IN 1940, AFTER MONTHS OF EFFORT, A TEAM OF US ARMY CRYPTANALYSTS, LED BY FRANK ROWLETT, WITH SPECIAL INPUT FROM MATHEMATICIAN GENEVIEVE GROTJAN, SOLVED A COMPLEX CIPHER USED BY JAPAN’S FOREIGN MINISTRY. THE AMERICANS GAVE IT THE DESIGNATION “PURPLE.”

THE CRYPTANALYSTS KNEW THE IMPORTANCE OF THEIR MISSION. THEY TOOK ONLY A FEW MINUTES’ BREAK TO CELEBRATE: THEY TOASTED SUCCESS WITH A COLA, THEN WENT BACK TO WORK. SOLVING PURPLE WAS VITAL FOR AMERICAN AND BRITISH DECISION MAKERS BEFORE AND AFTER WORLD WAR II.
**Front Cover:**
In this CryptoComic set during World War II, American cryptanalysts celebrate their successful efforts to solve the Japanese machine-generated cipher system known as Purple. (This system was used to protect Japanese diplomatic communications worldwide.) Their work was vital to US national security; therefore, they only spent a few moments celebrating and then got back to work.

*From left to right:* Frank Rowlett, Solomon Kullback, Genevieve Grotjan, Abraham Sinkov, and William Friedman

**Back Cover:**
Baltimore-based legend Edgar Allan Poe was a talented amateur cryptologist; as editor of a popular magazine, he published articles about cryptologic theory and famous instances of codebreaking. He challenged readers to send him cryptograms they thought he could not solve and he showed a remarkable success rate—somewhat fudged because, as editor, Poe only printed the submissions he did solve. Above all, his exciting short story, “The Gold-Bug,” inspired countless people to take up cryptology as a hobby and many others who have made cryptology their profession.
Foreword

Since its standup in 1989, the Center for Cryptologic History (CCH) has not only focused on preserving American cryptologic history and the history of the National Security Agency (NSA), but also has pursued disseminating that history to agency employees and the general public in new and memorable formats.

In 2019, CCH developed the idea of CryptoComics—a uniquely effective way of telling cryptologic history stories that appeals to a wide range of readers. CryptoComics also allowed CCH historians to help create visual representations of people and events for which CCH had no photographs or other graphic materials.

The first publication of a CryptoComic proved to be exceedingly popular with the NSA workforce. CCH now presents them to the wider public.

CCH’s 2024 cryptologic calendar is a celebration of this successful new resource for outreach. We hope the calendar will encourage you to read the entire CryptoComics collection, which is available on the NSA website at:

https://www.nsa.gov/History/Cryptologic-History/Historical-Publications/#cryptocomics
U-BOATS GOT THEIR ORDERS BY ENCRYPTED RADIO MESSAGES FROM THEIR HEADQUARTERS. THE MESSAGES WERE PROTECTED BY THE ENIGMA, A HIGH-GRADe CIPHER MACHINE THAT TURNED PLAINTEXT INTO Gobbledegook FOR TRANSMISSION, AND THEN BACK INTO PLAINTEXT ON THE SUB. THE ENIGMA WAS A VERY COMPLEX MACHINE TO BEGIN WITH, AND GERMAN SUBS USED A SPECIAL VARIANT THEY BELIEVED COULD NOT BE SOLVED.

U-BOATS PREYED ON CONVOYS IN THE ATLANTIC CARRYING VITAL SUPPLIES FROM THE U.S. TO GREAT BRITAIN. SHIP LOSSES THREATENED BRITAIN'S EXISTENCE.

GermAn U-BOATS WERE So SUCCESSFUL THEIR CREWS CALLED THIS PERIOD EARLY IN THE WAR "THE HAPPY TIME."

THE SOLUTIONS TOOK TIME, BUT THE BRITISH DEVELOPED A MACHINE CALLED A BOMBE THAT SPEEDED THE PROCESS UP.

THEY ALSO SHARED THE METHOD OF SOLVING THE ENIGMA WITH CRYPTANALYSTS FROM THE UNITED STATES.

BRITISH CRYPTANALYSTS AT THEIR HEADQUARTERS, BLETCHLEY PARK, NORTH OF LONDON, WITH EFFORT FINALLY SOLVED THE GERMAN NAVY ENIGMA.

THE U.S. NAVY CONTRACTED WITH THE NATIONAL CASH REGISTER IN DAYTON, OH, TO DESIGN AND BUILD AN IMPROVED VERSION OF THE BOMBe. ENGINEER JOSEPH DESCH ASSEMBLED A TEAM TO DEVELOP BLUEPRINTS FOR THE WORK.

THE U.S. NAVY PUT OVER 100 BOMBS IN OPERATION IN A SPECIALLY GUARDED BUILDING IN WASHINGTON, D.C. THESE MACHINES ENABLED NAVY CRYPTANALYSTS TO SOLVE MESSAGES GIVING U-BOATS THEIR ORDERS—OFTEN LEARNING IN ADVANCE WHERE U-BOATS WERE TOLD TO RENDEZVOUS TO ATTACK A BRITISH OR AMERICAN CONVOY.

THE U.S. GREATLY IMPROVED ITS ANTI-SUBMARINE WEAPONS, AND NOW WITH ACCURATE LOCATIONS FOR U-BOATS, NAVY AIRCRAFT AND SHIPS SANK LARGE NUMBERS OF U-BOATS.

THE LOSSES WERE SO MANY THAT THE U-BOAT COMMANDER LIMITED SUBMARINE OPERATIONS TO COASTAL AREAS OF EUROPE, WHERE THEY COULD BE BETTER PROTECTED.

THEY WERE SO BOLD THEY SANK SHIPS JUST OUTSIDE U.S. HARBORS, IN SIGHT OF THE PEOPLE WHO HAD LOADED THEM.

THEY WERE SO BOLD THEY SANK SHIPS JUST OUTSIDE U.S. HARBORS, IN SIGHT OF THE PEOPLE WHO HAD LOADED THEM.

THIS WAS THE TIME WHEN THE U.S. BEGAN SENDING HUNDREDS OF THOUSANDS OF SOLDIERS AND TONS OF SUPPLIES TO EUROPE TO HELP LIBERATE IT FROM NAZI TYRANNY.

VICTORY AGAINST THE ENIGMA AND THEN THE U-BOATS HELPED THE AMERICAN NAVY AND COAST GUARD DO IT MORE SAFELY, AND, THEREFORE, FASTER.
Early in World War II, one of Nazi Germany’s most powerful military forces was its large submarine fleet. It threatened to starve Great Britain into surrender and was a strong barrier that could prevent the United States from sending troops, weapons, and supplies to help liberate Europe from Nazi domination. But British and American cryptanalysts developed a secret method to locate the enemy submarines and then destroy them.
Many African Americans were hired and assigned to do cryptanalysis against systems the Army had not been able to get at because of the lack of staff power.

At the war’s end, the Army recognized the superior work done by this office, and William Coffee’s supervision of the cryptanalysts.

On paper, a white officer was chief of this office. However, in actual practice, William Coffee supervised the work of the all African American office at Arlington Hall Station.

Discrimination against minorities in the cryptologic organizations continued long after the war. At NSA, William Coffee continued as the Agency’s conscience, and, with many colleagues, struggled for equal opportunities for all Americans.
Even as the United States fought tyranny and injustice overseas in World War II, American society, including American military forces, was racially segregated. In the midst of the injustice, the U.S. Army’s cryptologic organization was ordered to hire African Americans for “meaningful work.” Read the full CryptoComic (“First African American Cryptologists”) on nsa.gov.
Minnie Kenny, an NSA senior manager, linguist, and diversity leader at NSA (1952-1993), handed out her own special award to those she thought had done outstanding work as managers and mentors; first thing in the morning, as they came to work, they would find on their desks — a red carnation.

The recognition was not official, it was personal from her, but it became one of the most coveted awards at NSA.
Over the decades, NSA has employed many remarkable individuals, but very few had more effect than Minnie Kenny. As a language expert and mentor to other linguists, she helped protect American national security. As an activist on diversity issues, she changed NSA’s work culture for the better. Read the full CryptoComic (“The Red Carnation”) on nsa.gov.
During World War II, every US Navy task force on a combat mission took with it a team of intercept operators to listen to enemy radio communications.

The interceptor team told the admiral when the enemy spotted the task force, warned him about enemy attack aircraft or ships coming, and gave him any other INFORMATION on the enemy available in COMMUNICATIONS.

This helped save lives and gave the admiral an advantage when making combat decisions.
During World War II, strategic signals intelligence (SIGINT) from high-level enemy messages provided intelligence of immense value to senior American and British decision makers. But tactical commanders needed SIGINT, too. Both the U.S. Army and Navy deployed tactical SIGINT units to monitor enemy communications.
UNCLASSIFIED DOCUMENTARY

ELEPHANT

INTERFACING

HAD TO HONOR

RECEIVING

NEEDED A DRONE

COORDINATED

THANK YOU:
- CAM
- Cast & Crew
- Commercial
- Media Team

THE MAKING OF THE ELEPHANT CAGE

Wednesday May 11, 2022, Session 4: 9:30am - 10:45am

ARTIST: WADE FORBES

"SIGNALS COLLECTED FROM ALL OVER THE WORLD..."
Sketchnoting, also known as visual notetaking, is the creative and graphic process to capture information through illustrations, symbols, and text. This sketchnote was drawn at the 2022 Cryptologic History Symposium for “The Making of The Last Elephant Cage” session, which covered the FLR-9 antenna and its 50 years of service. The antenna was about 120 feet tall and 1,443 feet in diameter. Watch this session on nsa.gov/history/. (The Museum reopened in October 2022!)
While this “Dream Team” of brilliant British and American cryptanalysts never worked side-by-side during WWII, the illustrated partnership includes Britain’s Brigadier John Tiltman, William Millward, and Alan Turing, and American William Friedman plus a man and two women in uniform who symbolize the thousands of UK and U.S. women and men who served as cryptologists. This depiction is part of original artwork presented by the NSA Director to his British counterpart at GCHQ in 2021.
Washington had Doctor Church taken into custody, and he sought someone who knew how to solve secret ciphers. Washington found a few patriots skilled at solving enciphered messages. One was Reverend Samuel West, chaplain to a Massachusetts army unit. The other was Elbridge Gerry, an officer in the Massachusetts militia.

General Washington continued to lead the patriot Army through many defeats until final victory, and the establishment of the United States of America.

Elbridge Gerry, who solved the cipher letter, became the 5th Vice President of the United States.
George Washington, as commander of the revolutionary army, was given a captured letter that had been intended for the British Army occupying New York City; the letter was enciphered. The letter writer was soon discovered to be Dr. Benjamin Church, a trusted member of Washington’s senior staff, who occupied a position similar to today’s surgeon general—and who was betraying his country! Read the full CryptoComic (“America’s First Spy Story”) on nsa.gov.
Eisenhower as President faced crises around the world—Berlin, Cuba, the Congo, among many others. The average American felt fear in Oct 1957, when the Soviet Union demonstrated its missile power by becoming the first nation to orbit an artificial Earth satellite—Sputnik (Спутник).

President Eisenhower met with the National Security Council, composed of the most senior officials in the American government who had responsibility for the country's defense and foreign policy.

Graves S. Erskine, retired Marine Corps General, chaired a meeting of Pentagon experts to plan how to meet the President's request. Erskine had commanded troops in the invasion of Iwo Jima—in not a person to be trifled with.

None of the Pentagon experts at the meeting thought that the results would come soon.

You must create a system that puts crisis information on my desk within 10 minutes after your departments learn about it.

(GASP...)

It can be done in a month or less.

You've got three weeks!!

Dick Day, from NSA, had other ideas.

Dick Day worked with NSA personnel to draw up a plan using existing communications equipment in innovative ways. A senior official briefed the plan to the President. "Ike" wasted no time in making a decision.

Let's do it.

This became known as "Critical Communications System," or "Criticon." Most of the system was operational before Dwight Eisenhower left office in 1961, but some parts flung components were not ready until John Kennedy became President. In the decades since then, this system has been an important factor in how U.S. Presidents and other senior leaders make major decisions.
The production of good intelligence is a critical step in supporting decision-making by civilian and military officials. However, timely dissemination of that intelligence is equally important; if the information isn’t received quickly, then its production process has been rendered meaningless. In this CryptoComic President Eisenhower challenges his advisors to forward intelligence information with greater speed to ensure timeliness.
When NSA moved its headquarters to Ft Meade, Maryland, in 1955, its main office building was still under construction. The first NSA offices were located in two newly-built barracks buildings.

The only heat for these two new buildings was from two locomotives that generated steam on a siding nearby.

After about two years, both the headquarters and the barracks had modern heating systems and more employees moved their offices from Northern Virginia.
NSA began moving to its now-familiar location on Fort Meade (Maryland) in the late 1950s. Some of the first employees arrived before the main buildings were fully constructed. They recalled that heat for the new buildings in those early days was provided by several steam-powered locomotives on a nearby railroad siding. Apparently, no photos of these locomotives exist today, so CCH did its best to recreate the situation in a CryptoComic.
All senior commanders had an "Ultra Officer" to see that they got the information from decrypts when they needed it. Captain Melvin Helfers was assigned to Patton's headquarters.

**Helfers:**

*We must wake the general. He must see these messages.*

**Officer:** You know he doesn't care for that mumbo jumbo!

*This could mean life or death for this command.*

*Ok, but he isn't going to like it.*

Once he was convinced the Ultra intelligence was real, Patton ordered his subordinate commanders to prepare to defend against the ambush. The result was a monumental American victory.

**Helfers:** This is good stuff. After all, you will brief me on it every morning personally. After the operational briefing is over.

**General Patton:** Became a believer in Ultra and used it to very good advantage in moving the U.S. Third Army against the Germans. Helfers briefed the 3-star daily for the rest of the war.
Before World War II, few senior American officers knew much about SIGINT, and some, even the famous General George Patton, wanted little to do with it. However, as they learned how useful the information that SIGINT provided could be, many became believers. Read the full CryptoComic (“Teaching an Old General New Tricks”) on nsa.gov.
“Friedman’s success with the Kryha test messages demonstrated his skills to his superior officers, and helped gain acceptance for his nontraditional ideas. He served as the Army’s (and later NSA’s) senior cryptologist for more than a quarter century.”
Nowadays, William Friedman is remembered and honored as an innovative pioneer who revolutionized the practice of cryptography and made countless contributions to U.S. national security through his forward thinking. But, as a new government employee, even Friedman had to prove himself and his theories about cryptologic work. Read the full CryptoComic (“The Unbreakable Kryha Machine”) on nsa.gov.
The battle began when an Australian platoon encountered large Viet Cong forces at the rubber plantation at Long Tan, not far from Nui Dat.

The Battle of Long Tan demonstrated the importance of wartime SIGINT cooperation between Allies.
Australian troops deployed to Vietnam achieved a hard-won victory in the Battle of Long Tan in August 1966. The conflict began with SIGINT intercepted by U.S. and Australian collection sites. Australia recognizes this battle as a major victory during the Vietnam War, which demonstrated the importance of SIGINT cooperation between allies.
Edgar Allan Poe, a magazine editor, was a talented amateur cryptologist. In 1843, he wrote the short story *The Gold-bug* about solving a cipher message with directions to buried treasure. This clever story inspired uncounted thousands to study cryptology, including many NSA professionals.