SECRET MESSAGES

CONCEALMENT, CODES, AND OTHER
TYPES OF INGENIOUS COMMUNICATION

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that the messages were picked out of their hiding places and delivered. Even a careful rummaging through the clothes by diligent German guards did not turn up the messages, many of which survive today in museums throughout Europe, testament to human ingenuity and determination in the face of death.

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THE FALL OF TROY AND THE ERIE CANAL: WHAT'S THE CONNECTION?

BEFORE THE ADVENT OF RADIO, microwaves, telegraph lines and cell phones, the extent of long-range communication from one person to another was exactly the distance one could shout. The megaphone was an audio breakthrough, though, amplifying the voice so that it could travel further than before. Infantry officers of the 18th century used them to issue commands over the din of battle. Their effectiveness was still only in the hundreds of feet, though, and that's why bugles and other battle horns were invented. In the hands of a strong-lunged player, bugle commands could pierce the clamor and be heard perhaps 150 yards away, even further on a quiet day.

Does that mean that messages or instructions in the ancient world could never travel further than the length of a soccer field? Absolutely not. Even thousands of years ago sharp-witted men knew one important fact about the senses-that the eyes can see much further than the ears can hear. They knew that the length of vision of a normal man standing at sea level is four miles. That is, standing on flat ground the most-distant horizon is about four miles away. But if one climbs a hill and looks to the same horizon, the increase in the length of vision improves to thirty miles, forty miles, or more

depending on the height of the hill and atmospheric conditions. Over the centuries many ingenious long-distance communications systems have been devised using that fact. Here are a few:

Where there's smoke, there's a message

The historian Aeschylus tells us that the fall of Troy in 1084 BC was news so important that it had to be communicated to Queen Clytemnestra as fast as possible.

But she was in Argos, some 500 miles away. Couriers could be dispatched; on foot, allowing for weather, uneven terrain, food intake and occasional stops to rest or sleep, the courier would make it to Argos in about five days. On horseback, the trip would take a little over two days. But the Greeks managed, on this occasion, to let their Queen know the good news by means of a telecommunications system only slightly slower than today's high-speed microwave transmissions. How did they do it?

In one of the first recorded uses of long-range communication at the speed of light, the Greeks arranged for fires to be lit at night on nine hills 45 miles apart, with the hills chosen for their geographic alignment between Troy and Argos. As previously agreed, the queen would know that a visible fire meant a good outcome. As soon as the first signal fire was lit, the flames would rise fifty feet in the air. Since there was no ambient ground light at all at that time in history, the flames would be seen instantly by the fire team 45 miles away on the second hill, who then lit their fire, which was seen by the fire team on the third hill who lit their fire, and so on. In a matter of minutes the message traveled the length of Greece.

A towering message

Fifty years before the advent of radio, the French army of the First Republic in the late 18th century developed a clever way to communicate messages at the speed of light over hundreds of miles. Under the direction of Claude Chappe, they erected hundreds of signaling stations on hilltops all over France, spaced three to six miles apart. Each station was equipped with a swiveling telescope and a wooden contraption that used moving, hinged arms and signal flags to send messages in semaphore fashion. The device was capable of nearly fifty semaphoric positions, enough to communicate the entire alphabet, plus a range of numbers and many special symbols. Signalers on station would scan the nearby hilltops with their telescopes for messages, and, having received one, would write down the message, spin 180 degrees, and pass it along to the next station in line as quickly as possible.

It was said that a message of roughly fifty letters could travel 400 miles in an hour, passing through 120 signal towers!

Taking the long view

The Indian tribes of the American southwest used the elevation provided by the mountains that ring the area and the crystal clarity of light in that region to create an interesting line-of-sight messaging system that protected them from invaders for centuries. Standing at a moderate height and looking down at the flat, tan desert floor, one could easily see a man and his movements at a distance of five miles or more.

Knowing this, the indigenous tribes of the region developed a system of motion signals that enabled a solo scout on the desert floor to communicate what he was seeing to his buddies who were up on the mountain, out of harm's way. For example, riding a horse in a circle meant that something had been observed. If it were a herd of buffalo he saw, the scout would dismount and give the sign for buffalo-holding a blanket by the corners and lowering it to the ground. If it were a column of Army soldiers, the scout would ride back and forth in a zigzag pattern, indicating the motions of a cav-

- NUCFLASH: To mean an incident involving a detonation or a possible detonation of a bomb which could create the risk of nuclear war between the US and the USSR.
- BROKEN ARROW: Seizure, theft, loss, unauthorized possible detonation (but not one that might trigger war), non-nuclear explosion or burning of a bomb, contamination or potential public hazard.
- BENT SPEAR: A significant incident other than an accident.
- DULL SWORD: An incident.
- FADED GIANT : A problem with a Navy nuclear reactor or the equipment around a nuclear reactor.

If all of that leaves you a bit cold and seems a little too analytical, an actual secret message sent from the Pacific Proving Grounds back to Los Alamos in 1952, might warm you up a bit. Six thousand miles and countless Soviet trawlers separated this distant test site at Eniwetok, where classified bombs were being exploded, from the nuclear labs back in New Mexico where the bomb had been developed. As preparations were underway for the explosion of a spectacular bomb codenamed Mike, the Los Alamos scientists nervously awaited word of whether their theoretical designs had worked. The bomb went off at 6:12 AM on October 31, 1952. The bomb blossomed into a 10 megaton fireball and forever changed nuclear design. How, though, were the results communicated to those scientists back home who were nervously biting their nails? The explosion of the world's first thermonuclear bomb was confirmed by using a secret message right out of everyday life: "It's a boy!"

Which leaves us with the message at the top of this page. The Mike bomb used a liquid fuel that required super-cooling and weighed 80 tons, which was completely useless as a weapon. The second thermonuclear bomb was designed to try out a much lighter dry fuel called lithium deutride. Would lithium-deutride work? At

6:45 AM, on March 1, 1954, the firing charge was set off inside a bomb codenamed Bravo during a series of tests codenamed Operation Castle.

Did a dry fuel work?

Read the message at the top of this story and you be the judge.

THE MONEY CODE

The American dollar may be the most stable sought-after currency in the world, but for most of its life American currency has also been among the most easily counterfeited in the world. Back in the 19th century counterfeiters were so numerous that fully one-third of all notes in circulation were fake.

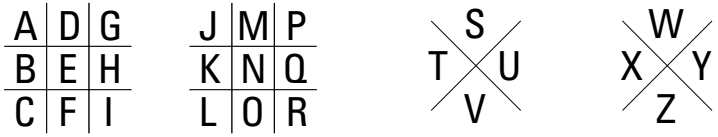
It's not that bad today, but even after the creation of the Federal Reserve Bank and its Federal Reserve Bank Notes (the money we use today) in 1913-14, the counterfeiting problem did not go away. Why? According to experts, the designs of the $1, $5, $10, $20, $50 and $100 bills have always been too easy to counterfeit. These bills, they say, lack the kind of artistic and design intricacy that discourages illicit printings. So beginning in 1996 with the $100 note, the United States began redesigning its currency, incorporating a wide range of new security features. The new notes have nine changes in them that the Treasury will acknowledge; the rumor is that there are other, undisclosed "secret messages" on and in the bill to catch counterfeiters. True or not, the new features are sufficient to ward off the temptations of the new desktop printing technologies. Here are the changes found on the new $20 bill:

- Andrew Jackson's portrait is larger and the engraving is more detailed. Exact duplication of the fine engraving lines would now be very laborious for a counterfeiter. The portrait is off-center and therefore mostly out of the "folding area" of the bill. This reduces the wear and tear on the portrait.
- A fine-line wavy pattern has been printed behind the portrait and behind the White House art. Printed poorly, these lines create a noticeable, stroboscopic effect.

of ways the strategy game Tic-Tac-Toe can be used to create a serviceable code system.

The Basic Tic-Tac-Toe Code

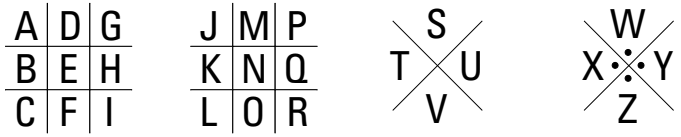
This is a clever code that uses the familiar grid lines of a Tic-Tac-Toe game as substitutes for letters. It starts with an arrangement of the entire alphabet into two Tic-Tac-Toe grids and two diagonal variations on the grid, with dots strategically placed as shown.



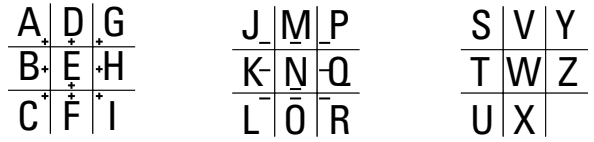
The key to understanding the system is found not in the letters themselves but in the geometric configuration of the grid lines and the position of the dots. These are used as substitutes for the letters that reside in the grid. In this way the letter A becomes ⌟•, B becomes ⌟, and so on.

"Breakout tonight" becomes:

This is an effective code because it is easy for first-timers to use, and is simple enough to memorize, eliminating the need to have a written code key lying around. Its weakness is its simplicity, too. Once discovered, it is no longer useful. That's why variations were developed, just to keep authorities on their toes. Simply moving the location of the dots offers a number of variations, such as this one confiscated from a Mexican Mafia member:



The use of symbols rather than dots gives the code a different twist:

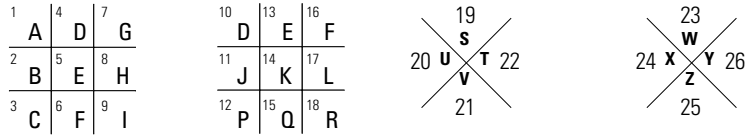


Finally, a degree of difficulty can be imposed by the prisoners' occasional switch or rotation of the symbols in the middle of a coded message.

Today's convict population might be surprised to learn that this code system has been around for centuries. It is often called the Pigpen Code, so named because of the rectilinear arrangement that resembles the fences in a hog lot. The Freemasons used the Pigpen system to encrypt the details of their financial transactions in the 1700s, and variations of the system have been handed down over hundreds of years in many British public schools.

The Spoken Tic-Tac-Toe Code

To communicate verbally in code (a handy skill when you're yelling from one end of the cell block to the other), prisoners in various populations have devised a number substitution code based on Tic-Tac-Toe. It is a variation of the simplest number substitution code known to man: 1=A, 2=B, etc. The Tic-Tac-Toe grid is simply used to re-order the alphabet as shown below:



So when a convict wants to express himself, he simply yells, "22-5-13-23-1-18-10-13-6-8-19-1-11-13-18-14!" (We'll let you figure it out.)