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# The difficulties of scientific life in occupied France : the examples of Emile Borel, Paul Lévy and others...<sup>1</sup>

Laurent MAZLIAK<sup>2</sup>

## Abstract

*Between June 1940 and the end of 1944, a large part of France (and even the whole of France after November 1942) was occupied and administered by the Germans. In the present paper, we present some aspects of the mathematical life in France during this difficult period. We try to illustrate that in institutional life as well as in scientific aspects, one can find a wide range of behaviours adopted by actors who try to adapt to the new situation in the best possible way.*

## Introduction

Between 1940 and 1944, during World War 2, France was experiencing, at the same time, both an Occupation by German forces and a specific regime, called the French State (Etat Français) under the direction of Marshal Philippe Pétain. It is probably relevant to begin the present paper by questioning the exactness of calling this regime a dictatorship. Though several aspects clearly relate it to this concept, the odd situation which made its existence strongly dependent on the Occupation forces as well as the brevity of its duration (hardly more than 4 years) did not allow the necessary stability of the regime that could have defined it with more precision. For many aspects, the Vichy régime was more a régime "fantoche" (puppet regime) than a real dictatorship which is difficult to conceive without sufficient independence.

This is not, needless to say, in order to find any excuse for the blackest sides of Vichy, the worst being obviously the ferocious repression against several parts of the population (Jews, masons, German or Spanish refugees and others...) and against all kind of public opposition (Communists, Gaullists, the Resistance as a whole). But the historian needs to qualify a regime in comparative studies with the situations in countries under a more indubious dictatorship (Fascist Italy, Nazi Germany, Francoist Spain...) , not least to understand which political decisions about research policy, or which individual choices of actors can be attributed to the dictatorial nature of the regime.

Even if the historiography of the period had met considerable developments after the publication of fundamental works such as *Vichy France* by Paxton in 1973 (Paxton, 2001), one must admit that the tensions are far from having disappeared and that it is still complicated in today's France to have a balanced approach to the period. Moreover, what is obvious to anyone who has looked into it, is how difficult it is to get a general perception of these complicated times. It was above all a "troubled" period, to use the term chosen by the historian Pierre Laborie for his essay *The French of the troubled years* (les Français des

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<sup>1</sup> This paper was written after a talk at the conference "Mathematical sciences and dictatorships in the 20th century" organized by Luis Saraiva in Lisbon in December 2015. A version will be published with the proceedings of this conference.

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années troubles) (Laborie, 2001) from which I borrow the following quotation illustrating the difficulty of such an historical approach.

*The judgements passed on the collective attitudes and behaviors of the period between 1940 and 1944 are characteristic of this mixture of respectable intentions, fearfulness, and anxiety over all that is at stake in the realm of memory. The extraordinary variety of personal experiences passed on by friends and family, as well as the topic's sensitivity and its popularity – everyone has an opinion on the matter – limit the dispassionate perspective of historians and their efforts to explain what happened. When these perspectives stray too far from what is touchily guarded as “memorially correct” to a particular group or community, they are poorly received, and sometimes even suspected of insidiously striving to justify the unjustifiable. The troubling question of behaviour during the Occupation is a recurring central theme in a debate that has been more about pronouncing judgement than dealing with issues and understanding their complexity. Such questions are deeply relevant to our times because of their moral dimension, and yet too often they are reduced to the level of excessive generalizations, simplistic alternatives, or even summary judgements of the ‘all guilty, all collaborationist’ variety.<sup>3</sup>*

I encountered this period, in past researches, on two occasions. The first one was when, together with Marc Barbut and Bernard Locker, we were preparing the edition of the correspondence between Paul Lévy and Maurice Fréchet, published by Hermann in 2004 and subsequently as an English second edition by Springer in 2014 as (Barbut, Locker & Mazliak, 2014). This correspondence extends from 1918 to 1965, with a remarkable set of letters dated from the years of the Occupation, in particular 1942 and 1943, when Paul Lévy, because of the racial laws, had to live clandestinely. Bernard Locker had chosen this subject (Lévy's mathematical works during the war) for his PhD defended in 2001 and he proved, on the basis of these rich documents how these months of isolation in hard personal conditions pushed Lévy to be extremely productive in his mathematical work (I shall return to this point later in the paper). The second encounter with Vichy France was a complete surprise to me, when I found some documents about Borel in the German administrative archive of occupied Paris. These archives were brought back to Paris in the 1990s and only in 2003 were they completely indexed. This implies that these documents are still relatively little exploited, at least for what concerns the intellectual life during the Occupation. This finding was at the origin of the study written with Glenn Shafer about Borel's arrest by the Germans in 1941 together with other members of the Academy of science, published in *Science in Context* in 2011 as (Mazliak & Shafer, 2011). In this paper, we tried to prove how the arrest of Academicians was the result of a fight between several rival services of the German administration and how Vichy officials tried to play their ambiguous part in the middle of this minefield. A concrete consequence of this troubled game was the dismissal of Emile Borel as Perpetual Secretary of the Academy of Science to replace Emile Picard in 1942 (I shall also return to this below).

Not being a specialist of this complicated period, I cannot, in the present paper, go beyond shedding some light on several disparate aspects of this story. In the first part, I shall provide some information about aspects of the scientific institutional life during the Occupation, examining the CNRS (Centre National de la Recherche Scientifique - National Center for Scientific Research), the Academy of Science and the personal file of Lévy, tossed

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<sup>3</sup> (Laborie, 2001), p.182

around from one institution to another because he was a Jew. I consider also the intricate situation of the prisoners of war - among which a certain number of mathematicians - which was always a sword of Damocles for the Vichy regime (Fishman, 1991).

Then in the second part, I look at some mathematical works realized during the period, trying to emphasize how they were influenced by the special situation of their production.

As already mentioned, the present paper certainly does not aim to provide a full description of the ambiguous and often contradictory organization of the intellectual stage of France during the Occupation. As we shall see, there is however a permanence to be mentioned, which was to a great extent a specificity of the French situation: the difficult cohabitation (which may have included a real collaboration but also, sometimes, an assumed opposition) between two concurrent administrations, one imposed by the occupiers, the other one organized by Vichy rulers with French personnel. Both administrations were emanations of repressive totalitarian forms of powers but they did not necessarily follow exactly the same logic, though they often merged when it came to reduce opponents to silence. The French population was taken between these pincers. I will concentrate first on some examples of institutional life, and then of scientific life, both being naturally much intertwined.

## **1- Some comments about the scientific institutional life in Vichy France**

### a- The CNRS.

To begin with, let me present some comments about the CNRS. The creation of the *Centre National de la Recherche Scientifique* had been a major institutional creation of the late 1930s in France. It found its roots in the reconversion of several war departments after the end of the Great War, in particular the *Direction des Inventions intéressant la Défense Nationale* created by Painlevé and headed by Borel after 1915 (Roussel, 1989). It is not the place here to describe the processes leading to the official creation of the CNRS in 1939, but let me mention just two aspects of this history : the decisive impulse given to the project when the Front Populaire came into power in 1936 with Léon Blum as President of the Council, and above all the central role played by Jean Perrin who, for years, had been the tireless supporter of the idea of a great independent institution in charge of scientific research in France. The CNRS created in 1939 was obviously Perrin's baby (Perrin, 1938 ; Guthleben, 2013). But Perrin's uncompromising desire of pursuing the fight against Germany in mid-June 1940 compelled him to go to Morocco together with several politicians who refused the Armistice (such as Jean Zay or Pierre Mendès-France) with the famous liner *Massilia*, and then to go to the United States where he died in 1942. It is therefore not difficult to understand why the reorganization of the CNRS was an urgent task for France's new rulers. The man chosen for this task, replacing Perrin at the head of the Centre and reshaping the institution in a way more suitable to the new spirit of the time, was Charles Jacob<sup>4</sup>, a geologist, member of Paris Academy of Science. Charles Jacob was not really involved in politics, though he clearly defended very conservative social views, quite compatible with Pétain's *Révolution Nationale* of the right-wing Vichy regime. For a man like Jacob, the harmonious functioning of a society was based on a selection of men trained to command, the "chefs" (leaders), who must be in position to decide and impose their views to their subordinates. Jacob had been a permanent opponent to Perrin's conception of a democratic approach of scientific research politics resulting in the introduction of several elected councils which have to decide the

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<sup>4</sup> Many details about Jacob and the reorganization of the CNRS during the Occupation are to be found in (Blay, 2012) ; the book contains the integrality of Jacob's report quoted in this section. See also (Chevassus-au-Louis, 2004).

research priorities in particular concerning financial support. In one of his reports to Pétain, Jacob wrote with anger "*des comités, toujours des comités, encore des comités!*" (committees, always committees, again committees!). For Jacob, this was a complete nonsense, not only spiritually polluted by Bolshevism, but above all completely inefficient as it resulted in a counterproductive dispersion of the means. During one of his meetings with Pétain that he himself described, Jacob had the following dialogue with the marshal.

*Pétain: I hear a lot about scientific research*

*Jacob: Yes, Marshal.*

*Pétain: What is scientific research?*

*Jacob: Until now, only a mess. But, with some order, it can be of great service to the country.*

*Pétain: You will put it in order.<sup>5</sup>*

So Jacob's task was clear in his mind : to be the "chef" the CNRS needed in these difficult times. In December 1940, Jacob wrote for the Government a long report to describe the then current situation of the Centre and his proposals for a reorganization. Jacob's report is impressive by its length and its precision, but also by a modern antidemocratic conception where the power belongs to the technocratic expert. Mathematics were not Jacob's first concern. However, some comments deserve to be examined. A strong idea of Jacob's report was his vigorous support for a single institution for pure and applied science. This had not been the case in Perrin's CNRS, entirely devoted to pure science, a *Centre National de la Recherche Appliquée* being created at the same time. Another requirement by Jacob was the maintaining of a total independence of the CNRS from Universities

*We declare that there is no need to maintain the separation of two sections, that of pure science and the other of applied science. We must merge them even if we must later conceive slightly different modalities of action for purely scientific research and for those that will be required or used by applications. While merging pure science and applied science is necessary, I am now, on the contrary, a resolute supporter of the need to preserve the independence of the National Centre with respect to Universities, **though my first preconceived idea had been the precise opposite.**<sup>6</sup>*

In the Chapter 1 of his report, called "*pure and applied science*", Jacob claims that the "separation between both domains is more theoretic than real". Jacob's idea is that pure science and applications (on his mind, a synonym for industry) should live in better harmony. The following paragraph sounds rather familiar today but was not at all such in 1940 France.

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<sup>5</sup> *Pétain : J'entends beaucoup parler de recherche*

*Jacob : Oui, M. le Maréchal.*

*Pétain : Qu'est-ce que la recherche?*

*Jacob : Pour le moment, jusqu'ici, la pagaille. Mais, avec de l'ordre, ça peut rendre de grands services au pays.*

*Pétain : Vous y remettez de l'ordre.*

<sup>6</sup> *On retiendra qu'il n'y a pas lieu de maintenir la séparation de deux sections, dites l'une de la science pure et l'autre de la science appliquée. Il faut les fusionner quitte à prévoir plus loin des modalités un peu différentes d'action pour les recherches purement scientifiques et pour celles qui seront requises ou utilisées par les applications. S'il y a lieu de fusionner la science pure et la science appliquée, je suis par contre non moins formel (...) - **et quoique parti d'une idée préconçue diamétralement opposée** - sur la nécessité de conserver l'indépendance du Centre national vis-à-vis de l'Enseignement supérieur. (my emphasis)*

*A question, a group of questions arise either from the side of science or from the industrial side. Some men are pretty much aware: some of them, on the industrial side, about the means of the technical process that may be used, even if it must be adapted; the other ones, on the scientific side, about the scientific aspects of the problem. We make them meet each other: they set up a program, a kind of draft. We agree on the teams and laboratories that would undertake the studies, and we provide the means. The experiments must be sometimes pushed to a semi-industrial level, and even an industrial one. The contact will remain constant until its achievement, even right up to production, taking into account the means it requires. Afterwards, if it yielded results, production would spread; This is no longer a scientific matter, but a matter of technique, decision and command, that is no longer the responsibility of the National Centre.<sup>7</sup>*

We shall see later that this "new spirit" of interdisciplinarity was used by some to obtain the creation of new laboratories.

#### b- the Academy of Science<sup>8</sup>

If a new institution like the CNRS was coping with the precepts of the Révolution Nationale, old and venerable institutions, such as the Paris Academy of Science, tried to continue their life as if nothing was happening outside, ready however to show their good will to avoid any trouble with the Germans. The twisting, changing attitude of the Academy during the Occupation has been dissected several times. For instance, Michèle Audin has touched on the politics of the Academy in her studies about publishing during the Occupation (Audin, 2009). I shall focus here on a small but important event which happened in 1942, namely the election of a new perpetual secretary after Emile Picard's death in December 1941. Picard had been one of the two permanent secretaries for the Académie des Sciences, the other being the mineralogist Alfred Lacroix (1863–1948). As permanent secretary, Picard had represented the mathematical sciences, which had subsections for geometry, mechanics, astronomy, geography, and physics. On 2 February 1942, the academy elected the physicist and Nobel laureate Louis de Broglie to succeed him. De Broglie's election was a delicate matter. Emile Borel would indeed have been a more natural successor to Picard, as the post had been held traditionally by the academy's most senior pure mathematician. Jacques Hadamard was in fact more senior than Borel, but he had fled to the United States because he was a Jew. A letter from the ministry, dated 30 December 1941, reveals that in response to the minister's official condolences for Picard's death, Lacroix had mentioned the vacancy of the post of permanent secretary and the academy's intention to proceed to an election to fill it. Lacroix asked for an appointment with the Minister Carcopino whom he met on the morning of 7 January 1942.

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<sup>7</sup> *Une question, un groupe de questions surgissent soit du côté de la science, soit du côté de l'industrie. Quelques hommes sont à peu près au courant, les uns, du côté de l'industrie, des moyens de réalisation technique dont on pourrait disposer, quitte à les modifier; les autres, du côté de la science, de la physionomie scientifique des problèmes. On les réunit : ils dressent un programme, une sorte d'avant-projet. On se met d'accord sur les équipes et les laboratoires qui entreprendraient les études, et on leur en fournit les moyens. Les expériences devront être poussées parfois jusqu'à une échelle semi-industrielle, voire même industrielle. Le contact restera permanent, jusqu'à la réalisation, jusqu'à la production, en tenant compte des moyens de celle-ci. Après quoi, si l'on a abouti à des résultats, la production essaimera ; ce n'est plus alors affaire de science, mais affaire de technique, de décision et de commandement, qui n'est plus du ressort du Centre national.*

<sup>8</sup> <sup>8</sup> Further details may be found in (Mazliak & Shafer, 2011).

The next day, Lacroix wrote to the members of the academy laying out how the new permanent secretary would be elected, with reference to documents going back to 1803, when the post had been introduced. There would be nothing out of the ordinary about such a notice, but the circumstances seem to have required supplementary precautions. Perhaps someone had suggested leaving the post vacant, because Lacroix cites an article of the regulations that had been amended in 1816 to state that the academy would not deliberate about whether or not to elect someone to the post but would elect a commission of six members from the concerned section (mathematical sciences in this case), which would produce a list of candidates in consultation with the academy's president. Lacroix then proposed a calendar for the process: the commission would be named on 19 January, it would name the candidates on 26 January, and the election would take place on 2 February if a quorum of 40 could be assembled; failing the quorum the election would take place on 9 February by simple majority of those present. It is relevant to observe that due to the circumstances (exile of some members, difficulties of communication between the two zones in France etc.) there had not been a quorum at any of the meetings of the Academy for December 1941.

A document, in Lacroix's hand, indicates the results of a secret committee meeting on 12 January that chose the commission members to be elected by the assembly the following week. The commission consisted, naturally, of the most senior members of the five subsections: Borel for geometry, Villat for mechanics, Deslandres for astronomy, Bourgeois for geography, and Cotton for physics, along with Maurain as the most senior of the other members of the section. The two candidates proposed by the commission on 19 January were Louis de Broglie and Elie Cartan. In his 7 January notice, Lacroix had prescribed that the commission would not make a report, on the surprising grounds that its work concerned a competition among colleagues.

On 2 February, 41 members of the academy were present, and 39 voted: 22 for de Broglie, 15 for Cartan, and two with blank ballots. The same day, Lacroix sent Carcopino an excerpt of the minutes proclaiming de Broglie's election and asking him to confirm the choice. The published minutes of the following week's meeting records the confirmation and reproduces de Broglie's very politically correct acceptance speech. He merely affirmed that the Académie des Sciences had to play its role in the difficult times being endured for the sake of the country's recovery. Such rhetoric would have been completely satisfactory from the viewpoint of the Vichy government, which always insisted that it was working for the restoration of the country and for its future triumphs.

Borel was thus swiftly put aside from a position he should have obtained. In our paper with Glenn Shafer about Borel's arrest in 1941, we expose how he tried to reverse the situation at the Liberation but did not obtain de Broglie's resignation.

#### c - Paul Lévy's institutional situation<sup>9</sup>

Another aspect on which I focus is Paul Lévy's academic affiliation between 1940 and 1941. Born in 1886, Paul Lévy had been since 1913 a professor of mathematics at the Ecole des Mines in Paris, the school where he received his engineering degree after his outstanding studies at the Ecole Polytechnique (Lévy was one of the extremely rare French mathematicians of his generation to have chosen Polytechnique instead of the Ecole

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<sup>9</sup> Most primary sources quoted in this section were found by Bernard Locker for his PhD thesis in Dossier Paul Lévy. Centre des Archives Contemporaines (Fontainebleau). Cote 771390, art.597.

Normale). From 1920, Lévy became one of the most renowned professors of mathematical analysis at the Ecole Polytechnique in Paris. He was also one of the leading probabilists of the time, a prominent specialist of the study of stochastic processes.<sup>10</sup> After the 1940 Armistice, the Ecole Polytechnique, which had a military status was ordered to relocate to Lyon where teaching activities would resume, in a demilitarized context.

Lévy's situation in Lyon became immediately problematic when, in conformity with the October 3rd Statute of Jews, he was soon dismissed from his teaching position. On December 19th, 1940, Paul Lévy received the following laconic letter from the Minister of Industrial Production and Labour

*I have the honor to inform you that under the Act of October 3, 1940, you cease to perform your duties in accordance with Article 7 of the said law, from December 20, 1940.*<sup>11</sup>

However, in the first months of Vichy regime, the director of the Ecole Polytechnique, General Henri Calvel, seems to have tried to limit the effects of the discriminations within the school.<sup>12</sup> It may be through his action that a decree in favor of Lévy was published in the Journal Officiel on 14 March 1941.

*The article of the Law of 3 October 1940 on the status of Jews planned that the Jews who provided outstanding services to the State by their scientific literary or artistic work could be excluded from the prohibitions of the aforementioned law.*

*At its meeting of 21 February 1941, the Council of Ministers considered that the benefit of this provision could be applied to Mr. Paul Levy.*

*We, Philippe Pétain, Marshal of France decree:*

*Article One: Mr. Lévy (Paul) mining engineer, professor at the Ecole Polytechnique and the School of Mines is freed from the bans imposed by the Law of October 3, 1940.*<sup>13</sup>

Another decree on 7 May 1941 reestablished Lévy as a member of the Corps des Mines which was his basic affiliation since 1913. Lévy lived in this fragile equilibrium during a little more than one year, teaching at the Ecole Polytechnique established in Lyon. We have some poignant pictures of Lévy's lectures at the Ecole Polytechnique situated in the theatre Comoedia in Lyon in 1941.

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<sup>10</sup> The amazing passage from functional calculus to probability is described in (Mazliak, 2015).

<sup>11</sup> *J'ai l'honneur de vous faire connaître qu'en application de la loi du 3 octobre 1940, vous cessez d'exercer vos fonctions dans les conditions prévues à l'article 7 de la dite loi, à dater du 20 décembre 1940.*

<sup>12</sup> See (Guigueno, 2000), for instance p.64.

<sup>13</sup> *L'article de la loi du 3 octobre 1940 portant statut des Juifs a prévu que les Juifs ayant rendu à l'Etat des services exceptionnels par des travaux littéraires scientifiques ou artistiques pourraient être relevés des interdictions prévues par la dite loi.*

*Au cours de sa réunion du 21 février 1941, le Conseil des ministres a estimé que le bénéfice de cette disposition pouvait être appliqué à Monsieur Paul Lévy.*

*Nous, Philippe Pétain, Maréchal de France décrétons :*

*Article Premier : Monsieur Lévy (Paul) ingénieur des Mines, professeur à l'Ecole Polytechnique et à l'Ecole supérieure des Mines est relevé des interdictions prononcées par la loi du 3 octobre 1940.*

The situation in Summer-Autumn 1942 dramatically changed with the prolongation of the war, the Germans trampling across the Soviet Union and finally the Americano-British landing in North-Africa followed by the German invasion of the south zone of France on November 11th. Though we do not know exactly when and how, Lévy accepted to leave Lyon and to settle down in the only part of France where Jews were still left in relative peace, namely the Italian occupation zone along the Alps. It may seem strange at first glance that the Italians were more generous in France than in Italy itself where the racial laws were applied with rigor. This had nothing to do with humanitarian feelings, but was a part of Mussolini's *realpolitik* desiring to display its independence from both the Germans and Vichy rulers. Lévy was near Grenoble, as his son-in-law, Robert Piron, who was not a Jew, had a position at the Institut polytechnique of this town. On 4 November 1942, Lévy wrote to Fréchet (Barbut & Locker & Mazliak, 2014)

*My dear Colleague,*

*I have received your letter of October 22 and the parcel it mentioned. I have not returned either to Grenoble or Montbonnot, and do not know where I will spend the winter. This explains why your mail has taken 12 days to reach me. Write me at Paul Piron, Polytechnic Institute, 46 Avenue Félix Viallet, Grenoble. Robert Piron, who himself left Montbonnot, will forward.<sup>14</sup>*

Lévy had therefore been absent from Lyon since the end of 1942, and, at the end of the Academic year 1942-43, the new governor of the Ecole Polytechnique wished to sort Lévy out, as the school's return to Paris had been decided. He wrote to the minister, Jean Bichelonne.<sup>15</sup> Bichelonne was an unambiguous supporter of an extreme industrial collaboration but he was also a former brilliant student of the Polytechnique himself, one of Lévy's favourite. His role in Lévy's affairs as we perceive it from the archives was ambiguous : it is quite possible that he was secretly of some help to protect his former professor. On June 1943, Bichelonne wrote :

*I have the honor to inform you that Mr. Paul Levy must be considered as never having ceased to belong to the Corps des Mines (...). I intend to ask the General Secretary for Industrial Production to find a new employment for him. You will have to authorize his salary up until 30 September 1943.<sup>16</sup>*

But *Monsieur le Secrétaire Général à la Production Industrielle*, from whom depended the Corps des Mines, was not pleased at all with the idea of dealing with the case of Lévy. On 8 December 1943, he wrote

*At present, among the 16 inspectors general of Mines 14 are in function and 2 are about to be appointed. The reintegration of Mr. Paul Levy would have the effect of barring the way to one of the*

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<sup>14</sup> *Mon cher Collègue, J'ai bien reçu votre lettre du 22 Octobre et l'envoi qu'elle m'annonçait. Je ne suis pas rentré à Grenoble ni à Montbonnot, et ne sais pas où je passerai l'hiver. Cela explique que votre envoi ait mis 12 jours à m'atteindre. Ecrivez moi à l'adresse Paul Piron, Institut polytechnique, 46 Avenue Félix Viallet, Grenoble- Robert Piron, qui a lui-même quitté Montbonnot, fera suivre.*

<sup>15</sup> On Bichelonne, see (Yagil, 2015).

<sup>16</sup> *J'ai l'honneur de vous faire connaître que M.Paul Lévy doit être considéré comme n'ayant jamais cessé d'appartenir au Corps des Mines (...). J'ai l'intention de le remettre à disposition de Monsieur le Secrétaire Général à la Production Industrielle.*

*promoted senior engineers. (...) It should be noted that Mr. Paul Levy has never held a regular post. One believes it would be difficult to entrust an engineering mission with a normal service to M.Lévy and his reintegration would subsequently freeze the careers in the service and is of no interest to the administration.*<sup>17</sup>

In the last of the war letters sent by Lévy to Fréchet on 29 November 1943, a desperate Lévy wrote

*Moreover, I just learned that I'm not a professor at the Ecole Polytechnique anymore. In early November, a postal check issued to get the money of my October salary was returned to me as "not sufficient funds". I wrote the administration of the school to ask for explanations. On November 24th, I received a copy of a decision dated June 30th by which the school transfers me to the Corps des Mines on October 1st; it is also apparent from the text of the decision that on April 29th, the governor of the school knew already that I was not to be "re-invested in my job" and asked the Minister how long he had to pay me !!! And all this is legal, if one considers as legal a 1941 regulation subjecting teachers to a decennial re-election, regardless of acquired rights. And now what will the Corps des Mines do with me, having left the place in 1913, and can not give me work for which I have no longer any expertise- and, in addition, with a delay of two months before taking up the post. Will it pay me? (...) I deeply hope that 1944 will see the end of these miseries.*<sup>18</sup>

In fact this sordid situation was never resolved, or rather it was resolved only when the Vichy regime was swept away in August 1944. In the meantime, Lévy, with some difficulty, survived in hiding. It is rather a small miracle that he escaped arrest, or worse, as he seems to have been quite often careless, as shown in his correspondence with Fréchet. Laurent Schwartz commented on this carelessness and related it to Lévy's indestructible bourgeois legalism

*Paul Levy couldn't change his very legalistic habits. For a while, he went around carrying both his true and his false identity cards. With all due respect, this was really stupid. One day a German officer in a train asked for his identity card and he accidentally handed him the one in the name of Levy. By a stroke of unheard-of luck, the German*

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<sup>17</sup> *A l'heure actuelle sur 16 inspecteurs généraux des Mines 14 sont en fonction et 2 sont sur le point d'être nommés. La réintégration de M.Paul Lévy aurait donc pour effet de barrer le chemin à l'un des ingénieurs en chef promus. (...) Il convient de noter que M.Paul Lévy n'a jamais fait de service ordinaire. [On] estime qu'il serait difficile de confier un poste d'ingénieur général du service ordinaire à M.Lévy et que la réintégration de M.Lévy aurait pour conséquence de boucher l'avancement sans aucun intérêt pour l'administration.*

<sup>18</sup> *D'autre part, je viens d'apprendre que je ne suis plus professeur à l'Ecole Poly-technique. Au début de novembre, un chèque postal émis pour disposer de mon traitement d'octobre m'est renvoyé comme étant sans provision. J'écris au trésor de l'Ecole pour demander des explications. Je reçois le 24 novembre, copie d'une décision du 30 juin par laquelle l'Ecole me remet le 1er octobre, à la disposition du Corps des Mines ; il ressort d'ailleurs du texte de cette décision que le 29 avril le Gouverneur de l'Ecole savait que je n'étais pas "réinvesti dans mes fonctions" et demandait au Ministre jusqu'à quand il devait me payer !!! Et tout cela est légal, si l'on considère comme légal un statut de 1941 soumettant les professeurs à la réélection décennale, sans tenir compte des droits acquis. Et maintenant que va faire de moi le Corps des Mines, dont j'étais détaché depuis 1913, et qui ne peut me confier des travaux pour lesquels je n'ai plus guère d'aptitude- et à la disposition duquel je ne me mets qu'avec deux mois de retard. Va-t-il me payer ? (...) j'espère bien que 1944 verra la fin de ces misères.*

*paid no attention and handed it back. And Paul Levy immediately got rid of it.*<sup>19</sup>

d- What about the prisoners?<sup>20</sup>

As early as the Fall of 1940, the Germans were interested in reshaping scientific life in occupied Europe and the mathematician Harald Geppert was sent to Paris in order to inquire about the situation of the mathematical community in Paris and in France. Geppert was a committed Nazi and the fanatical Ludwig Bieberbach, the most influential Nazi mathematician, placed him at the head of both German mathematical reviewing journals, the *Zentralblatt* and the *Jahrbuch*.<sup>21</sup> Geppert came to Paris in December 1940 and wrote a long report for the Minister of Education. Geppert's journey and report have been already extensively commented on by Reinhard Siegmund-Schultze in (Siegmund-Schultze, 2002) and I will just concentrate here on one aspect.

Geppert thought that the right strategy in France would be, through personal contacts, to collect the assent of some first-rate mathematicians ready to work inside a new German dominated international mathematical union. On this ground, he decided to meet Gaston Julia, who had for a long time written reviews for the *Zentralblatt*. Geppert described the meeting at length in his aforementioned report. Though Julia was presented as extremely careful in his words and opinions, Geppert remained convinced he was a possible reliable contact for organizing common works between German and French mathematicians.

A peculiarity of the French situation during the Occupation was the gigantic (more than 2 million!) number of prisoners of war kept in Germany. They were young men, the most powerful working force of France, and their absence was a terrible obstacle to the reconstruction of the country. It was also a source of permanent blackmail from the Germans to which Vichy rulers were unable to resist, supposing they had wanted to, with any efficiency. Among these young men there were also some mathematicians. Julia, whose brother, an engineer in electro-technique, was himself a prisoner, immediately mentioned to Geppert his desire to see his brother come back, but other young mathematicians were also mentioned.

*A corresponding request has already been made by the economic side. From our fellow mathematicians four men especially come into consideration whose release would be desirable from a cultural-political point of view, because they are scientists who have worked previously with Germany, or are known for their loyal attitude to Germany.*

*These are the mentioned men*<sup>22</sup>

- 1) Jean Leray Oflag XVII A Nr/11526
- 2) Ville

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<sup>19</sup> (Schwartz, 2001), p.191.

<sup>20</sup> A study about the students and academics prisoners of war is presented in (Durand, 1994).

<sup>21</sup> See (Segal, 2003), in particular p.355.

<sup>22</sup> *Ein entsprechendes Reklamationsgesuch ist auch von wirtschaftlicher Seite bereits gemacht worden. Von Mathematiker-Kollegen kämen insbesondere 4 Herren in Betracht, deren Freilassung aus kultur-politischen Gründen erwünscht wäre, weil es sich um Wissenschaftler handelt, die bereits früher mit Deutschland zusammengearbeitet haben, oder wegen ihrer loyalen Einstellung zu Deutschland bekannt sind. Es sind dies die Herren*

3) *Christian Pauc*

4) *Jean Favard*

The list was later completed by other names such as Robert Mazet, Henri Pailloux, Jean Kuntzmann, Frédéric Roger and Roger Apéry. Geppert obtained eventually the permission to have some of them working for the *Zentralblatt*. Among the names just mentioned, in fact only Jean Ville returned to France in 1941 for reasons we do not clearly know. It is worth mentioning here that Ville had had a direct knowledge of Hitler's Germany at its very beginning as he was in Berlin during the first months of Nazi power. Soon after he returned to France, Ville obtained his first university position in Lyon. Much additional information on Ville can be found in Glenn Shafer's study in the issue of the *Electronic Journal for History of Probability and Statistics* dedicated to the history of martingales, a notion invented by Ville in his PhD criticizing von Mises' collectives.

## 2 - Doing mathematics

So far I have commented on institutional aspects of the mathematical life during the Occupation. But, naturally, scientific continued during the whole period, sometimes in a business-as-usual way, sometimes with an opportunistic manipulation of the background circumstances, and sometimes, when scientists threatened by the new political situation were involved, in an amazing hidden way. Here again, I will only provide some examples of these situations.

### a- François Canac

An instance of an opportunistic use of the new spirit offered by the so-called national revolution is given by the creation of the Center for Scientific, Industrial and Marine Research (*Centre de recherches scientifiques, industrielles et maritimes*) in Marseilles, appearing to have been the first proper laboratory created inside the CNRS in 1941. Its director, the acoustician François Canac (1886-1969) had obtained from Charles Jacob the transformation of the Center for research of the navy (*Centre de recherche de la Marine - CRM*) in Toulon into this new laboratory<sup>23</sup>. Canac had been the head of the CRM since 1920. In fact it was named so only in 1939, the original name was Center for Submarine War (*Centre de Guerre Sous-Marine*), the structure created by Langevin in 1917 in order to make his first experiments on sonars. Canac wished to avoid the suppression of this institution due to the application of Armistice regarding the military research centers. He pleaded that a multidisciplinary structure where the most theoretical aspects of problems as well as their implementation (possibly industrial) were considered together would very much conform to the new spirit of the CNRS. Due to the relative isolation of France from the outside world, the members of the CRSIM published their results as internal notes and not in journals.

Canac seems to have had a quite wide vision of interdisciplinarity. Thus, one of the research team in the new laboratory was devoted to the "algebraic study of human profiles". The basic idea of its leader, Fernand Ozil (1875-1950) a retired professor of mathematics in Toulon who was quite close to Canac, was to use Fourier decompositions of profile curves on various pictures to get the characteristic "harmonics" for the different human races. (Guthleben, 2009) mentions that Ozil's archives are full of profile pictures carefully sorted by race : "Jewish race", "Gitan race", "Yellow race", "Negro race", "German race" and so on. Most of these pictures were provided by the Ministry of Police in Vichy. Several notes were published by Ozil during the years of the Occupation, but it is worth noting that two more notes were

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<sup>23</sup> See (Gazanhes, 2000).

published after the Liberation, under the same title. Up to now, I have not been able to discover any connection between Ozil's research and Georges Montandon or Alexis Carrel's fanatical racist studies of the time. It is at the very least reasonable to think that Canac could not be unaware of the echoes to such research in Vichy France.

#### b- Paul Lévy

Quite far from the limelights of the official stage, some mathematicians, reduced to hiding maintained however an amazing mathematical activity. Though Paul Lévy's case cannot be considered as completely representative of the situation of the others, both because of his personal network inherited from his long duty of professor at the Ecole Polytechnique and of his rather special scientific orientation, it contains several aspects common to each. Lévy had always been quite a singular case in the French mathematical community. His choice of probability theory in the aftermath of the Great War, for instance, when all had prepared him to become the French major junior specialist in functional analysis, was never fully accepted or understood by his mentor Hadamard.<sup>24</sup> Moreover, his relationship with the greatest French probabilist of the time, Emile Borel, was tense as Lévy wished to build probability theory on what seemed to him a sounder basis than Borel's views.<sup>25</sup> Lévy's correspondence with Fréchet, which begins precisely with Lévy's discovery of probability, is therefore of a major help to shed some light on Lévy probabilistic conceptions. In 1940, Lévy had become one of the world major specialists of stochastic processes. And then suddenly, the 55 years old mathematician who had produced a torrential flow of publications for more than 20 years was deprived of the possibility to send articles to journals. Moreover, as we have seen, his teaching tasks were also gradually reduced, and for some months in 1943, living in precarious silence in the Italian zone near Grenoble, Paul Lévy had nothing to do other than mathematics while waiting for better days. His luck was to remain in contact with Fréchet who played for him the role of a private registration journal and could also sometimes serve as a hub between Lévy and other mathematicians. The sequence of the eleven long letters from 1943 kept at the *Académie* (and we know by the contents that there were more letters written) shows a Lévy working day and night to obtain a satisfying description of the set  $E$  of the zeros of the brownian motion trajectory or a good definition for the stochastic integral. They contain a good deal of what was published after the war as an epoch-making book about Brownian motion (Lévy, 1948).

It is not the place here to give details on these sophisticated mathematics<sup>26</sup> but let me however make a small comment related to the particular situation in which Lévy found himself. His clandestine state forced Lévy to go as quickly as possible to the essential in his explanations to Fréchet. Lévy had for sure always been inclined to favor intuitive explanations. This had often been the source of misunderstanding between him and other mathematicians and it fostered the idea that Lévy's works were unreadable.<sup>27</sup> During this clandestine period, urgency made this tendency reach a level never attained before. The following passage of the letter from June 1st proves how Lévy himself was conscious of the fact.

*Theorem: - The stochastic nature of  $E$  is invariant through any homography.*

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<sup>24</sup> See for instance (Barbut & Mazliak, 2008).

<sup>25</sup> See (Lévy, 1970), in particular p.82. On Borel's contrasting approach to probability, see (Bustamante, Cléry & Mazliak, 2015).

<sup>26</sup> For details, the reader can consult (Barbut, Locker & Mazliak, 2014).

<sup>27</sup> See for instance (Itô, 1998).

*I discovered this theorem, as is proved by the P.S. of my Sunday letter, starting from an individual property of the intervals  $e$  whose reunion is complement set of  $E$ . I had proposed, assuming known two roots  $a$  and  $b$  of  $X(t)$  to find the probability that two numbers  $t_0$  and  $t_1$  of the interval  $(a, b)$  belong to the same interval  $e$ , i.e. that they are separated by no root of  $X(t)$ . I found that it depends only on the antiharmonic ratio of the numbers  $a, b, t_0$  and  $t_1$ . As the stochastic nature of  $e$  determines that of  $E$ , the above theorem follows. In fact, it surprised me. But I just found the above explanation relating it to the general properties of the Brownian motion. Although we often disagree on the value of what I call intuitive considerations, I think you share my opinion that this explanation is more interesting than a checking by calculus.<sup>28</sup>*

The brief paper (Lévy, 1943), sent by Lévy afterwards to Switzerland during the Summer 1943, was one of the rare publications by Lévy in this difficult period. Lévy introduced there his construction of the Brownian motion by interpolation as a limit in distribution of a discretized process on a dense sequence of times. The invariance by homography of the formulae obtained for the distribution involved in the process allowed Lévy to assert further properties of invariance for the set of zeros. As in his exchanges with Fréchet, he added in the paper<sup>29</sup> a heuristic explanation based on the invariance of Brownian motion by scaling and time inversion.

### c - Fréchet's activity

As we have seen, Fréchet maintained his connection with Paul Lévy during almost the whole war. In fact, Fréchet with Julia seem to have been the only French mathematicians to keep a permanent visible activity in this difficult period. The delivery of another paper to Fréchet occasioned a journey through Spain and Portugal in 1942. To my knowledge, Julia and Fréchet were the two only French mathematicians to go abroad during this period. If, as we have seen, Julia's political inclinations made the situation plausible, this was really not the case for Fréchet who was perceived as a moderate leftist with his numerous contacts with social scientists such as Maurice Halbwachs,<sup>30</sup> and also as someone not inclined to very positive feelings towards Germany as he had been in charge of the refrancisation of Strasbourg mathematical institute in the 1920s. In the lists established by the Germans as early as Summer 1940 in order to "purify" the professoriate at Paris University, we discover Fréchet's name as a person to be pushed aside ; the first list presents him even as a Jew, which he was not. But somehow, Fréchet's situation regularized and he seemed to have had a quite

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<sup>28</sup> *Théorème* : - La nature stochastique de  $E$  est invariante par n'importe quelle homographie.

*J'ai découvert ce théorème, comme le prouve le P.S. de ma lettre de dimanche, en partant d'une propriété individuelle des intervalles  $e$  dont la réunion constitue l'ensemble complémentaire de  $E$ . Je m'étais proposé, en supposant connues deux racines  $a$  et  $b$  de  $X(t)$  de chercher la probabilité que deux nombres  $t_0$  et  $t_1$  de l'intervalle  $(a, b)$  appartiennent à un même intervalle  $e$ , c'est à dire qu'ils ne soient séparés par aucune racine de  $X(t)$ . J'ai trouvé qu'elle ne dépend que du rapport anharmonique des nombres  $a, b, t_0$  et  $t_1$ . Comme la nature stochastique des  $e$  détermine celle de  $E$ , le théorème ci-dessus en résulte. Il m'a d'ailleurs surpris. Mais je viens d'en trouver l'explication ci-dessus qui le rattache aux propriétés générales du mouvement Brownien.*

*Quoique nous soyons souvent en désaccord sur la valeur de ce j'appelle des considérations intuitives, je pense que vous trouvez comme moi que cette explication est plus intéressante qu'une vérification par le calcul.*

<sup>29</sup> (Lévy, 1943), pp.247-248.

<sup>30</sup> Fréchet and Halbwachs met in Strasbourg at the beginning of the 1920s. They produced together the amazing book (Fréchet and Halbwachs, 1924) which can be considered as one of the first attempt of social mathematics with use of modern probability in French.

normal life during the whole period if we believe his correspondence with Lévy. A remarkable fact is that Fréchet seems not to have had any problems in obtaining the *ausweiser* he needed to travel from the North to the South zones. In 1941, Fréchet took Borel's succession on the *Chaire de Calcul des Probabilités et Physique Mathématique* at the Sorbonne. At this occasion, Fréchet resumed his correspondence with the Italian probabilist Bruno de Finetti. The exchanges between both men give a singular example of how Fréchet tried to continue his prewar activity despite the difficult circumstances. He had been in contact with his Italian colleague since the beginning of the 1930s when both had exchanges about countable additivity for probability,<sup>31</sup> a notion deeply criticized by de Finetti. De Finetti was subsequently invited for conferences at the Institut Henri Poincaré and was even put forward to write a fascicle of comments<sup>32</sup> on the international meeting on modern probability organized by Fréchet in Geneva in 1937.<sup>33</sup> In 1941, the exchanges between both men resumed after being interrupted in 1940 by the events. Fréchet sent a first letter on 28 May 1941, introduced by the following words

*Postal communications are again possible between our two countries and I take the opportunity to ask you about a scientific question. I shall obviously refrain myself from any comment on international events, if only to avoid that my letter be stopped by censorship.*<sup>34</sup>

Fréchet mentioned to de Finetti that he needed to better understand his concept of 'generic' and equivalent events introduced in his IHP conferences. He also informed his Italian colleague about the existence of papers he may have ignored, in particular the talk by Haag at Toronto international congress of mathematicians in 1924 where Haag introduced a model of exchangeability. Fréchet also called his colleague's attention on four notes published by his 'new student Loève' that may interest him. We shall comment later on Loève. Moreover, Fréchet was involved in several tasks he had begun before the war : a reflection about the standardization of statistical terms for the standardization agency AFNOR, several projects about a future laboratory of calculations at the Sorbonne. During the year 1943, he was also very busy with his project of *Aide-mémoire de Statistique Mathématique*. Fréchet wrote to several publishers in May 1943 to enquire about their possible interest for such a publication.

*1 May 1943*

*Dear Publisher,*

*My duties as Professor of Probability Theory and Mathematical Statistics (the only professorship of this kind existing in French universities) have given me the opportunity to see how it would be useful to publish a guide (or aide memoir or small textbook) of mathematical statistics. This would be of great service to a wide and varied audience of professional statisticians, economists, doctors, biologists, psychologists, engineers, astronomers etc.*

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<sup>31</sup> See (Regazzini, 2013).

<sup>32</sup> (de Finetti, 1938).

<sup>33</sup> On these aspects, the forthcoming PhD thesis by Matthias Cléry should provide relevant information.

<sup>34</sup> Les communications postales étant rétablies entre nos deux pays, j'en profite pour vous adresser une question d'ordre scientifique. Je m'abstiendrai naturellement de toute mention des événements internationaux, ne serait-ce que pour éviter de voir ma lettre arrêtée par la censure.

*There is already such a textbook, but it is written in English. It was published in America by ten collaborating authors, under the direction of one of them.*

*I am simply asking you to let me know if the publication of a book of the same nature in French may interest you. This would not be in fact for an immediate publication due to the current difficult circumstances, but an agreement to begin immediately the writing of just such a book in order to be able to undertake the publication as soon as normal conditions return.<sup>35</sup>*

As seen from the previous letter, Fréchet was playing on a two-level time scale, typical of the period, the year 1943 being the hardest in France with the Germans beginning to be seriously threatened after Stalingrad and the Anglo-American landing in North-Africa. In the short term, Fréchet wanted to gather collaborators to write the book he planned. But he knew that publication itself would be postponed to the, as yet unclear, future.

The publisher Masson accepted the project. During the Summer, Fréchet wrote to some fifteen people to propose a participation. A few refused such as Léopold Durgé de Bernonville (1880-1962), the editor of the Bulletin de la Statistique Générale de la France and a professor at the Statistical Institute of Paris university (ISUP) who wrote to Fréchet to decline his proposition due to the death of his son who was prisoner of war in Hamburg and died during an American bombing of the city. But most accepted and in November 1943, Fréchet was in position to write a circular letter to his contributors with a description of the project. Fréchet's group gathered people with a large spectrum of interest. There were some of his former students at the IHP, who had defended a thesis in probability at the end of the 1930s, such as Robert Fortet, Jean Ville or Gustave Malécot,<sup>36</sup> the three having just obtained their first university position in occupied France.<sup>37</sup> He asked also older members of his network to participate, forming a group with a wide spectrum of interests. Specialists in mathematical finance such as Henri Eyraud, actuaries such as Lucien Féraud, engineers such as Maurice Dumas, economists such as François Divisia or Maurice Roy, biologists such as Georges Teissier and others. Fréchet also used this occasion to help people in a difficult personal situation. He proposed Ky Fan,<sup>38</sup> a Chinese student who arrived in France in 1939 and defended a PhD in 1941 under Fréchet's direction to act as a secretary of the publication.

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<sup>35</sup> <sup>35</sup> 1er mai 1943

Monsieur l'Editeur,

Mes fonctions de Professeur titulaire de Calcul des Probabilités et Statistique Mathématique (la seule chaire de cette nature existant dans les universités françaises) m'ont donné l'occasion de constater combien serait utile la publication d'un formulaire (ou aide-mémoire ou manuel) de statistique mathématique. Celui-ci rendrait de grands services à un public étendu et varié de statisticiens professionnels, économistes, médecins, biologistes, psychologues, ingénieurs, astronomes etc.

Il existe bien un tel manuel mais il est rédigé en anglais. Il a été publié en Amérique par une dizaine d'auteurs en collaboration, sous la direction de l'un d'eux.

Je viens vous prier de me faire savoir si la publication d'un ouvrage de même nature, en français, vous intéresserait. Il ne s'agit pas du reste d'une impression immédiate dans les circonstances difficiles actuelles, mais d'un accord en vue de la rédaction, à commencer immédiatement, de ce livre, afin d'être en état d'en entreprendre l'impression dès le retour des conditions normales.

<sup>36</sup> See (Leloup, 2010).

<sup>37</sup> Fortet was appointed in Caen in 1942, Ville and Malécot in Lyon in 1943.

<sup>38</sup> Few documents are still available on Ky Fan's amazing life. After his French period, he eventually went to USA and finished his life as professor at the University of California. There is a wikipedia page on him with a few references.

He also proposed a chapter to the Russian refugee Vladimir Kostitzin<sup>39</sup> who gladly accepted the task in a difficult time for him.

The difficulties anticipated by Fréchet were in fact worse than expected and the book was never published, and probably never written. During the hard first semester of 1944, there was scant desire to set their minds to the task. At least, Fréchet did not forget his student Ky Fan as is proved by the publication, soon after the end of the war in 1946, of a small book *Introduction to combinatorial topology*<sup>1</sup> written by them both (Fan & Fréchet, 1946).

The fact that Fréchet helped several mathematicians in difficulty during the occupation is also testified by Maurice Loève's case. Michel Loève,<sup>40</sup> who had defended a thesis in probability in 1941, was in 1944 prisoner in a camp for British nationals where he was sent with his wife : his extraordinary luck was that, due to his British passport obtained during his childhood in Egypt, the Germans accepted, possibly partly on Fréchet's insistence, his transfer out of the camp in Drancy where he was first transferred as a Jew. Loève remained in contact with Fréchet (and through him with Lévy) during the whole war. In July 1944, as shown by an amazing postcard sent from Loève's prisoner camp in Vittel, Fréchet obtained a prize for his PhD.

## Conclusion

As mentioned above, the present paper gives obviously only a scattered picture of the intricate situation of mathematical activity in France during WW2. I presented a kind of patchwork intending to illustrate the complex situation in which the mathematicians of the period (as the country as a whole) tried to find a way to live among these difficult circumstances. Apart from the persecuted parts of the population (communists, freemasons, and above all Jews who were proportionally more numerous in education, and especially in universities, than in other domains of activity), and from the small number of committed followers of the new regime, we mostly find in this picture the grey zone of a community trying to adapt to the difficulties of time in order to be able to go on with business as usual. This in turn frequently led to ambiguous situations in which many scientists, often politically committed to the left, accepted to play the role Vichy attributed to them, including the propaganda and the repression programs. At the Liberation, except for a tiny number of fanatical collaborators, the scientific community was left untouched by the fourth Republic. For many people, the period of the occupation and its ambiguities heralded the end of the scientist-politician that the first half of the century had known (think about Painlevé or Borel among mathematicians) and the beginning of a technocratic governance of science.

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<sup>39</sup> On Kostitzin, the forthcoming thesis (Perfettini, 2018) will provide important information.

<sup>40</sup> On Loève, consult (Simon, 2010).

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