreakers worked on the grounds of Bletchley Park. The British army and navy were then able to use the information in their fight against German forces.
- 14 Turing and his colleague, Gordon Welchman, created an electro-mechanical device. It was this device that greatly assisted the codebreakers in breaking Enigma. They called the device The Bombe. The Bombe ran through all of the possible wheel combinations for Enigma. By doing this, it ruled out most of the configurations, leaving only a few for testing by hand.
- 15 The codebreakers at Bletchley Park had help in their efforts. People who were part of the “Y” Service, a vast system of listening stations across Britain, listened to Germany’s radio messages. They carefully noted each letter. They then sent their messages to Bletchley Park so Turing’s team could decipher them. The goal was to get as complete a picture of Germany’s plan as possible. The codebreakers, Turing included, were working practically nonstop to send the intelligence they were producing to the government in London.
- 16 When the naval commanders were first given intelligence based on cracked codes, they did not take it seriously. This changed once they realized that the intelligence was legitimate. In addition to the German Enigma, the codebreakers also cracked Japanese codes. They were able to monitor the Japanese as they prepared to join the war on the side of the Germans.
- 17 In 1942, the Germans made Enigma more difficult. The Germans had become aware that some of their codes were being deciphered. One year later, the codebreakers had cracked that code as well.

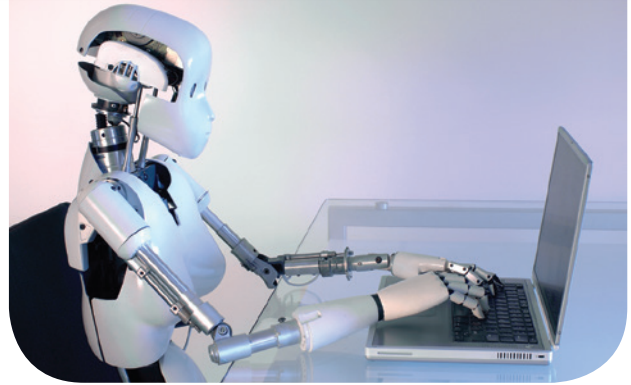
Bletchley Park



KEY IDEAS AND DETAILS

Turing's Legacy

- 18 In addition to his work with The Bombe breaking German codes during WWII, Turing is considered by many to be the father of computer science. In 1936, well before his work on Enigma, Turing attended a lecture. The speaker discussed a logic problem and the “mechanical process” used to test the validity of a mathematical assertion. Turing latched on to the phrase “mechanical process” and began to design a machine that could do the testing. His design is considered by many to be the idea for the first modern computer.
- 19 After Turing left Bletchley Park, he went back to his work on computers. He supervised the assembly of the first functioning computers. He devised a test



called the “Turing test” to determine if machines could think. This work is widely regarded as the birth of the field of artificial intelligence.

- 20 Thus, not only was Alan Turing a wartime codebreaker and hero, he was also the father of computer science and of artificial intelligence.

Comprehension Check

- 1A.** The Bombe, the code-breaking device created in part by Turing, most likely
- created codes as well as cracked them.
 - was a machine much like a typewriter.
 - saved the codebreakers a lot of time and energy.
 - helped people hear radio messages.
- 1B.** What sentence from the text supports the answer to Part A?
- “When clerks typed a letter, a different letter would appear.”
 - “Once the messages were deciphered, they were turned into intelligence reports.”
 - “This left only a few for testing by hand.”
 - “They carefully noted each letter.”
- 2A.** What can you infer about Alan Turing?
- He was very serious.
 - He was fun to work with.
 - He liked to build equipment.
 - He enjoyed living in the mansion.
- 2B.** Which detail from the text BEST supports the answer to Part A?
- He studied mathematics.
 - He pretended to enjoy hunting.
 - He brought a chef to the mansion.
 - He designed a machine to do testing.

CLOSE READING

Comprehension Check

- 3A.** Why did the British get involved with cracking Enigma?
- to help the Poles
 - to help the Indians
 - to help the Japanese
 - none of the above
- 3B.** What detail from the text supports the answer to Part A?
- “. . . the Enigma was a code-generating machine for German military information.”
 - “In the early 1930s, the Poles had cracked it when it was still in development.”
 - “In 1942, the Germans made Enigma more complex.”
 - “The Poles could no longer break the codes.”
- 4A.** Which of the following is a central idea that is supported by the text?
- Building machines is a fun hobby.
 - Spying is important during wartime.
 - Some people like to be secretive about their work.
 - all of the above
- 6.** How is Alan Turing described in the passage? Use details from the text to support your answer.

- 4B.** What detail from the text supports the answer to Part A?
- Turing helped assemble computers.
 - Turing helped his country by cracking codes.
 - Turing worked in a hut at Bletchley Park.
 - Turing went to Bletchley Park for the weekend.
- 5A.** What is the main reason a country has codebreakers?
- to build interesting machines
 - to give work to intelligent people
 - to provide a navy with information
 - to know what the enemy is planning
- 5B.** Which phrase from the text supports the answer to Part A?
- “The codebreakers at Bletchley Park had help in their efforts.”
 - “. . . anticipate what the German army was going to do.”
 - “Turing and his colleague . . . created an electro-mechanical device.”
 - “. . . naval commanders . . . realized that the intelligence was legitimate.”

KEY IDEAS AND DETAILS

7. What made Enigma a very difficult code to break? Use text details in your answer.

8. Summarize the steps in the process by which intelligence was given to the British military.

9. Analyze how the idea of spying, a central idea of the text, is introduced. Explain your answer giving examples from the text.

10. How is the description of Bletchley Park as a spy headquarters developed and elaborated on in the text? Write a paragraph using details and examples from the text to support your answer.
