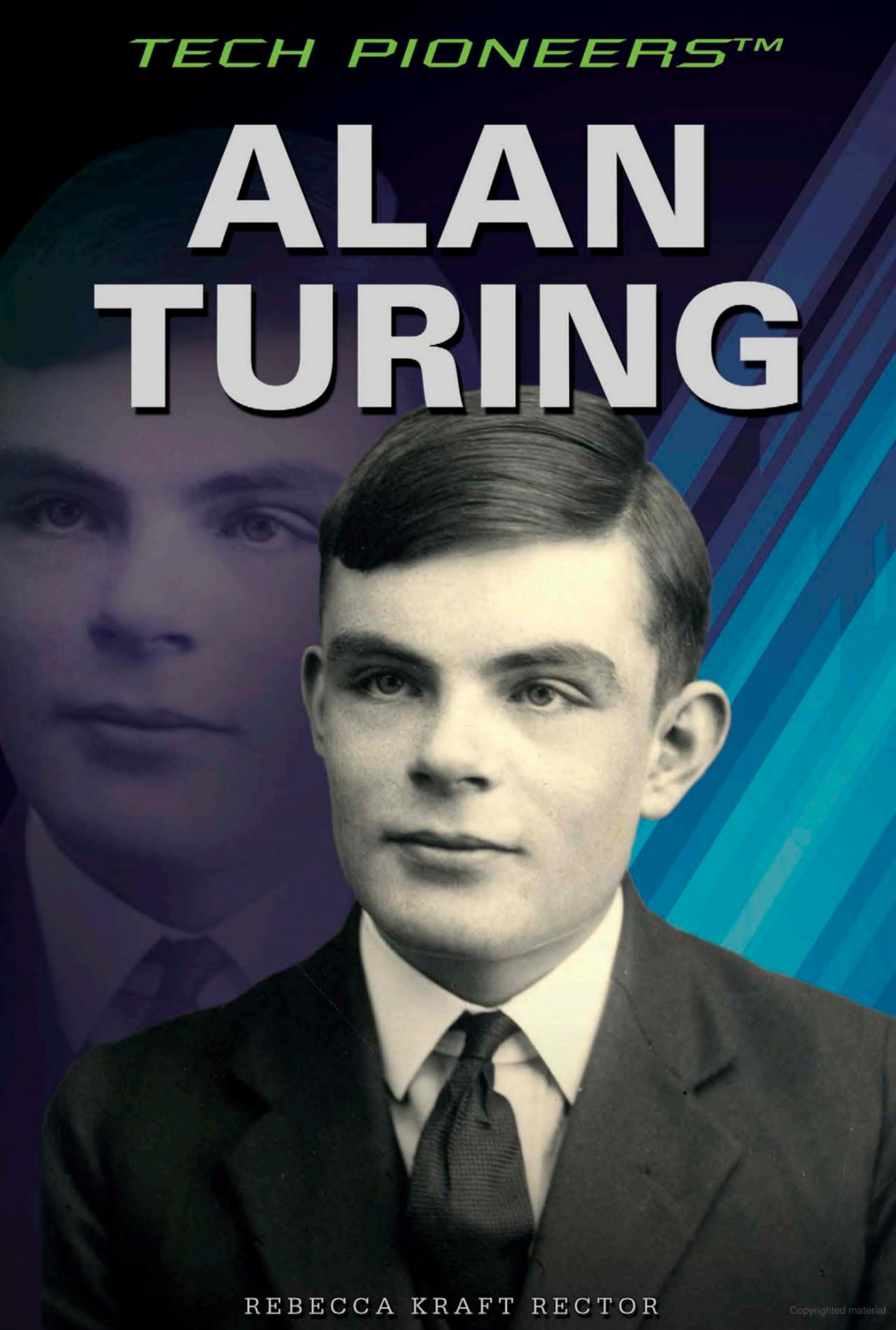
TECH PIONEERS™

ALAN TURING



REBECCA KRAFT RECTOR

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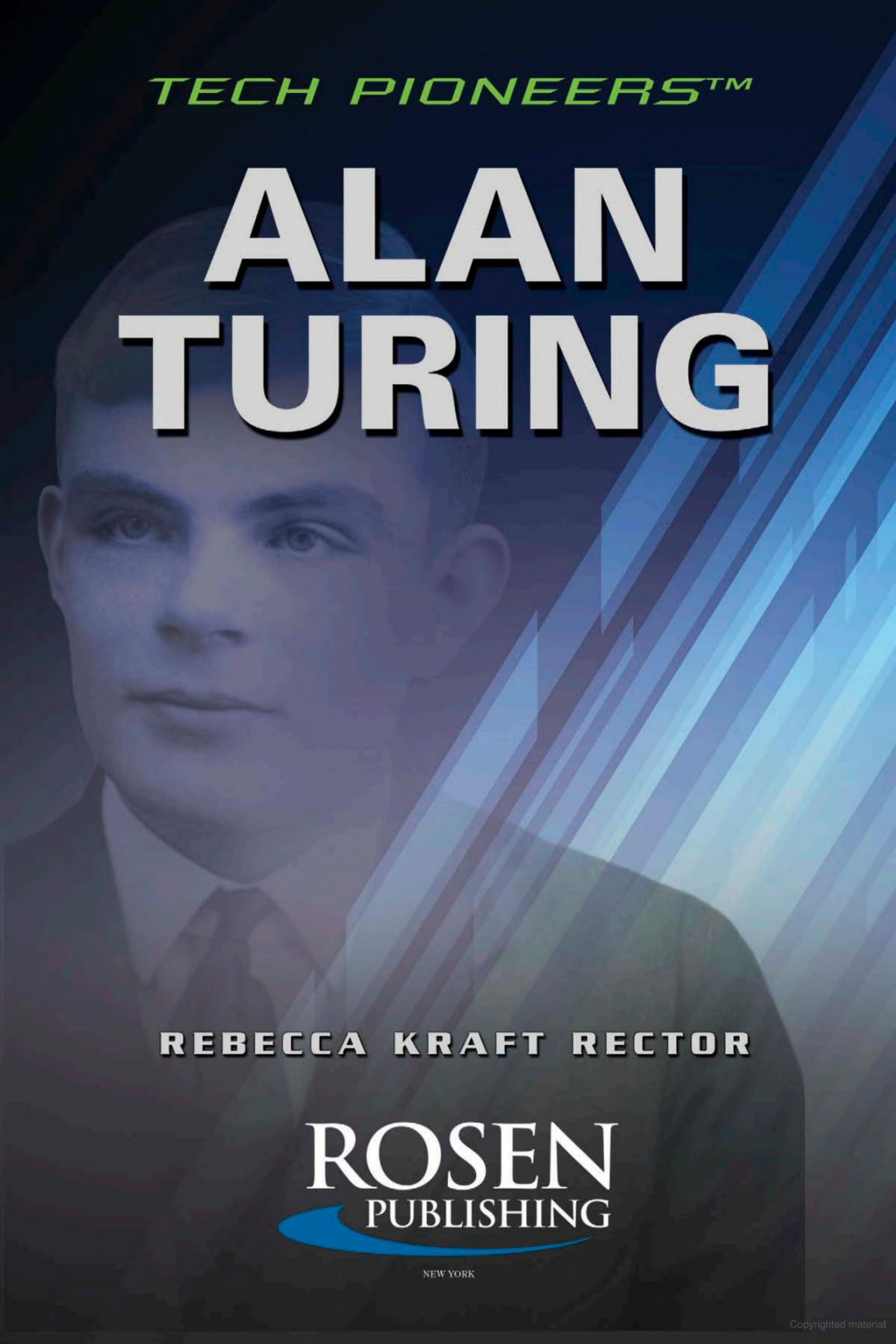

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Contents

Introduction 4

Chapter One
Boy Genius and Bad Student 8

Chapter Two
Ultra Versus Enigma 24

Chapter Three
Star Code Breaker 40

Chapter Four
Building a Brain 52

Chapter Five
Trial, Conviction, Death 65

Chapter Six
Famous After Death 76

Timeline 91

Glossary 94

For More Information 97

For Further Reading 100

Bibliography 103

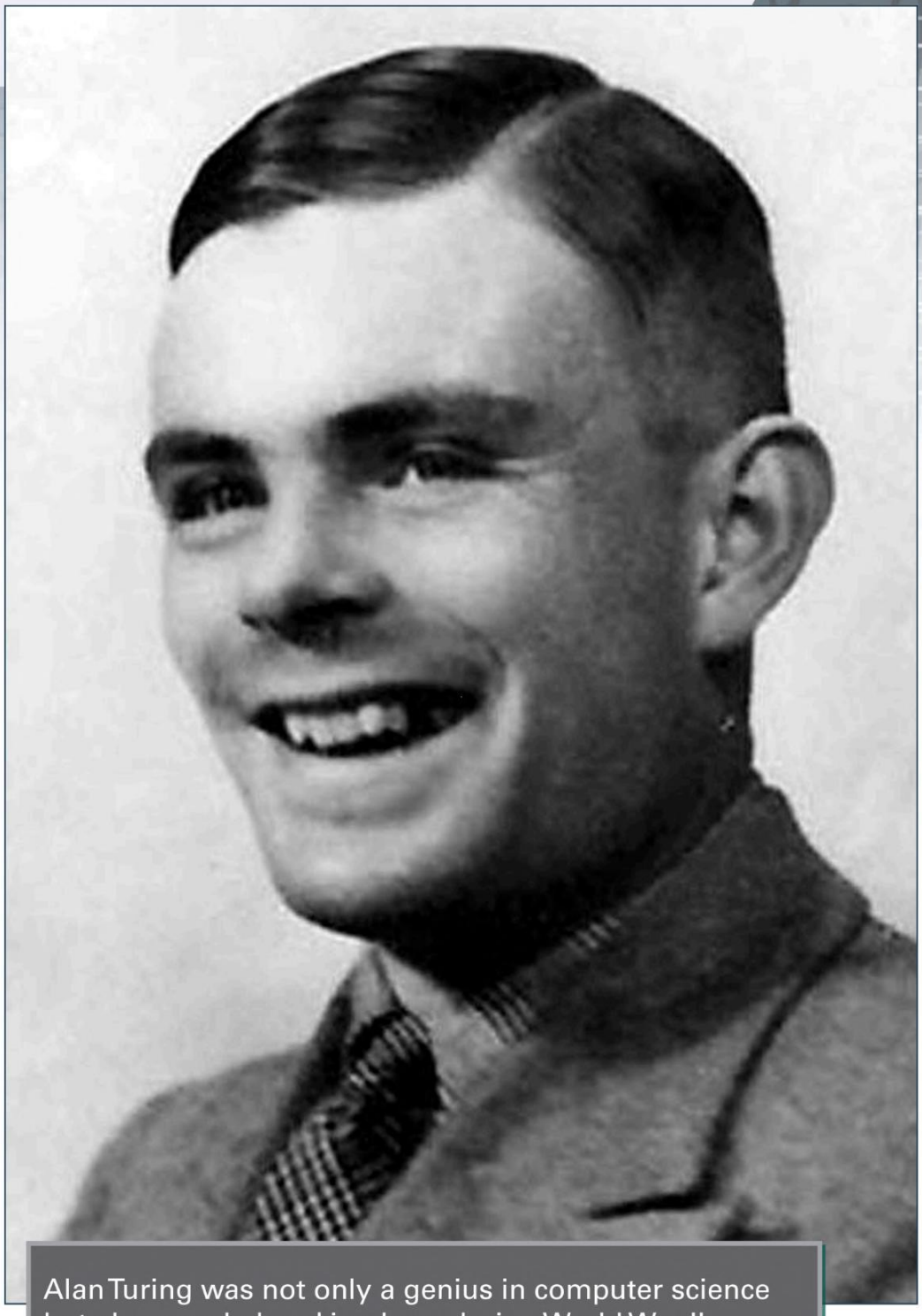
Index 108

INTRODUCTION

Alan Mathison Turing was a British mathematician, logician, cryptographer, and computer science pioneer. He is considered by some to be the founder of computer science. His papers on artificial intelligence were groundbreaking. He also contributed greatly to research in the concept of artificial life.

Even as a child Alan had a curious mind, inventing words and "helpful" items like green paint for the stairs. His interest in mathematics and science worried the teachers at the private schools—known, confusingly, as public schools in Britain—that he attended. At that time, education focused on the classics and literature, and Alan typically got failing grades in those classes. He was also untidy in his clothing and sloppy in his homework. He often jumped to the correct answer without demonstrating that he knew how he got there. His teachers could not decide if Alan was a genius because of his grasp of advanced mathematics or a failure because of his lack of interest in literature.

Turing attended Cambridge University, in Cambridge, England, and received his Ph.D. from Princeton University in Princeton, New Jersey. One of his most



Alan Turing was not only a genius in computer science but also a code-breaking hero during World War II.

famous and influential papers was published at that time. In it, he set forth the idea of a Universal Turing Machine, a machine that could solve mathematical problems and perform other tasks for which it was given instructions. This idea is commonplace now but was novel and groundbreaking then. It laid the foundation for computer science.

When Britain entered World War II, Turing worked at the secret British code-breaking headquarters called Bletchley Park. The people working there were trying to decipher the coded messages that Germany was using to communicate with its army, air force, and naval forces. The code was called the Enigma code, and Turing built a device called the Bombe to break it. The Bombe was an innovative machine that enabled the British to crack the Enigma code and read German army and air force messages. Turing was also instrumental in breaking the more sophisticated Naval Enigma code.

Turing's code-breaking work remained top secret until the 1970s. Even after the war, Turing's family and friends did not know about the important contributions that he had made to the war effort. However, Great Britain's prime minister, Winston Churchill, was well aware of Turing's brilliant work. He said that the work at Bletchley Park might have shortened the war by as much as five years.

In 1950 Turing published another important paper. In it he proposed the Turing Test—a method to test a computer's intelligence. The Turing Test is a benchmark in artificial intelligence. Turing also contributed groundbreaking work in the field of artificial life.

A gay man at a time when it was a crime, Turing was arrested, tried, convicted, and punished. His death of cyanide poisoning at the age of forty-two was ruled a suicide. Later the British government apologized for his punishment and the queen issued an official pardon for his conviction.

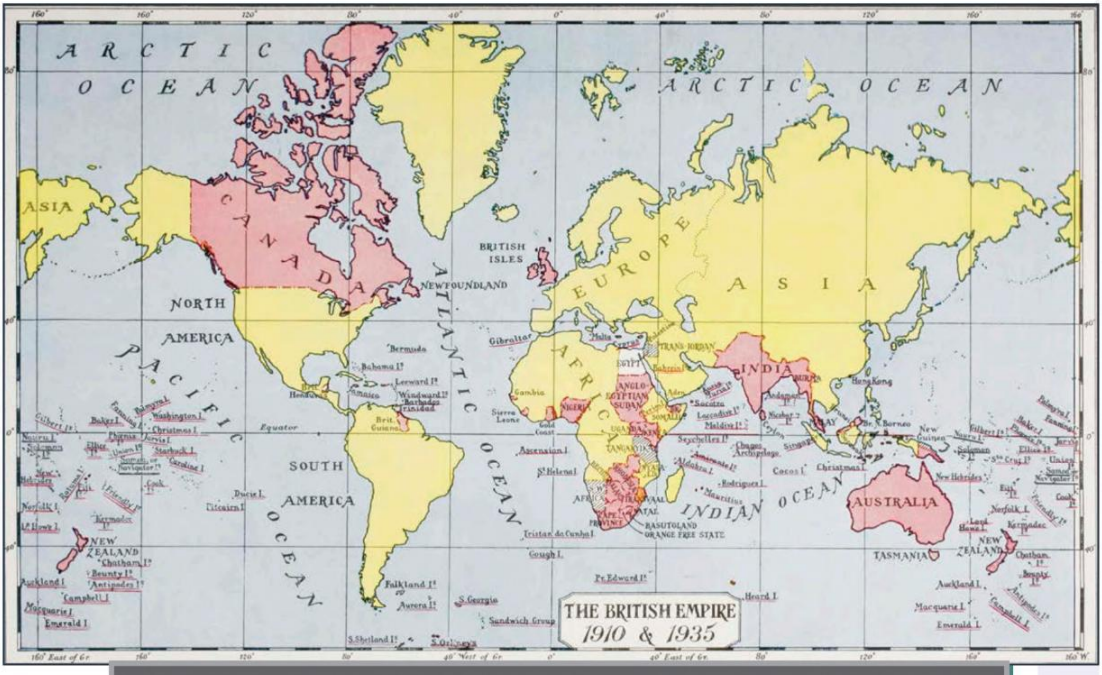
Chapter One

Boy Genius and Bad Student

Alan Mathison Turing was born June 23, 1912, in London, England. His parents were Julius and Ethel Sara Turing. Although Alan was born in England, his father worked in India for the British government. He was in the Indian Civil Service. Alan's parents lived in India most of the time. Alan and his brother, John, who was four years older, lived in England and rarely saw their parents.

Early Life

While their parents served in India, Alan and his brother stayed in England with Colonel and Mrs. Ward and their four daughters. Other boys sometimes boarded with the family, too. Alan and John called Mrs. Ward "Granny



This map of the British Empire, with British colonies in red, shows the enormous distance between young Alan in Britain and his parents in India.

Ward." Their nanny was called "Nanny Thompson." Alan became friends with the older daughter, Hazel, and later in life he gave Hazel money so that she could become a missionary.

Alan did not fit in well with the Wards. Mrs. Ward complained that he was a bookworm. His mother scolded him in her letters for this.

As a young child Alan liked to make up words. A candle that was about to go out was a "greasicle." The noise of seagulls was "quockling." His mother recorded

ALAN TURING'S WORLD

Alan Turing was part of the upper middle class in Britain. His parents paid for him to go to exclusive, boys-only schools, though he sometimes received a scholarship. Children of the working class went to state schools.

The British Empire had colonies around the world. British citizens were sent to the colonies to help rule them. Alan's father was part of the group ruling India, called the Indian Civil Service. It was not unusual for British citizens who worked in other parts of the British Empire to leave their children in England to be raised by nannies and educated in boarding schools.

Alan's parents traveled by ship to India. The trip could take weeks, so they did not visit easily back and forth with their children. Airplanes were used during World War I, which started two years after Alan was born. But it was not until later that passenger air travel became common. The Wright brothers had flown their first airplane only nine years before Alan was born.

The Turing parents could not call their children on the phone. Homes were becoming connected by telephones and electricity, but telephone calls could not be placed across an ocean until 1927. Those calls were between New York and London. Families like the Turings stayed in touch by writing letters.

Radio technology was still fairly new and home television broadcasts were still decades away. And of course, computers had to wait for Alan Turing to grow up before they became a reality!

many of the words that he made up. He taught himself to read before he started school.

Even as a toddler he liked to experiment. When he was three he planted the broken arms and legs of a wooden sailor in the garden, sure that they would grow. When he was older he invented a powder to turn the steps green. He figured out how to extract iodine from seaweed. He made his own ink and fountain pen, along with many other items. Alan was interested in everything and everyone. People he met thought he was a charming child.

In the summer of 1918, Alan was sent to a day school called St. Michael's, in East Sussex, England. There his teachers complained of his untidiness. However, when he left the school at age nine, the headmistress said, "I have clever boys and hard-working boys, but Alan has genius." She mentioned how talented he was with numbers.

As Alan grew older he read books about nature and liked to study maps. When his mother returned from

India to visit, she found Alan changed. He was no longer outgoing and interested in other people. So, during 1921, his mother spent some time homeschooling him.

After a few months, he started at his brother's school, Hazelhurst. It was also in East Sussex. John was at the top of the school and Alan was at the bottom. It was at Hazelhurst that Alan first became interested in chess. He also continued to make his own inventions while he was there.

In 1922 Alan was given the book *Natural Wonders Every Child Should Know.* It was written by Edwin Tenney Brewster and featured illustrations showing how plants and animals grow and develop. Alan Turing spoke highly of this book, even when he was an adult.

Alan's schoolwork continued to be untidy and his handwriting was poor. He stuttered when answering questions. He continued to do well in subjects like math and when he was twelve and a half he began learning organic chemistry from an encyclopedia.

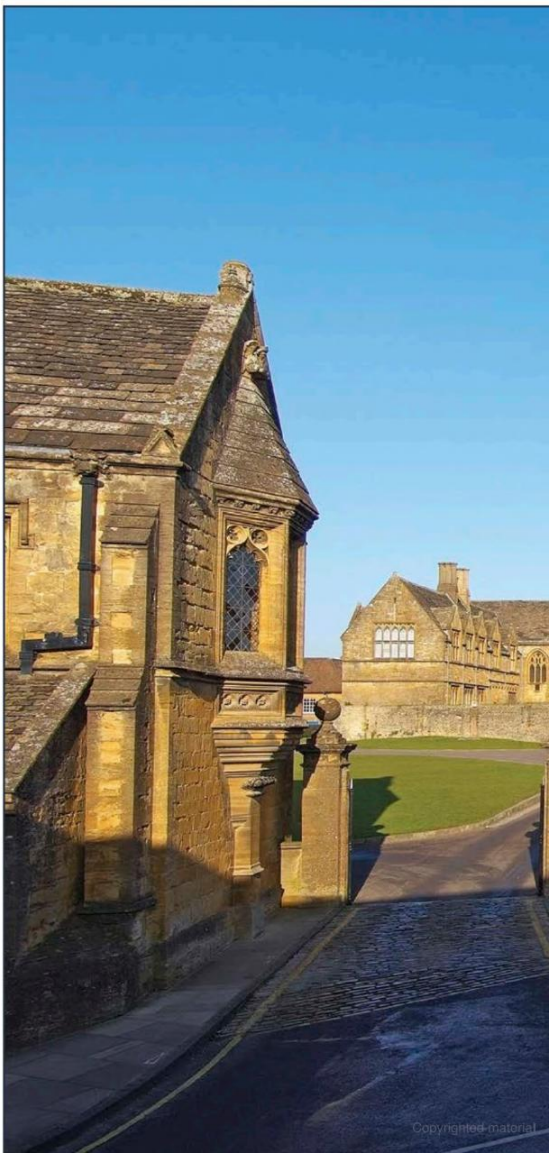
His father retired in 1926 and Alan's parents moved to the north of France. The boys continued to attend boarding school in England and visited their parents during the holidays.

Sherborne School

At the age of thirteen, Alan won a place at the highly competitive Sherborne School in Dorset, England. By the

Alan probably learned how chicks hatch from one of his favorite books, *Natural Wonders Every Child Should Know*.

time school started, he was fourteen years old. Despite his young age, Alan planned to travel on his own from France—where he was staying with his parents during his vacation—to his new school. He took a boat from France but when he landed, he discovered that there was a transportation strike! He had no way to get to school sixty miles (96 kilometers) away. He sent a telegram to his new headmaster to say he would be there on time. Then he set off on his bicycle, with a map. Alan stopped overnight at a hotel before arriving on time the next day. People were astonished that he had traveled such a long distance on his own. Even his headmaster admired his independence and determination. His feat was reported in the local paper.



Alan was still a poor student, untidy, inattentive, and jumping ahead in his books. He stammered when answering questions, and he couldn't keep his shirttail tucked in. His mother saved his school reports. They showed a mix

of successes and failures. At age fifteen, he figured out an advanced mathematical formula on his own. He did not know someone else had already done it. His teachers described him as a "keen and able mathematician."

Alan won mathematics prizes but often failed his exams because he did not show how he reached his conclusions. His housemaster—the member of the school

Alan attended Sherborne School, a private boarding school next to Sherborne Abbey in Dorset, England.