

## Gronsfeld Cipher

In 1892, French authorities arrested a group of anarchists and brought them to trial. Included in the evidence was a number of cryptograms that had been solved by [Étienne] Bazeries [1846 – 1931]. They used a system called the Gronsfeld, a kind of truncated Vigenère named for the count of Gronsfeld. Its key consists of numbers, each of which indicates the number of letters forward in the normal alphabet that the encipherer is to count from the plaintext letter to the ciphertext letter. (*The Code Breakers* by David Kahn)

Here is a table for the Gronsfeld cipher.

	<u>abcdefghijklmnopqrstuvwxyz</u>
0	ABCDEFGHIJKLMN <strong>OP</strong> QRSTUVWXYZ
1	BCDEFGHIJKLMN <strong>OPQ</strong> RSTUVWXYZA
2	CDEFGHIJKLMN <strong>OPQR</strong> STUVWXYZAB
3	DEFGHIJKLMN <strong>OPQRS</strong> TUVWXYZABC
4	EFGHIJKLMN <strong>OPQRS</strong> TUVWXYZABCD
5	FGHIJKLMN <strong>OPQRS</strong> TUVWXYZABCDE
6	GHIJKLMN <strong>OPQRS</strong> TUVWXYZABCDEF
7	HJKLMN <strong>OPQRS</strong> TUVWXYZABCDEFG
8	IJKLMN <strong>OPQRS</strong> TUVWXYZABCDEFGH
9	JJKLMN <strong>OPQRS</strong> TUVWXYZABCDEFGHI

## Beaufort Cipher

In England in 1857, a  $4 \times 5$  card with an alphabet square printed in red and black went on sale for sixpence. It was a new system of secret writing “adapted for telegrams and postcards,” the latter an even newer form of communication than the telegraph. Admiral Sir Francis Beaufort, R.N., creator of the Beaufort scale with which meteorologists indicate wind velocity ..., had originated the cipher, and his brother published it a few months after the admiral’s death. ... The alphabet square is essentially the same as Vigenère, except that it repeats the normal alphabet on all four sides ... . Its [method of] encipherment equals that of a Vigenère with reversed alphabets. ... The envelope for the card carried the instructions: “Let the key for the foregoing table be a line of poetry or the name of some memorable person or place, which cannot easily be forgotten ... . Now look in the side column [either side column] for the first letter of the [plain]text (*t*) and run the eye across the table until it comes to the first letter of the key (*v*), then at the top of the column in which *v* stands will be found the letter *c*,” “ which would be the ciphertext. (*The Code Breakers* by David Kahn)

## The Original Beaufort Square

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
BCDEFGHIJKLMNOPQRSTUVWXYZA  
CDEFGHIJKLMNOPQRSTUVWXYZABC  
DEFGHIJKLMNOPQRSTUVWXYZABCD  
EFGHIJKLMNOPQRSTUVWXYZABCDE  
FGHIJKLMNOPQRSTUVWXYZABCDEF  
GHIJKLMNOPQRSTUVWXYZABCDEFGH  
HIJKLMNOPQRSTUVWXYZABCDEFGHI  
IJKLMNOPQRSTUVWXYZABCDEFGHIJ  
JKLMNOPQRSTUVWXYZABCDEFGHIJK  
LMNOPQRSTUVWXYZABCDEFGHIJKL  
MNOPQRSTUVWXYZABCDEFGHIJKLM  
NOPQRSTUVWXYZABCDEFGHIJKLMN  
OPQRSTUVWXYZABCDEFGHIJKLMNO  
PQRSTUVWXYZABCDEFGHIJKLMNOP  
QRSTUVWXYZABCDEFGHIJKLMNOPQ  
RSTUVWXYZABCDEFGHIJKLMNOPQR  
STUVWXYZABCDEFGHIJKLMNOPQRS  
TUVWXYZABCDEFGHIJKLMNOPQRST  
UVWXYZABCDEFGHIJKLMNOPQRSTU  
VWXYZABCDEFGHIJKLMNOPQRSTUV  
WXYZABCDEFGHIJKLMNOPQRSTUVW  
XYZABCDEFGHIJKLMNOPQRSTUVWX  
YZABCDEFGHIJKLMNOPQRSTUVWXY  
ZABCDEFGHIJKLMNOPQRSTUVWXYZ  
ABCDEFGHIJKLMNOPQRSTUVWXYZA

Here is another example using the original square: Let us encrypt the letter h with key F. Find the plaintext letter h in the column on the left or on the right. Find in that row the key F. Proceed up that column to the ciphertext letter in the top row Y (or down the column to the ciphertext Y in the bottom row).

Notice that the Beaufort encryption is reciprocal. Begin with ciphertext Y. Find Y in the column on the left or on the right. Find in that row the key F. Proceed up that column to the plaintext letter in the top row h.