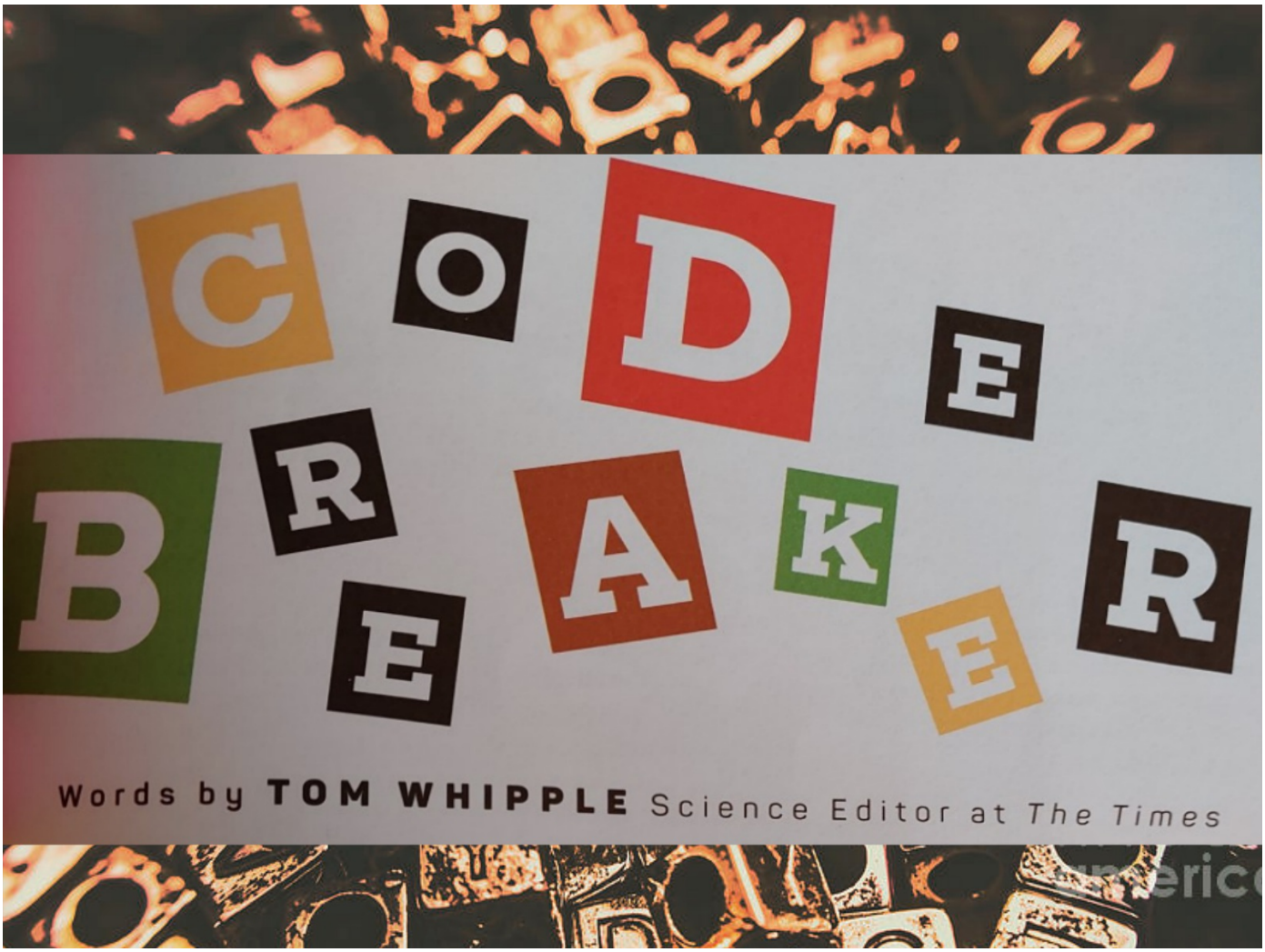

CODE
BREAKER
Words by TOM WHIPPLE Science Editor at The Times

Traditionally, history says the Germans lost the First World War on 11 November 1918 – when in a converted train carriage on the battlefields of France, the armistice was signed. You could argue, though, that the Germans really lost the First World War almost two years earlier, on 19 January 1917.

That was when a coded telegram was sent under the Atlantic, via Sweden, to the German ambassador in Mexico. It instructed the German ambassador to make an offer to the Mexicans – and this offer was, to say the least, explosive.

In the brief, shouty capital letters of a telegram this message declared that if the USA declared war on Germany, Germany would support the Mexicans in war against the USA. The Germans were prepared to give Mexico money and supplies to regain their 'lost' territory of Texas, New Mexico and Arizona.

In other words, the Germans were pledging to help the Mexicans double the size of their country, at America's expense. Unfortunately for the Germans, Britain intercepted the telegram. Even more unfortunately, by then the Royal Navy had cracked the German codes.

There are lots of types of code. The simplest is called letter-substitution. You could, for instance, say that 'a' is 1, 'b' is 2, 'c' is 3 ... and so on. Then the word 'code' would be written, '3-15-4-5'. The problem with that code is it is too easy to crack.

You can make it harder by jumbling up the numbers randomly so that they don't correspond to in alphabetical order – say, 'a' is 14, 'b' is 1, 'c' is 22, and so on.

But that is still too easy to break, and the reason why is that our letters aren't all used the same amount. The letters 'e' and 's' are used loads (they appeared eighteen times in the last sentence), while 'x' and 'q' aren't used much at all (they didn't appear at all in the last sentence).

So if you have a really long message, or lots of messages, and if your enemy is using a letter-substitution code, all you have to do is look for the most common number – and you can have a good guess that that is probably 'e'. Look for the least common number and it probably stands for 'x'. Very quickly, you will fill in the letters in between and guess the code.

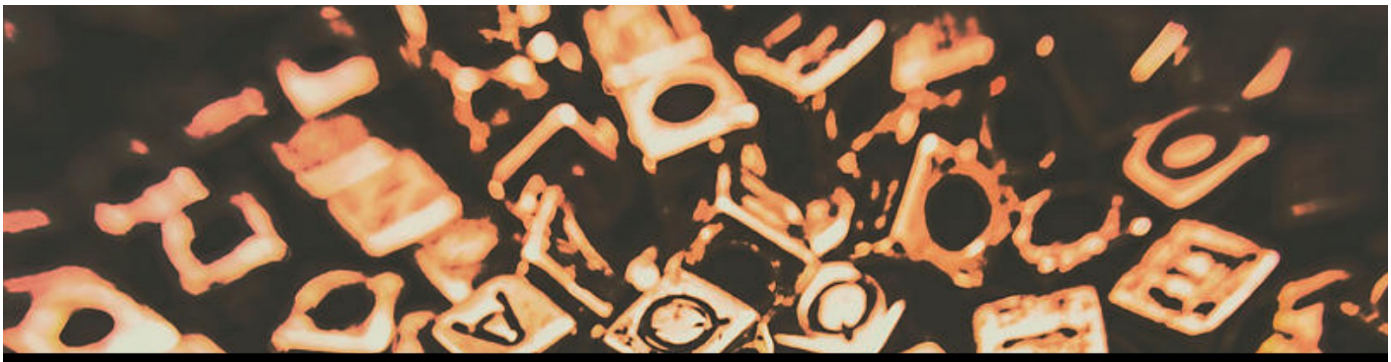
That was why in the First World War the Germans used more sophisticated codes. Instead of replacing letters with numbers, they replaced whole words with numbers – tens of thousands of them. So look in the code dictionary and the word 'word' might be coded as 5298, the word 'uncrackable' by 3029. People sending

the message would look up the number for each word and write that instead. People receiving the message would look up the word for each number and decrypt it.

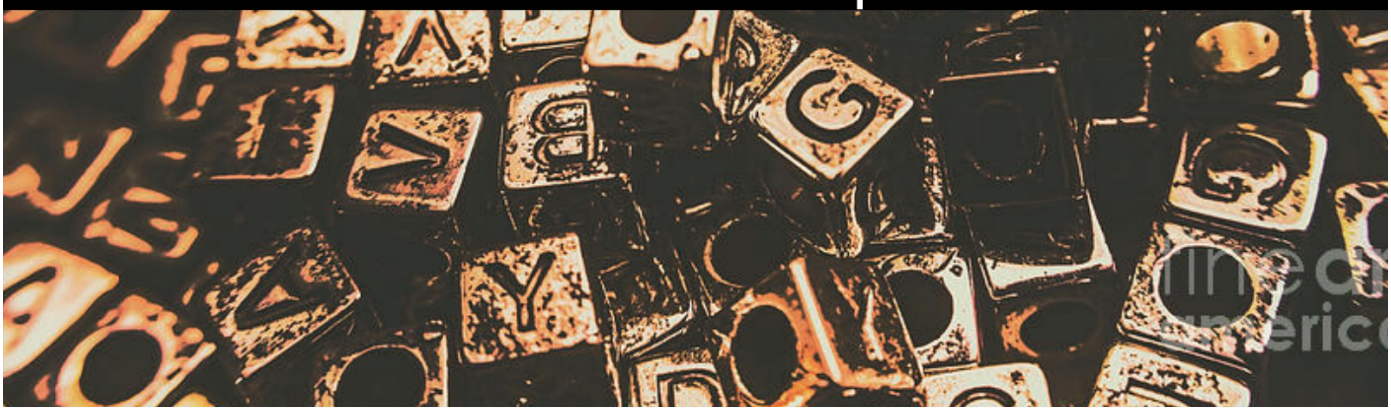
The Germans thought it was indeed uncrackable; they were wrong. Over the course of the war, Britain intercepted millions of words written in this code. The weakness was not the code itself, but the world it described. Sometimes, the messages might have been sent after a big tank battle; then the British had a good idea they would include the word 'tank'. Sometimes, the messages were sent on 25 December – and they guessed people would wish each other a happy Christmas.

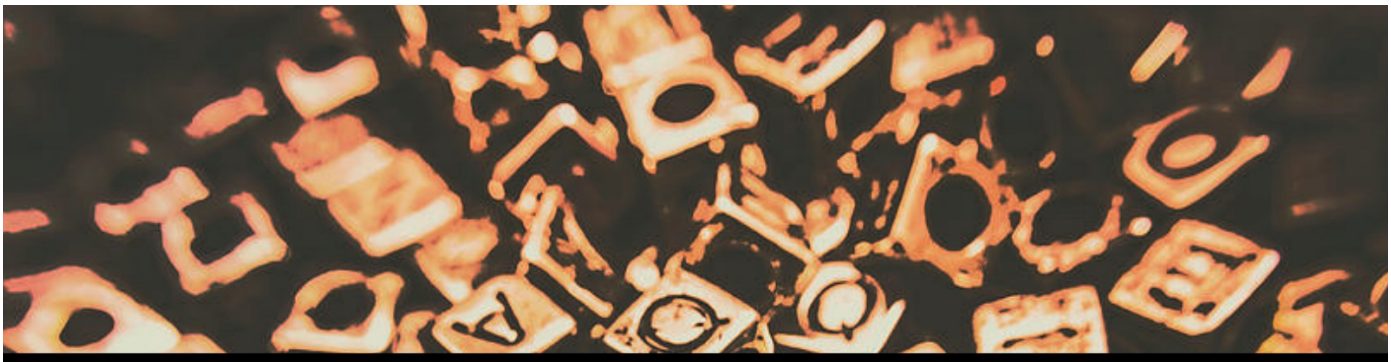
Slowly, in this way, the code-breakers worked out each word. It was incredibly hard, and often dull, but it paid off. Because it meant that when the Germans sent their telegram across the Atlantic to their Mexican ambassador, the British were able to read it. They had the most valuable document ever captured in war – a telegram that showed the Germans were planning to support an invasion of the USA.

A few months later, in large part because of seeing the telegram, the USA would finally enter the war and help defeat the Germans. And the Mexican invasion never came. S

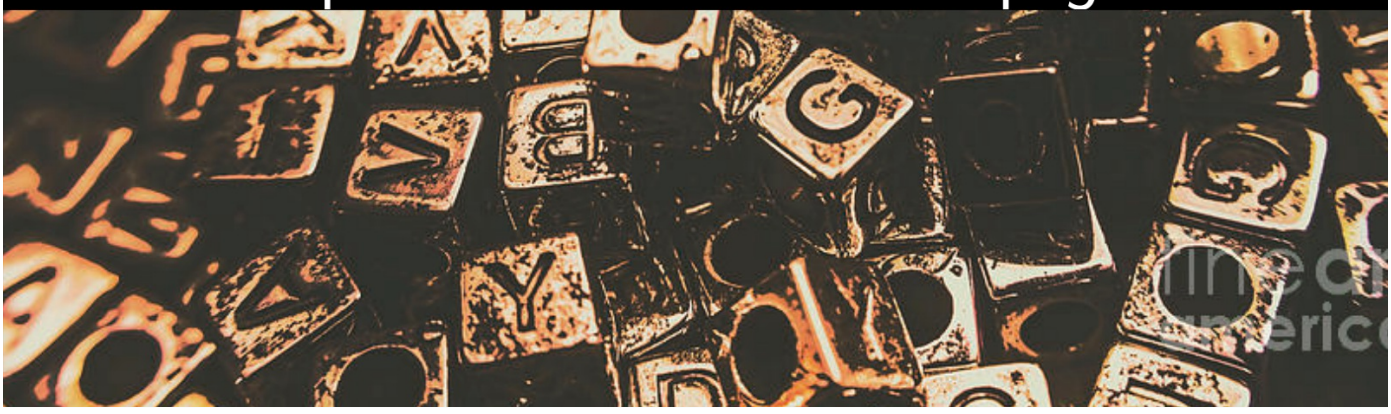


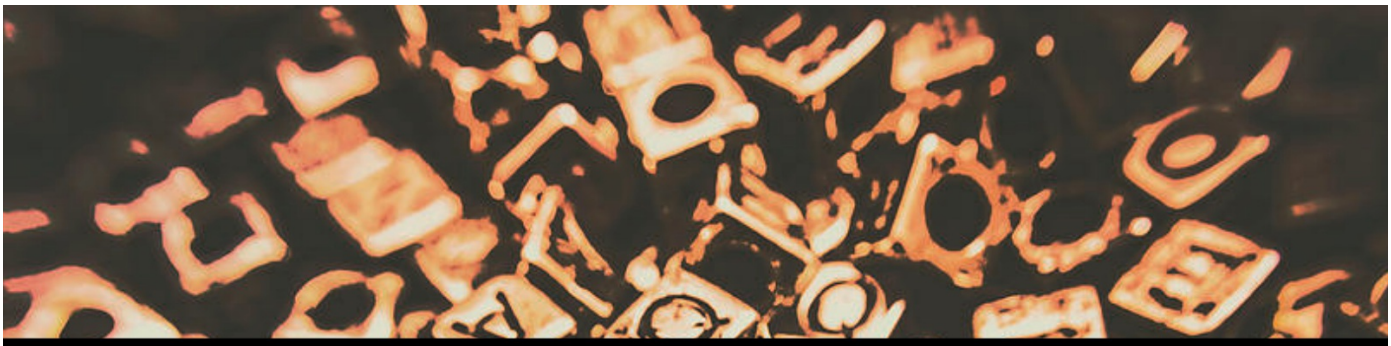
Objective: Make justified inferences about the perspective of the author from what is written and implied.





For the questions on the following slides, you will need to look back at the text on the previous slides to help you.

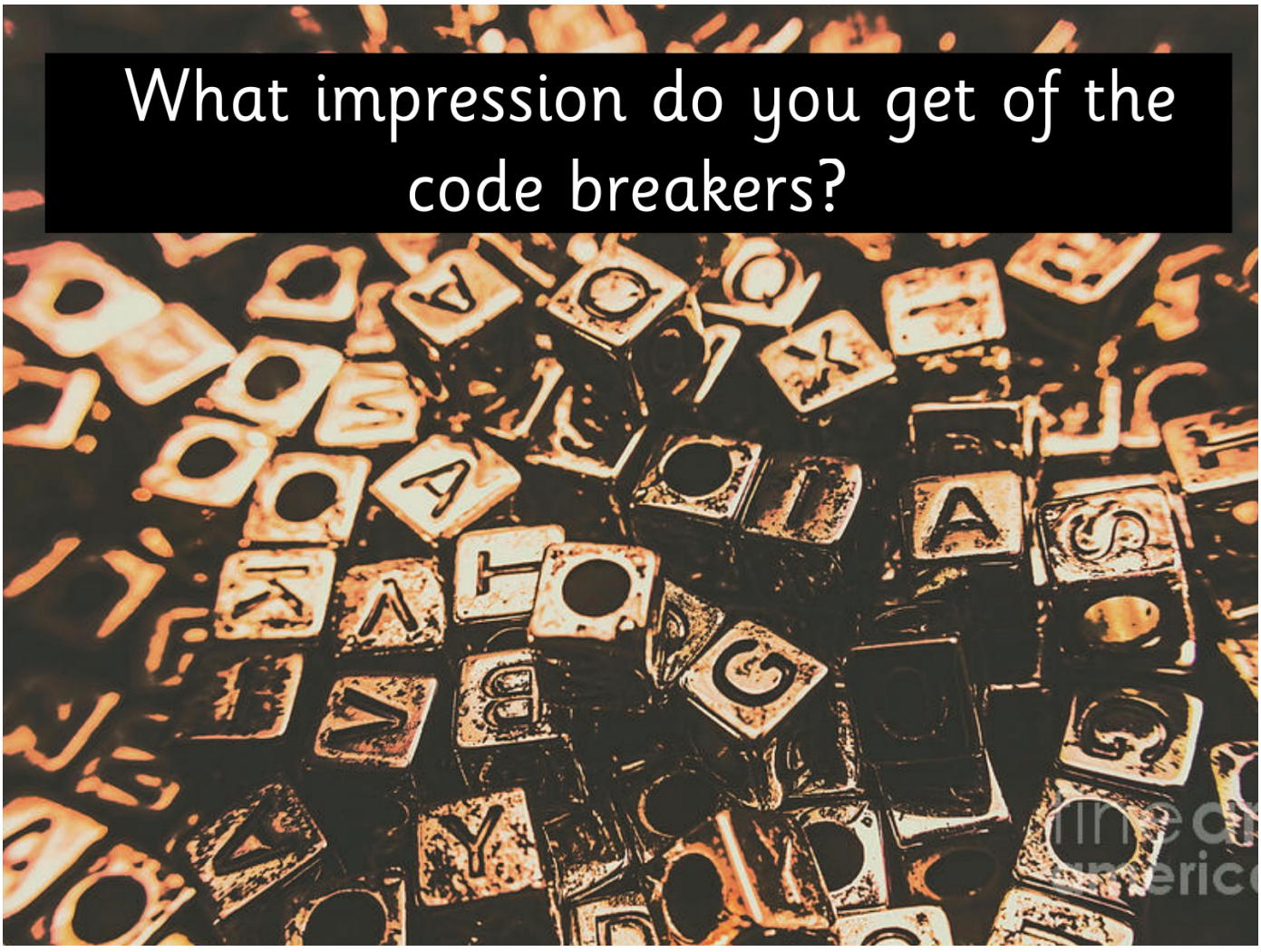




In the second paragraph, what does the word explosive tell us about the (author's perspective of) German's offer to the Mexicans?

Look at the last paragraph on the page. What impression do you get of the German's code?

Look at the final paragraph on the second page. What does this suggest about the USA in this context?


What impression do you get of the code breakers?

Words by **JAMES DOYLE**

THE ENIGMA GIRLS

Spying in the UK goes back many centuries but in the very early days it wasn't really a profession as such and most spying missions were given to men. That was until the Second World War, when the art of spying underwent a dramatic change. At spy HQ – or to give it its full title, the Government Code and Cypher School – there were more than 10,000 employees and, remarkably, two-thirds of the spies were female.

One of the young women was Ruth Bourne. Ruth was recruited to aid the Allied code-breaking efforts at the now famous Bletchley Park. Ruth recalls the excitement of working at Bletchley and the high level of secrecy there. She recounts: 'I was given only one sentence: "We are here to break German codes, end of story".'

It was at Bletchley that the Nazis' famously complex 'Enigma code' was cracked. Moreover, most of the code breakers were young English women just out of school. For many years, the achievements of these young code breakers has been overlooked, focusing instead on the man at the forefront of the project, the brilliant mathematician Alan Turing.

Each day during the war, the Enigma women had to try to pre-empt German plans. They couldn't do this manually as it would be much too slow a process. Instead, they used Turing's revolutionary code-breaking machine named the 'bombe', which worked at lightening speeds. Ruth recalls that code breaking and spying on the Nazis '... was exciting but standing in front of a machine for eight hours was not'. The biggest problem they faced was the sheer volume of codes the Nazi Enigma machine could generate in a single day. Using the machine, German forces could scramble a message in more than 158 million, million, million ways, and at the end of each day the settings used would be changed and the code breakers would hav from scratch the next day.

Ruth and her fellow service women were the Wrens. Each day they prepared and ma code-breaking bombes. They turned the d front and plugged up the boards at the bac to settings laid out in Turing's user manual. used what were called 'cribs' to help break codes. If the settings were correct, then th reveal some of the Enigma settings used t message and act as a starting point for uns the remaining settings. If the crib and initia were good, then the bombe could return th needed to crack the code within a matter o

Ruth arrived in Bletchley around D-Day a remembers that first day fondly as they w successfully cracking thousands of messa soon learned that despite a marvellously s day everything reset again the next day. Th of teenagers found themselves working a schedule, with very little margin for error. R estimates that they could have broken tw million messages during the war.

When the war was won, the order came fr Minister Winston Churchill to take apart the bombe machines. Amazingly, Ruth continu a bombe machine today. It is the only worki the world and is used in demonstrations at t Park museum. In 2009, the government als the Enigma girls and other Bletchley vetera commemorative badge emblazoned with th 'We also served'. The recognition of the wor Bletchley was long overdue for the young w played such a crucial role in the war effort.

Read the text The Enigma Girls on the next slide, annotating it with your thoughts as you do.

Then, independently answer the questions on the worksheet. You will eed to go back to the text at the beginning of this lesson to help you

EXT: What impression do you have of the actual work (the code reaking) that the Enigma girls did? Justify your answer with evidence from the text.