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# Why the French military cryptanalysis failed to break Enigma

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**ABSTRACT**

In July 1939, when the French military discovered the possibility of breaking Enigma thanks to revelations from the Polish Cipher Service, it came as a complete surprise. Although the French secret services had known about the German machine for almost ten years, the military cryptologists based in Paris had quickly concluded that it was impossible to break it. Only the forced exile of Polish mathematicians in France after the 1939 campaign enabled the French to decipher Enigma from January 1940 until the June defeat. While the story of the Polish and British cryptological successes is now well known through academic and mainstream literature, the French failure has received virtually no attention until now. Using unpublished archives held at the Defense Historical Service in Vincennes, this study analyzes the reasons for this fiasco and paints a picture of French military cryptanalysis in the 1930s, quite different from the past success of French codebreakers in the First World War.

## Introduction: a military cryptology poorly suited to modern warfare

"The last phase of the war, March-July 1918, marked for cryptology, in a decisive, I would even say spectacular way, the power of the weapon it constituted for our armies."[1] This quotation from the famous code-breaker Georges Painvin illustrates the advantage obtained by the French army during the First World War, whose cryptanalysts proved to be among the best in the armies of the Triple Entente. In the early 1930s, as Enigma began to equip the German army, France seemed to be in a good position to succeed in decrypting this new electromechanical machine. In addition to the excellent results obtained during the previous conflict, the French intelligence services managed in 1931 to recruit an employee of the *Chiffriestelle*, Hans-Thilo Schmidt, who provided technical information on the functioning of Enigma for a good salary.

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[1]De Lastours (1998, 212).

Unfortunately for France, when Hitler came to power in 1933, military cryptology was a shadow of its former self. Its great masters of the First World War were no more. Marcel Givierge and Étienne Bazeries died in 1931. Georges Painvin, probably the best French cryptanalyst, returned to his passion for paleontology. Military cryptology was split between the rival staffs of the Army, the Air Force, the Navy, and the Foreign Affairs. Instead of calling again on specialists from the civilian world, these services confined themselves to active and reserve officers more or less trained in cryptology.

This neglect of French cryptology has already been noted in the academic literature, without being really developed.[2] This study proposes to fill a historiographic blind spot by analyzing for the first time the evolution of French cryptology from the 1930s to the Second World War, through the trajectories of its main figures: colonel Jacques de France de Tersant, Majors Pierre Dimier de la Brunetière and Jean Joubert des Ouches, and Captains Henri Braquenié and Jean Proust. The careers of these officers, official representatives of French cryptology at the inter-allied conferences, who are very little known in international academic literature,[3] with the exception of Henri Braquenié, shed light on the missed appointment of French cryptology with history, which is part of the sum of the ills affecting the French army on the eve of the Second World War.

This article offers a starting point for the study of French military cryptology in the 1930s and during the Second World War, focusing on codebreaking, without claiming to dry up the subject, as the archives are still partly classified. Other themes remain to be studied in detail, notably cryptography based on the acquisition of Swedish Hagelin cipher machines from 1935, and junior cryptology officers. Thirty officers served in the Cipher Section of the Army Staff on the eve of the Second World War, whose identities and working methods remain largely unknown.[4]

The sources of this study are mainly based on the military archives of the French army kept at the *Service historique de la Défense* (Defense Historical Service) in Vincennes, France. They are mainly composed of the personal files of cipher officers, and of recently declassified archives on Enigma.[5]

## Military cryptology after 1918: a weapon abandoned by the French army

In the early 1930s, the French cryptology scene was fragmented between rival organizations. Two ministries had departments for the study of

[2]Kahn (1996), Ollier (2004), Forcade (2008).

[3]Some very short indications are given by Widman & Wik (2021, 31), Canuel (2013) and Faligot (2001).

[4]Ribadeau-Dumas (1975, 24).

[5]Service Historique de la Défense [Defense Historical Service – DHS], Vincennes, France.

ciphers and codes: the Ministry of War and the Ministry of Foreign Affairs. The latter, since the Dreyfus affair at the beginning of the century, refused to exchange information with the Army. The Ministry of War had several departments; the best equipped being the Cipher Section of the Army Staff (*État-Major de l'Armée*—E.M.A.). Composed of a dozen active officers and a few reserve officers, the Cipher Section communicated the results of its decryptions to the military intelligence (*Deuxième Bureau*) of the E.M.A. The Navy had its own decryption service, taking care to keep its distance from the other forces. The Air Force did not have its own cipher service until 1937.[6]

The data received by the E.M.A.'s Cipher Section was mainly collected upstream by the direction-finding service at the borders, to which was added the Intelligence Service (*Service de Renseignement*—S.R.), which endeavored to collect ciphers abroad, either by radio interception or by espionage. The E.M.A.'s Cipher Section did not transmit any decryption to the R.S., which became so impatient that in November 1930 it created "Section D," which was responsible for both intercepting ciphers and decrypting them. Unsurprisingly, the E.M.A.'s Cipher Section and Section D of the S.R. were in open competition with each other. Contrary to the glorious times of the First World War, no decoding genius emerged from this administrative mess.

The head of the Cipher Section for most of the 1930s was Lieutenant Colonel Jacques De France de Tersant. This officer alone symbolizes the French army's lack of adaptation to the evolution of the art of war after 1918. Born in 1883 into a good family, De France de Tersant obtained a qualification in literature at the completion of his secondary education, followed by a law bachelor's degree. He joined the army at the age of 20 and became a dragoon officer in 1905.[7] He stood out for his "intelligence, his bearing and the distinction of his manners," as well as his equestrian performances, with, according to his chiefs, "a perfect way of riding [ … ]."[8] Wounded three times in 1914, 1916 and 1917, De France de Tersant ended the First World War with the rank of captain. From 1919 onwards, he joined the E.M.A.'s Cipher Section, although his background did not justify such a career orientation. In fact, his laudatory notes reveal his lack of knowledge of cryptography, even though the French army had no shortage of experienced cipher specialists: "Intelligent, conscientious, diligent, hardworking, of a thoughtful character. Thanks to his qualities of judgment and methods combined with the study of foreign languages, he has made rapid

[6]DHS, 1937, *Feuille de renseignements concernant le Capitaine Braquenié* (DHS).

[7]DHS, 1913, *Relevé de notes* (DHS).

[8]DHS, 1912, *Feuillet individuel de campagne* (DHS).

progress in cryptography and has distinguished himself by the value of his work."[9] At the same time, the demobilization of the army led to an official disinterest in cryptology. This discipline disappeared from the courses of the Superior School of Warfare in 1919, and 2 years later the Cipher section was drastically reduced to 13 people. Promoted to squadron leader in 1925, De France de Tersant left the Cipher section to carry out a statutory period of command. Returning to the Cipher Section in 1927, he witnessed the retirement of Colonel Givierge, taking with him the vestiges of French cryptological glory. His successor, Colonel Portzert, was full of praise for De France de Tersant's performance, who won him over both in terms of substance, by giving "complete satisfaction through his zeal and his manner of service, which were excellent in every respect," and in terms of form, by being "very distinguished in manner and appearance."[10] Portzert thus instilled a spirit of quiet success in the Cipher Section for the decade, punctuated by triumphant reports on the supposed performance of French cryptologists, with no relation to reality. De France de Tersant faithfully took over from Portzert at the end of 1931, reaching the peak of his career. The timing seemed ideal for him, since at the same time the French intelligence services had just pulled off a masterstroke.

Section D of the S.R., commanded by Captain Gustave Bertrand, had just succeeded in weaving a network encircling Germany, through its relations with the intelligence services of the Baltic States, Poland and Czechoslovakia. In 1931, the French S.R. was the only one to have technical information on the Enigma machine, thanks to their new recruit from the *Chiffriestelle*, Hans-Thilo Schmidt. This data was relayed to both the E.M.A.'s Cipher Section and the Section D of the S.R. In this one, according to Bertrand's disillusioned words, they did not even bother to make a serious attempt at Enigma, as "their study was doomed to failure in advance."[11] The E.M.A.'s Cipher Section was no different, as its chief, Lieutenant Colonel De France de Tersant, considered Enigma unassailable: all intercepted messages ended up in the bin. Bertrand, himself a former member of the E.M.A.'s Cipher Section, did not mince his words about his former department: "The members of this office are in favor of the least effort; the place is good, the work schedule particularly elastic, and a few results provided from time to time [ … ] are more than enough to satisfy."[12] In fact, the staff reports on Lieutenant Colonel de France de

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[9]DHS, no date, *Relevé des notes* (DHS).

[10]DHS, 1930, *Feuillet individuel de campagne* (DHS).

[11]Bertrand (DHS, 10).

[12]Bertrand (DHS, 147).

Tersant compete with each other throughout the 1930s to praise his performance:

> Lieutenant Colonel de France is always as head of the Cipher section of rare technical competence. He follows with great attention the progress made in encryption procedures and in particular in the use of encryption machines. [ … ] With his perfect education and distinguished appearance, Lieutenant Colonel de France combines a number of qualities that make him suitable for inclusion in the promotion list for colonel.[13]

Indeed, in addition to codebreaking, the E.M.A.'s Cipher Section was also in charge of military cryptography, through the production of codes and keys. However, since 1919 and the abandonment of cryptology at the *École de Guerre* (War College), French officers no longer had any skills in cryptography, a deficiency already denounced by Colonel Givierge in 1926, who alerted in vain shortly before his departure from the Cipher Section. Five years earlier, a first alarm had been sounded about the suspected theft of the codebook "77 777" by the Soviets.[14] In the early 1930s, secret French communications were regularly deciphered by German army codebreakers, who closely followed the messages of Ambassador André-François Poncet sent to Paris from Berlin.[15]

Wishing to equip his service with cipher machines offering security comparable to that of Enigma, wrongly assumed to be unbreakable, Colonel De France de Tersant turned in 1934 to two devices proposed by Swedish inventor Boris Hagelin, designed specifically for the French army. The B.211 was an electromechanical machine with a keyboard, enabling it to encrypt and decrypt ten times faster than with the coding procedures used up to then. The B.211, used at corps level, was the lightest machine on the world market, weighing just 15 kilos, compared with the 27 kilos of an Enigma.[16] The C.36 was a slower, more complex mechanical machine, but also more compact and it could be used at the tactical. Successive orders placed by Colonel De France de Tersant enabled the French army to be equipped with 2,000 C.36s and 115 B.211s in 1939.[17] Both machines remained untouched by Germany until the fall of France in June 1940, less for cryptological reasons than because of the nature of the transmissions used by the French army, based on the wire network rather than radio.

Admittedly, as head of the service, De France de Tersant was not involved in codebreaking and was not necessarily supposed to be a

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[13]DHS, 1936, *Feuillet du personnel* (DHS).

[14]Forcade (2008, 179–180).

[15]Paillole (2013, 130–140).

[16]Durand-Richard and Guillot (2014, 160).

[17]Ribadeau-Dumas (1975, 26–27).

mathematical genius himself. However, the particularity of this highly demanding and strategic discipline implied at least a double operational base in both cryptology and intelligence, if only in a basic way to understand the issues and make appropriate decisions. The Polish and British heads of codebreaking, Gwido Langer and Alastair Denniston, while far from having outstanding skills, had several years of combat experience in this area and were capable of identifying the potential of men and equipment. This was by no means the case with De France de Tersant.

In spite of these many shortcomings, out of the ten or so full-time active officers in the E.M.A.'s Cipher Section, Lieutenant Colonel De France de Tersant considered Captain Jean Proust to be his best staff member. This officer was destined to represent the French Army's cryptology in the European intelligence community in 1939.

## Captain Jean Proust, the "first cryptologist of the French army"

Symptomatic of the failure of French cryptology, the name of its representative in 1939 is virtually absent from the abundant international literature on Enigma. Gustave Bertrand did not mention him in his memoirs, too exasperated with him. Colonel Louis Rivet, head of the French Second Bureau, mentions on 14 January 1937 "a visit from Colonel de France and Captain Proust,"[18] without specifying the latter's functions or even first name. Only Gustave Bertrand's postwar study, mentioned above, makes it possible to identify him by name. Biographical information on Captain Jean Proust is limited, confined to the terse nature of his military record.

Nothing is known about Jean Proust's childhood, apart from his arrival in the world on 21 August 1894. Shortly after the outbreak of the First World War, Jean Proust was drafted into the infantry as a private on 7 September 1914, before being appointed second lieutenant in 1915 and lieutenant in 1917. The young officer was taken prisoner on 15 July 1918, during the second day of the fourth battle of Champagne, which resulted in an Allied defensive victory. Lieutenant Proust did not return from captivity until after the end of hostilities on 16 February 1919. The summary of his military appraisals during the conflict indicates "an active, zealous officer, of keen intelligence, with a very fine attitude to fire. He has always successfully carried out the tasks entrusted to him."[19] Jean Proust then served in Syria in the new army of the Levant from 1921 to 1922, during the Cilicia campaign; he was in charge of the topographic service.[20] The

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[18]Rivet (2010, 99).

[19]DHS, 1932, *Résumé des notes antérieures à l'année 1932* (DHS).

[20]DHS, 1932, *Feuillet du personnel* (DHS).

French officer was then posted as an instructor in France, then joined the E.M.A.'s Cipher Section in 1927. From Jean Proust's background, nothing seems to justify this sudden appointment. The man had served until then mainly in the infantry and had tried his hand at topography for a year, without any obvious connection with cryptology. Although nothing is known of Proust's initial training, he had served in the French army since the age of twenty, so he never had the opportunity to undertake any advanced studies. Nor is there any indication in his military record of an innate genius for mathematics, languages, history, chess or any other discipline likely to interest a cipher service.

In his new postings, Captain Jean Proust quickly seemed to satisfy his superiors. His annual report cards, in keeping with the Cipher Section's policy of self-congratulation, were full of praise throughout the 1930s. "A cryptologist of exceptional value, he has extremely brilliant gifts for cryptography which have enabled him to obtain remarkable results,"[21] noted Colonel Portzert in 1931. Proust subsequently became the trainer of the recently promoted reserve officers in cryptography. In 1933, the new head of the E.M.A.'s Cipher Section, Colonel De France de Tersant, further praised his predecessor: "A very remarkable officer in every respect. Exceptionally gifted and passionate about his service. A first-rate instructor, a lucid and fine mind, he obtained the most brilliant results in the training of reserve officers in cryptology."[22] From 1934 to 1935, Captain Jean Proust temporarily abandoned his late vocation for cryptology, serving at the head of a company of the 5th Infantry Regiment. Colonel De France de Tersant hailed his return to the E.M.A.'s Cipher Section as a godsend in 1936:

> Captain Proust, after having given proof of his remarkable military qualities in the command of a company, was assigned to the Cipher Section ( … ). His hard work and his rare gifts as a cryptologist have enabled him not only to obtain very important results, but also to provide the Navy's Cipher Service with effective assistance which is particularly appreciated by this service.[23]

Despite his "cryptological gifts," Jean Proust was unable to defeat the German army's Enigma machine, which was the increasingly obvious threat, or didn't even seem to try. Far from this apparent world of triumphant successes, French military cryptology in 1938 was generally in a state of failure, unlike the successes of the Poles since 1932. A last hope, however, lay with the young Air Force, which had been officially created in 1934, and which was also eager to set up its own cipher service.

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[21]DHS, 1931, *Feuillet individuel de campagne* (DHS).

[22]DHS, 1933, *Feuillet individuel de campagne* (DHS).

[23]DHS, 1936, *Feuillet individuel de campagne* (DHS).

## Henri Braquenié and the cryptological ambitions of the Air Force

The most prominent officer in the new Cipher Section of the Air Force Staff (*État-Major de l'Armée de l'Air*—E.M.A.A.) was Reserve Captain Henri Braquenié, who was transferred on 20 August 1937 from the E.M.A.'s Cipher Section. Born on 12 December 1896 in Paris to a good family, Henri Braquenié spent a comfortable childhood and obtained his baccalaureate in science shortly before the outbreak of the First World War. At the age of 18, Braquenié joined the French army in December 1914, serving throughout the conflict in the artillery. He was demobilized in August 1919 and transferred to the military reserves with the rank of second lieutenant. In a France deeply marked by a disastrous human and material toll, the young man found his place as an electrical engineer.[24] Until 1936, Braquenié worked in functions that seemed to have little to do with his future cryptological speciality, such as a calculator-projector in steel structures, or a calculator in reinforced concrete.[25]

In parallel with his civilian employment, Henri Braquenié served occasionally in the military reserve. From 1928 onwards, the engineer seemed to be interested in cryptology by chance or by opportunity, since the access of reserve officers to the E.M.A.'s Cipher Section was only by co-option, and only for residents of the Paris region. Braquenié thus followed courses at the *École de Perfectionnement du Chiffre* (Development Cipher School) in Belfort, which he finished with the following praise: "Distinguished himself by his zeal, his assiduity and the quality of his work at the *École de Perfectionnement du Chiffre*. Very suitable for use in a decryption workshop during mobilization."[26] From 1931 onwards, Henri Braquenié did his reserve periods every year until 1936 in the E.M.A.'s Cipher Section. He was thus one of the new reserve officers trained by Captain Jean Proust.

Henri Braquenié was promoted to the rank of reserve captain on 25 December 1935, and was once again praised by his superiors, notably in 1936: "Very good cipher officer, active, conscientious, very good technical knowledge. Speaks and writes German."[27] This was a somewhat optimistic statement, since Braquenié himself later admitted that he had little knowledge of this language, which he had not spoken for a long time.[28] However, the French officer was soon confronted with the Enigma machine. In 1937, Braquenié left the Army to join the new E.M.A.A.'s Cipher Section—to the great outrage of the latter. His services were once

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[24]DHS, 1921, *Diplôme d'ingénieur des Travaux publics* (DHS).

[25]DHS, 1937, *Feuille de renseignements concernant le capitaine Henri Braquenié* (DHS).

[26]DHS, 1937, *Copie des notes inscrites au feuillet du personnel du capitaine de réserve Braquenié* (DHS).

[27]DHS, 1936, *Relevé des notes du capitaine Braquenié Henri* (DHS).

[28]Kozaczuk (1989, 328).

again appreciated: "He rendered very good services to the Cipher Section where, because of his knowledge as an electrical engineer, he specialized in the study of French and foreign electromechanical cryptographs."[29]

It is true that Henri Braquenié obtained some results by tackling the Enigma machine, but only on the old commercial model, less complex than the military version used by the German army. The French code-breaker also managed to break the French encryption machine used by the Army and Navy—which says a lot about the level of security of the latter.[30] But Braquenié's modest training in civil engineering soon found its limits when faced with complex electromechanical machines such as the various military versions of the Enigma, which he was no more successful at decrypting than his E.M.A. counterpart, Jean Proust.

## The weaknesses of French cryptology revealed: the Paris and Pyry conferences

On 5 March 1938, Jacques De France de Tersant died of natural causes.[31] While the Sudetenland crisis augured a bleak future, a *deus ex machina* could still claim to improve the situation and start serious efforts against Enigma, if not change the fate of France. Far from this perspective, De France's two successors had more or less the same trajectory and skills. On 9 March 1938, Colonel Louis Rivet received a suggestion for a new head of the Cipher Section from a certain "*Commandant* [Major] Joubert."[32] A search of the archives of officers with this surname is necessary to finally identify the person concerned. Born in 1892, Jean Joubert des Ouches joined a dragoon regiment in 1911. As a young second lieutenant in 1914, he ended the war wounded three times, with the rank of captain. Like De France de Tersant, Joubert des Ouches joined the E.M.A.'s Cipher Section in March 1919, at the twilight of military cryptology. He then served in several infantry regiments as a decryption officer, before returning to the E.M.A.'s Cipher Section in 1934 with the rank of Major.[33] Unsurprisingly, Joubert des Ouches' report cards do not suffer from any doubt, since they were written by the laudatory De France de Tersant, head of the E.M.A.'s Cipher Section:

> All the fine qualities recognized in Major Joubert have continued to assert themselves since his assignment to the E.M.A.'s Cipher Section. In particular, he has taken in hand with authority and competence the instruction of reserve officers at the advanced school and the direction of the training periods of these officers on whom

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[29]DHS, 1938, *Bulletin individuel de notes* (DHS).

[30]Bertrand (DHS, 151).

[31]DHS, 1938, *Bulletin de décès* (DHS).

[32]Rivet (2010, 198).

[33]DHS, no date, *Fiche biographique du général de brigade Joubert des Ouches* (DHS).

his personal ascendancy and his untiring activity have made a remarkable impression. Deserves, in all respects, the particularly laudatory appreciations that have always been awarded to him.[34]

Although he was approached to succeed Jacques De France de Tersant in March 1938, Jean Joubert des Ouches was then serving his statutory command time in the 6th Moroccan Rifle Regiment.[35] This time was extremely important in the advancement of a military career at the time, like a high point, allowing the soldier to prove his qualities as a leader and to position himself for the highest functions a few years later.

The interim of the E.M.A.'s Cipher Section was carried out by Major Pierre Dimier de la Brunetière. Once again, no change was to be expected from this officer, who came from the same background as his predecessors. Born in 1885 into a well-to-do family, Dimier de la Brunetière obtained a baccalaureate in philosophical rhetoric and elementary mathematics, before joining the army in 1906.[36] A lieutenant in 1910, he served in the artillery during the First World War, which he finished with the rank of captain. Dimier de la Brunetière was one of the officers who joined the E.M.A.'s Cipher Section late in July 1919, like De France de Tersant and Joubert des Ouches. He served in the cavalry in various regiments and reached the rank of squadron leader in 1930 before returning to the E.M.A.'s Cipher Section in January 1937.[37] Even if, once again, there was nothing in his background to suggest that he could overcome modern mechanical cryptography, Dimier de la Brunetière could, as always, count on his boss, Jacques De France de Tersant, to praise his merits: "Major De la Brunetière quickly became aware of his new duties. His great culture, his perfect tact, his habit of orderly and methodical work have already enabled him to render important services and to impose himself as an instructor."[38] In spite of these pompous declarations, in 1938 French cryptology had never recovered from the lack of interest shown in military ciphers since 1919. Gustave Bertrand, who had been upset with his rivals in the E.M.A.'s Cipher Section since the early 1930s, did not hesitate to describe French cryptologists as "zeros."[39]

At the beginning of 1939, after 7 years of success in secretly decrypting Enigma, the Polish army was faced with insoluble difficulties. The entry into service of two new rotors on 15 December 1938 and the increase in

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[34]DHS, 1935, *Relevé des notes* (DHS).

[35]DHS, no date, *Fiche biographique du général de brigade Joubert des Ouches* (DHS).

[36]DHS, 1909, *Feuille de notes* (DHS).

[37]DHS, 1940, *Feuillet du personnel* (DHS).

[38]DHS, 1938, *Feuillet du personnel* (DHS).

[39]Stengers (2004, 451).

connected plugs on 1 January 1939 rendered Marian Rejewski's bomby use-less. Only Henryk Zygalski's sheets could theoretically continue to defeat Enigma, but the Poles did not have the means to produce the tens of thousands of sheets needed. The time had come for the Poles to reveal their great secret to the British and French. A meeting between the three nations was scheduled for 9 and 10 January 1939 in Paris. Lieutenant Colonel Louis Rivet, head of the Second Bureau, had discussed this opportunity with his British counterpart, Commander Alastair Denniston, a month earlier:

> We thought of bringing together, in Paris, representatives of each service—with a view to comparing the results of ongoing research into radio traffic encrypted by means of the Enigma machine in use in the Wehrmacht—thinking that this opportunity could serve as a prelude to a deeper collaboration, for peacetime as well as for wartime.[40]

Alastair Denniston traveled to Paris in person on 9 January 1939, accompanied by his top code-breaker, the academic Dilly Knox, and his Japanese cipher expert, Hugh Foss. The Poles sent Lieutenant Colonel Gwido Langer, head of the Cipher Office in Warsaw, and his German section chief, Major Maksymilian Ciężki. Captains Jean Proust and Henri Braquenié represented French cryptology, for the Army and Air Force. Gustave Bertrand also attended the conference, and noted with a sarcastic eye the presence of Jean Proust: the E.M.A.'s Cipher Section had sent "its greatest cryptologist."[41] After the war, in 1949, the head of Section D presented the conference participants as follows:

- 2 Polish experts

- 3 British experts

- 1 French "expert" (Cne B.).[42]

The quotation marks certainly say a lot about what Gustave Bertrand thought of the French expert in question, Captain Braquenié. Dilly Knox began the conference by outlining the work of the British, who had so far succeeded in cracking the commercial version of Enigma, which had been used during the Spanish Civil War. Knox was close to breaking the military Enigma, but was still struggling with the "QWERTZU," the connections between the keyboard and the plugboard. Major Langer then intervened,

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[40]DHS, 1938, Letter from Louis Rivet to Stewart Menzies, 14 December 1938 (DHS).

[41]Bertrand (1973, 57).

[42]DHS, 1949, *Contribution à l'étude de la Machine à Chiffrer "Enigma" (type Wehrmacht) par le S.R. de l'E.M.A. (de 1931–1942)* (DHS, 151–152). In his memoirs, published in 1973, Bertrand mentioned only a French "expert," deleting the reference to "Cne B." It may have been due to a desire to spare Braquenié, still alive and totally unknown.

monologuing on the vague advances of his department; the Poles had finally been ordered not to reveal anything for the moment.

The turn of French cryptology comes next. Henri Braquenié seemed to display a certain arrogance when referring to French work. In a grandiloquent manner, he concluded his presentation by saying: "And this is the French method."[43] The British and the Poles, who were far more advanced, especially the latter, in their own work, were dubious, to say the least. Hugh Foss was disillusioned with the French methods: "They were even more clumsy than mine."[44] However, Jean Proust, who was also attending the conference, felt he had heard enough to not see fit to appear again on the second day of the conference on 9 January—which certainly did not add anything. "The light hadn't broken through,"[45] Bertrand noted bitterly.

However, a new conference was planned, this time in Poland, in Pyry, a southern suburb of Warsaw. Captain Jean Proust once again did not feel it was appropriate to travel. This was further proof of the smugness of the E.M.A.'s Cipher Section, and a final missed opportunity for Jean Proust to go down in history. Captain Henri Braquenié became the sole representative of French cryptology to the United Kingdom and Poland.

On 24 July 1939, Gustave Bertrand and Henri Braquenié were in Warsaw, where they met Commander Alastair Denniston and his codebreaker Dilly Knox the next day. The visitors were taken to a secret headquarters in the middle of the woods, where Major Maksymilian Ciężki revealed the Poles' great secret. The French and British were stunned. Dilly Knox exploded in the evening on his way back to the hotel: "The whole affair was a matter of espionage,"[46] he kept repeating, notes Denniston. The next day, Knox calmed down in contact with the three Polish codebreaking geniuses, Marian Rejewski, Henryk Zygalski and Jerzy Różycki. He quickly recognized the competence of the young mathematicians, and quickly understood the value of the bomby and Zygalski's Sheets. Marian Rejewski, for his part, also grasped the potential of the British scholar, and quickly noticed the difference in level of expertise compared with the French:

> The British were represented by Commander Knox ( … ), and the French by Commander Bertrand and Captain Braquenié. The British, in particular, proved to be quite brilliant. ( … ) Exactly how well Braquenié understood [the explanations] I don't know, but it is undeniable that Knox assimilated everything very quickly, almost as quickly as lightning. It was obvious that the British had worked on Enigma. They were specialists of a different kind—of a different class.[47]

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[43]Batey (2019, 70), Turing (30, 152).

[44]Turing (2022, 152).

[45]Bertrand (1973, 58).

[46]Erskine (2004, 300).

Marian Rejewski is said to have made his point even clearer, adding of Braquenié: "He wasn't very good."[48] The Pyry conference thus lifts the veil on the secrecy of the Polish codebreakers, and at the same time confirms in the eyes of all the weakness of the French cryptology. Despite his limited performance at Pyry, Braquenié was now well and truly enthroned as the representative of French cryptologists. On 20 August 1939, he was reappointed to the active army for a period of 2 years.[49]

In Paris, the news of the Polish successes did not seem to move the E.M.A.'s Cipher Section. Squadron Leader Dimier de la Brunetière was still satisfied with his lack of results and continued to praise his champion: "Captain Proust's exceptional gifts in cryptography, his passionate interest in these studies, supported by very brilliant intellectual faculties, make him, without a doubt, the first cryptologist in the French army."[50] In the wake of this glorious—and remarkably unjustified—title, Jean Proust was promoted to Major on 1 September 1939, at the start of the Second World War, and became Deputy Chief of the E.M.A.'s Cipher Section.[51] At the end of a final period of command in the regiment, Major Jean Joubert des Ouches did not take charge of the E.M.A.'s Cipher Section as originally planned, due to mobilization. He was promoted on 2 September 1939 when he received the direction of the Cipher Section at the Headquarters of the French Army, which had been set up five days earlier in anticipation of the conflict.[52] Dimier de la Brunetière was thus confirmed as head of the E.M.A.'s Cipher Section until the end of the French campaign.

## The Fifth Bureau: a too late centralization of military cryptology

The declaration of war on 3 September 1939 led to a mobilization plan for the S.R., with the creation of a Fifth Bureau attached to the E.M.A. and responsible for controlling all military intelligence. It was directed by Lieutenant Colonel Louis Rivet, who had already been head of the Second Bureau of the E.M.A. since 1936. However, Dimier de la Brunetière's E.M.A.'s Cipher Section initially insisted on remaining independent, in order to decipher the intercepted communications considered to be the most important. Due to a lack of results, it finally came under the control of the Fifth Bureau in April 1940. Jean Proust was dismissed and appointed to head a new eavesdropping service on 5 May 1940. A few days before the

[47]Rejewski (2011, 66), Kozaczuk and Straszak (2004, 236).

[48]Stengers (2004, 464).

[49]DHS, 1939, *Lettre du ministère de l'Air à Henri Braquenié* (DHS).

[50]DHS, 1939, *Copie des notes du feuillet du personnel* (DHS).

[51]*Ibid.*

[52]DHS, 1939, *Feuillet individuel de campagne*, Joubert des Ouches (DHS).

German offensive, the Fifth Bureau finally became the only centralized decryption body in the French army, but the time lost in internal rivalries over the last 20 years could not be recovered.

Henri Braquenié was also assigned to the Fifth Bureau's Cipher Section. The French officer quickly proved indispensable when in October 1939 15 Polish codebreakers including Marian Rejewski, Henryk Zygalski and Jerzy Różycki joined France, a few weeks after their country was crushed. "I was the only specialist who could read like them and work out the keys,"[53] Braquenié proudly recalls in a postwar interview. Indeed, Braquenié was trained in Polish methods in Pyry, including the Zygalski's Sheets. The reserve Captain now proved to be the most useful of the French decipherers, albeit in a purely technical role, only implementing the knowledge of the Poles.

In September 1939, Braquenié went twice to England to continue the inter-allied collaboration, and was admitted to the holy of holies of British decryption, Bletchley Park. There he met again with Dilly Knox, isolated from the Huts in his Cottage. Even if the details of their work are not known, the Cambridge scholar seems once again delighted to have seen Braquenié again, as he declared to Denniston on 29 September 1939: "It was a great pleasure for me, although challenging for my French, to receive Captain B."[54]

Henri Braquenié seemed to have proved sufficiently effective in England to be approached in November 1939 for a new mission at Bletchley Park. On 8 November Lieutenant Colonel Louis Rivet responded favorably to a request to this effect from Commander Alastair Denniston:

> I am in complete agreement with you on the study of the machine and it is becoming necessary on both sides to compare the results: I am therefore considering, in accordance with your wishes, sending Captain Braquenié to you, accompanied by Lieutenant Colonel Langer himself, in order to finalize the various outstanding questions.[55]

The head of Bletchley Park replied to his French counterpart at the Fifth Bureau on 11 November 1939, stating: "We will gladly welcome Lieutenant Colonel Langer and Captain Braquenié."[56] From 3 to 7 December 1939 the two men were indeed in England, Braquenié setting up a liaison system between the 5th Bureau and Bletchley Park using the Enigma, supposed unbreakable by the Germans. Henri Braquenié thus reached his peak at the end of 1939, emerging from anonymity to become known both to Allied

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[53]Kozaczuk (1989, 318).

[54]Batey (2019, 90).

[55]DHS, Letter from Louis Rivet to Alastair Denniston, 8 November 1939 (DHS).

[56]DHS, Letter from Alastair Denniston to Louis Rivet, 11 November 1939 (DHS).

codebreakers (more or less positively) and to intelligence chiefs on both sides of the Channel.

Henri Braquenié participated alongside the Poles in the precursor decryption of 17 January 1940, a success quickly achieved in turn by the British at Bletchley Park. In February 1940, the French officer took part in the third and last inter-allied conference at the *Château de Vignolles* (Vignolles manor house), which confirmed by default the supremacy of the British in decryption. But as in Paris and Warsaw, Braquenié played no active role in these summit discussions.[57] Until June 1940, Henri Braquenié's duty remained limited to two main tasks. "My job was to work out the keys," he said after the war. "When we received material, we tried to gather what we needed to reconstitute the keys."[58] Braquenié thus participated in the decryption of the keys specific to Wehrmacht operations thanks to Zygalski's Sheets, but he was not responsible for reading the messages, which was entrusted to Major Maksymilian Ciężki, a former German army officer. His other job was to send the decrypted messages to Bletchley Park using an Enigma machine, with its own keys designed in December 1939 in partnership with the British decoders. "I always finished, making it a bit longer, with a 'Heil Hitler',"[59] he adds mischievously. This is certainly a very French line of humor, but it is also risky, since it could provide a crib for the German codebreakers. Ironically, the two words "Heil Hitler" were among the cribs that the Bletchley Park decoders were ardently hunting down at the same time. An unconscious blunder on the part of Braquenié that did not seem to have harmed the Allies.

The codebreaking of Enigma provided major information during the Phony War and the campaigns in Norway and France. Unfortunately, the French high command, frozen in its archaism and inefficiency, often failed to exploit the information. Like Marian Rejewski and Gustave Bertrand, who deplore this lack of efficiency in their memoirs, Henri Braquenié evokes this obsolete legacy of the First World War: "We had sensational information, but we were not in a position to take advantage of it. ( … ) We were a country that was organized for defence."[60]

Following the offensive of 10 May 1940, Henri Braquenié followed the debacle in the last days of June, which led the Fifth Bureau to the south of France, then to North Africa. On 24 June, the French officer was in Oran with the Z team of the Poles. A few days later, the refugees rented a small villa south of Algiers, while awaiting the rebirth of the Fifth Bureau.

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[57]Kapera (2015, 106).

[58]Kozaczuk (1989, 320).

[59]*Ibid.* (322).

[60]*Ibid.* (321).

## Ambivalent trajectories between the resistance and Vichy

Unlike Captain Henri Braquenié, Major Jean Proust remained entirely loyal to the new Vichy regime and stayed in France. According to Squadron Leader Dimier de la Brunetière, who retired in August 1940, Proust's record during the brief French campaign was excellent:

> Major Proust's remarkable competence in cryptographic research and his tireless activity were exercised in every way during the entire duration of the hostilities: the establishment of many new encryption procedures, directives for the preparation of codebooks, the instruction of a hundred or so officers to make them specialists in ciphers, the study of enemy encryption systems of all kinds: by machines, by codes, by various means, the decryption of many important texts in Italian.[61]

An apparently remarkable record, which in fact poorly masks the obvious failure of the E.M.A.'s Cipher Section, as the decryption of German and Italian ciphers had relied solely on the Poles in France and especially on the British in England. Major Jean Proust was nevertheless deemed suitable to succeed Squadron Leader de la Brunetière as head of the E.M.A.'s Cipher Section in 1941.[62] Jean Proust thus reached the peak of his career as a cryptologist in the worst hours of French history. He was in charge of rebuilding the E.M.A.'s Cipher Section for the new Vichy regime.

During the summer of 1940, Henri Braquenié was in North Africa with the Polish codebreakers waiting for the outcome of events. In France, Colonel Louis Rivet spent the summer reconstituting his Fifth Bureau, which was reborn from its ashes in August as the *Bureau des Menées antinationales*—B.M.A. Officially dedicated to serving the Vichy regime and charged with chasing down the influence of the Gaullists, this B.M.A. continued its intelligence work against the Axis. Gustave Bertrand's decoding section was kept by him under the name of B.M.A.2, under his sole responsibility. It moved to the Fouzes manor house near Uzès in the south of France, and became the CADIX headquarters.[63] Henri Braquenié was a member of the B.M.A.2 and joined the CADIX HQ with the Poles in September 1940. He seems to be held in high esteem by Louis Rivet for his services since the beginning of the Second World War: "Has shown excellent technical qualities (cryptography) and unfailing dedication. Directed with great tact and skill a special team which produced results."[64]

In his new CADIX HQ, anchored in the picturesque landscapes of the Gard, Henri Braquenié continued his appointed duties: to overcome the daily

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[61]DHS, 1940, Copie des notes feuille du personnel, (DHS).

[62]*Ibid.*

[63]DHS, 1949, *Etudes et Résultats de la Recherche de Renseignement par les moyens techniques (1930–1942)* (DHS, 40).

[64]DHS, 20 August 1940, Note du Colonel Louis Rivet (DHS).

keys of the Enigma machine, of which he still had a copy. His work did not go beyond that, as he himself admitted: "I was a technician, I was not aware (…). I had (…) to work out the keys. I did not decipher at all."[65]

On 15 March 1941, Henri Braquenié was part of the first team sent to Algiers, where Colonel Louis Rivet had just organized a branch of the CADIX HQ, tasked in particular with spying on the German and Italian Armistice Commissions.[66] Among the successes obtained by the code-breakers on both sides of the Mediterranean, Braquenié managed to decrypt the relatively uncomplicated Enigma used by the *Reichsbahn*, and to overcome the keys of the German police on the Eastern Front, contributing to the awareness of the large-scale murders perpetrated against the population.[67]

The French officer was supposed to return to France in December 1941 aboard the *Lamoricière*, but according to him the Poles forced him to stay in Algiers to take care of one of their colleagues in detoxification in Algiers. This was lucky for Braquenié, as the *Lamoricière* accidentally sank off the Balearic Islands on 7 January 1942. Four officers (three Poles and a Frenchman) of the CADIX HQ perished in the wreck, as well as the youngest of the Polish decipherers, Jerzy Różycki. A disaster, which according to Bertrand, "dealt a very hard blow to the team's morale."[68]

In Vichy, Major Jean Proust, for his part, remained loyal to Marshal Pétain, taking no part in the double game of CADIX HQ. At the beginning of 1942, a new *Center d'Information Gouvernemental* (C.I.G.) was created under the direct orders of the Minister of National Defence, Admiral François Darlan. This C.I.G. was responsible for coordinating all the Vichy intelligence services, for the benefit of both the French and the Germans. On 27 March 1942, Jean Proust was appointed Inspector General of the C.I.G.'s Cipher Section.[69] He was supposed to go to the Fouzes manor house to inspect the CADIX HQ, but Proust did not even make the trip. "He knew very well in advance that he would only see what they wanted to show him,"[70] notes Gustave Bertrand. The internal rivalries of the French cryptographic services during the 1930s left lasting scars. Although the CADIX HQ officially worked for Vichy just like the C.I.G., the former was the only one to have an unofficial foot in the resistance. Jean Proust

[65]Kozaczuk (1989, 323–328).

[66]DHS, 1945, *Feuille de renseignements concernant le capitaine Henri Braquenié* (DHS).

[67]Kapera (2011, 63–67).

[68]DHS, 1949, *Etudes et Résultats de la Recherche de Renseignement par les moyens techniques (1930–1942)* (DHS, 46).

[69]*Ibid.* (41).

[70]*Ibid.*

navigated in waters that were too murky for the taste of the decipherers at the Fouzes manor house.

Henri Braquenié finally returned to France in February 1942, after eleven months spent at the Algiers antenna. His role in the CADIX HQ began to diminish. When the Allies landed in North Africa on 8 November 1942, Braquenié was the last to inspect the Fouzes Vignolles manor house and to erase all compromising traces. This was his last involvement in the CADIX HQ, which was evacuated on 9 November.[71] Obviously very reluctant to launch himself openly into the resistance in a France that was now totally occupied, Henri Braquenié remained in Nîmes for some time. He did not take part in the tragic evacuation of the Poles across the Pyrenees, where a good number of them were betrayed and deported to Germany.[72] Having lost all contact with Bertrand—and not seeking to find him—Braquenié found himself totally isolated: "When we occupied the two zones, at some point I realized that I really didn't have much to do in the Midi and so I decided to return to Paris."[73] Once he arrived home, Braquenié remained 'at disposal', and imitated the great majority of his compatriots during the war: he waited for the end of the conflict.[74]

Another French cipher officer summarizes the oscillation of French cryptology between Vichy and the fight against the occupier. Jean Joubert des Ouches, the former head of the GQG's Cipher Section, was appointed lieutenant colonel after the disaster of June 1940, then assigned to the staff of the French forces in North Africa at the end of the year. He passed the test of amalgamation without difficulty, after the Allied landing in November 1942, with General de Gaulle's Free France merging with Vichy's former North Africa to form Fighting France. From 1 December 1942 onwards, Joubert des Ouches headed the Cipher Department of the French Committee for National Liberation in Algiers, which was replaced in June 1944 by the Provisional Government of the French Republic.[75] Appointed brigadier general in 1946, he did not receive any effective command after the war for the rest of his career.[76]

The fate of Jean Proust, on the other hand, was dramatic. After the invasion of the free zone, the commander remained in Vichy in the service of Marshal Pétain. His last service record was a triumph, consecrating him as the best French cryptologist: "Remarkable senior officer who is an authority in France

[71]DHS, 1945, *Feuille de renseignements concernant le capitaine Henri Braquenié* (DHS).

[72]*Ibid.*

[73]Kozaczuk (1989, 323).

[74]*Ibid.* (327).

[75]Widman and Wik (2021).

[76]DHS, no date, *Fiche biographique du général de brigade Joubert des Ouches* (DHS).

in the field of cryptography. Has shown very brilliant qualities: sharp intelligence, developed spirit of initiative."[77] Jean Proust was demobilized at the height of his glory, which was questionable to say the least, on 1 December 1942.[78] He stayed in Vichy in the Grignan hotel. However, his rest was short-lived. Following the invasion of the free zone in November 1942, the *Abwehr* intended to do away with the French intelligence services, which had long been suspected of covering up resistance activities. Admiral Canaris obtained Hitler's order to destroy the staff of the Second Bureau in Vichy.[79] Jean Proust was on the list drawn up by SS Captain Hugo Geissler, head of the Sipo and the S.D. in Vichy. On 8 January 1943, there was a wave of at least fourteen arrests in the city, including officers and civilians considered suspicious.[80] For the second time, after his first capture in 1918, Jean Proust found himself a prisoner of the Germans. This was paradoxical, to say the least, since unlike Braquenié, Proust had never succeeded in deciphering Enigma, and until then had rather served the interests of the collaboration.

Those arrested in Vichy were taken to Clermont-Ferrand, then to the transit camp of Compiègne near Paris. At the beginning of 1944, the prisoners were transferred to the Buchenwald concentration camp, then to Flossenbürg on the border to the Czech Republic.[81] Jean Proust, promoted in absentia to Lieutenant Colonel on 25 June 1943, was reported dead in the latter camp on 4 July 1944.[82] He is thus one of the few codebreakers who died during the Second World War, along with the best known Jerzy Różycki in 1942 (by accident) and Dilly Knox (from illness) in 1943.

For his part, Henri Braquenié was finally recalled to active duty on 10 January 1945 at the newly created Directorate General of Studies and Research—the intelligence services. An investigation was carried out to study Braquenié's career in the Resistance. The author of the final report was none other than Gustave Bertrand, now a Lieutenant Colonel, who, although officially cleared of suspicion after his capture by the *Abwehr* in January 1944, preferred to divert attention from himself by charging—without difficulty—his former collaborator:

> During the period from November 1942 to March 1944, Captain Braquenié was not called to any activity. On the other hand, he always avoided any compromise likely to cause him trouble, even going so far as to make difficulties in receiving in his own accommodation (although it was paid for by the Service), people who came on mission or for liaison. ( … )

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[77]DHS, 1943, *Feuillet du personnel* (DHS).

[78]*Ibid.*

[79]Turing (2022, 306–307).

[80]DAA, 9 January 1943, *Rapport n°662 du Commissaire divisionnaire* (DAA).

[81]*Ibid.*

[82]DHS, 1943, *Feuillet du personnel* (DHS).

> He always showed excessive caution and great mistrust towards the representatives of the Network. He even refused to keep secret documents temporarily with him. On the other hand, he took advantage of the opportunities provided by his job to obtain, at a time when the situation was becoming delicate, his return to Paris, thus putting his interests before those of the network.

> His activity during this period was limited to keeping a few boxes of books that were not of a compromising nature.[83]

An unpatriotic lack of activity, which kept Braquenié in the rank of reserve Captain. Bertrand added a little more at the end of 1945, damning an "officer [who] knows how to take advantage of the work of others," and of "mediocre value."[84] Braquenié was officially demobilized on 11 December 1945, then struck off the reserve staff in 1950. Any trace of the former representative of French cryptology was then lost, for lack of archives left by the person concerned. The silence imposed on Enigma plunged Braquenié into obscurity, until the publication of Gustave Bertrand's memoirs in 1973. The Polish historian Władysław Kozaczuk narrowly manages to interview Braquenié 2 years later. The 79-year-old was suffering from advanced leukemia. The last major representative of French military cryptology died a few months later at the Saint-Gervais hospital on 14 December 1975.

## Conclusion: another symptom of institutional sclerosis

On the eve of the Second World War, military cryptology never recovered from the lack of interest shown by the French army after the previous conflict. Breaking with the opening toward the civilian academic world, which had contributed to its victory in the code war, the General Staff locked itself in the early 1920s into a purely military technical specialty, with very limited means. After the demise of Colonel Givierge in 1927, the E.M.A.'s Cipher Section passed into the hands of officers distinguished in combat and brilliant in their respective fields, infantry, cavalry, or artillery, but with little experience of cryptology and no academic training. Coming from well-to-do backgrounds in the Paris region, these officers displayed a certain poise and also a certain smugness in their abilities, unrelated to their actual results, as illustrated by the main head of the E.M.A.'s Cipher Section in the 1930s, Jacques De France de Tersant. Good external appearance counts at least as much as performance. The military prose in the report cards of the time was certainly often positive and complimentary in the context of ratings, especially if the superior believes that the subordinate is in a position to move up to a higher rank in the next few years. However, in the very specific and critical context of cryptology, this biased system, which

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[83]DHS, 22 March 1945, *Rapport particulier sur le capitaine Braquenié proposé pour le grade de commandant au titre de l'armée de l'Air* (DHS).

[84]DHS, 13 July 1945, *Feuillet individuel de campagne* (DHS).

did not separate the judgment of the man and his service, had fatal consequences. Unlike the Polish, British and American services, French codebreakers did not have an academic background in mathematics, science or classics. But this justification of academic training, which was not necessarily required to overcome Enigma, with the remarkable example of John Tiltman, is not enough to explain the failure. More decisively, no French codebreaker seemed to have demonstrated genius, that combination of intelligence, imagination and adaptation.

Beyond the aspect of recruitment, the failure of French cryptology was part of a more general problem affecting the whole army, described by General Beaufre as "the sclerosis that threatens victorious armies," combined with "the extreme ankylosis of the State." Relying on the "poisonous fruits"[85] of victory, the French army largely failed to adapt to the evolution of modern warfare. However, this required the integration of mechanical cryptology procedures, which were more complex than the code warfare of the First World War. In the early 1930s, the Enigma military machine posed problems that were immediately unsolvable for the French cipher services, as it was not adapted to the existing human resources. This failure, which was also encountered later by the British, proved to be a resounding one, given the paradox of the historical success of the French intelligence services. The Second Bureau thus had at its disposal the "greatest spy of the Second World War," to quote the historian David Kahn, whose information was nevertheless considered insufficient. This information was nevertheless used successfully by the Polish Cipher Office, after having imitated the French army's opening to the civilian world during the First World War. The late revelation of the Poles' secret in August 1939 did not lead to any major evolution in French cryptology, contrary to the rapid development of Bletchley Park. The integration of the Polish codebreakers in exile and their efficiency in the spring of 1940 was not enough to reverse the fate of a French army, which had not been able to adapt to defeat.

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## Disclosure statement

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[85]Beaufre (2020, 124–125).

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