

A CRYPTOLOGICAL TRAVELOGUE: RIVERBANK – 1992

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ABSTRACT: We offer a description of a trip to Riverbank, the birthplace of American cryptology, with a brief review of the people and events that made the name Riverbank Labs immortal.

KEYWORDS: George and Nelle Fabyan, William and Elizebeth Friedman, Riverbank Laboratories, Francis Bacon, William Shakespeare, Fabyan Villa, Department of Ciphers, Elizabeth Wells Gallup.

It has been more than 25 years since I first read about George Fabyan and his Riverbank estate in Geneva, Illinois. Here William F. Friedman, whom Fabyan had hired as a geneticist, was introduced to codes and ciphers, met his talented wife and wrote his landmark Riverbank Publications.

This almost mythical site, described by one writer as the cradle of cryptology, became the Shangri-la that I longed to visit. The airlines' promotion of half-price fares in 1992 provided the impetus to fulfill my long-held goal to see Riverbank.

BACKGROUND

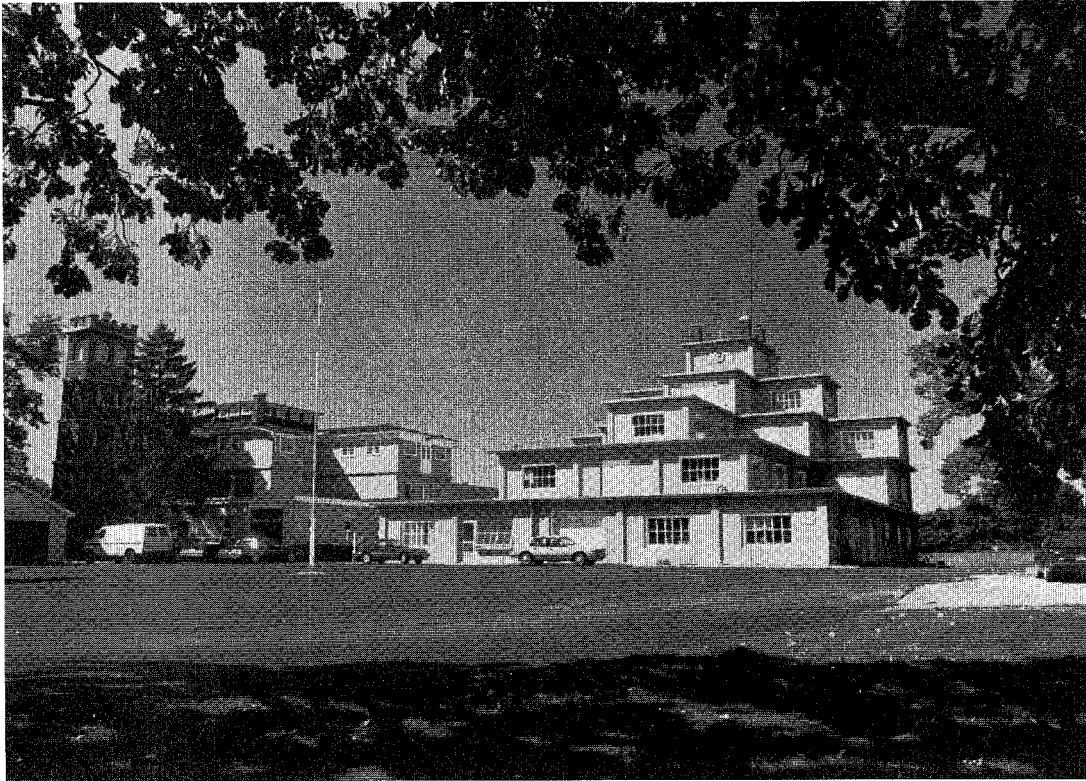
Colonel Fabyan – his title was an honorary one, bestowed by a governor of Illinois – and his wife, Nelle, came to Geneva in 1905 and bought an estate that eventually totaled 600 acres. The property is divided north-south by three landmarks – one natural and the other two man-made – that run roughly parallel to each other. The natural divider is the Fox River, which undoubtedly provided the name Riverbank. To the west of the river is Route 31 or Batavia Avenue, a four lane road, and to the east is Route 25.

In 1907, the Fabyans – whose money came from textiles – hired architect Frank Lloyd Wright to remodel and enlarge the old farmhouse on the estate where they were living, known today as the Fabyan Villa. The three-story frame house features decorative elements and details representative of Wright's work during that period.



Colonel George Fabyan, c. 1915.

Nelle Fabyan inherited the estate when her husband died in 1936. Before she herself died three years later, she arranged for the continuation of research at the Riverbank Laboratories under a Fabyan Trust. Since 1947, management of the laboratories has been assigned to the Illinois Institute of Technology. After Mrs. Fabyan's death, Kane County purchased the Fabyan Villa and some property east of Route 31. The property, now open to the public, is called the Fabyan Forest Preserve. The villa is a museum. The laboratories and property west of Route 31 remain in the Fabyan Trust.



The Wallace Clement Sabine Laboratory of Acoustics
and the five-tiered Riverbank Laboratory.

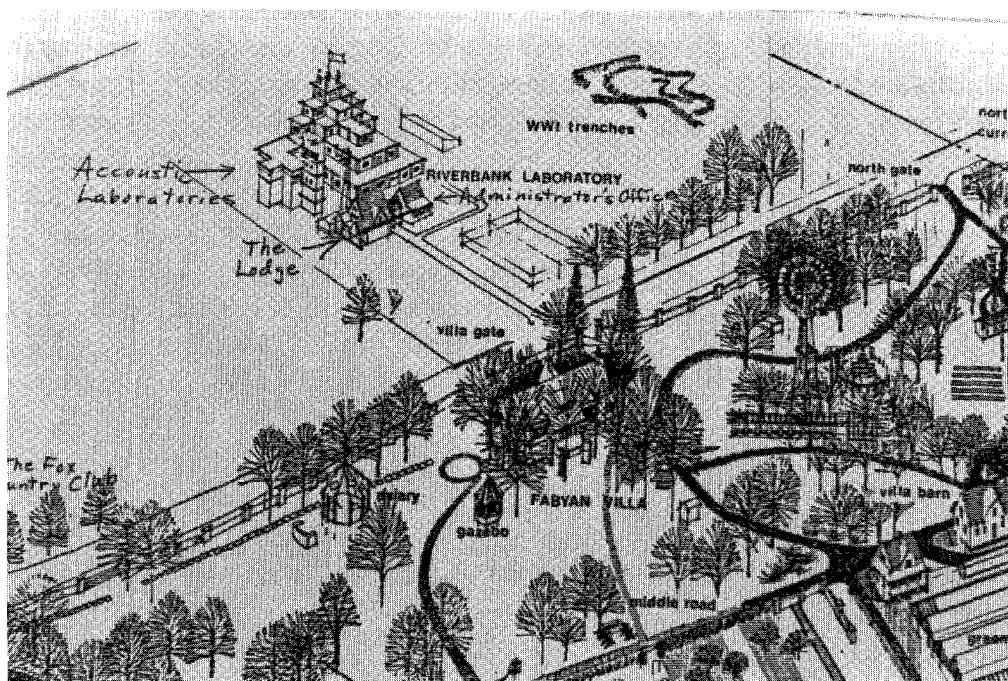
QPI photo by Jim Stocker.

RIVERBANK LABORATORIES

As a member of a leading textile firm, Bliss Fabyan and Company, engaged in a nationwide commission business in cotton goods, George Fabyan had a practical interest in codes and ciphers for the transmission of secret messages. In addition, he had a high degree of scientific curiosity and, soon after settling in Geneva, he established Riverbank Laboratories to undertake scientific research in the several fields in which he was interested. Some noteworthy work was done in plant genetics but during their early years the laboratories concentrated on cryptography and cryptanalysis. This stemmed from Fabyan's search for ciphers in William Shakespeare's plays to prove that Francis Bacon was their true author.

The laboratories consisted of three main buildings located on the west side of Route 31, across from the villa.

The northernmost building was designed by Fabyan in the shape of a five-tiered wedding cake – the result of his putting to use five boxcars of 15-foot I-beams he had purchased as railway salvage. Built in 1922, today it develops tuning forks and modern high-tech electronic devices.



A sketch of the Fabyan estate in the 1920s showing the location of the Villa, the Lodge, and the Laboratories with Batavia Avenue running across the center.

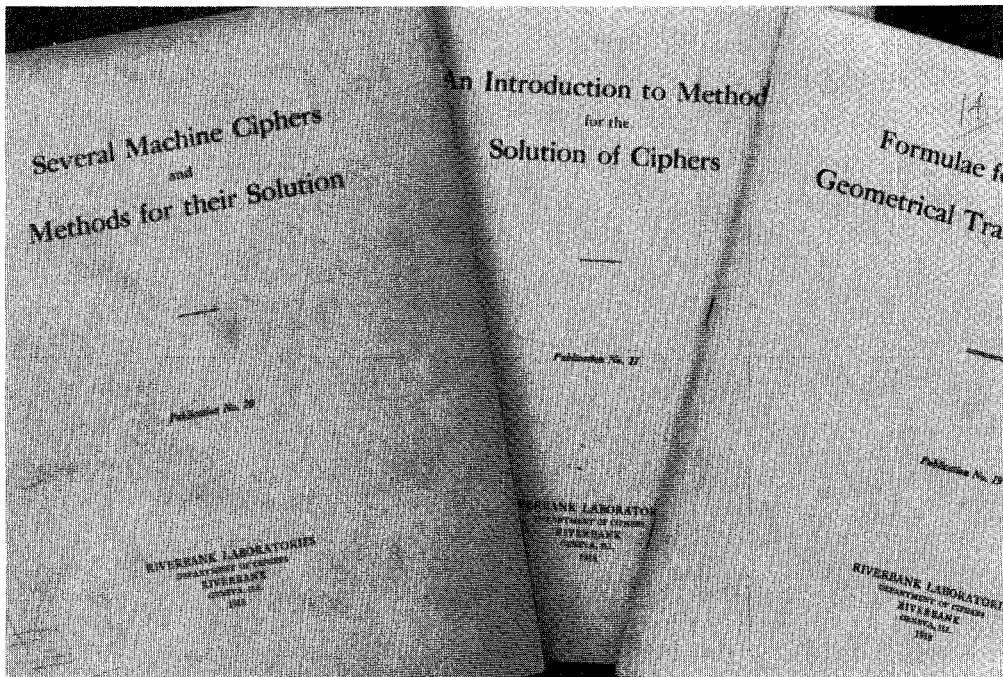
The easternmost building was the Lodge, where visiting scientists and Fabyan's secretary, Belle Cummings, lived. According to John W. Kopec, current supervisor of Riverbank Acoustical Laboratories, during World War I the northern section of the Lodge, known as the Studio, contained a vault and long tables. The vault was used to store cipher messages, many of them Mexican, surreptitiously obtained by the U.S. Army and forwarded to Fabyan for solution. William F. Friedman and his associates used the long tables as they labored to solve the secret messages. (At the outset of World War I, Fabyan had volunteered the services of his laboratories to assist the U. S. Army in solving intercepted code and cipher messages and to train selected officers in cryptanalysis. The Army promptly accepted his offer as it did not have a cryptanalytic section when the United States entered the war.)

The southernmost building, the Wallace Clement Sabine Laboratory of Acoustics, was named after the then leading acoustical expert in the country, whom Fabyan had hired in 1913 to consult on an acoustical levitation device. On the exterior walls of the building large plaques are affixed with words molded in concrete based on the initials in Sabine's name, Wisdom, Caution and Science. This may be Fabyan's tribute to Sabine, who died before the laboratory was ever completed. Also in concrete is the aphorism, Knowledge Is Power, written by Francis Bacon in 1597 and possibly Fabyan's testimonial to the man he believed had actually written Shakespeare's plays. In the basement of the laboratory stands the Sabine Reverberation Chamber, a room within a room within a building. Today it remains an outstanding example of such a facility and the acoustical laboratory is considered one of the finest of its type in the world.



Elizabeth Wells Gallup, c. 1915.

Kopec, who has written a book on the technical history of the laboratories and the science of architectural acoustics, is developing a museum in this building. During his search for acoustical items, he uncovered a few artifacts from the cryptologic work at Riverbank. All but one are related to the Bacon-Shakespeare controversy and consist of Baconian books published by Riverbank and a scroll with selected Shakespearean works glued to it, possibly used for quick scanning of the text. Fabyan's belief that Bacon wrote the plays commonly attributed to Shakespeare led him to bring Elizabeth Wells Gallup, a Baconian researcher and writer on the subject, to Riverbank to help prove this theory. Her books, the first of which was *The Biliteral Cypher of Sir Francis Bacon Discovered in his Works and Deciphered by Mrs. Elizabeth Wells Gallup*, sought to demonstrate that Bacon had enciphered a concealed message in Shakespeare's plays stating that he, Bacon, was the true author. Fabyan financed her efforts, which included a staff of assistants, to search for further such decipherments. He hoped that if she were successful, he would share in the credit. She later introduced Friedman to what would become his life's work. One of the people Fabyan hired to assist Gallup was a young librarian, Elizebeth Smith, who later became Mrs. William F. Friedman.



Riverbank Publications.

The sole non-Baconian item found by Kopec is a sliding strip device similar to The Sliding Poly-Alphabet shown in Riverbank Publication No. 17, *An Introduction to Methods for the Solution of Ciphers*, page 28. He has also turned up several letters to Fabyan from various government officials. Three of the most interesting are given in the appendix.

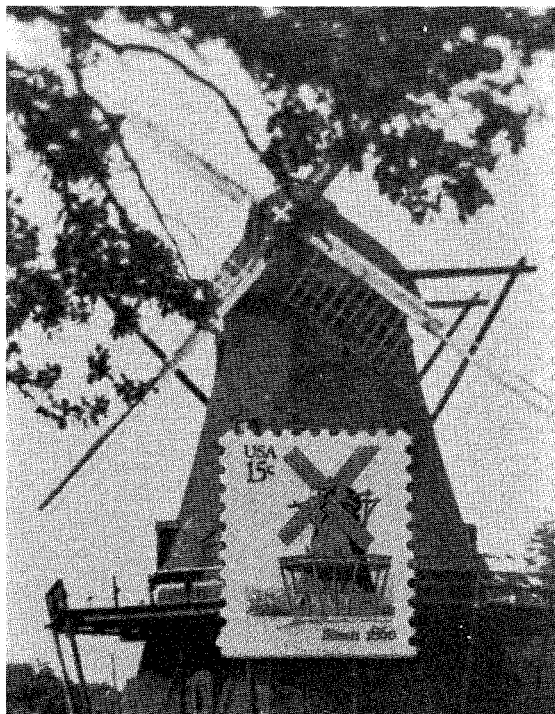
In addition to providing staff and space for solving cipher messages for the government, Fabyan lent his estate for the training of Army officers in cryptography and cryptanalysis. The Army sent three groups of officers to Riverbank for training: four officers in October-November, 1917; between 70 and 80 in January-February, 1918; and seven or eight in March-April, 1918. Many of the classes, which were conducted by Friedman, met on the third floor of the acoustical laboratory, according to Kopec. The officers and small training staff were housed in the Aurora Hotel in Aurora, Illinois, 10 miles south of Riverbank on Route 31, the nearest hotel able to accommodate the group. It was in front of this building that the Friedmans arranged their largest graduating class for a photograph in which the facing of the officers' heads (straight or to the side) spelled out the message, "Knowledge Is Power" in biliteral cipher. (See the article "The Day the Friedmans Had a Typo in Their Photo" by Louis Kruh, *Cryptologia*, 3(4): 236-241.) When I visited the Aurora Hotel, I found it vacant, scheduled for restoration. The distinctive windows prominent in the photograph are boarded up, but the balcony above the marquee is easily recognized even though the marquee itself has been altered.

As an offshoot of the lessons he prepared for training Army officers, Friedman wrote eight technical monographs on cryptologic subjects between 1917 and 1920. Up to that time, aside from some encyclopedia and magazine articles, a pamphlet by J. O. Mauborgne, a booklet by Parker Hitt and an unknown 31 page booklet by a Harvey Gray, nothing had been published on cryptanalysis in the United States. Friedman's scientific approach to the analysis of ciphers and his application of statistics to aid in their decryptment, which were detailed in his monographs, became the foundation for later 20th century advances in cryptology. Copyrighted by Fabyan and published in quantities of only 200 copies each except for *Methods for The Solution of Running Key-Ciphers* with 400 copies, they have become known in the literature of cryptology as the Riverbank Publications. Fabyan never put copies on the commercial market and they became collectors' items eagerly sought by both amateur and professional cryptologists. To this day, a complete set of these landmark publications is a hallmark of a top quality library on cryptology. Around 1928, Friedman gave a complete set to the Library of Congress, which became the only public library to possess one. During my trip to Geneva, however, I discovered that another complete set had been

presented to the library of the Geneva Historical Society Museum in memory of William F. Friedman by Elizebeth Friedman after her husband died. A lengthy inscription by Mrs. Friedman on each publication makes it a unique set.

FABYAN ESTATE/FABYAN FOREST PRESERVE

The Fabyan property east of Route 31, now a public preserve, encompasses 245 acres on both sides of Fox River. It is a beautiful park-like area that attracts thousands of visitors annually who walk, ride bicycles, picnic, fish, sightsee or just relax by the river. Key attractions in the preserve include a “Dutch” windmill, Japanese garden, lighthouse and the Frank Lloyd Wright-designed Villa and museum. The Villa and windmill are listed on the National Register of Historic Places.



1979 U. S. postage stamp, with Fabyan's "Dutch" windmill superimposed on a photograph of the actual windmill.

The windmill was built in the 1850's in York Center, Illinois, and purchased by Fabyan in 1914. It was disassembled and moved to Riverbank where it was reconstructed during World War I. It milled flour to provide bread for the estate,

which had as many as 100 people employed there. The 68-foot high structure was depicted on a U. S. postage stamp in 1979.

The Japanese garden and teahouse were constructed by Fabyan around 1910, undoubtedly motivated by his association with the Japanese people. In 1905, at the request of Theodore Roosevelt, he served on the negotiating team that ended the Russo-Japanese War in the Treaty of Portsmouth, advising Japan's minister of foreign affairs at the conference.

The lighthouse stands at the water's edge; it was always lit while Fabyan lived. It stemmed from Fabyan's attempt to build a bridge across Fox River. According to the story, he found that the river, which in some spots is only 4 feet deep, had been designated a navigable waterway by the government. Therefore, governmental approval was required to build his bridge. His reaction, which displayed a wry sense of humor, was to build a useless lighthouse to guide any "navigators" who happened to sail down the Fox River.

The Villa-museum is the centerpiece of the estate. Numerous exhibits feature American Indian artifacts, natural history displays with preserved animals, rare Oriental items including a samurai suit of armor, a marble statue by Edwin Elwell from the Columbian Exposition of 1893, and a five-foot mummy, which after being on display for many years, turned out to be a fake. There is also an exhibit of photographs taken when the Fabyans lived at the Villa.

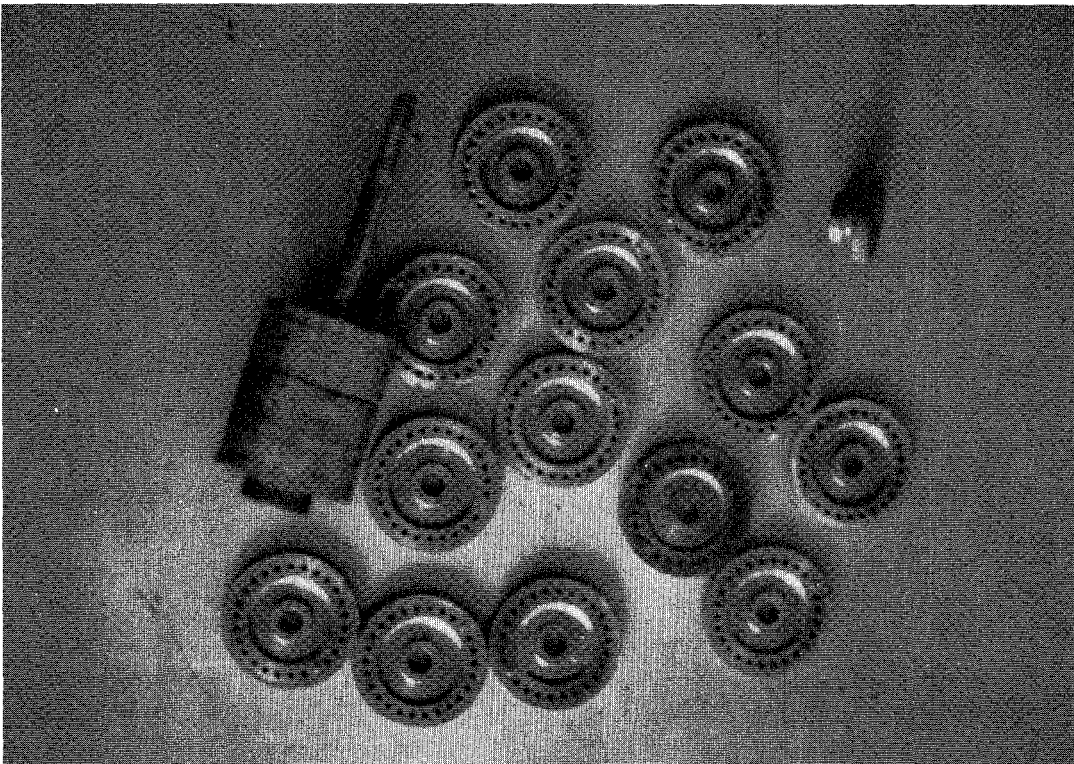
One display case contains artifacts from the laboratories. Included are two small white plaster puppies, a U. S. Army cipher device M-94 and four metal cipher disks.

The plaster canines originated in a slim book, *Jerry and The Bacon Puppy*, published in 1916 by Fabyan's Riverbank Press. A white plaster puppy with the bilateral or Bacon cipher inscribed on its base enables Jerry to solve a secret message and prevent a crime. The plaster puppy, reminiscent of RCA's Nipper, was also used like a trademark on many Riverbank publications dealing with the Baconian cipher and in advertisements offering courses in the deciphering of Baconian ciphers.

The M-94, unlike later models, has 26 holes on each disk, one under each letter, and a round pimple-like protrusion on one side. When the disks are lined up and tightened against each other, each "pimple" fits into a hole which keeps the disks from slipping out of line. Recent M-94s use right-angled slots and projecting rectangular lugs to hold the disks in place.

Three of the four cipher disks in the display case rotate in regular fashion. Two of them have room for three concentric sets of letters or numbers and one, designed for only two alphabets, has "Riverbank Laboratories" stamped into the metal on its top and bottom. The fourth disk is a World War I Pletts or

Wheatstone-type device that has two gears with different numbers of teeth. This causes the plain and cipher alphabets to move at different speeds to create a kind of irregular progressive cipher whose solution Friedman described in Riverbank Publication No. 20. These few items are all that remain at Riverbank of the first institution in America that had a Department of Ciphers. Its name, however, is immortalized in the annals of cryptology by Friedman's trailblazing Riverbank Publications.



Riverbank's M-94 with 26 holes and pimple-like protrusions.

As I wandered the grounds of Riverbank I sensed a subliminal air of cryptologic history. I could not help but feel gratified at the opportunity to tread the ground and visit the area where William F. Friedman first embraced cryptology and lifted it to heights never before envisioned. And, of course, it was the fulfillment of a quarter-century old dream that left me with fond memories of a place that to me had only been pictures in a book and of friendly people anxious to guide a visitor – and with a desire to visit again.



Fabyan's burial site in Foresthill Cemetery, Boston MA.

APPENDIX

These letters are printed here by kind permission of Riverbank Acoustical Laboratories and John W. Kopec, Supervisor.

WAR DEPARTMENT
OFFICE OF THE CHIEF OF STAFF
WASHINGTON

November 26, 1917

Colonel George Fabyan.
Riverbank, Geneva, Illinois.

My Dear Colonel:

I have been much gratified over your expressed approval of my plan for the establishment of a bureau of codes and ciphers in Washington. The establishment of this bureau has proceeded somewhat slowly at first, mainly for the reason that having received such important service from you I was anxious not to take any step which would seem to indicate lack of appreciation on my part, or that would tend to cause you any feeling of having been superseded or ignored. In view however of your recent letters expressing your approval of the plan I have in mind, the nucleus of a force has now been gathered and a centralization of the work will I hope result to the benefit of the several Governmental Departments. I may add that the heads of the several Departments have been consulted regarding the plan, and each has signified his enthusiastic acceptance of the proposal, so that we may now count on their cooperation.

The Bureau is beginning its work with a comparatively limited number of operators, but as it grows in efficiency and importance it will not be difficult to increase it as occasion demands. Our experience here shows that so large a percentage of messages can be handled as routine clerical work, that I feel that for the present the Bureau has a sufficiently large number of cipher experts to handle the work as it arises. Thus far the Bureau has been enabled to return messages deciphered within twenty-four hours of their submission, and we have made provision for increasing the staff as rapidly as the situation may demand.

One of the operators from the Department of Justice, whom I believe you already know, Mr. Victor Weiskopf, has been lent to the Bureau by Mr. [Alexander Bruce] Bielaski, [Director, Bureau of Investigation, Department of Justice] who is likewise contributing to the Bureau the cipher records in the possession of the Department. The same thing is planned to be done on the part of the State Department, and I am given to understand that Mr. [Leland] Harrison is writing you personally to express his sense of obligation of his share in the services you have rendered. [The next letter shows that the Secretary of State himself signed the letter.]

The Navy Department, through both Naval Intelligence and Naval Communications, has assured us of their support.

On his return from Europe Capt. [Dr. J. A.] Powell [Director, University of Chicago Press when he was hired by Fabyan in 1917 to work at Riverbank] will be ordered to report to this Bureau, so that, aside from all the other services you have rendered, it is a satisfaction to feel that you are making a valuable contribution also to the personnel of the Bureau itself.

Your proposal to conduct a campaign to secure funds for the financing of the Bureau is of a piece with your previous generosity in expending your time and energy in our behalf. But such a campaign seems to be both unnecessary and

unwise; unnecessary, because sufficient funds are already available for the work; unwise, because it is almost certain to arouse undesirable public discussion.

It is a difficult matter for me adequately to express the sense of obligation which I feel personally and officially for the service your staff has rendered in the past six months. At a time when all of us lacked operators capable of coping with the subject, you came forward with an offer to do for the Department work which they were wholly unable to do for themselves, and with an unexampled generosity you have borne the entire expense of the proceedings. The services you have rendered are not to be estimated in terms of money, and it is a source of regret to me that I am wholly unable to devise a method by which the sense of obligation, by the Intelligence Section in particular, may be fittingly evidenced. I trust that in the future I may have the opportunity of expressing more fully in person my sense of the great service you have rendered, and I am sure the sentiments expressed are entertained by the several Departments and will be conveyed to you in due course.

Sincerely yours

R. H. Van Deman [signature]
Colonel, General Staff,
Chief, Military Intelligence Section

THE SECRETARY OF STATE
WASHINGTON

December 19, 1917.

My dear Mr. Fabyan:

I am informed that the Military Intelligence Section of the War College has organized a Bureau of Ciphers and that it is now prepared, largely owing to your assistance, to undertake some of the confidential and difficult work the Riverbank Laboratories have been so ably performing for the Government during the past six months.

In this connection, I desire to express my deep appreciation and thanks for the patriotic service you have generously rendered, which has been of the greatest possible value not only to this Department but also to other branches of the Government.

Sincerely yours,
Robert Lansing [signature]

George Fabyan, Esquire,
Chicago, Illinois.

GENERAL HEADQUARTERS
AMERICAN EXPEDITIONARY FORCES
GENERAL STAFF, SECOND SECTION (G.2)

France, May 14, 1918.

Colonel George Fabyan,
Riverbank,
Geneva, Illinois

My dear Colonel:

I have just received your valuable and interesting pamphlets on ciphers and wish to thank you, not only for them, but also for your generous interest in our work.

Graduates of Riverbank are now doing the greater part of the work in our code office, and Colonel Van Deman has been requested to send us the other men recommended by you.

We regard this cipher work as of great importance, and thoroughly appreciate the value of your assistance and the patriotic spirit in which it is rendered.

Hoping for your continued support, I am, with best regards to both yourself and Captain [Dr. J. A.] Powell.

Very respectfully yours,
(signature)
D. E. Nolan
Colonel, General Staff,
A. C. of S. (G.2)

ACKNOWLEDGEMENT

A special note of thanks for their help and hospitality to:

Gordon F. Cummings, President, Geneva Historical Society;
Marie Frasz, Curator, Fabyan's Forest Preserve-Museum;
John W. Kopec, Supervisor, Riverbank Acoustical Laboratories;
Diane Larson, President, Friends of Fabyan;
Reference Librarian, Geneva Public Library.

BIOGRAPHICAL SKETCH

Louis Kruh is an attorney who has been fascinated by cryptology for more than forth years. He has written numerous articles, hundreds of reviews, and is co-author of *Machine Cryptography and Modern Cryptanalysis* (Artech Hous, Inc., Norwood MA, 1985).