"Like all of them at Bletchley Park, they were all told never to talk about it. Churchill called them the geese that laid the golden eggs but never cackled."

RICHARD FLETCHER, Secretary, the Bill Tutte Memorial Fund

PHOTO: DAVID L. HUNSBERGER COLLECTION, DONATED TO THE MENNONITE ARCHIVES OF ONTARIO

THE HUMBLE MATH PROFESSOR WHO CRACKED TOP NAZI CODE

ing secrets

One of the most influential code breakers of the Second World War spent more than two decades quietly shaping the University of Waterloo's fledgling Faculty of Mathematics into a global powerhouse.

As a professor of mathematics, William "Bill" Tutte was revered for his mathematical genius and pioneering ways, attracting top-level researchers and building the reputation of the University from the ground up.

And yet for the entire length of his decorated career at Waterloo, no one — not longtime friends, colleagues or students — knew Tutte had been one of the brilliant minds of Bletchley Park, site of the now-legendary team of wartime code breakers who worked feverishly to stop Hitler's advance.

And while the history of Bletchley Park was dominated by Enigma and the tragic story of Alan Turing — recently immortalized in the Oscar-winning film *The Imitation Game* — historians and those who knew Tutte personally believe Tutte's contributions were far greater.

It took almost 50 years for the truth about Tutte's wartime role to be revealed. During that time, he emigrated to Canada, married Dorothea Mitchell, lived happily in the tiny hamlet of West Montrose and, with characteristic modesty, got on with the job of being a math professor. »

« 1917

FITZROY HOUSE: Newmarket's Fitzroy House is the birthplace of Bill Tutte, where Tutte's father William worked as the gardener and his mother Annie the housekeeper. Today, Fitzroy House is one of Britain's most picturesque and historic racing yards, home to dozens of champion racehorses.

PHOTO COURTESY OF MICHAEL BELL

> We should never forget how lucky we were to have men like Professor Tutte in our darkest hour and the extent to which their work not only helped protect Britain itself but [saved] countless lives.

BRITISH PRIME MINISTER DAVID CAMERON, in a 2012 letter to Tutte's remaining family in Newmarket, England

The makings of a math genius

Born into humble circumstances in Newmarket, England, in May 1917, Tutte received his early education at the village school in Cheveley. His potential was quickly recognized with a scholarship to the Cambridge and County Day School — which ultimately led to a scholarship to study chemistry at Trinity College, Cambridge.

At Cambridge, Tutte was able to nurture his passion for mathematical puzzles, and in 1941 he received an invitation to join Britain's Government Code and Cypher School at Bletchley Park.

There, Tutte's extraordinary achievement — breaking the complex German Lorenz code without ever seeing the machine that generated it — is said to have hastened the end of the war by about two years and saved millions of lives.

According to Bletchley Park historians, General Dwight D. Eisenhower himself described Tutte's work as one of the greatest intellectual feats of the Second World War.

The Lorenz code machine — used by Adolf Hitler and senior members of the German High Command to communicate high-level strategy — was believed to be unbreakable, and trusted with the most sensitive, highly strategic information. Alan Turing's Enigma, on the other hand, was used to send tactical messages between individual formations and units, notably ships and submarines.

"Bill Tutte cracked the German Lorenz code, which was vastly more complex than Enigma and strategically much more important," says Richard Fletcher, secretary of the Bill Tutte Memorial Fund in Newmarket, England.

"However, for continuing Cold War security reasons his achievement was not publicly acknowledged, while Turing went on to dominate the history of Bletchley Park, largely as a result of the tragic circumstances of his death."

Tutte's silence, which endured for decades, demonstrates enormous strength of character. Yet it was also, quite simply, part of the job. He and his colleagues at Bletchley were bound under the Official Secrets Act of Britain, which made it an act of treason to reveal what they knew. His story did not come out until the late 1990s and then only by accident. It wasn't until 2012 that Prime Minister David Cameron publicly acknowledged the debt owed to him.

"Like all of them at Bletchley Park, they were all told never to talk about it. Churchill called them the geese that laid the golden eggs but never cackled," Fletcher says. "Bill Tutte not only never mentioned his wartime work at any stage — even after becoming a famous mathematician in Waterloo — he saw all the hype going on about Turing and remained silent."

« 1923

BILL WITH SCHOOL CLASSMATES: Tutte (bottom row, far right) is pictured with his classmates at Cheveley Village School in 1923.

PHOTO COURTESY OF SYLVIA GREENING

« 1941

BLETCHLEY BLOCK F: It was Tutte's interest in mathematical puzzles that led to his invitation to join the Government Code and Cypher School at Bletchley Park, where he was based in the Testery in F Block (now demolished).

PHOTO BY J. E. HOAD, WITH THE PERMISSION OF THE BLETCHLEY PARK TRUST

"It was always fun to be with him"

Dan Younger, who was a graduate student in the early '60s when he first heard Tutte speak, and later became a faculty colleague and close friend, confirms how closely those secrets were held.

"One of the ways we got to know each other was through hiking along the rivers in Waterloo region and around [West Montrose, where Tutte lived with his wife Dorothea until her death in 1994]," says Younger, a professor emeritus in the Faculty of Mathematics.

"He was a lover of wildflowers and he would soak up the wonder of them on our hikes. He was a very knowledgeable person in many different areas: about history, astronomy, almost every area of human knowledge. It was always fun to be with him.

"He was a fairly quiet person and I'm an inquisitive person, and in all those years hiking together he never ever told the secret of what he'd done in the war. [Hollywood] *should* do a movie because Tutte's contribution was of a greater scope than Alan Turing's, there's no doubt about that."

Stories about Tutte's role began to emerge in the mid-1990s, and although he did eventually receive formal recognition as an Officer of the Order of Canada, this didn't happen until October 2001 — only a few months before he died. It wasn't until 2011 that Tutte's feat garnered public attention through the BBC documentary, *The Lost Heroes of Bletchley Park*. »

THE MATHEMATICIAN WHO PUT WATERLOO ON THE MAP

It's hard to truly grasp the extent to which Tutte's mathematical genius helped tip the scales in the Allies' favour. Yet Tutte's cryptography work essentially came to an end when the war ended — and it was his pioneering work in another field of mathematics for which he was so revered.

Alfred Menezes, Chair of the University of Waterloo's Department of Combinatorics and Optimization, says Tutte's contributions to the University generally — and the Faculty of Mathematics specifically — were monumental.


PHOTO: UNIVERSITY OF WATERLOO ARCHIVES

Special Mathematics Convocation and opening of the Mathematics and Computer building, May 1968.

"Through the '50s and '60s, Bill really was a pioneer in building up the field of mathematics called graph theory, a branch of combinatorics," Menezes says. "He had very deep insights into this field and he became known as the world's most prominent expert."

Tutte emigrated to Canada after the war and began his teaching career at the University of Toronto. Fourteen years later, in 1962, he came to Waterloo and quickly built on his reputation as a pioneer in graph theory. Tutte played a major role in the development of this young institution, which was just five years old at the time. His presence attracted combinatorialists from around the world.

"When he moved to Waterloo, this was just an emerging place — and to build a university from scratch is hard," Menezes adds. "He was so well known in his field, he was a magnet to attract other professors, graduate students and well-known researchers.

"Why would someone come and work at a tiny school that's basically farmland? Tutte was the reason. In a sense he really formed the department. When we discover new mathematical facts, we call the important ones theorems — and there are many famous theorems named after him."

It is a legacy about which Tutte himself would surely be proud.

« 1941

ENIGMA AND LORENZ: The four-rotor naval Enigma (left) used Morse code and the 26-letter alphabet, whereas the vastly more complex German Lorenz cipher encrypted messages that were sent by radio teleprinter using Baudot code. Tutte is credited with cracking the Lorenz code.
PHOTOS COURTESY OF CLAIRE BUTTERFIELD

"He did say that to finally be able to tell the story removed an enormous pressure that had been on him all those years," Younger says. "He was very proud of the fact that it finally came out, and wanted to share it with me. I think [the British government] made it a mistake in keeping it a secret for so long."

Tutte's efforts were especially critical in the latter part of the war, Younger explains. Between November 1942 and May 1945, more than 13,500 Lorenz messages were deciphered at Bletchley, allowing the Allies to pinpoint the positioning of Nazi units.

In fact, the Allied invasion of Normandy was successful partly because Tutte and his colleagues had intercepted Nazi communications showing the Germans were expecting an invasion at a different location.

War hero recognized at last

Cracking the code was indeed a herculean effort, but Tutte was a modest man.

"He would've emphasized the fact that he was part of a larger effort, but he was also extremely proud that the Canadian government honoured him with the Order of Canada," Younger says. "He wanted to be recognized for what he did. He was fortunate that he lived just long enough to tell the story and to be recognized for that story."

That Tutte isn't yet a household name is something a handful of passionate British historians are trying to rectify.

The Bill Tutte Memorial in Newmarket's town centre was unveiled this past September as a way to pay tribute to the man and to raise awareness of Tutte's contributions to code breaking and mathematics.

A memorial fund in Tutte's name (donations to which can be made online) has also been established to help promising young students of modest means to further their studies in mathematics or computer science.

SOURCE: CREATIVE COMMONS

CHANGING THE COURSE OF HISTORY

Cracking the Nazis' Lorenz code translated into lives saved on many battlefields — and the invasion of Normandy was one of the most critical.

According to historian Richard Fletcher, United States General Dwight Eisenhower knew from intercepted Lorenz messages that Hitler had swallowed a deception plan and was convinced the invasion would come at the Pas de Calais rather than Normandy. He had ordered Rommel not to move Panzer reserves to Normandy — and it was important for Eisenhower to act when he did on June 6 rather than wait for better weather in case Hitler learned of the deception.

"The final defeat of Nazi Germany in May 1945 can be linked directly to the work of Bill Tutte," Fletcher says. "Information from intercepted Lorenz messages and passed on by the British allowed the Russians to defeat the Germans at Kursk in 1943. Had the Russians been defeated at Kursk or had Eisenhower hesitated on D-Day, the war in the West would have been very different indeed [and] without Bill Tutte's cracking of the Lorenz code, the war could have gone on for many years longer.

"Alan Turing may have saved Britain from defeat in the Battle of the Atlantic in 1941 when we stood alone, but Bill Tutte shortened the war in Europe by some two years, saving countless lives," Fletcher adds, quoting Captain Jerry Roberts, the last surviving member of Tutte's team at Bletchley Park.

« 1968

BILL IN HIS GARDEN: The mathematician circa 1968 near his home in West Montrose.

PHOTO COURTESY OF RICHARD YOULDEN

« 2001

Tutte was made an **OFFICER IN THE ORDER OF CANADA** in 2001, shortly before he died in 2002.