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THE APERTURE

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THE CODE BREAKERS OF BLETCHLEY PARK

FORWARD

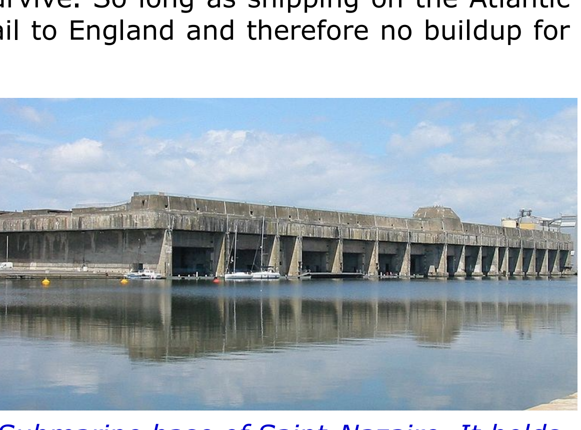
Several years ago Kathy and I made several visits to the United Kingdom. During one of those visits we spent a day at Bletchley Park, the home of the British code breakers of WWII. We had a fascinating tour conducted by a very knowledgeable guide who provided us with a great deal of information about the park and the activities of the code breakers. In this issue I want to share some of that information with you and a few of the photos I took while on the tour along with a few scenes of England.

Bletchley Park

In the early days of World War II the greatest threat to the United Kingdom was from German U-boats. Admiral Donitz, the commander of the NAZI U-boat Fleet, was increasing the number of U-boat and their attacks on merchant shipping crossing the Atlantic from the United States to England. These attacks became more frequent and effective after the fall of France when the German Navy established a large submarine bases on the coast of France. Major German World War II U-boat pens in France included Bordeaux, Lorient, La Rochelle, Saint-Nazaire, and Toulon. Donitz's U-boats could now be supplied for their long-range patrols and enter into the Atlantic convoy lanes without taking the circuitous route from their home base at Bremerhaven through the North Sea or the narrow and mined English Channel or passing north of Scotland. It was this threat that prompted Winston Churchill to request the loan of fifty old destroyers from the United States, a request that was honored by President Roosevelt through his Lend-Lease program.

The early U-boat operations from the French bases were spectacularly successful. This was the heyday of the great U-boat aces like Günther Prien of U-47, Otto Kretschmer of U-99, Joachim Schepke of U-100, Engelbert Endrass of U-46, Viktor Oehrn of U-37 and Heinrich Bleichrodt of U-48. The U-boat crews became heroes at home in Germany. From June until October 1940, over 270 Allied ships were sunk: this period was referred to by U-boat crews as "Die Glückliche Zeit", the Happy Time.

While the Battle for Britain was more spectacular and drew the world's attention Churchill believed the Battle of the Atlantic and its U-boat threat was far greater to the survival of Great Britain. Without a constant stream of food, fuel and war materials from the United States, Canada and South America England could not survive. So long as shipping on the Atlantic was under the constant threat of u-boat attack troop ships would not be able to sail to England and therefore no buildup for an invasion of France.



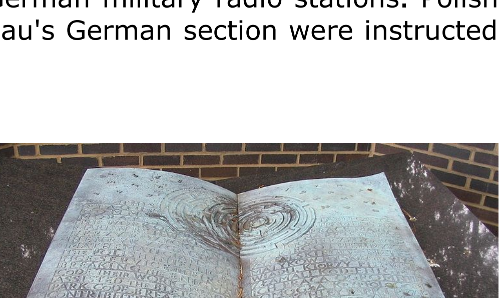
Submarine base of Saint-Nazaire. It holds today a museum and some commercial activities.

The German Navy's communication with their U-boats had to be in an unbreakable code or cipher if they were to be successful in carrying out their attacks against shipping. This communication was carried out using a very sophisticated coding and ciphering machine called "Enigma." Each submarine, along with German Army field units, was equipped with an Enigma cipher machine. This enabled them to transmit their position, weather reports and convoy sighting to other U-boats and their home bases. This was crucial for planning and conducting their attacks. Donitz was supremely confident that his Enigma ciphers could not be broken by the British. The crib code was changed on a daily basis and without this code the operator could not correctly set the three or four rotors on the machine to translate the ciphers. The key for any code breaker was to get the crib code. This was a catch 22 as the daily crib was transmitted in code or written in a code book carried in each U-boat. The German Army carried their own unique cribs codes.

Three young mathematicians at the Polish Cipher Bureau (*Biuro Szyfrów*) discovered a method for breaking the crib code needed to set the rotors on an Enigma machine. Five weeks before the outbreak of World War II, on 25 July 1939, the Polish Cipher Bureau revealed its Enigma-decryption techniques and equipment to French and British military intelligence representatives who had been invited to Warsaw. This was to have incalculable consequences for the course and outcome of World War II.

In late 1927 or early 1928, there arrived at the Warsaw Customs Office from Germany a package that, according to the accompanying declaration, was supposed to contain radio equipment. The German firm's representative strenuously demanded that the package be returned to Germany even before going through customs, as it had been shipped with other equipment by mistake. His insistent demands alerted the customs officials, who notified the Polish General Staff's Cipher Bureau, which took a keen interest in new developments in radio technology. And since it happened to be a Saturday afternoon, the Bureau's experts had ample time to look into the matter. They carefully opened the box and found that it did not, in fact, contain radio equipment but a cipher machine. They examined the machine minutely, and then put it back into the box.

On July 15, 1928, the first German machine-enciphered messages were broadcast by German military radio stations. Polish monitoring stations began intercepting them, and Polish cryptologists in the Cipher Bureau's German section were instructed to try to read them. The effort was fruitless, however, and was eventually abandoned.



A plaque at Bletchley Park commemorating Polish code breakers

In 1929 Ciężki, Franciszek Pokorny and a civilian Bureau employee, Antoni Palluth, taught a secret cryptology course at Poznań University for selected mathematics students. In September 1932, Ciężki hired three young graduates of the Poznań course to be Bureau (B.S.-4) staff members: Marian Rejewski, Jerzy Różycki and Henryk Zygalski. Rejewski made in December 1932, according to historian David Kahn, one of the greatest advances in cryptologic history by applying pure mathematics — group theory — to breaking the German armed forces' Enigma machine ciphers. (The Navy adopted a modified civilian Enigma machine in 1926, the Army — in 1928.)

The Cipher Bureau commissioned the AVA Radio Company to build "copies" of the German Enigma to Rejewski's specifications. AVA subsequently constructed cryptologic devices such as Rejewski's "cyclometer" and "cryptologic bomb." Zygalski sheets," on the other hand, were produced at the Cipher Bureau itself.

Information obtained from Enigma decryption seems to have been directed from B.S.-4 principally to the German Office of the General Staff's Section II (Intelligence). There, from fall 1935 to mid-April 1939, it was worked up by Major Jan Leśniak, who in April 1939 would turn the German Office over to another officer and himself form a Situation Office intended for wartime service. He would head the Situation Office to and through the September 1939 Campaign.

When World War II broke out on September 1, 1939, Leśniak and his colleagues had been working very intensively through the previous two or three years to establish the German order of battle and had succeeded in working out nearly 95 percent of it. The German attack on Poland did not come as a surprise to the Polish General Staff. The results obtained by Polish intelligence, according to Leśniak, had "absolutely exceeded what would normally have been possible."

It was there, on July 25, 1939, with World War II looming only five weeks off, that the Cipher Bureau's chiefs, Lt. Col. Gwido Langer and Major Maksymilian Ciężki, the three civilian mathematician-cryptologists, and Col. Stefan Mayer (Polish General Staff intelligence chief), on General Staff instructions, revealed Poland's Enigma-decryption achievements to intelligence representatives of France (Major Gustave Bertrand, the French radio-intelligence and cryptology chief, and Capt. Henri Braquenié of the French Air Force staff) and Britain (Commander Alastair Denniston, chief of Britain's Government Code and Cipher School; Alfred Dillwyn Knox, chief British cryptologist; and Commander Humphrey Sandwith, chief of the Royal Navy's intercept and direction-finding stations.

Rejewski had ultimately solved a crucial element in the Enigma machine's structure, the wiring of the letters of the alphabet into the entry drum, with the inspired guess that they might be wired in simple alphabetical order. Now, at the trilateral meeting — Rejewski was later to recount — "the first question that... Dillwyn Knox asked was: 'What are the connections in the entry drum?'" Knox was mortified to learn how simple the answer was.

The Poles' gift, to their western Allies, of Enigma decryption, five weeks before the outbreak of World War II, came not a moment too soon. Former Bletchley Park mathematician-cryptologist Gordon Welchman has written: "ULTRA [the British Enigma-decryption operation] would never have gotten off the ground if we had not learned from the Poles, in the nick of time, the details both of the German military... Enigma machine, and of the operating procedures that were in use." After the war, Britain's Prime Minister Winston Churchill was to tell King George VI: "It was thanks to ULTRA that we won the war." Allied Supreme Commander Dwight D. Eisenhower, at war's end, described Enigma decryption as having been a "decisive contribution to the Allied war effort."

Churchill's greatest wartime fear was that the German submarine wolf packs would succeed in strangling sea-locked Britain. A major factor that averted Britain's defeat in the Battle of the Atlantic was her regained mastery of Naval Enigma decryption; and while the latter benefited crucially from British seizure of German Enigma-equipped naval vessels, the breaking of German naval signals ultimately relied on techniques that had been pioneered by the Polish Cipher Bureau. Had Britain capitulated to Hitler, the United States would have been deprived of an essential forward base for its subsequent involvement in the European and North African theaters.

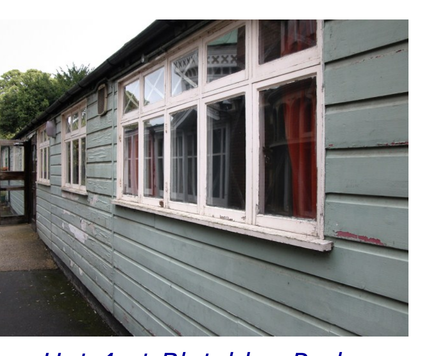
On September 5, 1939, as it became clear that Poland was unlikely to halt the German invasion, BS-4 received orders to destroy part of its files and evacuate essential personnel. These brilliant and heroic Polish cryptologists, even when being captured and sent to forced labor camps never revealed any of the secrets of BS-4. This is a tribute to the bravery and honor of the Poles. The 2001 Hollywood film "*Enigma*" has been criticized for many historical inaccuracies, including omission of the crucial role of the Polish Cipher Bureau in breaking Enigma. There is a statue and plaque in a corner of Bletchley Park dedicated to these Polish code breakers.

Bletchley Park was easily the most closely guarded and enduring secret of World War II. Thousands of books, articles and reminiscences by the generals, admirals and civilian leadership masterminding the war were all silent on the subject. The usually loquacious Winston Churchill said nothing about it in his six- volume History of the Second World War. The 12,000 men and women, who were there, sworn by an oath to king and country, neither spoke nor wrote anything for three decades after the war. They remained silent until the mid 1990s.

Sir Herbert Leon's manor house at Bletchley Park

In the last years of the Twentieth Century much of what happened at Bletchley Park remained as mysterious as when the 581 acre Buckinghamshire estate became the headquarters for an unprecedented intellectual attack into the heart of Hitler's encrypted intelligence empire. Code-named ULTRA, the collective cover name for the interception and decoding of encrypted German military radio communication, Churchill's secret of the century became the most successful intelligence penetration in history. Its historic triumph - the discovery of the secret entrance into the labyrinth of the Enigma device - the primary means for encryption of dispatches to the German armed forces.

An arrogantly confident German High Command had determined that neither man nor machine would ever pierce the multi-layers of its three and four rotor mystery mechanism. But Enigma was neither impenetrable nor puzzling. Waterloo was said to have been won on the playing fields of Eton, so too the Allied victory in World War II was won by the code breakers at Bletchley Park. It all began very modestly inside a hulking red brick Victorian mansion.



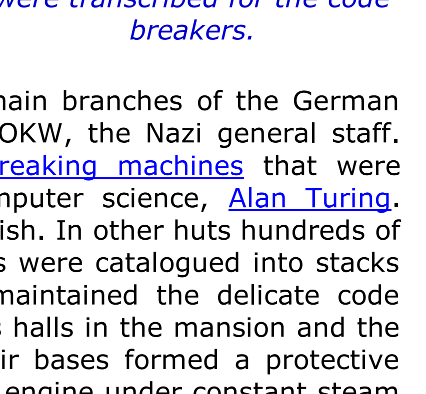
Hut 4 used by the Naval Intelligence code breakers

Part of a landed manor awarded by William the Conqueror to a notable commander after the Battle of Hastings, the Bletchley estate was later confiscated by the Crown, and passed through various family lines before being sold in 1883 to Sir Herbert Leon, a financier and member of the London Stock Exchange. Like a many-chambered nautilus the existing unassuming residence became intermittently appended through the years; here a servant's wing and ice house, there a new entrance hall and an addition to the drawing and dining rooms. Then a library, ballroom, and more bedrooms were added. Numerous outbuildings sustained the social and agricultural pursuits of the Leon family. Unfortunately, the additions only added to its hulking, irregular appearance, completely lacking in harmony or refinement.

Hut 4 at Bletchley Park

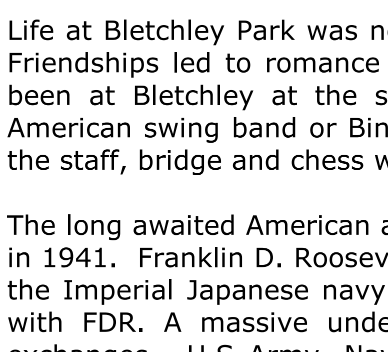
It was however, perfectly sited directly across the road from the mainline Midland & Scottish Railway. An easy 42 mile commute connected Bletchley with London and the Whitehall and Downing Street nerve centers. And the mansion was midway between Oxford and Cambridge, fertile soil for code breaker candidates. Even better for later motorcycle dispatch riders, the A5, one of the country's principle trunk highways, was only a mile away. When it was appropriated by the government in 1938, Bletchley Park's greatest days were just ahead.

Seven decades ago as the world edged to the brink of a new dark age, the democracies faced no greater challenge than overcoming the malaise of governmental neglect. In the last days of peace, the British army maneuvered with only 259 tanks and even fewer antitank guns and artillery pieces - all obsolete. The Home Guard trained with antiquated sporting guns, most lacking ammunition. Only 620 aircraft were combat ready, and the RAF was short of fighter pilots and aviation fuel. The Admiralty ignored the rapidly developing U boat threat, allowing the proud Royal Navy to sail a fleet of mostly ancient dreadnoughts, the mightiest of which would soon be on the ocean bottom. And America could hardly be expected to come to the immediate aid of its cultural cousin. America, divided by the anguish of isolationism, and only a generation removed from the sacrifices of World War I, had a standing army ranked eighteenth in the world, just behind tiny Holland.



The radio eavesdropping building where daily intercepts were transcribed for the code breakers.

In late 1938, against a background of imminent peril, the first thirty members of the government cipher school began modest radio eavesdropping operations in the mansion's castellated tower. Much later, as the tangled layers of the Enigma puzzle were progressively revealed, the personnel at the mansion or billeted in nearby villages rapidly increased. Lawns and flower beds outside the drawing room were uprooted to build Hut Four, where the German naval Enigma was broken. The Leon's cherished Victorian maze disappeared one weekend to make room for two tennis courts ordered by Churchill during an early inspection. At an impromptu gathering outside the mansion after the visit, the Prime Minister saluted his staff as the "golden geese that never cackled."



A reconstructed replica of Alan Turning's Bombe decoding machine

Translators, linguists and specialist teams focused on the four main branches of the German Wehrmacht, or on Abwehr - the intelligence service - even on OKW, the Nazi general staff. Naval WREN's operated "Bombes," the hot and noisy code breaking machines that were conceived by the Cambridge mathematician and father of computer science, Alan Turing. Typists transcribed German language plain-text solutions into English. In other huts hundreds of thousands of intercepts written in longhand on 5x7 inch file cards were catalogued into stacks of shoe box size cartons. Machine operators and technicians maintained the delicate code breaking apparatus. Cooks prepared meals for canteens and mess halls in the mansion and the former Leon fields. Troops, antiaircraft batteries and five RAF air bases formed a protective cordon around the complex. In the event of invasion, a train with engine under constant steam waited at the station to transfer the vital code breaking equipment to Liverpool and passage to America.

Life at Bletchley Park was not without opportunities to socialize and temporarily disengage from the crushing stress of duty. Friendships led to romance and marriage for some. Others would meet and marry years later only to learn that each had been at Bletchley at the same time without meeting. A drama club was organized. Dances were regular events, with American swing band or Bing Crosby recordings among the phonograph favorites. Considering the peacetime occupations of the staff, bridge and chess were popular diversions.

The long awaited American assistance began with covert information exchanges well before the United States entered the war in 1941. Franklin D. Roosevelt gave Churchill secrets of MAGIC, the American code-breaking system which would later defeat the Imperial Japanese navy at Midway. In return, details about ULTRA and the Enigma intercepts were shared by Churchill with FDR. A massive undercover British operation at Rockefeller Center in New York City controlled joint intelligence exchanges. U.S Army, Navy and civilian cryptanalysts were dispatched to Bletchley months before Pearl Harbor. One of them, William Friedman, America's leading cryptanalyst, collaborated with Alan Turing, the English code breaking genius and inventor of modern digital computing.

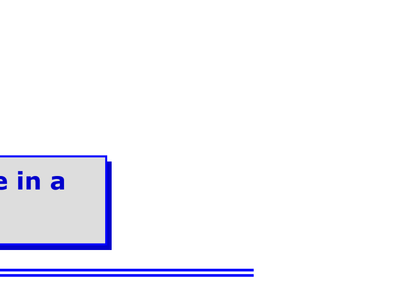
Our tour guide at Bletchley Park

The Ultra advantage changed the lives of millions who fought and unknown others affected by its global reach. By knowing the names of enemy units, their strength, exact location, order of battle, ammunition and fuel status, entire divisions were neutralized with minimal manpower effect. The breaking of the German Enigma naval code disclosed the specific grid locations of U-boat wolf packs and their refueling "milk cows." Convoys were diverted as North Atlantic ship losses dropped 75%. Even the operational depth of U-boats was learned - a crucial detail for attacking destroyers. Submarine losses reached unacceptable levels forcing redeployment to safer waters. Crucial cargo from North America safely reached diverse ports from Southampton to Murmansk. ULTRA became the silent partner in sinking the Bismarck, in victory at El Alamein, and decisively defeated the wolf-packs in the Battle of the Atlantic. In planning Operation Overlord, strategists knew from ULTRA intercepts that Germany expected invasion at the Pas de Calais. By using the ruse of a fictitious army commanded by a very real General George Patton, nineteen German divisions were thus removed from the battle.

Interior of the Manor House set up for a wedding party

When Patton's U.S. Third Army began the race from Normandy across France, it was guided by daily and often hourly briefings from Ultra intelligence. Almost all of the decrypts were hand delivered by specially trained soldiers. And resulting from its understanding of the German high command's intentions and strategy, Ultra eliminated the crucial element of surprise.

With the war over Churchill ordered the destruction of all the code breaking machines into "pieces no larger than a man's hand." The Bletchley mansion was shuttered, the staff discharged and the huts emptied and boarded up. The ULTRA secret became decades of ultra silence, destined to expire with its high priests and practitioners.



Bust of Winston Churchill

The brilliant mathematician Alan Turing was a homosexual. While homosexuality was a criminal offense in England during the war it was ignored during his tenure at Bletchley Park. After the war a male prostitute he had taken to his home one night broke into his house for the purpose of burglary. When the break in was reported to the police and the perpetrator apprehended it Turning's homosexuality became public knowledge. He was arrested and forced to take female hormone treatments and began to develop breasts. He fell into a great depression and committed suicide by ingesting cyanide. He had injected the poison into an apple of which he took a few bites. The police found a partial eaten apple at the scene of his death. Today some people claim the Steve Jobs, one of the founders of the Apple Computer, used the partial eaten apple as a logo for his company in honor of Turing, who many claim was the father of the modern computer.

For a gallery of captioned photos Bletchley Park click here.

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