



ACTION THIS DAY

The Museum of WWII • Boston

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SPECIAL EXHIBITION

THE MOST SECRET

TOP SECRET

A SPECIAL EXHIBITION OF GERMAN ENIGMA CODE MACHINES

The Allies' breaking of the German Enigma codes was so secret that it wasn't even revealed at the end of the war and it remained top secret until 1974 when *The Ultra Secret* was published.



In the spring of 1946, the British ordered every piece of paper relating to the breaking of the codes destroyed. The thousands of people who worked at Bletchley Park, the British code breaking headquarters, never spoke or wrote about their work. Possibly military reputations for winning battles would have been diminished were it known that code-breaking geniuses had played major roles. A more realistic concern may have been that the Soviets developed a code very similar to one of the German codes and the Allies were able to quickly read it.

Hundreds of books about Enigma have been published since 1974. Capturing Enigma machines has been the main plot of several movies but the role of Alan Turing, the intuitive and mathematical genius credited with inventing the modern computer, in breaking the German code was brought to life and to the attention of the

Left: "Beware – Spies. Be Careful What You Say!"

Right: The German Army 3-rotor Enigma (seen in *The Imitation Game*).

general public thanks to the recently released (and Academy Award nominated) movie, *The Imitation Game*.

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A leader of deliberate conduct, Winston Churchill would attach a bright red sticker emblazoned with the words: "Action This Day" to his memos to prioritize and make clear to his subordinates that he expected specific action that day.



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SPECIAL EXHIBITION

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In our own form of *The Imitation Game*, we are opening a special exhibition of the most comprehensive collection of Enigma code machines on display in the United States, outside of the National Security Agency. The exhibit opens February 14th and runs thru May 1st. Eight different Enigma code machines are in the exhibition, including one of three known Enigmas with a printer, one of five known Siemens ten-rotor code machines made for the German High Command, a U-Boat four-rotor Enigma and an Army three-rotor Enigma that was blown apart by retreating forces (one of the reasons they are so rare).

German short wave radios used by the military (ironically marked "Warning: the enemy is listening"); posters warning Germans that spies are everywhere and cautioning them about the need for secrecy at all times; an original Enigma code sheet from a U-Boat sunk off the East Coast of the United States; and a British deciphering code sheet with the last messages of the war are also on display.

The new German military tactic of *Blitzkrieg* (lightening war) meant that land lines could not be used for communication; only short wave radios could keep up with the fast moving tanks and Stuka dive bombers. Accordingly messages had to be sent in unbreakable codes and the Germans were certain Enigma was unbreakable. Early versions of Enigma were broken by Polish mathematicians by making a copy of an Enigma machine and using deductive reasoning alone. Their work was given to the French and the English just before Germany invaded Poland. France had little time to make progress so it fell to the British to find an Alan Turing.

The complexity of the Enigma machine is legendary. To set up an Enigma for transmission, the operator uses the field instructions that are given to him each day. He selects 3 rotors from the 5 with each machine; he then puts them in the correct order, and changes the rings on each (26 different positions). After the rotors are put in place, he changes the wiring of the plug board to the daily instructions (none of this is given in advance, only that day). If this were the entire process, the capture of a machine and the instructions for that day would enable the Allies to read that day's message only, but the Germans went further.

The sender then comes up with 3 random letters and sets the rotors to these letters. He sends these 3 letters in the clear to the code machine he is communicating with; that operator sets his rotors to the same setting, making the two machines identical,

but also allowing a captured machine to do the same. To make the code unbreakable, the sender then uses the Enigma to encode 3 random letters and he does this twice, getting 6 coded letters. These are then sent, and the receiving machine decodes these letters into the original random letters.

The flaw was in repeating the letters, enabling the British to begin to understand how the rotors were set up. Their progress came to a halt when the Germans issued new instructions not

to repeat the three letters but to enter six random letters. Thanks to human nature, the British were soon back in the game.

Knowing that Enigma was unbreakable, operators began to use the same "random letters" day after day. The most common were HITLER, BERLIN, LONDON, names of girlfriends; one German operator even used the American cowboy actor's name TOMMIX. The human element, laziness, and confidence that the code was unbreakable, led to breakthroughs (dramatized in *The Imitation Game*) with the Army three rotor codes.

The Enigmas on U-Boats had four rotors and their operators were required to use code books with random letters. The British were unable to break them and the submarines were sinking convoys and communicating with impunity. Alan Turing was making progress when suddenly the code books and a 4-rotor Enigma were captured from a sinking U-Boat. The German crew were certain that their submarine was sinking too fast for them to destroy their valuable encoding equipment and abandoned ship. A heroic British boarding party went into the rapidly sinking submarine and changed the course of the naval war.

Alan Turing's greatest contribution to winning the war was the invention of a Bombe (a Polish word honoring the

Polish mathematicians) which could process Enigma messages almost as quickly as they were received. Turing's Bombe was destroyed at the end of the war, along with everything else. Bletchley Park now has a working recreation which is regularly demonstrated for visitors. (The Bombe in *The Imitation Game* was a dramatized recreation.)

The theoretical number of possible configurations for the three rotor Enigma machine is 3,283,883,513,796,974,198,700,882,069,882,752,878,379,955,261,095,623,685,444,053,152,226,006,433,615,627,409,666,933,182,371,154,802,769,920,000,000,000

The four rotor U-Boat Enigma configuration adds 31 numbers to this number. It is no wonder the German cryptographers had confidence that it was unbreakable!



Germans were warned that the enemy was listening over their shoulder.

GERMAN ENIGMA CODE MACHINES

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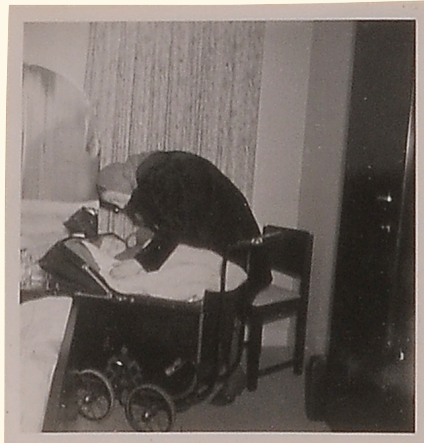
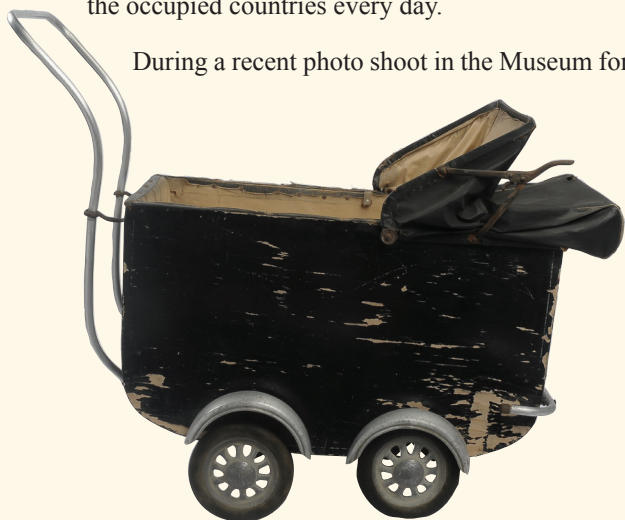
COLLABORATING WITH *NATIONAL GEOGRAPHIC* ON A NEW BOOK LEADS TO A FIND IN THE EXTENSIVE ARCHIVES IN THE MUSEUM

by Founder and President Kenneth W. Rendell

The French baby carriage on display in the Resistance section of the Museum has a panel removed in the bottom showing a radio and a box of sabotage equipment hidden underneath. It is both very personal – a baby carriage, exemplifying what most people consider one of the most human of symbols – and very violent, the equipment emblematic of the human will to resist and destroy evil. It is the dichotomy that faced people in the occupied countries every day.

National Geographic Society's next World War II book, *The Secret War*, the editor asked me to go through photographs taken in Amsterdam by a Resistance photographer for ones to use in the book. It was almost with disbelief that I found the ones seen here of a Dutch Resistance member hiding a German rocket launcher in a baby carriage. The baby in the carriage must have been real – a doll would have been obvious – but what a start to life, riding around on top of the captured weapons to destroy the evil of the Nazi occupiers.

During a recent photo shoot in the Museum for the



Top: A French baby carriage used to hide sabotage equipment.

Bottom: Dutch Resistance photos of a similar baby carriage in use.



The National Geographic Society's *The Secret War*, a 353 page, large format book, will be published in 2016. Kenneth W. Rendell will write the Foreword to it. All of the artifacts in the book are from The Museum of World War II.



Our New Director of Education

We are pleased to announce that Marshall Carter, Principal at Milton Academy, one of the most prestigious prep schools in New England (and in America), is going to be joining The Museum of World War II as its first Director of Education.

As education is central to the mission of the Museum, this is a very important position and we wanted just the right person to fill it. Marshall Carter more than exceeds our expectations.

He comes from a military background; both his father and grandfather are West Point graduates. His grandfather was a three-star general in World War II; his father was awarded a Silver Star for his bravery in Vietnam. Marshall graduated from Bowdoin College and Harvard Graduate School of Education. He is an experienced teacher and administrator. Among his many passions is a love of history.

In leaving Milton Academy, Marshall wrote: *"I am thrilled to be joining The Museum of World War II staff.... From my earliest visits to the Museum and my many conversations with Ken and Shirley, it has become clear to me that this collection has the potential to become a powerful and significant public resource for history education in Massachusetts, and nationally."*

"I'm very excited to be joining the Museum staff at this particular moment in its history as well. As an education leader, I've chosen roles at schools that are poised for transformation, innovation, and rapid growth. Helping the Museum expand its mission, programs, and spaces energizes me. I'm familiar with the process of develop-

ing a strategic vision for education, naming and staging concrete programmatic steps towards that vision, and implementing and refining those priorities."

"... I've always believed in the power of hands-on, experiential education, and as a teacher, I have a particular commitment to using primary sources to interpret the past. Students and teachers become historians themselves when they handle authentic

documents and artifacts at the Museum.... Their own ideas, insights and conclusions emerged.... When engaged with their multiple senses by 'the stuff of history,' students do not just master facts and concepts,

they make profound meaning of World War II."

"Yet the materials transcend mere historical study; primary sources unfailingly impact students emotionally, too and help them feel the joys and losses, the mundane daily life and profound experiences of the people who lived through the era: general and GI, Victory gardener and Resistance leader, concentration camp survivor and war correspondent. World War II is the central American and global narrative of the twentieth century, and remains deeply relevant to today's students. The Museum highlights powerful themes of heroism and sacrifice, good and evil, resilience and courage, devastation and regeneration. These are endlessly compelling for young people."

Marshall will officially begin his duties on September 1st, 2015 but will be working with us informally between now and then.