(b)(3)-P.L. 86-36

An Unsolved Puzzle Solved

As a professional cryptanalyst, I couldn't resist the urge to attack the unknown cipher which appeared in Dr. Brent Morris's article, "Fraternal Cryptography" (*Cryptologic Spectrum,* Summer 1978). The unusual cipher (supposedly Masonic in nature) with its exotic-looking forms was said to have been part of a manuscript written in 1827 by one Robert Folger of New York. As no recorded solution of Folger's cipher appeared to exist, I set out with paper and pencil in hand to try to remedy that situation.

Initially a number of assumptions about the cipher had to be made. Some could be justified, others could not. The assumptions I made were as follows:

• That the underlying plain language is English — a logical assumption as the creator of the cipher lived in New York and had an English-sounding surname.

• That the orientation of the sample page of cipher is correct as shown, with the cipher text reading from top to bottom and from left to right. This would be expected for normal English plain text. Additionally a paragraph appears to end in the middle of the second line of cipher text. The third line likely begins a new paragraph as indicated by the indentation of the line and the illustration or illumination of its first few characters.

• That the cipher is homogeneous throughout. Individual cipher symbols, as well as clusters of these symbols, are repeated throughout the text.

• That the cipher is monoalphabetic. The occurrence of repeated elements in the cipher at many different intervals with no common factors strongly supports this assumption.

• That the cipher is uniliteral. If the cipher substitution were biliteral (or triliteral), cipher elements would be composed only of multiples of two (or three) symbols or strokes. No such limitations are observed.

• That the clusters of cipher symbols between successive spaces represent, in general, words rather than individual letters or syllables. If clusters of cipher symbols represent letters only, not words or syllables, then such clusters would contain many meaningless strokes because hundreds of discrete cipher clusters can be identified. Furthermore, the average number of strokes per cluster is observed to be 12. Estimating two or three strokes per cipher symbol, each cluster would be composed of four to six plaintext letters, which is about the average length of English words. These clusters of cipher symbols may be referred to as cipher-words.

• That there is no transposition of the order of letters within a cipher-word. If transposition within a word were part of the enciphering process, then repeats of longer words would be rare. But, in fact, repeats of many words do occur, with no change in the sequence of symbols within a word.

• That a discrete set of approximately 26 elemental cipher symbols represent plaintext letters, generally on a one-for-one basis. This follows from the assumption that the cipher is uniliteral. This does not imply that all variants are excluded, nor does it mean that a cipher symbol cannot represent more than one plaintext letter. However, these two conditions would be the exception rather than the rule.

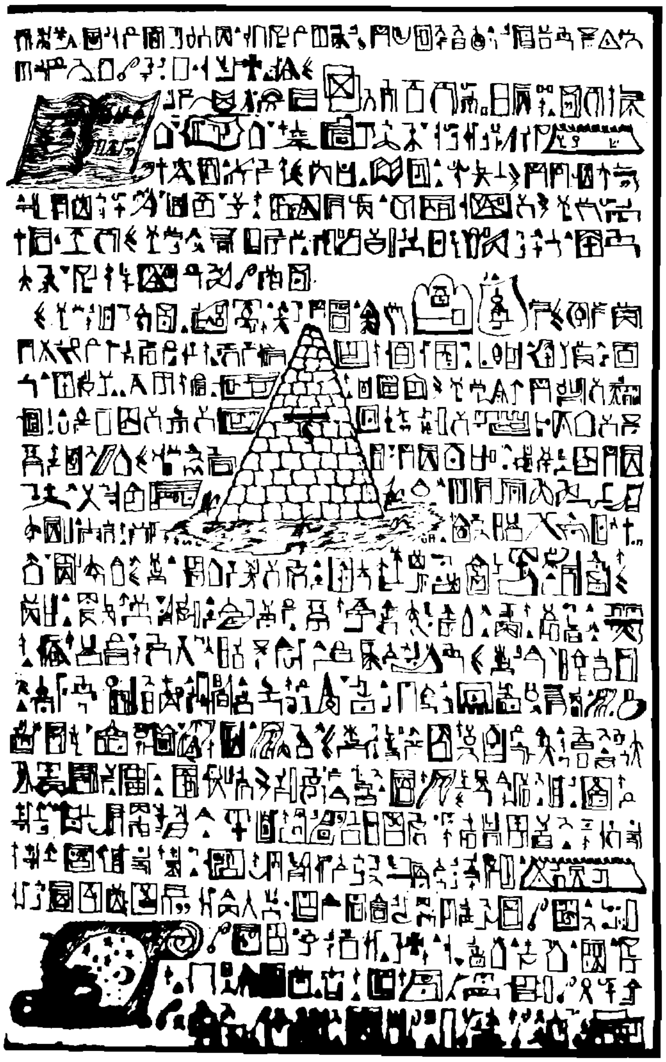


Figure 1.
Page from manuscript of Folger's cipher.

• That the order of the symbols within a cipher-word is from top to bottom and/or from left to right, corresponding to that of English plain text.

• That the size of the individual cipher symbols is immaterial.

• That minor artistic variations in the formation of cipher symbols are immaterial.

• That dark shading of certain strokes may affect the meaning of the symbols in which they occur.

• That nulls (meaningless strokes) may be present in the cipher, but they probably represent less than half of the total number of strokes. A cipher system composed of a majority of nulls would be impractical, unwieldy, and conducive to errors.

• That each elemental cipher symbol contains at least one stroke, but may contain more than one stroke.

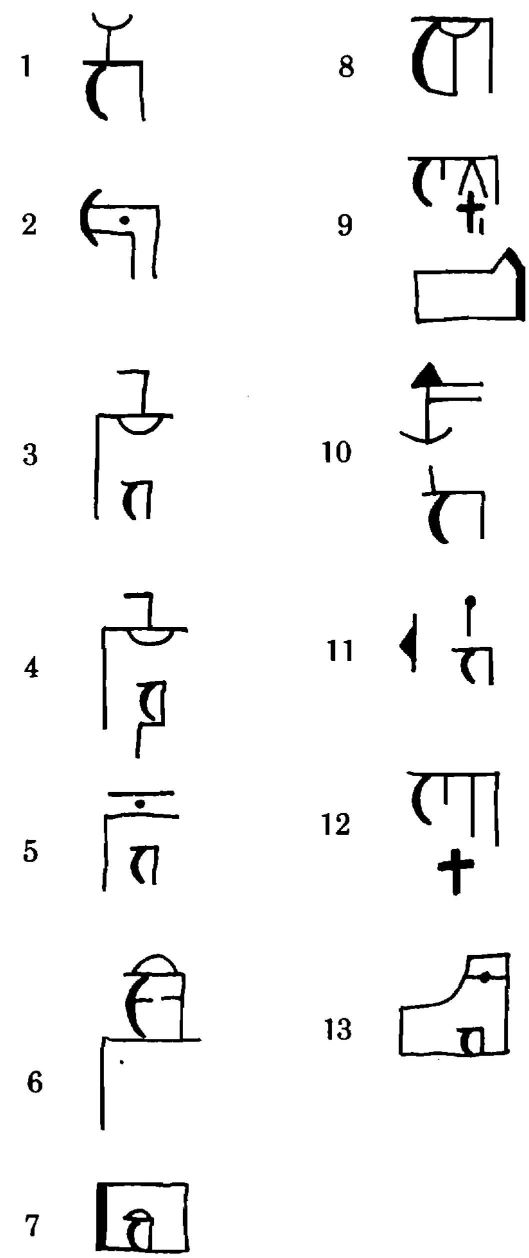
• That no individual stroke in the cipher may belong to more than one cipher symbol. This condition is necessary to avoid ambiguity in the deciphering process.

Having made the above set of assumptions (either explicitly or implicitly), I was ready to perform a monographic scan of the cipher text to see what might show up. On the whole, the results of this scan were rather disappointing — it was not at all clear what the set of elemental cipher symbols might be.

The author of the cipher had succeeded well in disguising his cipher symbols. Most of the strokes in the cipher were angular, a characteristic of Masonic cipher systems. Only a few curved strokes, such as ⌒, ◡, and • , were observed. Each of these three curved strokes might be an elemental cipher symbol. Some other symbols which showed up repeatedly in the cipher text were Λ, Γ, ⅂, L, ⅃, □, †, ʖʖ, and (. The last three symbols, which occurred less frequently than did the first six, were assumed to equate to infrequent plaintext letters, the first six to high-frequency plaintext letters.

The only other useful information gained from the monographic scan was the observation that many of the cipher-words were surrounded by boxes. I assumed that the boxlike cipher character was the first letter of the word and that the rest of the word was contained within the box. I could not determine, at this time, whether the dark shading along some sides of the boxes (e.g., , , , and) was significant. I did make an interesting observation about these boxed-in words: out of roughly 150 such words appearing in the cipher, no less than 42, or 28 percent of the total, contained a horizontal stroke just inside the box, near the top (e.g.,). The horizontal stroke appeared to be the second letter in these words. The most frequent letter in English plain text is the letter *E* and its favorite position within a word is the second position. The horizontal stroke could be the symbol for the letter *E*! This symbol occurs frequently throughout the text but is relatively inconspicuous — a desirable characteristic for a cipher symbol representing a high-frequency letter.

I did not make any firm identity of any of the cipher symbols at this time. Continuing my analysis, I scanned the cipher text looking for digraphs with noticeable positional limitations. In English plain text, the most striking example of a digraph with positional limitation is *QU* — the letter *Q* is always followed by the letter *U*. During the digraphic scan of the cipher text, a pronounced positional limitation was observed involving the cipher characters and , which I called "crescent moon" and "backward gamma," respectively. The crescent moon is always immediately followed by the backward gamma—without exception! The backward gamma, however, is followed only occasionally by the crescent moon. A limitational phenomenon such as this was something that fully justified the risk of making a plaintext assumption. But first, all cipher-words containing this "mystery digraph" were extracted from the text and listed. A frequency count revealed that the mystery digraph appeared a total of 23 times in 13 different cipher-words. The first cipher-word on the list occurs seven times, the second and third three times each, and all others only one time. The cipher-words were listed as follows:



The most distinctive feature of the mystery digraph is that it occurs as the *last* two letters of a word in 15 cases out of 23, and as the *first* two letters of a word in 6 cases out of 23. Only twice (in Words 4 and 6) does the mystery digraph appear elsewhere within a word, and Word 4 appears to be the same as Word 3 with a suffix added. Based on their relative frequencies, the first three words on the list could be fairly common words, consisting of perhaps three to five letters each. As for the crescent moon and the backward gamma, I concluded that the former equates to an infrequent plaintext letter, the latter to a high-frequency plaintext letter. If so, then what is the mystery digraph? Certainly not *QU*, because *QU* cannot occur at the end of words. To me, it seemed most likely that the mystery digraph was *TH*, where ┐ is *T* and (is *H*.

Testing this hypothesis proved to be interesting and fruitful. Word 1 on the list has *TH* or *HT* as its last two letters, with either one or two letters preceding. Since no three-letter word in English fits this format, it must be a four-letter word, such as *both, with, hath,* or *doth.* (Incidentally, when assuming the mystery digraph to be *TH*, it was taken into consideration that verb forms such as *hath, doth, goeth, doeth, sayeth, walketh,* etc., might occur frequently in English text written in 1827.) There was no use guessing which four-letter word this might be, but if the cipher combination Y represents two letters of plain text, then the most logical way to split this combination into two symbols is as follows: ◡ and | . I assumed each to be an elemental symbol in the cipher alphabet.

I turned next to Word 2 — a short word beginning with *TH* (an *HT* beginning would be impossible) and containing one, two, or three additional letters, depending on how the cipher combination ┐̇ is interpreted. If this combination is interpreted as either one cipher symbol or three, then a number of possibilities arise which cannot readily be proved or disproved. I decided, however, to interpret the character ┐̇ as two cipher symbols, with the dot as one and the backward gamma as another, and an intriguing pathway opened up. Since I had already assumed the backward gamma to stand for *T*, Word 2 must have the form *TH*__*T*. There is only one word in English which fits this format — the word *that*. This implies that the dot stands for plain letter *A*. At this point, I could have plugged in the letter *A* wherever the dot symbol occurs in the cipher, and continued from there. Before going off on this tangent, however, it seemed wiser to go on analyzing the list of words containing the mystery digraph.

The third word on the list apparently begins with the letter *T* and ends in either *TH* or *HT*. Since I had previously assumed the symbol ◡ to represent one letter, all that remained in determining the word length was to decide whether the cipher combination Γ represents one letter or two. Word 3 could take the form of *T*___*TH*, *T*___*HT*, *T*____*TH*, or *T*____*HT*, with the symbol ◡ representing the third from the last letter in all cases. The word fitting this pattern that comes to mind most readily is *truth*, which is exactly the sort of word that a Mason might be expected to use three times on one page. Alternate possibilities, such as *tenth, troth, taketh,* or *taught,* seem less likely than *truth. Taketh* and *taught* are improbable because they contain the letter *A*, and Word 3 has no dot symbol. I assumed *truth* to be the correct word, with cipher symbols Γ and ◡ equating to plain letters *R* and *U*, respectively, or vice versa.

At first glance, the fourth word on the list would appear to be *truths,* but this leads to an unlikely situation in which the gamma symbol (Γ) represents both *R* and *S*. Skipping over this problem,[1] I went on to Word 5. It apparently consists of five letters, four of which have been tentatively identified. This word takes the form of __*ARTH* or __*AUTH*. The only candidate for this word pattern is *earth,* which identifies the horizontal stroke as the cipher symbol for plain *E*. This confirmed my earlier supposition concerning the identity of the horizontal stroke and indicated that the gamma symbol stands for plain *R*. At this point, I had tentatively equated the following cipher and plain elements: • = *A*, — = *E*, (= *H*, Γ = *R*, ⌝ = *T*, ◡ = *U*.

The digraph *TH* appears in the second and third positions of the sixth word, with a stroke resembling the top half of a circle (⌒) representing the first letter. The gamma symbol, identified with plaintext *R*, is also in Word 6. Unfortunately, this cipher-word contains a couple of "glitches." The horizontal stroke near the middle of the word is discontinuous near its center. Is this significant, or is it a meaningless slip of the pen? Additionally, a faint dot appears near the end of the word. Is this a random speck of ink or a bona fide, but poorly formed, dot? Taking all things into consideration, I came up with the following possibilities: __*THER*, __*THEER*, __*THERA*, and __*THEERA*. Only one of these choices — the first one — suggests a valid word. That word, of course, is *other*. The only alternative, *ether*, can be eliminated because the cipher-word does not begin with a horizontal stroke, the symbol for plain *E*. Thus the cipher symbol ⌒ is identified as that for plain letter *O*. Hoping to confirm this recovery, I examined the seventh word on the list and found that it contains the ⌒ symbol, followed by *TH*. It appears to be a short word ending in *OTH*. Several possibilities come to mind, such as *doth, both,* or *sloth*. This does not confirm the symbol ⌒ as plain *O*, but neither does it contradict the assumption.

The ⌒ symbol does not occur again in the rest of the word list so I decided to try another approach. Why not synthesize a short, common word containing the letter *O* and then look for it in the cipher text? Thus far, the symbols for plain letters *A, E, H, O, R, T,* and *U* had been identified. This allowed me to predict what a couple of frequently occurring, two-letter words — namely *to* and *or* — should look like in cipher. *To* should appear as , , or , and *or* as or . The cipher-word occurs 17 times in the message and the cipher-word three times. As I scanned the cipher text, I came across a similar cipher-word, , which led me to an interesting discovery: a circle can be split into two parts, the top half (⌒) representing plain *O* and the bottom half (◡) plain *U*. Thus, a circle equates to the digraph *OU* and cipher-word reads as *our*. This seemed to be adequate confirmation that the symbol ⌒ represents plaintext *O*.

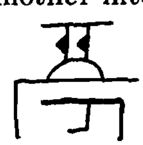
Returning to my analysis of the words on the list, I attempted to decipher Word 8, which appears to begin with the letters *THU* followed by one or two other letters. Logically this word should be *thus,* which means that the last cipher symbol in the word stands for *S*. Unfortunately this symbol is difficult to make out because it merges with the bottom of the crescent moon symbol. However, the symbol for *S* appears to be either or .

Words 9 through 12 on the list are either

[1] It turns out that Word 4 on the list really was *truths*. Part of a stroke was missing, which caused another stroke to be overlooked.

too long to allow good assumptions or have too many unknown symbols. Word 13, however, lends itself to partial analysis. It is one of the "boxed-in" words, and assuming the box itself to be the initial letter, the letters inside the box appear to be *AETH* or *EATH*. Since the former possibility is unlikely, the word probably ends in *EATH*. This could be a five-letter word such as *death* if the box stands for plain *D* or perhaps a six-letter word if the box is a combination of two cipher symbols. In this particular word, the box has a "bite" missing from the upper left corner so I had to be careful in making assumptions as to its meaning.

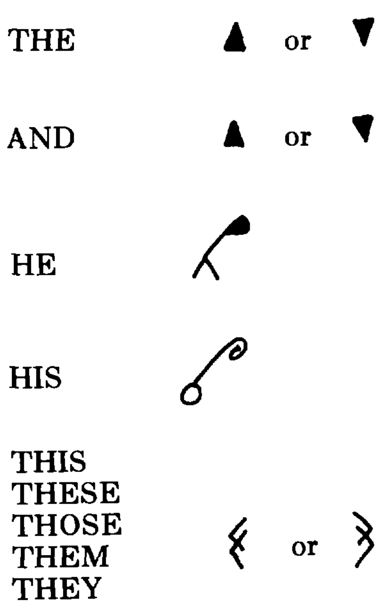
Having exhausted the list of words containing the mystery digraph, which I was convinced is *TH*, I scanned the rest of the cipher text, looking for other "interesting" cipherwords in which most of the symbols were already known. Such a word was , which occurs at the end of line 25 of the cipher. This word apparently begins *RU*, followed by three to five additional letters, one of which is *E*. Also, the last cipher character in the word () may be the letter *S*, based on Word 8. Assuming a terminal *S* gives a word of the form *RU__ES* or *RU__EES*, depending on whether the cipher character  is one symbol or two. Some possible choices were *rubes*, *rules*, *runes*, *ruses*, or *rupees*. The word *ruses* was eliminated because it contains a repeat of the final letter. Of the survivors, the most likely word was *rules*. This indicated that the cipher symbol for the letter *L* is, of all things, an *L*! This seemed suspicious, but the recovery was later verified.

Another interesting word in the cipher text is  , which occurs on line 17. This word begins with *E*, followed by a repeated letter or a repeated digraph (depending on whether the repeated character  represents one letter or two), followed by the letters *ORT__*, where the last letter may be an *S*, based on tentative previous recoveries. This gives a word of the form *E____ORT__* or *E________ORT__*, where the blanks between *E* and *O* must contain a repeated letter or digraph. The obvious choice here was the word *efforts*. This confirmed the backward *L* () as the symbol for plain *S* and the character  as the symbol for plain *F*.

At this point, another common two-letter word could be synthesized from the newly recovered symbols for *F* and *O*. The word *of* should appear as , , or  . Surely enough, the last combination appears 36 times in the message. This sequence of results and conclusions strongly indicated that the recoveries made thus far were correct.

From this point on, further recoveries could be made in a straightforward manner, using the values already known. A great deal of work involving trial and error was still necessary, but ultimate success in reading the cipher text was now assured because there were so many correct paths to follow. The symbols recovered thus far included those for plain letters *A*, *E*, *F*, *H*, *L*, *O*, *R*, *S*, *T*, and *U*. These ten recoveries were more than enough to allow solution of the rest of the cipher, including the key (cipher alphabet) and the complete plain text underlying the cipher text. In quick succession, fifteen symbols of the cipher alphabet and their plaintext equivalents were recovered, and then twenty. At this point, progress slowed a bit because the last few unrecovered cipher symbols represented such low-frequency letters as *J*, *K*, *Q*, *X*, and *Z*. Eventually all of the cipher/plain equations were recovered except one, that for plain letter *Z*. No cipher equivalent for *Z* was found on this page of the cipher.

The cipher alphabet was recovered as follows:



Note that the same cipher symbol is used for plaintext letters *U*, *V*, and *W*. Thus cipher-word equates to *with*, even though cipher symbol was originally recovered as the letter *U*. Furthermore, plain letter *H* may be represented by either of two symbols. The standard symbol for *H* is , but a variant symbol ( ) is sometimes used when *H* follows *T*. The word *thus* is enciphered with the variant form . It would appear that the variant form of plain *H* was introduced partly for security reasons and partly because Folger sometimes found it difficult to interconnect his standard symbols for *T* and *H* without either leaving a gap or creating an ambiguity. Because the standard three- stroke symbol for *H* ( ) contains within itself the two-stroke symbol for *T* ( ), Folger apparently decided to modify the standard symbol for *H*, whenever the digraph *TH* occurred, as follows: . This modification allows the frequent digraph *TH* to be enciphered more readily, without a gap and without cumbersome repetition of strokes. It also avoided any ambiguity in the decipherment process because the occurrence of the crescent moon symbol in cipher specifically indicates the presence of an *H* following a *T*. The fact that the author used the crescent moon symbol only when the digraph *TH* occurred was a cryptographic weakness in the cipher that proved to be exploitable.[2] There are, however, several instances in the cipher where Folger does encipher the digraph *TH* using the standard symbols for *T* and *H*. An interesting case in point occurs in line 3, where the phrase appears. This deciphers as *to that end that*. Here Folger uses both the standard and the variant symbols for plain *H* to encipher *TH* in the two close occurrences of the word *that*. Folger seems to

[2] It should not be inferred that the cipher was solvable only because of this weakness. Had the variant symbol for plaintext *H* not been used, there were many other ways the cipher could have been attacked. In particular, an analysis of all the apparent two-letter words in the message would probably have yielded a solution.

have had an obsession for providing variants for *TH;* he enciphers this digraph or words containing it in five different ways: , , , , and ▲.

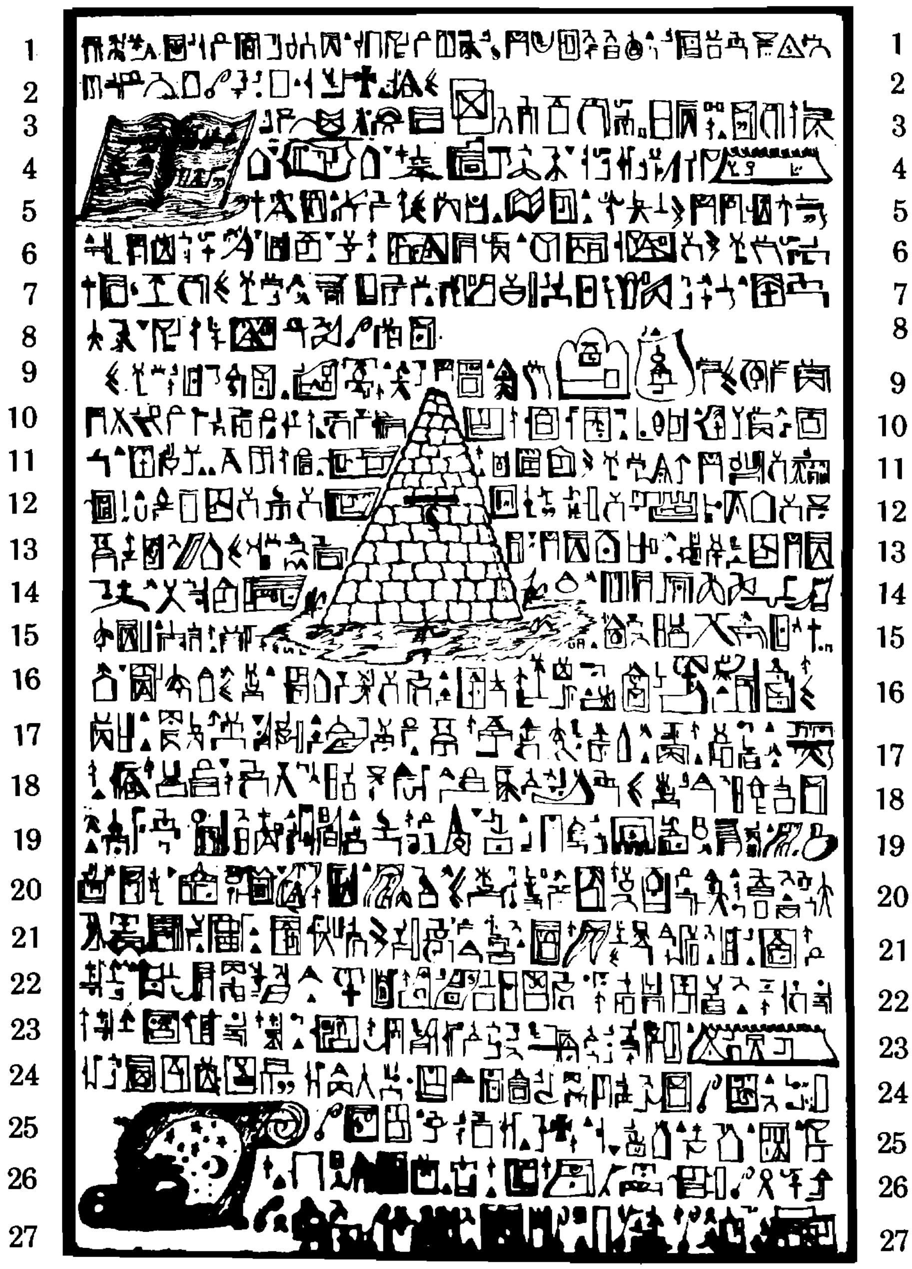
It should also be noted that Folger used special symbols to represent the common words *the, and, he, his, this, these, those, them,* and *they.* He realized that in a long cipher message words like *the* and *and* would be very susceptible to exploitation if they were spelled out every time. So Robert Folger decided that no one was going to solve his cipher by guessing *the* or *and.* Accordingly, he devised special symbols for these words and certain others. Unfortunately for him, he had to draw the line somewhere in using special symbols, and many common short words still had to be spelled out. For example, the word *of* is spelled out 36 times in the message, occurring approximately once per line.

The cipher alphabet apparently makes no provision for numerals or punctuation marks. Likewise there is no indication of upper and lower case.

The cipher component of the cipher alphabet consists almost entirely of symbols with linear strokes and sharp angles; only four or five symbols (those for *O, U, J, Y,* and perhaps *A*) use curved strokes. No systematic scheme for generating the cipher alphabet has been recovered. There are, however, some noticeable trends. For example, the five major vowels (*A, E, I, O, U*) are each represented by a simple one-stroke symbol. Four different positions of right angles (┌, ┘, ┐, └) represent the consonants *R, S, T,* and *L.* Four variations of "box" symbols represent four consonants. The box symbols for plain letters *P* and *Q* are mirror images of each other, and the box symbol for plain *B* is merely that for plain *D* with heavy shading added to the left side of the box. The standard symbol for plaintext *H* is the symbol for *G* rotated 180 degrees. Most of the heavy shading on the cipher symbols seems to be meaningless camouflage, with a few exceptions. The symbol for plain *M* ( ) and the standard symbol for plain *H* ( ) differ only in their shading on the left side. (Note that the crescent moon variant symbol for *H* is also shaded.) An unshaded box, the cipher symbol for plaintext *D,* can be shaded in three different ways to produce the cipher symbols for plain letters *B, P,* and *Q.* Plaintext *K* is represented by a shaded cross ( ), while plaintext *X* is symbolized by an unshaded plus sign (+). Some of the cipher symbols "crash" with their plaintext equivalents; that is, some cipher symbols are identical in appearance or similar to their plaintext equivalents. The identical symbols are those for plain letters *L, I,* and *U;* the similar symbols are those for plain letters *D, J, R,* and *X.* The cipher symbols for *C* and *I* are easily confused. The former is a long vertical stroke and the latter is a short vertical stroke. It is not always clear to the eye which is which, but fortunately they can usually be distinguished linguistically because one is a consonant and the other a vowel. Another example of confusion over symbols involves the symbol for plain letter *J* ( ). Sometimes Folger uses this symbol when that for plain letter *I* ( ) is called for.

After I had recovered the entire cipher alphabet, I attempted a complete decryption of the cipher text. With the exception of a few uncertain spots, I managed to get good, readable plain text. (See Figure 3.) I transcribed the plain text as literally as possible, adding punctuation marks for clarity. Hyphens appearing within plaintext words do not indicate hyphenated words in the cipher; instead, they denote areas in the cipher text where a noticeable space occurred within a plaintext word. The parentheses indicate areas where the cipher text is unreadable or where the plaintext recovery is uncertain.

The message contained in the underlying



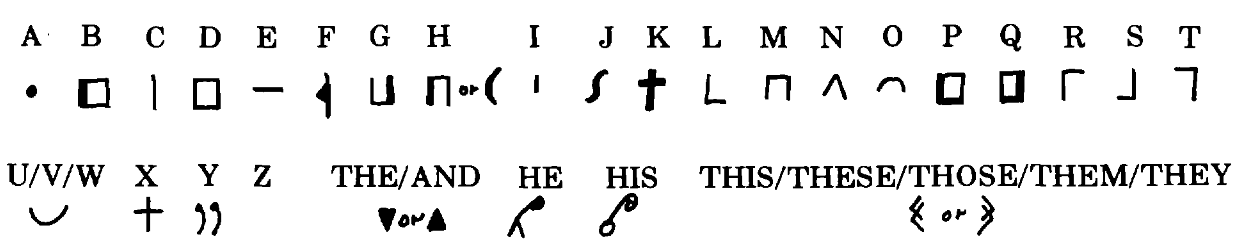


Figure 2.
Folger's cipher with key recovered by (b)(3)-P.L. 86-36

[SOMEW][1]HAT INCONVENIENT BECAU-SE OF OUR HABITS. SUCH MEN AND SUCH RULES OR DOCTRINES AS (I) HAVE ALLU-DED TO BE FOUND, AND IT IS BELIEVED THAT EVERY N.E.J. WHO [2]HAS STROVE TO DO (HIS) TASK AS A D. AND F. WILL SEEK AND FIND (THEM).

(THIS) (Illustration) MASONRY [3]IS EVER OPEN IN A PRO-PER (DEED) TO THAT END THAT WE SHOUL-D BE REMINDED OF THE DUTY, THAT OF LEARNI-[4]NG AND PRACTISI-NG THE EXCELLENT PRECEPTS IT CONTAINS. IF WE, AS FAR AS WE CAN, SCRUPU-LOUSLY [5]EXAMINE BOTH THE CHARACTER OF (THOSE) WHO GAVE THE PRECE-PTS AND THE INFLUENCE (THEY) HAVE HAD UPON SOCIETY [6]AND STILL HAVE UPON IT; IF WE EX-AMINE THE GREAT ENDS AND VIEWS OF THE DOCTRINES HERE WRITEN AND THUS BECOME AC-QUAINTED WITH (THIS) VOLUME, WE SHALL [7]EXPERI-ENCE THAT (THIS) VOLUME IS AN INESTIMABLE TREAS-URE AND SHOULD BE VIEWED AS SUCH BY ALL GOOD MEN. IT IS, IN FACT, THE BOOK THAT [8]CON-TAINS THE RULES OF LIFE POINTING OUT TO A MAN (HIS) WHOLE DUTY.

[9](THIS) VOLUME IS OF GREAT ANTI-QUITY. THE SPLENDID MONUMENTS OF THE ANCIEN-TS HAVE DECAYED, AND NATIONS WHO PEOPLED THE COUNTRIES WHERE (THESE) THINGS WERE WRITTEN [10]HAVE VANI-SHED OR ARE SCAT-TERED OVER THE FACE OF THE EARTH. THEIR FORMER PLACES OF ABODE ARE DESOLA-TE AND LANGUA-GES THE BOOK WAS WRITEN IN ARE DEAD. [11]YET, THE BOOK SURVI-VES. THE ENE-MIES OF ORDER AND OPPOSERS OF THE GOOD PRECEPTS (THIS) VOLUME CONTAI-NS HAVE SOUGHT, WITH ASTONISHING [12]OBDURACY AND UNWEARIED PAINS, WITH JESTS, WITH PHILOSO-PHY (FALSELY SO-CALLED), WITH MISA-PLIED LEARNI-NG, WITH EVERY [13]EFFORT OF THEIR GENIUS, TO BR-ING (THIS) VOLUME INTO CONTEMPT, BUT THEY HAVE BEEN ENGA-GED IN A FOOLISH WORK. ALL THEIR PAINS HAVE BEEN [14]TAKEN IN VAIN. IT STANDS DESERVEDLY NOW IN HIG-HER ESTIMATION THAN EVER ( ). [15]CONSI-DERIN-G THE CHARACTER OF THE WRITERS OF (THIS) VOLUME AND FINDING THEM TO BE GOOD, EVEN INIMITA-BLY SO, EXAM-[16]INING THE DOCTRINES CONTAI-NED IN (THIS) VOLUME AND (O)BSERVI-NG THEIR UNISON WITH TRUTH AND THEIR BENEFI-CENT INFLUENCE UPON SOCIETY AND UPON INDIVIDUA-LS, THINKING UPON THE GREAT ANTI-QUITY OF (THESE) [17]WRITIN-GS, AND THE MANY REVO-LUTIO-NS WHICH THEY HAVE SURVIVED, AND THEIR COMPLETE VICTORY OVER THE EFFORTS OF ENEMIES, THEREWITH CONTINU-ALL-Y INCREASI-NG IN THE ESTIMATION OF THE WORLD AT LARGE AND IN THE ESTIMATION [18]OF THE FRIENDS OF GOOD ORDER AND OF TRUTH, THEN IT CAN BE SAID, EVEN (IF) THERE WERE NO OTHER REASONS FOR SO SAY-ING, THAT (THIS) VOLUME IS NOT TO BE NEGLE-CTED, BUT [19]ON THE CONTRARY, THAT IT OUGHT TO BE EXAMINED AND SHOULD BE MADE THE SUB-JECT OF OUR ATTENTION AND STUDY. SEE HOW CORRECT IS ITS PHI-LOSOPHY, HOW IN-TERERE-STING THE HISTORY, HOW [20]SUBLIME AND BEAUTIFULL THE POETRY, HOW ACCEPTABLE THE DOCTRINES OF (RELIGION) AND MORALITY CON-TAIN(E)D IN (THIS) VOLUME. IT IS CA-LCULATE-D IN EVERY POINT OF VIEW TO ENGAGE OUT ATTE-NTION AND, IF AT-TENDE-D TO, THE TRU-THS IT CON-[21]TAINS MAKETH A MAN BETTER, WISER, AND HAPPIE-R. THE BENEFITS ARISIN-G FROM (THESE) SACRED TRUTHS ARE NOT LIMITED TO THE PERIOD OF HUMAN LIFE. (THEY) POINT NOT FORWARD TO THE GRAVE AS THE BOUNDARY OF OUR [22]EXISTA-NCE, AS THE PLACE WHERE MEN SHALL CEASE TO BE. NO, THE THICK GLOOM OF DEATH IS DISSIPA-TED BY DIVINE TRUTH; A RAY OF SACRED LIGHT MAKES VISIBLE TO THE EYE OF FAITH A STATE [23]OF EXISTA-NCE BEYOND THE GRAVE, A STATE OF EXISTANCE AT THE APPROACH OF WHICH ALL MUST FEAR, FOR IT LASTS TO ALL ETERNITY; FOR IT IS A STATE OF REWARDS AND PUNISHMENTS; [24]FOR IT IS DEPEN-DANT UPON DIVINE MERCY; FOR NO MAN CAN CLAIM A PLACE THERE. HAPY INDEED IS ( ) MAN WHO HAS STROVE TO SUBDUE (HIS) PASSIONS AND TO LAY ASID(E) [25](HIS) PREJU-DICES, AND THUS IS FITTED FOR THE TASK OF THE ( ) AND STUDY-ING AND EXECUTING THE DESIGNS AND RULES [26]OF THEM. BY (CONTEMPLATING) UPON THE IMAGE OF THE PLACE OF BEAUTY, (HE) MAY HAVE OBSERVED (HIS) OWN WEAKNESS. . .

Figure 3.

Decipherment of the cipher text shown in Figure 2.

plain text is basically a homily emphasizing the importance of the Bible as a guidebook for living. Carefully polished, the text appears to be in its final form, ready for delivery. Couched in generalities, without any hint of denominationalism, specific doctrines, or sectarian theology, it might have been used as a speech to new initiates in a fraternal order. In fact, the word *masonry* appears in the message in the illustration on line three. The meanings of the two abbreviations *N. E. J.* (or possibly *N. E. I.*) and *D. and F.*, which occur in the first two lines, are not known. Dr. Morris has suggested that *D.* and *F.* could mean *disciples and followers*[3] and that *N. E. I.* could stand for *newly elected instructor*. Another guess is that *N. E. I.* means *newly enrolled initiate*. Whatever its meaning, this abbreviation is of special interest because it appears not only on line one, but also as the drawing on the center of the page. That is, the drawing of the pyramid and the symbols inside it may be deciphered as *N. E. J.* or *N. E. I.* (I have since found that Folger represented the first few numbers as follows: 1 = , 2 = , 3 = . Thus *every N.E.J.* should read *everyone.*)

Breaking the cipher and reading the plain text solved only part of this puzzle. Some important questions were still unanswered. Who was Robert Folger? What kind of a person was he? Why did he invent this cipher? For whom was the plaintext message intended?

Certain facts lead me to believe that Robert Folger was probably a well-educated man for his day. The grammar, syntax, and spelling in the message are, on the whole, quite good. A few misspelled words, such as *hapy*, *beautifull*, and *intereresting*, could well be clerical errors in encryption. His treatment of *U*, *V*, and *W* as one letter and his confusing the cipher symbols for *I* and *J* indicate that Folger may have studied Latin. The Latin alphabet contains a *V* but no *U* or *W* and an *I* but no *J*.

Folger was a meticulous draftsman when he committed his cipher to paper. His characters are clear and well defined and, for the most part, his angular symbols are sharp and precise so that little ambiguity is encountered in the deciphering process. It is obvious that Folger intended his cipher message to be readable for someone who possessed the key. For unauthorized readers, he tried to make matters difficult by the imaginative use of special symbols for certain common words and by adding meaningless decorations to his basic cipher symbols. He also employed variations in size, form, and shading to disguise these symbols.

It appears that Mr. Folger's basic plan of encipherment was to combine cipher symbols into clusters (words) of cipher so that each cipher-word represented a word of plain text. However, he had to modify this plan whenever a plaintext word was too long for one cluster of cipher symbols, or whenever it became too cumbersome to continue attaching additional symbols to the same cipher-word. In particular, whenever a boxlike cipher symbol was called for within a word, Folger would usually skip a space and begin a new cipher-word because he needed "breathing" space to form the next symbol. Thus, cryptographic necessity sometimes dictated that a cipher-word represent a plaintext syllable, rather than a plaintext word. But there is no appreciable evidence that Mr. Folger consciously divided his plaintext words into syllables for purposes of encipherment.

Why did Folger choose to encipher such innocuous plain text? Dr. Morris conjectured that perhaps Folger had planned to organize a new fraternal order or to start his own chapter or branch of an existing order. The enciphered material may have been intended as part of the ritual of the new organization. A possibility certainly — but who can say for

[3] I have since learned that *D. and F.* stands for *"Disciple and Fellow."*

sure? This part of the puzzle remains unsolved — at least for the time being.

Epilogue

Months after I had solved Folger's cipher and written the above article, Dr. Brent Morris, who had been digging around for information pertaining to Folger and his unsolved cipher, unearthed some very interesting facts.

Mr. Robert Folger turned out to be Dr. Robert Folger. Born in Hudson, New York in 1803, Robert Benjamin Folger was educated

Figure 4.
Robert Benjamin Folger.

as a physician, and became an M.D. in 1824. The same year, he was initiated into a Masonic lodge in New York City. Two years later, at age 23, he composed the cipher which is the subject of this article. The cipher was written in manuscript form in two little notebooks. One of the notebooks is now in the possession of Macoy Publishing Company of Richmond, Virginia; the other is said to be part of a private estate.

Dr. Folger was quite active in various Masonic orders, having been elected Master of his Lodge at least five times. Between 1837 and 1857, he gained notoriety among Masons as a leader of several schismatic factions of Masonry which had broken off from the Grand Lodge. He also served as a member of the New York legislature for part of this period. In 1857 he was reinstated to membership in the regular Grand Lodge of New York and later authored a work entitled *Ancient and Accepted Scottish Rite of Freemasonry in Thirty Three Degrees*, first published in 1862. He died in 1892.

This biography, brief as it is, supports several of the inferences drawn about Robert Folger by both this author and Dr. Morris. Having been a physician in New York City, Folger would have been a highly educated man for his day. Furthermore, there is little doubt that he would have studied Latin as part of his medical training. And he was indeed a Mason, having been quite active in a number of different Masonic organizations. However, at the time Dr. Folger wrote the cipher, he had been a Mason only two years. Even so, the fact that he was a leader of several Masonic schisms in his middle years suggests that Dr. Morris's conjecture about Folger's purpose in composing the cipher may have been correct. Perhaps, at the tender age of twenty-three, young Dr. Folger was already writing the ritual for a future Masonic order he hoped to found and was protecting his secret by committing that ritual to cipher!

M (b)(3)-P.L. 86-36 **graduate of the University of Texas, served three years in the Army Security Agency as a cryptanalyst. He joined NSA as a civilian in 1966, and has 13 years of cryptologic experience in A5, where he is currently assigned as a cryptanalyst in A54. Mr.** (b)(3)-P.L. 86-36 **not associated with the Masons or any other fraternal order.**