The Cryptology System of Pliny Earle Chase

This file illustrates a system of cryptology devised by the mid-nineteenth-century businessman and mathematics professor Pliny Earle Chase. The file ends by challenging the reader to decode the name BKXVDI.

Chase used the name PHILIP to illustrate one of the four encoding systems he created. Each letter was represented by a 2×1 vector $\begin{bmatrix}R\\C\end{bmatrix}$ whereby *R* is the row and *C* the column of that letter in the defining 3×10 tableau *M:*

M =

X	U	A	C	O	N	Z	L	P	φ
B	Y	F	M	&	E	G	J	Q	ω
D	K	S	V	H	R	W	T	I	Λ

Thus, P is $\begin{bmatrix}1\\9\end{bmatrix}$ and, more generally, PHILIP is formed by placing each successive vector from left to right, resulting in:

1	3	3	1	3	1
9	5	9	8	9	9

Chase's ingenious approach was to multiply row 2 by 9 (to get 8639091) and form a new tableau by retaining row 1 and substituting this product as the new row 2 as follows:

	1	3	3	1	3	1
8	6	3	9	0	9	1

Now working from left to right, the initial vector $\begin{bmatrix}\\8\end{bmatrix}$ can be any letter in the eighth column of the defining tableau *M*, so that letter can be L, J, or T. All other 2×1 vectors define unique letters, so that $\begin{bmatrix}1\\6\end{bmatrix}$ is N, $\begin{bmatrix}3\\3\end{bmatrix}$ is S, etc., producing *NSIφIX, where * can be L, J, or T. Notice that the numeral 0 in the vector $\begin{bmatrix}1\\0\end{bmatrix}$ refers to column 10 in *M*. In conclusion, LNSIφIX was one of three possible coded forms for the name PHILIP. It is notable that the encrypted form in the Chase system generally contains one more symbol than the plaintext, an aspect that minimizes (even educated) guessing.

The key to Pliny Chase's encoding scheme was to multiply row 2 by 9. His paper also showed how to proceed similarly by dividing, subtracting, or taking the log of row 2. The three-page paper concluded, "These illustrations, I think, are sufficient to show that a very simple

arithmetical process may effectually conceal the meaning of a message from every one [*sic*] but the persons who hold the key to the cipher."[1] The intellectually curious reader is invited to decode the name BKXVDI.

Endnote:

[1] On p. 195 of Pliny Earle Chase, Mathematical holocryptic cyphers, *Mathematical Monthly* **1** (March 1859), 194-196.